Power and sensing
Selection guide 2022
Dear customer,

Thank you for downloading the Power and Sensing Selection Guide 2022 edition. This guide was created to eliminate choice overload by arranging our broad, cutting-edge portfolio and game-changing solutions around applications and technologies in a synthesized and easy-to-digest format.

The intelligent world we are living in brings new challenges and exciting opportunities for all of us in decarbonization and digitalization. The fusion of present and emerging technologies promises a digital, connected, and sustainable future. At Infineon, we not only want to be a part of this future, but we want to shape it - TOGETHER with you.

We continuously push technology limits to enable the advanced solutions of tomorrow. For your benefit, we bring products to systems maximizing your value. Our leading competencies in power, sensors, security, connectivity, and computing supported by our software expertise, application understanding, and outstanding quality leadership are part of our commitment to you.

Thanks to you and your trust in our company, we are the global leader in the power semiconductor market with our discrete and integrated silicon and wide-bandgap devices.

But we don’t stop there! Following our long-term manufacturing strategy, we opened a state-of-the-art 300 mm wafer fab in Villach, Austria, and have started further expanding our frontend capacity in Kulim, Malaysia. With an additional €2 billion expenditure, we aim to add significant manufacturing capacities in wide bandgap (SiC and GaN) semiconductors. All these investments we make to enhance our supply security, increase our manufacturing flexibility and enable faster time to market for our customers.

As we grow, our responsibility grows - not only for the customers and employees, but also for the planet. Through our solutions, we make green energy happen within the entire power chain. This, in combination with our goal to achieve CO₂ neutrality by 2030, will have a significant impact on the world’s CO₂ balance.

Sustainability and innovation are in our DNA, and our customers are at the heart of everything we do.

Adam White,
Division President of Power and Sensor Systems
电源与传感系统事业部总裁

尊敬的客户，

感谢您下载《2022电源与传感选型手册》（以下简称“手册”）！本手册的目的是通过以综合且易于理解的方式，根据具体应用和技术来优化推荐更广泛、更领先的产品组合以及能够改变游戏规则的解决方案，从而帮助您减轻方案选择过程中的许多负担。

我们生活在一个智能世界，这当中许多人都会在减少碳排放和数字化方面面临新的巨大挑战和激动人心的机遇。现有技术和新兴技术的融合预示着未来将更加注重数字化、互联和可持续性，而对于英飞凌，我们不仅要参与这个美好未来的建设，而且还要与您一起来塑造更美好的未来！

为了能够提供面向未来的先进解决方案，我们正在不断突破技术极限。出于对客户的考虑，我们在为具体应用提供产品时将为您实现更大的价值。英飞凌拥有在电源、传感器、安全、连接和计算等方面的领先竞争力，深入的软件专业知识、应用理解和卓越的质量保证，这是我们对客户的一贯承诺。

正是您的大力支持和对英飞凌的长期信任，我们才得以凭借广泛和先进的分立与集成电路，以及宽带隙器件成为功率半导体市场的全球领先厂商。

但我们不会就此止步。根据我们的长期制造战略，英飞凌已经在奥地利菲拉赫（Villach，Austria）开设了先进的300毫米晶圆厂，并进一步扩大了我们在马来西亚居林（Kulim，Malaysia）的前端产能。通过额外的20亿欧元投资，我们的目标是大幅提高宽带隙（SiC和GaN）半导体的制造能力。所有这些投资是为了增强我们的供货安全保证，提升我们的制造灵活性，并帮助客户加快上市速度。

伴随我们业务的不断增长，我们也在承担更多的责任。在对客户和员工提供更多支持和关爱的同时，我们也更加关注自然环境。英飞凌解决方案已经在整个功率链路完全实现绿色能源目标，这与到2030年实现二氧化碳中和的目标相结合，将对全球二氧化碳的平衡产生重大影响。

可持续发展和创新刻在我们的DNA中，而客户则是我们所有关注的核心。

Adam White
Division President of Power and Sensor Systems
电源与传感系统事业部总裁
Dear users!
Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

**Contents**

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMPS</td>
<td>4</td>
</tr>
<tr>
<td>SMPS - server power supply</td>
<td>5</td>
</tr>
<tr>
<td>SMPS - telecom power supply</td>
<td>7</td>
</tr>
<tr>
<td>SMPS - industrial SMPS</td>
<td>10</td>
</tr>
<tr>
<td>SMPS - PC power supply</td>
<td>12</td>
</tr>
<tr>
<td>SMPS - TV power supply</td>
<td>13</td>
</tr>
<tr>
<td>Power over Ethernet</td>
<td>16</td>
</tr>
<tr>
<td>Fast/wireless EV charging</td>
<td>18</td>
</tr>
<tr>
<td>Wireless charging for consumer/industrial</td>
<td>23</td>
</tr>
<tr>
<td>USB-C chargers and adapters</td>
<td>27</td>
</tr>
<tr>
<td>SMPS - battery chargers</td>
<td>29</td>
</tr>
<tr>
<td>Battery management systems</td>
<td>31</td>
</tr>
<tr>
<td>Battery protection</td>
<td>31</td>
</tr>
<tr>
<td>Battery monitoring</td>
<td>33</td>
</tr>
<tr>
<td>Relay replacement</td>
<td>36</td>
</tr>
<tr>
<td>Motor control</td>
<td>38</td>
</tr>
<tr>
<td>Low-voltage motor drive and control</td>
<td>38</td>
</tr>
<tr>
<td>High-power low-voltage motor drive</td>
<td>41</td>
</tr>
<tr>
<td>Uninterruptible power supply</td>
<td>45</td>
</tr>
<tr>
<td>Contactless power and sensing</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applications</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appliances and consumer electronics</td>
<td>52</td>
</tr>
<tr>
<td>Major home appliances</td>
<td>53</td>
</tr>
<tr>
<td>Small home appliances</td>
<td>58</td>
</tr>
<tr>
<td>Power and gardening tools</td>
<td>62</td>
</tr>
<tr>
<td>Wrist-worn devices</td>
<td>64</td>
</tr>
<tr>
<td>Class D audio amplifiers</td>
<td>67</td>
</tr>
<tr>
<td>Smart speaker</td>
<td>69</td>
</tr>
<tr>
<td>Surveillance camera</td>
<td>71</td>
</tr>
<tr>
<td>LED lighting</td>
<td>73</td>
</tr>
<tr>
<td>Plug &amp; LEDs play solutions</td>
<td>75</td>
</tr>
<tr>
<td>Smart lighting solutions</td>
<td>76</td>
</tr>
<tr>
<td>ITC solutions</td>
<td>81</td>
</tr>
<tr>
<td>Renewables - residential and commercial</td>
<td>84</td>
</tr>
<tr>
<td>solar infrastructure &amp; energy storage systems</td>
<td></td>
</tr>
<tr>
<td>Robotics</td>
<td>91</td>
</tr>
<tr>
<td>Onboard chargers for xEV applications</td>
<td>94</td>
</tr>
<tr>
<td>Light electric vehicles and forklift</td>
<td>97</td>
</tr>
</tbody>
</table>

| 20-300 V MOSFETs                                | 100  |
| 500-950 V MOSFETs                               | 136  |
| Gate-driver ICs                                 | 167  |
| Digital isolators                               | 199  |
| Discrete IGBTs and silicon power diodes         | 204  |
| Intelligent power switches and modules          | 224  |
| Microcontrollers                                | 242  |
| Power management ICs                            | 273  |
| Wide bandgap semiconductors                     | 350  |
| XENSIV™ sensors                                 | 372  |
| Packages                                        | 427  |
| Infineon Customized Solutions                   | 433  |
| The Infineon Partner Program                    | 436  |
Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
The trend in the field of data center and enterprise servers is to deliver more power per rack. Meanwhile, the rising cost of energy and environmental concerns make SMPS efficiency optimization a key requirement across the entire load range for server and data center designs. This challenging task is combined with the requirement for higher power, higher power density, and cost effectiveness.

In the PFC stage and generally in hard-switching topologies used in server applications, Infineon recommends its 600 V CoolMOS™ C7 and G7 families offering the lowest FOM $R_{D\cdot\text{on}}\cdot Q_G$ and $R_{D\cdot\text{on}}\cdot E_{oss}$. These MOSFET series provide the lowest switching losses, which is necessary in fast-switching-frequency operations in high-end server SMPS. With Infineon’s C7 and G7 series, the efficiency is optimized already from a very light-load operation. Available in compact SMD packages such as ThinPAK, DDPAK, and TOLL, these SJ MOSFETs offer benefits in space usage and power density. The 600 V CoolMOS™ C7 and G7 products are best used with Infineon’s industry-benchmark, the non-isolated EiceDRIVER™ 2EDN752x and the isolated EiceDRIVER™ Compact 1ED AF gate driver families.

Complementary to the 600 V CoolMOS™ C7 in high efficiency PFC are the CoolSiC™ Schottky diodes. The 600 V CoolMOS™ P7 family offers a good compromise between price and performance. This is valuable in both PFC and HV DC-DC stages where low $Q_G$ and turn-off losses are important benefits, especially in case of high-switching-frequency operations and high light-load efficiency requirements.

As high power (2-6 kW and above) requires ultrahigh efficiency (96-98 percent peak) and high power density, Infineon’s CoolGaN™ GIT HEMT 600 V family with totem-pole PFC controls deliver the highest efficiency and power density in the world. Using the 600 V CoolMOS™ S7 devices with active bridge circuit fulfills the Titanium® requirement at the lowest cost. Operating expenses (OPEX) and capital expenditures (CAPEX) are both reduced through simplified topologies and the power density in the server PSU is doubled.

In applications with low output voltage and high output current, further efficiency improvements are enabled by the continuous reduction of on-resistance. This can be achieved by using Infineon’s low-voltage OptiMOS™ MOSFET series in the synchronous rectification stage. Infineon’s low-voltage products are complemented by StrongIRFET™ devices that are optimized for lower switching frequencies and highest system robustness. Infineon’s EiceDRIVER™ gate-driver IC family perfectly matches the CoolGaN™ and CoolSiC™ wide-bandgap products, and CoolMOS™ and OptiMOS™ MOSFET products.

In addition, ISOFACE™ digital isolators, based on the Infineon’s coreless transformer (CT) technology, provide robust galvanic isolation for safety requirements.

www.infineon.com/smps
## Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PFC</strong></td>
<td>High-voltage MOSFETs</td>
<td>CCM/interleaved PFC, TTF</td>
<td>CoolMOS™ C7</td>
<td>Best FOM, low $R_{DS(on)}$, and $R_{ON,Max}$; Lowest $R_{ON,Max}$ per package; Low dependence of switching losses form $V_{DS}$; Enables highest efficiency and highest power density</td>
</tr>
<tr>
<td></td>
<td>High-voltage GaN</td>
<td>TSTP™</td>
<td>650 V</td>
<td>Enable the highest efficiency and highest power density</td>
</tr>
<tr>
<td></td>
<td>High-voltage SiC MOSFET</td>
<td>TSTP™</td>
<td>650 V</td>
<td>Highest power handling capability; Highest temperature handling</td>
</tr>
<tr>
<td><strong>SiC diodes</strong></td>
<td>CCM/interleaved PFC</td>
<td>CoolSiC™ Schottky diode 650 V</td>
<td>Low FOM Q V</td>
<td></td>
</tr>
<tr>
<td><strong>Control ICs</strong></td>
<td>CCM/PCIC</td>
<td>CoolIC™ 350G</td>
<td>Easy of use</td>
<td></td>
</tr>
<tr>
<td><strong>Gate driver ICs</strong></td>
<td>TSTP™</td>
<td>EiceDRIVER™ 1EDF1672F and 1EDF672K</td>
<td>Negative $V_{DS}$ voltage to avoid false triggering; Differential output for GIT technology based GaN driving</td>
<td></td>
</tr>
<tr>
<td><strong>SiC MOSFET gate driver ICs</strong></td>
<td>TSTP™</td>
<td>EiceDRIVER™ 2EDF975/1/2EDF975/1</td>
<td>37 m/45 ns typical propagation delay time; Functional isolation 5 kV</td>
<td></td>
</tr>
<tr>
<td><strong>Gate driver ICs</strong></td>
<td>Interleaved PFC</td>
<td>EiceDRIVER™ 1EDN7542 / 1EDN7542 for Kelvin-sourceCoolMOS™</td>
<td>Source and sink driver capability: -5 A for 2EDN -4 A/4 A for 1EDN -17 ns for 1EDN (650 V) propagation delay precision for fast MOSFET and GaN switching -650 V half bridge SOT driver with integrated bootstrap diode -Improved ruggedness and high efficiency in low inductance designs</td>
<td></td>
</tr>
<tr>
<td><strong>Boost PFC</strong></td>
<td>TSTP™</td>
<td>EiceDRIVER™ 2EDF2417/201F</td>
<td>Dual-channel, 10 A low-side driver in DSO8 with power-pool Integrated ULD protection and enable (EN) function High frequency, high power operation with BDM savings -4A/4A high low-side gate driver</td>
<td></td>
</tr>
<tr>
<td><strong>Main stage</strong></td>
<td>High-voltage MOSFETs</td>
<td>ITTF</td>
<td>600 V CoolMOS™ C7</td>
<td>Fast switching speed for improved efficiency and thermal losses Low gate charge for enhanced high-load efficiency and low power consumption at no-load condition Optimized $V_{DS}$ threshold for lower turn-off losses Rugged body diode which prevents device failure during hard commutation</td>
</tr>
<tr>
<td></td>
<td>LLC, half-bridge below 1 kW</td>
<td>CoolMOS™ C7/CF, CFDT</td>
<td>Low turn-off losses Low $Q_{on}$ Low $Q_{off}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LLC, phase-shift full-bridge below 1 kW</td>
<td>CoolMOS™ C7/CF, CoolMOS™ CFD2</td>
<td>Fast and rugged body diode Optimized low $Q_{on}$ and soft commutation behavior to reach highest efficiency Highest reliability for 650 V$_{DS}$</td>
<td></td>
</tr>
<tr>
<td><strong>ZVS PS FB, LLC, TTF</strong></td>
<td>650 V 18kHz/STP™ 484 F5</td>
<td>Improved ruggedness and high efficiency in low inductance designs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control ICs</strong></td>
<td>HB LLC ICs</td>
<td>ICEHS8540, ICEHS8541G</td>
<td>High efficiency and low EMI</td>
<td></td>
</tr>
<tr>
<td><strong>Gate driver ICs</strong></td>
<td>LLC, ZVS phase-shift full-bridge, TTF</td>
<td>EiceDRIVER™ 2EDS1604, 2EDS256H</td>
<td>37 m/17 ns typical propagation delay time; Reinforced (safe) isolation 6 kV CMTI -150 Vms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ Compact: 1EDE6024SF, 1EDE3248M12F</td>
<td>Isolated gate driver, up to 14 A, 100 ns propagation delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ 2EDH6421AF with pulse transformer</td>
<td>5 A source and sink driver capability 17 ns propagation delay precision for fast MOSFET and GaN switching</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ low side: 2EDD427/201F</td>
<td>Double-channel, 10 A low-side driver in DSO8 with power-pool Integrated ULD protection and enable (EN) function High frequency, high power operation with BDM savings -4A/4A high low-side gate driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ level-shift: 1EDS1604SF, 1EDS14506J</td>
<td>650 V half bridge SOT driver with integrated bootstrap diode -650 V half bridge SOT driver with integrated bootstrap diode -Improved ruggedness and high efficiency in low inductance designs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Synchronous rectification</strong></td>
<td>Low-voltage MOSFETs</td>
<td>TSTP™</td>
<td>600 V CoolMOS™ C7/CF, CFD2</td>
<td>Very low EMI, high efficiency over whole load range, layout tolerance</td>
</tr>
<tr>
<td></td>
<td>ZVS PS FB and center tap</td>
<td>OyoMOS™ 40V</td>
<td>High efficiency over whole load range, layout tolerance</td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary power supply</strong></td>
<td>Control ICs</td>
<td>QRF/FF-flyback CoolSET™</td>
<td>Very low EMI, high efficiency over whole load range, layout tolerance</td>
<td></td>
</tr>
<tr>
<td><strong>Isolation</strong></td>
<td>Digital isolator</td>
<td>-</td>
<td>20/40 F</td>
<td>2°C digital isolator with TTL input threshold and fail-safe default low output state 3 kHz isolation voltage (UL 1577) in DSO8 package High common mode transient immunity &gt; 100 kV/us</td>
</tr>
<tr>
<td><strong>Housekeeping</strong></td>
<td>Microcontrollers</td>
<td>-</td>
<td>XMC1xx</td>
<td>Flexibility, HPI, PWM, digital communication 3° C based standard (HCS) family and wide family</td>
</tr>
<tr>
<td><strong>Conversion</strong></td>
<td>Microcontrollers</td>
<td>-</td>
<td>XMC4xx</td>
<td>Flexibility, HPI, PWM, digital communication</td>
</tr>
</tbody>
</table>
The ever increasing data consumption, coupled with new levels of virtualization and complexity of the 5G telecom infrastructure, is bringing its demanding requirements into the telecom power arena. The outstanding improvements made in telecom SMPS performance in the past decade have been primarily brought by the dramatic reduction of the on resistance achieved in high voltage MOSFETs, using the revolutionary superjunction principle. This principle was introduced by Infineon at the end of the nineties with the CoolMOS™ series.

To achieve the current demanding, flat energy efficiency targets, it has been increasingly popular to employ synchronous rectification utilizing the unique performance of medium-voltage OptiMOS™ power MOSFETs. The OptiMOS™ power MOSFET family, which has gained terrific popularity in DC-DC brick solutions, coupled with gate-driver ICs and microcontrollers efficiently powers the BBUs, RRUs and AAUs of the macro and the small cells.

Infineon’s wide bandgap technologies, such as the CoolGaN™ 600 V (gallium-nitride-based) and the CoolSiC™ 650 V (silicon-carbide-based) for primary side and the upcoming CoolGaN™ 100 V/200 V* for synchronous rectification, complement the wide portfolio of silicon-based switches, enabling highest electrical conversion efficiency and robustness at attractive system costs. Infineon’s EiceDRIVER™ gate driver IC family perfectly matches the CoolGaN™ and CoolSiC™ wide bandgap products, and CoolMOS™ and OptiMOS™ MOSFET products.
## Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PFC</strong></td>
<td>High-voltage MOSFETs</td>
<td>Classic CCM/interleaved PFC</td>
<td>Dual-boost PFC</td>
<td>600 V/650 V CoolMOS™-CT</td>
</tr>
<tr>
<td><strong>High-voltage GaN</strong></td>
<td>CCM totem-pole PFC</td>
<td>CoolSiC™ 650 V</td>
<td></td>
<td>600 V CoolMOS™-PT</td>
</tr>
<tr>
<td><strong>High-voltage SiC MOSFET</strong></td>
<td>CCM totem-pole PFC</td>
<td>CoolSiC™ 650 V</td>
<td></td>
<td>600 V CoolMOS™-ST</td>
</tr>
<tr>
<td><strong>SiC diodes</strong></td>
<td>Classic CCM/interleaved PFC</td>
<td>Dual-boost PFC</td>
<td>CoolSiC™ Schottky diode 650 V 66</td>
<td></td>
</tr>
<tr>
<td><strong>Control ICs</strong></td>
<td>CCM PFC ICs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GaN gate-driver ICs</strong></td>
<td>Totem-pole PFC</td>
<td>EiceDRIVER™ 2EDF375F/1EDB375F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SiC MOSFET gate-driver ICs</strong></td>
<td>Totem-pole PFC</td>
<td>EiceDRIVER™ 2EDF375F/1EDB375F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gate-driver ICs</strong></td>
<td>Totem-pole PFC</td>
<td>EiceDRIVER™ 2EDF375F/1EDB375F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interleaved dual-boost PFC</strong></td>
<td></td>
<td>EiceDRIVER™ 2EDF375F/1EDB375F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DC-DC main stage</strong></td>
<td>High-voltage MOSFETs</td>
<td>TFF, TITF</td>
<td>600 V CoolMOS™ C/PCT</td>
<td></td>
</tr>
<tr>
<td><strong>HB/BLL LLC</strong></td>
<td>600 V CoolMOS™-PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GaN gate-driver ICs</strong></td>
<td>ZVS P5SB</td>
<td>600 V CoolMOS™-CFD7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gate-driver ICs</strong></td>
<td>ZVS phase-shift full-bridge</td>
<td>EiceDRIVER™ 2EDF375F/1EDB375F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control ICs</strong></td>
<td>ZVS phase-shift full-bridge</td>
<td>ICE1HS01G-1, ICE2HS01G</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GaN gate-driver ICs</strong></td>
<td>ZVS phase-shift full-bridge</td>
<td>ICE5QRxx80BG</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High-voltage GaN</strong></td>
<td>ZVS phase-shift full-bridge</td>
<td>CoolSET™ 600 V</td>
<td></td>
<td>600 V CoolMOS™-C/PCT</td>
</tr>
<tr>
<td><strong>Synchronous rectification</strong></td>
<td>Low-voltage MOSFETs</td>
<td>Synchronous rectification MOSFET</td>
<td>OptimOS™ 40-200 V</td>
<td></td>
</tr>
<tr>
<td><strong>Gate-driver ICs</strong></td>
<td>Synchronous rectification</td>
<td>EiceDRIVER™ 2EDF725K (with pulse transformer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control ICs</strong></td>
<td>ZVS phase-shift full-bridge</td>
<td>ICE2HS01G-1, ICE2HS01G</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary power supply</strong></td>
<td>5th generation QR/FF flyback CoolSET™</td>
<td>QRF 800 V - ICE5QR60x8BG</td>
<td>300 W - ICE5QR60x8AG</td>
<td></td>
</tr>
<tr>
<td><strong>Housekeeping</strong></td>
<td>Microcontrollers</td>
<td>-</td>
<td>XMC1xx</td>
<td></td>
</tr>
<tr>
<td><strong>Power conversion</strong></td>
<td>Microcontrollers</td>
<td>-</td>
<td>XMC1xx, XM1xxx</td>
<td></td>
</tr>
<tr>
<td><strong>Isolated DC-DC</strong></td>
<td>Microcontrollers</td>
<td>-</td>
<td>XDP1110</td>
<td></td>
</tr>
</tbody>
</table>
For more details on the product, click on the part number, visit infineon.com or contact our product support.

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Or-ing</td>
<td>Low-voltage MOSFETs</td>
<td>Or-ing MOSFET</td>
<td>OptiMOS™ 60-200 V</td>
<td>Industry’s lowest FOM (RDS(on)*Qg) leading to high efficiency at good price/performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Back-to-back disconnect</td>
<td>OptiMOS™ 80-200 V StrongIRFET™ 80-200 V</td>
<td>Low-voltage overshoots enabling easy design-in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>PSoC™ 4</td>
<td>Industry’s lowest Low RDS(on)</td>
</tr>
<tr>
<td>Battery management and protection</td>
<td>Low- and medium-voltage MOSFETs</td>
<td>-</td>
<td>ISO11898 compliant</td>
<td></td>
</tr>
<tr>
<td>Microcontroller</td>
<td>-</td>
<td>Lin</td>
<td>Low- and medium-voltage MOSFETs Back-to-back disconnect</td>
<td>Robust communication without the need of transformers or common-mode chokes</td>
</tr>
<tr>
<td>Current sensing</td>
<td>Coulomb count</td>
<td>TLE4971</td>
<td>-</td>
<td>Training accuracy even after soldering thanks to stress sensor technology</td>
</tr>
<tr>
<td>Battery management IC</td>
<td>-</td>
<td>CAN</td>
<td>-</td>
<td>Functional isolation for high-voltage applications</td>
</tr>
<tr>
<td>Small signal N/P channel MOSFET</td>
<td>Cell balancing</td>
<td>OptiMOS™ 20-30 V StrongIRFET™ 20-30 V</td>
<td>-</td>
<td>Perfect match of robust and excellent price/performance</td>
</tr>
<tr>
<td>Communication</td>
<td>-</td>
<td>CAN</td>
<td>-</td>
<td>Optimum solution</td>
</tr>
<tr>
<td>Security</td>
<td>-</td>
<td>OPTIGA™ Trust M</td>
<td>-</td>
<td>Longest battery lifetime</td>
</tr>
<tr>
<td>Isolated DC-DC</td>
<td>Microcontrollers</td>
<td>XDP™</td>
<td>-</td>
<td>Optimized for flexible power conversion</td>
</tr>
<tr>
<td>Low-voltage MOSFETs</td>
<td>Primary-side PWM MOSFETs</td>
<td>OptiMOS™ 60-200 V StrongIRFET™ 80-200 Small-signal MOSFETs 60-200 V</td>
<td>-</td>
<td>Highest system efficiency and power density</td>
</tr>
<tr>
<td>Synchronous rectification MOSFET</td>
<td>OptiMOS™ 40-100 V StrongIRFET™ 40-100</td>
<td>-</td>
<td>-</td>
<td>Reduces the need for a snubber circuit</td>
</tr>
<tr>
<td>Or-ing MOSFET</td>
<td>OptiMOS™ 25-30 V StrongIRFET™ 25-30 V</td>
<td>-</td>
<td>-</td>
<td>Available in LGA-13 5x5 mm package</td>
</tr>
<tr>
<td>Active snubber</td>
<td>OptiMOS™ power MOSFET 60 V/100 V/150 V</td>
<td>-</td>
<td>-</td>
<td>Available in LGA-13 5x5 mm package</td>
</tr>
<tr>
<td>Gate-driver ICs</td>
<td>Primary side</td>
<td>EiceDriver™ E2DF7275K</td>
<td>-</td>
<td>Functional isolation up to 650 VDC channel-to-channel isolation</td>
</tr>
<tr>
<td></td>
<td>Synchronous rectification</td>
<td>EiceDriver™ E2DF7275K</td>
<td>-</td>
<td>Functional isolation up to 650 VDC channel-to-channel isolation</td>
</tr>
<tr>
<td></td>
<td>Low side: EiceDriver™ 2EDN75x/2EDN65x, 1EDN75x/1EDN65x</td>
<td>EiceDriver™ E2ED811x/2EDL801x</td>
<td>-</td>
<td>Functional isolation up to 650 VDC channel-to-channel isolation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EiceDriver™ E2ED811x/2EDL801x</td>
<td>-</td>
<td>Functional isolation up to 650 VDC channel-to-channel isolation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low side: EiceDriver™ 2EDN75x/2EDN65x, 1EDN75x/1EDN65x</td>
<td>EiceDriver™ low-shift: IRS21865, IRS21864S</td>
<td>4 A 4 A high- and low-side gate driver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EiceDriver™ low-shift: IRS21865, IRS21864S</td>
<td>-</td>
<td>Dual-channel, 10 A low-side gate driver in PG-DSON package with power-pad</td>
</tr>
</tbody>
</table>

Click here for more information on ICT solutions.

www.infineon.com/smps
Industrial SMPS powers a wide range of devices from industrial automation robots to medical equipment and vending machines. With the expansion of the Internet of Things (IoT) and the adoption of Industry 4.0, the demand for industrial SMPS is on the rise. Industrial switch-mode power supplies (SMPS) are mostly operated in outdoor environments without air conditioning or systems without fans. Such operating conditions make reliability and robustness the key requirements for the industrial SMPS, especially when it comes to high-temperature operations, outdoor use, line surges, load jumps, short circuit, and so on. In addition to quality, reliable supply and long-term product availability are also some of the key customer concerns. Industrial SMPS life cycle goes beyond 10 years and it takes 3 to 5 years to ramp. Hence, not only do customers need high-quality products, but also stable and reliable supply over the industrial SMPS life cycle (10 to 20 years).

Infineon meets all of these requirements with its CoolMOS™, OptiMOS™, StrongIRFET™ and EiceDRIVER™ gate-driver product families. Infineon's products offer the best price/performance ratio along with the highest efficiency and reliability. For new designs, we recommend our CoolMOS™ P7 600 V/800 V/950 V parts, as well as the latest generation of OptiMOS™ 30 V/40 V/60 V/80 V/100 V/150 V and 250 V products. For high-power designs with convection cooling and high power supplies, our CoolMOS™ S7 in active bridge configuration will reduce the power losses to enable fanless operation. In addition, the ISOFACE™ digital isolators, based on the Infineon’s coreless transformer (CT) technology, provide robust galvanic isolation for safety requirements.

Application diagrams

www.infineon.com/smps
## Product portfolio

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Technology</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| PFC/Main stage            | High-voltage MOSFETs | CrCM/DCM PFC | 600 V/800 V/1000 V CoolMOS™ P7 | › Best thermal performance  
› Rugged body diode  
› ESD enhancement for production line  
› Wide R\(_{\text{DS(on)}}\) portfolio including both THD and SMD packages  
600 V CoolMOS™ P6 | Fast-switching speed for improved efficiency and thermal stability  
› Low gate charge for enhanced light-load efficiency and low power consumption at no load condition  
› Optimized V\(_{\text{th}}\) threshold for low turn-off losses  
600 V CoolMOS™ S7 | PFC efficiency boost ~1%  
› Lowest R\(_{\text{DS(on)}}\) in SMD packages |
|                           |                  |                     |                     |                                                                          |
|                           |                  | Totem-pole PFC      | CoolSiC™ 650 V      | › Highest power handling  
› Best thermal capability  
Boost diodes               |                  | DCM PFC             | 650 V Rapid 1        | Low conduction losses  
CCM PFC                   |                  | 650 V Rapid 2        | Low reverse recovery losses and PFC switch turn-on losses  
Control ICs               |                  | CCM PFC ICs         | ICE3PCS06G           | High PFC and low THD  
Main stage                |                  | HB LLC ICs          | 650 V – ICE1HS01G-1/ICE2HS01G | High efficiency and low EMI  
Synchronous rectification | Medium-voltage diodes | HB LLC + center-tap | OptiMOS™ 30 V/40 V/60 V/80 V/150 V/250 V V | Optimized cost/performance and low thermals  
PFC/Main stage/ Synchronous rectification | Gate driver ICs | Boost PFC | EiiceDRIVER™ low side: 1ED44173N01B | Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)  
Totem-pole PFC/ HB LLC    |                  | EiiceDRIVER™ Compact: 1ED60N124F, 1ED124MU12F | Isolated gate driver, up to 14 A, 100 ns propagation delay  
Interleaved PFC/ HB LLC   |                  | EiiceDRIVER™ level-shift: 2ED2181506F, 2ED21814506J | 650 V half-bridge SOI driver with integrated bootstrap diode  
                            |                  | EiiceDRIVER™ level-shift: 4RS21865, 4RS21864S | 4 A/4 A high- and low-side gate driver  
Flyback                   | Control ICs      | QR flyback          | ICEQSBG            | High efficiency and low standby power  
Auxiliary power supply    | Control ICs      | QR/FF flyback       | ICEQ90x10/80AZ(G)   | Low standby power, high efficiency and robustness  
Isolation                 | Digital isolator |                     | 2DB0410F*          | 2+0 digital isolator with TTL input threshold and fail-safe default low output state  
                            |                  |                     |                     | 3 kV\(_{\text{rms}}\) isolation voltage (UL 1577) in DSO8 package  
                            |                  |                     |                     | High common mode transient immunity > 100 kV/µs  
www.infineon.com/smps  
*Coming soon
The PC power market is divided into high-end gaming PC and better cost-performance sectors to achieve a better price/performance for desktop SMPS. The PC OEMs are implementing the desktop SMPS by removing the AUX power block to save the cost of having a flyback circuit.

Due to the new structure of the CPU and GPU, higher and higher peak power is needed (1.5 to 2 times higher than normal power). In addition to the needed CCM PFC, Infineon 600 V CoolMOS™ P7 and OptiMOS™ 40 V / 60 V offer the best price/performance and reliability to meet the design requirements, as well as to achieve the highest efficiency enabled by semiconductors available in the market.

For that CPU and GPU power-hungry gaming PCs, the ICE3PCS0xG CCM PFC IC provides high efficiency over the whole load range and low count of external components, besides that, the ICE3PCS0xG CCM PFC IC offers fast output dynamic response during load jump. In addition to PGFC IC, Infineon’s LLC ICs ICE1HS01G/ICE2HS01G support customers to minimize the external component count.
In addition to their outstanding image quality, new generation TVs gain attention for their user interface, low power consumption, and slim design. This requires the power supply unit (PSU) either to keep a low profile to maintain the slim appearance of a TV and a low thermal dissipation image or to have an external adapter. In addition, a growing number of TV manufacturers use external adapters to deliver DC power to the TV. Infineon products based on digital power technology have been designed to meet the challenges of efficiency and standby power requirements for the IoT-enabled TVs (both embedded PSU and adapter).

Thanks to digital power, our customers can reduce the number of TV power supplies by easily and flexibly adapting the digital IC parameters to different TV and screen models. Infineon’s digital-based flyback controllers are ideal for low-power adapters for TVs and monitors. With digital soft switching, the adapter power density can significantly be improved.

The 600 V CoolMOS™ P7 series has been developed to cover a broad spectrum of different applications where excellent performance and perfect ease of use are required. The rugged body diode enables the use of hard-switching topologies, such as power factor correction (PFC), boost, and two-transistor forward (TTF) and resonant topologies such as LLC, where the technologies lead to high efficiency in both hard-switching and resonant circuits.

For higher on-state resistance ($R_{DS(on)}$) classes, a new feature of an integrated ESD diode helps to improve the quality in manufacturing. At the same time, the low $R_{DS(on)}$ and gate charge ($Q_G$) enable high efficiency in the various topologies. The 600 V CoolMOS™ P7 with a wide variety of $R_{DS(on)}$ and packages on consumer-grade for TV power. Infineon developed a family of packages specifically for TV power supplies, characterized by short lead, SOT-223 mold stopper, and wide creepage distance, which enable low-cost and reliable manufacturing for our customers.

Non-AUX digital solution for large screen size

High-power solution for larger screen size

Flyback solution for small screen size

www.infineon.com/smps
### Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main stage/PFC combo</strong>&lt;br&gt;non-AUX</td>
<td>High-voltage MOSFETs</td>
<td>Active bridge</td>
<td>600 V CoolMOS™ S7</td>
<td>Body diode robustness at AC line commutation&lt;br&gt;Improved thermal resistance&lt;br&gt;Absolute lowest R_DS(on) in the market&lt;br&gt;Ideal fit for solid-state and hybrid relays and circuit breakers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Active bridge DCM PFC HB LLC</td>
<td>600 V CoolMOS™ P7</td>
<td>Fast-switching speed for improved efficiency&lt;br&gt;Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition&lt;br&gt;Optimized V_GS threshold for lower turn-off losses&lt;br&gt;Rugged body diode for HB LLC application</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DCM PFC, HB LLC</td>
<td>600 V CoolMOS™ PFD7</td>
<td>Robustness and reliability with integrated robust, fast body diode and up to 2 kV ESD protection in gate&lt;br&gt;Reduced gate charge for enhanced light-load efficiency, and lower hysteresis loss</td>
</tr>
<tr>
<td></td>
<td>Gate-driver IC HB LLC</td>
<td>EiceDRIVER™ level-shift: 2ED2181S06F, 2ED21814S06J</td>
<td>650 V half-bridge SOI driver with integrated bootstrap diode&lt;br&gt;High-frequency switching (500 kHz)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control ICs IDP2308</td>
<td>PFC-LCC non-AUX digital IC for TV embedded PSU</td>
<td>Low BOM count/system cost due to high integration&lt;br&gt;Low standby power&lt;br&gt;High system reliability&lt;br&gt;Shorter development cycles and higher design and production flexibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDP2303A</td>
<td>PFC-LCC non-AUX digital IC for TV adapter</td>
<td>Low BOM count/system cost due to high integration&lt;br&gt;Low standby power&lt;br&gt;Small form factor designs&lt;br&gt;High system reliability</td>
</tr>
<tr>
<td><strong>Synchronous rectification</strong></td>
<td>Low-voltage MOSFETs</td>
<td>Synchronous rectification</td>
<td>OptiMOS® S 100-150 V&lt;br&gt;StrongRFET™ 2 100 V</td>
<td>Low conduction losses, reduced overshoot&lt;br&gt;FullPAK package available</td>
</tr>
<tr>
<td></td>
<td>Boost diodes</td>
<td>DCM PFC</td>
<td>650 V Rapid diode</td>
<td>Low conduction losses</td>
</tr>
<tr>
<td></td>
<td>Control ICs CCM PFC ICs</td>
<td>ICE3PCS0xS</td>
<td>High PFC and low THD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WBG PFC</td>
<td>CoolGaN™ 600 V e-mode HEMTs</td>
<td>Highest efficiency contribution via less parasitic parameter&lt;br&gt;Space saving with SMD smaller package</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gate-driver IC PFC</td>
<td>1ED4417JN01B</td>
<td>Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)</td>
<td></td>
</tr>
<tr>
<td><strong>High voltage MOSFETs</strong></td>
<td>Active bridge DCM PFC HB LLC</td>
<td>600 V CoolMOS™</td>
<td>Fast-switching speed for improved efficiency&lt;br&gt;Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition&lt;br&gt;Optimized V_GS threshold for lower turn-off losses&lt;br&gt;Rugged body diode for HB LLC application</td>
<td></td>
</tr>
<tr>
<td><strong>Main stage</strong></td>
<td>Control ICs HB LLC ICs</td>
<td>ICE1HS01G-1/ICE2HS01G</td>
<td>Highest efficiency and low EMI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WBG HB LLC</td>
<td>CoolGaN™ 600 V Integrated Power Stage</td>
<td>Highest efficiency, highest power density&lt;br&gt;High reliability&lt;br&gt;Isolated gate driver integrated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High-voltage MOSFETs HB LLC</td>
<td>600 V CoolMOS™ P7</td>
<td>Fast-switching speed for improved efficiency&lt;br&gt;Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition&lt;br&gt;Optimized V_GS threshold for lower turn-off losses&lt;br&gt;Rugged body diode for HB LLC application</td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary power supply</strong></td>
<td>Control ICs QR/FF flyback</td>
<td>CoolSET™</td>
<td>Low standby power, high efficiency and robustness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control ICs QR flyback</td>
<td>ICEQ503G</td>
<td>Forced resonant ZVS control reduces the switching loss&lt;br&gt;Multi-level protection enables the robust design&lt;br&gt;Flexible firmware provides more differentiation for OEMs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High-voltage MOSFETs</td>
<td>Flyback</td>
<td>700 V CoolMOS™ P7</td>
<td>Optimized for flyback topologies&lt;br&gt;Best price competitive CoolMOS™ SJ MOSFET family&lt;br&gt;Lower switching losses versus standard MOSFET&lt;br&gt;Controlled dv/dt and di/dt for better EMI</td>
</tr>
</tbody>
</table>

www.infineon.com/smps
OLED TVs improve user experience as they can be thinner, lighter, more flexible, and consume less power than LCD/LED TVs.

www.infineon.com/smps
Power over Ethernet (PoE)

Designing reliable and power-efficient PoE power supplies

The latest IEEE 802.3bt standard for Power over Ethernet (PoE) not only increased the available power via PoE but also changed requirements for its power supply. Power sourcing equipment (PSE) now provides up to 100 W per port via a twisted pair of Ethernet cabling, whereas powered devices (PD) will have up to 71 W available. The adoption of this new PoE standard also largely depends on the capability to increase the power density on the PSE side while maintaining the same form factor as wide load conditions and higher power budgets change requirements. Infineon has long-standing expertise in switched-mode power supply (SMPS) designs and offers a highly reliable, rugged and efficient high-quality MOSFET portfolio for your PoE PSE and PD designs.

Powered devices

Powered devices (PD) include devices powered by PoE such as wireless access points, 5G small-cell radio units, IP cameras, conference systems, thin clients or public address systems. DC-DC SMPS designs need to be power efficient to maximize the available power for the PD itself with the simultaneous increase of power density. Moreover, PDs need to function reliably in the field even under potentially rough conditions for a long time.

Power sourcing equipment

Power sourcing equipment (PSE) is any equipment that is able to provide and source power on the twisted pair Ethernet cable, such as PoE switches, PoE extenders and PoE injectors. PSE needs to be highly reliable to prevent device failure and ensure uninterruptible operations of connected power devices. With IEEE 802.3bt PoE, the power demand for PoE switches significantly increases with highest efficiency over wide load conditions. For example, to fully enable a switch with twenty-four 802.3bt compliant PoE ports, up to 2.4 kW of available PoE power budget is required. This makes modifications in AC-DC SMPS designs necessary to fulfill these requirements.
### Recommended product portfolio for power sourcing equipment

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFC</td>
<td>High-voltage MOSFETs</td>
<td>DCM, CCM, CCM,</td>
<td>600 V/650 V CoolMOS™ C7 600 V CoolMOS™ P7</td>
<td>★ Best FOM RDS(on) x Qg and RDS(on) x Eoss ★ Lowest RDS(on) per package ★ Lowest dependency of switching losses from RDS(on) ★ Low turn-off losses, low Qg, and low Qg'</td>
</tr>
<tr>
<td>Control ICs</td>
<td>DCM, CCM, CCM</td>
<td>ICE3PG560G</td>
<td>Simple external circuitry ★ High PFC and low THD</td>
<td></td>
</tr>
<tr>
<td>High-voltage GaN</td>
<td>CCM totem-pole</td>
<td>CoolGaN™ 600 V</td>
<td>★ Highest efficiency and highest power density</td>
<td></td>
</tr>
<tr>
<td>GaN driver ICs</td>
<td>CCM totem-pole</td>
<td>EiceDRIVER™ 1EDF5673Fx/1EDS5663H</td>
<td>Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) ★ Input-output propagation delay accuracy: ± 5 ns ★ Functional and reinforced isolation available</td>
<td></td>
</tr>
<tr>
<td>Silicon power diode</td>
<td>DCM, CCM, CCM</td>
<td>CoolSi™ Schottky diode 650 V/650 V</td>
<td>★ Low FOM x Vg</td>
<td></td>
</tr>
<tr>
<td>DC-DC main stage</td>
<td>High-voltage MOSFETs</td>
<td>Flyback (ACF), FB LLC, FB LLC, ITI, ZVS</td>
<td>600 V CoolMOS™ P7/CT/CFD7 650 V TRENCSTOP™ F5</td>
<td>★ Best FOM RDS(on) x Qg and RDS(on) x Eoss ★ Lowest RDS(on) per package ★ Lowest dependency of switching losses from RDS(on) ★ Low turn-off losses, low Qg, and low Qg'</td>
</tr>
<tr>
<td>Low- and medium-voltage MOSFETs</td>
<td>Isolated DC-DC primary-side PWM</td>
<td>OptiMOS™ 60 V-200 V StrongRFET™ 60 V-200 V Small-signal MOSFETs 60 V-200 V</td>
<td>★ Industry’s lowest RDS(on) ★ Highest system efficiency and power density ★ Outstanding quality and reliability ★ Reduces the need for a snubber circuit</td>
<td></td>
</tr>
<tr>
<td>Gate-driver ICs</td>
<td>-</td>
<td>EiceDRIVER™ IDEn/1ED/2EDNTx/2EDLs/2EDFx/2EDSx</td>
<td>Broadest portfolio in terms of isolation, channels, and protection</td>
<td></td>
</tr>
<tr>
<td>Control ICs</td>
<td>HB LLC PWM-QF PWM-FF</td>
<td>ICE2HS03G ICE2QDG56 ICE2QSG8 ICE2SAG/ICE2SAG</td>
<td>★ High efficiency and low EMI</td>
<td></td>
</tr>
<tr>
<td>High-voltage GaN</td>
<td>Flyback (ACF), FB LLC, FB LLC, ZVS</td>
<td>CoolGaN™ 600 V</td>
<td>★ Highest efficiency and highest power density</td>
<td></td>
</tr>
<tr>
<td>GaN driver ICs</td>
<td>-</td>
<td>EiceDRIVER™ IDEF5673Fx/1EDS5663H</td>
<td>Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink) ★ Functional and reinforced isolation available</td>
<td></td>
</tr>
<tr>
<td>PFC-main stage combo</td>
<td>High-voltage MOSFETs</td>
<td>HB LLC</td>
<td>600 V CoolMOS™ P7</td>
<td>★ Low turn-off losses, low Qg, and low Qg' ★ Fast-switching speed for improved efficiency and thermal</td>
</tr>
<tr>
<td>Synchronous rectification</td>
<td>Low- and medium-voltage MOSFETs</td>
<td>Synchronous rectification</td>
<td>OptiMOS™ 100 V-150 V StrongRFET™ 40 V-100 V</td>
<td>★ Industry’s lowest RDS(on) ★ Highest system efficiency and power density ★ Outstanding quality and reliability ★ Reduces the need for a snubber circuit</td>
</tr>
<tr>
<td>Gate-driver ICs</td>
<td>-</td>
<td>EiceDRIVER™ IDEn/1ED/2EDNTx/2EDLs/2EDFx/2EDSx</td>
<td>Broadest portfolio in terms of isolation, channels, and protection</td>
<td></td>
</tr>
<tr>
<td>ORing</td>
<td>Low- and medium-voltage MOSFETs</td>
<td>ORing MOSFETs</td>
<td>OptiMOS™ 25 V-200 V</td>
<td>★ Industry’s lowest FOM RDS(on) x Qg</td>
</tr>
<tr>
<td>Auxiliary power supply</td>
<td>AC-DC integrated power stage</td>
<td>Fixed-frequency (FF) Quasi resonant (QR)</td>
<td>CoolSET™ ICE6Rx0904G CoolSET™ ICE6Qx0808G</td>
<td>★ Quasi-resonant switching operation for high efficiency and low EMI signature ★ Fixed-frequency switching operation for ease of design</td>
</tr>
<tr>
<td>Analog and digital control IC</td>
<td>32-bit XMC™ industrial microcontroller based on Arm® Cortex® M</td>
<td>-</td>
<td>32-bit XMC1000 32-bit XMC4000</td>
<td>★ Flexibility, HR PWM, digital communication ★ Arm® based standard MCU family and wide family</td>
</tr>
<tr>
<td>Port MOSFET</td>
<td>Medium-voltage MOSFETs</td>
<td>-</td>
<td>OptiMOS™ 100 V StronRFET™ 100 V</td>
<td>★ Widest SOA quality and outstanding reliability ★ Lowest RDS(on)</td>
</tr>
</tbody>
</table>

### Recommended product portfolio for powered devices

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active bridge rectifier</td>
<td>Medium-voltage MOSFETs</td>
<td>Active bridge rectifier</td>
<td>OptiMOS™ 100 V-150 V StrongRFET™ 100 V</td>
<td>★ Industry’s lowest RDS(on) ★ Highest system efficiency and power density</td>
</tr>
<tr>
<td>Synchronous rectification</td>
<td>Low- and medium-voltage MOSFETs</td>
<td>Synchronous rectification</td>
<td>OptiMOS™ 25 V-100 V StrongRFET™ 40 V-100 V</td>
<td>★ Industry’s lowest RDS(on) ★ Highest system efficiency and power density ★ Outstanding quality and reliability ★ Reduces the need for a snubber circuit</td>
</tr>
<tr>
<td>DC-DC switching stage</td>
<td>Medium-voltage MOSFETs</td>
<td>Flyback (ACF)</td>
<td>OptiMOS™ 100 V-150 V</td>
<td>★ Low conduction losses, reduced overshoot ★ Logic level switching</td>
</tr>
<tr>
<td>AC-DC backup SMPS</td>
<td>High-voltage MOSFETs</td>
<td>Flyback (ACF)</td>
<td>600 V to 950 V CoolMOS™ P7</td>
<td>★ Fast-switching speed for improved efficiency and thermal ★ Reduced gate charge for enhanced light load efficiency ★ Optimized gate-to-source voltage (VGS) threshold for lower turn-offs losses</td>
</tr>
<tr>
<td>AC-DC integrated power stage</td>
<td>Fixed-frequency (FF) Quasi resonant (QR)</td>
<td>CoolSET™ 800 V ICE6Rx0904G, 800 V ICE6Rx0808G, 700 V ICE6Rx070AG, 700 V ICE6Rx070AS</td>
<td>★ Quasi-resonant switching operation for high efficiency and low EMI signature ★ Fixed-frequency switching operation for ease of design</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/poe
As e-mobility increasingly becomes part of daily life, there is a growing need for more efficient charging solutions. Fast electric vehicle (EV) charging stations equipped with powerful DC chargers are the answer. DC EV chargers are an attractive choice because they allow much faster charging than the standard AC EV ones that many EV owners have at home. Today, a DC charger with 150 kW can put a 200 km charge on an EV in around 15 minutes. As fast charging and battery technologies continue to evolve and improve in the near future, experts anticipate the charging time to drop even further.

As a market leader and the global front-runner in power electronics, Infineon enables you to bring energy-efficient DC EV charger designs to life, with our highly efficient components and in-depth technical support. We cover power ranges from kilowatts to megawatts in our broad portfolio of high-quality power semiconductors, microcontrollers, gate drivers, security, safety, and authentication solutions. Our CoolMOS™ and CoolSiC™ MOSFETs, together with EiceDRIVER™ gate drivers, for example, are ideal in a wide range of DC EV charging designs. Their matchless advantages include high-frequency operation, high power density and reduced switching losses, allowing you to reach high efficiency levels in any battery charging system.

Infineon offering and customer benefits

### Infineon offering
- CoolMOS™ and CoolSiC™ discrete and power module semiconductor solutions
- EiceDRIVER™ gate driver and XMC™ microcontroller
- XENSIV™ magnetic current sensor
- OPTIGA™
- Power supply ICs (LDO, DC-DC)
- Communication (CAN transceiver)

### Customer benefits
- Highly efficient power conversion for reducing system size by up to 50 percent and reduced cooling efforts
- Scalability across various platforms for upgrading system power charger levels on demand
- Safe drive, advanced protection and ease of control
- Bidirectional high precision current sensing
- Identity protection against fake devices and protection against the manipulation of the data
- Robust quality and easy to use implementation shorten time to market and guarantee long operation

**Application diagram**

![Application diagram](https://www.infineon.com/ev-charging)
Wireless charging

Wireless methods for power transfer to charge the batteries of electric vehicles are gaining attention. Several concepts for wireless power transfer systems have been proposed, which in general seek to compensate the significant stray inductances on primary and secondary sides of the magnetic couplers by adaptive resonant methods. At the end of 2013, SAE announced a new standard for inductive charging which defined three power levels at 85 kHz. Infineon’s CoolMOS™ CFD7, C7, and P7 series along with TRENCHSTOP™ IGBTs, CoolSiC™ diodes, and EiceDRIVER™ gate-driver ICs are perfectly suited for driving inductive power transfer systems on the road side which operate inside the 80 to 90 kHz band.

Infineon’s solution recommendation for DC EV charging system blocks

Our solutions have been designed for harsh environmental conditions and long lifetime thanks to Infineon’s deep understanding of quality requirements. Take the next step by exploring our product portfolio for DC EV charging systems.

PFC stage (3-phase input)

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-voltage MOSFET/SiC MOSFET/IGBT</td>
<td>650 V CoolMOS™ C7</td>
<td>IPW65R019C7</td>
<td>650 V, 19 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>600 V CoolMOS™ C7</td>
<td>IPW60R017C7</td>
<td>600 V, 17 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>600 V CoolMOS™ P7</td>
<td>IPW60R024P7</td>
<td>600 V, 24 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW60R037P7</td>
<td>600 V, 37 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>600 V CoolSiC™ MOSFET</td>
<td>IMW65R027M1H</td>
<td>650 V, 27 mΩ, TO-247-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IMZ65R027M1H</td>
<td>650 V, 27 mΩ, TO-247-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IMWA65R027M1H</td>
<td>650 V, 48 mΩ, TO-247-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IMZA65R027M1H</td>
<td>650 V, 48 mΩ, TO-247-4</td>
</tr>
<tr>
<td></td>
<td>650 V TRENCHSTOP™ S5 Easy hybrid module</td>
<td>F3L200R07W2S5_B11</td>
<td>650 V, 200 A, TO-247, three-level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3L200R07W2S5FP_B11</td>
<td>650 V, 200 A, TO-247, three-level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3L200R07W2S5FP_B56</td>
<td>650 V, 200 A, TO-247, three-level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3L200R07W2S5F_B11</td>
<td>650 V, 200 A, TO-247, three-level</td>
</tr>
<tr>
<td>CoolSiC™ MOSFET 1200 V</td>
<td>IMW120R045M1/IMZ120R045M1</td>
<td>1200 V, 45 mΩ, TO-247, three-level</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW120R030M1/IMZ120R030M1</td>
<td>1200 V, 30 mΩ, TO-247, three-level</td>
</tr>
<tr>
<td>CoolSiC™ Easy modules 1200 V</td>
<td>F3L11MR12W2M1_B74</td>
<td>1200 V, 11 mΩ, Easy 2B, ANPC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3L12MR12W2M1P_B11*</td>
<td>1200 V, 12 mΩ, Easy 2B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF11MR12W2M1P_B11*</td>
<td>1200 V, 11 mΩ, Easy 1B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF23MR12W1M1P_B11*</td>
<td>1200 V, 23 mΩ, Easy 1B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FS45MR12W1M1_B11</td>
<td>1200 V, 45 mΩ, Easy 1B, six-pack</td>
</tr>
<tr>
<td>SiC diodes</td>
<td>CoolSiC™ Schottky diodes 1200 V G5</td>
<td>IDW15G120CSB/IDWD15G120C5</td>
<td>1200 V, 15 A, TO-247-3/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW20G120CSB/IDWD20G120C5</td>
<td>1200 V, 20 A, TO-247-3/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW30G120CSB/IDWD30G120C5</td>
<td>1200 V, 30 A, TO-247-3/2</td>
</tr>
</tbody>
</table>

www.infineon.com/ev-charging
### HV DC-DC main stage

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-voltage MOSFET/SiC MOSFET</strong></td>
<td>600 V CoolMOS™ CFD7/CSFD</td>
<td>IPW60R018CFD7</td>
<td>600 V, 18 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW60R024CFD7</td>
<td>600 V, 24 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW60R027CSFD</td>
<td>600 V, 37 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW60R040CFD7</td>
<td>600 V, 40 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>600 V CoolMOS™ C7</td>
<td>IPW60R040C7</td>
<td>600 V, 40 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>650 V CoolMOS™ CFD7</td>
<td>IPW65R018CFD7</td>
<td>650 V, 29 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW65R029CFD7</td>
<td>650 V, 29 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPW65R041CFD7</td>
<td>650 V, 41 mΩ, TO-247</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ SiC MOSFET 650 V</td>
<td>IMW65R027M1H</td>
<td>650 V, 27 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IMW65R048M1H</td>
<td>650 V, 48 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ SiC MOSFET 1200 V</td>
<td>IMW120R045M1</td>
<td>1200 V, 45 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IMZ120R030M1H</td>
<td>1200 V, 30 mΩ, TO-247-3/4</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Easy module 1200 V</td>
<td>FF6MR12W2M1(P)_B11*</td>
<td>1200 V, 6 mΩ, Easy 2B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF8MR12W2M1(P)_B11*</td>
<td>1200 V, 8 mΩ, Easy 2B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF11MR12W1M1(P)_B11*</td>
<td>1200 V, 11 mΩ, Easy 1B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF23MR12W1M1(P)_B11*</td>
<td>1200 V, 23 mΩ, Easy 1B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF45MR12W1M1(P)_B11*</td>
<td>1200 V, 45 mΩ, Easy 1B, half-bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F4-45MR12W1M1(P)_B76*</td>
<td>1200 V, 45 mΩ, Easy 1B, four-pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F4-23MR12W1M1(P)_B76*</td>
<td>1200 V, 23 mΩ, Easy 1B, four-pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F4-15MR12W2M1(P)_B76*</td>
<td>1200 V, 15 mΩ, Easy 2B, four-pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F4-11MR12W2M1(P)_B76*</td>
<td>1200 V, 11 mΩ, Easy 2B, four-pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FS45MR12W1M1_B11</td>
<td>1200 V, 45 mΩ, Easy 1B, sixpack</td>
</tr>
<tr>
<td><strong>SiC diodes output rectification diodes</strong></td>
<td>CoolSiC™ Schottky diode 1200 V G5</td>
<td>IDW15G120C5B</td>
<td>1200 V, 15 A, TO-247-3/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW20G120C5B</td>
<td>1200 V, 20 A, TO-247-3/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW30G120C5B</td>
<td>1200 V, 30 A, TO-247-3/2</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Schottky diode 1200 V G5 rectifier bridge modules</td>
<td>DDB2U20N12W1RF(P)_B11*</td>
<td>1200 V, 20 A, Easy 1B, rectifier bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DDB2U40N12W1RF(P)_B11*</td>
<td>1200 V, 40 A, Easy 1B, rectifier bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DDB2U60N12W1RF(P)_B11*</td>
<td>1200 V, 60 A, Easy 1B, rectifier bridge</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Schottky diode 650 V G5</td>
<td>IDW12G65C5</td>
<td>650 V, 12 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW16G65C5</td>
<td>650 V, 16 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW20G65C5</td>
<td>650 V, 20 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW29G65C5B</td>
<td>650 V, 10 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW24G65C5B</td>
<td>650 V, 24 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW30G65C5</td>
<td>650 V, 30 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW32G65C5B</td>
<td>650 V, 32 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW40G65C5</td>
<td>650 V, 40 A, TO-247</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDW40G65C5B</td>
<td>650 V, 40 A, TO-247</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Schottky diode 650 V G6</td>
<td>IDH20G65C6</td>
<td>650 V, 20 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH16G65C6</td>
<td>650 V, 16 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH12G65C6</td>
<td>650 V, 12 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH10G65C6</td>
<td>650 V, 10 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH08G65C6</td>
<td>650 V, 8 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH06G65C6</td>
<td>650 V, 6 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDH04G65C6</td>
<td>650 V, 4 A, TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDD20G65C6</td>
<td>650 V, 20 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDD16G65C6</td>
<td>650 V, 16 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDD12G65C6*</td>
<td>650 V, 12 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDD10G65C6</td>
<td>650 V, 10 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDDD08G65C6</td>
<td>650 V, 8 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDDD06G65C6</td>
<td>650 V, 6 A, DDPAK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDDD04G65C6</td>
<td>650 V, 4 A, DDPAK</td>
</tr>
</tbody>
</table>

* For more information on the product, contact our product support.
(P): Module with pre-applied thermal interface material (TIM)
## Gate driver and galvanic isolation

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate-driver ICs</td>
<td>EiceDRIVER™ (non-isolated)</td>
<td>1EDN family, 2EDN family</td>
<td>Single-channel/dual-channel, non-isolated low-side gate driver ICs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1ED4417xN01B</td>
<td>Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2ED24427N01F</td>
<td>Dual-channel, 10 A low-side gate drive in DSO8 package with power-pad</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ level-shift gate driver</td>
<td>2ED2184506F, 2ED2110506M</td>
<td>650 V half-bridge gate driver for IGBTs and MOSFETs with SOI technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Integrated bootstrap diode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High-frequency switching (500 kHz) and superior – VS transient voltage immunity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IRS2186S, IRS21864S</td>
<td>600 V, 4 A high- and low-side gate driver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IR2114SS, IR2214SS</td>
<td>600 V/1200 V half-bridge gate driver with DESAT, 2L SRC, Soft-SD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IR2213S</td>
<td>1200 V high- and low-side gate driver</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ 2EDF/S isolated gate driver</td>
<td>2EDF7175F, 2EDF7275F</td>
<td>Dual-channel functional isolated (1,5 kV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2EDS826SH, 2EDS816SH</td>
<td>Dual-channel reinforced (safe) isolated (6 kV)</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ compact isolated gate driver</td>
<td>1ED2012MF, 1ED2012AF, 1ED2012SF, 1ED6012AF</td>
<td>1200 V single-channel, cost-effective functional isolated driver with Miller clamp/separate output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1ED3122MU12H, 1ED3124MU12H, 1ED3125MU12F</td>
<td>5.7 kV / 3 kV single-channel isolated driver with Miller clamp or separate output, UL 1577 certification</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ enhanced isolated gate driver</td>
<td>1ED3491MU12M, 1ED3890MU12M</td>
<td>5.7 kV single-channel isolated driver with analog/digital configurability, DESAT, Miller clamp, and Soft-off, UL 1577 certification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1ED3212MC12N</td>
<td>1200 V, single-/dual-channel, functional isolated driver with DESAT and Miller clamp</td>
</tr>
</tbody>
</table>

## Current sensor

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic current sensor</td>
<td>XENSIV™</td>
<td>TLI4971-A1220TS-E0001</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLI4971-A1220TS-U-E0001</td>
<td>UL certified</td>
</tr>
</tbody>
</table>

## Microcontroller

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcontroller</td>
<td>XMC™</td>
<td>XMC1400 family (PFC stage)</td>
<td>Arm® Cortex® M0 based microcontroller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>XMC4500/XMC4700 (HV DC-DC/PWM stage)</td>
<td>Arm® Cortex® M4F based microcontroller</td>
</tr>
<tr>
<td></td>
<td>AURIX™</td>
<td>TC26X/TC27X, TC36X/TC37X</td>
<td>TriCore® AURIX™ 32-bit microcontroller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HSM (hardware secure module) full EVITA compliance</td>
<td></td>
</tr>
</tbody>
</table>

## Internal power supply

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC power conversion</td>
<td>CoolSET™ 5 QR/FF flyback</td>
<td>ICE5QR0660BG, ICE5QR0660AG</td>
<td>800 V, 42 W, 710 mΩ, PG-D00-12</td>
</tr>
<tr>
<td></td>
<td>S^ generation PWM controllers and CoolMOS™ P</td>
<td>ICE5QS680BG and IPP9R360P7, ICE5QS680BG and IPP9R540P7</td>
<td>800 V, 360 mΩ, TO-220</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ HV SJ MOSFETs</td>
<td>IPN95R1K2P7, IPN95R1K2P7</td>
<td>950 V, 450 mΩ, TO-220 FP</td>
</tr>
<tr>
<td>DC-DC power conversion</td>
<td>Low power LDOs</td>
<td>TSL805/TLS810/TLS820</td>
<td>50 mA/100 mA/200 mA ultralow quiescent current linear voltage regulator with a wide input voltage range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLS202</td>
<td>150 mA LDO in a small-footprint package</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TLS203/TLS205</td>
<td>300/500 mA low noise LDO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSL850</td>
<td>500 mA wide input voltage LDO</td>
</tr>
<tr>
<td></td>
<td>Buck converter</td>
<td>TLE8366E</td>
<td>1.9 A DC-DC buck converter</td>
</tr>
<tr>
<td></td>
<td>Safety PMIC for AURIX™ MCU</td>
<td>TLF35584/TLF35585</td>
<td>Multichannel power supply IC, optimized for AURIX™ MCU, up to ASIL-D rated</td>
</tr>
</tbody>
</table>

---

www.infineon.com/ev-charging
Authentication and encryption
As embedded systems are increasingly becoming targets of attackers, Infineon offers OPTIGA™ - a turnkey security solution.

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>OPTIGA™ Trust B</td>
<td>SLE952500000XTSA1</td>
<td>Asymmetric ECC authentication with individual certificate key pair and an extended temperature range of -40 to 110°C</td>
</tr>
<tr>
<td></td>
<td>OPTIGA™ Trust TPM</td>
<td>SLB9670XQ2.0</td>
<td>Fully TCG TPM 2.0 standard compliant module with the SPI interface</td>
</tr>
<tr>
<td></td>
<td>SLC37</td>
<td>SLC37ESA2M0, SLI97CSIFX1M00PE</td>
<td>New class of performance and security cryptocontroller adhering to CC EAL6+ high targeted and EMVCo targeted certifications for payment and eSIM applications</td>
</tr>
</tbody>
</table>

Communication

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Product</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN transceiver</td>
<td>Automotive CAN transceiver</td>
<td>TLE9350, TLE9351, TLE9252</td>
<td>High-speed automotive CAN transceiver with 5 Mbps</td>
</tr>
</tbody>
</table>

www.infineon.com/ev-charging
Over the last years, wireless charging has gained more and more traction in the market and is expected to heavily influence our daily lives. Infineon offers a broad portfolio of efficient, high-quality products and solutions to serve the key requirements of the dominant market standards: inductive (Qi (WLC)) and resonant (AirFuel). Whether a smartphone (e.g., at home or in the car), a handful of wearables, a power tool, a laptop, kitchen appliance or a service robot is being charged, Infineon’s components and solutions help overcome a wide range of common wireless power transfer challenges for consumer and industrial wireless charging designs. Wireless charging is a complex subject that requires in-depth system knowledge and expertise. Designers have to understand antennas and their interactions with surrounding structures. To successfully transfer power wirelessly, the power delivery has to be precisely controlled. We can help customers master all design challenges, including:

Applications that benefit from wireless charging

Infineon’s key enabling products for consumer and industrial solutions

- Power MOSFETs – OptiMOS™, StrongIRFET™ and CoolMOS™
- Gate-driver ICs – EiceDRIVER™: MOTIX™ three-phase gate-driver IC
- P-channel and N-channel small signal power MOSFETs
- XMC™, XMC™-SC (including software IP), AURIX™, PSoC™
- Wireless charging ICs (including software IP)
- 32-bit microcontrollers – XMC™, AURIX™, PSoC™
- USB-C and Power Delivery (PD)
- Authentication - OPTIGA™ Trust Charge
- PSoC™ 4 MCU with AIROC™ Bluetooth LE
- AIROC™ Bluetooth® LE and Bluetooth®
- PWM/flyback controllers and integrated power stage ICs – CoolSET™
- GaN GIT HEMT - CoolGaN™
- Voltage and buck regulators for component and bridge supply
- Reverse Conducting IGBTs R5/R6 - 650 V

www.infineon.com/wirelesscharging
Key benefits when choosing Infineon

<table>
<thead>
<tr>
<th>Faster time-to-market</th>
<th>Collaboration with partners</th>
<th>In-depth system expertise</th>
<th>Inductive and resonant</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powerful and cost-effective system solutions that ensure smart, secure and high-performance wireless charging for a range of applications</td>
<td>Ready-to-go system solutions including software supported by our partners (plural)</td>
<td>We draw on our in-depth knowledge and expertise to help to solve wireless power challenges</td>
<td>Addressing both standards (inductive and resonant) with components or system solutions</td>
<td>We help you master your design challenges with leading silicon technology and upcoming new technologies</td>
</tr>
</tbody>
</table>

Inductive wireless charging for consumer and industrial

Example: >30 W inductive system solution

Key components for inductive designs for consumer and industrial

<table>
<thead>
<tr>
<th>Sub-application</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs*</td>
<td>30 V BSC0996NS, BSC0993ND, BS20909NS, BS20909ND, BSZ0910ND, IRFHS8342</td>
</tr>
<tr>
<td></td>
<td>40 V BS20970415L, BS2063N4LS, BSC035N04LSG, BSC072N04LD</td>
</tr>
<tr>
<td></td>
<td>60 V BS20909N6L5, BS2065N06L5, BSZ040N06L55</td>
</tr>
<tr>
<td></td>
<td>80 V IRL0805L20</td>
</tr>
<tr>
<td></td>
<td>100 V IRL100HS121, BSZ146N10L5, BSZ206N10L55</td>
</tr>
<tr>
<td>Driver IC</td>
<td>WDC5024, PX3519, IRS2301S, LEDN7512B, LEDN41701B, LEDN412A, LEDN7524G, IRS2007M, LED21232OF, LED7L41</td>
</tr>
<tr>
<td>Wireless Charging IC</td>
<td>WLC1115-680XX transmitter IC (including software IP)</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC™, AURIX™ XMC™-SC (including software IP), PSOC™ family 4</td>
</tr>
<tr>
<td>Voltage regulators</td>
<td>TLE4269G-V3, TLE4211EL, TLEX366EV</td>
</tr>
<tr>
<td>MCU + BLE Controller</td>
<td>PSOC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)</td>
</tr>
<tr>
<td>AIOOC™ Bluetooth® LE and Bluetooth®</td>
<td>CYW20719B2 / CYW20721B2</td>
</tr>
<tr>
<td>USB-C and power delivery (PD)</td>
<td>PAG1: Power Adapter Generation 1, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ Barrel Connector Replacement (BCR)</td>
</tr>
<tr>
<td>Small-signal MOSFETs</td>
<td>See the portfolio on our webpage small-signal MOSFETs</td>
</tr>
<tr>
<td>Authentication</td>
<td>SLS32AA01200UX – OPTIGA™ Trust Charge (USON10 x 3 package)</td>
</tr>
<tr>
<td>Reverse conducting IGBTs RS/RI - 650 V</td>
<td>Package TO-247 IHW30N65RS (30 A), IHW40N65RS (40 A), IHW50N65RS (50 A)</td>
</tr>
<tr>
<td>Reference designs and kits</td>
<td>REF_WLC_TX15W_C1 - 15 W Qi power transmitter solution (on demand)</td>
</tr>
</tbody>
</table>

* Explore more MOSFET offerings at our webpage.
15W Qi transmitter solution with Infineon’s Wireless Charging IC WLC1115

The REF_WLC_TX15W_C1 MP A11 Power Transmitter solution board, is highly integrated, Qi v1.3 compliant Extended Power Profile (EPP) transmitter design. This reference board is powered using USB PD 3.0-compliant USB-C power adapter and can support DC connector input of 9V-20V through firmware option. Combined with the OptiMOS™ power MOSFETs and OPTIGA™ Trust Charge, this solution offers a highly efficient and secure wireless charging platform. The solution board supports firmware upgrades using USB-C or I2C interface along with the included dongle and the Wireless Charging Configuration Graphical User Interface (GUI). There are additional options provided for firmware updates using Serial Wire Debug (SWD) while using the ModusToolBox™ and Programmer.

Key components
› Wireless charging IC – WLC1115-68LQXQ
› OptiMOS™ MOSFETs – BSZ0910LS
› OPTIGA™ Trust Charge – SLS32AIA020Ux
› Small Signal MOSFETs

Features and benefits

Key features
› Qi v1.3 compliant transmitter
› UDB-PD/legacy protocol input >9 VDC
› Peak system efficiency >83%
› Typical active charging area ±10 mm
› Serial communication ports: I²C, UART
› Programming, EXT clock option
› Foreign object detection with LEDs
› Configurable using wireless charging GUI

Key benefits
› Compliant Qi stack with library support
› Programmable solution for evolving Qi standard
› Zero voltage switching for high efficiency
› Configurable gate drivers for EMC
› Configurable thresholds for FOD, protection

Complimentary
› PAG1S Adaptor Reference Designs

Explore more details:
www.infineon.com/REF_WLC_TX15W_C1

www.infineon.com/wirelesscharging
### Key components for resonant designs for consumer and industrial applications

<table>
<thead>
<tr>
<th>Sub-application</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs**</td>
<td>30 V IRLH6376PBF, BSZ0909ND, BSZ0910ND, IRLML0030PBF</td>
</tr>
<tr>
<td></td>
<td>40 V IRLML0040</td>
</tr>
<tr>
<td></td>
<td>60 V IRLML0060</td>
</tr>
<tr>
<td></td>
<td>80 V IRL80HS120</td>
</tr>
<tr>
<td></td>
<td>100 V IRL100HS121</td>
</tr>
<tr>
<td></td>
<td>150 V BSZ900N15NS3, BSZ920N15NS3</td>
</tr>
<tr>
<td></td>
<td>200 V BSZ900N20NS3, BSZ22DN20NS3, BSZ12DN20NS3</td>
</tr>
<tr>
<td></td>
<td>250 V BSZ42DN25NS3</td>
</tr>
<tr>
<td>Driver ICs</td>
<td>EiceDRIVER™ 2EDL71*, 1EDTN712, 2EDN7524, 2ED2182S06F, 2ED2442TN01F, 1ED60N12AF, 1ED4417N01B</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ for CoolGaN™ GIT HEMTs 1EDSS663H, 1EDFS673F, 1EDFS673K</td>
</tr>
<tr>
<td>GaN e-mode HEMTs</td>
<td>CoolGaN™ GIT HEMT 600 V IGT60R190D1S (HDSOF-8-3)</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC™, AURIX™ MCU and wireless power controller XMC™-SC (including software IP), PSoC™ family 4</td>
</tr>
<tr>
<td></td>
<td>MCU + BLE Controller PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)</td>
</tr>
<tr>
<td></td>
<td>AIROC™ Bluetooth® LE &amp; Bluetooth®</td>
</tr>
<tr>
<td></td>
<td>USB-C and power delivery (PD) PMG1: Power Adapter Generation 1, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ Barrel Connector Replacement (BCR)</td>
</tr>
<tr>
<td>Voltage regulators</td>
<td>TLE4296G V33, TLE4296G V50, TLE4296-2G V33, TLE4296-2G V50, TLF50211EL, TLE8366EV, TLE8366EV33, TLE8366EV50</td>
</tr>
<tr>
<td>Small signal MOSFETs</td>
<td>See the portfolio on our webpage small-signal MOSFETs</td>
</tr>
</tbody>
</table>

*coming soon
** Explore more MOSFET offerings at our webpage.

---

Are you searching for a turnkey solution for your application?

Wireless power becomes an important part of our connected lifestyles. Infineon puts an emphasis on the development of the next-generation technologies and standards that allow easy charging without the limitation of wires. What started out with phones will quickly evolve - applications such as tablets, laptops, robots, drones, power tools, handheld gaming devices, medical devices, infrastructure, and applications around Industry 4.0 will have wireless charging included. For more information, please get in contact with us via [www.infineon.com/support](http://www.infineon.com/support) to get your customized system solution.

---

www.infineon.com/wirelesscharging

*coming soon
** Explore more MOSFET offerings at our webpage.
USB-C chargers and adapters

Outstanding solution offering for mobile chargers and laptop adapters

USB-C Power Delivery (USB-PD) has emerged as the standard for unified and fast charging and as power supplies for all kinds of mobile devices such as smartphones, tablets, laptops, smart speakers, TVs, and others.

USB-C simplifies the end user experience and together with the introduction of GaN HEMTs and increasing switching frequencies it enables compact and lightweight chargers and adapters.

Infineon offers a leading portfolio of power controllers, flexible and programmable USB Type-C controllers, high-voltage CoolMOS™ superjunction MOSFETs, OptiMOS™ medium- and low-voltage MOSFETs as well as CoolGaN™ discretes and integrated power stages.

Our offering of USB-C reference and demo designs is based on quasi-resonant (QR), ZVS and hybrid flyback operation, for different power levels and power density requirements and for single and dual-output chargers.

Features and benefits

**Key features**
- Ready-to-use reference designs
- Comprehensive offering of power and protocol controllers, high- and low-voltage switches and TVS diodes allow customers to source all components from a single supplier
- Highly integrated solutions
- Smallest form factor, low $R_{DS(on)}$, and low parasitic capacitances, Kelvin-source engaged ThinPAK and PQFN packages
- Digital controllers enabling high-efficiency designs
- Fully programmable USB-C PD port controllers
- Configurability and upgradability
- Infineon has the largest installed in-house power semiconductor capacity with 12" wafer production for discretes for maximum supply security
- Dedicated supply chain programs to secure capacity and enable flexibility to demand fluctuations

**Key benefits**
- Ease-of-use and reduced complexity
- High-efficiency designs
- Differentiation and short time to market
- Secured supply chain

Application diagram

AC $\rightarrow$ $V_{in}$ $\rightarrow$ Main stage $\rightarrow$ Rectification $\rightarrow$ Switch $\rightarrow$ Type-C connector $\rightarrow$ $V_{out}$ DC

Primary-side PWM control $\leadarrow$ SR and protocol control

ESD

www.infineon.com/USB-PD
**Recommended products**

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product category</th>
<th>Topology</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flyback converter</td>
<td>High-voltage MOSFETs and HEMTs</td>
<td>Quasi-resonant flyback (QR)</td>
<td>600 V CoolMOS™ P7</td>
<td>Fast switching speed for improved efficiency and thermal management, reduced gate charge for enhanced light-load efficiency, optimized gate-to-source voltage ($V_{GS}$) threshold for lower turn-off losses, 600 V CoolMOS™ C7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Active-clamp flyback (ACF) Hybrid flyback (HFB)</td>
<td>600 V CoolMOS™ PFDT</td>
<td>Robustness and reliability with integrated robust fast body diode and up to 2 kV ESD protection, reduced gate charge for enhanced light-load efficiency, lower hysteresis loss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flyback (QR, ZVS, ACF, HFB)</td>
<td>CoolGaN™ GIT HEMTs 600 V</td>
<td>Highest efficiency, highest power density</td>
</tr>
<tr>
<td></td>
<td>Controller</td>
<td>ZVS flyback controller</td>
<td>XDP521081</td>
<td>Optimization of low line AC input with forced quasi-resonant, suitable for high power density design</td>
</tr>
<tr>
<td></td>
<td>Hybrid flyback controller</td>
<td>XDP52203</td>
<td>Supports wide range of configurable parameters, supports ultra-high power density (20 W/in3) design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QR flyback controller</td>
<td>EZ-PD™ PAC18YS</td>
<td>Secondary-side-controlled flyback solution, dual-chip flyback solution with integrated SR+PD controller</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gate-driver IC</td>
<td>Active-clamp flyback (ACF)</td>
<td>IRS25752L</td>
<td>High-side gate driver enables active clamp mode of operation, cost-effective, 600 V, single-channel driver in SOT23 package</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IRS21271S</td>
<td>High-side gate driver enables active clamp mode of operation, 600 V, single-channel driver with over-current protection (OCP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PFC DC-DC</td>
<td>High-voltage MOSFETs, GIT HEMTs, and diodes</td>
<td>600 V CoolMOS™ P7</td>
<td>Fast switching speed for improved efficiency, reduced gate charge for enhanced light-load efficiency, optimized gate-to-source voltage ($V_{GS}$) threshold for lower turn-off losses</td>
</tr>
<tr>
<td></td>
<td>DCM PFC</td>
<td>CoolGaN™ GIT HEMTs 600 V</td>
<td>Highest efficiency contribution via less parasitic parameter, space-saving with SMD smaller package</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DCM/CCM PFC</td>
<td>650 V Rapid 1 diodes</td>
<td>Low conduction losses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Controller</td>
<td>PFC/LLC Combo</td>
<td>IDP2108</td>
<td>Digital multimode PFC and LLC combined controller with floating high side driver and a startup cell, comprehensive and configurable protection features, wide set of configurable parameters</td>
</tr>
<tr>
<td></td>
<td>High-voltage MOSFETs and GIT HEMTs</td>
<td>HB LLC</td>
<td>600 V CoolMOS™ P7</td>
<td>Fast switching speed for improved efficiency and thermal management, reduced gate charge for enhanced light-load efficiency, optimized gate-to-source voltage ($V_{GS}$) threshold for lower turn-off losses</td>
</tr>
<tr>
<td></td>
<td>Gate-driver IC</td>
<td>HB LLC</td>
<td>CoolGaN™ IPS 600 V</td>
<td>Highest efficiency and highest power density, isolated gate driver integrated</td>
</tr>
<tr>
<td></td>
<td>Synchronous rectification</td>
<td>Low-voltage MOSFETs</td>
<td>OptiMOS™ PD 60-150 V</td>
<td>Low conduction losses, reduced overshoot, adapter-oriented synchronous rectification MOSFETs, control ICs, synchronous rectification</td>
</tr>
<tr>
<td></td>
<td>Control ICs</td>
<td>Optimus™ PD 124F</td>
<td>EZ-PD™ PAG15</td>
<td>Supports USB PD 2.0, PD 3.0 with PPS, QC4+, QC 4.0, QC 3.0, QC 2.0, Samsung AFC, Apple charging, and BC v1.2 charging protocols, space-saving with SMD smaller package</td>
</tr>
<tr>
<td>Protocol control</td>
<td>USB-C ICs</td>
<td>Protocol controller</td>
<td>EZ-PD™ PAG15</td>
<td>Supports USB PD 2.0, PD 3.0 with PPS, QC4+, QC 4.0, QC 3.0, QC 2.0, Samsung AFC, Apple charging, and BC v1.2 charging protocols, space-saving with SMD smaller package</td>
</tr>
<tr>
<td></td>
<td>Protocol controller</td>
<td>EZ-PD™ CGG3PA-NFET</td>
<td>Supports USB PD 3.0 with Programmable Power Supply (PPS), independent constant current (CC) and constant voltage (CV) modes, Configurable OVP, OCP, and OTP, integrates NFET gate driver to drive the load switch, 64 kB Flash Memory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-port controller</td>
<td>EZ-PD™ CGG70DC multi-port controller</td>
<td>Supports USB PD 3.0 with PPS, QC4, Apple 2.4 A charging, ABC, BCL2 etc., supports 1C and 1A port, 64 kB flash memory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connector</td>
<td>ESD protection</td>
<td>Multi-purpose diodes for ESD protection</td>
<td>Small packaging to support minimum board space consumption, high linearity - reducing harmonic generation/enabling suppression EMC problems, exceptional quality and reliability</td>
</tr>
</tbody>
</table>

---

[www.infineon.com/USB-PD](http://www.infineon.com/USB-PD)

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Infineon offers AC/DC battery charger reference designs targeted for charging Li-Ion batteries for mobile appliances such as power and gardening tools, small home appliances, e-bikes, and e-scooters.

The reference designs are based on Infineon’s leading portfolio of high-voltage (CoolMOS™) and low-and medium-voltage (OptiMOS™) switches as well as power controllers, designed to meet customers’ requirements and needs for battery chargers.

The flyback-based reference design* is scalable from 65 W to >100 W and aimed for 18 V/36 V Li-Ion battery packs. It is based on the quasi-resonant flyback controller ICC80QSG and the 700 V CoolMOS™ P7 series in the small-footprint and wave-solderable SOT-223 package. The controller burst mode enables a low standby power of <100 mW. The demo board includes a secondary-side auxiliary supply for battery switch and supply of a MCU. The measured efficiency is >89% at 230 V<sub>AC</sub> input voltage, providing excellent performance versus BOM cost ratio for chargers for consumer appliances.

The 170 W reference design* is aimed for e-bike battery charging and is based on the digital hybrid flyback controller XDP™ digital power XDSP2201 and the well-established 600 V CoolMOS™ P7S series in the TO-220-FP package. The measured efficiency is >94.5 % at 230 V<sub>AC</sub> input voltage, enabling fanless, very compact and fast charging e-bike chargers for outdoor use cases.

Features and benefits

### Key features
- Wide output voltage range
- High efficiency (>89 % for flyback, >93 % for LCC)
- Low standby consumption
- Inrush current, reverse polarity protection
- CC/CV operation
- Isolated aux voltage supply

### Key benefits
- Scalable to support a wide range of battery cells
- Fewer heatsinks, fanless and varnished operation for outdoor use
- Meet DoE level VI regulation
- Robustness
- Allows for optimization of charging process via microcontroller
- Supply for microcontroller

Application diagram

[Application diagram image]

www.infineon.com/charging

*Reference designs available by Q3 2022
## Product portfolio

<table>
<thead>
<tr>
<th>Application</th>
<th>Topology</th>
<th>Product type</th>
<th>Product/product family</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery charger for mobile appliances</td>
<td>QR flyback</td>
<td>QR flyback controller</td>
<td>ICC80QSG</td>
<td>DSQ8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-voltage MOSFETs</td>
<td>700 V CoolMOS™ PT</td>
<td>SOF-223</td>
</tr>
<tr>
<td>Hybrid flyback</td>
<td>Digital hybrid flyback controller</td>
<td>XDP™ digital power XDPS2201</td>
<td></td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-voltage MOSFETs</td>
<td>600 V CoolMOS™ PT</td>
<td>TO-220-FP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium-voltage MOSFETs</td>
<td>60 V/80 V/100 V OptiMOS™</td>
<td>Multiple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium-voltage MOSFETs</td>
<td>150 V StrongIRFET™</td>
<td>TO-220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC/DC integrated power stage</td>
<td>CoolSET™ Gen 5</td>
<td>DIP-7</td>
</tr>
<tr>
<td></td>
<td>Aux supply</td>
<td>CoolSET™</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

www.infineon.com/charging

For more details on the product, click on the part number, visit infineon.com or contact our product support.
The high-power density of lithium-ion batteries has made them very popular. However, the unstable behavior of lithium-ion cells under critical conditions requires them to be handled with care. That means a battery management system (BMS) is needed to monitor the battery state and ensure safe operation. BMS is typically equipped with an electronic switch that disconnects the battery from the charge or load under critical conditions that can lead to dangerous reactions. A battery protection unit (BPU) prevents possible damages to the battery cells and the failure of the battery.

Such critical conditions include:

- Over-charge that occurs when the battery is charged over the allowed maximum capacity.
- High and low temperature when the internal temperature of the battery cells exceeds their safe operational temperature range.
- Over-discharge when the battery is discharged under the allowed minimum capacity.
- Overcurrent when the battery is exposed to a short circuit condition or a high inrush turn-on current.
- Reverse polarity when the battery terminals are wrongly plugged into the device.

Failing to disconnect the battery during such conditions can lead to the following problems:

- Thermal runaway often due to over-charging or over-heating of the battery. The over-heating event can be due to a rise in the ambient temperature or due to charging/discharging the batteries with high current rates. Thermal runaway damages the battery cells and can lead to fires.
- Death of the cell often due to the discharge of batteries below its specified thresholds.
- Damage of load device often due to either improper inrush current management or reverse polarity.

In order to prevent these failures, Infineon offers a wide range of battery protection solutions that increase the lifetime and efficiency of lithium-ion batteries under stressful conditions.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{R}_{\text{DS(on)}} ) and safe operating area (SOA)</td>
<td>( \text{Higher performance with lower } \text{R}_{\text{DS(on)}} \text{ and wider safe operating area (SOA)} )</td>
</tr>
<tr>
<td>Compact bill of material (BOM)</td>
<td>( \text{Cheaper solutions with a more compact bill of material and more effective parallelization solutions} )</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>( \text{Short circuit protection with higher peak current rates to withstand higher current values} )</td>
</tr>
<tr>
<td>Turn-on and turn-off capabilities</td>
<td>( \text{Turn-on and turn-off solutions tailored to applications needs} )</td>
</tr>
<tr>
<td>All voltage class solutions</td>
<td>( \text{Up to 600 V MOSFET protection solutions (including single- and multi-module)} )</td>
</tr>
</tbody>
</table>

Application diagram

For more details on the product, click on the part number, visit infineon.com or contact our product support.
## Product portfolio

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>MOSFET voltage class</th>
<th>Package</th>
<th>Technology</th>
<th>R(_{\text{on}}) (max)</th>
<th>R(_{\text{thJC}}) (max)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 V</td>
<td>SuperS08</td>
<td>StrongIRFET™</td>
<td>≤ 0.95 mΩ</td>
<td>≤ 0.8 °C/W</td>
<td>IRFHL200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DirectFET</td>
<td>≤ 2.7 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>HFF1124</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 0.45 mΩ</td>
<td>≤ 0.8 °C/W</td>
<td>BSCH04N02L</td>
<td></td>
</tr>
<tr>
<td>PQFN 3.3x1.3</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 0.65 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td>IQE065NE2LSM5</td>
<td></td>
</tr>
<tr>
<td>DirectFET</td>
<td>≤ 6.8 mΩ</td>
<td>≤ 1.8 °C/W</td>
<td>BSCH06N02LX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PQFN 3.3x1.3</td>
<td>≤ 0.9 mΩ</td>
<td>≤ 1.9 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DirectFET</td>
<td>≤ 1.7 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td>IRF6726M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.95 mΩ</td>
<td>≤ 0.64 °C/W</td>
<td>IRLS3813</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 1.7 mΩ</td>
<td>≤ 0.8 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 1.9 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
</tr>
<tr>
<td>DirectFET</td>
<td>≤ 0.8 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 2.7 mΩ</td>
<td>≤ 0.8 °C/W</td>
<td>HFF6620</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 0.2 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH02N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 0.3 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH03N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 V</td>
<td>DirectFET</td>
<td>≤ 2.7 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH05N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.2 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH06N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 V</td>
<td>DirectFET</td>
<td>≤ 2.6 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 3.3 mΩ</td>
<td>≤ 0.45 °C/W</td>
<td>HFF6620</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 0.7 mΩ</td>
<td>≤ 0.8 °C/W</td>
<td>BSCH07N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.6 mΩ</td>
<td>≤ 0.6 °C/W</td>
<td>BSCH11N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72 V</td>
<td>DirectFET</td>
<td>≤ 3.7 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 2.2 mΩ</td>
<td>≤ 0.6 °C/W</td>
<td>BSCH12N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 1.1 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH08N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 0.9 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V</td>
<td>DirectFET</td>
<td>≤ 4.4 mΩ</td>
<td>≤ 1.1 °C/W</td>
<td></td>
<td>HFF7761L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 2 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH18N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH19N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 0.9 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH20N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 V</td>
<td>DirectFET</td>
<td>≤ 2.6 mΩ</td>
<td>≤ 1.5 °C/W</td>
<td></td>
<td>HFF7776L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 0.3 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH21N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 0.2 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH22N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 0.1 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH23N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 V</td>
<td>DirectFET</td>
<td>≤ 4.8 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td></td>
<td>HFF8041N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.1 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>HFF8051N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 11 mΩ</td>
<td>≤ 1.2 °C/W</td>
<td>BSCH02N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.1 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH03N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 V</td>
<td>DirectFET</td>
<td>≤ 30 mΩ</td>
<td>≤ 2 °C/W</td>
<td></td>
<td>BSCH04N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 30 mΩ</td>
<td>≤ 2 °C/W</td>
<td>BSCH05N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 11 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH06N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 11 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH07N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 V</td>
<td>DirectFET</td>
<td>≤ 48 mΩ</td>
<td>≤ 0.45 °C/W</td>
<td></td>
<td>HFF8041N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 20 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>HFF8051N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 90 mΩ</td>
<td>≤ 2.5 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 20 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 V</td>
<td>DirectFET</td>
<td>≤ 2.1 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 2.1 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>HFF6620</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 41 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 1.5 mΩ</td>
<td>≤ 1 °C/W</td>
<td>BSCH11N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 V</td>
<td>DirectFET</td>
<td>≤ 120 mΩ</td>
<td>≤ 2 °C/W</td>
<td></td>
<td>HFF8041N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 120 mΩ</td>
<td>≤ 2 °C/W</td>
<td>BSCH13N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 11 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH14N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 11 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>BSCH15N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180 V</td>
<td>DirectFET</td>
<td>≤ 59 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td></td>
<td>HFF6641</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 59 mΩ</td>
<td>≤ 1.4 °C/W</td>
<td>HFF6641</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 90 mΩ</td>
<td>≤ 2.5 °C/W</td>
<td>BSCH09N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 90 mΩ</td>
<td>≤ 2.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>240 V</td>
<td>DirectFET</td>
<td>≤ 21 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 21 mΩ</td>
<td>≤ 0.4 °C/W</td>
<td>HFF6620</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360 V</td>
<td>SuperS08</td>
<td>OptiMOS™</td>
<td>≤ 41 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH10N02L</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 41 mΩ</td>
<td>≤ 0.5 °C/W</td>
<td>BSCH11N02L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480 V</td>
<td>DirectFET</td>
<td>≤ 22 mΩ</td>
<td>≤ 0.32 °C/W</td>
<td></td>
<td>HFF6620</td>
<td></td>
</tr>
<tr>
<td>TO-220</td>
<td>≤ 22 mΩ</td>
<td>≤ 0.32 °C/W</td>
<td>HFF6620</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Battery monitoring

Optimize system performance by cell balancing and monitoring key battery parameters

Dedicated cell monitoring controllers are being used to keep lithium-ion cells within their allowed operational ranges regarding voltages, currents, and temperatures. They monitor the state of each cell according to pre-adjusted voltages and temperatures using high-precision ADCs. Synchronizing the distributed measurements across all cells inside a battery is key to achieving the best possible insights into the battery’s dis-/charging state (SOD/SOC) and overall battery health (SOH). The critical battery state assessment becomes less precise if these measurements are spread across wider time windows and if the measurement accuracy for each parameter is not high enough. A robust high-speed communication link across multiple daisy-chained monitoring devices supports complex cell topologies for a battery. For additional robustness, the daisy-chaining realizes a redundant ring, which keeps communication up between all connected ICs in case of a broken link. CRC protected data frames complement communication robustness. To achieve extreme low-power dedicated housekeeping functions such as periodically scheduled cell measurements and state analysis required for functional safety, the cell controller can perform independently from the master controller of the BMS. Safety features for signaling over-/undervoltage, thermal stress, etc., including emergency alarms, are triggered autonomously. When the number of cells increases, a reliable transfer of information from the cell balancing IC to the BMS controller becomes very important. Digital isolators can be used to ensure that the right data is transferred reliably by isolating the low voltage side (BMS controller) from the high voltage battery side.

TLE9012DQU
Li-ion battery monitoring and balancing IC

Features
› Voltage monitoring of up to 12 battery cells connected in series
› Hot plugging support
› Dedicated 16-bit delta-sigma ADC for each cell with selectable measurement mode
› High accuracy measurement for SOC and SOH calculation
› Integrated stress sensor with digital compensation algorithm and temperature-compensated measurements
› Secondary ADC with same averaging filter characteristics as advanced end to end safety mechanism
› Five temperature measurement channels for external NTCs
› Internal temperature sensors
› Integrated balancing switch allows up to 200 mA balancing current
› Differential robust serial 2 Mbit/s communication interface
› Additional four GPIO pins to e.g., connect an external EEPROM
› Internal round robin cycle routine triggers majority of diagnostics mechanisms
  - Automatic balancing over- and undercurrent detection scheme
  - Automatic open load and open wire detection scheme
  - Automatic NTC measurement unit monitoring scheme
› End to end CRC secured iso UART/UART communication
› Emergency mode for communication
› ISO 26262 safety element out of context for safety requirements up to Automotive safety integrity level D
› Green product (RoHS compliant)

www.infineon.com/battery-monitoring
TLE9015QU
BMS transceiver IC - UART to iso UART

Features

 › General
   – Two UART ports for serial communication to host microcontroller
   – Two iso UART interfaces for communication to other BMS ICs
   – 2 Mbit/s data rate for fast communication
   – Fully transparent communication scheme from UART to iso UART
   – Ring mode topology compatible

 › Communication ports
   – Integrated internal logic to minimize pin count on the UART side
   – Differential current edge triggered iso UART communication interface
   – High robustness against external noise

 › General purpose error pin
   – Two external fault inputs (EMM and ERRQ_ext)
   – Latching error output pin to trigger external microcontroller

 › Supporting diagnosis features
   – Internal supply monitoring
   – Green product (RoHS compliant)

Application diagram

![Application diagram of TLE9015QU](image)

www.infineon.com/battery-monitoring
## Digital isolators for battery monitoring

<table>
<thead>
<tr>
<th>Part number</th>
<th>Isolation ring</th>
<th>Safety certifications</th>
<th>Channel configuration</th>
<th>Input thresholds</th>
<th>Default output state</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>2DIB0400F*</td>
<td>V&lt;sub&gt;ISO&lt;/sub&gt;=3000 VRMS (UL1577 Ed. 5)</td>
<td>UL1577 (Ed. 5) VDE 0884-11 VDE 0844-17 IEC 62368-1 IEC 60601-1 IEC 61010-1 GB4943.1</td>
<td>2 forward 0 reverse (2+0)</td>
<td>Variable (CMOS)</td>
<td>Low</td>
<td>PG-DSO8 5 x 4 mm</td>
</tr>
<tr>
<td>2DIB0401F*</td>
<td></td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB1400F*</td>
<td></td>
<td></td>
<td></td>
<td>Fixed (TTL)</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2DIB1401F*</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2DIB0410F*</td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB0411F*</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2DIB1410F*</td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB1411F*</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Coming soon
1)Certifications planned
FET-based high-voltage solid-state relays

Best-in-class $R_{\text{DS(on)}} \times A$ enables unprecedented low losses in combination with advanced control and protection features.

Electromechanical relays are a mature and well-established technology. However, they suffer from some inherent weaknesses. The mechanical movement of metal contacts causes noise. The high voltages can arc before the contacts are completely opened or closed, which leads to contact degradation. An increase of the contact resistance over the lifetime causes the behavior to become less predictable. Triacs (or silicon-controlled rectifiers, SCRs) are widely used as solid-state relays in AC applications. However, their controllability is limited and they suffer from high power dissipation in the range of 1 W/A.

FET-based solid-state solutions offer many benefits in relay applications. This includes significantly faster switching while eliminating arcing and the noise associated with electromechanical devices. Inherently, this results in higher reliability and more stable performance. When considering the maintenance, repair and operations (MRO) cost, a strong argument can be made for using solid-state relays. Compared to triacs, a FET-based solution offers advanced control and protection methods. The significantly lower power dissipation minimizes the cooling effort in the application. The latest CoolMOS™ S7(A) technology is a perfect match for solid-state relay applications. It offers an unprecedentedly low $R_{\text{DS(on)}} \times A$ figure of merit that will meet the needs of customers and their end markets.

Features and benefits

**Key features**
- Operational lifetime: tens of millions of operations
- No mechanical parts
- Significantly faster switching
- No increasing resistance vs. lifetime
- Lowest $R_{\text{DS(on)}} \times A$ in class

**Key benefits**
- Maintenance free (no degradation of contacts), MRO cost savings
- Arcing-free operation, no contact bounce, clicking noise is eliminated
- Advanced control and protection methods
- Stable performance, predictable behavior
- Highest power density, minimized cooling effort, parallelization and scalability

Application diagram

www.infineon.com/ssr
www.infineon.com/S7
# Product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Product family</th>
<th>Voltage class ([V_{DS} \text{ max}])</th>
<th>(R_{DS(on)})</th>
<th>Package</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>CoolMOS™ S7 industrial</td>
<td>600 V</td>
<td>22 mΩ to 65 mΩ</td>
<td>TO-220</td>
<td>IPP60R02257, IPP60R04057, IPP60R06557</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22 mΩ to 65 mΩ</td>
<td>TOLL</td>
<td>IPT60R02257, IPT60R04057, IPT60R06557</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 mΩ to 65 mΩ</td>
<td>QDPAK top-side cooled</td>
<td>IPPQ60R01057, IPPQ60R02257, IPPQ60R04057, IPPQ60R06557</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ S7A automotive</td>
<td>600 V</td>
<td>10 mΩ</td>
<td>QDPAK top-side cooled</td>
<td>IPPQ60R01057A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Product family</th>
<th>Output voltage</th>
<th>Output current ([\text{typ.}])</th>
<th>Isolation type</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate drivers</td>
<td>EiceDRIVER™</td>
<td>20 V</td>
<td>5 A/9 A</td>
<td>functional/basic isolation</td>
<td>1EDB6275F, 1EDB8275F, 1EDB9275F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 A/9 A</td>
<td>non-isolated</td>
<td>1EDN6550B, 1EDN8550B, 1EDN9550B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 A/9 A</td>
<td>non-isolated</td>
<td>1EDN8511B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 V</td>
<td>±2 A to ±6 A</td>
<td>functional isolation</td>
<td>1EDI012MF, 1EDI012MF, 1EDI012MF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 V</td>
<td>±2.6 A</td>
<td>non-isolated</td>
<td>1ED4173N01B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 V</td>
<td>±3 A to ±6 A</td>
<td>functional isolation</td>
<td>1ED4314MU12M, 1ED4314MU12M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>±3 A to ±6 A</td>
<td>reinforced isolation</td>
<td>1ED4314MC12H, 1ED4314MC12H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Product family</th>
<th>Load voltage</th>
<th>Output/load current</th>
<th>Isolation voltage</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated solid-state relays</td>
<td>Photovoltaic isolators (PVI)</td>
<td>-</td>
<td>2 x 5 µA</td>
<td>3.75 kV</td>
<td>PVIS033R</td>
</tr>
<tr>
<td></td>
<td>Photovoltaic relays (PVR)</td>
<td>60 V</td>
<td>2 A</td>
<td>4 kV</td>
<td>PVG612A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400 V</td>
<td>1 A</td>
<td>3.75 kV</td>
<td>PVX6012</td>
</tr>
</tbody>
</table>

www.infineon.com/ssr  
www.infineon.com/S7
Low-voltage motor drive and control
Low-power battery applications

When it comes to increased efficiency and durability, brushless DC (BLDC) motors offer the ideal solution for power electric motor applications. Compared to traditional brushed motors, brushless DC motors are quieter, lighter, and offer an overall smaller design footprint while providing increased reliability. These improvements, however, come with an increased need for monitoring and control, requiring significantly more complex electronics and supporting algorithms. This move toward BLDC motors occurs in concert with a continuous push towards higher energy efficiency, resulting in trade-offs between power delivery and battery lifetime. This, in turn, puts a significant burden on semiconductor technologies to deliver high performance in motor control applications. In parallel, shortening life cycles and increased product diversity put an additional burden on suppliers to provide that same high performance, cost-efficient solutions across an increasing variety of use cases.

With industry-leading technology and reliability, Infineon’s extensive portfolio of discrete and integrated circuits offers the breadth and depth of solutions necessary to meet the demands across a wide spectrum of motor control needs.

Features and benefits

**Key features**
- A complete eco-system of simulations, documentation and demonstration boards
- Comprehensive portfolio of products and solutions
- Best in-class MOTIX™ gate drivers for OptiMOS™ and StrongIRFET™ MOSFETs offering high efficiency and protection
- World-class broad and deep portfolio of LV FETs with SMD packaging improves capability and reliability while reducing assembly cost
- Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest \( R_{\text{ds(on)}} \)
- High reliability of Infineon components results in prolonged product life spans

**Key benefits**
- Fast time to market
- Broad portfolio allows for right product fit to meet application needs
- Extended battery life and product life span
- Reduction overall system size and cost

**Key enabling products**
- Power MOSFETs – OptiMOS™, StrongIRFET™
- MOTIX™ low-voltage motor control solutions
- XMC1000 microcontrollers
- XMC4000 microcontrollers
- PSoC™ 4100 microcontrollers
- PSoC™ 62 microcontrollers
- XENSIV™ angle sensor
- XENSIV™ magnetic sensor
- XENSIV™ current sensor
- XENSIV™ Hall switch

**Application diagram**

**Target end applications**

www.infineon.com/bldc
www.infineon.com/bdc
### Product portfolio

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Package options</th>
<th>Voltage class [V]</th>
<th>Part number</th>
<th>Current source/sink</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter/MOSFETs</td>
<td>StrongRFET™  SuperSO8</td>
<td>PQFN 3x3 DirectFET™ S/M/L-Can TOLL TOLS TOLT TO-220 TO-247 DFPAK D²PAK 7-pin</td>
<td>12-16</td>
<td>25-30</td>
<td>BSC005N03, IQE006NE2, IPT004N, IPP05SN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td></td>
<td>18</td>
<td>40</td>
<td>IRL40DM2, BSC010N04, IST011N06, BSZ097N04, ITRF045C, IPB011N04, IRL40215</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>36-48</td>
<td>60</td>
<td>IST011N06NM, BSC012N06N, BSZ100N06N, IPT007N06N, ITRF07534, BSC014N06N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48-60</td>
<td>75-80</td>
<td>BSC021N08N, BSC030N08N, IPT010N08N, ITRF011N08N, IPP040N08N, IPP049N08N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60-72</td>
<td>100-120</td>
<td>BSC035N10N, ISZ080N10N, IPT015N10N, ITRF031N10N, IPP036N12N, IPP050N10N</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>72-96</td>
<td>150</td>
<td>BSC074N15N, BSC110N15N, IPT059N15, IPB072N15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>96-144</td>
<td>200</td>
<td>BSC220N20N, IRF2005234, ITRG111N20NM, IPT111N20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product category</th>
<th>Voltage class [V]</th>
<th>Configuration</th>
<th>Part number</th>
<th>Current source/sink</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate drivers</td>
<td>25</td>
<td>Low-side</td>
<td>1ED44173</td>
<td>2.6 A/2.6 A</td>
<td>Integrated fast-forward protection, fault reporting and enable functionality, SOT-23 package</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>Three-phase</td>
<td>6EDL7141 NEW</td>
<td>1.5 A/1.5 A</td>
<td>Configurable smart gate driver, integrated power management and current sense amplifiers, VQFN-48 package</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>Three-phase</td>
<td>6ED2742 NEW</td>
<td>1 A/2 A</td>
<td>SOI, integrated BSD, trickle charge pumps, power management and current sense amplifiers, RFE, QFN32 package</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>High- and low-side</td>
<td>2ED2732 NEW</td>
<td>1 A/2 A</td>
<td>SOI, integrated BSD, separate VSS/COM, thermal pad, DFN10 package</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>Half-bridge</td>
<td>2ED2748</td>
<td>4 A/8 A</td>
<td>SOI, integrated BSD, separate VSS/COM, thermal pad, DFN10 package</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Three-phase</td>
<td>6EDL04N02</td>
<td>0.165 A/0.375 A</td>
<td>SOI, Integrated BSD, OCP, enable, fault reporting, TSSOP-28 package</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>High- and low-side</td>
<td>IRS2005S</td>
<td>0.29 A/0.6 A</td>
<td>VCSS, UVOLO, matched propagation delay, TSSOP-28 package</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Half-bridge</td>
<td>IRS2007S</td>
<td>0.29 A/0.6 A</td>
<td>VCSS, UVOLO, matched propagation delay, TSSOP-28 package</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Low- or high-side</td>
<td>1EDN7550</td>
<td>4 A/8 A</td>
<td>Low propagation delay, differential input, high common mode input, UVOLO, SOT23-6 and TSNP-6 package options</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>Half-bridge</td>
<td>IRS21867S</td>
<td>4 A/4 A</td>
<td>High current level-shift gate driver with low VCC operation, DSO8 package</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>Three-phase</td>
<td>6EDL04N06PT</td>
<td>0.165 A/0.375 A</td>
<td>SOI, Integrated BSD, tolerant to -Vss up to 100 V, OCP, enable, fault reporting, DSO-28W package</td>
</tr>
<tr>
<td></td>
<td>650</td>
<td>Half-bridge</td>
<td>2ED2304506F</td>
<td>0.36 A/0.7 A</td>
<td>SOI, Integrated BSD, tolerant to -Vss up to 100 V, DSO8 package</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/bldc
www.infineon.com/bdc
### Evaluation platforms

<table>
<thead>
<tr>
<th>Category</th>
<th>Product name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>DEMO-PTOOL-300W-M</td>
<td>This design kit for cordless power tools uses the DirectFET™ ME/MF and firmware developed using the XMC1300 family.</td>
</tr>
<tr>
<td></td>
<td>KIT_MOTOR_DC_250W_24V</td>
<td>Three-phase DC motor control power card ( V_{DC} ) 24 V, 250 W motor drive power card for XMC1000 and XMC4000</td>
</tr>
<tr>
<td></td>
<td>Stepper motor control shield with IFX9201 and XMC1300</td>
<td>The stepper motor control shield based on Infineon’s H-bridge IFX9201 and XMC1300 microcontroller can drive the two coils in a stepper motor featuring a dual-H-bridge configuration. This current stepper motor control board is compatible with Arduino microcontroller boards and Infineon’s XMC™ microcontroller kits using the Arduino form factor.</td>
</tr>
<tr>
<td></td>
<td>KIT_XMC1X_AK_MOTOR_001</td>
<td>XMC1000 motor control application kit</td>
</tr>
<tr>
<td>Product</td>
<td>CY8CKIT-037</td>
<td>The CY8CKIT-037 is used for PSoC™ 4 solution evaluation for motor control application. The kit supports BLDC motors, PMSM (permanent magnetic synchronous motors), and stepper motors. We provide example projects including single-shunt and sensorless FOC (field oriented control), sensorless BLDC control, sensorless BLDC control, and stepper motor control example projects.</td>
</tr>
<tr>
<td></td>
<td>EVAL_6EDL7141_TRAP_1SH</td>
<td>The EVAL_6EDL7141_TRAP_1SH features fully configurable operating parameters with an on-board debugger ready for direct USB connection to PC. The BLDC motor drive board uses trapezoidal commutation based on the MOTIX™ 6EDL7141 smart three-phase driver.</td>
</tr>
</tbody>
</table>
| | S2GO_CUR-SENSE_TLI4971 | For evaluation purposes of the latest XENSIV™ current sensor TLI4971, we rely on our proven evaluation concept of Shield2Go and 2GO Kits – therefore the TLI4971 evaluation environment is also offered in those two configurations: 
  > TLI4971 MS2GO: 2GO Kit version 
  > TLI4971 S2GO: Shield2Go version |
High-power low-voltage motor drives power both personal light e-mobility vehicles such as e-bikes, e-scooters, e-motorcycles, microEVs, as well as material handlers such as e-forklifts, delivery vehicles (xDVs), autonomous mobile robots (AMR), automated guided vehicles (AGV), and commercial, construction and agricultural vehicles (CAV). These applications can be collectively referred to as light electric vehicles (LEVs). LEVs have an ever-growing need for highly efficient, intelligent, and powerful motor-drive systems to address requirements such as high speed, high peak, and continuous torque, safety, reliability, and most of all, long battery lifetime. Infineon offers a comprehensive, end-to-end solution for every segment and variation of this diverse market with power levels ranging from 200 W to 50 kW.

The OptiMOS™ and StrongIRFET2™ MOSFET families form a powerful yet efficient muscle of the system, while the EiceDRIVER™ gate driver family offers a broad range of both isolated and non-isolated gate drivers. An array of motor control MCUs such as iMOTION™, XMC™ and AURIX™ along with their software/tools ecosystem, enable quick, easy, and tailor-made implementations of advanced motor control algorithms with necessary safety requirements. The XENSIV™ current and angle/position sensors enable accurate closed-loop control. Along with an extensive product portfolio, Infineon simplifies and accelerates the design process by offering demonstration, evaluation, and reference boards, simulation models, application notes, comprehensive technical support, and a vibrant developer community.

Features and benefits

### Key features

- MOSFETs with best FOMs for drives with low $R_{DS(on)}$, low $Q_{RSS}$, low $\Delta V_{GS}$
- Broad and deep microcontroller portfolio enabling varied design approaches (plug n play, optimized custom design), S/W tool libraries, hall and encoder I/F Co-processor, $\Delta$ demodulator, functional safety
- Gate drivers with robust isolation, TDI, high/programmable output current, active miller clamp
- Current sensors having high current range, coreless sensing, high resolution, noise immunity and programmability
- Hall switches, angle/position sensors and 3D angle sensors with high accuracy, low jitter and low power consumption

### Key benefits

- Extended range/increase in battery life
- Precise motor control
- Enable compact motor drive design
- Quick and easy system-design enabling fast time-to-market
- Rugged, reliable and safe motor drives
- Proven Infineon quality ensuring durability and long life of the system

### Application diagram

![Application diagram](www.infineon.com/pmsm-below-200v)
## Typical power level of the inverter system: 200 W-4 kW

<table>
<thead>
<tr>
<th>Component</th>
<th>Product family</th>
<th>Package options</th>
<th>Battery voltage support (V)</th>
<th>Voltage class ( V_{DS,\text{max}} )</th>
<th>Representative part numbers</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter/ MOSFETs</td>
<td>StrongIRFET™ OptiMOS™</td>
<td>TOLL TOLG D²PAK 7-pin D²PAK TO-220 TO-247 SuperSO8</td>
<td>24-36</td>
<td>60</td>
<td>IPT007N06N, IPTG007N06N5M5, BSC012N06N5, ISCO10N06N5M5, IRFS7534, IRP204N06N5M5, IRP801N06N5M5, IRF60SC241, IRFS7537</td>
<td>Low ( R_{DS,\text{ON}} ), and low conduction losses, tight ( V_{GS,\text{th}} ) spread for efficient paralleling, low ( Q_{rr} ), soft body diode, innovative packages</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>36-48</td>
<td>80</td>
<td>IPTG011N08N5M5, IPTC012N08N5M5, IPT012N08N5M5, IPT010N08N5M5, IPT012N08NF2S*, IPB015N08N5M5, BSC017N08N5M5, ISPC40N08N5M5, IPBP40N08N5F2S, IPBP24N08N5F2S, IPBP040N08N5F2S, BSC037N08N5M5, IPBP40N08N5F2S</td>
<td></td>
</tr>
</tbody>
</table>

## Typical power level of the inverter system: 4 kW-11 kW

<table>
<thead>
<tr>
<th>Component</th>
<th>Product family</th>
<th>Package options</th>
<th>Battery voltage support (V)</th>
<th>Voltage class ( V_{DS,\text{max}} )</th>
<th>Representative part numbers</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>StrongIRFET™ OptiMOS™</td>
<td>TOLL, TOLG D²PAK 7-pin D²PAK TO-220 TO-247 SuperSO8</td>
<td>48-72</td>
<td>100-120</td>
<td>IPTG014N10N5M5, IPTC015N10N5M5, IPT015N10N5M5, IPT010N10N5M5, IPTP042N10N5F2S*, IPBP050N10N5F2S*</td>
<td>Low ( R_{DS,\text{ON}} ), and low conduction losses, tight ( V_{GS,\text{th}} ) spread for efficient paralleling, low ( Q_{rr} ), soft body diode, innovative packages</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>72-96</td>
<td>135-150</td>
<td>IRF5150P220, IPT039N15N5M5, IPTGP039N15N5M5*, IPTC039N15N5M5*, IPBP044N15N5M5, IPTP044N15N5M5, IPBP040N15N5M5, BSC039N15N5M5, IPPR4568, IPTP063N15N5M5, IPT073N15N5M5, IPPR7779L2, IPP076N15N5M5, IRFS4115</td>
<td></td>
</tr>
</tbody>
</table>

Note: The MOSFET parts listed under various power-levels in the above tables is only for guidance purposes; higher power levels can be achieved even with lower voltage class MOSFETs through paralleling.

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/pmsm-below-200v

* Coming soon
Typical power level of the inverter system: >11 kW

<table>
<thead>
<tr>
<th>Component</th>
<th>Product family</th>
<th>Package options</th>
<th>Voltage class support (V)</th>
<th>Voltage class ([V_{DS}\text{\ max}])</th>
<th>Representative part numbers</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter/ MOSFETs</td>
<td>StrongIRFET™</td>
<td>OptiMOS™</td>
<td>96-144</td>
<td>200</td>
<td>IRF200P222, IPB107N20N3G, IPTG111N20NM3FD, IRFP4668, IRF200S234, IRF54127</td>
<td>Low (R_{\text{on}}) and low conduction losses, tight (V_{\text{th}}) spread for efficient paralleling, Low Qrr, soft body diode, innovative packages</td>
</tr>
</tbody>
</table>

Microcontrollers and sensors for precision control and accurate sensing (power-level agnostic)

<table>
<thead>
<tr>
<th>Component</th>
<th>Product family</th>
<th>Core/ MaxClock speed</th>
<th>Representative parts</th>
<th>Package</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcontroller</td>
<td>iMOTION™</td>
<td>Arm® Cortex® M0, 48 MHz</td>
<td>IMC301A-F048, IMC301A-F064</td>
<td>LQFP-48, LQFP-64</td>
<td>UART, SPI, I²C, LIN, MATH, 2x ACMP, CCU4</td>
</tr>
<tr>
<td></td>
<td>XMC™</td>
<td>Arm® Cortex® M0, 32 MHz</td>
<td>XMC13xx</td>
<td>TSSOP-16/28/38, QFN-24/40</td>
<td>UART, SPI, I²C, I²S, CAN, POSIF, MATH, 4x ACMP, 2x CCU8</td>
</tr>
<tr>
<td></td>
<td>Arm® Cortex® M0, 48 MHz</td>
<td>XMC14xx</td>
<td>XMC14xx</td>
<td>TSSOP-38, QFN-40/48/LQFP-64</td>
<td>UART, SPI, I²C, I²S, CAN, POSIF, MATH, 4x ACMP, 2x CCU8</td>
</tr>
<tr>
<td></td>
<td>Arm® Cortex® M4F, 80 MHz</td>
<td>XM41xx</td>
<td>XM41xx</td>
<td>QFN-48/QFP-64</td>
<td>UART, SPI, I²C, I²S, CAN, POSIF, HRPWM, CCU8</td>
</tr>
<tr>
<td></td>
<td>Arm® Cortex® M4F, 80 MHz</td>
<td>XM42xx</td>
<td>XM42xx</td>
<td>QFN-48/QFP-64</td>
<td>UART, SPI, I²C, I²S, CAN, POSIF, HRPWM CCU8</td>
</tr>
<tr>
<td></td>
<td>Arm® Cortex® M4F, 120 MHz</td>
<td>XM44xx</td>
<td>XM44xx</td>
<td>TQFP-64/100</td>
<td>Ethernet, USB, UART, SPI, I²C, I²S, CAN, POSIF, HRPWM, CCU8</td>
</tr>
<tr>
<td></td>
<td>Arm® Cortex® M4F, 144 MHz</td>
<td>XM47xx</td>
<td>XM47xx</td>
<td>TQFP-100/144, LFGBA-196</td>
<td>Ethernet, USB, UART, SPI, I²C, I²S, CAN, POSIF, SD/MMC, CCU8</td>
</tr>
</tbody>
</table>

Design resources

Low-voltage drives scalable power demoboard platform
XMC™ demonstration and eval boards
XENSIV™ TLE-5501 evaluation kit
XENSIV™ current sensors evaluation boards

www.infineon.com/pmsm-below-200v

* Coming soon
### System specification exemplar

**V\text{\textsubscript{bat}} = 24 V, 500 W PMSM motor**

<table>
<thead>
<tr>
<th>Component</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>BSC012N06NS</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>IMC301A-F048/XMC1302T038X-0032</td>
</tr>
<tr>
<td>Gate driver</td>
<td>6ED2742501Q*</td>
</tr>
<tr>
<td>Position/speed sensor</td>
<td>TLI49611MXTMA1</td>
</tr>
<tr>
<td>Current sensor</td>
<td>TLI4971-A120TS-U-E001</td>
</tr>
</tbody>
</table>

### System specification exemplar

**V\text{\textsubscript{bat}} = 48 V, 3 kW PMSM motor**

<table>
<thead>
<tr>
<th>Component</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>IPTC012N08NM5</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>IMC301A-F064/XMC1403Q848X0200AA</td>
</tr>
<tr>
<td>Gate driver</td>
<td>2ED2738501Q*</td>
</tr>
<tr>
<td>Position/speed sensor</td>
<td>TLI5012B E1000</td>
</tr>
<tr>
<td>Current sensor</td>
<td>TLI4971-A120TS-U-E001</td>
</tr>
</tbody>
</table>

### System specification exemplar

**V\text{\textsubscript{bat}} = 48 V, 20 kW PMSM motor**

<table>
<thead>
<tr>
<th>Component</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>IPTG014N10NM5</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC47D0-F100K1536AA</td>
</tr>
<tr>
<td>Gate driver</td>
<td>2ED88259F*</td>
</tr>
<tr>
<td>Position/speed sensor</td>
<td>TLE5501 E0002</td>
</tr>
<tr>
<td>Current sensor</td>
<td>TLE4972-AE35SS</td>
</tr>
</tbody>
</table>

### System specification exemplar

**V\text{\textsubscript{bat}} = 96 V, 6 kW PMSM motor**

<table>
<thead>
<tr>
<th>Component</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFETs</td>
<td>IPT039N15NS</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC1404-F064X0200AA</td>
</tr>
<tr>
<td>Gate driver</td>
<td>2ED88259F*</td>
</tr>
<tr>
<td>Position/speed sensor</td>
<td>TLE5501 E0002</td>
</tr>
<tr>
<td>Current sensor</td>
<td>TLE4972-AE35SS</td>
</tr>
</tbody>
</table>

www.infineon.com/pmsm-below-200v

* Coming soon
Today’s uninterruptible power supply systems introduce a wide range of challenges. Overcoming them requires an increase in output power, energy efficiency and power density. We offer complete system-level solutions and high quality products for diverse uninterruptible power supply applications. Equipped with our semiconductors, UPS applications can achieve best-possible power-conversion efficiency and cutting-edge power density. The benefits are cost reduction and fewer passive components – regardless of the topology used.

Our solutions and products for UPS applications fulfill the latest market requirements. This includes the trend of modularization of UPS brick units due to scalable power demand from data centers, as well as the topology shift from two-level to three-level to achieve higher efficiency. Our products are suitable for any kind of uninterruptible power supplies in telecom, data center, server or industrial automation environments.
Offline UPS

Bi-directional UPS power stage

Full-bridge bi-directional power stage

Push-pull bi-directional power stage

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>Topology</th>
<th>MOSFET breakdown voltage</th>
<th>TO-220</th>
<th>TO-247</th>
<th>DPAK and DPAK-7</th>
<th>Gate drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V</td>
<td>Push-pull</td>
<td>IRFB7530, IRFB7534, IRFB7540, IRFB7545</td>
<td></td>
<td></td>
<td>IRFS7530, IRFS7530-TP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full-bridge</td>
<td>IRFP7730, IRFP7734, IRFP7736</td>
<td></td>
<td></td>
<td>IRFP7430, IRFP7430-TP</td>
<td></td>
</tr>
<tr>
<td>24 V</td>
<td>Push-pull</td>
<td>IRFB7430, IRFB7434, IRFB7436 (60 V), IRFB7438 (60 V)</td>
<td></td>
<td></td>
<td>IRFP7530, IRFP7532, IRFP7534</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full-bridge</td>
<td>IRFP7718, IRFP7720, IRFP7722</td>
<td></td>
<td></td>
<td>IRFP7718, IRFP7720, IRFP7722</td>
<td></td>
</tr>
<tr>
<td>48 V</td>
<td>Push-pull</td>
<td>IRFB4115, IRFB4321, IPP046N15NS*, IRFB4326, IRFB4409</td>
<td></td>
<td></td>
<td>IRFP9468, IRFP9470, IRFP9472, IRFP9474</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full-bridge</td>
<td>IPP030N10, IRFB4110, IRFB4110N3G, IRFB4510, IPP1801N3G</td>
<td></td>
<td></td>
<td>IPP030N10, IRFB4110, IRFB4110N3G, IRFB4510, IPP1801N3G</td>
<td></td>
</tr>
<tr>
<td>72 V</td>
<td>Push-pull</td>
<td>IPP11N20N3, IRFB4127, IRFB4227, IPP22N20N3</td>
<td></td>
<td></td>
<td>IPP046N15NS*, IRFP9468, IRFP9470, IRFP9472, IRFP9474</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Full-bridge</td>
<td>IPP030N10, IRFB4110, IRFB4110N3G, IRFB4510, IPP1801N3G</td>
<td></td>
<td></td>
<td>IPP030N10, IRFB4110, IRFB4110N3G, IRFB4510, IPP1801N3G</td>
<td></td>
</tr>
</tbody>
</table>

Microcontrollers 12-72 V XMC1300 series

www.infineon.com/ups

*For more information on the product, contact our product support*
Unidirectional

Grid

Sensing

AC-DC charger

Battery 12 V / 24 V

Multistage

DC-DC step up

Inverter + filter

Load

Unidirectional power stage (output stage)

DC-DC stage

Inverter stage

Battery +

HFB7430

HFB7434

IRF7430

IRF7430-7P

IRF7430*

IRF44273

HFB7540

HFB7545

IRF60B217

IRF7730

IRF7734

IRF4321

IRF4615

Microcontrollers

XMC1300 series

www.infineon.com/ups

*For more information on the product, contact our product support
Unidirectional inverter stage

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>Topology</th>
<th>MOSFET breakdown voltage</th>
<th>TO-220</th>
<th>TO-247</th>
<th>Gate drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 V</td>
<td>Full-bridge inverter</td>
<td>300 V</td>
<td>IPP410NJON</td>
<td>IRFB4137</td>
<td>IRF300P226, IRF300P227, IRFP4868, IRFP4137, IRS211X*, IRS2186</td>
</tr>
<tr>
<td>400 V</td>
<td>Full-bridge inverter</td>
<td>500 V</td>
<td>IPP50R280CE, IPP50R380CE, IPP50R190CE</td>
<td>IRFW50R190CE, IRS211X*, IRS2186</td>
<td></td>
</tr>
</tbody>
</table>

Microcontrollers: XMC1300 series

Unidirectional charger

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>Topology</th>
<th>MOSFET breakdown voltage</th>
<th>TO-220</th>
<th>TO-247</th>
<th>PG-DIP-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-72 V</td>
<td>Flyback</td>
<td>650 V</td>
<td>CoolSET™</td>
<td>ICE3RBR1765JZ, ICE3RBR1665JZ</td>
<td></td>
</tr>
<tr>
<td>12-72 V</td>
<td>Flyback</td>
<td>800 V</td>
<td>CoolMOS™ P7</td>
<td>IPP80R750P7, IPP80R600P7, IPP80R450P7, IPP80R360P7, IPP80R280P7</td>
<td></td>
</tr>
</tbody>
</table>

Microcontrollers: Integrated, ICE3AS03LJG, ICE3BS03LJG

www.infineon.com/ups

*For more information on the product, contact our product support
### Online UPS

#### Online UPS power stage

![Diagram of Online UPS power stage](image)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Topology</th>
<th>Voltage class</th>
<th>Technology</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rectifier</strong></td>
<td>Three-phase</td>
<td>800 V/1600 V</td>
<td>EasyBRIDGE, EconoBRIDGE™</td>
<td></td>
</tr>
<tr>
<td><strong>PFC</strong></td>
<td>Boost PFC / Vienna “T-type”</td>
<td>1200 V</td>
<td>TRENCHSTOP™ IGBT6</td>
<td>IKW40N120CS6, IKQ75N120CS6</td>
</tr>
<tr>
<td></td>
<td>Boost PFC / Vienna rectifier</td>
<td>1200 V</td>
<td>CoolSiC™ MOSFET</td>
<td>F3L15MR12W2M1_B69</td>
</tr>
<tr>
<td></td>
<td>Boost PFC / Vienna “T-type”</td>
<td>650 V</td>
<td>TRENCHSTOP™ 5 HS</td>
<td>IKW50N65EH5, IKW75N65EH5</td>
</tr>
<tr>
<td></td>
<td>Boost PFC</td>
<td>600 V/1200 V</td>
<td>EasyPACK™</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boost PFC</td>
<td>1200 V</td>
<td>CoolSiC™ Schottky diode</td>
<td></td>
</tr>
<tr>
<td><strong>PFC</strong></td>
<td></td>
<td>600 V</td>
<td>CoolSiC™ P7</td>
<td>IPP610R060P7, IPB610R060P7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 V</td>
<td>CoolSiC™ C7</td>
<td>IPP610R040C7</td>
</tr>
<tr>
<td><strong>Inverter</strong></td>
<td>NPC 1</td>
<td>650 V</td>
<td>TRENCHSTOP™ 5 HS</td>
<td>IKW50N65EH5, IKW75N65EH5, IKZ50N65EH5, IKZ75N65EH5</td>
</tr>
<tr>
<td></td>
<td>NPC 1</td>
<td>650 V</td>
<td>TRENCHSTOP™ 5 SS</td>
<td>IKW50N65SS, IKW75N65SS</td>
</tr>
<tr>
<td></td>
<td>NPC 1</td>
<td>650 V</td>
<td>TRENCHSTOP™ HighSpeed3 IGBT Rapid diode</td>
<td>FS3L50R07W2H3F_B11</td>
</tr>
<tr>
<td></td>
<td>NPC 2</td>
<td>1200 V</td>
<td>TRENCHSTOP™ IGBT6</td>
<td>IKW40N120CS6, IKQ75N120CS6</td>
</tr>
<tr>
<td></td>
<td>NPC 2</td>
<td>1200 V</td>
<td>CoolSiC™ Schottky diode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NPC 2</td>
<td>1200 V</td>
<td>TRENCHSTOP™ HighSpeed3 IGBT Rapid diode</td>
<td>FS3L25R12W2H3_B11, FS3L200R12W2H3_B11, FS3L200R12W2H3_B47</td>
</tr>
<tr>
<td></td>
<td>NPC 2</td>
<td>650 V</td>
<td>TRENCHSTOP™ 5 SS</td>
<td>IKW50N65SS, IKW75N65SS</td>
</tr>
<tr>
<td></td>
<td>Two-level</td>
<td>1200 V</td>
<td>EconoPACK™, EasyPACK™</td>
<td>FS75R12W2T4_B11, FS200R12KT4_B11</td>
</tr>
<tr>
<td></td>
<td>Two-level</td>
<td>1200 V</td>
<td>EconoDUAL™</td>
<td>FF600R12ME4_B11</td>
</tr>
<tr>
<td></td>
<td>Three-level NPC1</td>
<td>600 V/1200 V</td>
<td>EconoPack™</td>
<td>F3L300R07PE4</td>
</tr>
<tr>
<td><strong>Battery charger</strong></td>
<td>Half-bridge</td>
<td>1200 V</td>
<td>TRENCHSTOP™ IGBT6</td>
<td>IKW40N120CS6, IKQ75N120CS6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 V</td>
<td>CoolSiC™ MOSFET</td>
<td>F3L6MR12W2M1_B11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>TRENCHSTOP™ 5 HS</td>
<td>IKW50N65EH5, IKW75N65EH5</td>
</tr>
<tr>
<td><strong>Gate driver ICs</strong></td>
<td>Single-channel</td>
<td>2300 V</td>
<td>EiceDRIVER™ X3 Compact</td>
<td>1ED3122MC12H, 1ED3124MC12H</td>
</tr>
<tr>
<td></td>
<td>AUX</td>
<td>-</td>
<td>650-800 V</td>
<td>CoolSET™</td>
</tr>
</tbody>
</table>

*For more information on the product, contact our product support*
Near-field communication (NFC) is a mature technology for contactless exchange of data over short distances. Besides the data exchange, NFC technology itself can also transfer power from the polling device to the receiver devices. Due to the working principle of resonant coupling, power transmission via NFC is efficient and user-friendly because it is less sensitive to antenna/coil alignment. The combination of data exchange and energy transfer in one interface and the availability in billions of smartphones make NFC exciting enabler for the following novel use cases:

**Passive device parameter configuration:** Programming or configuring product operation parameters is sometimes complicated because of access problems or equipment requirements. Using an NFC interface, contactless or even passive operation can be performed anywhere. Modern LED power supplies are already equipped with the NFC interface to enable output current configuration in production, sales channel, and the field. Infineon’s NLM product series supports customers to enable NFC configuration functions effectively.

**Smart actuator and sensing devices:** In the IoT age, smart devices help people make their life easier and more sustainable. NFC technology provides an option to develop battery-less smart devices that operate when the NFC reader device, like a mobile phone, is present. As a complement to mainstream active IoT technology, passive NFC technology is suitable for use cases like a passive smart lock, passive sensor inlay, medical care patch, etc.

With Infineon’s new NFC tag-side controller family a single-chip solution is available to develop cost-effective, miniaturized, actuation or sensing applications operating in either passive or active mode. The NAC1080, with integrated H-bridge and energy harvesting modules, enables cost-effective development of passive smart actuators like passive locks.

The NGC1081 is a low-power controller with ADC/DAC unit, integrated temperature sensor, and sophisticated analog and digital I/Os. It is the ideal solution for contactless sensing applications like temperature logger, gas detector, sensor inlay, medical patch, etc. Furthermore, both sensing and actuation control capability make the NGC1081 a unique product in the market, ideally suited for applications that require these functions – for example, radiator thermostats.

www.infineon.com/cps
NFC configuration – NLM series

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Package</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLM0011</td>
<td>Dual-mode NFC configuration IC with PWM output and CLO function</td>
<td>SOT23-5</td>
<td>NLM0011XTSA1</td>
</tr>
<tr>
<td>NLM0010</td>
<td>Dual-mode NFC configuration IC with PWM output, without CLO function</td>
<td>SOT23-5</td>
<td>NLM0010XTSA1</td>
</tr>
</tbody>
</table>

See LED lighting chapter for more information.

NFC actuation and sensing – NAC1080 and NGC1081

**Highly integrated single-chip solution**
The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, sensing unit, motor driver, and energy harvesting function enables customers to develop smart actuation and sensing devices with minimum system BOM requirement.

**Full flexible software-defined functions**
The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize the utilization of software-defined functions.

**Build-in security functions to meet the application requirements**
These ICs include hardware security functions such as secure area in Flash, 128 bit AES accelerator and true random generator. A separate secure element can be connected via the digital interface on demand.

www.infineon.com/CPS

* Please, check product availability at our webpage.
Applications

Appliances and consumer electronics, ITC infrastructure, renewables, robotics, e-mobility

- Major home appliances
- Small home appliances
- Power and gardening tools
- Wrist-worn devices
- Class D audio amplifiers
- Smart speaker
- Surveillance camera
- LED lighting
- Plug & LEDs play solutions
- Smart lighting solutions
- ITC solutions
- Solar
- Energy storage systems
- Robotics
- Onboard chargers for xEV applications
- Light electric vehicles and forklift

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
Product designers are facing the daunting challenge of developing smaller, smarter, more powerful, and more energy-efficient appliances. Based on industry-leading technology and manufacturing expertise, Infineon’s line of innovative components for household appliances meets and exceeds even the most rigorous requirements for reliability and quality. The block diagram of an air conditioning system shown below, together with the product selection table, provides an effective recommendation for engineers to select the right component for each power management stage inside major home appliances.

In addition to efficiency gain through power solutions, Infineon’s XENSIV™ sensor portfolio also enhances major home appliances’ operation through advanced sensor-enabled use cases such as condition monitoring and predictive maintenance to detect potential device failures before they occur. Furthermore, integration of voice control or presence detection in those appliances increases user convenience and results in even more efficient devices.

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Selection/benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensors</td>
<td>Pressure sensor</td>
<td>Airflow monitoring</td>
</tr>
<tr>
<td></td>
<td>MEMS microphone</td>
<td>Noise monitoring</td>
</tr>
<tr>
<td></td>
<td>Magnetic current sensor</td>
<td>Current sensing</td>
</tr>
<tr>
<td></td>
<td>3D magnetic sensor</td>
<td>Vibration and position monitoring</td>
</tr>
<tr>
<td></td>
<td>Linear Hall sensor</td>
<td>Linear vibration monitoring</td>
</tr>
<tr>
<td></td>
<td>Hall sensors and switches</td>
<td>Opened and closed lid detection</td>
</tr>
<tr>
<td></td>
<td>Double Hall sensor</td>
<td>Speed and direction measurement</td>
</tr>
<tr>
<td></td>
<td>32-bit XMC4000 industrial microcontroller Arm® Cortex®-M4</td>
<td>Data processing, sensor system management, cloud connection management and ethernet connectivity</td>
</tr>
<tr>
<td></td>
<td>OPTIGA™ embedded security solutions</td>
<td>Data and cloud security</td>
</tr>
</tbody>
</table>

www.infineon.com/homeappliance
## Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Voltage class</th>
<th>Technology/product family</th>
<th>Selection/benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor unit (ODU) PFC</td>
<td>IMOTION™ controller</td>
<td>-</td>
<td>IMC302A-F064</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td>Non-isolated EiceDRIVER™</td>
<td>25 V</td>
<td>1ED4417N01B</td>
<td>Integrated over-current protection</td>
<td></td>
</tr>
<tr>
<td>Non-isolated EiceDRIVER™</td>
<td>25 V</td>
<td>1ED4417N01B</td>
<td>Cost/performance</td>
<td></td>
</tr>
<tr>
<td>TRENCHSTOP™ IGBTs WR5/WR6</td>
<td>650 V</td>
<td>IKW30N65WR5, IKWH30N65WR6</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>TRENCHSTOP™ S IGBT advanced isolation</td>
<td>650 V</td>
<td>IKFW40N65DH5</td>
<td>Easy to use</td>
<td></td>
</tr>
<tr>
<td>TRENCHSTOP™ IGBT7</td>
<td>650 V</td>
<td>IKW30N65ET7</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>Rapid I Diodes</td>
<td>650 V</td>
<td>IDW60C65D1</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>CIPOS™ Mini</td>
<td>600 V</td>
<td>CIPOS™ Mini PFC interleaved IPM series</td>
<td>Easy to use/system size saving</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IFCM20T60GD / IFCM20U60GD / IFCM30T60GD / IFCM30U60GD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CIPOS™ Mini PFC integrated IPM series</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IFCM10P60GD / IFCM30S60GD / IFCM1SP60GD / IFCM1SS60GD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoolMOS™ SJ MOSFETs</td>
<td>600 V</td>
<td>IPP60R120P7</td>
<td>Recommended</td>
<td></td>
</tr>
<tr>
<td>ODU motor drive (compressor)</td>
<td>IMOTION™ controller</td>
<td>-</td>
<td>IMC302T-F064</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>CIPOS™ IPM</td>
<td>600 V</td>
<td>CIPOS™ Tiny IM323 series</td>
<td>Easy to use/system size saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>CIPOS™ Mini</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level-shift EiceDRIVER™</td>
<td>600 V</td>
<td>6EDL0490EP</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TRENCHSTOP™ IGBTs</td>
<td>600 V</td>
<td>IKD15N60R0C2</td>
</tr>
<tr>
<td>ODU motor drive (outdoor fan)</td>
<td>IMOTION™ controller</td>
<td>-</td>
<td>IMC101T-T038</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>CIPOS™ IPM</td>
<td>600 V</td>
<td>CIPOS™ Micro IM241 series</td>
<td>Easy to use/system size saving</td>
</tr>
<tr>
<td></td>
<td>Reverse Conducting Drive 2</td>
<td>600 V</td>
<td>IKD04N60RC2</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>600 V</td>
<td>IPD60R10PFPD7S</td>
<td>Recommended</td>
</tr>
<tr>
<td>Condition monitoring and predictive maintenance</td>
<td>XENSW™ Hall switches</td>
<td>-</td>
<td>TLE4961-2M</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ pressure sensor</td>
<td>-</td>
<td>DPS368</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ MEMS microphone</td>
<td>-</td>
<td>IM69D130</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ Hall sensors</td>
<td>-</td>
<td>TLE4961, TLE4964, TLE4913, TLE4966</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ 3D magnetic sensor</td>
<td>-</td>
<td>TLI493D-W2BW</td>
<td>Vibration and position monitoring</td>
</tr>
<tr>
<td></td>
<td>XMC4000 microcontroller</td>
<td>-</td>
<td>XMC4700</td>
<td>Recommended</td>
</tr>
<tr>
<td>Indoor unit (IDU)</td>
<td>XMC™ microcontroller</td>
<td>-</td>
<td>XMC1400, XMC4100</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>IMOTION™ controller</td>
<td>-</td>
<td>IMC302A-F064</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td>IDU motor control</td>
<td>XMC™ Microcontroller</td>
<td>-</td>
<td>CY6C62x4/S</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>IMOTION™ controller</td>
<td>-</td>
<td>IMC101T-T038</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>CIPOS™ IPM</td>
<td>600 V</td>
<td>CIPOS™ Nano</td>
<td>Easy to use/system size saving</td>
</tr>
<tr>
<td>IDU motor drive</td>
<td>IMOTION™ IPM</td>
<td>-</td>
<td>IMM101T-015M</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>Level-shift EiceDRIVER™</td>
<td>-</td>
<td>6EDL0490EP</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>Reverse Conducting Drive 2</td>
<td>600 V</td>
<td>IKD04N60RC2, IKD04N60RC2</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>600 V</td>
<td>IPN60R10PFPD7S</td>
<td>Recommended</td>
</tr>
<tr>
<td>Security</td>
<td>OPTIGA™ Trust family</td>
<td>-</td>
<td>OPTIGA TRUST M SLS32AA</td>
<td>Recommended</td>
</tr>
<tr>
<td>Connectivity Wi-Fi/BLE</td>
<td>AIROC™</td>
<td>-</td>
<td>CY93439</td>
<td>Recommended</td>
</tr>
<tr>
<td>User interface</td>
<td>PSoc™ 6</td>
<td>-</td>
<td>CY96C62x4/S</td>
<td>Recommended</td>
</tr>
<tr>
<td>Sensors</td>
<td>XENSW™ radar</td>
<td>-</td>
<td>BGT60LTR114IP</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ PAS CO2</td>
<td>-</td>
<td>PASCO2V01</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ MEMS microphone</td>
<td>-</td>
<td>IM69D130</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSW™ Hall switches</td>
<td>-</td>
<td>TLI4963-2M</td>
<td>Recommended</td>
</tr>
<tr>
<td>Auxiliary supply</td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>800 V</td>
<td>IPN80R4KSP7</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolSET™</td>
<td>700 V</td>
<td>ICE5A4770BZS</td>
<td>Flyback with error amplifier</td>
</tr>
<tr>
<td>UV-C LED for health</td>
<td>LED driver ICs</td>
<td>42 V</td>
<td>BCR43x</td>
<td>Recommended</td>
</tr>
</tbody>
</table>
Today, consumers are not only looking at energy consumption and noise levels. Compact design coupled with maximum storage space is also playing an increasingly important role. In addition, there is a desire for intelligent appliances that can be easily integrated into the home network. From the manufacturer’s point of view, the challenge is to meet the stricter regulations on energy efficiency while at the same time ensuring the form factor and a reduction in costs. Thus, intelligent, compact, energy- and cost-efficient drive solutions for refrigerators and freezers meet the high customer requirements.

Infineon offers a comprehensive portfolio for refrigerator compressors. Whether you choose the highest level of integration with our intelligent power modules (IPM) or aim for the best price/performance ratio with discrete components, our IGBTs, MOSFETs, gate drivers, and microcontrollers are designed to work together seamlessly. CIPOS™ family of IPMs is the optimal solution for highly integrated compressor drives whilst discrete solutions like the 600 V RC-D2 IGBT or the CoolMOS™ PFD7 SJ MOSFET are the best choice whenever layout flexibility and thermal performance optimization are the key design targets. If full-load operation and EMI performance are key for the design, the 600 V RC-D2 is the best choice. The diode is monolithically integrated and its current rating has been optimized for price and performance. The RC-D2 is the first IGBT family to introduce the SOT-223 package to further improve the price with a smaller package that is pin-to-pin compatible and substitutable with the DPAK package. They can all be combined with iMOTION™ products for dedicated motor control. For the auxiliary power supply, the CoolSET™ family rounds up our power portfolio by offering increased robustness and performance.

Our PSoC™ microcontroller family, AIROC™ Wi-Fi & Combos connectivity products and XENSIV™ sensors complete the portfolio needed for a truly smart refrigerator. The energy-efficient CIPOS™ modules integrate various power and control components to increase reliability, optimize board size and reduce system costs. This simplifies power supply design and shortens time-to-market. Infineon offers the OPTIGA™ Trust hardware security solution and enables secure access to all major cloud providers.
**CoolMOS™ PFD7 for next-level energy saving**

Although both MOSFETs and IGBTs can be used in refrigerator compressor drives, as most of the time, the refrigerator operates under light load, the MOSFET is highly recommended due to its lower conduction loss, thus reducing overall power loss at this condition.

The 600 V CoolMOS™ PFD7 high-voltage MOSFET series, shaped by Infineon’s experience of more than twenty years in pioneering in superjunction SJ technology innovation, sets a new benchmark in 600 V SJ technologies. This product family combines best-in-class performance with state-of-the-art ease of use, features an integrated fast body diode ensuring a robust device and allowing for reduced BOM for the customer.

![Conduction loss graph](image)

**Motor current**
- IGBT
- MOSFET

**Light load**  **Nominal load**

---

**Smart, connected and secured – system solutions for the new home appliance era**

Modern refrigerators can sense their environment by being smart and connected. They provide data to their users as well as to the manufacturer (who can remotely analyze the performance data and suggest preventive maintenance). In this data exchange, secure communication systems play a crucial role.

Components and system solutions from Infineon enable you to build smart home appliances while providing secure data acquisition, control, and device connectivity. Furthermore, they enable the highest device efficiency, smallest form factors, and improved carbon footprint with smart power supply designs. Benefit from one of the most comprehensive, out-of-the-box product and design portfolios on the market to best meet your unique application needs.

[www.infineon.com/homeappliance](http://www.infineon.com/homeappliance)
Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Voltage class</th>
<th>Technology/product family</th>
<th>Selection/benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>System/motor control</td>
<td>XMC™ microcontroller</td>
<td>-</td>
<td>XMC1400; XMC4100</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>iMOTION™ driver</td>
<td>25 V</td>
<td>IMD112T-6F040</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>600 V</td>
<td>IPN60R120P7</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Diodes</td>
<td>650 V</td>
<td>IW30G6ESC5</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFC</td>
<td></td>
<td>600 V</td>
<td>6EDL04N06PT</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>2ED204546F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XMC™ microcontroller</td>
<td>-</td>
<td>XMC1400; XMC1300</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>iMOTION™ controller</td>
<td>-</td>
<td>IMC102T-F048</td>
<td>Motor/PFC controller incl. software</td>
</tr>
<tr>
<td></td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>600 V</td>
<td>IPN60R120P7</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolSiC™ Diodes</td>
<td>650 V</td>
<td>IW30G6ESC5</td>
<td>Recommended</td>
</tr>
<tr>
<td>Inverter</td>
<td></td>
<td>600 V</td>
<td>1K04N60RC2; 1K06N60RC2</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 V</td>
<td>6EDL04N06PT</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2ED204546F</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User interface</td>
<td>PSoc™ 6</td>
<td>-</td>
<td>CY8C624A/5</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectivity Wi-Fi/BLE</td>
<td>AIROC™</td>
<td>-</td>
<td>CYW43439</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auxiliary supply</td>
<td>CoolMOS™ SJ MOSFETs</td>
<td>800 V</td>
<td>IPN80R4K5P7</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>CoolSET™</td>
<td>700 V</td>
<td>IES54R770BZS</td>
<td>Flyback with error amplifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>OPTIGA™ Trust family</td>
<td>-</td>
<td>OPTIGA TRUST M SLS32AIA</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensors</td>
<td>XENSIV™ radar sensor</td>
<td>-</td>
<td>BGT60LTR12AP</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ MEMS microphones</td>
<td>-</td>
<td>IM69D130</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ magnetic position</td>
<td>-</td>
<td>TLV493D-A1BK</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ pressure sensor</td>
<td>-</td>
<td>TMP518</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ PAS CO2 sensor</td>
<td>-</td>
<td>PAS CO2</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ digital barometric pressure sensors DPSxxx</td>
<td>Advanced predictive maintenance analytics are enabled based on highest precision and relative accuracy over a wide temperature range to detect anomalies in airflow.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XENSIV™ TLV493D-A1B6 3D magnetic sensor</td>
<td>Accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package to enable vibration and position monitoring of the compressor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XENSIV™ TLV497D current sensor</td>
<td>Fully digital solution featuring high precision and ease of use, significantly reduces overall implementation efforts as well as PCB space to enable cost fan and compressor current measurement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XENSIV™ 60 GHz radar sensor</td>
<td>Accurate presence detection and vibration detection based on the ability to track sub-millimeter motion at high speed and accuracy, in both stand-alone chip as well as system solution available.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

XENSIV™ sensor solutions for smart refrigerators

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product family</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensors</td>
<td>XENSIV™ MEMS microphones IM69D130</td>
<td>High-performance microphone with low self-noise (high SNR) and low distortions enables noise monitoring for advanced predictive maintenance analytics.</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ digital barometric pressure sensors DPSxxx</td>
<td>Advanced predictive maintenance analytics are enabled based on highest precision and relative accuracy over a wide temperature range to detect anomalies in airflow.</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ TLV493D-A1B6 3D magnetic sensor</td>
<td>Accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package to enable vibration and position monitoring of the compressor.</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ TLV497D current sensor</td>
<td>Fully digital solution featuring high precision and ease of use, significantly reduces overall implementation efforts as well as PCB space to enable cost fan and compressor current measurement.</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ 60 GHz radar sensor</td>
<td>Accurate presence detection and vibration detection based on the ability to track sub-millimeter motion at high speed and accuracy, in both stand-alone chip as well as system solution available.</td>
</tr>
</tbody>
</table>

www.infineon.com/homeappliance
Ceiling fan
Energy-efficient and cost-effective with high integration for system size-reduction

Ceiling fan manufacturers currently face more stringent regulations of the appliance’s form factor and are under constant pressure to reduce costs. Infineon is here to provide compact, energy-efficient, cost-effective motor drive solutions. Infineon proposes a competitive solution with an extensive portfolio, high integration for system size reduction, and low cost.

Infineon is your ideal partner for all ceiling fan designs. In our portfolio, you’ll find a wide range of solutions for inverterized fan motor control – whether your priority is achieving the highest level of integration using our IPMs or showcasing ultimate flexibility with the right price-performance ratio using our discrete IGBTs or MOSFETs. No matter your target, our power semiconductors, drivers, IPMs, and iMOTION™ motor controllers are designed to work together seamlessly. This means you can effortlessly realize smoother-running, quieter systems with low energy consumption and a smaller form factor.

Features and benefits

Key features
- Reference design for ready-to-copy PCB
- Turnkey PFC and motor control with MCE
- Integrated infrared remote control
- Suitable for single-sided PCB assembly process
- Compatible with low- and high-voltage motors
- MCU design option for higher flexibility
- IEC61000-4-5 4 kVs surge compliant and EN55032 class B EMI compliant

Key benefits
- Compact and cost-effective system solution
- Eliminate the need for motor control software development
- Easy evaluation and system verification
- Reduce design-in effort and speed up time to market
- Achieve maximum system performance per costs
- Higher reliability from system perspectives
- One-stop-shop

Application diagram

By selecting components from Infineon, you get parts engineered for best-in-class performance that upholds the highest quality standards for long-term reliability. Moreover, our excellent supply chain allows you to both build the most cost-effective, energy-efficient inverterized ceiling fan and meet the changing supply demands of the fluctuating consumer market. Explore our selection of semiconductor solutions now to find the best-fit components for your designs.

www.infineon.com/ceiling-fan
The huge global market for induction cooking appliances, such as induction ranges, microwave ovens, and rice cookers, is characterized by great competition and price pressure. Along with this, manufacturers must meet rising consumer expectations and produce more reliable, energy-efficient appliances that offer more and more functions. Benefits such as faster cooking, advanced functionalities, easy cleaning, and safety features play a crucial role.

At Infineon, we are well equipped to help you overcome all the challenges common to induction cooking appliances. Our solutions target the increased consumer expectations regarding modern home appliances: Appliances must be energy-efficient and fully integrable, ensuring a high level of safety and reliability. An intelligent, user-friendly, and secure user interface is essential. We support you in creating intuitive devices with an intelligent touch interface.

**Induction cooking**
Enabled by Infineon’s high-efficient power switches, secured connectivity, and touch sensor technology for best cooking experience

**Features and benefits**

**Key features**
- Complete system solution offerings for inverter, system control, auxiliary power, HMI, connectivity, sensor, security blocks
- Highly reliable and market-proven Infineon products
- Evaluation and reference boards
- Innovative reverse conducting IGBT technology
- Cutting-edge touch sensing technologies

**Key benefits**
- Faster time-to-market and saving system design efforts
- One-stop-shop
- Extend system lifetime and product life spans
- Fast prototyping and system verification
- Higher efficiency and better reliability
- “Just work” and deliver the robustness and intelligence

**Induction heating inverter (voltage resonance)**
- Single-switch

**Induction heating inverter (current resonance)**
- Half-bridge

Visit infineon.com or contact our product support.
Product portfolio

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product</th>
<th>Product family</th>
<th>Specification</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter (half-bridge/quasi-resonant)</td>
<td>IGBT discretes</td>
<td>Reverse conducting R6</td>
<td>650 V up to 75 kHz</td>
<td>High performance and low losses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse conducting RS</td>
<td>650 V/1200 V/1350 V/1600 V up to 60 kHz</td>
<td>High performance and low losses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse conducting E1</td>
<td>1200 V up to 40 kHz</td>
<td>Price versus performance leader</td>
</tr>
<tr>
<td>Gate driver</td>
<td>EiceDRIVER™ 1ED44173N01B</td>
<td>Low-side gate driver/25 V</td>
<td>1ED integrated with overcurrent protection fault and enable functions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ 1ED44175N01B</td>
<td>Gate driver EiceDRIVER™ 1ED2304506F, 2ED2182S06F, 2ED1200V06P1</td>
<td>Half-bridge gate driver/650 V/600 V</td>
<td>SOI with integrated bootstrap diode</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ 1EDI20I12AF, 1EDI2012MF, 2ED02012-F2</td>
<td>Isolated gate driver/1200 V</td>
<td>Galvanic isolation, separate sink/source output, DESAT, Miller clamp</td>
<td></td>
</tr>
<tr>
<td>System control</td>
<td>Microcontroller</td>
<td>XMC™ 1000 series</td>
<td>32-bit Arm® Cortex®-M0</td>
<td>#1 choice to bring traditional 8-bit designs to the next level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>XMC™ 4000 series</td>
<td>32-bit Arm® Cortex®-M4</td>
<td>Successor to traditional DSP/DSC and 32-bit MCU solutions.</td>
</tr>
<tr>
<td></td>
<td>PSoC™ 4 series</td>
<td>32-bit Arm® Cortex®-M0</td>
<td>Tackled some of the complex portions of embedded system design making it easier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PSoC™ 6 series</td>
<td>32-bit Arm® Cortex®-M4</td>
<td>Dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture</td>
<td></td>
</tr>
<tr>
<td>Connectivity</td>
<td>Wireless connectivity</td>
<td>AIROC™ Wi-Fi + Bluetooth® combo</td>
<td>IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip</td>
<td>Technical support through our global network of IoT partners</td>
</tr>
<tr>
<td></td>
<td>CoolSET™ ICESA44710BZS</td>
<td>Up to 15 W flyback controller with integrated 700 V MOSFET</td>
<td>Higher switching frequency to take advantage of smaller magnets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Microcontroller</td>
<td>PSoC™ 4 series</td>
<td>CAPSENSE™ technology</td>
<td>Most flexible and scalable low-power mixed-signal architecture</td>
</tr>
<tr>
<td>Security</td>
<td>OPTIGA® TRUST</td>
<td>OPTIGA® TRUST M SLS324A</td>
<td>High-end security solution for connected consumer devices</td>
<td>The OPTIGA® Trust M is a high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud</td>
</tr>
</tbody>
</table>

www.infineon.com/induction-cooking
## Functional block | Product | Product family | Specification | Benefits
--- | --- | --- | --- | ---
Inverter including PFC control and user interface | Controller | IMOTION™ IMC100 series | Integrated motion control engine, PFC control and scripting engine | › Fast time-to-market
| XMC™1000 series | 32-bit Arm® Cortex®-M0 | First choice to bring traditional 8-bit designs to the next level

Controller + gate driver | iMOTION™ IMD110 series | Integrated gate driver in addition to iMOTION™ IMC100 functionalities | Compatible with low- and high-voltage motors

Fully integrated IPM | iMOTION™ IMM100 series | All-in-one for complete HW and SW integration | Compact design and fast time-to-market

Fully integrated IPM | iMOTION™ IMI110 series | All-in-one for complete HW and SW integration | Compact design and fast time-to-market with competitive cost

IPM | CIPOS™ Nano IPMs | Highly integrated IPM with various voltage options (40 V to 600 V) | Compact design and broad coverage in same footprint

IGBT discretes | 600 V Reverse Conducting Drive 2 | 600 V/1 A to 6 A in SOT-223 600 V/4 A to 15 A in DPAK | › Competitive in terms of price and performance

| TRENCHSTOP™ 5 | 650 V/9 A in TO-220FP | Excellent efficiency for the boost PFC stage switch

Gate driver | EiceDRIVER™ 1ED44173N01B and 1ED44175N01B for PFC control | 25 V single-channel low-side MOSFET gate driver | Integrated fast over-current protection (OCP), fault reporting

| EiceDRIVER™ 1ED44171N01B | Cost-effective

| EiceDRIVER™ 6EDL04006PT for motor control | 600 V three-phase in silicon-on-insulator technology | Excellent ruggedness and noise immunity with integrated bootstrap diode for reduced BOM cost

| EiceDRIVER™ 2ED2304S06F for motor control | 650 V half-bridge in silicon-on-insulator technology | › Excellent ruggedness and noise immunity with integrated bootstrap diode for reduced BOM cost

MOSFET | N-channel MOSFETs IRLML00x0 series | 40 V/60 V/SOT-23 | › Fast switching and cost-competitive

Auxiliary power supply | Single stage flyback controller | ICL8810 | Single-stage PFC-flyback LED controller for constant voltage output | › High-power factor supply combines optimum efficiency and low EMI, additional output voltages e.g. for MCU or LED lighting via aux winding

MOSFET | 800 V CoolMOS™ CE series | 800 V superjunction MOSFET | › High efficiency and power density with outstanding price/performance

---
Infineon is bringing reliability and safety to consumer projects. Millions of households worldwide rely on power tools to complete daily tasks or creative projects around the home. Consumers want robust, reliable and portable power tools that are easy-to-use with low price and long battery life as key selection options. Battery-powered tools must also be equipped with diagnostic and safety features to ensure confidence with high quality.

Infineon’s broad portfolio offers best-fit, innovative solutions for all power tools applications. We help you meet each consumer need and reduce your overall costs. Also, our wireless-charging reference designs deliver high performance and are easily optimized in our DAVE™ development platform. Configure your BOM and exceed expectations with Infineon components in your cordless power tool designs.

www.infineon.com/powertools

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Comprehensive portfolio of products and solutions, easy to tailor to design specification</td>
<td>› Convenient selection of the right fit products thanks to broad portfolio and complete solutions</td>
</tr>
<tr>
<td>› Infineon offers complete solutions for power supplies, chargers and motor drives</td>
<td>› Extended battery lifetime and product life span</td>
</tr>
<tr>
<td>› Best-in-class EiceDRIVER™ level-shift driver for OptiMOS™ and StrongIRFET™, offering high efficiency and protection</td>
<td>› Productive capability</td>
</tr>
<tr>
<td>› High reliability of Infineon components</td>
<td>› Overall system size and cost reduction</td>
</tr>
<tr>
<td>› Offering LV FETs with SMD packaging improves the productive capability by automatic production, improves reliability and reduces assembly cost</td>
<td>› Security, quality, and safety</td>
</tr>
<tr>
<td>› Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest RDS(on)</td>
<td>› Authentication</td>
</tr>
<tr>
<td>› Trustworthy hardware-based security</td>
<td>› Short time to market</td>
</tr>
<tr>
<td>› Highest quality standards and a safety-certified development process</td>
<td></td>
</tr>
<tr>
<td>› Proven track record and outstanding partner network for embedded security</td>
<td></td>
</tr>
<tr>
<td>› OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries etc.)</td>
<td></td>
</tr>
<tr>
<td>› Evaluation and demonstration boards for fast prototyping</td>
<td></td>
</tr>
<tr>
<td>› Available simulations, documentation, and system support to reduce development time and cost</td>
<td></td>
</tr>
</tbody>
</table>

Application block diagram example: cordless power tools

Mains

Sensor systems
  - Motion
  - Speed
  - Angle
  - Direction
  - Magnetic
  - Pressure

Communication connectivity
  - WiFi/BLE
  - Security identification

Motor control
  - Motor controller

Charger solutions
  - Battery charger
  - USB-C
  - PD

Battery management system
  - Battery monitoring
  - Security identification
  - Wireless charging

Motor control
  - Gate driver
  - Sensor systems

Power management
  - Gate-driver ICs
  - Microcontrollers
  - Power management ICs

WFС-sensors
  - Magnetic
  - Pressure

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/powertools
## Application block diagram example: cordless power tools

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Product category</th>
<th>Product family</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor control</td>
<td>12 V, 15 V, 18 V, 22 V</td>
<td>MOSFET</td>
<td>OptiMOS™/StrongIRFET™</td>
<td>BSC050N03, QEO06N02, IPT004N, IPP055N, IRL40MD2, BSC010N04, IST011N06, BSZ097N04, IRE40SC, IPB011N04, IRL40B215</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate drivers</td>
<td>MOTIX™</td>
<td>6EDL7141, IDM 700A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontroller</td>
<td>XMC™ series</td>
<td>TLE7140QW, 1EMN55X, 6ED2742, 2ED2732, 2ED2734, 2ED2748</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensor systems</td>
<td>Hall switches</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Angle</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3D magnetic</td>
<td>TLU503D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnetic core</td>
<td>TLU4071</td>
</tr>
<tr>
<td></td>
<td>36 V</td>
<td>MOSFET</td>
<td>OptiMOS™/StrongIRFET™</td>
<td>IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRE40SC, IPB011N04, IRL40B215</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate drivers</td>
<td>MOTIX™</td>
<td>6EDL7141, IDM 700A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontroller</td>
<td>XMC™ series</td>
<td>TLE9140EQW, 1EDN55X, 6ED2742, 2ED2732, 2ED2734, 2ED2748</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensor systems</td>
<td>Hall switches</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Angle</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3D magnetic</td>
<td>TLU503D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnetic core</td>
<td>TLU4071</td>
</tr>
<tr>
<td></td>
<td>48 V, 56 V, 72 V</td>
<td>MOSFET</td>
<td>OptiMOS™/StrongIRFET™</td>
<td>BSC021N08N, BSC030N08N, IPT010N08N, IPTG011N08N, IPP040N08N, IPB049N08N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate drivers</td>
<td>MOTIX™</td>
<td>TLE9140QW, 1EDN55X, 6ED2742, 2ED2732, 2ED2734, 2ED2748</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontroller</td>
<td>XMC™ series</td>
<td>TLE9140EQW, 1EDN55X, 6ED2742, 2ED2732, 2ED2734, 2ED2748</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensor systems</td>
<td>Hall switches</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Angle</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3D magnetic</td>
<td>TLU503D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnetic core</td>
<td>TLU4071</td>
</tr>
<tr>
<td>Charging</td>
<td>12 V</td>
<td>MOSFET</td>
<td>CoolMOS™</td>
<td>IPD60R210PFD7S, IPD60R360PFD7S, IPT60R035CFD7, IPP60R360CFD7, IPT60R145CFD7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate drivers</td>
<td>Eice DRIVER™</td>
<td>2EDL05N06PF, 2ED2304S06F, 6EDL04N06PT, 2EDF9275F, 1EDB9275F, 2EDS9265H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontroller</td>
<td>XMC™</td>
<td>CCGL3PA, CCGL7D dual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensor systems</td>
<td>Hall switches</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Angle</td>
<td>TLU5012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3D magnetic</td>
<td>TLU503D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnetic core</td>
<td>TLU4071</td>
</tr>
<tr>
<td></td>
<td>18 V</td>
<td>Battery charging</td>
<td>-</td>
<td>ICLS1102, ICBO0Q16, XDS52201</td>
</tr>
<tr>
<td></td>
<td>24 V</td>
<td>Protection MOSFET</td>
<td>OptiMOS™/StrongIRFET™</td>
<td>BSC0204NE2LS5, QEO06NE2LS5, BSB008NE2LSX, BSZ0209NE2LS5, IRE6200, IRE6200, IRE6200, IRE6200, IRE6200, IRE6200, IRE6200</td>
</tr>
<tr>
<td></td>
<td>36 V</td>
<td>Gate drivers</td>
<td>MOTIX™</td>
<td>TLE7140QW, 1EMN55X, 6ED2742, 2ED2732, 2ED2734, 2ED2748</td>
</tr>
<tr>
<td></td>
<td>48 V</td>
<td>Gate drivers</td>
<td>Eice DRIVER™</td>
<td>2EDL05N06PF, 2ED2304S06F, 6EDL04N06PT, 2EDF9275F, 1EDB9275F, 2EDS9265H</td>
</tr>
<tr>
<td></td>
<td>72 V</td>
<td>Gate drivers</td>
<td>Eice DRIVER™</td>
<td>2EDL05N06PF, 2ED2304S06F, 6EDL04N06PT, 2EDF9275F, 1EDB9275F, 2EDS9265H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring balancing IC</td>
<td>-</td>
<td>TLE9012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cell balancing MOSFETs</td>
<td>StrongIRFET™</td>
<td>IRLML9303, IRLFS59342, IRLML3301</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontrollers</td>
<td>XMC™, PSoC™</td>
<td>XMC1100, XMC1200, XMC1400, XMC1400, XMC4400, CY8C41x4/5/6/5, CY8C41x4/5/6/5, CY8C41x4/5/6/5, CY8C41x4/5/6/5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensors</td>
<td>-</td>
<td>TLU4012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital isolators</td>
<td>-</td>
<td>TLU4012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate-drivers</td>
<td>-</td>
<td>TLU4012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontrollers</td>
<td>-</td>
<td>TLU4012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensors</td>
<td>-</td>
<td>TLU4012</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/power-tools

* Coming soon
Wrist-worn devices

Smartwatches, sports watches, fitness bands and medical wrist-worn devices

Next level of wrist-worn devices with Infineon’s excellent RF, sensing, connectivity, power, memory and security solutions

With its broad product portfolio, Infineon helps wearable manufacturers to overcome the following design challenges across all device categories:

› the need for reliable device and data security to protect personal and sensitive information,
› accurate sensor readings for precise location tracking and recognition between everyday movements and a fall event,
› longer battery lifetimes and small form factors for elegant, unobtrusive designs.

Infineon’s widely-deployed AIROC™ Wi-Fi and Bluetooth® Combo ICs portfolio offers the industry’s best interoperability and RF performance. Infineon also helps customers to differentiate their offerings with highly efficient, secured and innovative solutions supporting the integration of additional use cases such as smart payment and ticketing, notifications and voice calls, Bluetooth® audio streaming, smart access or different ways of charging (wireless, NFC, USB).

A smartwatch provides a two-way connection via Bluetooth®, cellular baseband or Wi-Fi to a smartphone. It receives electronic communications like texts or voice calls, must display the time and have a glance-able display. These lifestyle devices monitor health and make communication (text, calls) more convenient.

A sports watch is a highly functional, robust and usually water-resistant device. Leisure or professional athletes mainly monitor their health conditions, fitness and sleep activities. Sports watches have fewer features compared to a smart watch as its main focus is on sports tracking.

A wristband or fitness band offers limited functionalities. Compared to a smartwatch, it just covers a selected amount of use cases (e.g. step counting, sleep monitoring, location tracking, access control, etc.).

A medical wrist-worn device measures and analyzes physical activity and body functions of the wearer. These wristbands are used for elderly care, safety, connected health and much more.

www.infineon.com/wearables

Key enabling products

› XENSIV™ 3D magnetic sensor
› XENSIV™ 60 GHz radar sensor
› XENSIV™ pressure sensor
› XENSIV™ MEMS microphones
› XENSIV™ Multigas sensor
› Wireless charging
› AIROC™ Wi-Fi and Combos
› AIROC™ Wi-Fi
› AIROC™ Bluetooth® LE and Bluetooth®
› AIROC™ Bluetooth® 5.0 SOC for Audio
› Wi-Fi MCUs
› Secora™ Connect
› PSoC™ 6 Microcontrollers
› PSoC™ 4 Microcontrollers
› PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart)
› PSoC™ including CAPSENSE™ technology
› RF switches
› OPTIGA™ Connect Consumer eSIM solution
› OPTIGA™ Authenticate S
› NOR Flash / F-RAM
› GPS LNA
› ESD protection
› Antenna tuners
› 4G / 5G LTE LNAs
Block diagram for smartwatch, sports watch and wristband

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product family</th>
<th>Functional block</th>
<th>Recommended parts and families</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>OPTIGA™ Authenticate S (e.g., SLE95401)</td>
<td>USB type-C controller (e.g., EZ-PD™ CCG2)</td>
<td>SEMPER™ Nano NOR Flash / F-RAM</td>
</tr>
<tr>
<td></td>
<td>OPTIGA™ Connect Consumer eSIM solution (OC1120)</td>
<td>ESD protection (e.g., ESD119-B1, ESD131-B1, ESD307-U1)</td>
<td>Wireless charging</td>
</tr>
<tr>
<td></td>
<td>SECORA™ Connect (boosted SiP or MCP, passive NFC)</td>
<td>Power stage</td>
<td>4G / 5G LTE LNAs (e.g., BGA5x1BN6 family)</td>
</tr>
<tr>
<td></td>
<td>RF switch (e.g., BGS12WN6, BGS14WMA9)</td>
<td>RAM</td>
<td>4G / 5G LTE LNAs (e.g., BGA5x1BN6 family)</td>
</tr>
<tr>
<td>Security</td>
<td>eSIM</td>
<td>Flash</td>
<td>GPS LNAs (e.g., BGA123L4, BGA524N6)</td>
</tr>
<tr>
<td></td>
<td>NFC security solution</td>
<td>Memory</td>
<td>AIROC™ Wi-Fi (e.g., CYW43362, CYW43364)</td>
</tr>
<tr>
<td></td>
<td>Authentication</td>
<td>Connectivity</td>
<td>AIROC™ Wi-Fi and combos (e.g., CYW43369, CYW43022)</td>
</tr>
<tr>
<td>Human-machine interface</td>
<td>XENSIV™ 3D magnetic sensor (e.g., TLI493-W2BWAO)</td>
<td>Connectivity</td>
<td>AIROC™ Bluetooth® 5.0 SoC for audio (e.g., CYW20719/21)</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ MEMS microphones [e.g., IM69D120/D130]</td>
<td>3G/4G cellular modem</td>
<td>Antenna tuners [e.g., BGS12WN6, BGS14WMA9]</td>
</tr>
<tr>
<td></td>
<td>PSoC™ 6 MCU + BLE [e.g., CY8C68237FM-BLE]</td>
<td>Power stage</td>
<td>RF switches (e.g., BGS12WN6, BGS14WMA9)</td>
</tr>
<tr>
<td>Sensing</td>
<td>XENSIV™ pressure sensor (e.g., DPS368/DPS310)</td>
<td>USB charging</td>
<td>4G / 5G LTE LNAs (e.g., BGA5x1BN6 family)</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ MEMS microphones [e.g., IM69D120/D130]</td>
<td>Wireless charging</td>
<td>GPS LNAs (e.g., BGA123L4, BGA524N6)</td>
</tr>
<tr>
<td></td>
<td>XENSIV™ MEMS packaging partners</td>
<td>Internal power management</td>
<td>AIROC™ Wi-Fi and combos (e.g., CYW43369, CYW43022)</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/wearables
Main use cases for wrist-worn devices

<table>
<thead>
<tr>
<th>Main use cases for smartwatches, sports watches and wristbands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notifications</td>
</tr>
<tr>
<td>Location tracking</td>
</tr>
<tr>
<td>Health monitoring (heart rate, etc.)</td>
</tr>
<tr>
<td>Fitness monitoring</td>
</tr>
</tbody>
</table>

Infineon the right partner to solve your design challenges

- Highest accuracy and fast signal pick-up for location tracking and altitude measurement
- Secure cellular network connection
- Products with smallest form factors enable high functional integration
- Integrated lowest power compute, BLE connectivity and most robust capacitive touch
- Bluetooth® audio streaming with BT / BLE Combo SoC
- Precise detection of single steps, body motions or fall events
- Best performance for voice call and voice assistant with MEMS microphones
- Reliable and low-power code and data storage in a tiny footprint
- Easy, convenient and secure data transmission by NFC
- Device protection to enable high user experience
- High reliability and data throughput with Wi-Fi / BT connectivity
- Low power consumption to increase battery lifetime

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Class D audio amplifiers
No compromise on quality – products for exceptional audio performance

At Infineon, we manufacture power-efficient class D audio amplifier solutions that maintain best-in-class audio quality, without heating up the surroundings. We believe smaller and lighter is better, and that the amplifier embedded in your product should be heard, but not seen. Our amplifier solutions help you design robust, flexible products that meet the needs of your customers and the market. Choose from our high-performance class D audio amplifier solutions for all power ranges and application requirements, from the smallest fully integrated single-chip solutions to highly scalable driver and power MOSFET combinations (for a full portfolio, see Audio amplifier ICs).

Design with Infineon’s solutions to benefit from:

- Exceptional audio performance
- Maximized power efficiency
- Maximized output power
- Design freedom
- Fast time to market

<table>
<thead>
<tr>
<th>Portable/battery powered audio applications</th>
<th>Home audio applications</th>
<th>Professional audio applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery powered speakers:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>› On-the-go Bluetooth® speakers</td>
<td>› Multiroom systems</td>
<td>› Power-over-ethernet (PoE)</td>
</tr>
<tr>
<td>› Docking speakers</td>
<td>› Audio hub systems</td>
<td>audio systems</td>
</tr>
<tr>
<td>› Boom boxes</td>
<td>› TVs</td>
<td>› Touring amplifiers</td>
</tr>
<tr>
<td>› Wearable speakers</td>
<td>› Sound bars</td>
<td>› Active speakers</td>
</tr>
<tr>
<td></td>
<td>› Home theater systems</td>
<td>› Public announcement 70-100 V</td>
</tr>
<tr>
<td></td>
<td>› Smart speakers</td>
<td>systems</td>
</tr>
</tbody>
</table>

**Home audio**
Modern home audio products vary in shapes, sizes and configurations, but common requirement is great sound in combination with outstanding industrial and acoustic design. In addition to producing exceptional sound quality, MERUS™ amplifiers from Infineon can completely eliminate the need for bulky and expensive LC output filters and heatsinks. This allows the design of new innovative and great-sounding home audio products in form factors and shapes that were previously unthinkable.

**Solution example:** 2.1 configuration (2xBTL + 1xPBTL)

- Wireless connection e.g. Wi-Fi
- Power supply unit

**Solution specification**
- **Number of audio channels:** 2 bridge-tied load (BTL) and 1 parallel BTL channels
- **Peak power output:** 2x80 W @ 4 Ω, 10% THD and 160 W @ 2 Ω, 10% THD
- **Featured audio ICs:** 2x MA12070

www.infineon.com/merus
www.infineon.com/audio

**4.1 configuration (4xBTL + 1xPBTL)**

- Wireless connection e.g. Wi-Fi
- Power supply unit

**Solution specification**
- **Number of audio channels:** 5 bridge-tied load (BTL)
- **Peak power output:**
  - 2x40 W @ 4 Ω, 10% THD; 2x80 W @ 4 Ω, 10% THD;
  - 200 W @ 3 Ω (IR4302M)/400 W @ 8 Ω (MA5332MS), 10% THD
- **Featured audio ICs:** MA12040, MA12070, IR4302M, MA5332MS

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Portable audio
When designing portable/battery-powered audio devices, it is essential to maximize battery playback time, and at the same time, maintain excellent audio performance. Infineon’s MERUS™ amplifiers provide up to twice as long battery playback time in combination with the best-in-class audio performance and unsurpassed sound quality.

Solution example: 2.1 configuration (2xBTL + 1xPBTL)

Solution specification
- Number of audio channels: 2 bridge-tied load (BTL) and 1 parallel BTL channels
- Peak power output: 2x37 W @ 4 Ω, 10% THD and 74 W @ 2 Ω, 10% THD
- Featured audio ICs: Ultra low idle power MA2304DNS* (integrated DSP) and MA2304PNS* (digital volume control and limiter)

Professional audio
Professional audio equipment is all about maximizing output power and power density. With the conception of Infineon’s MERUS™ multilevel class D technology and GaN-based CoolGaN™ GIT HEMTs, it is now possible to conceive both amplifiers and power supply units with great audio performance and high efficiency in a very compact design.

For engineers developing amplifiers, Infineon offers both monolithic and chip-set solutions with versatile MOSFET combinations for the scaling of output power.

Solution example: active speakers

Solution specification
- Number of audio channels: 2 half-bridge channels
- Peak power output: 500 W @ 4 Ω, 1% THD
- Featured audio ICs: IRS2092S, IRS20957S, MA2492WE*

Solution example: public announcement 70-100 V system

Solution specification
- Number of channels: 2 half bridge channels
- Peak power output: 500 W, 70 Vrms/100 Vrms, 1% THD
- Featured IC: IRS2452AM

*Coming soon

www.infineon.com/audiosolutions
Once a novelty in households, smart speakers are more and more becoming increasingly commonplace. Rising user expectations accompany this rapid adoption. However, frustration with devices that do not understand or hear commands leads to lower user adoption. Consequently, growth rates for smart speakers are failing to reach their full potential. Components such as MEMS microphones, touch controllers, and new technologies such as radar are vital in improving the user experience in the smart speaker segment.

Infineon has long-standing expertise in sensor, connectivity and power solutions that fulfill the consumer market requirements in terms of outstanding performance, reliability and energy efficiency.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› High sensitivity, low self-noise (high SNR) and distortion, wide dynamic range, and high acoustic overload-point with XENSIV™ MEMS microphones</td>
<td>› Improved audio input and thus voice command recognition, especially in extended use cases such as whispering or longer distances to the speaker for better user experience</td>
</tr>
<tr>
<td>› Multilevel switching technology at fully rated power in a wide range of MERUS™ class D amplifiers</td>
<td>› Best-in-class audio quality and lowest power consumption enables the class D audio amplifier to be used in filterless configurations</td>
</tr>
<tr>
<td>› Ultralow-power AIROC™ Wi-Fi and Bluetooth® combo in a single-chip solution enables small-form-factor IoT designs</td>
<td>› Connectivity for highest interoperability and performance without dropouts anywhere in the home, extended battery playback time, or the reduction of battery size without compromising on battery playback time to save cost</td>
</tr>
<tr>
<td>› Reliable, elegant and durable CAPSENSE™ touch controller with advanced capacitive touch sensors</td>
<td>› Noise immunity, water-resistance, and sleek, futuristic user interfaces and gesture recognition</td>
</tr>
<tr>
<td>› XENSIV™ 60 GHz radar sensor brings innovative, intuitive sensing capabilities</td>
<td>› Precise presence detection for more contextual awareness to ease interaction, sub-millimeter motion tracking to capture movement at high speed accurately, vital sensing for monitoring health status such as respiratory and heart rate</td>
</tr>
<tr>
<td>› Highly efficient and power-dense SMPS solutions</td>
<td>› Highly efficient charger in small form factor</td>
</tr>
<tr>
<td>› Highly-integrated EZ-PD™ USB-C controller supports all USB-PD profiles</td>
<td>› USB-IF certified with market-proven USB-PD stack, ensuring specification compliance and interoperability, requiring no firmware development</td>
</tr>
<tr>
<td>› IoT security controller OPTIGA™ Trust M maintains the unique identity and integrity of the speaker</td>
<td>› Easy and secure cloud provisioning services</td>
</tr>
</tbody>
</table>

Application diagram

www.infineon.com/smart-speaker
## Recommended products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product family</th>
<th>Product</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audio input</strong></td>
<td>Microphones</td>
<td>XENSIV™ MEMS microphones</td>
<td>- High performance microphone with low self-noise (high SNR) and low distortions, setting a new performance benchmark for a superior user experience</td>
</tr>
<tr>
<td><strong>Audio output</strong></td>
<td>Class D amplifier</td>
<td>MERUS™ class D audio amplifiers MA120xx</td>
<td>- Cooler, smaller and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in product form factors for great sounding audio products</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>Wi-Fi + Bluetooth® combos</td>
<td>AIROC® Wi-Fi + Bluetooth combos</td>
<td>- Best-in-class interoperability to the widest deployed wireless IP</td>
</tr>
<tr>
<td><strong>Sensing</strong></td>
<td>Capacitive sensing touch controller</td>
<td>CAPSENSE™ capacitive touch sensing controller</td>
<td>- State-of-the-art noise immunity (SNR &gt; 100:1) &amp; water rejection have made CAPSENSE™ the industry leader</td>
</tr>
<tr>
<td></td>
<td>Radar sensor</td>
<td>XENSIV™ 60 GHz radar sensor</td>
<td>- Advanced inductive touch sensors make possible sleek, futuristic user interfaces with metallic overlay</td>
</tr>
<tr>
<td></td>
<td>CO₂ sensor</td>
<td>XENSIV™ PAS CO₂ sensor</td>
<td>- Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy, both stand-alone chip as well as system solution available</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>IoT security controller</td>
<td>OPTIGA™ Trust M</td>
<td>- Best-in-class interoperability to the widest deployed wireless IP</td>
</tr>
<tr>
<td></td>
<td>USB-C PD controller</td>
<td>EZ-PD™ USB-C controller</td>
<td>- Best-in-class interoperability to the widest deployed wireless IP</td>
</tr>
<tr>
<td></td>
<td>ESD protection</td>
<td>ESD111, ESD245</td>
<td>- Outstanding low capacitance devices for best signal integrity</td>
</tr>
<tr>
<td></td>
<td>Wireless charging</td>
<td>15 W inductive wireless power transmitter</td>
<td>- High protection performance by ultralow clamping voltage</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>High-voltage MOSFETs</td>
<td>700 V CoolMOS™ P7 (standard grade)</td>
<td>- Best price-competitive CoolMOS™ SJ MOSFET family</td>
</tr>
<tr>
<td></td>
<td>Flyback converter Control ICs</td>
<td>AC50, FMC1</td>
<td>Lower Qg, lower hysteresis loss, low RIv</td>
</tr>
<tr>
<td></td>
<td>SMPS Flyback converter Control ICs</td>
<td>CQ108</td>
<td>High efficiency and low standby power</td>
</tr>
<tr>
<td></td>
<td>SMPS synchronous rectification Low-voltage MOSFETs</td>
<td>OptiMOS™ PD</td>
<td>High power density and ideal for USB-PD</td>
</tr>
<tr>
<td></td>
<td>Control ICs</td>
<td>IR1161TRPBF</td>
<td>High efficiency</td>
</tr>
<tr>
<td></td>
<td>SMPS load switch Low voltage MOSFETs</td>
<td>OptiMOS™ 30 V</td>
<td>Low conduction losses</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Advancements in video surveillance technology take indoor and outdoor security solutions to the next level. They help you protecting your building against undesired intruders and detecting unusual behaviors. Smart cameras that are connected to management systems and cloud platforms detect intruders more easily and alarm you in case of danger. By equipping surveillance and IP cameras with reliable and accurate sensors and connectivity solutions, safety-enhancing IoT features can be implemented, significantly improving detection of intrusion and other unusual behavior. Of course, cutting-edge camera technology needs to run reliably and efficiently to guarantee image capturing at all times while also reducing operating costs and needed bandwidth. Connected IP cameras often demand low-power with advanced thermal features.

Infineon offers a broad range of products to make surveillance cameras smart and connected. The connectivity solutions portfolio for Wi-Fi, Bluetooth® and USB offers stable connection to cloud and management systems. Sensors such as Infineon’s XENSIV™ BGT60LTR11AIIP radar sensors can help overcome bandwidth limitations, for example, by the waking-up function when motion near the camera is detected. Furthermore, XENSIV™ MEMS microphone (or an additional low-power MCU) enables sound/voice triggered recording and notification. At the same time, Infineon’s embedded security solutions make connected surveillance cameras more robust against cyberattacks, while the highly efficient power MOSFETs allow for low power consumption and efficient operations.

Matter – the new smart home standard from the Connectivity Standards Alliance (CSA) – promises interoperable, secure connectivity for the future of the smart home and surveillance camera. Infineon’s unique combination of software support for Matter, ModusToolbox™ software and tools, broad family of AIROC™ connectivity chips (Thread 802.15.4, Wi-Fi, Bluetooth®) and PSoC™ 6 MCUs, and its involvement in Matter open-source development puts it in a strong position to help companies quickly bring Matter products to the market.

**Features and benefits**

### Key features

- Best-in-class figures of merit
- Reliable connectivity and power solutions
- Co-processor in connectivity solutions
- Small footprints of components
- Turnkey embedded security solutions
- Highly accurate set of sensors with low power consumption

### Key benefits

- Lower system power consumption and energy savings and enablement of deep sleep modes
- Less failure and increased up-time with stable connectivity of surveillance camera to cloud and management platforms
- Keep-alive feature in connectivity solutions
- Sleeker designs and space savings
- More robust designs against cyberattacks in connected eco-systems
- Accurate data collection for IoT use cases, e.g. wake-up functions with radar sensors

www.infineon.com/surveillance
For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/surveillance
LED lighting
Solutions for cost-sensitive applications as well as for smart lighting

Infineon supplies tailored products for LED drivers, LED strips, horticultural, and smart lighting. Our broad portfolio of tailored products and solutions for LED lighting comprises LED driver ICs, MOSFETs, and microcontrollers suited for LED drivers as well as sensors and dedicated ICs for secure communication. In addition to offering products of proven quality, a competent global lighting team supports our lighting customers in designing LED lighting products and systems in collaboration with our channel partners.

Key trends and challenges in LED lighting and our offering:
› Human-centric lighting (HCL)
  – The lowest cost implementation of tunable white with single-stage flyback constant voltage and smart linear regulators with advanced headroom control ensuring high efficiency – BCR601
› Configuration of output current and some further parameters
  – Our NFC controller allows the configuration of the output current without the need for an additional microcontroller
  – Our XDPL lighting IC family allows, besides output current, also adjustment of other features like protection, dimming curves, etc.
› Cost reduction combined with efficiency increase
  – Integration of resonance inductor for PFC + resonant topology enables highest efficiency at low cost
  – Integration is enabled by the coreless transformer technology that enables high switching frequencies

LED drivers

www.infineon.com/lighting
Recommended LED driver products

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product type</th>
<th>Product family</th>
<th>MOSFET technology</th>
<th>Voltage class</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFC stage</td>
<td>PFC</td>
<td>IRS2505</td>
<td>CoolMOS™ P7</td>
<td>600 V/700 V/800 V/950 V</td>
</tr>
<tr>
<td>Main stage</td>
<td>PFC + LCC (constant current)</td>
<td>ICS102^4</td>
<td>CoolMOS™ P7 (up to 600 mΩ)</td>
<td>600 V/600V</td>
</tr>
<tr>
<td></td>
<td>PFC + LLC (constant current)</td>
<td>ICS102HV^4</td>
<td>CoolMOS™ P7 (above 600 mΩ)</td>
<td>600 V</td>
</tr>
<tr>
<td></td>
<td>PFC + flyback (dual-stage)</td>
<td>XDPL8221^4</td>
<td>CoolMOS™ P7</td>
<td>600 V/950 V</td>
</tr>
<tr>
<td></td>
<td>PFC/flyback (single-stage constant current)</td>
<td>XDPL8105</td>
<td>CoolMOS™ P7</td>
<td>800 V/950 V</td>
</tr>
<tr>
<td></td>
<td>PFC/flyback (single-stage constant voltage)</td>
<td>XDPL8219</td>
<td>CoolMOS™ P7</td>
<td>800 V/950 V</td>
</tr>
<tr>
<td></td>
<td>PFC/flyback (single-stage constant voltage)</td>
<td>ICL8800/ICL8810/ICL8820</td>
<td>CoolMOS™ P7</td>
<td>800 V/950 V</td>
</tr>
<tr>
<td></td>
<td>PFC, flyback low-side gate driver</td>
<td>1EDN7550B</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2EDN8524F</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Half-bridge LLC gate driver</td>
<td>1ED2101506F</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>650 V (SOI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1ED20N12AF</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>1200 V (coreless transformer/CT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2EDF7275F</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>650 V (coreless transformer/CT)</td>
</tr>
<tr>
<td>Buck/linear solutions</td>
<td>Secondary buck (single-channel)</td>
<td>ILD8150</td>
<td>integrated</td>
<td>80 V</td>
</tr>
<tr>
<td></td>
<td>Secondary buck (multichannel)</td>
<td>ILD8150</td>
<td>integrated</td>
<td>80 V</td>
</tr>
<tr>
<td></td>
<td>High-side buck gate driver</td>
<td>1ED82875F</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>650 V</td>
</tr>
<tr>
<td></td>
<td>Low-side buck gate driver</td>
<td>1EDN8511B</td>
<td>any CoolMOS™ SJ MOSFETs</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Secondary linear controller with feedback</td>
<td>BCR601</td>
<td>small-signal MOSFETs</td>
<td>75 V/100 V</td>
</tr>
<tr>
<td></td>
<td>Tunable white with linear LED driver</td>
<td>BCR601, BCR602</td>
<td>small-signal MOSFETs</td>
<td>75 V/100 V</td>
</tr>
<tr>
<td>Dimming</td>
<td>0-10 V dimming interface IC</td>
<td>CDM10 V</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CDM10 VD</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NFC</td>
<td>NFC configuration IC</td>
<td>NLM0010/NLM0011^4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC™ microcontroller</td>
<td>XMC1100</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

LED driver with constant voltage output and linear/switch mode LED driver ICs

Linear LED driver IC product portfolio

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>IC product family</th>
<th>MOSFET technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest cost LED driver IC</td>
<td>Linear</td>
<td>BCR400W series</td>
<td>Integrated</td>
</tr>
<tr>
<td>Low voltage drop LED driver IC</td>
<td>Linear</td>
<td>BCR430/BCR431</td>
<td></td>
</tr>
<tr>
<td>Robust LED driver IC</td>
<td>Linear</td>
<td>BCR40xU/BCR42xU</td>
<td></td>
</tr>
</tbody>
</table>

For additional portfolio, take a look at Lighting ICs.

1) 700 V, 800 V and 950 V CoolMOS™ P7 are optimized for PFC and flyback topologies. 600 V CoolMOS™ P7 is suitable for hard as well as soft switching topologies (flyback, PFC and LLC)
2) PFC and resonant combo controllers
3) Higher input voltage
4) In addition to current configuration also constant lumen output (CLO) feature is included.
Plug & LEDs play solutions
Modular LED lighting reference designs for LLC, buck and PFC flyback topologies

LED lighting has become a mature technology with stringent requirements on light quality. In order to achieve high light quality, there is a strong trend towards two-stage topologies. These two-stage topologies ensure that the light flicker or, also called light ripple, remains at low levels according to the IEEE 1789 standard and other new upcoming regulations. Primary constant voltage output, followed by a DC-DC buck, enables dimming, efficiency, cost, and scalability benefits. Infineon has solutions for both the primary AC-DC stage as well as for the secondary DC-DC buck stage. These solutions can be combined in a plug & play concept. In other words, depending on the requirements, the suitable AC-DC stage and the best fitting DC-DC stage can be selected and tested.

Our solutions include but are not limited to:
Low to medium power platform promising tunable white at low cost

320 W DCM PFC cost-effective and scalable platform design with up to 4 DC-DC channels

Discover more solutions on www.infineon.com/leddriver-reference-solutions
In the last few years, connected and smart lighting has gained high momentum in the lighting industry. In this application field, sensing and connectivity play an essential role. Besides helping to realize energy savings, they also enable new use cases that go beyond lighting controls.

Radar sensor solutions

For energy saving, passive infrared (PIR) sensors are used. Novel sensors like radar can overcome weaknesses of PIR sensors like poor design, limited detection of micro-movements, and limited area coverage, to name a few. Radar sensors can be seamlessly integrated into the luminaires enabling nice design as well as platform design of luminaires since there is no need for drilling holes as in the case of PIR sensors. Advanced use cases like people counting and people tracking can also be ensured with radar technology. In order to add more intelligence into the entire system, connectivity is a key element.

Our partners:
Our system design house partners deliver both standard products and customized solutions to fit specific lighting applications from movement detection through automatic light activation to person counting. In addition, they offer all levels of support to get your intelligent lighting system up and running as quickly and efficiently as possible. See below a list of some of our partner solutions and check our Lighting brochure for more.

Additionally, Infineon provides numerous radar solutions. Please find out more about them in Radar sensor ICs chapter.

www.infineon.com/smart-lighting
www.infineon.com/makeradar
Bluetooth® Mesh devices and modules for connected and smart lighting applications
Embedding Bluetooth® Mesh networking in lighting systems, including luminaires, fixtures, and wall switches, opens a range of system applications to manage lighting brightness or color, efficiency based on occupancy movements, and correlation of lighting ecosystem components. The range and coverage of Bluetooth® Mesh devices allow for low latency, whole building coverage of automation and occupancy interaction via smartphone and tablet applications, as well as cloud applications for building management. Infineon provides a range of Bluetooth® Mesh MCUs and certified modules that enable lighting control functionality, safety and occupancy sensor management and robust, secure, reliable networked managed solutions.

Bluetooth® Mesh SoCs and certified modules: solutions and benefits
Bluetooth® Mesh system-on-a-chip (SoCs) and certified modules offer a range of efficient and future-proof upgradeable solutions:

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>‣ Module diversity with integrated components ranging from the basic battery-powered sensor to the most sophisticated detection and safety devices</td>
<td>‣ Accommodating different needs now and in future</td>
</tr>
<tr>
<td>‣ Fully-integrated modules</td>
<td>‣ Accelerate time-to-market</td>
</tr>
<tr>
<td></td>
<td>‣ Reducing development and manufacturing costs</td>
</tr>
<tr>
<td>‣ Ultra-high-transmit power designs with integrated antennas</td>
<td>‣ Enabling long range and unfailing node-node connections</td>
</tr>
<tr>
<td>‣ Integrated CPU, memory (Flash and RAM) and I/O</td>
<td>‣ Suiting all foreseeable applications hosting</td>
</tr>
</tbody>
</table>

Bluetooth® Mesh evaluation kit CYBT-213043-MESH
The Bluetooth® Mesh evaluation kit (CYBT-213043-MESH) enables you to evaluate SIG Mesh functionality and features using the CYBT-213043-02 module. The CYBT-213043-02 module is an integrated, fully certified, 12.0 mm x 16.61 mm x 1.70 mm, programmable Bluetooth® Smart Ready module designed to reduce your time-to-market.

Utilized device: CYW20819
Kit contents:
4x mesh evaluation boards
4x USB A to micro-B cables
1x quick-start guide (this document)

Bluetooth® Mesh Networking - An Introduction for Developers
Bluetooth®-Mesh-Paving-the-Way-for-Smart-Lighting
Bluetooth®-Mesh specifications:
www.bluetooth.com/specifications/mesh-specifications

www.infineon.com/smart-lighting
www.infineon.com/makeradar
Mesh-enabled, silicon, dual-mode Bluetooth® 5.0 AIROC™ MCUs

<table>
<thead>
<tr>
<th></th>
<th>CYW20706</th>
<th>CYW20735</th>
<th>CYW20819</th>
<th>CYW20820</th>
<th>CYW20719</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product features</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBA Processor</td>
<td>CM3</td>
<td>CM4 w/ FPU</td>
<td>CM4</td>
<td>CM4</td>
<td>CM4 w/ FPU</td>
</tr>
<tr>
<td>TBA Radio</td>
<td>–</td>
<td>ULP RF</td>
<td>ULP RF</td>
<td>ULP RF</td>
<td>ULP RF</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>105 C</td>
<td>85 C</td>
<td>125 C planned</td>
<td>125 C planned</td>
<td>85 C</td>
</tr>
<tr>
<td>Transmit power</td>
<td>10 dBm Tx</td>
<td>10 dBm Tx</td>
<td>4 dBm Tx</td>
<td>10 dBm Tx</td>
<td>4 dBm Tx</td>
</tr>
<tr>
<td>Memory</td>
<td>–</td>
<td>–</td>
<td>256 kB Flash</td>
<td>256 kB Flash</td>
<td>1 MB Flash</td>
</tr>
</tbody>
</table>

Interested in more? We offer a broad silicon portfolio to support your Bluetooth® Mesh design. Explore here.

Fully-certified Bluetooth® modules (FCC, ISED, MIC, CE)

<table>
<thead>
<tr>
<th>Feature</th>
<th>CYBT-483056-02</th>
<th>CYBT-353027-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load range</td>
<td>Up to 20 dBm transmit power</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>Balance of features for cost sensitive applications</td>
<td></td>
</tr>
<tr>
<td>Integation</td>
<td>Fully integrated SoC with lowest power and extended range</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/smart-lighting
www.infineon.com/makeradar
Wi-Fi enterprise networking and internet connectivity

Wi-Fi networking is the back-bone of enterprise, retail, and home internet connectivity. Wi-Fi is the bridging medium for Bluetooth® Mesh networks to enterprise networks and cloud applications capturing messaging from across the lighting installation for secure enterprise building management applications. Wi-Fi can also be used to connect sensors and fixtures directly to enterprise or home access points for long range solutions or integrated solutions including security lighting and cameras. Infineon offers a range of secure, high performance enterprise ready Wi-Fi solutions that can be added to switches, panels, and lighting bays. These solutions can be stand-alone network nodes or offer Bluetooth® Mesh Gateway services bridging Mesh-networked devices to cloud applications.

IoT Wi-Fi portfolio

<table>
<thead>
<tr>
<th>Technology</th>
<th>Wi-Fi</th>
<th>Wi-Fi + MCU</th>
<th>Wi-Fi + Bluetooth® combos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-Fi 4 (802.11n)</td>
<td>CYW43364 SB 1x1 11n</td>
<td>CYW43439* SB 1x1 11n + BT5.2 SDIO/SPI</td>
<td>CYW43012 ULP DB 1x1 11n + BT5.1 SDIO/SPI WLBGA/WLCSP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CYW43903 SB 1x1 11n + 160-MHz R4</td>
<td>CYW54590** DB 2x2 11ac + BT5.1 PCIe/SDIO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CYW43907 1x1 DB 11n + 320-MHz R4</td>
<td>CYW4373/89373 DB 1x1 11ac + BT5.0 USB/SDIO/PCIe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CYW54907 1x1ac DB + 320-MHz R4</td>
<td>CYW54591 DB 2x2 11ac, RSD8, BT5.1 PCIe/SDIO</td>
</tr>
</tbody>
</table>

Infineon’s Wi-Fi portfolio provides high-performance, flexible connectivity for Linux, Android, and RTOS. Many of the Wi-Fi + Bluetooth® combos are supported on Infineon’s WICED Wi-Fi and ModusToolbox Software Development Kits (SDK) which provide code examples, tools and development support.

Infineon’s Wi-Fi and Bluetooth® combos use production-ready, fully-certified Wi-Fi + Bluetooth® combo modules based on both Linux and RTOS based platforms. Many of the Wi-Fi + Bluetooth® combos are supported on Infineon’s WICED Wi-Fi and ModusToolbox Software Development Kits (SDK) which provide code examples, tools and development support for easier and faster development.

www.infineon.com/smart-lighting
www.infineon.com/makeradar

*Coming soon
**For more information on this product, contact our product support.
Wi-Fi enterprise networking and internet connectivity

We offer a broad platform portfolio to support your Bluetooth® Mesh gateway. Explore more here.

IoT Wi-Fi portfolio

A global Wi-Fi module partner ecosystem enables support and development for your IoT application.

Design, build and sell RF Modules with limited software and hardware certification support

Module makers

www.infineon.com/smart-lighting
www.infineon.com/makeradar

*Coming soon
ITC solutions

DC-DC power solution for data center, edge, enterprise, telecom and datacom

Digital multiphase and point-of-load DC-DC solution

As an industry leader in digital power management, Infineon delivers solutions for the next-generation data center, edge, enterprise, server and telecom applications, storage and client computing applications. Infineon offers a complete portfolio including digital multiphase controllers, integrated power stages, integrated point-of-load (POL) voltage regulators and discrete MOSFETs. These proven technologies offer full flexibility to our customers to optimize a complete system solution for space, performance, ease of design and cost to meet critical design goals. In addition, our latest software tools help simplify design, shorten design cycles, and improve time-to-market.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Best-in-class efficiency</td>
<td>› Digital multiphase controller and power stage provide industry’s highest efficiency of more than 95 percent</td>
</tr>
<tr>
<td>› Multi-protocol support</td>
<td>› Intel SVID, AMD SVID/2, NVIDIA PWM VID, parallel VID (up to 8 bits) , PMBus Rev1.3, AVS Bus (PMBus Rev1.3)</td>
</tr>
<tr>
<td>› Complete system solution</td>
<td>› A broad portfolio of fully integrated point-of-load, integrated power stage and digital controller solutions in addition to discrete drivers and MOSFETs offers full flexibility to optimize complete system solutions ranging from 1 A to 1000+ A</td>
</tr>
<tr>
<td>› Digital controller flexibility</td>
<td>› Industry’s benchmark for feature richness and low-quiescent power</td>
</tr>
<tr>
<td>› Ease of design</td>
<td>› Intuitive GUI enables faster optimization, thereby reduces design cycle time</td>
</tr>
<tr>
<td>› Smallest solution size</td>
<td>› Best-in-class OptiMOS™ MOSFETs combined with advanced packaging technologies enable high power density at high efficiency, and superior control engine with digital multiphase controllers help minimize output capacitance significantly</td>
</tr>
</tbody>
</table>

Multiphase DC-DC system solution

Click here for more information on server SMPS and telecom SMPS solutions.

www.infineon.com/dataprocessing
Multiphase DC-DC system solution

AC adapters
OptiMOS™

Battery charger

DC-DC PWM controller

Phase I

Phase N

Chipset, I/O, other peripheral loads

CPU, GPU, DDR

www.infineon.com/dataprocessing
Infineon’s IPOL converters integrate a PWM controller, a driver, and MOSFETs into a small PQFN package for ease of use. The patented PWM modulation scheme allows greater than 1 MHz switching frequencies to deliver ultracompact layouts and the smallest bill of materials (BOM). A PMBus interface is available for monitoring and control in systems that use advanced CPUs, ASICs and FPGAs.

**DC-DC enterprise power solution for data processing applications**

Integrated point-of-load (IPOL) converters

Infineon’s IPOL converters integrate a PWM controller, a driver, and MOSFETs into a small PQFN package for ease of use. The patented PWM modulation scheme allows greater than 1 MHz switching frequencies to deliver ultracompact layouts and the smallest bill of materials (BOM). A PMBus interface is available for monitoring and control in systems that use advanced CPUs, ASICs and FPGAs.

**DC-DC IPOL portfolio**

**Digital interface IPOL**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Max. current [A]</th>
<th>Package size [mm]</th>
<th>Max. V_in</th>
<th>Max. f_sw</th>
<th>Distinctive features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR38064MTRPBF</td>
<td>35</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 KHz</td>
<td>PMBus</td>
</tr>
<tr>
<td>IR38063M</td>
<td>25</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 KHz</td>
<td></td>
</tr>
<tr>
<td>IR38062M</td>
<td>15</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 KHz</td>
<td></td>
</tr>
<tr>
<td>IR38060M</td>
<td>6</td>
<td>5 x 6</td>
<td>16 V</td>
<td>1500 KHz</td>
<td></td>
</tr>
<tr>
<td>IR38163M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID + PMBus</td>
</tr>
<tr>
<td>IR38165M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID</td>
</tr>
<tr>
<td>IR38363M</td>
<td>15</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID + PMBus</td>
</tr>
<tr>
<td>IR38365M</td>
<td>15</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID</td>
</tr>
<tr>
<td>IR38263M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID + PMBus</td>
</tr>
<tr>
<td>IR38265M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, PMBus</td>
</tr>
<tr>
<td>IR38164M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 KHz</td>
<td>OptiMOS™ 5, SVID + PMBus, enhanced Imon</td>
</tr>
<tr>
<td>IRPS5401M</td>
<td>4x4+2+2xH5</td>
<td>7 x 7</td>
<td>14 V</td>
<td>1500 KHz</td>
<td>5 output PMIC, PMBus</td>
</tr>
</tbody>
</table>

**Analog IPOL**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Max. current [A]</th>
<th>Package size [mm]</th>
<th>Max. V_in</th>
<th>Max. f_sw</th>
<th>Distinctive features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR3883MTRPBF</td>
<td>3</td>
<td>3 x 3</td>
<td>14 V</td>
<td>800 KHz</td>
<td>Constant-on-time (COT)</td>
</tr>
<tr>
<td>IR3823AMTRPBF</td>
<td>3</td>
<td>3.5 x 3.5</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3899AMTRPBF</td>
<td>9</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>TDA388Z0</td>
<td>20</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3888MTRPBF</td>
<td>25</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3847AMTRPBF</td>
<td>25</td>
<td>5 x 6</td>
<td>17 V</td>
<td>600 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3887MTRPBF</td>
<td>30</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3889MTRPBF</td>
<td>30</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>TDA38840</td>
<td>40</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 KHz</td>
<td></td>
</tr>
<tr>
<td>IR3846AMTRPBF</td>
<td>40</td>
<td>5 x 7</td>
<td>17 V</td>
<td>600 KHz</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/dataprocessing
Infineon provides a comprehensive portfolio to deliver the best efficiency and reliability for solar applications. Cutting-edge technologies such as CoolMOS™ SJ MOSFETs, HighSpeed 3 IGBT and TRENCHSTOP™ 5, CoolSiC™ Schottky diodes, CoolSiC™ MOSFETs, coreless transformers, drivers and many more combined with the rich experience and highest quality ensure Infineon’s unique supplier position for solar applications. The newly added Arm® Cortex®-M4 based MCU enables easy and high-efficiency design.

Infineon’s products for complete solar system

Solar
High efficiency designs for solar power systems

www.infineon.com/solar
**Optimizer**

Microinverter can either be used per
› single (~300 W) PV panel or
› multiple PV panels (600 – 1500 W)

---

**Functional block**

<table>
<thead>
<tr>
<th>Product family</th>
<th>Voltage class (V_{DS} \text{ max})</th>
<th>Package</th>
<th>Part number</th>
<th>(R_{DS(on)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPPT – Boost stage</td>
<td>OptiMOS™</td>
<td>≤ 48 V 60 V</td>
<td>SuperS08 SC</td>
<td>BSC0120N06NSC 1.2 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BSC0140N06NSSC 1.4 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DirectFET™ BSB028N06NN3G 2.8 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 64 V 80 V</td>
<td>SuperS08 SC</td>
<td>BSC0180N06NSSC 1.6 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DirectFET™ BSB044N06NN3G 4.4 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 80 V 100 V</td>
<td>SuperS08 SC</td>
<td>BSC0270N06NSSC 2.7 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DirectFET™ BSB056N06NNSC 5.6 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 125 V 200 V</td>
<td>SuperS08 SC</td>
<td>BSC220N06NSSC 9.3 mΩ</td>
</tr>
</tbody>
</table>

**Gate-driver ICs**

- Single channel: PG-SOT23-6 1EDN85S50
  - DSO8: 1ED60N12AF [10 A]
- Dual channel: VDSON 2EDL81xx
  - DSO8: IRS2011 [1 A]
  - DSO8: 2ED2181S06F [2.5 A] IRS2186ST [4 A]

**Microcontroller**

- XMC4000 and PSoC™6

---

**www.infineon.com/solar**

*For more information on the product, contact our product support*
In a multilevel inverter, four high-voltage MOSFETs/IGBTs in an H-bridge topology are replaced with a higher number of lower-voltage MOSFETs. Compared to a conventional H-bridge inverter, a multilevel inverter, composed of lower voltage MOSFETs, offers several advantages:

- With much lower R_{DS(on)} and switching loss parameters, it significantly reduces conduction and switching losses
- Higher effective output frequency (smaller magnetics) is possible with lower switching losses
- Improved EMC due to reduced switching voltages
- Significant reduction in the cooling system, size and weight

Discrete power devices for multilevel string inverter

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Product family</th>
<th>Voltage class ([V_{DS} \text{ max}])</th>
<th>Package</th>
<th>Part number</th>
<th>(R_{DS(on)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boost</td>
<td>CoolMOS™</td>
<td>600 V</td>
<td>TO-247</td>
<td>IPW60R017C7</td>
<td>17 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TO-247</td>
<td>IPW60R024P7</td>
<td>24 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPAK</td>
<td>IPB60R045P7</td>
<td>45 mΩ</td>
</tr>
<tr>
<td>IGBT TRENCHSTOP™ 5</td>
<td></td>
<td>650 V</td>
<td>TO-247</td>
<td>IKW40N65EHS, IKW40N65ESS</td>
<td>40 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPAK</td>
<td>IKB40N65EHS, IKB40N65ESS</td>
<td>40 A</td>
</tr>
<tr>
<td>CoolSiC™ Schottky diode</td>
<td></td>
<td>650 V</td>
<td>TO-247</td>
<td>IDW20G65C5</td>
<td>20 A</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ 1EDN</td>
<td></td>
<td>PG-SOT23-6</td>
<td>1EDN8511B</td>
<td>4.8 A/8 A</td>
</tr>
<tr>
<td>Flying-capacitor-based active</td>
<td>OptiMOS™</td>
<td>150 V</td>
<td>SuperSO8</td>
<td>BSC039N15NS5</td>
<td>9.3 mΩ</td>
</tr>
<tr>
<td>neutral-point-clamp (NPC)</td>
<td></td>
<td></td>
<td>SuperSO8</td>
<td>BSC110N15NS5</td>
<td>11 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DirectFET™</td>
<td>IRE150DM115*</td>
<td>11.3 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPAK</td>
<td>IPB044N15NS</td>
<td>4.4 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DPAK</td>
<td>IPB048N15NS</td>
<td>4.8 mΩ</td>
</tr>
<tr>
<td>Gate-driver ICs</td>
<td>EiceDRIVER™ 2Edi</td>
<td></td>
<td>NB-DS016</td>
<td>2EDF7275F</td>
<td>4.8 A/8 A</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ SOI</td>
<td>650 V</td>
<td>DS08, DSO-14</td>
<td>2ED2181506F / 2ED21814506J</td>
<td>2.5 A</td>
</tr>
<tr>
<td></td>
<td>EiceDRIVER™ Compact</td>
<td>1200 V/2300 V</td>
<td>DS08</td>
<td>1ED160N12AF, 1ED3124MU12F</td>
<td>10 A, 14 A</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>XMC4000 and PSoC™6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/solar

*For more information on the product, contact our product support*
Solar

Single-phase string inverter

H4 topology

H6 topology

Three-phase string inverter

www.infineon.com/solar
## Discrete power devices for string inverter

<table>
<thead>
<tr>
<th>Inverter type</th>
<th>Functional block</th>
<th>Product category</th>
<th>Product technology</th>
<th>Voltage</th>
<th>Package</th>
<th>Part number</th>
<th>Rds(on)</th>
<th>Ampere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single phase</td>
<td>MPPT – Boost stage</td>
<td>Si MOSFET</td>
<td>CoolMOS™ P7</td>
<td>600 V</td>
<td>TO-247-3</td>
<td>IPW60R037P7</td>
<td>37 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SiC MOSFET</td>
<td>CoolSiC™ MOSFET</td>
<td>650 V</td>
<td>TO-247-4</td>
<td>IM2A65R027M1H</td>
<td>27 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247-3</td>
<td>IMW65R048M1H</td>
<td>48 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1200 V</td>
<td>TO-247-3</td>
<td>IMW120R045M1</td>
<td>45 mΩ</td>
</tr>
<tr>
<td></td>
<td>IGBT</td>
<td>TRENCHSTOP™ S5/S/HS</td>
<td>650 V</td>
<td>TO-247-3</td>
<td>IKW40N65ES5, IKW40N65EHS</td>
<td>-</td>
<td>40 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247-4</td>
<td>IKZ50N65ES5, IKZ50N65EHS</td>
<td>-</td>
<td>50 A</td>
</tr>
<tr>
<td></td>
<td>Diode</td>
<td>CoolSiC™ diode</td>
<td>650 V</td>
<td>TO-247</td>
<td>IDW20G65C5</td>
<td>-</td>
<td>20 A</td>
<td></td>
</tr>
<tr>
<td>Inverter</td>
<td>Si MOSFET</td>
<td>CoolMOS™ C7</td>
<td>650 V</td>
<td>TO-247-3</td>
<td>IPW65R065C7</td>
<td>65 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoolMOS™ S7</td>
<td>600 V</td>
<td>TO-Leadless</td>
<td>IPT60R022S7</td>
<td>22 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPT60R040S7</td>
<td>40 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoolMOS™ CFD7</td>
<td>600 V</td>
<td>TO-247-3</td>
<td>IPW60R018CFD7</td>
<td>18 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPW60R031CFD7</td>
<td>31 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SiC MOSFET</td>
<td>CoolSiC™ MOSFET</td>
<td>650 V</td>
<td>TO-247-4</td>
<td>IM2A65R027M1H</td>
<td>27 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247-3</td>
<td>IMW65R048M1H</td>
<td>48 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1200 V</td>
<td>TO-247-3</td>
<td>IMW120R045M1</td>
<td>45 mΩ</td>
</tr>
<tr>
<td></td>
<td>IGBT</td>
<td>TRENCHSTOP™ S5/S/HS</td>
<td>650 V</td>
<td>TO-247-4</td>
<td>IKZ50N65ES5, IKZ50N65EHS</td>
<td>-</td>
<td>50 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247-3</td>
<td>IKW40N65ES5, IKW40N65EHS</td>
<td>-</td>
<td>40 A</td>
</tr>
<tr>
<td>Three phase</td>
<td>MPPT – Boost stage</td>
<td>IGBT</td>
<td>HighSpeed 3</td>
<td>1200 V</td>
<td>TO-247-3</td>
<td>IKW40N120H3</td>
<td>-</td>
<td>40 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247PLUS-3</td>
<td>IKQ75N120CH3</td>
<td>-</td>
<td>75 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SiC MOSFET</td>
<td>CoolSiC™ MOSFET</td>
<td>1200 V</td>
<td>TO-247-3/4</td>
<td>IMW120R030M1H, IMZ120R030M1H</td>
<td>30 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IMW120R045M1, IMZ120R045M1</td>
<td>45 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IMW120R060M1H, IMZ120R060M1H</td>
<td>60 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inverter</td>
<td>IGBT</td>
<td>HighSpeed 3</td>
<td>1200 V</td>
<td>TO-247-3</td>
<td>IKW40N120H3</td>
<td>-</td>
<td>40 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TO-247PLUS-3</td>
<td>IKQ75N120CH3</td>
<td>-</td>
<td>75 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SiC MOSFET</td>
<td>CoolSiC™ MOSFET</td>
<td>1200 V</td>
<td>TO-247-3/4</td>
<td>IMW120R030M1H, IMZ120R030M1H</td>
<td>30 mΩ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IMW120R045M1, IMZ120R045M1</td>
<td>45 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IMW120R060M1H, IMZ120R060M1H</td>
<td>60 mΩ</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Silicon carbide MOSFET module</td>
<td>CIPOS™ Maxi</td>
<td>1200 V</td>
<td>DIP 36x23D</td>
<td>IM828-XXC</td>
<td>55 mΩ</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Gate-driver ICs**
- **EiceDRIVER™** low side | 25 V | SOT-23-6 | 1ED44175/3N01B | 2.6 A |
- **EiceDRIVER™** | 24 V | DSO8 | 2ED44176MO1F | 10 A |
- **EiceDRIVER™** | 650 V | DSO-16 | 2ED5715H | 8 A |
- **EiceDRIVER™** SOI | 650 V | DSO8 | 2ED21615G6F | 2.5 A |
- **EiceDRIVER™** | 1200 V | SSOP-23, DSO-16 | IR22145S, IR2215S | 2.5 A |
- **EiceDRIVER™** Compact | 1200 V | DSO8 | 1ED061012AF, 1ED1012MF | 10 A, 6 A |
- **EiceDRIVER™** Enhanced | 2300 V | DSO-16/36 | 1ED3322MC12H, 2ED021212F2 | 8.5 A |
- **EiceDRIVER™** | 2300 V | DSO-16 | 1ED3491MU12M, 1ED3890MU12M | 9 A |

**Microcontroller**
- XMC4000 and PSoC™6
Facing diminishing fossil reserves, the world nonetheless needs to manage the rising demand for electrical energy while meeting the growing call for urgent climate action. The transition to renewable energies has become inevitable.

Energy storage systems play a vital role in managing this transition successfully. Our system solutions help to make energy storage the backbone of the new energy era. Our unique application expertise and comprehensive offering make us the natural choice to advance energy storage solutions in efficiency, performance, optimal cost, and innovation.

Features and benefits

**Key features**

- Efficient power conversion in DC-DC and AC-DC stage
- Power dense design
- Bi-directional power flow
- Safe operation of Li-ion battery
- Long battery lifetime

**Key benefits**

- Improvement of system performance with industry leading semiconductor offering such as OptiMOS™, CoolMOS™, CoolSiC™ MOSFETs but also best-in-class modules and matching EiceDRIVER™ gate drivers
- Reduction of design efforts and faster time to market
- Trust in a true partnership during the whole system lifetime
- Full system provider form power conversion stage (PCS) to the battery management system (BMS)

Application diagram

![Application diagram](image_url)

www.infineon.com/energy-storage-systems
## Highlight/recommended product portfolio

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Power/battery voltage</th>
<th>Voltage class (V&lt;sub&gt;DS&lt;/sub&gt; max)</th>
<th>Product family</th>
<th>Package</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power conversion systems (PCS)</td>
<td>&lt; 10 kW</td>
<td>150 V</td>
<td>BSC074N15N5S, IPT059N15N3</td>
<td>SuperSO8, TOLL</td>
<td>High power density and system cost reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 V/650 V</td>
<td>CoolMOS™ CF17/S7</td>
<td>TO-220/247, ThinPAK 8x8, TOLL</td>
<td>Highest efficiency, enabling increased power density / more compact and easier design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 V</td>
<td>CoolSiC™ Schottky diode G6</td>
<td>TO-220</td>
<td>Improved system efficiency and extremely fast switching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>CoolSiC™ MOSFET</td>
<td>TO-247</td>
<td>Combination of high performance, high reliability and ease of use</td>
</tr>
<tr>
<td></td>
<td>10-100 kW</td>
<td>150 V</td>
<td>OptiMOS™</td>
<td>TO-263</td>
<td>High power density and system cost reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 V</td>
<td>CoolMOS™ C7/P7</td>
<td>TO-247</td>
<td>Ease of use and fast design-in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>CoolSiC™ MOSFET</td>
<td>TO-247</td>
<td>Combination of high performance, high reliability and ease of use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>TRENCHSTOP™ S HS</td>
<td>TO-247</td>
<td>Benefit increase at high current conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 V</td>
<td>CoolSiC™ Schottky diode C6</td>
<td>TO-220</td>
<td>Higher frequency and increased power density</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 V</td>
<td>CoolSiC™ MOSFET</td>
<td>TO-247</td>
<td>Highest efficiency and increased power density</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 V</td>
<td>TRENCHSTOP™ S5/6 or S6</td>
<td>TO-247</td>
<td>High device reliability and lifetime expectancy</td>
</tr>
<tr>
<td></td>
<td>101-250 kW</td>
<td>150 V</td>
<td>IPB048N15N5</td>
<td>D'PAK</td>
<td>Enables and simplifies the setup of 2nd life batteries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 V</td>
<td>IPB107N20N3 G</td>
<td>D'PAK</td>
<td>Enables and simplifies the setup of 2nd life batteries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 V</td>
<td>EasyPACK™ 2B</td>
<td>Modules</td>
<td>Highest efficiency for reduced cooling effort</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1700 V</td>
<td>PrimePACK™/EconoDUAL™</td>
<td>Modules</td>
<td>Highest efficiency for reduced cooling effort</td>
</tr>
<tr>
<td></td>
<td>&gt; 0.25 MW</td>
<td>1700 V</td>
<td>PrimePACK™/EconoDUAL™</td>
<td>Modules</td>
<td>High power density</td>
</tr>
<tr>
<td>Gate driver</td>
<td>20 V</td>
<td>EiceDRIVER™ 1EDN</td>
<td>PG-SOT23-6</td>
<td></td>
<td>Single-channel non-isolated</td>
</tr>
<tr>
<td></td>
<td>25 V</td>
<td>1ED44175N01B/1ED44173N01</td>
<td>PG-SOT23-6</td>
<td></td>
<td>Single-channel with fast, accurate (± 5%), integrated over-current protection (OCP)</td>
</tr>
<tr>
<td></td>
<td>24 V</td>
<td>2ED24427N01F</td>
<td>PG-DSO8 with power-pad</td>
<td>DSO8</td>
<td>Dual-channel, 10 A low-side gate driver</td>
</tr>
<tr>
<td></td>
<td>650 V</td>
<td>EiceDRIVER™ 2EDS</td>
<td>PG-DSO16-NB</td>
<td>DSO16</td>
<td>Dual-channel reinforced (safe) isolated</td>
</tr>
<tr>
<td></td>
<td>650 V</td>
<td>EiceDRIVER™ 2EDF</td>
<td>PG-DSO16-NB</td>
<td>DSO16</td>
<td>Dual-channel functional isolated</td>
</tr>
<tr>
<td></td>
<td>650 V</td>
<td>2ED2181506F</td>
<td>DS08-14</td>
<td>DSO14</td>
<td>Integrated bootstrap diode</td>
</tr>
<tr>
<td></td>
<td>600 V</td>
<td>IR52185S/IR52186S</td>
<td>DS08 / DSO-14</td>
<td></td>
<td>4 A/4 A high- and low-side gate driver</td>
</tr>
<tr>
<td></td>
<td>600 V/1200 V</td>
<td>IR2114SS/IR2114SS</td>
<td>SSOP-24</td>
<td></td>
<td>Half-bridge gate driver with DESAT, 2L SRC, soft-SD</td>
</tr>
<tr>
<td></td>
<td>1200 V</td>
<td>IR2213S</td>
<td>DSO-28</td>
<td></td>
<td>High- and low-side gate driver</td>
</tr>
<tr>
<td></td>
<td>2300 V</td>
<td>EiceDRIVER™ Compact 1ED3124MC12H/1ED3122MC12H</td>
<td>PG-SOT-48</td>
<td></td>
<td>Single-channel isolated driver with Miller clamp/sep-out</td>
</tr>
<tr>
<td></td>
<td>1200 V/2300 V</td>
<td>EiceDRIVER™ Enhanced clamp 1ED3122MC12H</td>
<td>DSO-16</td>
<td></td>
<td>Single-channel isolated driver with Miller clamp</td>
</tr>
<tr>
<td>BMS – battery protection</td>
<td>40-60 V</td>
<td>100 V</td>
<td>IPT007N06N/FR4052C40/ IPB010N06N</td>
<td>TOLL, D'PAK</td>
<td>Highest system efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60-100 V</td>
<td>IPT015N10N5/ IPT015N10N5/ IPB010N10N5/ IPB020N10N5LF</td>
<td>TOLL, D'PAK</td>
<td>Minimize parallelization of MOSFETs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100-150 V</td>
<td>IPB020N10N5LF/IPB048N15N5LF</td>
<td>D'PAK</td>
<td>Market-leading MOSFETs with lowest R&lt;sub&gt;DS(tot)&lt;/sub&gt; enabling low conduction losses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150-400 V</td>
<td>CoolSiC™ S7</td>
<td>TO-247</td>
<td>Widest SOA area with LinearFET™</td>
</tr>
<tr>
<td>BMS Monitoring and balancing</td>
<td>IC</td>
<td>Battery management IC (TLE9012DQU)</td>
<td>PG-TQFP-48</td>
<td></td>
<td>Lowest R&lt;sub&gt;DS(tot)&lt;/sub&gt; MOSFET</td>
</tr>
<tr>
<td>BMS Transceiver</td>
<td>IC</td>
<td>Battery management IC (TLE9015QU)</td>
<td>PG-TQFP-48</td>
<td></td>
<td>- ASIL-D compliant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Cell balancing with integrated switches with up to 150 mA using external resistors to reduce chip power consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- 12x delta-sigma ADCs ensure that the voltage of all cells is measured synchronously</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- ISO UART includes an 8-bit CRC to ensure data integrity until microcontroller register</td>
</tr>
<tr>
<td>BMS Digital isolator</td>
<td>IC</td>
<td>ISOFACE™ digital isolators*</td>
<td>PG-DSO8</td>
<td></td>
<td>- Isolated CAN/UART communication</td>
</tr>
<tr>
<td>BMS Microcontroller</td>
<td>MCU</td>
<td>PSoC™</td>
<td>Main features of PSoC™ 4:</td>
<td></td>
<td>- 32-bit MCU subsystem</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- 48-MHz Arm® Cortex®-M0+ CPU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Up to 256 kB flash</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- 32 kB SRAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Up to 2 CAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- USB / up to 4 serial channels</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.

---

*Coming soon*
Disruptive technologies have significantly changed our lifestyle in the past few decades. Now a new era is on the horizon – the age of robots. Robots are joining the ranks of innovative and disruptive technologies by revolutionizing traditional habits and processes. Today’s robots can identify and navigate through surroundings, work alongside and even interact with humans. Moreover, they teach themselves the skills required to complete a new task.

All this would not be possible without semiconductor solutions. Whether in an industrial robot, a collaborative robot (cobot), a mobile robot (AGV, AMR) for warehouses or last-mile delivery and personal care purposes (or a domestic robot in form of vacuum or lawn mower robots) intelligent semiconductors are the key enablers for all major robotic functions. Drawing on our insight into all facets of the robotics field and with a comprehensive portfolio of power products and sensors on offer, Infineon provides reliable system solutions that address the latest trends in robotics.

Whether it is artificial intelligence, Internet of Things, smart home, cloud-based services, human-machine interface or any robotics-related field, Infineon has value to add to nearly all robot designs.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast time to market</td>
<td>A complete eco-system of simulations, documentation, and demonstration boards enable a faster time to market</td>
</tr>
<tr>
<td>Complete solutions – broad portfolio from power to connectivity (Wi-Fi &amp; Bluetooth®) and sensors</td>
<td>Whatever design specification, Infineon has the answer thanks to its comprehensive portfolio of products and solutions which you can easily tailor to your needs</td>
</tr>
<tr>
<td>Extended battery lifetime and product life spans</td>
<td>High reliability of Infineon components results in prolonged product life spans</td>
</tr>
<tr>
<td>Overall system size and cost reduction</td>
<td>Reduction of overall system size and cost thanks to small form factor and compact design of components, both of which are required for highest power density</td>
</tr>
<tr>
<td>Security, quality, and safety</td>
<td>BOM savings thanks to lowest R_GS</td>
</tr>
<tr>
<td>Authentication</td>
<td>Trustworthy hardware-based security</td>
</tr>
<tr>
<td></td>
<td>As a security market leader with a proven track record and outstanding partner network for embedded security, Infineon provides highest quality standards and a safety-certified development process</td>
</tr>
<tr>
<td></td>
<td>OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries)</td>
</tr>
</tbody>
</table>

Domestic robots - simplifying everyday life and work

Structural system overview: domestic robots

The latest generation of domestic robots has ushered in a new level of assistance and simplicity in homes and professional environments. They directly interact with humans, which introduces unique challenges from a design perspective, especially in domestic environments. Energy efficiency, long battery life as well as security aspects and sensing capabilities are key to user-friendly and safe designs. By choosing Infineon, you get a one-stop semiconductor shop for all your robot design needs.

www.infineon.com/robotics
Serving industrial robot manufacturers with the best system solutions for years, Infineon is also well set to provide the right fit products for the upcoming category of collaborative robots Cobots, as they are shortly called work outside the limitation of a safety cell, directly interacting with real people. This setup requires a precise set of design features, especially for the sake of workplace safety. With Infineon’s semiconductors for cobot systems, you benefit from the expertise of an experienced and reliable partner.

Our radar and sensor solutions, for example, provide the tools to uphold even the highest safety standards and allow the robots to leave their formerly fenced working environment.

Autonomous mobile robots (AMRs) are a self-driving force behind automated processes and offer the highest degree of flexibility within working environments due to battery-powered systems. Covering the entire product portfolio for robotics applications – from the power supply to motor drives and sensors for navigation and environment scanning – Infineon is equipped to ensure mobile robots can find their way through nearly all environments.

www.infineon.com/robotics
### Recommended products

<table>
<thead>
<tr>
<th>Common system power</th>
<th>Industrial robots</th>
<th>Cobots</th>
<th>Mobile robots (AMR, AGV)</th>
<th>Domestic robots</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 5 kW</td>
<td>60 V and 1200 V CoolSiC™ MOSFET</td>
<td>600 V/650 V CoolSiC™</td>
<td>60 V/650 V CoolSiC™</td>
<td>600 V/650 V CoolSiC™</td>
</tr>
<tr>
<td>&lt; 5 kW</td>
<td>60 V/650 V CoolSiC™</td>
<td>650 V CoolSiC™</td>
<td>650 V CoolSiC™</td>
<td>650 V CoolSiC™</td>
</tr>
<tr>
<td></td>
<td>1 V ~ 400 V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>1 V ~ 110 V/220 V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>24 V ~ 48 V&lt;sub&gt;c&lt;/sub&gt;</td>
<td>12 V ~ 36 V&lt;sub&gt;c&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

#### Power supply and charger

- **Power switch**
  - 650 V and 1200 V CoolSiC™ MOSFET
  - 600 V/650 V /1200 V TRENCHSTOP™

- **PFC power diodes**
  - 650 V CoolSiC™

- **Gate driver EiceDRIVER™ family**
  - Low single-channel: 1ED11xx and 1ED-1M
  - Low single-channel isolated: 1ED13xx and 1ED-F2
  - 650 V high-side: 1EDB9275F, 1EDB6275F, 1EDBB8275F

#### Motor control and drive

- **Power Switch**
  - 1200 V single-channel
  - 1200 V single-channel isolated: 1ED31xx and 1ED-MF

- **Gate driver EiceDRIVER™ family**
  - 650 V single-channel isolated: 1ED34xx and 1ED2
  - 650 V high-side: 1EDB8275F, 1EDBB8275F, 1EDBB6275F

- **Microcontroller (MCU)**
  - Arm Cortex-M0: XMC1100 or XMC1300
  - Arm Cortex-M4: XMC4200

- **Microcontroller (MCU)**
  - PSoC: XMC4x00 (Arm® Cortex® M4F)
  - XMC4x00 (Arm® Cortex® M4F)

- **Digital isolator ISOFACE™ family**
  - ISO1813T
  - ISO1816G
  - 2DIB0410F

- **Hall switch**
  - XENSIV™ TL496x

- **Current sensor**
  - XENSIV™ TL4971

- **Angle sensor**
  - XENSIV™ TLE/TLS012B, TLE50145P

#### Battery management system (BMS)

- **Microcontroller (MCU)**
  - XMC4x00 (Arm® Cortex® M4F)

- **Protection switches**
  - 60 – 150 V OptiMOS™ and StrongIRFET™

- **Balancing switches (small signal)**
  - 20 V or 30 V N/P MOSFETs in SOT23, TSOP6 or SOT363 dual-channel

- **Monitoring and balancing IC**
  - TLE9012AU (sensing IC)
  - TLE9015SU (transceiver IC)

- **Battery authentication**
  - OPTIGA™ Trust M
  - OPTIGA™ Trust B

#### Sensing

- **Radar**
  - XENSIV™ 60 GHz BGT60UTR114P
  - XENSIV™ 60 GHz BGT60UTR114P

- **ToF (Time-of-Flight) 3D image sensors**
  - XENSIV™ REAL3™ 3D image sensor: IRS1125A, IRS2877AS

- **MEMS Microphones**
  - XENSIV™ MEMS microphones, digital I/F: IM60D130 or IM60D120

- **Other sensors**
  - Pressure sensor: XENSIV™ DPs368 (e.g., airflow control)
  - CO<sub>2</sub> Sensor - XENSIV™ PAS CO<sub>2</sub>

#### Connectivity and human-machine interface (HMI)

- **Wi-Fi**
  - CYW43731 (1x1 dual-band Wi-Fi 5)
  - CYW43340 (1x1 2.4 GHz 802.11 A/G/N/BC)

- **HMI**

- **Security Authentication and protection**
  - OPTIGA™ Trust B
  - OPTIGA™ Trust M

- **Memory NOR Flash**
  - S25FL-L serial NOR Flash memories

- **Others**
  - Voltage regulator: DC-DC voltage regulator 12 V/5 V or 3.3 V, watchdog, error monitoring, safe state control, BIST etc.
  - LED Driver: Driving currents from 10 mA to 250 mA – linear driver ICS: BCR3xx, BCR4xx
  - Support currents from 150 mA to 3 A – DC-DC switch-mode: ILS4xxx, ILS6xxx

---

For more details on the product, click on the part number or contact our product support.
Onboard chargers for xEV applications

Best solutions for electrified powertrain in XEV applications: on-board chargers and HV/LV DC-DC converter

The electrification of the powertrain enables local emission-free mobility and driving pleasure. The needed energy is stored and delivered from a battery. Infineon’s semiconductor solutions do not only enable core functionalities in the electrification but also extend the driving range, reduce charging times and energy transfer between the high voltage systems with the traditional 12 V domain.

On-board chargers

Every plug-in hybrid electric vehicles (PHEV) and pure electric cars are equipped with at least one on-board charger, allowing battery recharge from any standard AC power outlet. Available power depends on regional regulations and installation base, typically providing up to 7.4 kW for PHEVs and up to 22 kW maximum power. System designers face the challenge of supporting the varied voltage and current levels while increasing the power density. When it comes to on-board charging, the key success factors involve efficiency and a high power density for a small form factor. The long-term trend is moving towards bidirectional charging, where the charger also feeds power from the car to the smart grid.

High-voltage DC-DC converter

The architecture of electric vehicles comprises at least one low-voltage sub-network with low-voltage energy storage and multiple electrical loads and one high-voltage sub-network with high-voltage energy storage. The auxiliary HV/LV DC-DC converter’s function is to enable the bidirectional energy flow between these two electrical subnets. Typical design challenges are achieving the greatest possible efficiency and keeping the overall system costs under control. The space required for the DC-DC converter should also be kept to an absolute minimum. Infineon’s portfolio is specially designed to help easily overcome these barriers.

On-board chargers: functional blocks

HV/LV DC-DC converter: functional blocks

www.infineon.com/emobility
www.infineon.com/obc
Product portfolio for on-board charger and HV/LV DC-DC applications

Infineon’s comprehensive portfolio of semiconductors (sensors, microcontrollers, power semiconductors, etc.) lends itself perfectly to designing compact units for on-board, off-board, and wireless charging. Infineon products in this sector support high-switching frequencies at lowest possible on-state resistance ($R_{DS(on)}$) to enable compact and efficient designs. The power offering includes MOSFETs such as CoolMOS™, IGBTs such as TRENCHSTOP™ 5, SiC Schottky diodes such as the CoolSiC™ diode 650 V, the CoolSiC™ Hybrid discrete (integrated IGBT and SiC diode), and easy module solutions. In addition, integrated MOSFET and IGBT drivers, controller ICs for active CCM PFC high-performance microcontroller solutions, and highly accurate current sensors complete the product portfolio. For more information about off-board chargers, refer to the Fast/wireless EV charging chapter.

**Automotive products for on-board charger units**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Product family</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoolMOS™ 650 V</td>
<td>IPx65RxxxCFD7A</td>
<td>650 V MOSFETs with integrated fast body diode</td>
</tr>
<tr>
<td>TRENCHSTOP™ AUTO IGBT</td>
<td>AIKW50N, AIKW40N, AIGW40</td>
<td>IGBT discrete dedicated to automotive applications</td>
</tr>
<tr>
<td>CoolSiC™ 1200 V</td>
<td>AIHW120Rx</td>
<td>Automotive 1200 V discrete SiC MOSFET</td>
</tr>
<tr>
<td>Level shifter</td>
<td>AUIRS2191S, AUIRS2113S</td>
<td>Automotive high and low side driver</td>
</tr>
<tr>
<td>Automotive EiceDRIVER™</td>
<td>2ED020112FA</td>
<td>Dual-channel isolated driver for 650 V/1200 V IGBTs and MOSFets</td>
</tr>
<tr>
<td>AURIX™ microcontroller</td>
<td>TC2x3L, TC2x6D, TX36x*, TC37x*</td>
<td>32-bit lockstep microcontroller</td>
</tr>
<tr>
<td>OPTIREG™ PMIC</td>
<td>TLF35584, TLF35585</td>
<td>ISO 26262 – system-supplied optimized for AURIX™</td>
</tr>
<tr>
<td>CAN FD transceiver</td>
<td>TLE9350, TLE9351, TLE9252</td>
<td>High-speed automotive CAN transceiver with 5 Mbps</td>
</tr>
<tr>
<td>OPTIREG™ SBC</td>
<td>TLE9461, TLE9471</td>
<td>High integrated solution for microcontroller supply and communication</td>
</tr>
<tr>
<td>OPTIREG™ Linear</td>
<td>TLS810, TLS850, TLS105, TLS820</td>
<td>Automotive linear voltage regulators</td>
</tr>
<tr>
<td>XENSIV™ current sensor</td>
<td>TLI4971</td>
<td>Coreless magnetic current sensors</td>
</tr>
</tbody>
</table>

**Easy modules for on-board charger units**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Product family</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoolMOS™ Easy module 650 V</td>
<td>F4-35MR07W1D7S8_B11/A*</td>
<td>650 V MOSFET in H-bridge configuration with integrated capacitor in Easy 1B package</td>
</tr>
<tr>
<td>CoolMOS™ Easy module 650 V</td>
<td>F4-35MR07W2D7S8_B13/A*</td>
<td>650 V MOSFET in H-bridge configuration with IGBT HS, rapid diode &amp; integrated capacitor in Easy 2B package</td>
</tr>
<tr>
<td>CoolMOS™ Easy module 650 V</td>
<td>F4-xxMR07Wx0x7_Bxx/A</td>
<td>650 V MOSFET in H-bridge configuration in Easy package</td>
</tr>
<tr>
<td>CoolMOS™ Easy module 650 V</td>
<td>F5xxMR07Wx0x7_Bxx/A</td>
<td>650 V MOSFET in SixPACK configuration in Easy package</td>
</tr>
<tr>
<td>CoolMOS™ Easy module 650 V</td>
<td>FFxxMR07Wx0x7_Bxx/A</td>
<td>650 V MOSFET in half-bridge configuration in Easy package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F4-xxMR12WxM1H_Bxx/A</td>
<td>1200 V SiC MOSFET in H-bridge configuration in Easy package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F5xxMR12WxM1H_Bxx/A</td>
<td>1200 V SiC MOSFET in SixPACK configuration in Easy package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>FFxxMR12WxM1H_Bxx/A</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy package</td>
</tr>
</tbody>
</table>

For more information about off-board chargers, refer to the Fast/wireless EV charging chapter.

www.infineon.com/emobility
www.infineon.com/obc

* Coming soon
### Automotive products for the car side**

<table>
<thead>
<tr>
<th>Product family</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive EiceDRIVER™</td>
<td>1ED020H12FA2</td>
<td>Single-channel isolated driver for 650 V/1200 V IGBTs and MOSFETs</td>
</tr>
<tr>
<td>Automotive EiceDRIVER™</td>
<td>1ED020H12FTA</td>
<td>Single-channel isolated driver, two-level turn-off for 650 V/1200 V IGBTs</td>
</tr>
<tr>
<td>Automotive EiceDRIVER™</td>
<td>2ED020H12FA</td>
<td>Dual-channel isolated driver for 650 V/1200 V IGBTs and MOSFETs</td>
</tr>
<tr>
<td>CoolSiC™ Easy module</td>
<td>1ED035H850</td>
<td>1200 V SiC MOSFET with integrated fast body diode</td>
</tr>
<tr>
<td>AURIX™</td>
<td>TC232L, TC2620, TX36*, TC37X*</td>
<td>32-bit lockstep microcontroller</td>
</tr>
<tr>
<td>OPTIREG™ PMIC</td>
<td>TLJ35S84, TLJ35S85</td>
<td>ISO 26262 - system-supply optimized for AURIX™</td>
</tr>
<tr>
<td>CAN FD transceiver</td>
<td>TLE9350, TLE9351, TLE9252</td>
<td>High-speed automotive CAN transceiver with 5 Mbps</td>
</tr>
<tr>
<td>OPTIREG™ SBC</td>
<td>TLE9461, TLE9471</td>
<td>High integrated solution for microcontroller supply and communication</td>
</tr>
<tr>
<td>OPTIREG™ Linear</td>
<td>TLE8110, TLE850, TLE805, TLE820</td>
<td>Automotive linear voltage regulators</td>
</tr>
</tbody>
</table>

### Industrial products for the road side**

<table>
<thead>
<tr>
<th>Product family</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoolMOS™ CFD7 SJ MOSFET</td>
<td>IPW80R031CFD7</td>
<td>600 V MOSFET, 31 mΩ, TO-247</td>
</tr>
<tr>
<td>CoolMOS™ CT SJ MOSFET</td>
<td>IPW80R040CT</td>
<td>600 V MOSFET, 40 mΩ, TO-247</td>
</tr>
<tr>
<td>CoolMOS™ PT SJ MOSFET</td>
<td>IPW80R037PT</td>
<td>600 V MOSFET, 37 mΩ, TO-247</td>
</tr>
<tr>
<td>TRENCHSTOP™ IGBTs</td>
<td>IKW40N65F5</td>
<td>Fast IGBT with Rapid 1 diode, 40 A, TO-247</td>
</tr>
<tr>
<td>TRENCHSTOP™ IGBTs</td>
<td>IGW40N65F5</td>
<td>Fast IGBT, single, 40 A, TO-247</td>
</tr>
<tr>
<td>CoolSiC™ diode</td>
<td>IDW40G65C5</td>
<td>650 V SiC Schottky diode generation 5, 40 A, TO-247</td>
</tr>
<tr>
<td>XMC™ microcontroller</td>
<td>XMC4000</td>
<td>32-bit Arm® Cortex® -M4 microcontrollers, up to 125 °C ambient temperature</td>
</tr>
<tr>
<td>Linear voltage regulators</td>
<td>TLE805, TLE820, TLE850</td>
<td>Scalable Linear regulator family from 50mA to 500mA with robust design and feature sets</td>
</tr>
<tr>
<td>Current sensor</td>
<td>TLH970</td>
<td>600 V functional isolation, ± 50 A</td>
</tr>
<tr>
<td>EiceDRIVER™ SOI gate driver</td>
<td>2ED21xX06F</td>
<td>650 V half-bridge gate driver for IGBTs and MOSFETs</td>
</tr>
<tr>
<td>EiceDRIVER™ 1ED Compact gate-driver IC</td>
<td>1ED020H12AF, 1ED31xxU12H</td>
<td>1200 V, single-channel, isolated driver with Miller clamp or separate output</td>
</tr>
</tbody>
</table>

### Industrial products for the road side

<table>
<thead>
<tr>
<th>Part number</th>
<th>Product family</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F3L11MR12W2M1_BT64</td>
<td>1200 V SiC MOSFET in three-level configuration in Easy 2B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F45MR12W1M1(P)_B11*</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F23MR12W1M1(P)_B11</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F11MR12W1M1(P)_B11</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>FF6MR12W2M1(P)_B11</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy 2B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F1MR12W2M1(P)_B11</td>
<td>1200 V SiC MOSFET in half-bridge configuration in Easy 2B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F4-5MR12W1M1(P)_B76*</td>
<td>1200 V SiC MOSFET in H-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F4-23MR12W1M1(P)_B76*</td>
<td>1200 V SiC MOSFET in H-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F4-15MR12W1M1(P)_B76*</td>
<td>1200 V SiC MOSFET in H-bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy module 1200 V</td>
<td>F4-11MR12W2M1(P)_B76*</td>
<td>1200 V SiC MOSFET in H-bridge configuration in Easy 2B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy rectifier bridge module 1200 V</td>
<td>DDB2U20N12W1RF(P)_B11</td>
<td>1200 V SiC diode in rectifier bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy rectifier bridge module 1200 V</td>
<td>DDB2U40N12W1RF(P)_B11</td>
<td>1200 V SiC diode in rectifier bridge configuration in Easy 1B package</td>
</tr>
<tr>
<td>CoolSiC™ Easy rectifier bridge module 1200 V</td>
<td>DDB2U60N12W1RF(P)_B11</td>
<td>1200 V SiC diode in rectifier bridge configuration in Easy 1B package</td>
</tr>
</tbody>
</table>

* For more information on the product, contact our product support
** Available in different current ratings

www.infineon.com/emobility
www.infineon.com/obc
As a leader in power semiconductors, Infineon strives to provide the most efficient, reliable, and smart solutions in the market. Keeping up with the latest market trends worldwide, Infineon prepares for the introduction of the following vehicle types, including but not limited to light electric vehicles:

- Micromobility - e-bike, kick e-scooter
- Electric powered 2/3 wheelers (ePTW) - e-moped, e-scooter, e-rickshaw, e-motorcycle
- Low-speed electric vehicles (microEV), neighborhood EV (NEV), e-quadracycle
- Other electric transporters (e.g., e-forklift, e-golf cart) with less than 200 V batteries

In contrast to automotive requirements, these applications (though also on-road) require different sets of safety and qualification standards that place more responsibility on the operator than the vehicle itself to mitigate risks. Many of Infineon’s non-automotive and automotive offerings target these applications.

Different from the traditional vehicles with internal combustion engines, these type of vehicles are battery-powered with a bus voltage ranging from 28 V to 168 V. The commonalities among the electric light vehicles are motor drives/inverters, battery management systems, battery chargers/stations, as well as the increasingly popular smart features and electronics made possible due to their larger size batteries.

Key features and benefits

**Key features**

- Leading power MOSFET technology
- Track record of reliability and quality
- Complete portfolio for driver, microcontroller, and sensors
- Broad connectivity products compliant to various standards
- Complete design support with simulations, documentation and demonstration boards for high-end solutions

**Key benefits**

- Highest power density and increased battery operating time
- Prolonged lifetime and low failure rate
- One-stop shop for designers
- Enabling smart features
- Shortened development cycle

www.infineon.com/lev
### 6 kW motor drive with 96 V bus voltage

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Product category</th>
<th>Product family</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor drive</td>
<td>3-phase half bridge (B6)</td>
<td>LV MOSFETs</td>
<td>OptiMOS™ S</td>
<td>IPTJ39N15SN5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontrollers</td>
<td>XMC1400 series</td>
<td>XMC1404-F064X0200 AA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate driver</td>
<td>EiceDRIVER™</td>
<td>2ED85B259F, IRS218675</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Position/speed sensor</td>
<td>XENSIV™</td>
<td>TLE5501 EG002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current sensor</td>
<td>XENSIV™</td>
<td>TLE4972-AE35S5</td>
</tr>
</tbody>
</table>

For additional configurations, please refer to High power low voltage drives.

### Swappable 48 V 1.2 kWh battery

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Product category</th>
<th>Product family</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS</td>
<td>Back-to-back with pre-charge</td>
<td>LV MOSFETs (charge)</td>
<td>OptiMOS™</td>
<td>IPTG014N10NMS5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LV MOSFETs (discharge)</td>
<td>OptiMOS™</td>
<td>IPTG014N10NMS5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LV MOSFETs (pre-charge)</td>
<td>HEXFET™</td>
<td>IRLR31102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microcontrollers</td>
<td>XMC™</td>
<td>XM1200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate driver</td>
<td>EiceDRIVER™</td>
<td>2ED4820</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Memory (RAM)</td>
<td>NOR Flash</td>
<td>S25FL256AGMFB001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bluetooth®</td>
<td>AIROC™</td>
<td>CYW20719B1KJULMG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Security</td>
<td>OPTIGATM-Authenticate IDoT</td>
<td>SLE95401TSNP6X7SA1</td>
</tr>
</tbody>
</table>

For additional configurations, please refer to Battery management systems.

### 3 kW AC-DC rectifiers in swapping battery stations

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Product category</th>
<th>Product family</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery charging</td>
<td>Dual-boost PFC</td>
<td>PFC switch</td>
<td>CoolMOS™ P7</td>
<td>IPW60R037P7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PFC diode</td>
<td>CoolSiC™ G6</td>
<td>IDH20G65C6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate driver</td>
<td>EiceDRIVER™</td>
<td>2EDN7524F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PFC controller</td>
<td>ICE3x family</td>
<td>ICE3PSG01C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HB LLC</td>
<td>LLC switch (primary side)</td>
<td>IPW60R040CDF7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate driver</td>
<td>EiceDRIVER™ dual-channel functional isolated MOSFET gate drivers</td>
<td>2EDF7275F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sec SR MOSFET</td>
<td>OptiMOS™ S</td>
<td>BSC039N15NS5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gate driver SR</td>
<td>EiceDRIVER™ non-isolated driver IC</td>
<td>2EDN7524</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCU</td>
<td>XMC™ industrial microcontroller family</td>
<td>XMC4200-F64K256BA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QR flyback</td>
<td>Aux power controller</td>
<td>CoolSET™</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ICE5Q42280AZ</td>
</tr>
</tbody>
</table>

For additional configurations, please refer to Battery chargers.

### 250 W AC-DC offline charger

<table>
<thead>
<tr>
<th>Functional block</th>
<th>Topology</th>
<th>Product category</th>
<th>Product family</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery charging</td>
<td>PFC</td>
<td>Controller</td>
<td>Resonant combo PFC/LCC controller</td>
<td>ICL5102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PFC switch</td>
<td>CoolMOS™ P7</td>
<td>IP60R099P7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LLC HV DC-DC</td>
<td>HB switch</td>
<td>IP60R280P7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SR switch</td>
<td>StrongIRFET™</td>
<td>IRF84615PBF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety switch</td>
<td>OptiMOS™</td>
<td>IP60R011N10S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QR flyback controller</td>
<td>Aux power IC</td>
<td>CoolSET™</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ICE5Q42280AZ</td>
</tr>
</tbody>
</table>

For additional configurations, please refer to Battery chargers.

www.infineon.com/lev
Products

› 20-300 V MOSFETs
› 500-950 V MOSFETs
› Gate-driver ICs
› Discrete IGBTs and silicon power diodes
› Intelligent power switches and modules
› Microcontrollers
› Power management ICs
› Wide bandgap semiconductors
› XENSIV™ sensor technologies for automotive, industrial and consumer applications
› Packages

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

---

20-300 V MOSFETs

- 20-300 V MOSFETs N-channel power MOSFETs
  - Technology development and product family positioning
  - Guidance for applications and voltage classes
  - Space-saving and high-performance packages
  - Discrete packages
- Small-signal/small power MOSFETs -250 to 600 V
- OptiMOS™ Source-Down power MOSFETs 25-150 V
- StrongIRFET 2 MOSFETs 40 V/60 V/80 V/100 V
- TOLx family
- Product portfolio
- Nomenclature

---

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Infineon shapes power for growth through MOSFET innovation

With more than 40 years of experience in power MOSFET innovation, Infineon has led the way in solving the challenges design engineers face on a daily basis while enabling them achieve their targets. Although these targets may have changed over the years, the innovative spirit behind Infineon’s product offering has persisted – from device design, technology, package and product development through manufacturing. Looking at the evolution of MOSFETs in the industry, numerous advancements in MOSFET technology have enabled the applications and trends that have become an indispensable part of our lives. Infineon power MOSFET innovation has proven that optimization at the component level brings significant system-level performance advantages and contributes to an easier, safer and greener future.

www.infineon.com/powermosfet-12V-300V
OptiMOS™ and StrongIRFET™

20-300 V N-channel power MOSFETs

Infineon’s semiconductors are designed to bring greater efficiency, power density and cost-effectiveness. The full range of OptiMOS™ and StrongIRFET™ power MOSFETs enables innovation and performance in applications such as switch mode power supplies (SMPS), battery powered applications, motor control, drives, inverters, and computing.

Infineon’s highly innovative OptiMOS™ and StrongIRFET™ families consistently meet the highest quality and performance demands in key specifications for power system designs such as on-state resistance ($R_{\text{DS(on)}}$) and figure of merit (FOM).

OptiMOS™ power MOSFETs provide best-in-class performance. Features include ultra low $R_{\text{DS(on)}}$, as well as low charge for high switching frequency applications. StrongIRFET™ power MOSFETs are designed for drives applications and are ideal for designs with a low switching frequency, as well as those that require a high current carrying capability.

Technology development and product family positioning

<table>
<thead>
<tr>
<th>StrongIRFET™</th>
<th>OptiMOS™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robust and excellent price/performance ratio</td>
<td>Best-in-class technology</td>
</tr>
<tr>
<td>› Optimized for switching frequency &lt; 100 kHz</td>
<td>› Optimized for broad switching frequency</td>
</tr>
<tr>
<td>› Designed for industrial applications</td>
<td>› Designed for high performance applications</td>
</tr>
<tr>
<td>› High current carrying capability</td>
<td>› Industry’s best figure of merit</td>
</tr>
<tr>
<td>› Rugged silicon</td>
<td>› High efficiency and power density</td>
</tr>
</tbody>
</table>

OptiMOS™

- Robust and excellent price/performance ratio
  - Active (price/performance optimized)
    - StrongIRFET™ 80-100 V
    - IR MOSFET™ 20-250 V
  - Active and preferred (high-performance optimized)
    - StrongIRFET™ 2 80-100 V
    - StrongIRFET™ 20-300 V
  - OptiMOS™ 25-60 V
  - OptiMOS™ 80/100/150 V

StrongIRFET™

- Robust and excellent price/performance ratio
  - Active (price/performance optimized)
    - StrongIRFET™ 2 80-100 V
    - StrongIRFET™ 20-300 V
  - Active and preferred (high-performance optimized)
    - StrongIRFET™ 2 80-100 V
    - StrongIRFET™ 20-300 V

OptiMOS™

- Best-in-class technology
  - Active (price/performance optimized)
    - OptiMOS™ 5
    - OptiMOS™ 6
  - Active and preferred (high-performance optimized)
    - OptiMOS™ 5 25 V/30 V
    - OptiMOS™ 6 40 V/60 V
    - OptiMOS™ 6 80 V/100 V
    - OptiMOS™ 6 150 V
    - OptiMOS™ 6 25 V / 120 V
    - OptiMOS™ 6 200-300 V

www.infineon.com/powermosfet-12V-300V
With more than 40 years of experience in power MOSFET innovation, Infineon offers a broad portfolio of products. The product portfolio is divided into “active and preferred”, referring to the latest technology available offering best-in-class performance, and “active”, consisting of well-established technologies which complete this broad portfolio.

**StrongIRFET™** 2 power MOSFETs are the latest generation to be added to the family. Currently available in 80 and 100 V options with additional voltages to be released later this year, this family offers broad availability and excellent price/performance ratio and are suitable for a broad range of applications.

**OptiMOS™** 6 power MOSFETs 40 V/100 V are the newest addition to the OptiMOS™ product family. They are the perfect solution when best-in-class (BiC) products and high efficiency over a wide range of output power are required. For other voltage classes, from 25 V up to 150 V, OptiMOS™ 5 represents the latest generation in the market, offering low conduction losses and high switching performance.

For high and low frequency applications OptiMOS™ 3 power MOSFETs is our largest OptiMOS™ family and complements our existing product portfolio as well as providing additional options when best-in-class is not required. StrongIRFET™ is recommended for 20-300 V applications when the high performance is not essential and the cost is a more significant consideration.

[www.infineon.com/powermosfet-12V-300V](http://www.infineon.com/powermosfet-12V-300V)
OptiMOS™ and StrongIRFET™ portfolio, covering from 20 up to 300 V MOSFETs, can address a broad range of needs from low to high switching frequencies. The tables below provide a guidance on the recommended OptiMOS™ or StrongIRFET™ products for each major sub-application and voltage class.

<table>
<thead>
<tr>
<th>Recommended voltage</th>
<th>20 V to 30 V</th>
<th>40 V</th>
<th>60 V</th>
<th>75 V to 80 V</th>
<th>100 V</th>
<th>120 V to 150 V</th>
<th>200 V</th>
<th>250 V</th>
<th>300 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low power</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery Powered</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High power (EXCLUDE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online UPS</td>
<td>Slow switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fast switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offline UPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapter / Charger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC Power</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCD TV</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Server</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC/DC</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telecom</td>
<td>OptiMOS™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>StrongIRFET™</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/powermosfet-12V-300V
### Space-saving and high-performance packages

<table>
<thead>
<tr>
<th>Package</th>
<th>TO-247</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>D'PAK</th>
<th>D'PAK 7-pin</th>
<th>TO-Leadless</th>
<th>TOLT (Top-side cooling)</th>
<th>TOLG (Gullwing leads)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
</tr>
<tr>
<td>Special features</td>
<td>Optimized for high power applications and high current capability</td>
<td>–</td>
<td>Optimized for top-side cooling</td>
<td>Optimized for TCoB ¹ robustness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height [mm]</td>
<td>5.0</td>
<td>4.4</td>
<td>4.5</td>
<td>4.4</td>
<td>4.4</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Outline [mm]</td>
<td>40.15 x 15.9</td>
<td>29.5 x 10.0</td>
<td>29.5 x 10.0</td>
<td>15.0 x 10.0</td>
<td>15.0 x 10.0</td>
<td>11.7 x 9.9</td>
<td>15.0 x 9.9</td>
<td>11.7 x 9.9</td>
</tr>
<tr>
<td>Thermal resistance RthJC [K/W]</td>
<td>2.0</td>
<td>0.5</td>
<td>2.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

### sTOLL, SuperSO8, SuperSO8 super cool, Power Block, PQFN 3.3x3.3 Source-Down, PQFN 3.3x3.3, PQFN 2x2, DirectFET™

<table>
<thead>
<tr>
<th>Package</th>
<th>sTOLL</th>
<th>SuperSO8</th>
<th>SuperSO8 super cool</th>
<th>Power Block</th>
<th>PQFN 3.3x3.3 Source-Down</th>
<th>PQFN 3.3x3.3</th>
<th>PQFN 2x2</th>
<th>DirectFET™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
<td><img src="image9" alt="Image" /></td>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
<td><img src="image13" alt="Image" /></td>
<td><img src="image14" alt="Image" /></td>
<td><img src="image15" alt="Image" /></td>
<td><img src="image16" alt="Image" /></td>
</tr>
<tr>
<td>Special features</td>
<td>Optimized for high power in small form factor</td>
<td>For highest efficiency and power management</td>
<td>Optimized for dual-side cooling</td>
<td>Significant design shrink</td>
<td>Highest power density per area</td>
<td>High efficiency in small form factor</td>
<td>Enables significant space saving</td>
<td>Best performing dual-side cooling package</td>
</tr>
<tr>
<td>Height [mm]</td>
<td>2.3</td>
<td>1.0</td>
<td>0.75</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>Small: 0.65 Medium: 0.65 Large: 0.71</td>
</tr>
<tr>
<td>Outline [mm]</td>
<td>8.0 x 7.0</td>
<td>5.15 x 6.15</td>
<td>5.0 x 6.0</td>
<td>5.0 x 6.0</td>
<td>3.3 x 3.3</td>
<td>3.3 x 3.3</td>
<td>2.0 x 2.0</td>
<td>Small: 4.8 x 3.8 Medium: 6.3 x 4.9 Large: 9.1 x 6.98</td>
</tr>
<tr>
<td>Thermal resistance RthJC [K/W]</td>
<td>0.6</td>
<td>0.8</td>
<td>0.5</td>
<td>1.5</td>
<td>1.4</td>
<td>3.2</td>
<td>11.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

¹ Temperature cycling on board

www.infineon.com/powermosfet-12V-300V
Infineon has been making an impact in the MOSFET industry with innovation in MOSFET manufacturing techniques and processes as well as pioneering new packages to meet the changing demands of cutting-edge designs in various applications. OptiMOS™ and StrongIRFET™ technologies are available in different packages to address demands for high current carrying capability and significant space saving. The broad portfolio enables footprint reduction, boosted current rating and optimized thermal performance. While the surface mount leadless devices are enabled for footprint reduction, through-hole packages are characterized by a high-power rating.

Infineon offers innovative packages such as DirectFET™ and TO-Leadless (TOLL). DirectFET™ is designed for high frequency applications by offering the lowest parasitic resistance. This package is available in three different can sizes: small, medium and large. TO-Leadless is optimized to dissipate power up to 375 W, increasing power density with a substantial reduction in footprint.

New package innovations include the SuperSO8 Source-Down package offering high power density and performance; the TOLG (Gullwing leads) optimized for TCoB (Thermal cycling on board) robustness; TOLT (top-side cooling) optimized for superior thermal performance; sTOLL optimized for high power in small form factor; and the SuperSO8 super cool optimized for dual-side cooling in a standard 5x6 mm² footprint.
Small-signal/small-power MOSFETs -250 to 600 V
Combining latest high-performance silicon technology with small and innovative packaging

Small-signal/small power products are ideally suited for space-constrained automotive and non-automotive applications. With an optimal price/performance ratio and small footprint packages, Infineon’s small-signal and small-power MOSFETs are the best fit for a wide range of applications and circuits. These include low-voltage drives, linear battery charger, battery protection, load switches, DC-DC converters, reverse polarity protection and many more.

The entire family includes different packages:
SOT-223, SOT-23, SOT-323, SOT-363, SOT-89, TSOP-6 and SC59

The product portfolio covers N-channel and P-channel enhancement mode MOSFETs as well as N-channel depletion mode products:
- -250 V to -12 V P-channel enhancement mode (available in single and dual configurations)
- 20 V to 600 V N-channel enhancement mode (available in single and dual configurations)
- -20/+20 V and -30/+30 V complementary (P + N channel) enhancement mode
- 60 V to 600 V N-channel depletion mode

Key benefits
- Suitable for automotive and high quality demanding applications
- Easy interface to MCU
- Reduction of design complexity
- Wide selection of products available
- Environmentally friendly

Key features
- Products qualified to Automotive and Industrial standards
- Four VGS(th) classes available for 1.8 V, 2.5 V, 4.5 V, and 10 V gate drives
- ESD protected P-channel parts
- VGS range from -250 V to 600 V
- RoHS compliant and halogen free

Small-signal/small-power MOSFETs are available in seven industry-standard package types ranging from the largest SOT-223 to the smallest SOT-323.

Products are offered in single, dual and complementary configurations and are suitable for a wide range of applications, including battery protection, LED lighting, low-voltage drives and DC-DC converters.

www.infineon.com/smallsignal
www.infineon.com/smallpower
OptiMOS™ Source-Down power MOSFETs 25-150 V
An innovative PQFN 3.3 mm x 3.3 mm product family

Once again, Infineon is setting a new standard in MOSFET performance with the new Source-Down package to support the requirement for high power density and optimized system-level efficiency. In comparison with a normal Drain-Down device, in the Source-Down technology, the source potential is connected to the thermal pad. Optional Center-Gate footprint is also available. Here the gate pin is moved to the center supporting easy parallel configuration of multiple MOSFETs. With the larger drain-to-source creepage distance, it is possible to connect the gates of multiple devices on a single PCB layer.

<table>
<thead>
<tr>
<th>Standard Drain-Down</th>
<th>New Source-Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>PQFN 3.3x3.3 standard Drain-Down footprint</td>
<td>PQFN 3.3x3.3 Standard-Gate Source-Down footprint</td>
</tr>
<tr>
<td>$R_{thJC}$ [°C/W]</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Key benefits
- Enabling highest power density and performance
- Superior thermal performance
- Form factor reduction
- Optimized layout possibilities
- Simplifying parallel configuration of multiple MOSFETs with Center-Gate footprints

Optimized thermal management

In the Source-Down package technology, the heat is dissipated directly into the PCB through a thermal pad instead of over the bond wire or the copper clip. The package significantly improves the thermal resistance ($R_{thJC}$) of this product family. In most cases, thermal vias cannot be used on the thermal pad if it is connected to the noisy switch node potential. With Source-Down, the thermal pad of the low-side MOSFET is now on the ground potential enabling the use of thermal vias right underneath the device. This considerably improves the thermal performance and the power density in the end application.
OptiMOS™ 6 power MOSFETs 100 V

Next generation of cutting-edge MOSFETs

OptiMOS™ 6 100 V devices are setting a new technology standard in the field of discrete MOSFET devices. Compared to alternative products, Infineon’s leading thin wafer technology enables significant performance benefits compared to OptiMOS™ 5:

- $R_{\text{DS(on)}}$ reduced by 22%
- Improved FOM $Q_g \times R_{\text{DS(on)}}$ by 37%
- Improved FOM $Q_{gd} \times R_{\text{DS(on)}}$ by 38%

Infineon’s OptiMOS™ 6 power MOSFET 100 V family offers an optimized solution for synchronous rectification in switched mode power supplies (SMPS) in servers, desktop PCs, wireless and quick chargers. The improved performance in on-state resistance ($R_{\text{DS(on)}}$) and figure of merits (FOM - $R_{\text{DS(on)}} \times Q_g$ and $Q_{gd} \times R_{\text{DS(on)}}$) yields an efficiency improvement, allowing easier thermal design and less paralleling, leading to system cost reduction. In addition, the best-in-class $R_{\text{DS(on)}}$ and high switching performance makes these devices suitable for Telecom applications.

Infineon’s market-leading OptiMOS™ 6 power MOSFETs 100 V are available in two different packages:

- **SuperSO8** – 5x6 mm² with $R_{\text{DS(on)}}$ ranging from 23 mΩ down to 2.2 mΩ
- **PQFN 3x3** – 3.3 x 3.3 mm² with $R_{\text{DS(on)}}$ ranging from 23 mΩ down to 8 mΩ

Target applications include a ZVS inverting buck-boost -(36...60) V to 12 V DC-DC converter. In this topology, an active clamp circuit recovers, in a lossless way, $Q_r$ from the SR switch towards the output, while achieving zero-voltage switching for the control switch.

Best-in-class products in the newly released OptiMOS™ 6 technology (ISC022N10NM6) are compared to OptiMOS™ 5 (BSC027N10NS5) in SuperSO8 (PQFN 5x6) package in this application. The result is stunning: OptiMOS™ 6 in 2.2 mΩ achieves roughly 1% better efficiency across all the line and load conditions, compared to the 2.7 mΩ product in OptiMOS™ 5.

The improvement in efficiency is explainable as the joint contribution of the lower driving losses (thanks to approximatively 20% lower (typ) $Q_g$), lower turn-off losses (due the lower $Q_{gd}$ – an improvement just shy of 40%) and lower conduction losses with a 18% lower $R_{\text{DS(on)}}$. The improvement in efficiency lowers the total losses by 7 W, a remarkable improvement allowing easier thermal management and increased power density. ISC022N10NM6 represents the lowest $R_{\text{DS(on)}}$ available in the market for SuperSO8 (PQFN 5x6) package in 100 V.

www.infineon.com/optimos-6-100v
OptiMOS™ PD
The best fit for USB-PD and fast charger designs

OptiMOS™ PD is Infineon’s new MOSFET portfolio representing the best fit for USB-PD and fast charger designs and is available in 2 small standard packages: PQFN 3.3x3.3 and SuperSO8. Logic level availability enables parts to be fully driven from 4.5 V or directly from microcontrollers resulting in a lower part count in the application. The portfolio ranges from 25 V up to 150 V MOSFETs where 25 V and 30 V products represent the fit as load switch and 60-150 V parts are the optimal choice to function as synchronous rectification FETs in charger and adapter designs.

The OptiMOS™ PD family features MOSFETs offering a low on-state resistance ($R_{\text{DS(on)}}$), less switching losses as well as low gate-, output- and reverse-recovery charges. The reduction in overall losses results in an excellent price/performance ratio leading to a decrease in total system BOM cost.

www.infineon.com/optimos-pd
StrongIRFET™ 2 MOSFETs – 40 V/60 V/80 V/100 V

Right-fit products for a broad range of applications

The new StrongIRFET™ 2 power MOSFETs are the latest generation of MOSFET technology addressing a wide range of applications such as adapters, motor drives, e-scooters, battery management systems, light electric vehicles, robotics, power and gardening tools. Featuring broad availability and excellent price/performance ratio, this new technology offers right-fit products with an easy choice for designers interested in convenient selection and purchasing. Optimized for both low- and high-switching frequencies, the family supports a broad range of applications enabling flexibility in design.

StrongIRFET™ 2 vs. previous generation 100 V performance comparison

Compared to the previous StrongIRFET™ generation in 100 V TO-220 package, StrongIRFET™ 2 shows significant improvements such as ~40% lower $R_{\text{ds(on)}}$ and ~65% reduced $Q_g$. This results in better efficiency and longer life time.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Broad availability from distribution partners</td>
<td>› Increased security of supply</td>
</tr>
<tr>
<td>› Excellent price/performance ratio</td>
<td>› Right-fit products</td>
</tr>
<tr>
<td>› Ideal for high and low switching frequency</td>
<td>› Supports wide variety of applications</td>
</tr>
<tr>
<td>› Industry standard footprint</td>
<td>› Standard pin out allows for drop-in replacement</td>
</tr>
<tr>
<td>› High current rating</td>
<td>› Increased product ruggedness</td>
</tr>
</tbody>
</table>

StrongIRFET™ 2 MOSFETs

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/strongirfet2
TOLx family

TO-Leadless (TOLL)

TO-Leadless is optimized to handle currents up to 500 A, increasing power density with a substantial reduction in footprint. A footprint reduction of 30% compared to D2PAK, together with a height reduction of 50%, results in an overall space saving of 60% enabling much more compact designs.

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Best-in-class technology</td>
<td>› High performance capability</td>
</tr>
<tr>
<td>› High current rating &gt; 500 A</td>
<td>› High system reliability</td>
</tr>
<tr>
<td>› 60% space reduction compared to D2PAK 7-pin</td>
<td>› Optimized board utilization</td>
</tr>
</tbody>
</table>

TOLG (Gullwing leads)

TOLG package offers a compatible footprint to the TO-Leadless with the additional feature of Gullwing leads resulting in two times higher TCoB performances compared to TO-Leadless. This package is excellent on aluminum insulated metal substrate boards (Al-IMS).

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Best-in-class technology</td>
<td>› High performance capability</td>
</tr>
<tr>
<td>› High current rating &gt; 450 A</td>
<td>› High system reliability</td>
</tr>
<tr>
<td>› Low ringing and voltage overshoot</td>
<td>› High efficiency and lower EMI</td>
</tr>
<tr>
<td>› 60% space reduction compared to D2PAK 7-pin</td>
<td>› Optimized board utilization</td>
</tr>
<tr>
<td>› Gullwing leads</td>
<td>› High thermal cycling on board performance</td>
</tr>
</tbody>
</table>

TOLT (Top-side cooling)

TOLT is the new top-side cooling package within the TOLx family. With top-side cooling, the drain is exposed at the surface of the package allowing for 95 percent of the heat to be dissipated directly to the heatsink, achieving 20 percent better $R_{D,ON}$ and 50 percent improved $R_{th,JC}$ compared to the TOLL package. With bottom-side cooling packages, like the TOLL or the D2PAK, the heat is dissipated via the PCB to the heatsink resulting in high power losses.

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Low $R_{D,ON}$</td>
<td>› Reduction in conduction losses</td>
</tr>
<tr>
<td>› High current rating</td>
<td>› Increased product ruggedness</td>
</tr>
<tr>
<td>› Top-side cooling</td>
<td>› Superior thermal performance</td>
</tr>
<tr>
<td>› Negative standoff</td>
<td>› Minimize thermal resistance to heatsink</td>
</tr>
</tbody>
</table>

www.infineon.com/toll
www.infineon.com/tolg
www.infineon.com/tolt
TOLx family

TOLx family – Cooling concept

With TOLL / TOLG, board mounting, the heat is dissipated through the PCB to the heatsink.
Due to the PCB thermal resistance, power losses occur.

With top-side cooling setup, the drain pad is exposed on the top of the package allowing the majority of the heat to be dissipated into the top-mounted heatsink. This pulls heat away from the PCB resulting in at least 20 percent better $R_{thJA}$ compared to standard over-molded TOLL.

Thermal cycling on IMS board (TCoB) performance

www.infineon.com/optimos-tolg
www.infineon.com/optimos-tolt
## OptiMOS™ and StrongIRFET™ 20 V (super) logic level

<table>
<thead>
<tr>
<th><strong>R(<em>{\text{DS(ON),max}}) @ V(</em>{GS})=4.5 V</strong> [mΩ]</th>
<th><strong>TO-252 (DPAK)</strong></th>
<th><strong>PQFN 2x2</strong></th>
<th><strong>PQFN 3.3x3.3</strong></th>
<th><strong>SuperSO8</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>IRFH6200TRPBF</td>
<td>R(_{\text{DS(on)}})=0.99 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-4</td>
<td>IRL6225TRPBF</td>
<td>R(_{\text{DS(on)}})=2.5 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10</td>
<td>IRLH6242TRPBF</td>
<td>R(_{\text{DS(on)}})=4.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 10</td>
<td>IRLH6276TRPBF</td>
<td>R(_{\text{DS(on)}})=45 mΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

## OptiMOS™ and StrongIRFET™ 25 V logic level

<table>
<thead>
<tr>
<th><strong>R(<em>{\text{DS(ON),max}}) @ V(</em>{GS})=10 V</strong> [mΩ]</th>
<th><strong>DirectFET™</strong></th>
<th><strong>PQFN 2x2</strong></th>
<th><strong>PQFN 3.3x3.3</strong></th>
<th><strong>SuperSO8</strong></th>
<th><strong>Source-Down PQFN 3.3x3.3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>BSC009NE2LS5</td>
<td>R(_{\text{DS(on)}})=0.9 mΩ</td>
<td></td>
<td></td>
<td>IQE006NE2LMS5</td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=0.9 mΩ</td>
<td></td>
<td></td>
<td></td>
<td>R(_{\text{DS(on)}})=0.6 mΩ</td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=0.9 mΩ</td>
<td></td>
<td></td>
<td></td>
<td>IQE006NE2LMS5C</td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=0.9 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>BSZ010NE2LS5</td>
<td>R(_{\text{DS(on)}})=1.0 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.1 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.1 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.1 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.2 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.2 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.5 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.5 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=1.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=2.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=2.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.8 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=3.8 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 10</td>
<td>BSC009NE2LS5</td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R(_{\text{DS(on)}})=6.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

www.infineon.com/powermosfet-12V-300V

* Optimized for resonant applications (e.g. LLC converter)
** Monolithically-integrated Schottky-like diode
*** R\(_{\text{DS(ON),max}}\) @ V\(_{GS}\)=4.5 V

1) 2.5 V\(_{GS}\) capable

For more details on the product, click on the part number, visit infineon.com or contact our product support.
OptiMOS™ and StrongIRFET™ 25 V in Power Block 5x6

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package</th>
<th>Monolithically-integrated Schottky-like diode</th>
<th>BVDS [V]</th>
<th>RDS(on) max. [mΩ] @ VGS=4.5 V max.</th>
<th>Qgs [nC] @ VGS=4.5 V typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSG0910NDI*</td>
<td>SuperSO8</td>
<td>✓</td>
<td>25</td>
<td>5.9</td>
<td>1.6</td>
</tr>
<tr>
<td>BSG0911ND*</td>
<td>SuperSO8</td>
<td>–</td>
<td>25</td>
<td>4.8</td>
<td>1.7</td>
</tr>
<tr>
<td>BSG0912NDI*</td>
<td>SuperSO8</td>
<td>✓</td>
<td>30</td>
<td>7</td>
<td>2.1</td>
</tr>
<tr>
<td>BSG0923NDI*</td>
<td>SuperSO8</td>
<td>✓</td>
<td>30</td>
<td>7</td>
<td>3.7</td>
</tr>
<tr>
<td>BSC0925ND*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>30</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>BSC0993ND*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>30</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

OptiMOS™ 25/30 V symmetrical and asymmetrical dual N-Channel MOSFETs in 5x6 and 3x3 PQFN

Integrates the low-side and high-side MOSFET of a synchronous DC-DC converter into a single package.

Part number | Package | Monolithically-integrated Schottky-like diode | BVDS [V] | RDS(on) max. [mΩ] @ VGS=4.5 V max. | Qgs [nC] @ VGS=4.5 V typ. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC0910NDI*</td>
<td>asymmetrical dual 5x6</td>
<td>✓</td>
<td>25</td>
<td>5.9</td>
<td>1.6</td>
</tr>
<tr>
<td>BSC0911ND*</td>
<td>asymmetrical dual 5x6</td>
<td>–</td>
<td>25</td>
<td>4.8</td>
<td>1.7</td>
</tr>
<tr>
<td>BSC0912NDI*</td>
<td>asymmetrical dual 5x6</td>
<td>✓</td>
<td>30</td>
<td>7</td>
<td>2.1</td>
</tr>
<tr>
<td>BSC0923NDI*</td>
<td>asymmetrical dual 5x6</td>
<td>✓</td>
<td>30</td>
<td>7</td>
<td>3.7</td>
</tr>
<tr>
<td>BSC0925ND*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>30</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>BSC0993ND*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>30</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

OptiMOS™ / StrongIRFET™ 30 V - 100 V dual N-Channel MOSFETs

Integrates two independent N-channel MOSFETs into a single package for high power density and compact design.

Ideal for DC motors with power rating < 200 W

Part number | Package | Monolithically-integrated Schottky-like diode | BVDS [V] | RDS(on) max. [mΩ] @ VGS=10 V max. | Qgs [nC] @ VGS=10 V typ. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IRL62975DFRPBF*</td>
<td>symmetrical dual DirectFET™</td>
<td>–</td>
<td>20</td>
<td>3.8**</td>
<td>3.8**</td>
</tr>
<tr>
<td>IRLHS65276*</td>
<td>symmetrical dual PQFN 2x2</td>
<td>–</td>
<td>20</td>
<td>45**</td>
<td>45**</td>
</tr>
<tr>
<td>IFR7907*</td>
<td>asymmetrical dual SO8</td>
<td>–</td>
<td>30</td>
<td>16.4</td>
<td>11.8</td>
</tr>
<tr>
<td>IFR7905TRPBF*</td>
<td>asymmetrical dual SO8</td>
<td>–</td>
<td>30</td>
<td>21.8</td>
<td>17.1</td>
</tr>
<tr>
<td>IRLH6376TRPBF*</td>
<td>symmetrical dual PQFN 2x2</td>
<td>–</td>
<td>30</td>
<td>63**</td>
<td>63**</td>
</tr>
<tr>
<td>IFR40H233</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>40</td>
<td>6.2</td>
<td>6.2</td>
</tr>
<tr>
<td>BSC072N04LD*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>40</td>
<td>7.2</td>
<td>7.2</td>
</tr>
<tr>
<td>BSC076N04ND</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>40</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>BSC112N06LD*</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>60</td>
<td>11.2</td>
<td>11.2</td>
</tr>
<tr>
<td>BSC135N06ND</td>
<td>symmetrical dual 5x6</td>
<td>–</td>
<td>60</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>IRF7351</td>
<td>symmetrical dual SO8</td>
<td>–</td>
<td>60</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>BSO615NG</td>
<td>symmetrical dual SO8</td>
<td>–</td>
<td>60</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>IRFH4792</td>
<td>symmetrical dual PQFN 3 x 3</td>
<td>–</td>
<td>100</td>
<td>195</td>
<td>195</td>
</tr>
</tbody>
</table>

Dual N-channel audio MOSFETs

Digital audio MOSFET half-bridges are specifically designed for class D audio amplifier applications. They consist of two power MOSFET switches connected in half-bridge configuration.

Part number | Package | Monolithically-integrated Schottky-like diode | BVDS [V] | RDS(on) max. [mΩ] @ VGS=4.5 V max. | Qgs [nC] @ VGS=4.5 V typ. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IRF4212H-117P</td>
<td>half bridge in TO220FP</td>
<td>–</td>
<td>100</td>
<td>72.5</td>
<td>72.5</td>
</tr>
<tr>
<td>IRF4019H-117P</td>
<td>half bridge in TO220FP</td>
<td>–</td>
<td>150</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>IRF4020H-117P</td>
<td>half bridge in TO220FP</td>
<td>–</td>
<td>200</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
### OptiMOS™ and StrongIRFET™ 30 V logic level

<table>
<thead>
<tr>
<th></th>
<th>TO-252 (DPAK)</th>
<th>TO-220</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>IRLB3813PBF</td>
<td>R_{DS(on)}=1.95 mΩ</td>
</tr>
<tr>
<td>2-4</td>
<td>IRLB8314TRPBF</td>
<td>R_{DS(on)}=2.2 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLR8743TRPBF</td>
<td>R_{DS(on)}=3.1 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLB841PBF</td>
<td>R_{DS(on)}=2.4 mΩ</td>
</tr>
<tr>
<td>4-10</td>
<td>IRLR8726TRPBF</td>
<td>R_{DS(on)}=5.8 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLR8729TRPBF</td>
<td>R_{DS(on)}=8.5 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLB8748PBF</td>
<td>R_{DS(on)}=4.8 mΩ</td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 30 V logic level

<table>
<thead>
<tr>
<th></th>
<th>DirectFET™</th>
<th>PQFN 3.3 x 3.3</th>
<th>PQFN 3.3 x 3.3</th>
<th>SuperSO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>IQE08N03LM5</td>
<td>R_{DS(on)}=0.85 mΩ</td>
<td>BSC005N03LSS</td>
<td>R_{DS(on)}=0.5 mΩ</td>
</tr>
<tr>
<td></td>
<td>IQE08N03LMOCG</td>
<td>R_{DS(on)}=0.85 mΩ</td>
<td>BSC005N03LSSI*</td>
<td>R_{DS(on)}=0.5 mΩ</td>
</tr>
<tr>
<td>1-2</td>
<td>IRLF8301TRPBF</td>
<td>R_{DS(on)}=1.3 mΩ</td>
<td>ISC011N03LSS</td>
<td>R_{DS(on)}=1.1 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLF8726TRPBF</td>
<td>R_{DS(on)}=1.3 mΩ</td>
<td>ISC011N03LSSI*</td>
<td>R_{DS(on)}=1.1 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLF8727TRPBF</td>
<td>R_{DS(on)}=1.22 mΩ</td>
<td>ISC011N03LSS</td>
<td>R_{DS(on)}=1.1 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRLF8302TRPBF</td>
<td>R_{DS(on)}=1.4 mΩ</td>
<td>ISC011N03LSSI*</td>
<td>R_{DS(on)}=1.1 mΩ</td>
</tr>
<tr>
<td>2-4</td>
<td>ISC019N03LSS</td>
<td>R_{DS(on)}=1.9 mΩ</td>
<td>ISC037N03LSS</td>
<td>R_{DS(on)}=3.7 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISC050N03LSS</td>
<td>R_{DS(on)}=2.0 mΩ</td>
<td>ISC045N03LSS</td>
<td>R_{DS(on)}=4.5 mΩ</td>
</tr>
<tr>
<td>4-10</td>
<td>ISC065N03LSS</td>
<td>R_{DS(on)}=6.5 mΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Monolithically-integrated Schottky-like diode
**For more information on the product, contact our product support

www.infineon.com/powermosfet-12V-300V
## OptiMOS™ and StrongIRFET™ 30 V logic level

<table>
<thead>
<tr>
<th>DirectFET™</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>SO8</th>
<th>PQFN 2x2</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRF6304TRPBF</td>
<td>BSZ0801NS*</td>
<td>IRF83111TRPBF</td>
<td>ISK036N03LMS</td>
<td>R(<em>{\text{iss_max}})@V(</em>{GS})=10 V [mΩ]</td>
</tr>
<tr>
<td>IRF6724TRPBF</td>
<td>BSZ0802NS</td>
<td>BSC0502NS*</td>
<td>R(_{\text{iss_max}})=2.1 mΩ</td>
<td>R(_{\text{iss_max}})=2.1 mΩ</td>
</tr>
<tr>
<td>BSZ0901NS**</td>
<td>BSZ0902NS</td>
<td>BSC0902NS*</td>
<td>R(_{\text{iss_max}})=2.6 mΩ</td>
<td>R(_{\text{iss_max}})=2.6 mΩ</td>
</tr>
<tr>
<td>IRF6722TRPBF</td>
<td>BSZ0902NS*</td>
<td>BSC0902NS*</td>
<td>IRF8788TRPBF</td>
<td>R(_{\text{iss_max}})=2.8 mΩ</td>
</tr>
<tr>
<td>BSZ0502NS**</td>
<td>BSZ0503NS*</td>
<td>BSZ0904NS*</td>
<td>R(_{\text{iss_max}})=3.4 mΩ</td>
<td>R(_{\text{iss_max}})=3.7 mΩ</td>
</tr>
<tr>
<td>IRLH630**</td>
<td>BSC0503NS*</td>
<td>BSC0504NS*</td>
<td>IRF7862TRPBF</td>
<td>R(_{\text{iss_max}})=3.3 mΩ</td>
</tr>
<tr>
<td>IRF6722TRPBF</td>
<td>BSZ0904NS**</td>
<td>BSC0904NS*</td>
<td>IRF8324TRPBF</td>
<td>R(_{\text{iss_max}})=4.1 mΩ</td>
</tr>
<tr>
<td>BSZ0506NS</td>
<td>BSZ0506NS</td>
<td>BSC0906NS</td>
<td>R(_{\text{iss_max}})=4.4 mΩ</td>
<td>R(_{\text{iss_max}})=4.5 mΩ</td>
</tr>
<tr>
<td>Add BSZ0589NS</td>
<td>BSZ065N03LS</td>
<td>IRF83301TRPBF</td>
<td>BSZ0994NS</td>
<td>R(_{\text{iss_max}})=6.5 mΩ</td>
</tr>
<tr>
<td>BSZ065N03LS</td>
<td>IRF83301TRPBF</td>
<td>BSZ0994NS</td>
<td>R(_{\text{iss_max}})=6.6 mΩ</td>
<td>R(_{\text{iss_max}})=6.6 mΩ</td>
</tr>
<tr>
<td>BSZ0994NS</td>
<td>IRF8334TRPBF</td>
<td>IRF838342</td>
<td>R(_{\text{iss_max}})=7.0 mΩ</td>
<td>R(_{\text{iss_max}})=9.0 mΩ</td>
</tr>
</tbody>
</table>

**Monolithically-integrated Schottky-like diode**

***R\(_{\text{iss\_max}}\), max. @V\(_{GS}\)=4.5 V***

****For more information on the product, contact our product support****

---

**Solutions and Applications**

- **20-300 V MOSFETs**
- **500-950 V MOSFETs**
- **WBG semiconductors**
- **IGBT discretes and silicon power diodes**
- **Power management ICs**
- **Intelligent power switches and modules**
- **Gate-driver ICs**
- **Microcontrollers**
- **Sensors**
- **Digital isolators**

**www.infineon.com/powermosfet-12V-300V**

For more details on the product, click on the part number, visit infineon.com or contact our product support.
<table>
<thead>
<tr>
<th>Part Number</th>
<th>R(<em>{\text{DS(on)}}) (at V(</em>{\text{GS}})=10 V) [mΩ]</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRF40SC240</td>
<td>0.65</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IRF7430TRLPBF</td>
<td>1.3</td>
<td>TO-263 (DPAK 7-pin)</td>
</tr>
<tr>
<td>IST006N04NM6</td>
<td>0.6</td>
<td>TO-247</td>
</tr>
<tr>
<td>ISC007N04NM6</td>
<td>0.7</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF7434TRL7PP</td>
<td>1.0</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IST007N04NM6</td>
<td>0.7</td>
<td>TO-247</td>
</tr>
<tr>
<td>ISC010N04NM6</td>
<td>1.0</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF53004TRLPBF</td>
<td>1.75</td>
<td>TO-263 (DPAK)</td>
</tr>
<tr>
<td>IRF7434PBF</td>
<td>1.6</td>
<td>TO-247</td>
</tr>
<tr>
<td>IRF7480MTRPBF</td>
<td>1.2</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF7339L1TRPBF</td>
<td>1.0</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IRF40HC100</td>
<td>1.7</td>
<td>TO-247</td>
</tr>
<tr>
<td>ISC019N04NM5</td>
<td>1.9</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF7437TRLBPBF</td>
<td>1.8</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IRF7437PBF</td>
<td>2.0</td>
<td>TO-247</td>
</tr>
<tr>
<td>ISC017N04NM5</td>
<td>1.7</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF40DM229</td>
<td>1.85</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>ISC028N04NM3S</td>
<td>2.8</td>
<td>TO-247</td>
</tr>
<tr>
<td>IRFR7440TRPBF</td>
<td>2.4</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IRF7440TRLPBF</td>
<td>2.5</td>
<td>TO-247</td>
</tr>
<tr>
<td>IRF7483MTRPBF</td>
<td>2.3</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF7440PBF</td>
<td>2.5</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>ISC028N04NM5</td>
<td>2.8</td>
<td>TO-247</td>
</tr>
<tr>
<td>IRF7446TRLPBF</td>
<td>3.3</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>IRF7466PBF</td>
<td>3.3</td>
<td>TO-247</td>
</tr>
<tr>
<td>ISC036N04NM5</td>
<td>3.6</td>
<td>TO-220 FullPAK</td>
</tr>
<tr>
<td>IRF40R207</td>
<td>5.1</td>
<td>TO-252 (DPAK)</td>
</tr>
<tr>
<td>ISC058N04NM5</td>
<td>5.8</td>
<td>TO-247</td>
</tr>
</tbody>
</table>

www.infineon.com/powermosfet-12V-300V
<table>
<thead>
<tr>
<th>OptiMOS™ and StrongIRFET™</th>
<th>40 V logic level</th>
</tr>
</thead>
<tbody>
<tr>
<td>R$_{DS\text{on}}$ max.</td>
<td>@V$_{GS}$=10 V</td>
</tr>
<tr>
<td>(&lt;1)</td>
<td>(mΩ)</td>
</tr>
<tr>
<td>TO-252</td>
<td>TO-263</td>
</tr>
<tr>
<td>(DPAK)</td>
<td>(DPAK)</td>
</tr>
<tr>
<td>IRL40SC229</td>
<td>IRL40SC216</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=0.65 mΩ</td>
<td>R$_{DS\text{on}}$=0.6 mΩ</td>
</tr>
<tr>
<td>TO-263</td>
<td>TO-220</td>
</tr>
<tr>
<td>(D2PAK)</td>
<td>(TO-263</td>
</tr>
<tr>
<td>IRLS3034TRLPBF</td>
<td>IRLB3034PBF</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=1.7 mΩ</td>
<td>R$_{DS\text{on}}$=1.7 mΩ</td>
</tr>
<tr>
<td>1-2</td>
<td></td>
</tr>
<tr>
<td>IRL40B210</td>
<td>IRL40B211</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=1.0 mΩ</td>
<td>R$_{DS\text{on}}$=1.0 mΩ</td>
</tr>
<tr>
<td>BSC010N04LS</td>
<td></td>
</tr>
<tr>
<td>BSZ018N04LS</td>
<td>BSZ018N04LS</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=2.7 mΩ</td>
<td>R$_{DS\text{on}}$=2.7 mΩ</td>
</tr>
<tr>
<td>2-4</td>
<td></td>
</tr>
<tr>
<td>IRL40B215</td>
<td>IRL40B216</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=1.1 mΩ</td>
<td>R$_{DS\text{on}}$=1.1 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=2.5 mΩ</td>
<td>R$_{DS\text{on}}$=2.5 mΩ</td>
</tr>
<tr>
<td>4-10</td>
<td></td>
</tr>
<tr>
<td>IRL3114ZTRPBF</td>
<td>IRL3114ZTRPBF</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=4.3 mΩ</td>
<td>R$_{DS\text{on}}$=4.3 mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>IPD036N04L G</td>
<td>IPD036N04L G</td>
</tr>
<tr>
<td>R$_{DS\text{on}}$=3.6 mΩ</td>
<td>R$_{DS\text{on}}$=3.6 mΩ</td>
</tr>
</tbody>
</table>

* Increased creepage distance

www.infineon.com/powermosfet-12V-300V
<table>
<thead>
<tr>
<th>**R(<em>{\text{D(son)}}) max. @(V</em>{\text{GS}}=10) V (mΩ)</th>
<th>**TO-252 (DPAK)</th>
<th>**TO-263 (D²PAK)</th>
<th>**TO-263 (D²PAK 7-pin)</th>
<th>**TO-262 (FPAK)</th>
<th>**TO-220</th>
<th>**TO-220 FullPAK</th>
<th>**TO-247</th>
<th>**SuperS08</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
<td><strong>IPB010N06N</strong></td>
</tr>
<tr>
<td><strong>R(_{\text{D(son)}}) =1.0 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.1 mΩ</strong></td>
</tr>
<tr>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
<td><strong>IPR014N06N</strong></td>
</tr>
<tr>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
</tr>
<tr>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
<td><strong>IPR015N06N</strong></td>
</tr>
<tr>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.4 mΩ</strong></td>
</tr>
<tr>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
<td><strong>IPR016N06N</strong></td>
</tr>
<tr>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
<td><strong>R(_{\text{D(son)}}) =1.6 mΩ</strong></td>
</tr>
</tbody>
</table>

---

1) Coming soon
2) 6 V rated (R\(_{\text{D(son)}}\) also specified @\(V_{\text{GS}}=6\) V)
### OptiMOS™ and StrongIRFET™ 60 V normal level

<table>
<thead>
<tr>
<th></th>
<th>DirectFET™</th>
<th>PQFN 3.3x3.3</th>
<th>SO8</th>
<th>SuperSO8</th>
<th>TO-Leadless</th>
<th>sTOLL</th>
<th>TOLG (TO-Leaded Gullwing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>IRF7749L1TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.5 mΩ</td>
<td>BSC012JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.45 mΩ</td>
<td>IPT012N06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.2 mΩ</td>
<td>IST01N06N5M5</td>
</tr>
<tr>
<td></td>
<td>IPT007N06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=0.7 mΩ</td>
<td>IST011N06N5M5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.1 mΩ</td>
<td>IPTG007N06N5M5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=0.75 mΩ</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>IRF7748L1TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=2.2 mΩ</td>
<td>BS203JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=3.9 mΩ</td>
<td>BSC028JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=2.8 mΩ</td>
<td>ISZ009N06L5M5</td>
</tr>
<tr>
<td></td>
<td>IPT60DM206</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=2.9 mΩ</td>
<td>BSC334JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=3.4 mΩ</td>
<td>IRFH705STRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=3.2 mΩ</td>
<td>BSC036JN06N5</td>
</tr>
<tr>
<td>2-4</td>
<td>IRF6648</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=7.0 mΩ</td>
<td>BS2042JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=4.2 mΩ</td>
<td>IRF7855TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=9.4 mΩ</td>
<td>BSC037JN06N5</td>
</tr>
<tr>
<td></td>
<td>IRF6674</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=11.0 mΩ</td>
<td>BSZ068JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=6.8 mΩ</td>
<td>BSC035JN06N5</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=9.7 mΩ</td>
<td>BSC039JN06N5</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>IRF60H5118</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=17.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 60 V logic level

<table>
<thead>
<tr>
<th></th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (D²PAK)</th>
<th>TO-263 (D²PAK 7-pin)</th>
<th>TO-262 (I²PAK)</th>
<th>TO-220</th>
<th>PQFN 2x2</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>IRL605C216</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.5 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRL695216</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.95 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRL5036TR17PP</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=1.9 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-4</td>
<td>IRLB3036TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=2.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRLB3036TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=2.4 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10</td>
<td>IRLR3636TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=6.8 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRLR3636TRPBF</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=6.8 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 10</td>
<td>IRL60H5118</td>
<td>R&lt;sub&gt;Gate&lt;/sub&gt;=17.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

For more details on the product, click on the part number, visit infineon.com or contact our product support.

1) 6 V rated (R<sub>Gate</sub>, also specified @ V<sub>GS</sub> = 6 V)
## OptiMOS™ and StrongIRFET™ 75 V normal level

<table>
<thead>
<tr>
<th>R(<em>\text{on, max.}) @ V(</em>\text{GS}=10) V (mΩ)</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (D²PAK)</th>
<th>TO-263 (D²PAK 7-pin)</th>
<th>TO-220</th>
<th>TO-247</th>
<th>DirectFET™</th>
<th>SuperSO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>IRFS7730TRL7PP (R_{\text{on, max.}}=2.0) mΩ</td>
<td>IRFP7718PBF (R_{\text{on, max.}}=1.8) mΩ</td>
<td>IRFP4368PBF (R_{\text{on, max.}}=1.85) mΩ</td>
<td>IRF7750L2TRPBF (R_{\text{on, max.}}=2.3) mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-4</td>
<td>IRFS3107TLPBF (R_{\text{on, max.}}=2.0) mΩ</td>
<td>IRF7718PBF (R_{\text{on, max.}}=1.8) mΩ</td>
<td>IRFS3107TLPBF (R_{\text{on, max.}}=2.6) mΩ</td>
<td>IRFB3077PBF (R_{\text{on, max.}}=3.3) mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10</td>
<td>IRFS3107TLPBF (R_{\text{on, max.}}=5.8) mΩ</td>
<td>IRF7718PBF (R_{\text{on, max.}}=1.8) mΩ</td>
<td>IRFS33072PBF (R_{\text{on, max.}}=5.8) mΩ</td>
<td>IRF7718PBF (R_{\text{on, max.}}=8.0) mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>IRFS7746TRPBF (R_{\text{on, max.}}=9.0) mΩ</td>
<td>IRF7718PBF (R_{\text{on, max.}}=1.8) mΩ</td>
<td>IRFS7746TRPBF (R_{\text{on, max.}}=10.6) mΩ</td>
<td>IRF7718PBF (R_{\text{on, max.}}=10.6) mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

## OptiMOS™ and StrongIRFET™ 80 V normal level / logic level

| R\(_\text{on, max.}\) @ V\(_\text{GS}=10\) V (mΩ) | TO-252 (DPAK) | TO-263 (D²PAK) | TO-263 (D²PAK 7-pin) | TO-220 | TO-220 FullPAK | DirectFET™ | PQFN 2x2 | PQFN 3.3x3.3 | SuperSO8 | TO-Leadless |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-2 | IPB017N08N5 \(R_{\text{on, max.}}=1.7\) mΩ | IPB015N08N5 \(R_{\text{on, max.}}=1.5\) mΩ | IPP016N08NF2S \(R_{\text{on, max.}}=1.6\) mΩ | BSC012N08NS5 \(R_{\text{on, max.}}=5.9\) mΩ | IPT013N08NM5 \(R_{\text{on, max.}}=1.9\) mΩ |
| 2-4 | IPB024N08N5 \(R_{\text{on, max.}}=2.4\) mΩ | IPP020N08NS5 \(R_{\text{on, max.}}=2.0\) mΩ | IPB020N08N5 \(R_{\text{on, max.}}=2.0\) mΩ | BSC020N08NS5 \(R_{\text{on, max.}}=1.9\) mΩ | IPT013N08NM5F \(R_{\text{on, max.}}=1.9\) mΩ |
| 4-10 | IPB031N08N5 \(R_{\text{on, max.}}=3.1\) mΩ | IPP034N08NS5 \(R_{\text{on, max.}}=3.4\) mΩ | BSC037N08NS5 \(R_{\text{on, max.}}=1.9\) mΩ | BSC037N08NS5 \(R_{\text{on, max.}}=1.9\) mΩ |
| >10 | IPP040N08NS5 \(R_{\text{on, max.}}=4.0\) mΩ | IPP043N08NS5 \(R_{\text{on, max.}}=4.3\) mΩ | BSC043N08NS5 \(R_{\text{on, max.}}=4.0\) mΩ | BSC043N08NS5 \(R_{\text{on, max.}}=4.0\) mΩ |

---

For more details on the product, click on the part number, visit infineon.com or contact our product support.
### OptiMOS™ and StrongIRFET™ 80 V normal level / logic level

<table>
<thead>
<tr>
<th>R_{DSS}, max. @V_{GS}=10 V [mΩ]</th>
<th>TO-LG (TO-Leaded Gullwing)</th>
<th>TO-LT (TO-Leaded top-side cooling)</th>
<th>sTOLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>IPTG011N08NM5: R_{DSS}=1.1 mΩ</td>
<td>IPTC012N08NM5: R_{DSS}=1.2 mΩ</td>
<td>ISTG019N08NM5: R_{DSS}=1.9 mΩ</td>
</tr>
<tr>
<td>IPTG018N08NM5: R_{DSS}=1.8 mΩ</td>
<td>IPTC014N08NM5: R_{DSS}=1.4 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPTG025N08NM5: R_{DSS}=2.5 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 100 V normal level

<table>
<thead>
<tr>
<th>R_{DSS}, max. @V_{GS}=10 V [mΩ]</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (D²PAK)</th>
<th>TO-263 (D²PAK 7-pin)</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>IPB020N10NS: R_{DSS}=2.0 mΩ</td>
<td>IPB017N10NS: R_{DSS}=1.7 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPB027N10NS: R_{DSS}=2.7 mΩ</td>
<td>IPP024N10NS: R_{DSS}=2.4 mΩ</td>
<td>IPP023N10NS: R_{DSS}=2.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPB033N10NSLF: R_{DSS}=3.3 mΩ</td>
<td>IPP032N10NS: R_{DSS}=3.2 mΩ</td>
<td>IPP030N10NS: R_{DSS}=3.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPP039N10NS: R_{DSS}=3.9 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-4</td>
<td>IPTG011N08NM5: R_{DSS}=5.0 mΩ</td>
<td>IPF4010TRL7PP: R_{DSS}=4.0 mΩ</td>
<td>IPF100B201: R_{DSS}=4.2 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFS4010TRLBF: R_{DSS}=4.7 mΩ</td>
<td>IPP050N10NSF2S: R_{DSS}=5.0 mΩ</td>
<td>IPA030N10NF2S: R_{DSS}=3.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFS4310ZTRLPBF: R_{DSS}=7.0 mΩ</td>
<td>IPP082N10NSF2S: R_{DSS}=8.2 mΩ</td>
<td>IPA083N10NS: R_{DSS}=8.3 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFS4410ZTRLPBF: R_{DSS}=9.0 mΩ</td>
<td>IPP100B202: R_{DSS}=8.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-10</td>
<td>IPTG011N08NM5: R_{DSS}=13.9 mΩ</td>
<td>IFRS4510TLPBF: R_{DSS}=13.9 mΩ</td>
<td>IFR4510PBF: R_{DSS}=13.5 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFR4510PBF: R_{DSS}=12.9 mΩ</td>
<td>IPA126N10NM5S: R_{DSS}=12.6 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-25</td>
<td>IPD78CN10N G: R_{DSS}=78.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/powermosfet-12V-300V
### OptiMOS™ and StrongIRFET™ 100 V normal level

<table>
<thead>
<tr>
<th>R(<em>{\text{D(on), max.}}) max. @V(</em>{GS}=10) V (mΩ)</th>
<th>DirectFET™</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>SuperSO8 super cool</th>
<th>SOR</th>
<th>TO-Leadless</th>
<th>TOLT (TO-Leaded topside cooling)</th>
<th>TOLOG (TO-Leaded Gullwing)</th>
<th>sTOLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>ISZ08N10NM6</td>
<td>ISC022N10NM6</td>
<td>IPT015N10N5</td>
<td>IPT015N10N5</td>
<td>1.5 mΩ</td>
<td>IPTG014N10NMS</td>
<td>1.4 mΩ</td>
<td>IPTG018N10NMS</td>
<td>1.8 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISC027N10NM6</td>
<td>ISC030N10NM6</td>
<td>ISC027N10NM6</td>
<td>ISC030N10NM6</td>
<td>2.7 mΩ</td>
<td>ISC027N10NM6</td>
<td>2.7 mΩ</td>
<td>ISC030N10NM6</td>
<td>3.0 mΩ</td>
</tr>
<tr>
<td>2-4</td>
<td>BSC027N10N5S</td>
<td>BSC027N10N5S</td>
<td>BSC027N10N5S</td>
<td>BSC027N10N5S</td>
<td>2.7 mΩ</td>
<td>BSC027N10N5S</td>
<td>2.7 mΩ</td>
<td>BSC027N10N5S</td>
<td>3.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>IRF7769L1TRPBF</td>
<td>IRF7769L1TRPBF</td>
<td>IRF7769L1TRPBF</td>
<td>IRF7769L1TRPBF</td>
<td>9.0 mΩ</td>
<td>IRF7769L1TRPBF</td>
<td>9.0 mΩ</td>
<td>IRF7769L1TRPBF</td>
<td>9.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISC066N10NM6</td>
<td>ISC066N10NM6</td>
<td>ISC066N10NM6</td>
<td>ISC066N10NM6</td>
<td>6.0 mΩ</td>
<td>ISC066N10NM6</td>
<td>6.0 mΩ</td>
<td>ISC066N10NM6</td>
<td>6.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISC070N10N5S</td>
<td>ISC070N10N5S</td>
<td>ISC070N10N5S</td>
<td>ISC070N10N5S</td>
<td>7.0 mΩ</td>
<td>ISC070N10N5S</td>
<td>7.0 mΩ</td>
<td>ISC070N10N5S</td>
<td>7.0 mΩ</td>
</tr>
<tr>
<td>10-25</td>
<td>IRF6644TRPBF</td>
<td>ISZ230N10NM6</td>
<td>IRF6662TRPBF</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
<td>IRF6662TRPBF</td>
<td>23 mΩ</td>
<td>IRF6662TRPBF</td>
<td>23 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
</tr>
<tr>
<td>&gt;25</td>
<td>IRF6644TRPBF</td>
<td>ISZ230N10NM6</td>
<td>IRF6662TRPBF</td>
<td>ISZ230N10NM6</td>
<td>22 mΩ</td>
<td>IRF6644TRPBF</td>
<td>22 mΩ</td>
<td>IRF6644TRPBF</td>
<td>22 mΩ</td>
</tr>
<tr>
<td></td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
<td>ISZ230N10NM6</td>
<td>23 mΩ</td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 100 V logic level

<table>
<thead>
<tr>
<th>R(<em>{\text{D(on), max.}}) max. @V(</em>{GS}=10) V (mΩ)</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (D²PAK)</th>
<th>TO-263 (D²PAK 7-pin)</th>
<th>TO-220</th>
<th>PQFN 2x2</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4</td>
<td>IRL4030TRLPP</td>
<td>IRL4030TRLPP</td>
<td>IRL4030TRLPP</td>
<td>BSC034N10LSS</td>
<td>BSC034N10LSS</td>
<td>BSC034N10LSS</td>
<td>BSC034N10LSS</td>
</tr>
<tr>
<td>4-10</td>
<td>IRL5405TRPBF</td>
<td>BSC094N10LSS</td>
<td>BSC094N10LSS</td>
<td>BSC094N10LSS</td>
<td>BSC094N10LSS</td>
<td>BSC094N10LSS</td>
<td>BSC094N10LSS</td>
</tr>
<tr>
<td>10-25</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
<td>BSC140N10LSS</td>
</tr>
<tr>
<td>&gt;25</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
<td>IRL100NS121</td>
</tr>
</tbody>
</table>

www.infineon.com/powermosfet-12V-300V
### OptiMOS™ and StrongIRFET™ 120 V normal level / logic level

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>R(<em>{\text{Dson}, \max \ (V</em>{GS}=10 , \text{V})}) [mΩ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPB038N12N3 G</td>
<td>TO-252</td>
<td>2-4</td>
</tr>
<tr>
<td></td>
<td>DPAK</td>
<td>R(_{\text{Dson}})=3.8 mΩ</td>
</tr>
<tr>
<td>IPB036N12N3 G</td>
<td>TO-263</td>
<td>2-4</td>
</tr>
<tr>
<td></td>
<td>DPAK</td>
<td>R(_{\text{Dson}})=3.6 mΩ</td>
</tr>
<tr>
<td>IPD041N12N3 G</td>
<td>TO-263</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>DPAK</td>
<td>R(_{\text{Dson}})=4.1 mΩ</td>
</tr>
<tr>
<td>IPP041N12N3 G</td>
<td>TO-262</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=4.1 mΩ</td>
</tr>
<tr>
<td>BSC077N12NS3 G</td>
<td>TO-263</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=4.8 mΩ</td>
</tr>
<tr>
<td>IPP048N12N3 G</td>
<td>TO-262</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=8.0 mΩ</td>
</tr>
<tr>
<td>BSC080N12LS G*</td>
<td>TO-263</td>
<td>4-10</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=8.0 mΩ</td>
</tr>
<tr>
<td>IPD078N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=7.6 mΩ</td>
</tr>
<tr>
<td>IPP076N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=7.6 mΩ</td>
</tr>
<tr>
<td>BSC112N12LS G*</td>
<td>TO-263</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=12.0 mΩ</td>
</tr>
<tr>
<td>IPD110N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=11.4 mΩ</td>
</tr>
<tr>
<td>IPP114N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=11.4 mΩ</td>
</tr>
<tr>
<td>BSC120N12LS G*</td>
<td>TO-263</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=12.0 mΩ</td>
</tr>
<tr>
<td>IPD144N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=14.4 mΩ</td>
</tr>
<tr>
<td>IPP147N12N3 G</td>
<td>TO-262</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>FPAK</td>
<td>R(_{\text{Dson}})=14.7 mΩ</td>
</tr>
<tr>
<td>BSC240N12NS3 G</td>
<td>TO-263</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=24.0 mΩ</td>
</tr>
<tr>
<td>BSC190N12NS3 G</td>
<td>TO-263</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>TO-263</td>
<td>R(_{\text{Dson}})=19.0 mΩ</td>
</tr>
</tbody>
</table>

*logic level devices

---

**www.infineon.com/powermosfet-12V-300V**

*For more details on the product, click on the part number, visit infineon.com or contact our product support.*
### OptiMOS™ and StrongIRFET™ 135-150 V normal level

<table>
<thead>
<tr>
<th>$R_{DSS, \text{max}}$ @ $V_{GS}=10$ V [mΩ]</th>
<th>DirectFET™</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>TO-Leadless</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-10</td>
<td></td>
<td>BSC074N15N5S</td>
<td>IPT033N15NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$R_{DSS}=7.4$ mΩ</td>
<td>$R_{DSS}=3.9$ mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BSC093N15N5S</td>
<td>IPT044N15NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$R_{DSS}=9.3$ mΩ</td>
<td>$R_{DSS}=4.4$ mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPT054N15NSS</td>
<td>IPT063N15NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$R_{DSS}=5.4$ mΩ</td>
<td>$R_{DSS}=6.3$ mΩ</td>
<td></td>
</tr>
<tr>
<td>10-25</td>
<td>IRF7778L2TRPBF</td>
<td>BSC110N15N5S</td>
<td>IRF6502STRPBF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=31.0$ mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC160N15N5S</td>
<td>IRF6643TRPBF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=16.0$ mΩ</td>
<td>$R_{DSS}=34.5$ mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;25</td>
<td>IRF6775MTRPBF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSZ300N15N5S</td>
<td>IRF6521STRPBF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=50.0$ mΩ</td>
<td>$R_{DSS}=58.0$ mΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 135-150 V normal level

<table>
<thead>
<tr>
<th>$R_{DSS, \text{max}}$ @ $V_{GS}=10$ V [mΩ]</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-263 (DPAK 7-pin)</th>
<th>TO-262 (YPAK)</th>
<th>TO-220</th>
<th>TO-247</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-10</td>
<td>IPB048N15N5S</td>
<td>IPBO48N15N5S</td>
<td>IPBO48N15N5S LF</td>
<td>IPB051N15N5S</td>
<td>IPP051N15N5S</td>
<td>IPB150P220</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=4.8$ mΩ</td>
<td>$R_{DSS}=4.4$ mΩ</td>
<td>$R_{DSS}=5.1$ mΩ</td>
<td>$R_{DSS}=5.1$ mΩ</td>
<td>$R_{DSS}=4.8$ mΩ</td>
<td>$R_{DSS}=2.5$ mΩ</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=7.3$ mΩ</td>
<td>$R_{DSS}=8.3$ mΩ</td>
<td>$R_{DSS}=7.6$ mΩ</td>
<td>$R_{DSS}=7.6$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
</tr>
<tr>
<td></td>
<td>IPF083N15N5S</td>
<td>IPF083N15N5S</td>
<td>IPF083N15N5S LF</td>
<td>IPF083N15N5S</td>
<td>IPF083N15N5S</td>
<td>IPF083N15N5S</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
<td>$R_{DSS}=8.4$ mΩ</td>
</tr>
<tr>
<td></td>
<td>IPF150P220</td>
<td>IPF150P220</td>
<td>IPF150P220</td>
<td>IPF150P220</td>
<td>IPF150P220</td>
<td>IPF150P220</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
<td>$R_{DSS}=11.0$ mΩ</td>
</tr>
<tr>
<td>10-25</td>
<td>IRF54321</td>
<td>IRF54321</td>
<td>IRF54321</td>
<td>IRF54321</td>
<td>IRF4321PBF</td>
<td>IRF4321PBF</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=15.0$ mΩ</td>
<td>$R_{DSS}=15.0$ mΩ</td>
<td>$R_{DSS}=15.0$ mΩ</td>
<td>$R_{DSS}=15.0$ mΩ</td>
<td>$R_{DSS}=15.0$ mΩ</td>
<td>$R_{DSS}=15.0$ mΩ</td>
</tr>
<tr>
<td></td>
<td>IRF5411STRPP</td>
<td>IRF5411STRPP</td>
<td>IRF5411STRPP</td>
<td>IRF5411STRPP</td>
<td>IRF5411STRPP</td>
<td>IRF5411STRPP</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=11.8$ mΩ</td>
<td>$R_{DSS}=11.8$ mΩ</td>
<td>$R_{DSS}=11.8$ mΩ</td>
<td>$R_{DSS}=11.8$ mΩ</td>
<td>$R_{DSS}=11.8$ mΩ</td>
<td>$R_{DSS}=11.8$ mΩ</td>
</tr>
<tr>
<td>10-25</td>
<td>IRF54615PBF</td>
<td>IRF54615PBF</td>
<td>IRF54615PBF</td>
<td>IRF54615PBF</td>
<td>IRF54615PBF</td>
<td>IRF54615PBF</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=42.0$ mΩ</td>
<td>$R_{DSS}=39.0$ mΩ</td>
<td>$R_{DSS}=39.0$ mΩ</td>
<td>$R_{DSS}=39.0$ mΩ</td>
<td>$R_{DSS}=39.0$ mΩ</td>
<td>$R_{DSS}=39.0$ mΩ</td>
</tr>
<tr>
<td>25</td>
<td>IRF4019PBF</td>
<td>IRF4019PBF</td>
<td>IRF4019PBF</td>
<td>IRF4019PBF</td>
<td>IRF4019PBF</td>
<td>IRF4019PBF</td>
</tr>
<tr>
<td></td>
<td>$R_{DSS}=95.0$ mΩ</td>
<td>$R_{DSS}=95.0$ mΩ</td>
<td>$R_{DSS}=95.0$ mΩ</td>
<td>$R_{DSS}=95.0$ mΩ</td>
<td>$R_{DSS}=95.0$ mΩ</td>
<td>$R_{DSS}=95.0$ mΩ</td>
</tr>
</tbody>
</table>
### OptiMOS™ and StrongIRFET™ 200 V normal level

<table>
<thead>
<tr>
<th><strong>R(<em>{\text{D(on), max.}}) @V(</em>{GS}=10) V [mΩ]</strong></th>
<th><strong>TO-252 (DPAK)</strong></th>
<th><strong>TO-263 (D²PAK)</strong></th>
<th><strong>TO-220 FullPAK</strong></th>
<th><strong>TO-247</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4-10</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPB107N20N3 G</td>
<td>R(_{\text{D(on)}}) = 10.7 mΩ</td>
<td>IFF107N20N3 G</td>
<td>R(_{\text{D(on)}}) = 11.0 mΩ</td>
<td>IFF200P223</td>
</tr>
<tr>
<td>IPB110N20N3LF</td>
<td>R(_{\text{D(on)}}) = 11.0 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10-25</strong></td>
<td>IPB117N20NFD</td>
<td>R(_{\text{D(on)}}) = 11.7 mΩ</td>
<td>IFF117N20NFD</td>
<td>R(_{\text{D(on)}}) = 12.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>IPB156N22NFD</td>
<td>R(_{\text{D(on)}}) = 15.6 mΩ</td>
<td>IFFB4127PBF</td>
<td>R(_{\text{D(on)}}) = 20.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>IFS4127TRLPBF</td>
<td>R(_{\text{D(on)}}) = 22.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>&gt;25</strong></td>
<td>IPF320N20N3 G</td>
<td>R(_{\text{D(on)}}) = 32.0 mΩ</td>
<td>IFF4227PBF</td>
<td>R(_{\text{D(on)}}) = 26.0 mΩ</td>
</tr>
<tr>
<td></td>
<td>IPF320N20N3 G</td>
<td>R(_{\text{D(on)}}) = 32.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IFR4620TRLPBF</td>
<td>R(_{\text{D(on)}}) = 78.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IFS4620TRLPBF</td>
<td>R(_{\text{D(on)}}) = 78.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IFR4200TRLPBF</td>
<td>R(_{\text{D(on)}}) = 105.0 mΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**OptiMOS™ and StrongIRFET™ 200 V normal level**

<table>
<thead>
<tr>
<th><strong>R(<em>{\text{D(on), max.}}) @V(</em>{GS}=10) V [mΩ]</strong></th>
<th><strong>DirectFET™</strong></th>
<th><strong>PQFN 3.3x3.3</strong></th>
<th><strong>SuperSO8</strong></th>
<th><strong>SO8</strong></th>
<th><strong>TO-Leadless</strong></th>
<th><strong>TOLG (TO-Leaded Gullwing)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10-25</strong></td>
<td>BSC220N20NSFD</td>
<td>R(_{\text{D(on)}}) = 22.0 mΩ</td>
<td>IPT111N20NFD</td>
<td>R(_{\text{D(on)}}) = 11.1 mΩ</td>
<td>IPTG111N20N3S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC220N20N3S G</td>
<td>R(_{\text{D(on)}}) = 32.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC500N20N5S</td>
<td>R(_{\text{D(on)}}) = 50.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>&gt;25</strong></td>
<td>IRF6641TRPBF</td>
<td>R(_{\text{D(on)}}) = 59.9 mΩ</td>
<td>IRFS5020</td>
<td>R(_{\text{D(on)}}) = 55.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC900N20N3S G</td>
<td>R(_{\text{D(on)}}) = 90.0 mΩ</td>
<td>BSC900N20N3S G</td>
<td>R(_{\text{D(on)}}) = 90.0 mΩ</td>
<td>IRF7820TRPBF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC900N20N5S</td>
<td>R(_{\text{D(on)}}) = 90.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRF67880TRPBF</td>
<td>R(_{\text{D(on)}}) = 100.0 mΩ</td>
<td>BSC120N20N3S G</td>
<td>R(_{\text{D(on)}}) = 125.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BSC120N20N3S G</td>
<td>R(_{\text{D(on)}}) = 125.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BSC222D20N5S3 G</td>
<td>R(_{\text{D(on)}}) = 225.0 mΩ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

www.infineon.com/powermosfet-12V-300V

1) 220 V rated
### OptiMOS™ and StrongIRFET™ 250 V normal level

<table>
<thead>
<tr>
<th>VGS(max), max. @ VDS=10 V [mΩ]</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 (TO-Leaded Gullwing)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>TO-Leadless</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-25</td>
<td>IPB200N25N3 G RGS=20.0 mΩ</td>
<td>IPTG210N25NM3FD RGS=21.0 mΩ</td>
<td>IPP200N25N3 G RGS=20.0 mΩ</td>
<td>IRC250P224 RGS=12.0 mΩ</td>
<td>IPT210N25NFD RGS=21.0 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPP220N25NFD RGS=22.0 mΩ</td>
<td>IRFP476PBF RGS=17.5 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRC250P225 RGS=22.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;25</td>
<td>IRFS4229TRLPBF RGS=48.0 mΩ</td>
<td>IRFB4332PBF RGS=33.0 mΩ</td>
<td>IRFP4332PBF RGS=33.0 mΩ</td>
<td>BSC430N25NSFD RGS=43.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD600N25N3 G RGS=60.0 mΩ</td>
<td>IRFB4229PBF RGS=46.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPP600N25N3 G RGS=60.0 mΩ</td>
<td>IRP44229PBF RGS=46.0 mΩ</td>
<td>BSZ16DN25NS3 G RGS=165.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPP600N25NM3S RGS=60.0 mΩ</td>
<td></td>
<td>BSZ16DN25NS3 G RGS=165.0 mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OptiMOS™ and StrongIRFET™ 300 V normal level

<table>
<thead>
<tr>
<th>VGS(max), max. @ VDS=10 V [mΩ]</th>
<th>TO-263 (DPAK)</th>
<th>TO-220</th>
<th>TO-247</th>
<th>SuperSO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25</td>
<td>IRC300P216 RGS=19.0 mΩ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;25</td>
<td>IPB407N30N RGS=40.7 mΩ</td>
<td>IPP410N30N RGS=41.0 mΩ</td>
<td>IRC430P227 RGS=40 mΩ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRFB4137PBF RGS=69.0 mΩ</td>
<td>IRFP4137PBF RGS=69.0 mΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRFB4137PBF RGS=69.0 mΩ</td>
<td></td>
<td>BSC13DN30NSFD RGS=110.0 mΩ</td>
<td></td>
</tr>
</tbody>
</table>

### Power MOSFETs complementary

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>PQFN 3.3x3.3</th>
<th>SO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20/20</td>
<td>BS215DC62KD H*** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSZ215C H*** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A</td>
<td></td>
</tr>
<tr>
<td>-30/30</td>
<td>27-64 mΩ</td>
<td>IRFS389 N: 27 mΩ, 6.8 A P: 64 mΩ, -6.6 A</td>
</tr>
<tr>
<td></td>
<td>BSO612CV G* N: 0.12 Ω, 3.0 A P: 0.30 Ω, -2.0 A</td>
<td></td>
</tr>
<tr>
<td>-60/60</td>
<td>11-30 Ω</td>
<td>BSO615C G* N: 0.11 Ω, 3.1 A P: 0.30 Ω, -2.0 A</td>
</tr>
</tbody>
</table>
## Power P-channel MOSFETs

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>SO8</th>
<th>PQFN 2x2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-20</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD04GP03L3 G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 4.2 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSO01SP H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 7.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRLHS2242TRPBF **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 33.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSC030P03NS3 G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 7.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IRLHS2242TRPBF **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 33.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD10GP06HM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 38 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPB110P06LM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 11 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06P H-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 23.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06P G-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 23.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06P G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06P G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSO20SPV H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD30P06HM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 65 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPB110P06LM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 11 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06G H-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 23.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06G G-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 23.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06G G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P06G G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSO20SPV H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 130.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD30P10HM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 185 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPB110P10LM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 185 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P10P H-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 200.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P10P G-*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 200.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P10P G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 450.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPP10P10P G**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 450.0 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPD40P15LM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_{on,typ} = 72 \text{ m}\Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Products are qualified to Automotive AEC Q101
** $R_{on,typ}$ specified at 4.5 V
1) 5-leg
<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>SOT-233</th>
<th>TSOP-6</th>
<th>SOT-89</th>
<th>SC59</th>
<th>SOT-23</th>
<th>SOT-323</th>
<th>SOT-363</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 V</td>
<td>BSL202SN</td>
<td></td>
<td></td>
<td>HLM50202**</td>
<td></td>
<td></td>
<td>BSR202N*</td>
</tr>
<tr>
<td></td>
<td>36 mΩ, 7.5 A, SLL</td>
<td></td>
<td></td>
<td>45 mΩ, 6.5 A, SLL</td>
<td></td>
<td></td>
<td>33 mΩ, 3.8 A, SLL</td>
</tr>
<tr>
<td></td>
<td><strong>82 mΩ, 2.3 A, ULL, dual</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 V</td>
<td>IRLT5034Z</td>
<td></td>
<td></td>
<td>HFP5034Z</td>
<td></td>
<td></td>
<td>IRLM5030**</td>
</tr>
<tr>
<td>30 V</td>
<td>IRLM5031**</td>
<td></td>
<td></td>
<td>200 mΩ, 3.2 A, LL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 V</td>
<td>IRL202Z</td>
<td></td>
<td></td>
<td>IRL202Z</td>
<td></td>
<td></td>
<td>IRL202Z</td>
</tr>
<tr>
<td>55 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>60 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>100 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td></td>
<td>240 mΩ, 1.2 A, LL</td>
<td></td>
<td></td>
<td>400 mΩ, 1.2 A, LL</td>
<td></td>
<td></td>
<td>400 mΩ, 1.2 A, LL</td>
</tr>
<tr>
<td>150 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>200 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td></td>
<td>3.5 Ω, 0.14 A, LL, depletion</td>
<td></td>
<td></td>
<td>7.5 Ω, 0.25 A, LL</td>
<td></td>
<td></td>
<td>7.5 Ω, 0.25 A, LL</td>
</tr>
<tr>
<td>240 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>250 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>400 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
<tr>
<td>600 V</td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
<td></td>
<td></td>
<td>BSR5035*</td>
</tr>
</tbody>
</table>

1) not qualified to Automotive AEC-Q101
2) $R_{ON}$ specified at 10 V
3) $R_{ON}$ specified at 4.5 V
4) $R_{ON}$ specified at 2.5 V
5) $R_{ON}$ specified at 1.8 V
6) $R_{ON}$ specified at 0 V

For more details on the product, click on the part number, visit infineon.com or contact our product support.
## Small-signal/small-power P-channel

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>SOT-223</th>
<th>TSOP-6</th>
<th>SOT-89</th>
<th>SC59</th>
<th>SOT-23</th>
<th>SOT-323</th>
<th>SOT-363</th>
</tr>
</thead>
<tbody>
<tr>
<td>-250</td>
<td>BSSP117P</td>
<td>5 D, -0.43 A, LL</td>
<td>BSSL115P</td>
<td>15 D, -0.15 A, LL</td>
<td>BSSM115P</td>
<td>15 D, -0.14 A, LL</td>
<td></td>
</tr>
<tr>
<td>-150</td>
<td>BSSP92P</td>
<td>3 D, -0.26 A, LL</td>
<td>BSSP115P</td>
<td>1.4 D, -0.12 A, LL</td>
<td>BSSP115P</td>
<td>1.4 D, -0.12 A, LL</td>
<td></td>
</tr>
<tr>
<td>-100</td>
<td>BSSP102P</td>
<td>0.3 D, -0.98 A, NL</td>
<td>BSSP116P</td>
<td>2.2 D, -0.36 A, LL</td>
<td>BSSP116P</td>
<td>2.2 D, -0.36 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP110P</td>
<td>2.3 D, -0.68 A, LL</td>
<td>BSSP110P</td>
<td>190 mΩ, -3.9 A, LL</td>
<td>BSSP110P</td>
<td>190 mΩ, -3.9 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP110P</td>
<td>1.0 D, -1.0 A, LL</td>
<td>BSSP110P</td>
<td>150 Ω, -1.55 A, LL</td>
<td>BSSP110P</td>
<td>150 Ω, -1.55 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP102P</td>
<td>200 mΩ, -3.99 A, LL</td>
<td>BSSP102P</td>
<td>200 mΩ, -3.99 A, LL</td>
<td>BSSP102P</td>
<td>200 mΩ, -3.99 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP102P</td>
<td>65 mΩ, -3.7 A, LL</td>
<td>BSSP102P</td>
<td>65 mΩ, -3.7 A, LL</td>
<td>BSSP102P</td>
<td>65 mΩ, -3.7 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP102P</td>
<td>125 mΩ, -2.8 A, NL</td>
<td>BSSP102P</td>
<td>125 mΩ, -2.8 A, NL</td>
<td>BSSP102P</td>
<td>125 mΩ, -2.8 A, NL</td>
<td></td>
</tr>
<tr>
<td>-60</td>
<td>BSSP115P</td>
<td>120 mΩ, -2.4 A, LL</td>
<td>BSSP115P</td>
<td>120 mΩ, -2.4 A, LL</td>
<td>BSSP115P</td>
<td>120 mΩ, -2.4 A, LL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSP102P</td>
<td>40 mΩ, -5.9 A, LL</td>
<td>BSSP102P</td>
<td>40 mΩ, -5.9 A, LL</td>
<td>BSSP102P</td>
<td>40 mΩ, -5.9 A, LL</td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td>BSSL107P</td>
<td>74 mΩ, -6.5 A, LL</td>
<td>BSSL107P</td>
<td>130 mΩ, -2.4 A, LL, ESD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL107P</td>
<td>180 mΩ, -2.1 A, LL, dual, ESD</td>
<td>BSSL107P</td>
<td>180 mΩ, -2.1 A, LL, dual, ESD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL107P</td>
<td>165 mΩ, -3.0 A, LL</td>
<td>BSSL107P</td>
<td>165 mΩ, -3.0 A, LL</td>
<td>BSSL107P</td>
<td>165 mΩ, -3.0 A, LL</td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td>BSSL115P</td>
<td>41 mΩ, -6.0 A, SL</td>
<td>BSSL115P</td>
<td>95 mΩ, -4.3 A, SL</td>
<td>BSSL115P</td>
<td>95 mΩ, -4.3 A, SL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL115P</td>
<td>55 mΩ, -6.9 A, SL</td>
<td>BSSL115P</td>
<td>55 mΩ, -6.9 A, SL</td>
<td>BSSL115P</td>
<td>55 mΩ, -6.9 A, SL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL115P</td>
<td>110 mΩ, -4.7 A, SL</td>
<td>BSSL115P</td>
<td>110 mΩ, -4.7 A, SL</td>
<td>BSSL115P</td>
<td>110 mΩ, -4.7 A, SL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL115P</td>
<td>280 mΩ, -1.5 A, SL</td>
<td>BSSL115P</td>
<td>280 mΩ, -1.5 A, SL</td>
<td>BSSL115P</td>
<td>280 mΩ, -1.5 A, SL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BSSL115P</td>
<td>600 mΩ, -0.78 A, SL</td>
<td>BSSL115P</td>
<td>600 mΩ, -0.78 A, SL</td>
<td>BSSL115P</td>
<td>600 mΩ, -0.78 A, SL</td>
<td></td>
</tr>
<tr>
<td>-12</td>
<td>BSSL115P</td>
<td>125 mΩ, -4.3 A, ULL</td>
<td>BSSL115P</td>
<td>125 mΩ, -4.3 A, ULL</td>
<td>BSSL115P</td>
<td>125 mΩ, -4.3 A, ULL</td>
<td></td>
</tr>
</tbody>
</table>

## Small-signal/small-power complementary

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>TSOP-6</th>
<th>SOT-363</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20/20</td>
<td>BSSL215C</td>
<td>50 mΩ, -1.5 A, SL</td>
</tr>
<tr>
<td></td>
<td>N: 250 mΩ, -1.5 A, SL</td>
<td>P: 250 mΩ, -1.5 A, SL</td>
</tr>
<tr>
<td></td>
<td>R_{DS(on)} specified at 2.5 V</td>
<td>R_{DS(on)} specified at 2.5 V</td>
</tr>
<tr>
<td>-30/30</td>
<td>BSSL30C</td>
<td>93 mΩ, -3.7 A, LL</td>
</tr>
<tr>
<td></td>
<td>N: 93 mΩ, -2.4 A, LL</td>
<td>P: 93 mΩ, -2.4 A, LL</td>
</tr>
<tr>
<td></td>
<td>R_{DS(on)} specified at 1.8 V</td>
<td>R_{DS(on)} specified at 1.8 V</td>
</tr>
<tr>
<td></td>
<td>R_{DS(on)} specified at 1.8 V</td>
<td>R_{DS(on)} specified at 1.8 V</td>
</tr>
<tr>
<td></td>
<td>R_{DS(on)} specified at 0 V</td>
<td>R_{DS(on)} specified at 0 V</td>
</tr>
</tbody>
</table>

### Notes:
1) not qualified to Automotive AEC-Q101
2) R_{DS(on)} specified at 10 V
3) R_{DS(on)} specified at 4.5 V
4) R_{DS(on)} specified at 2.5 V
5) R_{DS(on)} specified at 1.8 V
6) R_{DS(on)} specified at 0 V
OptiMOS™ nomenclature

**Nomenclature**

**OptiMOS™**

- **BSB** = DirectFET™ (M Can)
- **BSC** = SuperSO8
- **BSF** = DirectFET™ (S Can)
- **BSK** = PQFN 2x2
- **BSO** = SO-8
- **BSZ** = PQFN 3.3x3.3
- **IPA** = FullPAK
- **SPB/IPB** = DPAK
- **IPC** = Chip product
- **SPD/IPD** = DPAK
- **IPI** = PAK
- **SPP/IPP** = TO-220
- **IPS** = PAK Short Leads
- **IPT** = TO-Leadless

**R\text{\small{DS(on)}} (\text{m}/\text{uni})**

Divide by 10 to get R\text{\small{DS(on)}} value, e.g., 014 = 1.4 m/uni

However, if the sixth character is a C, the fourth and the fifth character indicate the R\text{\small{DS(on)}} value, e.g., 12C = 12 m/uni

For chip products, chip area in mm² multiplied by 10

- **N** = N-channel
- **P** = P-channel
- **C** = Complementary

**Breakdown voltage [V]**

Multiply by 10 to get voltage class, e.g., 03 = 30 V

- **E** = Extended, +5 V, e.g., E2 = 25 V

**Level**

To be used from V\text{\small{GS}}

- **N** = Normal level (NL) 10.0
- **M** = Logic level 5 V opt. (LL) 4.5
- **L** = Logic level (ELL) 4.5
- **K** = Super logic level (SLL) 2.5
- **J** = Ultra logic level (ULL) 1.8

**DirectFET™**

- **X** = MX footprint
- **N** = MN footprint
- **Z** = MZ footprint
- **Q** = SQ footprint
- **T** = ST footprint
- **H** = SH footprint
- **J** = SJ footprint

**3** = Technology generation

- **I** = Monolithically-integrated Schottky-like diode
- **FD** = Fast diode
- **LF** = Linear mode capability

**Features**

- **F** = Fast switching
- **R** = Integrated gate resistor
- **E** = ESD protection
- **A** = Qualified according to Automotive AEC Q101

**RoHS compliant**

**Package options**

- **SO-8/SuperSO8/PQFN 3.3x3.3/PQFN 2x2**
- **S** = Single chip
- **D** = Dual chip

**OptiMOS™ 30 V**

- **Consecutive number** without any correlation to product specification

- **Channels**
  - **N** = N-channel
  - **P** = P-channel

- **I** = Monolithically-integrated Schottky-like diode

- **D** = Dual
- **E** = ESD
- **S** = Single
StrongIRFET™ (from May 2015 to 2019)

Drive voltage
F = 4.5 V_{GS} capable for BV ≤ 30 V
L = 2.5 V_{GS} capable for BV ≤ 30 V, 4.5 V_{GS} capable for BV ≥ 40 V

2 to 3 digit voltage
For example:
25 = 25 V
135 = 135 V

Additional features
E = ESD-protected MOSFET

“X” indicates the package
D = SOT-363
P = SOT-223
R = SC59
S = SOT-89, SOT-23, SOT-323
L = TSOP-6

Package
1 or 2 letters
B = TO-220
BA = Super220
C = Bare die or wafer
DL = DirectFET™ 1.5 Large Can
DM = DirectFET™ 1.5 Medium Can
Can DS = DirectFET™ 1.5 Small Can
Can FF = TO-220 FullPAK
H = PQFN 5x6
HB = Power Block 5x6
HM = PQFN 3.0x3.0 or 3.3x3.3
HS = PQFN 2x2
I = TO-220 FullPAK
K = SO-8
L = SOT-223
ML = SOT-23
P = TO-247
PS = Super247
R = DPAK
S = D’PAK
SL = TO-262
SA = D2 7-pin with pin 2 void
SN = D2 7-pin with pins void
SC = D2 7-pin with pin 4 void
T = TollFET
TS = TSOP-6
U = IPAK

Only present in following case
W = to distinguish SOT-323 from SOT-23

Polarity
N = N-channel
P = P-channel
C = Complementary (N-ch + P-ch)

3 digits product identifier
 meaning dependent on product generation

Only present in following case
S = Single (only for packages which are also used for multichip products)

3 sequential digits
3 digits issued sequentially

Additional features
E = ESD-protected MOSFET
New nomenclature (2019 onward)

New nomenclature for OptiMOS™ and StrongIRFET™ MOSFETs (2019 onward)

Package type
- SC = SuperSO8
- SD = SOT-363
- SL = TSOP-6
- SK = PQFN 2x2
- SA = SO8
- SP = SOT-223
- SQ = CE2
- SR = SC59
- SS = SOT-89, SOT-23, SOT-323
- ST = sTOLL
- SZ = PQFN 3.3x3.3
- PA = TO-220 FullPAK
- PB = D²PAK
- PC = Chip Product
- PD = DPAK
- IPF = D²PAK-7-pin
- PI = IPAK
- PP = TO-220
- PS = IPAK Short Leads
- PT = TO-Leadless
- PW = TO-247
- QA = PQFN 5x6
- QB = PQFN 3x2
- QC = PQFN 3x5
- QD = PQFN 5x6 Source-Down
- QE = PQFN 3.3x3.3 Source-Down
- WS = DirectFET™ (S)
- WM = DirectFET™ (M)
- WL = DirectFET™ (L)
- QF = PQFN 8x6

Features
- D = Dual
- H = Half-bridge
- 3 = Marketing generation with branding strategy
- CG = Center gate
- E = ESD protection
- F = Fast switching
- FD = Fast diode
- SC = Super cool
- I = Monolithically-integrated Schottky-like diode
- LF = Linear mode
- R = Integrated gate resistor

Last letter – requirement category:
- A = Qualified according to AECQ 101
- S = Standard
- None = Industrial

Level to be used for VGS
- N = Normal level (NL) 10.0 V
- L = Logic level (LL) 4.5 V
- M = Logic level 5 V opt. (ELL) 4.5 V
- K = Super logic level (SLL) 2.5 V
- J = Ultra logic level (ULL) 1.8 V

Breakdown voltage [V]
Divide by 10
- e.g. E2 = 25 V
  - 10 = 100 V
  - 25 = 250 V

R_{DS(on)} [mΩ]
Divide by 10 to get R_{DS(on)} value
- e.g. 012 = 1.2 mΩ

However, if the sixth character is D or E the fourth and the fifth characters indicate the R_{DS(on)} e.g.
- 12D = 120 mΩ
- 12E = 1200 mΩ
For chip products chip area in mm² multiplied by 10

Version
- N = N-channel
- P = P-channel
- C = Complementary
- G = GaN
Infineon support for low voltage MOSFETs

Useful links and helpful information

Further information, data sheets and documents
www.infineon.com/powermosfet-12V-300V
www.infineon.com/smallsignal
www.infineon.com/pchannel
www.infineon.com/depletion
www.infineon.com/complementary

Evaluation boards and simulation models
www.infineon.com/to-leadless-evaluationboard
www.infineon.com/powermosfet-simulationmodels

Die support
www.infineon.com/baredie

MOSFET Cross Reference

MOSFET Community
community.infineon.com/t5/Power-MOSFET/bd-p/MOSFET

For more information regarding StrongIRFET™ and OptiMOS™ power MOSFET bare die products, please contact the Infineon Service Center or your local sales counterpart.
500-950 V MOSFETs

> CoolMOS™ SJ MOSFETs
> 950 V CoolMOS™ P7 SJ MOSFETs
> 800 V CoolMOS™ P7 SJ MOSFETs
> 700 V CoolMOS™ P7 SJ MOSFETs
> 600 V CoolMOS™ P7 SJ MOSFETs
> 600 V CoolMOS™ PF7 SJ MOSFETs
> 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs
> 600 V CoolMOS™ S7 SJ MOSFETs
> 650 V CoolMOS™ CFD7 SJ MOSFETs
> CoolMOS™ CE SJ MOSFETs
> CoolMOS™ SJ MOSFETs for automotive
> CoolMOS™ SJ MOSFET package innovations
> 500-950 V MOSFETs product portfolio
> 500-950 V MOSFETs nomenclature

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
CoolMOS™ SJ MOSFETs
Trusted leader in high-voltage MOSFETs

Infineon’s CoolMOS™ products offer a significant reduction of conduction, switching and driving losses, and enable high power density as well as efficiency for superior power conversion systems.

<table>
<thead>
<tr>
<th>Voltage class</th>
<th>Consumer applications (&lt;400 W)</th>
<th>Industrial applications (&gt;250 W)</th>
<th>Automotive applications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active</td>
<td>Active and preferred</td>
<td>Active</td>
</tr>
<tr>
<td>900 V C3</td>
<td>950 V P7</td>
<td>900 V C3</td>
<td>800 V C3A</td>
</tr>
<tr>
<td>800 V CE</td>
<td>800 V P7</td>
<td>800 V C3</td>
<td>600 V G7</td>
</tr>
<tr>
<td>800 V C3</td>
<td>700 V P7</td>
<td>600 V P6</td>
<td>600 V CPA</td>
</tr>
<tr>
<td>650/700 V CE</td>
<td>600 V P7</td>
<td>600 V P6</td>
<td>600 V CPA</td>
</tr>
<tr>
<td>600 V CE</td>
<td>600 V PFD7</td>
<td>600 V P6</td>
<td>600 V CPA</td>
</tr>
<tr>
<td>600 V P6</td>
<td>600 V CE</td>
<td>650 V CFD2</td>
<td>650 V CFDA</td>
</tr>
<tr>
<td>600 V C3</td>
<td>600 V PFD7</td>
<td>650 V CFD7</td>
<td>600 V CPA</td>
</tr>
<tr>
<td>500 V CE</td>
<td>600 V PFD7</td>
<td>600 V CFD7</td>
<td>600 V CPA</td>
</tr>
</tbody>
</table>

1) Best-fit for flyback topologies

High-voltage superjunction MOSFETs address consumer applications, such as home appliance drives, smartphone/tablet chargers, notebook adapters, LED lighting, PC power, as well as audio and TV power supplies. Customers are increasingly replacing standard MOSFETs with superjunction MOSFETs to benefit from higher efficiency and lower power consumption for end users. CoolMOS™ P7 sets a benchmark by offering high performance and competitive price all at once. The CoolMOS™ PFD7 series is a state-of-the-art solution for high density chargers/adapters as well as home appliance drives (e.g., refrigerator compressors).

Also for industrial applications such as server, telecom, PC power, solar, UPS, EV-charging and others, Infineon’s latest CoolMOS™ 7 superjunction MOSFETs with the C7, G7, CFD7, P7 and S7 product families offer what you need - from highest efficiency to best price performance. Complementary to the silicon CoolMOS™ portfolio, Infineon offers a broad wide bandgap (WBG) portfolio of CoolGaN™ HEMTs and CoolSiC™ MOSFETs to further optimize efficiency and system cost (see Wide bandgap semiconductors).

Infineon’s industrial- and consumer-qualified CoolMOS™ superjunction MOSFET offering is complemented by the automotive qualified series 600 V CPA, 650 V CFDA, 800 V C3A and the latest 650 V CFD7A as well as 600 V ST7. Infineon’s excellent-performing automotive series address on-board chargers, DC-DC converters, active pre-charge and discharge function, insulation monitor, HV eFuse, and HV eDisconnect with proven outstanding quality standards going well beyond the AEC-Q101, supporting customers to gain momentum in the rapidly growing xEV market.

www.infineon.com/coolmos
950 V CoolMOS™ P7 SJ MOSFETs

Perfect fit for PFC and flyback topologies

Designed to meet the growing consumer needs in the high-voltage MOSFETs arena, the 950 V CoolMOS™ P7 technology focuses on the low-power SMPS market. The P7 family addresses applications ranging from lighting, smart meter, mobile phone charger, notebook adapter, to AUX power supply and industrial SMPS. Offering 50 V more blocking voltage than its predecessor 900 V CoolMOS™ C3, the 950 V CoolMOS™ P7 series delivers outstanding performance in terms of efficiency, thermal behavior, and ease of use. As all other P7 family members, the 950 V CoolMOS™ P7 series comes with an integrated Zener diode ESD protection. The integrated diode considerably improves ESD robustness, thus reducing ESD-related yield loss and reaching exceptional ease-of-use levels. CoolMOS™ P7 is developed with a best-in-class threshold voltage ($V_{\text{GS(th)}}$) of 3 V and a narrow tolerance of only ± 0.5 V, which makes it easy to drive and design-in.

Compared to competition, the 950 V CoolMOS™ P7 delivers best-in-class efficiency and thermal performance. Plug-and-play at 90 V$_{\text{ac}}$ in a 40 W adapter reference design, featuring the snubberless concept, demonstrates excellent efficiency gains of up to 0.2 percent and lower MOSFET temperature of up to 5.2°C compared to similar competitor technology. With over 20 years of experience in superjunction technology, Infineon introduces 950 V CoolMOS™ P7 with best-in-class DPAK on-resistance ($R_{\text{DS(on)}}$). This SMD device comes with the $R_{\text{DS(on)}}$ of 450 mΩ - more than 60 percent lower $R_{\text{DS(on)}}$ compared to the nearest competitor. Such low $R_{\text{DS(on)}}$ value enables higher density designs while decreasing BOM and assembly cost.

Best-in-class DPAK $R_{\text{DS(on)}}$

Customer benefits:
› Possible change from leaded to SMD packages
› High power density
› Lower BOM cost
› Lower production cost

www.infineon.com/950v-p7
800 V CoolMOS™ P7 SJ MOSFETs
A benchmark in efficiency and thermal performance

With the 800 V CoolMOS™ P7 series, Infineon sets a benchmark in 800 V superjunction technologies and combines best-in-class performance with the remarkable ease of use. This product family is a perfect fit for flyback-based consumer and industrial SMPS applications. In addition, it is also suitable for PFC stages within consumer, as well as solar applications, fully covering the market needs in terms of its price/performance ratio.

The technology offers fully optimized key parameters to deliver best-in-class efficiency as well as thermal performance. As demonstrated on an 80 W LED driver, bought on the market, the >45 percent reduction in switching losses ($E_{oss}$) and output capacitance ($C_{oss}$) as well as the significant improvement in input capacitance ($C_{iss}$) and gate charge ($Q_G$), compared to competitor technologies, lead to 0.5 percent higher efficiency at light load which helps to reduce standby power in the end application. At full load, the observed improvement is up to 0.3 percent higher efficiency and 6°C lower device temperature.

EMI is a system level topic, and the optimization needs to be done on the system level only. Nevertheless, a pure plug-and-play measurement on Infineon’s 45 W adapter reveals that 800 V CoolMOS™ P7 shows similar EMI performance to Infineon’s previous technologies as well as to competitors’ technologies.

Compared to competition, the 800 V CoolMOS™ P7 technology allows to integrate much lower $R_{DS(on)}$ values into small packages, such as a DPAK. This finally enables high power density designs at highly competitive price levels.

**Overview of lowest DPAK $R_{DS(on)}$ for 800 V superjunction MOSFET**

<table>
<thead>
<tr>
<th></th>
<th>650 mΩ</th>
<th>630 mΩ</th>
<th>450 mΩ</th>
<th>360 mΩ</th>
<th>280 mΩ</th>
<th>-56%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitor 2</td>
<td>Competitor 1</td>
<td>CoolMOS™ P7</td>
<td>CoolMOS™ P7</td>
<td>CoolMOS™ P7</td>
<td>CoolMOS™ P7</td>
<td></td>
</tr>
</tbody>
</table>

**CoolMOS™ P7 sets a new benchmark in best-in-class DPAK $R_{DS(on)}$**

Customer benefits:
- High power density
- Lower BOM cost
- Lower production cost

The complete P7 platform has been developed with an integrated Zener diode that is used as an electrostatic discharge (ESD) protection mechanism, which increases the overall device ruggedness up to human body model (HBM) class 2 level.
700 V CoolMOS™ P7 SJ MOSFETs

Infineon’s solution for flyback topologies

The 700 V CoolMOS™ P7 family has been developed to serve today’s and, especially, tomorrow’s trends in flyback topologies. The products address the low-power SMPS market, mainly focusing on mobile phone chargers and notebook adapters, but are also suitable for power supplies, used within lighting applications, home entertainment (TV, game consoles or audio), and auxiliary power supplies. 700 V CoolMOS™ P7 achieves outstanding efficiency gains of up to 4 percent and a decrease in device temperature of up to 16 K compared to the competition. In contrast with the previous 650 V CoolMOS™ C6 technology, 700 V CoolMOS™ P7 offers 2.4 percent gain in efficiency and 12 K lower device temperature, measured at a flyback-based charger application, operated at 140 kHz switching speed.

Keeping the ease of use in mind, Infineon has developed the technology with a low threshold voltage (V_GS(th)) of 3 V and a very narrow tolerance of ±0.5 V. This makes the CoolMOS™ P7 easy to design-in and enables the usage of lower gate source voltage, which facilitates its driving and leads to lower idle losses. To increase the ESD ruggedness up to HBM class 2 level, 700 V CoolMOS™ P7 has an integrated Zener diode. This helps to support increased assembly yield, leads to reduction of production related failures and, finally, manufacturing cost savings on customer side.

Features and benefits

Key features
- Highly performant technology
  - Low switching losses (E_{oss})
  - Highly efficient
  - Excellent thermal behavior
- Allowing high-speed switching
- Integrated protection Zener diode
- Optimized V_GS(th) of 3 V with very narrow tolerance of ±0.5 V
- Finely graduated portfolio

Key benefits
- Cost-competitive technology
- Further efficiency gain at higher switching speed
- Supporting less magnetic size with lower BOM costs
- High ESD ruggedness up to HBM class 2 level
- Easy to drive and design-in
- Enabler for smaller form factors and high power density designs
- Excellent choice in selecting the best-fitting product

www.infineon.com/700V-p7
600 V CoolMOS™ P7 SJ MOSFETs

Perfect combination of high efficiency and ease of use

The 600 V CoolMOS™ P7 is a general purpose series, targeting a broad variety of applications, ranging from low-power SMPS up to the highest power levels. In the low-power arena, it is the successor of the 600 V CoolMOS™ CE, and for high-power SPMS applications, it is the replacement for the 600 V CoolMOS™ P6, which makes it the perfect choice for applications such as chargers, adapters, lighting, TV and PC power supplies, solar, small light electric vehicles, server and telecom power supplies, and electric vehicle (EV) charging.

The 600 V CoolMOS™ P7 is Infineon’s most well-balanced CoolMOS™ technology in terms of combining ease of use and excellent efficiency performance. Compared to its predecessors, it offers higher efficiency and improved power density due to the significantly reduced gate charge ($Q_G$) and switching losses ($E_{oss}$) levels, as well as optimized on-state resistance ($R_{DS(on)}$). The carefully selected integrated gate resistors enable very low ringing tendency and, thanks to its outstanding robustness of body diode against hard commutation, it is suitable for hard as well as soft-switching topologies, such as LLC. In addition, an excellent ESD capability helps to improve the quality in manufacturing. The 600 V CoolMOS™ P7 family offers a wide range of on-resistance ($R_{DS(on)}$)/package combinations, including THD, as well as SMD devices, at an $R_{DS(on)}$ granularity from 24 to 600 mΩ and comes along with the most competitive price/performance ratio of all 600 V CoolMOS™ offerings.

Features and benefits

Key features
- Suitable for hard and soft switching (PFC and LLC) due to an outstanding commutation ruggedness.
- Optimized balance between efficiency and ease of use.
- Significant reduction of switching and conduction losses leading to low MOSFET temperature.
- Excellent ESD robustness >2 kV (HBM) for all products.
- Better $R_{DS(on)}/package$ products compared to competition.
- Large portfolio with granular $R_{DS(on)}$ selection qualified for a variety of industrial and consumer applications.

Key benefits
- Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages.
- Improved efficiency and simplified thermal management due to low switching and conduction losses.
- Higher manufacturing quality due to >2 kV ESD protection.
- Increased power density solutions enabled by using products with smaller footprint.
- Suitable for a wide variety of applications and power ranges.

www.infineon.com/600V-p7
600 V CoolMOS™ PFD7 SJ MOSFETs

The next level for ultrahigh power density designs and energy-efficient home appliance drives

The 600 V CoolMOS™ PFD7 MOSFET series sets a new benchmark in 600 V superjunction (SJ) technologies, shaped by Infineon’s experience of more than 20 years in pioneering in superjunction technology innovation. The series combines best-in-class performance with state-of-the-art ease of use and features an integrated fast body diode ensuring a robust device and in turn reduced BOM for the customer. This product family offers up to 1.17 percent efficiency increase compared to the CoolMOS™ P7 technologies, which leads to a power density increase of 1.8 W/in³. CoolMOS™ PFD7 pushes the SJ MOSFET technology to new limits leading to outstanding improvement of lower conduction and charge/discharge losses as well as a reduced turn-off and gate-driving losses.

A broad range of $R_{DS(on)}$ Values in combination with a variety of packages helps in selecting the right part to optimize designs. Furthermore, an integrated ESD protection of up to 2 kV eliminates ESD-related yield loss. Infineon's industry-leading SMD package offering contributes to bill-of-material and PCB space savings and simplifies manufacturing. This unique set of product features and their resulting benefits, position the CoolMOS™ PFD7 superjunction MOSFET family exceptionally well for ultrahigh density applications like chargers and adapters, USB power delivery but also for home appliance drives (e.g. refrigerator compressors) and specific lighting SMPS applications.

600 V CoolMOS™ PFD7 increases efficiency in light- and full-load conditions. This results in a power density increase of 1.8 W/in³ for ultrahigh power chargers and adapters.

600 V CoolMOS™ PFD7 provides up to 2 percent higher efficiency at 100 W, which results in an 18°C thermal improvement. Its excellent commutation ruggedness makes it the perfect fit for low-power drives.

Features and benefits

Key features
- Very low FOM $R_{DS(on)} \times E_{oss}$
- Integrated robust fast body diode
- Ultra-low Qg, and industry's fastest recovery time ($t_{rr}$)
- Up to 2 kV ESD protection (HBM class 2)
- Wide range of $R_{DS(on)}$ values and broad package portfolio
- Excellent commutation ruggedness

Key benefits
- Minimized switching losses
- Power density improvement compared to latest CoolMOS™ charger technology
- Increased efficiency (especially at light-load operation) and improved thermal behavior compared to CoolMOS™ CE technology for home appliance motor drives
- BOM cost reduction and easy manufacturing
- Robustness and reliability
- Easy to select right parts for design fine-tuning

www.infineon.com/600V-PFD7
600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs

Infineon’s superjunction MOSFET series for highest efficiency

The 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFET series are designed to achieve record level efficiency performance – they offer substantial efficiency benefits over the whole load range in hard-switching applications compared to previous series and competition. This is achieved by minimizing switching losses via ultralow levels of switching losses ($E_{oss}$) (approximately 50 percent reduction compared to the CoolMOS™ CP), reduced gate charge ($Q_G$), and a careful balance of other relevant product key parameters. The low $E_{oss}$ and $Q_G$ also enable operation at higher switching frequency and related size reduction of the circuit magnetics.

The outstanding figures of merit (FOM) and the best-in-class on-state resistance ($R_{DS(on)}$) offerings make the CoolMOS™ C7 and C7 Gold series key enablers for highest efficiency and power density. While the 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFETs are solely designed for hard-switching applications such as PFC, the 600 V version is also well suited for high-end LLC stages due to its rugged body diode that withstands slew rates up to 20 V/ns. The product portfolio contains TO-247 4-pin, ThinPAK 8x8, TO-Leadless and top-side cooled Double DPAK (DDPAK) packages which come with additional Kelvin source contacts enabling further efficiency advantages over the classical 3-pin approach.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Increased efficiency in hard-switching topologies such as PFC and TTF</td>
<td>– Increased efficiency in hard-switching topologies such as PFC and TTF</td>
</tr>
<tr>
<td>– Reduced size and cost of magnetic components by increased switching frequency (e.g. 65 - 130 kHz)</td>
<td>– Reduced size and cost of magnetic components by increased switching frequency (e.g. 65 - 130 kHz)</td>
</tr>
<tr>
<td>– Increased power density by smaller packages for the same $R_{DS(on)}$</td>
<td>– Increased power density by smaller packages for the same $R_{DS(on)}$</td>
</tr>
</tbody>
</table>

PFC CCM 1200 W efficiency difference for 90 $V_{in}$ (PFC CCM, 1.150 W @ 65 kHz)

MOSFET losses (W)

| IPW60R045CP vs. IPZ60R060C7, highline 2.5 kW |
|---|---|---|---|---|
| 65 kHz | 130 kHz |
| CoolMOS™ CP | 7.1 | 3.0 | 1.9 |
| CoolMOS™ C7 | 4.7 | 1.0 | 2.8 |
| CoolMOS™ CP | 6.0 | 2.1 |
| CoolMOS™ C7 | 12.4 | 6.6 |

For more details on the product, click on the part number, visit infineon.com or contact our product support.
The 600 V CoolMOS™ S7 superjunction MOSFET is the perfect fit for applications where MOSFETs are switched at low frequency, such as active bridge rectification, inverter stages, in-rush relays, PLCs, power solid state relays and solid state circuit breakers. The new MOSFET design with the best conduction performance allows the CoolMOS™ S7 to offer cost-optimized distinctively low on-resistance ($R_{DS(on)}$) values, ideally suited for applications looking to minimize conduction losses at the best price.

**Use cases**

Typically, CoolMOS™ S7 is used in active rectification bridges, where diodes are replaced or paralleled with MOSFETs, obtaining an increase in efficiency without the need for extensive system redesign. In this application, the TO-leadless (TOLL) package in low $R_{DS(on)}$ allows the most efficient and compact modular design based on daughter cards. The CoolMOS™ S7 delivers also tremendous value to solid state relay (SSR) and solid state circuit breaker (SSCB) designs, by bringing the superjunction MOSFET advantages to a system level cost comparable to other silicon alternatives. In addition, any socket or topology switching at low frequency can greatly benefit from the leading low $R_{DS(on)} \times$ price.

**Features and benefits**

- **Key features**
  - Best-in-class $R_{DS(on)}$ in SMD packages
  - Optimized for conduction performance, reaching the lowest $R_{DS(on)}$ values
  - High pulse current capability
  - Improved thermal resistance

- **Key benefits**
  - Minimizes conduction losses
  - An easy step into Titanium level SMPS
  - Modular, more compact and easier designs
  - Eliminates or reduces heat sink in solid state relays and circuit breakers
  - Lower TCO cost or BOM cost

**Efficiency in 2400 W PFC at $V_{in} = 230 V_{AC}$**

Difference between using or not using the active-bridge rectification

CoolMOS™ S7 brings more efficiency to power supplies when used in an active rectification bridge.

www.infineon.com/s7
600 V CoolMOS™ CFD7 SJ MOSFETs

Infineon’s solution for resonant switching high-power applications

The 600 V CoolMOS™ CFD7 is one of Infineon’s high-voltage superjunction MOSFET series with an integrated fast body diode. It is the ideal choice for resonant topologies, such as LLC and ZVS PSFB, and targets the high SMPS market.

As a result of significantly reduced gate charge (Qg), improved turn-off behavior, a reverse recovery charge (Qrr) of up to 69 percent lower compared to the competition, as well as the lowest reverse recovery time (tff) in the market, it combines the highest efficiency and best-in-class reliability in soft-switching applications, without sacrificing the easy implementation in the design-in process.

In addition, the 600 V CoolMOS™ CFD7 enables higher power density solutions by offering the best-in-class on-state resistance (RDS(on)) package combinations in through-hole devices, as well as in surface mount devices. In ThinPAK 8x8 and TO-220 with CoolMOS™ CFD7, a RDS(on) of around 30 percent below the next best competitor offering can be achieved. All this together makes CoolMOS™ CFD7 the perfect fit for server and telecom applications, and it is also suitable for EV-charging stations.

Features and benefits

**Key benefits**
- Best-in-class hard commutation ruggedness
- Highest reliability for resonant topologies
- Highest efficiency with outstanding ease of use/performance trade-off
- Enabling increased power density solutions

**Features and benefits**
- Ultrafast body diode
- Best-in-class reverse recovery charge (Qrr)
- Improved reverse diode dv/dt and di/dt ruggedness
- Lowest figure of merit (RDS(on) x Qg x Eoss)
- Best-in-class RDS(on)/package combinations

www.infineon.com/cfd7
650 V CoolMOS™ CFD7 SJ MOSFETs
Tailored to win in resonant topologies

The need for improved efficiency and higher power density in industrial SMPS applications is driven by the megatrends of the 21st century such as big data, digitalization and e-mobility. Furthermore, over the last few years, due to the higher nominal input voltages in the US, a trend towards 450 V bus voltage, and the need for worldwide applicable designs, the demand for 650 V breakdown voltage has increased significantly - also for resonant topologies.

The 650 V device family is the voltage-range extension of Infineon’s renowned CoolMOS™ CFD7 family, the successor to the well-established CoolMOS™ CFD2. It comes along with an additional 50 V breakdown voltage, integrated fast body diode, improved switching performance (compared to previous generations), and excellent thermal behavior. Thanks to these features, the 650 V CoolMOS™ CFD7 allows for the highest efficiency and power density levels in soft-switching applications such as LLC and ZVS phase-shift-full-bridge.

The best-in-class $R_{DS(on)}$ in TO-247, TO-220, and D²PAK enables customers to increase the power density level of their designs primarily addressing telecom, server, solar, and (off-board) EV-charging applications.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 V blocking voltage</td>
<td>50 V extra margin for increased bus voltage</td>
</tr>
<tr>
<td>Ultrafast body diode</td>
<td>Excellent hard commutation ruggedness</td>
</tr>
<tr>
<td>Reduced switching losses</td>
<td>Outstanding light load efficiency</td>
</tr>
<tr>
<td>Low $R_{DS(on)}$ dependency over temperature</td>
<td>High full load efficiency</td>
</tr>
</tbody>
</table>

www.infineon.com/650v-cfd7
CoolMOS™ CE SJ MOSFETs
High-voltage superjunction MOSFETs for consumer applications

Infineon’s CoolMOS™ CE is a product family that addresses consumer and lighting applications. It offers benefits in efficiency and thermal behavior versus standard MOSFETs and is optimized for ease of use and cost-competitiveness, while delivering the right-fit performance and excellent Infineon quality.

Application example: 10 W and 15 W smartphone charger

CoolMOS™ CE meets the standard efficiency requirements in charger applications

CoolMOS™ CE case temperature:
The maximum MOSFET case temperature is required to be below 90°C. CoolMOS™ CE meets this requirement and offers enough margin required for design-in flexibility.

CoolMOS™ CE efficiency performance:
CoolMOS™ CE meets the 80 percent standard efficiency requirement and offers enough margin required for design-in flexibility.

The performance of CoolMOS™ CE in the 10 W and 15 W design demonstrates that the series meets common EMI requirements for charger applications and thus, is also offering design-in flexibility.

CoolMOS™ CE customer benefits
Product portfolio Broad portfolio covering five voltage classes in both through-hole and SMD packages
Quality Field failure rates are as low as 0.1 DPM
Design-in support Large field application engineering team to provide professional and flexible support for your design

www.infineon.com/ce
CoolMOS™ SJ MOSFETs for automotive

600 V CoolMOS™ CPA, 650 V CoolMOS™ CFDA, 800 V CoolMOS™ C3A, 650 V CoolMOS™ CFD7A – on the fast lane in automotive applications

The highest system performance in a size and weight constrained environment, outstanding and proven product quality and reliability, as well as 100 percent reliable delivery, are key requirements for manufacturers in the automotive market. With the high-voltage automotive MOSFET series 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA, 800 V CoolMOS™ C3A and 650 V CoolMOS™ CFD7A, Infineon is perfectly prepared to take the challenges in the strongly growing automotive market.

### CoolMOS™ SJ MOSFET automotive – benchmark in quality and reliability

Focus on top-notch quality and reliability without any compromise – that is the principle Infineon applies during development and qualification of all CoolMOS™ superjunction technologies. For our automotive grade derivatives, the great quality levels of the industrial-based technologies are further boosted by special screening measures in front-end, back-end, as well as by extended qualification procedures. The Infineon robustness validation approach with extended stress-test procedures, doubling the real application requirements, is one of our key measures to ensure a quality level well beyond the formal requirements of the AEC Q101 standard. Aside from extended stress times on standard qualification tests, it comprises test procedures, specially developed by Infineon to ensure highest quality of e.g., the power metallization of our devices. Usage of robust package technologies, 100 percent gate oxide screening, and top-notch production monitoring, including yield screening measures, part average testing (PAT), statistical bin alarm (SBA), and pattern recognition procedures, complete our package to guarantee highest automotive quality. This holistic approach results in an unrivalled quality position of Infineon’s CoolMOS™ SJ MOSFETs for automotive.

www.infineon.com/cfd7a
www.infineon.com/coolmos-automotive
CoolMOS™ SJ MOSFET automotive – ready to support future application trends

Driven by the carbon dioxide (CO₂) reduction initiatives, the market of plug-in hybrid PHEV and pure EV is strongly growing. Higher ranges of the electric vehicles are realized by increasing the battery capacity and the energy efficiency of the used electric components. The used battery voltage classes tend to become standardized at approximately 450 V with a trend towards the higher voltages, as this supports faster charging times and enables lighter cabling within the vehicle. Discrete high-voltage components are widely used for on-board charger (OBC) and DC-DC converter (LDC) applications, as price pressure increasingly displaces module-based solutions. The trend towards fast charging impacts on the power range demanded from OBC topologies. Presently, as well as in the past, a vast majority of OBC topologies have been found in the range up to 7.2 kW, whereas the future tends to stir the trend towards 11 kW or even up to 22 kW. This development, paired with a demand for high efficiency and power density at low system cost, is a strong driver for the usage of three-phase solutions.

While for the lower power OBC solutions classic PFC approaches are the well-established approaches in the market, the Vienna rectifier is the optimal solution for the higher power levels. As a true three-phase topology, it delivers full power if attached to a three-phase input but is flexible enough to run on a single-phase if required. The three-level topology minimizes the filter effort compared to other solutions. By using the doubled frequency on the magnetic components, it also helps to significantly reduce the size of the passives. As a three-level topology, the Vienna rectifier, followed by two paralleled DC-DC stages, furthermore leads to a relaxed voltage stress level on the power MOSFETs. This way, it enables to handle upcoming higher battery voltage levels. The $R_{\text{DS(on)}}$, required to yield a desired efficiency level in a Vienna Rectifier, is a function of applied switching frequency and demanded power level. With our 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA portfolio, covering an $R_{\text{DS(on)}}$ range from 45 to 660 mΩ, we are well-prepared to support your next-generation three-phase Vienna rectifier design. With CoolMOS™ you are ready to seize your share in the emerging high-power on-board charger markets.

www.infineon.com/coolmos-automotive
600 V CoolMOS™ S7A
Best-in-class \(R_{\text{DS(on)}}\) x A SJ MOSFET for slow-switching automotive applications

The automotive-grade 600 V CoolMOS™ S7A superjunction MOSFET addresses xEV applications where MOSFETs are switched at low frequency, such as HV eFuse, HV eDisconnect, and on-board charger in the slow-switching leg of the PFC stage. The more stringent requirements for increased power density, safety, and reliability in these applications are met by combining the superior robustness and performance of the S7A MOSFET with the innovative package concept offered by the QDPAK TSC. The new MOSFET design offers a cost-optimized, distinctively low on-resistance \(R_{\text{DS(on)}}\) of 10 mΩ, enabling increased power density and minimized conduction losses. The top-side cooled QDPAK package offers increased efficiency and controllability thanks to its intrinsic Kelvin source, high power dissipation capability, and innovative cooling concept.

CoolMOS™ S7A is the ideal device for the ALR active line rectification in a classic boost PFC topology, which offers a power loss reduction up to 30 percent and an overall PLC efficiency improvement of 0.5 percent.

CoolMOS™ S7A is the semiconductor solution for HV eDisconnect and HV eFuse. It answers e-mobility needs with respect to reliability (maintenance-free), flexible and cost-optimized system integration, scalability, and minimized failure propagation.

HV power distribution unit

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best-in-class (R_{\text{DS(on)}}): 10 mΩ</td>
<td>Minimized conduction losses</td>
</tr>
<tr>
<td>Smallest (R_{\text{DS(on)}}) in SMD packages</td>
<td>Increased energy efficiency</td>
</tr>
<tr>
<td>Optimized for conduction performance</td>
<td>More compact and easier designs</td>
</tr>
<tr>
<td>Industry’s leading heat-sinking capability</td>
<td>Increased power density</td>
</tr>
<tr>
<td>High pulse current capability</td>
<td>Lower TCO cost or BOM cost</td>
</tr>
<tr>
<td>Body diode robustness at AC line commutation</td>
<td>Flexible system integration</td>
</tr>
<tr>
<td>Kelvin-source concept</td>
<td>Variable cooling strategy</td>
</tr>
</tbody>
</table>

www.infineon.com/s7a
CoolMOS™ SJ MOSFET high-power package innovations
Space-saving and high performance packages

TO-263-7 (D²PAK-7-pin)
The TO-263-7-pin package is a SMD package addressing automotive-specific requirements including high efficiency and controllability. The Kelvin source pin leads to reduced switching losses. Furthermore, the new 7-pin design increases the creepage distance at the PCB and therefore helps to improve the manufacturability.

Top-side cooled Double & Quadruple DPAK (DDPAK + QDPAK)
These top-side cooled surface mount device (SMD) packages address high-power SMPS applications such as PC power, solar, server and telecom as well as automotive applications like HV eDisconnect, HV eFuse and on-board charger. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded packages such as the common TO-220 and TO-247 package. In today’s SMD-based designs, the output power is restricted by the thermal limit of the PCB material because the heat must be dissipated through the board. Thanks to the top-side cooling concept of DDPAK and QDPAK, the thermal decoupling of the board and semiconductor is possible, enabling higher power density or improved system lifetime.

TO-247 4-pin with asymmetric leads
The TO-247 4-pin package with asymmetric leads is an optimized version of the standard TO-247 4-pin and enables highest efficiency and controllability in the high-power SMPS market. The fourth pin acts as a Kelvin source. The main current of the switch is placed outside of the gate loop and the feedback is eliminated. This leads to less switching losses, especially at high currents. Secondly, the EMI will be reduced due to cleaner waveforms. In addition, the asymmetric leads further improve the ease of use in the design-in process. Compared to the standard TO-247 4-pin the distance between the critical pins has been increased to enable simplified wave soldering and reduced board yield loss.

ThinPAK 8x8
With a very small footprint of only 64 mm² (vs. 150 mm² for the D²PAK) and a very low profile with only 1 mm height (vs. 4.4 mm for the D²PAK) the ThinPAK 8x8 leadless SMD package for high-voltage MOSFETs is a first choice to decrease system size in power-density driven designs. Low parasitic inductance and a separate 4-pin Kelvin source connection offer best efficiency and ease of use. The package is RoHS compliant with halogen-free mold compound.

TO-Leadless
Combined with the CoolMOS™ C7 Gold (G7) technology, the TO-Leadless (TOLL) package is Infineon’s flagship SMD package for high power/high current SMD solutions. Compared to D²PAK 7-pin, TO-Leadless shows a 30 percent reduction in footprint, yet offers improved thermal performance. This, and the 50 percent height reduction result in a significant advantage whenever highest power density is demanded. Equipped with 4-pin Kelvin source connection and low parasitic inductances the package offers best efficiency and ease of use. The package is MSL1 compliant and reflow solderable.

www.infineon.com/coolmos-latest-packages
CoolMOS™ SJ MOSFET low-power package innovations
Addressing today’s consumer needs

**SOT-223**
The SOT-223 package without middle pin is a cost-effective alternative to DPAK, addressing the need for cost reductions in price-sensitive applications. It offers a smaller footprint, while still being pin-to-pin compatible with DPAK, thus, allowing a drop-in replacement for DPAK and second sourcing. Moreover, SOT-223 achieves comparable thermal performance to DPAK and enables customers to achieve improved form factors or space savings in designs with low power dissipation.

**ThinPAK 5x6**
ThinPAK 5x6 reduces the PCB area by 52 percent and height by 54 percent when compared to the DPAK package which is widely used in chargers and adapters. ThinPAK 5x6 is the right device to replace DPAK and meet the market demands of slimmer and smaller designs. Also, ThinPAK 5x6 enables a reduced charger and adapter case hot spot temperature by increasing the space between the MOSFET and the charger and adapter case.

**TO-220 FullPAK Narrow Lead**
Infineon’s TO-220 FullPAK Narrow Lead addresses customer needs with regards to height reduction requirements in adapter and charger applications. By offering an optimized standoff width and height and improved creepage distance, the package can be fully inserted into the PCB without any production concerns and, therefore, is especially suitable for slim and semi-slim adapter solutions.

**TO-220 FullPAK Wide Creepage**
This package solution has an increased creepage distance between the pins to 4.25 mm compared to 2.54 mm of a TO-220 FullPAK package. It targets open frame power supplies such as TV sets and PC power, where dust can enter the case through air vents. Dust particles can reduce the effective creepage between pins over time, which may lead to high voltage arcing. The package meets the requirements of open frame power supplies without any additional measures. Thus, it reduces system cost by offering an alternative to frequently used approaches to increase creepage distance.

www.infineon.com/coolmos-latest-packages
### 950V CoolMOS™ PFD7

<table>
<thead>
<tr>
<th>$R_{	ext{DS(on)}}$ [mΩ]</th>
<th>TO-220 FullPAK</th>
<th>TO247</th>
<th>TO252 DPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>IPW95R60PFD7†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>IPA95R130PFD7†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310</td>
<td>IPA95R310PFD7†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>IPA95R450PFD7†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 950V CoolMOS™ P7

<table>
<thead>
<tr>
<th>$R_{	ext{DS(on)}}$ [mΩ]</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>SOT-223</th>
<th>TO-251 Long lead</th>
<th>TO-252 DPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td>IPA95R450P7</td>
<td></td>
<td>IPU95R450P7</td>
<td>IPD95R450P7</td>
<td></td>
</tr>
<tr>
<td>750</td>
<td>IPA95R750P7</td>
<td></td>
<td>IPU95R750P7</td>
<td>IPD95R750P7</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>IPA95R1K2P7</td>
<td></td>
<td>IPU95R1K2P7</td>
<td>IPD95R1K2P7</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>IPA95R2K0P7</td>
<td></td>
<td>IPU95R2K0P7</td>
<td>IPD95R2K0P7</td>
<td></td>
</tr>
<tr>
<td>3700</td>
<td>IPA95R3KTP7</td>
<td></td>
<td>IPU95R3KTP7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 900V CoolMOS™ C3

<table>
<thead>
<tr>
<th>$R_{	ext{DS(on)}}$ [mΩ]</th>
<th>TO-220</th>
<th>TO-262 (IPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-252 (DPAK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>IP90R120C3</td>
<td></td>
<td></td>
<td>IP90R120C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>340</td>
<td>IP90R340C3</td>
<td>IP90R340C3</td>
<td>IPU90R340C3</td>
<td>IP90R340C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>IP90R500C3</td>
<td>IP90R500C3</td>
<td>IPU90R500C3</td>
<td>IP90R500C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>IP90R800C3</td>
<td>IP90R800C3</td>
<td>IPU90R800C3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>IP90R1K2C3</td>
<td>IP90R1K2C3</td>
<td>IPU90R1K2C3</td>
<td>IP90R1K2C3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 800V CoolMOS™ P7

<table>
<thead>
<tr>
<th>$R_{	ext{DS(on)}}$ [mΩ]</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-252 (DPAK)</th>
<th>TO-251 (IPAK)</th>
<th>TO-251 (IPAK Short Lead)</th>
<th>SOT-223</th>
<th>TO-220 FullPAK narrow lead</th>
<th>ThinPAK 5x6</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td>IP80R280P7</td>
<td>IP80R280P7</td>
<td>IP80R280P7</td>
<td>IP80R280P7</td>
<td></td>
<td>IP80R280P7</td>
<td>IPU80R280P7</td>
<td>IPD80R280P7</td>
<td>IPAN80R280P7</td>
</tr>
<tr>
<td>360</td>
<td>IP80R360P7</td>
<td>IP80R360P7</td>
<td>IP80R360P7</td>
<td>IP80R360P7</td>
<td></td>
<td>IP80R360P7</td>
<td>IPU80R360P7</td>
<td>IPD80R360P7</td>
<td>IPAN80R360P7</td>
</tr>
<tr>
<td>450</td>
<td>IP80R450P7</td>
<td>IP80R450P7</td>
<td>IP80R450P7</td>
<td></td>
<td></td>
<td>IP80R450P7</td>
<td>IPU80R450P7</td>
<td>IPD80R450P7</td>
<td>IPAN80R450P7</td>
</tr>
<tr>
<td>600</td>
<td>IP80R600P7</td>
<td>IP80R600P7</td>
<td>IP80R600P7</td>
<td>IP80R600P7</td>
<td>IP80R600P7</td>
<td>IP80R600P7</td>
<td>IPU80R600P7</td>
<td>IPD80R600P7</td>
<td>IPD80R600P7</td>
</tr>
<tr>
<td>750</td>
<td>IP80R750P7</td>
<td>IP80R750P7</td>
<td>IP80R750P7</td>
<td>IP80R750P7</td>
<td>IP80R750P7</td>
<td>IP80R750P7</td>
<td>IPU80R750P7</td>
<td>IPD80R750P7</td>
<td>IPD80R750P7</td>
</tr>
<tr>
<td>900</td>
<td>IP80R900P7</td>
<td>IP80R900P7</td>
<td>IP80R900P7</td>
<td>IP80R900P7</td>
<td>IP80R900P7</td>
<td>IP80R900P7</td>
<td>IPU80R900P7</td>
<td>IPD80R900P7</td>
<td>IPD80R900P7</td>
</tr>
<tr>
<td>1200</td>
<td>IP80R1K2P7</td>
<td>IP80R1K2P7</td>
<td>IP80R1K2P7</td>
<td>IP80R1K2P7</td>
<td>IP80R1K2P7</td>
<td>IP80R1K2P7</td>
<td>IPU80R1K2P7</td>
<td>IPD80R1K2P7</td>
<td>IPD80R1K2P7</td>
</tr>
<tr>
<td>1400</td>
<td>IP80R1K4P7</td>
<td>IP80R1K4P7</td>
<td>IP80R1K4P7</td>
<td>IP80R1K4P7</td>
<td>IP80R1K4P7</td>
<td>IP80R1K4P7</td>
<td>IPU80R1K4P7</td>
<td>IPD80R1K4P7</td>
<td>IPD80R1K4P7</td>
</tr>
<tr>
<td>2000</td>
<td>IP80R2K0P7</td>
<td>IP80R2K0P7</td>
<td>IP80R2K0P7</td>
<td>IP80R2K0P7</td>
<td>IP80R2K0P7</td>
<td>IP80R2K0P7</td>
<td>IPU80R2K0P7</td>
<td>IPD80R2K0P7</td>
<td>IPD80R2K0P7</td>
</tr>
<tr>
<td>2400</td>
<td>IP80R2K4P7</td>
<td>IP80R2K4P7</td>
<td>IP80R2K4P7</td>
<td>IP80R2K4P7</td>
<td>IP80R2K4P7</td>
<td>IP80R2K4P7</td>
<td>IPU80R2K4P7</td>
<td>IPD80R2K4P7</td>
<td>IPD80R2K4P7</td>
</tr>
<tr>
<td>3300</td>
<td>IP80R3K3P7</td>
<td>IP80R3K3P7</td>
<td>IP80R3K3P7</td>
<td>IP80R3K3P7</td>
<td>IP80R3K3P7</td>
<td>IP80R3K3P7</td>
<td>IPU80R3K3P7</td>
<td>IPD80R3K3P7</td>
<td>IPD80R3K3P7</td>
</tr>
<tr>
<td>4500</td>
<td>IP80R4K5P7</td>
<td>IP80R4K5P7</td>
<td>IP80R4K5P7</td>
<td>IP80R4K5P7</td>
<td>IP80R4K5P7</td>
<td>IP80R4K5P7</td>
<td>IPU80R4K5P7</td>
<td>IPD80R4K5P7</td>
<td>IPD80R4K5P7</td>
</tr>
</tbody>
</table>

www.infineon.com/coolmos  
www.infineon.com/c3  
www.infineon.com/800v-p7  
www.infineon.com/950v-p7  
www.infineon.com/950v-p7

* Coming soon
### 800 V CoolMOS™ CE

<table>
<thead>
<tr>
<th>( \text{R}_{\text{DS(on)}} ) [mΩ]</th>
<th>TO-220 FullPAK</th>
<th>TO-252 (DPAK)</th>
<th>TO-251 (PAK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>310</td>
<td>IPA80R310CE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>IPA80R460CE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>IPA80R650CE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>IPA80R1K0CE</td>
<td>IPD80R1K0CE</td>
<td>IPU80R1K0CE</td>
</tr>
<tr>
<td>1400</td>
<td>IPA80R1K4CE</td>
<td>IPD80R1K4CE</td>
<td></td>
</tr>
<tr>
<td>2800</td>
<td></td>
<td>IPD80R2K8CE</td>
<td></td>
</tr>
</tbody>
</table>

### 800 V CoolMOS™ C3

<table>
<thead>
<tr>
<th>( \text{R}_{\text{DS(on)}} ) [mΩ]</th>
<th>TO-220</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-252 (DPAK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td></td>
<td></td>
<td>SPW55N80C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>290</td>
<td>SPP17N80C3</td>
<td>SPB17N80C3</td>
<td>SPA17N80C3</td>
<td>SPW17N80C3</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>SPP11N80C3</td>
<td>SPA11N80C3</td>
<td>SPW11N80C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>SPP08N80C3</td>
<td>SPA08N80C3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>SPP06N80C3</td>
<td>SPA06N80C3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1300</td>
<td>SPP04N80C3</td>
<td>SPA04N80C3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2700</td>
<td></td>
<td>SPA02N80C3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 700 V CoolMOS™ P7

<table>
<thead>
<tr>
<th>( \text{R}_{\text{DS(on)}} ) [mΩ]</th>
<th>TO-251 (PAK Short Lead)</th>
<th>TO-220 FullPAK</th>
<th>TO-252 (DPAK)</th>
<th>TO-251 (PAK Short Lead w/ ISO Standoff)</th>
<th>SOT-223</th>
<th>ThinPAK Sx6</th>
</tr>
</thead>
<tbody>
<tr>
<td>360</td>
<td>IPS70R360P7S</td>
<td>IPA70R360P7S</td>
<td>IPD70R360P7S</td>
<td>IPANT70R360P7S</td>
<td>IPS70R360P7S</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td></td>
<td>IPA70R450P7S</td>
<td>IPD70R450P7S</td>
<td>IPANT70R450P7S</td>
<td>IPS70R450P7S</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>IPS70R600P7S</td>
<td>IPA70R600P7S</td>
<td>IPD70R600P7S</td>
<td>IPANT70R600P7S</td>
<td>IPS70R600P7S</td>
<td>IPK70R600P7</td>
</tr>
<tr>
<td>750</td>
<td>IPS70RT50P7S</td>
<td>IPA70RT50P7S</td>
<td>IPD70RT50P7S</td>
<td>IPANT70RT50P7S</td>
<td>IPS70RT50P7S</td>
<td>IPK70RT50P7</td>
</tr>
<tr>
<td>900</td>
<td>IPS70R900P7S</td>
<td>IPA70R900P7S</td>
<td>IPD70R900P7S</td>
<td>IPANT70R900P7S</td>
<td>IPS70R900P7S</td>
<td>IPK70R900P7</td>
</tr>
<tr>
<td>1200</td>
<td>IPS70R1K0P7S</td>
<td>IPA70R1K0P7S</td>
<td>IPD70R1K0P7S</td>
<td>IPANT70R1K0P7S</td>
<td>IPS70R1K0P7S</td>
<td>IPK70R1K0P7</td>
</tr>
<tr>
<td>1400</td>
<td>IPS70R1K4P7S</td>
<td>IPA70R1K4P7S</td>
<td>IPD70R1K4P7S</td>
<td>IPANT70R1K4P7S</td>
<td>IPS70R1K4P7S</td>
<td>IPK70R1K4P7</td>
</tr>
<tr>
<td>2000</td>
<td>IPS70R2K0P7S</td>
<td>IPA70R2K0P7S</td>
<td>IPD70R2K0P7S</td>
<td>IPANT70R2K0P7S</td>
<td>IPS70R2K0P7S</td>
<td>IPK70R2K0P7</td>
</tr>
</tbody>
</table>

### 700 V CoolMOS™ CE

<table>
<thead>
<tr>
<th>( \text{R}_{\text{DS(on)}} ) [mΩ]</th>
<th>TO-220 FullPAK Wide Creepage</th>
<th>TO-262 (PAK)</th>
<th>TO-251 (PAK Short Lead with ISO Standoff)</th>
<th>TO-252 (DPAK)</th>
<th>TO-251 (PAK Short Lead)</th>
<th>SOT-223</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>IPA70R600CE</td>
<td>IPS70R600CE</td>
<td>IPD70R600CE</td>
<td>IPS70R600CE</td>
<td>IPS70R600CE</td>
<td></td>
</tr>
<tr>
<td>950</td>
<td>IPA70R950CE</td>
<td>IPS70R950CE</td>
<td>IPD70R950CE</td>
<td>IPS70R950CE</td>
<td>IPS70R950CE</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPN70R1K0CE</td>
</tr>
<tr>
<td>1400</td>
<td>IPS70R1K4CE</td>
<td>IPD70R1K4CE</td>
<td>IPS70R1K4CE</td>
<td>IPS70R1K4CE</td>
<td>IPS70R1K4CE</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPN70R1K5CE</td>
</tr>
<tr>
<td>2000</td>
<td>IPS70R2K0CE</td>
<td>IPD70R2K0CE</td>
<td>IPS70R2K0CE</td>
<td>IPS70R2K0CE</td>
<td>IPS70R2K0CE</td>
<td></td>
</tr>
<tr>
<td>2100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPN70R2K1CE</td>
</tr>
</tbody>
</table>
### 650 V CoolMOS™ C7

<table>
<thead>
<tr>
<th>R_D(on) [mΩ]</th>
<th>TO-220</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 4-pin</th>
<th>TO-252 (DPAK)</th>
<th>ThinPAK 8x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>IPWS6R018CF7</td>
<td>IP26SR018CF7</td>
<td>IP6WS6R018CF7</td>
<td>IP26SR018CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>IPWS6R018CF7</td>
<td>IP26SR018CF7</td>
<td>IP6WS6R018CF7</td>
<td>IP26SR018CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>IPWS6R021CF7</td>
<td>IP26SR021CF7</td>
<td>IP6WS6R021CF7</td>
<td>IP26SR021CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IPT6S040CF7</td>
<td>IPT6S040CF7</td>
<td>IP6T6S040CF7</td>
<td>IP6T6S040CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>IPT6S040CF7</td>
<td>IPT6S040CF7</td>
<td>IP6T6S040CF7</td>
<td>IP6T6S040CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IPWS6R060CF7</td>
<td>IP26SR060CF7</td>
<td>IP6WS6R060CF7</td>
<td>IP26SR060CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>IPT6S065CF7</td>
<td>IPT6S065CF7</td>
<td>IP6T6S065CF7</td>
<td>IP6T6S065CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>IPT6S080CF7</td>
<td>IPT6S080CF7</td>
<td>IP6T6S080CF7</td>
<td>IP6T6S080CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>IPT6S090CF7</td>
<td>IPT6S090CF7</td>
<td>IP6T6S090CF7</td>
<td>IP6T6S090CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>IPT6S099CF7</td>
<td>IPT6S099CF7</td>
<td>IP6T6S099CF7</td>
<td>IP6T6S099CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>IP6WS6R110CF7</td>
<td>IP26SR110CF7</td>
<td>IP6WS6R110CF7</td>
<td>IP26SR110CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>IP6WS6R110CF7</td>
<td>IP26SR110CF7</td>
<td>IP6WS6R110CF7</td>
<td>IP26SR110CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IP6WS6R125CF7</td>
<td>IP26SR125CF7</td>
<td>IP6WS6R125CF7</td>
<td>IP26SR125CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>IP6WS6R125CF7</td>
<td>IP26SR125CF7</td>
<td>IP6WS6R125CF7</td>
<td>IP26SR125CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>IP6WS6R150CF7</td>
<td>IP26SR150CF7</td>
<td>IP6WS6R150CF7</td>
<td>IP26SR150CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>IP6WS6R150CF7</td>
<td>IP26SR150CF7</td>
<td>IP6WS6R150CF7</td>
<td>IP26SR150CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>IP6WS6R160CF7</td>
<td>IP26SR160CF7</td>
<td>IP6WS6R160CF7</td>
<td>IP26SR160CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>IP6WS6R190CF7</td>
<td>IP26SR190CF7</td>
<td>IP6WS6R190CF7</td>
<td>IP26SR190CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>IP6WS6R200CF7</td>
<td>IP26SR200CF7</td>
<td>IP6WS6R200CF7</td>
<td>IP26SR200CF7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Solutions and Applications

- **CoolMOS™ product portfolio**
- **Power management ICs**
- **Intelligent power switches and modules**
- **Gate-driver ICs**
- **Microcontrollers**
- **Sensors**
- **Digital isolators**

---

For more details on the product, visit [www.infineon.com/coolmos](http://www.infineon.com/coolmos) or [www.infineon.com/cfd2](http://www.infineon.com/cfd2)
## 600 V CoolMOS™ P7

<table>
<thead>
<tr>
<th>R&lt;sub&gt;DS(on) (mΩ)&lt;/sub&gt;</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 4-pin asymmetric leads</th>
<th>TO-252 (DPAK)</th>
<th>ThinPAK 8x8</th>
<th>D'PAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 600 V CoolMOS™ PFD7

<table>
<thead>
<tr>
<th>R&lt;sub&gt;DS(on) (mΩ)&lt;/sub&gt;</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-251 (DPAK)</th>
<th>TO-252 (DPAK)</th>
<th>SOT-223</th>
<th>ThinPAK 5x6</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 600 V CoolMOS™ CFD7

<table>
<thead>
<tr>
<th>R&lt;sub&gt;DS(on) (mΩ)&lt;/sub&gt;</th>
<th>TO-220</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>ThinPAK 8x8</th>
<th>DDPAK</th>
<th>To-Leadless (TOLL)</th>
<th>QDPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31/35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40/45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

For more details on the product, click on the part number, visit infineon.com or contact our product support.

*Coming soon*
### 600 V CoolMOS™ S7

<table>
<thead>
<tr>
<th>R(_{DS(on)}) [mΩ]</th>
<th>TO-220</th>
<th>TO-Leadless (TOLL)</th>
<th>TO247-3</th>
<th>QDPAK TSC</th>
<th>QDPAK BSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>IPW60R01057*</td>
<td></td>
<td>IPQ60R011057*</td>
<td>IPQ60R011057*</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>IPW60R01757*</td>
<td></td>
<td>IPQ60R01757*</td>
<td>IPQ60R01757*</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>IPP60R02257</td>
<td>ITP60R02257</td>
<td>IPW60R02257</td>
<td>IPQ60R02257*</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IPW60R04057</td>
<td>ITP60R04057</td>
<td>IPW60R04057</td>
<td>IPQ60R04057*</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>IPP60R06557</td>
<td>ITP60R06557</td>
<td>IPW60R06557</td>
<td>IPQ60R06557*</td>
<td></td>
</tr>
</tbody>
</table>

### 600 V CoolMOS™ C7 Gold (G-series)

<table>
<thead>
<tr>
<th>R(_{DS(on)}) [mΩ]</th>
<th>TO-Leadless (TOLL)</th>
<th>TO-252 (Double DPAK)</th>
<th>ThinPAK 8x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>IPT60R017G7</td>
<td>IPZ60R017G7</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>IPT60R028G7</td>
<td>IPZ60R028G7</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IPB60R040G7</td>
<td>IPZ60R040G7</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IPB60R060G7</td>
<td>IPZ60R060G7</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>IPB60R080G7</td>
<td>IPZ60R080G7</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>IPT60R102G7</td>
<td>IPZ60R102G7</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IPT60R125G7</td>
<td>IPZ60R125G7</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>IPT60R150G7</td>
<td>IPZ60R150G7</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>IPT60R190G7</td>
<td>IPZ60R190G7</td>
<td></td>
</tr>
</tbody>
</table>

### 600 V CoolMOS™ C7

<table>
<thead>
<tr>
<th>R(_{DS(on)}) [mΩ]</th>
<th>TO-220</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 4-pin</th>
<th>TO-252 (DPAK)</th>
<th>ThinPAK 8x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>IPW60R017C7</td>
<td>IPW60R017C7</td>
<td>IP60R017C7</td>
<td>IP60R017C7</td>
<td>IP60R017C7</td>
<td>IP60R017C7</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>IPT60R028G7</td>
<td>IPT60R028G7</td>
<td>IP60R028G7</td>
<td>IP60R028G7</td>
<td>IP60R028G7</td>
<td>IP60R028G7</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IPB60R040C7</td>
<td>IPB60R040C7</td>
<td>IP60R040C7</td>
<td>IP60R040C7</td>
<td>IP60R040C7</td>
<td>IP60R040C7</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IPB60R060C7</td>
<td>IPB60R060C7</td>
<td>IP60R060C7</td>
<td>IP60R060C7</td>
<td>IP60R060C7</td>
<td>IP60R060C7</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>IPB60R080C7</td>
<td>IPB60R080C7</td>
<td>IP60R080C7</td>
<td>IP60R080C7</td>
<td>IP60R080C7</td>
<td>IP60R080C7</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>IPT60R102G7</td>
<td>IPT60R102G7</td>
<td>IP60R102G7</td>
<td>IP60R102G7</td>
<td>IP60R102G7</td>
<td>IP60R102G7</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IPT60R125G7</td>
<td>IPT60R125G7</td>
<td>IP60R125G7</td>
<td>IP60R125G7</td>
<td>IP60R125G7</td>
<td>IP60R125G7</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>IPT60R150G7</td>
<td>IPT60R150G7</td>
<td>IP60R150G7</td>
<td>IP60R150G7</td>
<td>IP60R150G7</td>
<td>IP60R150G7</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>IPT60R190G7</td>
<td>IPT60R190G7</td>
<td>IP60R190G7</td>
<td>IP60R190G7</td>
<td>IP60R190G7</td>
<td>IP60R190G7</td>
<td></td>
</tr>
</tbody>
</table>

### 600 V CoolMOS™ P6

<table>
<thead>
<tr>
<th>R(_{DS(on)}) [mΩ]</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-263 (DPAK)</th>
<th>TO-247</th>
<th>TO-247 4-pin</th>
<th>TO-252 (DPAK)</th>
<th>ThinPAK 5x6</th>
<th>ThinPAK 8x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>IPW60R041P6</td>
<td></td>
<td>IPZ60R041P6</td>
<td>IP60R041P6</td>
<td>IP60R041P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>IPW60R070P6</td>
<td></td>
<td>IPZ60R070P6</td>
<td>IP60R070P6</td>
<td>IP60R070P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>IP60R099P6</td>
<td></td>
<td>IP60R099P6</td>
<td>IP60R099P6</td>
<td>IP60R099P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IP60R125P6</td>
<td></td>
<td>IP60R125P6</td>
<td>IP60R125P6</td>
<td>IP60R125P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>IP60R160P6</td>
<td></td>
<td>IP60R160P6</td>
<td>IP60R160P6</td>
<td>IP60R160P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>IP60R180P6</td>
<td></td>
<td>IP60R180P6</td>
<td>IP60R180P6</td>
<td>IP60R180P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>IP60R210P6</td>
<td></td>
<td>IP60R210P6</td>
<td>IP60R210P6</td>
<td>IP60R210P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>IP60R230P6</td>
<td></td>
<td>IP60R230P6</td>
<td>IP60R230P6</td>
<td>IP60R230P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
<td>IP60R255P6</td>
<td></td>
<td>IP60R255P6</td>
<td>IP60R255P6</td>
<td>IP60R255P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>IP60R280P6</td>
<td></td>
<td>IP60R280P6</td>
<td>IP60R280P6</td>
<td>IP60R280P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>330/360</td>
<td>IP60R330P6</td>
<td></td>
<td>IP60R330P6</td>
<td>IP60R330P6</td>
<td>IP60R330P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>380</td>
<td>IP60R380P6</td>
<td></td>
<td>IP60R380P6</td>
<td>IP60R380P6</td>
<td>IP60R380P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>IP60R600P6</td>
<td></td>
<td>IP60R600P6</td>
<td>IP60R600P6</td>
<td>IP60R600P6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>IP60R650P6</td>
<td></td>
<td>IP60R650P6</td>
<td>IP60R650P6</td>
<td>IP60R650P6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
### 800 V CoolMOS™ C3A

<table>
<thead>
<tr>
<th>$R_{DS(	ext{on})}$ @ $T_J = 25^\circ\text{C}$</th>
<th>TO-247</th>
<th>TO-252</th>
<th>TO-263</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{GS} = 10$ V [mΩ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>290</td>
<td>IPW80R290C3A</td>
<td></td>
<td>IPB80R290C3A</td>
</tr>
<tr>
<td>2700</td>
<td>IPD80R2KTC3A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 650 V CoolMOS™ CFDA

<table>
<thead>
<tr>
<th>$R_{DS(	ext{on})}$ @ $T_J = 25^\circ\text{C}$</th>
<th>TO-220</th>
<th>TO-247</th>
<th>TO-252</th>
<th>TO-263</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{GS} = 10$ V [mΩ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>IPW65R048CFDA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>IPW65R080CFDA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>IPP65R110CFDA</td>
<td>IPP65R110CFDA</td>
<td>IPB65R110CFDA</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>IPP65R150CFDA</td>
<td>IPP65R150CFDA</td>
<td>IPB65R150CFDA</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td></td>
<td>IPB65R190CFDA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310</td>
<td></td>
<td>IPB65R310CFDA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>420</td>
<td></td>
<td>IPD65R420CFDA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>660</td>
<td></td>
<td>IPD65R660CFDA</td>
<td>IPB65R660CFDA</td>
<td></td>
</tr>
</tbody>
</table>
### 650 V CoolMOS™ CFD7A

<table>
<thead>
<tr>
<th>( R_{DS(on)} ) at ( T_J = 25^\circ C )</th>
<th>TO-220</th>
<th>TO-247</th>
<th>TO-247 3-pin</th>
<th>TO-263 7-pin</th>
<th>QDPAK BSC</th>
<th>QDPAK TSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>IPW65R017CFD7A*</td>
<td>IPW65R017CFD7A*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>IPW65R022CFD7A</td>
<td>IPW65R022CFD7A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>IPW65R029CFD7A*</td>
<td>IPW65R029CFD7A*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>IPW65R035CFD7A</td>
<td>IPW65R035CFD7A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IPW65R040CFD7A*</td>
<td>IPW65R040CFD7A*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>IPP65R050CFD7A</td>
<td>IPP65R050CFD7A</td>
<td>IPB65R050CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IPP65R060CFD7A</td>
<td>IPP65R060CFD7A</td>
<td>IPB65R060CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>IPP65R075CFD7A</td>
<td>IPP65R075CFD7A</td>
<td>IPB65R075CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>IPP65R099CFD7A</td>
<td>IPP65R099CFD7A</td>
<td>IPB65R099CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>IPP65R115CFD7A</td>
<td>IPP65R115CFD7A</td>
<td>IPB65R115CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>IPP65R125CFD7A*</td>
<td>IPP65R125CFD7A*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>IPP65R145CFD7A</td>
<td>IPP65R145CFD7A</td>
<td>IPB65R145CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>IPP65R190CFD7A</td>
<td>IPP65R190CFD7A</td>
<td>IPB65R190CFD7A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>IPP65R230CFD7A</td>
<td>IPP65R230CFD7A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 600 V CoolMOS™ CPA

<table>
<thead>
<tr>
<th>( R_{DS(on)} ) at ( T_J = 25^\circ C )</th>
<th>TO-220</th>
<th>TO-247</th>
<th>TO-262</th>
<th>TO-263</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>IPW60R045CPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>IPW60R075CPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>IPP60R099CPA</td>
<td>IPP60R099CPA</td>
<td>IP60R099CPA</td>
<td>IPB60R099CPA</td>
</tr>
<tr>
<td>199</td>
<td>IPP60R190CPA</td>
<td>IPP60R190CPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>299</td>
<td>IPP60R299CPA</td>
<td>IPP60R299CPA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 600 V CoolMOS™ S7A

<table>
<thead>
<tr>
<th>( R_{DS(on)} ) at ( T_J = 25^\circ C )</th>
<th>QDPAK TSC</th>
<th>QDPAK BSC</th>
<th>TO-247 3-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>IPDQ60R040ST7A*</td>
<td>IPDQ60R040ST7A*</td>
<td>IPW60R040ST7A*</td>
</tr>
<tr>
<td>22</td>
<td>IPDQ60R022ST7A*</td>
<td>IPDQ60R022ST7A*</td>
<td>IPW60R022ST7A*</td>
</tr>
<tr>
<td>17</td>
<td>IPDQ60R017ST7A*</td>
<td>IPDQ60R017ST7A*</td>
<td>IPW60R017ST7A*</td>
</tr>
<tr>
<td>10</td>
<td>IPDQ60R010ST7A</td>
<td>IPDQ60R010ST7A</td>
<td>IPW60R010ST7A*</td>
</tr>
</tbody>
</table>

*Coming soon*

www.infineon.com/coolmos-automotive
www.infineon.com/cfd7a
www.infineon.com/s7a
For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/coolmos-latest-packages

### CoolMOS™ SJ MOSFETs – packages

#### SOT-223

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>600</td>
<td></td>
<td>550/1400</td>
<td>2000/3000</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>P7</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td>1000/1500</td>
<td>2100/3400</td>
<td></td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000/1500</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td>360</td>
<td>450/500</td>
<td>750</td>
<td>900/1200/1400</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000/1500</td>
<td>2100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td>600/750</td>
<td>900/1200/1400</td>
<td>2000/2400/3300/4500</td>
<td></td>
<td>1200</td>
<td>2000/3700</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>950</td>
<td>P7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TO-247

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>P7</td>
<td>24/37/45</td>
<td>60/80</td>
<td>99/120</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>17/40</td>
<td>60</td>
<td>99/120</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2P7</td>
<td>41</td>
<td>70</td>
<td>99/125</td>
<td>160/190</td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td>18/24/31/40/55</td>
<td>70</td>
<td>90/105/125/145</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CP2A</td>
<td>10/24/41</td>
<td>60</td>
<td>90/110/125</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CT</td>
<td>19/45</td>
<td>65</td>
<td>96/125</td>
<td>190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD2</td>
<td>41</td>
<td>80</td>
<td>99/125</td>
<td>150/190</td>
<td>420</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>48</td>
<td>80</td>
<td>110</td>
<td>150/190</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>22/35/50</td>
<td>75</td>
<td>90/115/145</td>
<td>190</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td>280</td>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT</td>
<td>85</td>
<td>290</td>
<td>450</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>CT</td>
<td>120</td>
<td>340</td>
<td>550</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>CFD7</td>
<td>60/°</td>
<td>130/°</td>
<td>310/°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TO-247 short leads

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>650</td>
<td>CFD7A</td>
<td>22/36/50</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TO-247 4-pin

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>C7</td>
<td>17/40</td>
<td>60</td>
<td>99/120</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P4</td>
<td>70</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>C7</td>
<td>19/45</td>
<td>65</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TO-247 4-pin asymmetric leads

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>P7</td>
<td>24/37/45</td>
<td>60/80</td>
<td>99/120</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>18/29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### IPAK

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>600</td>
<td></td>
<td>550/1400</td>
<td>2000/3000</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td>600</td>
<td>750</td>
<td>900/1200/1400</td>
<td>2000/2400/ 3300/4500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>950</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td></td>
<td>2000/3700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage [V]</td>
<td>Series</td>
<td>0-59</td>
<td>60-89</td>
<td>90-149</td>
<td>150-199</td>
<td>200-299</td>
<td>300-400</td>
<td>401-600</td>
<td>601-899</td>
<td>900-1500</td>
<td>&gt;1500</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
<td>---------</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>600</td>
<td>CE</td>
<td>400</td>
<td>600</td>
<td>1000</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
<td>8000</td>
</tr>
<tr>
<td></td>
<td>PFD7</td>
<td>210</td>
<td>360</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>650</td>
<td>CE</td>
<td>400</td>
<td>650</td>
<td>1000</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
<td>8000</td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td>360</td>
<td>600</td>
<td>900</td>
<td>1400</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td>600</td>
<td>750</td>
<td>900</td>
<td>1200</td>
<td>1400</td>
<td>1700</td>
<td>2000</td>
<td>2400</td>
<td>2800</td>
<td>3200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>CPA</td>
<td>99</td>
<td>190</td>
<td>340</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>650</td>
<td>CFD2</td>
<td>190</td>
<td>340</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
</tr>
<tr>
<td>700</td>
<td>CE</td>
<td>950</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td>900</td>
<td>C3</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>CE</td>
<td>180</td>
<td>380</td>
<td>500</td>
<td>600</td>
<td>800</td>
<td>1000</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>600</td>
<td>P7</td>
<td>280</td>
<td>380</td>
<td>500</td>
<td>600</td>
<td>800</td>
<td>1000</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>180</td>
<td>360</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td>400</td>
<td>600</td>
<td>900</td>
<td>1400</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>P6</td>
<td>380</td>
<td>600</td>
<td>900</td>
<td>1400</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>145</td>
<td>170</td>
<td>210</td>
<td>300</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>PFD7</td>
<td>210</td>
<td>360</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>650</td>
<td>CE</td>
<td>190</td>
<td>225</td>
<td>400</td>
<td>650</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td></td>
<td>CFD2</td>
<td>190</td>
<td>225</td>
<td>400</td>
<td>650</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td></td>
<td>CFD4</td>
<td>190</td>
<td>225</td>
<td>400</td>
<td>650</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td>360</td>
<td>600</td>
<td>900</td>
<td>1400</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td>280</td>
<td>360</td>
<td>450</td>
<td>700</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>C3A</td>
<td>600</td>
<td>900</td>
<td>1200</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td>1200</td>
<td>1800</td>
<td>2250</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
</tr>
<tr>
<td>900</td>
<td>C3</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
</tr>
<tr>
<td>950</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>PFD7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td>2000</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
</tr>
</tbody>
</table>
### D²PAK

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>C7</td>
<td>60</td>
<td>99/120</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P7</td>
<td>60/80</td>
<td>99/120</td>
<td>180</td>
<td>280</td>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>C7</td>
<td>55</td>
<td>9/105</td>
<td>125/145</td>
<td>170</td>
<td>210</td>
<td>280</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>41</td>
<td>95/110</td>
<td>125/145</td>
<td>165</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>C7</td>
<td>45</td>
<td>95/125</td>
<td>190</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>110</td>
<td>150/150</td>
<td>310</td>
<td>660</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>C6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>340</td>
</tr>
</tbody>
</table>

### D²PAK 7-pin

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>650</td>
<td>CFD7A</td>
<td>50</td>
<td>75</td>
<td>99/115</td>
<td>145/190</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Double DPAK (DDPAK)

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>CFD7</td>
<td>45/53</td>
<td>75</td>
<td>102/125</td>
<td>125/145</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GT</td>
<td>50</td>
<td>80</td>
<td>102/125</td>
<td>150/190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### QDPACK TSC

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>ST</td>
<td>10/17/20/40</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S1A</td>
<td>14/17/22/40/45</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CFD7</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### QDPACK BSC

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>ST</td>
<td>10/17/22/40/45</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S1A</td>
<td>10/17/22/40/45</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CFD7</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TO-220 FullPAK

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>C6</td>
<td>60/80</td>
<td>99/120</td>
<td>180</td>
<td>280</td>
<td>380</td>
<td>460</td>
<td>500</td>
<td>800</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>C7</td>
<td>60</td>
<td>99/120</td>
<td>180</td>
<td>280</td>
<td>380</td>
<td>460</td>
<td>500</td>
<td>800</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P7</td>
<td>280</td>
<td>360</td>
<td>450</td>
<td>500</td>
<td>575</td>
<td>900/1200/1400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>C5</td>
<td>290</td>
<td>450</td>
<td>650</td>
<td>900/1300</td>
<td>2700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>310</td>
<td>460</td>
<td>650</td>
<td>900/1300</td>
<td>2700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td>340</td>
<td>500</td>
<td>800</td>
<td>1000/1500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td>P7</td>
<td>450</td>
<td>750</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>PFD7</td>
<td>125</td>
<td>210/280</td>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TO-220 FullPAK Narrow Lead

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>C6</td>
<td>60</td>
<td>99/120</td>
<td>180</td>
<td>280</td>
<td>380</td>
<td>460</td>
<td>500</td>
<td>800</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>C7</td>
<td>60/80</td>
<td>99/120</td>
<td>180</td>
<td>280</td>
<td>380</td>
<td>460</td>
<td>500</td>
<td>800</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P7</td>
<td>280</td>
<td>360</td>
<td>450</td>
<td>500</td>
<td>575</td>
<td>900/1200/1400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CFD7</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>60/80</td>
<td>99/110</td>
<td>125</td>
<td>150</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number.

www.infineon.com/coolmos-latest-packages

*Coming soon*
**CoolMOS™ product portfolio**

**Solutions and Applications**
- Packages
- 20-300 V MOSFETs
- 500-950 V MOSFETs
- Gate-driver ICs
- Digital isolators
- IGBT discretes and silicon power diodes
- Power management ICs
- Intelligent power switches and modules
- Microcontrollers
- Sensors
- Digital isolators

**TO-Leadless**

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>CFD7</td>
<td>35/45/55</td>
<td>75</td>
<td>90/105/125/145</td>
<td>150</td>
<td>200-299</td>
<td>300-400</td>
<td>401-600</td>
<td>601-899</td>
<td>900-1500</td>
<td>&gt;1500</td>
</tr>
<tr>
<td></td>
<td>G7</td>
<td>28/50</td>
<td>80</td>
<td>102/125</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S7</td>
<td>22/40</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CFD7</td>
<td>40*</td>
<td>60*/80*</td>
<td>99*/125*</td>
<td>155*/190*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TO-220**

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>P7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>190</td>
<td>380</td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>40</td>
<td>60</td>
<td>99/120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P6</td>
<td></td>
<td></td>
<td>99/125</td>
<td>160/190</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>70</td>
<td>90/105/125/145</td>
<td>170</td>
<td>280</td>
<td>360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPA</td>
<td></td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S7</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>CFD7</td>
<td>41</td>
<td>60</td>
<td>90/110</td>
<td>155</td>
<td>190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>45</td>
<td>65</td>
<td>95/125</td>
<td>180</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD2</td>
<td></td>
<td></td>
<td>110</td>
<td>150/190</td>
<td>310</td>
<td>420</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFDA</td>
<td>50</td>
<td>99/110/115</td>
<td>150/190</td>
<td>310</td>
<td>660</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7A</td>
<td>50/75*</td>
<td>60/115/145*</td>
<td>190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>P7</td>
<td></td>
<td></td>
<td>280</td>
<td>360</td>
<td>450/600</td>
<td>750</td>
<td>900/1200/1400</td>
<td>900/1200/1400</td>
<td>900/1200/1400</td>
<td>900/1200/1400</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td></td>
<td></td>
<td>290</td>
<td>450</td>
<td>650</td>
<td>900/1300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TO-220 FullPAK Wide Creepage**

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>P7</td>
<td></td>
<td></td>
<td>180</td>
<td>280</td>
<td>360</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE</td>
<td></td>
<td></td>
<td>190</td>
<td>280</td>
<td>380</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>600</td>
<td>950</td>
</tr>
</tbody>
</table>

**ThinPAK 5x6**

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>PFD7</td>
<td></td>
<td></td>
<td>360</td>
<td>600</td>
<td>1000/1500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>P7</td>
<td></td>
<td></td>
<td>600</td>
<td>750</td>
<td>900/1200/1400</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>P7</td>
<td></td>
<td></td>
<td>600</td>
<td>750</td>
<td>900/1200/1400</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ThinPAK 8x8**

<table>
<thead>
<tr>
<th>Voltage [V]</th>
<th>Series</th>
<th>0-59</th>
<th>60-89</th>
<th>90-149</th>
<th>150-199</th>
<th>200-299</th>
<th>300-400</th>
<th>401-600</th>
<th>601-899</th>
<th>900-1500</th>
<th>&gt;1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>P7</td>
<td>65/85</td>
<td>105/125</td>
<td>185</td>
<td>285</td>
<td>365</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>65</td>
<td>104/125</td>
<td>185</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD7</td>
<td>60/75</td>
<td>95/115/140</td>
<td>160/185</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P6</td>
<td></td>
<td>180</td>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>CFD7</td>
<td>65</td>
<td>95/115/130</td>
<td>160</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>70</td>
<td>99/130</td>
<td>195</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD2</td>
<td>165</td>
<td>210</td>
<td>340</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

www.infineon.com/coolmos-latest-packages

*Coming soon*
Nomenclature

Power MOSFETs (until 2005)

Company
S = Formerly Siemens
P = Power MOSFET
Device

Package type
A = TO-220 FullPAK
B = TO-263 (D²PAK)
D = TO-252 (DPAK)
I = TO-262 (P²PAK)
N = SOT-223
P = TO-220
U = TO-251 (P²PAK)
W = TO-247
Z = TO-247 4-pin

Specifications
Continuous drain current
(@ $T_C = 25°C$) [A]

Breakdown voltage
Divided by 10 (60x10=600 V)

Technology
N = N-channel transistors

Continuous drain current
(@ $T_C = 25°C$) [A]

Power MOSFETs (from October 2015 onwards)

Company
I = Infineon
P = Power MOSFET
Device

Package type (max. 2 digits)
A = TO-220 FullPAK
B = TO-263 (D²PAK)
C = Bare die
D = TO-252 (DPAK)
I = TO-262 (P²PAK)
L = ThinPAK 6x8
N = SOT-223
P = TO-220
S = TO-251 (PAK Short Lead)
U = TO-251 (PAK Long Lead)
W = TO-247
Z = TO-247 4-pin
T = TO-Leadless
DD = TO-252 (Double DPAK)
AW = TO-220 (Wide Crepage)
AH = TO-220 (Narrow Lead)
LS = ThinPAK 5x6
LK = ThinPAK 5x6 Kelvin source
DQ = TO-252 (Quadruple DPAK)
SA = TO-251 (PAK Short Lead with ISO Standoff)
ZA = TO-247 4-pin asymmetric

Reliability
blank = Industrial
A = Automotive
S = Standard

Series name (2-4 digits)
In this case CoolMOS™ P7
(max. digits e.g. CFD7)

$R_{DS(on)}$ [mΩ]

Breakdown voltage
Divided by 10 (60x10 = 600 V)

Automotive MOSFETs

Company
I = Infineon
Device
P = Power MOSFET

Package type
B = TO-263 (D²PAK)
D = TO-252 (DPAK)
I = TO-262 (P²PAK)
P = TO-220
W = TO-247
BE = TO-263 (D²PAK 7-pin)
WS = TO-247 SL
DQ = QDPAK TSC
QC = QDPAK BSC

Automotive

Series name
CoolMOS™ CP, CoolMOS™ CFD, CoolMOS™ C3,
CoolMOS™ CFD7, CoolMOS™ S7

$R_{max}$ [mΩ]

Breakdown voltage
Divided by 10 (60x10 = 600 V)
Infineon support for high-voltage MOSFETs

Useful links and helpful information

Further information, datasheets and documents
www.infineon.com/coolmos
www.infineon.com/coolmos-latest-packages
www.infineon.com/coolmos-automotive
www.infineon.com/gan

Evaluationboards and simulation models
www.infineon.com/coolmos-boards
www.infineon.com/powermosfet-simulationmodels
Gate-driver ICs

› Infineon gate-driver IC technologies
› Infineon gate-driver IC applications
› How to choose a gate driver
› Silicon carbide MOSFET gate-driver ICs
› Driver configuration overview
› Gate-driver ICs portfolio
› Infineon gate driver IC package options
› EiceDRIVER™ non-isolated low-side gate drivers
› 2EDN EiceDRIVER™ family
› EiceDRIVER™ 1EDN71x6G/U family
› EiceDRIVER™ 2EDL8x2x family
› MOTIX™ 6EDL7141 high performance motor control
› MOTIX™ 160 V SOI gate-driver family
› EiceDRIVER™ 650 V level-shift SOI gate driver family
› EiceDRIVER™ 1200 V level-shift SOI gate driver family
› 2Edi EiceDRIVER™ family
› EiceDRIVER™ X3 Compact and 2L-SRC Compact
› EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog
› EiceDRIVER™ Enhanced X3 Digital
› EiceDRIVER™ APD 2ED4820-EM
› EiceDRIVER™ 1EDI302xAS/1EDI303xAS
› Gate driver nomenclature

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
EiceDRIVER™ and MOTIX™ gate-driver IC

Gate-driver ICs serve as the interface between control signals (digital or analog controllers) and power switches (IGBTs, MOSFETs, SiC MOSFETs, and GaN HEMTs). The integrated gate driver solutions reduce design complexity, development time, bill of materials (BOM), and board space while improving reliability over discretely-implemented gate-drive solutions.

Every switch needs a driver, the right driver makes a difference. Infineon offers a comprehensive portfolio of EiceDRIVER™ gate-driver ICs with a variety of configurations, voltage classes, isolation levels, protection features, and package options. EiceDRIVER™ gate-driver ICs are complementary to Infineon IGBT discretes and modules, silicon (CoolMOS™, OptiMOS™ and StrongIRFET™) and silicon carbide MOSFETs (CoolSiC™), gallium nitride HEMTs (CoolGaN™), or as part of integrated power modules (CIPOS™ IPM and iMOTION™ smart IPM).

In addition, MOTIX™ gate driver is part of the MOTIX™ scalable product portfolio for low-voltage motor control solutions including MOTIX™ Driver, MOTIX™ Bridge, MOTIX™ SBC, and MOTIX™ MCU.

www.infineon.com/gatedriver
Infineon gate-driver IC applications

Leveraging the application expertise and advanced technologies of Infineon and International Rectifier, EiceDRIVER™ gate-driver ICs are well-suited for many applications such as industrial motor drives, home appliances, solar inverters, automotive applications, EV charging, UPS, switch-mode power supplies (SMPS), high-voltage lighting, battery-powered applications, and so on.

Infineon gate-driver IC technologies

<table>
<thead>
<tr>
<th>Non-isolated GD</th>
<th>Level-shift GD</th>
<th>Isolated GD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-isolated (N-ISO)</td>
<td>Junction isolation (JI)</td>
<td>Silicon on insulator (SOI)</td>
</tr>
</tbody>
</table>

- **Non-isolated GD**
  - Monolithic construction of ground-reference gate drivers for 20 V to 35 V supply voltage applications
  - Comprehensive families of single- and dual-low-side drivers with flexible options for output current, logic configurations and UVLOs (plus non-isolated TDI)
  - Uses rugged and high-performance technologies of HVIC process or state-of-the-art 130 mm process

- **Level-shift GD**
  - Monolithic construction of one to six gate drive channels up to 1200 V rating
  - Industrial pioneering high-voltage IC (HVIC) technology used in all high-voltage gate drive applications
  - Gen 2 technology (IR prefix): Industrial pioneering HVIC process
  - Gen 5 technology (IRS prefix): Cost-effective pin-to-pin versions of Gen 2

- **Isolated GD**
  - Monolithic construction of 2 to 6 gate drive channels up to 1200 V rating
  - Built-in PN-based bootstrap diode (36 Ω typ.) for simplified bootstrap operation & reduced PCB area
  - Negative transient immunity to prevent latch-up: -100 V for 300 ns
  - >50 percent lower level-shift losses for higher efficiency, higher frequency operation, smaller heat sinks, and higher reliability
  - Two separate chips solution with magnetic coupling providing galvanically isolated single- and dual-channel gate drivers
  - VDE 0884-11 isolation technology providing isolation up to 8 kVpk $V_{\text{DC}}$ and up to ±2300 V functional isolation
  - CMTI of more than 300 V/ns
  - Strongest gate-driver output currents (up to ±18 A) reducing need for external booster

www.infineon.com/gatedriver
## Choosing a gate-driver IC

### Gate driver

**Isolation requirement**

- Non-isolated
- Functional level-shift
- Isolation on high-side and low-side

**Voltage class**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>ISOL REQUIREMENT</th>
<th>Product family</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 V</td>
<td>Basic</td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx</td>
</tr>
<tr>
<td>25 V</td>
<td>Galvanic</td>
<td>2EDN74xx, 2EDN74xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>28 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>100 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>200 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>240 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>280 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>300 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>320 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>500 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>550 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
<tr>
<td>600 V</td>
<td></td>
<td>1EDN75xx, 1EDN75xxx, 2EDN75xx, 2EDN75xxx</td>
</tr>
</tbody>
</table>

---

www.infineon.com/gatedriver

* Coming soon
Silicon carbide MOSFET gate-driver ICs

Ultra-fast switching 650 V to 2000 V power transistors such as CoolSiC™ SiC MOSFETs can be more easily handled by isolated gate driver solutions. Therefore, the following EiceDRIVER™ isolated gate drivers based on Infineon coreless transformer technology are recommended as most suitable. For a larger selection of isolated gate drivers, refer to the product portfolio overview section of this selection guide.

The following EiceDRIVER™ isolated gate drivers incorporate the most important key features for driving SiC MOSFET such as tight propagation delay matching, precise input filters, wide output supply voltage range, negative gate voltage capability, extended CMTI capability, Miller clamp, and DESAT protection.

<table>
<thead>
<tr>
<th>Product family</th>
<th>Part number</th>
<th>Typ. current</th>
<th>$V_{CC2}$</th>
<th>UVLO</th>
<th>Prop. delay (accuracy)</th>
<th>CMTI</th>
<th>Other key features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>EiceDRIVER™ 1EDB 1-channel family</td>
<td>1EDB9275F</td>
<td>5 / 9 A</td>
<td>14.9 / 14.4 V</td>
<td>45 ns (+6/-4 ns)</td>
<td>300 V/ns</td>
<td>Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577</td>
<td>DSO8, 150 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 2EDi 2-channel family</td>
<td>2EDR9259X</td>
<td>5 / 9 A</td>
<td>14.9 / 15.4 V</td>
<td>38 ns (+9/-5 ns)</td>
<td>150 V/ns</td>
<td>2ED Gen 2, dead-time control, disable/enable, reinforced isolation, UL 1577, VDE-11, IEC 62368-1, GB4943.1</td>
<td>DSO-14, 300mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 1EDN-TDI 1-channel family</td>
<td>1EDN6550B</td>
<td>4 / 8 A</td>
<td>12.2 / 11.5 V</td>
<td>45 ns (+10/-7 ns)</td>
<td>N/A</td>
<td>Separate source/sink outputs, reinforced isolation, UL 1577, GB4943.1</td>
<td>DSO-14, 150 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 1ED Compact 1-channel family</td>
<td>1EDI2012MF</td>
<td>4 A</td>
<td>12.7 / 10.5 V</td>
<td>300 ns</td>
<td>100 V/ns</td>
<td>Miller clamp, functional isolation</td>
<td>DSO8, 150 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ X3 Compact 1-channel family</td>
<td>1ED3xxMC12H</td>
<td>5.5 / 10 / 14 A</td>
<td>12.5 / 10.5 V</td>
<td>90 ns (+/- 7 ns)</td>
<td>200 V/ns</td>
<td>Miller clamp, reinforced isolation, UL 1577 and VDE-11</td>
<td>DSO8, 150 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 2L-SRC Compact 1-channel family</td>
<td>1ED3xxMC12H</td>
<td>10 / 18 A</td>
<td>12.5 / 10.4 V</td>
<td>110 ns (+/- 15 ns)</td>
<td>200 V/ns</td>
<td>Two-level slew-rate control, reinforced isolation, UL 1577 and VDE-11</td>
<td>DSO8, 150 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ X3 Analog 1-channel family</td>
<td>1ED3xxMC12M</td>
<td>3 / 6 / 9 A</td>
<td>12.6 / 10.4 V</td>
<td>244 ns (+/- 30 ns)</td>
<td>200 V/ns</td>
<td>Analog configurable, fast and accurate short circuit protection and soft turn-off Miller clamp, reinforced isolation, UL 1577 and VDE-11</td>
<td>DSO-16, 300 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ X3 Digital 1-channel family</td>
<td>1ED3xxMC12M</td>
<td>3 / 6 / 9 A</td>
<td>12.6 / 10.4 V</td>
<td>244 ns (+/- 30 ns)</td>
<td>200 V/ns</td>
<td>Digital configurable (OC), fast and accurate short circuit protection, rich monitoring functionality (predictive maintenance) Miller clamp, reinforced isolation, UL 1577 and VDE-11</td>
<td>DSO-16, 300 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 2ED-F3 1-channel family</td>
<td>1ED3xxMC12N</td>
<td>3 / 6 A</td>
<td>12.6 / 10.4 V</td>
<td>85 ns</td>
<td>300 V/ns</td>
<td>Miller clamp, short circuit protection, soft-off, reinforced isolation, UL 1577 and VDE-11</td>
<td>DSO-16, 300 mil</td>
<td></td>
</tr>
<tr>
<td>EiceDRIVER™ 2ED-F2 2-channel family</td>
<td>2ED02012-F2</td>
<td>2 A</td>
<td>12.6 / 10.4 V</td>
<td>170 ns</td>
<td>50 V/ns</td>
<td>Miller clamp, short circuit protection</td>
<td>DSO-36, 300 mil</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/gatedriver

* Coming soon
# Driver configuration overview

<table>
<thead>
<tr>
<th>1-channel low-side driver</th>
<th>1-channel high-side driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows low offset of the voltage between input and output</td>
<td>Allows high voltage offset between input and output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2-channel low-side driver</th>
<th>2-channel high-side driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both channels allow individual low voltage offsets, no interlock</td>
<td>Both channels allow individual high voltage offsets, no interlock</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Half-bridge driver</th>
<th>High- and low-side driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two interlocked channels for shoot through protection where one of the channels allows a high voltage offset.</td>
<td>Two non-interlocked channels, one for high voltage, one for low voltage offsets. The industry may also refer this as half-bridge.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Half-bridge plus single low-side driver</th>
<th>Full-bridge driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-bridge with one additional low-side driver.</td>
<td>Four channels in a package with two independent half bridges.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synchronous-buck drivers</th>
<th>Three-phase bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>High speed drivers for dual high side and low side MOSFETs in synchronous rectified buck converters.</td>
<td>Six channels in a package with three independent half bridges</td>
</tr>
</tbody>
</table>

[www.infineon.com/gatedriver](http://www.infineon.com/gatedriver)
Product overview

Infineon’s gate-driver IC solutions are the expert’s choice. With more than 400 reliable and efficient gate driver solutions, we provide a comprehensive portfolio for virtually any application. To ease the selection process, this overview is structured along the configurations of the gate-driver ICs, as opposed to application topology.

Non-isolated low side gate-driver IC

Typical connection

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Voltage class (V)</th>
<th>Io (typ. [mA])</th>
<th>UVLO on/off typ. (V)</th>
<th>Prop delay on typ. (ns)</th>
<th>Base PN</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-channel</td>
<td>25</td>
<td>2.6/2.6</td>
<td>8.0/7.3</td>
<td>34/34</td>
<td>1ED44173N01B</td>
<td>NEW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.6/2.6</td>
<td>11.9/11.0</td>
<td>50/50</td>
<td>1ED44175N01B</td>
<td>NEW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8/1.75</td>
<td>11.9/11.4</td>
<td>50/50</td>
<td>1ED44176N01F</td>
<td>NEW</td>
</tr>
</tbody>
</table>
|               |                  | 2.6/2.6        | 11.9/11.0            | 50/50                  | 1ED44171N01B | Weather 

1) Coming soon

www.infineon.com/gatedriver
www.infineon.com/gdfinder

For more details on the product, click on the part number, visit infineon.com or contact our product support.

Click on the part number.
Non-isolated TDI gate-driver IC

Typical connection

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Voltage class [V]</th>
<th>$I_{O+}$/$I_{O-}$ typ. [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-channel 200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/8</td>
<td>4.2/3.9</td>
<td>45/45</td>
<td>LEDN7550U</td>
<td>N-ISO</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/8</td>
<td>4.2/3.9</td>
<td>45/45</td>
<td>LEDN7550B</td>
<td>N-ISO</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/8</td>
<td>8.0/7.0</td>
<td>45/45</td>
<td>LEDN8550B</td>
<td>N-ISO</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/8</td>
<td>12.2/11.5</td>
<td>45/45</td>
<td>LEDN6550B</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/8</td>
<td>14.9/14.4</td>
<td>45/45</td>
<td>LEDN9550B</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/2</td>
<td>3.85/3.75</td>
<td>55/55</td>
<td>LEDN7116G</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/2</td>
<td>3.85/3.75</td>
<td>55/55</td>
<td>LEDN7116U</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/2</td>
<td>3.85/3.75</td>
<td>75/75</td>
<td>LEDN7212G</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/2</td>
<td>3.85/3.75</td>
<td>75/75</td>
<td>LEDN7212U</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/1</td>
<td>3.85/3.75</td>
<td>105/105</td>
<td>LEDN7136G</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/1</td>
<td>3.85/3.75</td>
<td>105/105</td>
<td>LEDN7136U</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5/0.5</td>
<td>3.85/3.75</td>
<td>125/125</td>
<td>LEDN7146G</td>
<td>NEW</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5/0.5</td>
<td>3.85/3.75</td>
<td>125/125</td>
<td>LEDN7146U</td>
<td>N-ISO</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

1) Coming soon

www.infineon.com/gatedriver
www.infineon.com/gdfinder

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Three-phase gate-driver ICs

### Typical connection

- **DC+ bus**
- **IC**
- **EN**
- **FAULT**
- **RCIN**
- **VCC**
- **LIN**
- **HIN**
- **ITRIP**

### Voltage class [V] | I_{in}/I_{out} [mA] | UVLO on/off typ. [V] | Prop delay off/on typ. [ns] | Base PN | Technology | Features | Package
---|---|---|---|---|---|---|---

#### 1200

<table>
<thead>
<tr>
<th>Voltage class [V]</th>
<th>I_{in}/I_{out} [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.35/0.65</td>
<td>11.4/10.4</td>
<td>600/600</td>
<td>6ED2230512T</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25/0.5</td>
<td>8.6/8.2</td>
<td>700/750</td>
<td>IR2233S</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25/0.5</td>
<td>8.6/8.2</td>
<td>700/750</td>
<td>IR2233J</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25/0.5</td>
<td>10.4/9.4</td>
<td>700/750</td>
<td>IR2235S</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25/0.5</td>
<td>10.4/9.4</td>
<td>700/750</td>
<td>IR2235J</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.35/0.54</td>
<td>11.2/10.2</td>
<td>550/550</td>
<td>IR2238Q</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 600

<table>
<thead>
<tr>
<th>Voltage class [V]</th>
<th>I_{in}/I_{out} [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.165/0.375</td>
<td>11.7/9.8</td>
<td>490/530</td>
<td>6ED003L06-F2</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.165/0.375</td>
<td>11.7/9.8</td>
<td>490/530</td>
<td>6EDL04106NT</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.165/0.375</td>
<td>11.7/9.8</td>
<td>490/530</td>
<td>6EDL04106PT</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>9/8.7</td>
<td>425/675</td>
<td>6EDL20518</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>9/8.7</td>
<td>425/675</td>
<td>6EDL20518S</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>9/8.7</td>
<td>425/675</td>
<td>6EDL20518G</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>8.9/8.2</td>
<td>400/425</td>
<td>IR2136S</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>8.9/8.2</td>
<td>400/425</td>
<td>IR21363S</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>8.9/8.2</td>
<td>400/425</td>
<td>IR21363J</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2/0.35</td>
<td>10.4/9.4</td>
<td>530/500</td>
<td>IR21364S</td>
<td>JI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 200

<table>
<thead>
<tr>
<th>Voltage class [V]</th>
<th>I_{in}/I_{out} [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.165/0.375</td>
<td>11.7/9.8</td>
<td>490/530</td>
<td>6ED003L06-F2</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.165/0.375</td>
<td>9/8.1</td>
<td>530/530</td>
<td>6EDL04N02PR</td>
<td>SOI</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Coming soon

www.infineon.com/gatedriver
www.infineon.com/gdfinder
# Gate-driver ICs Portfolio

## Half-bridge and high- and low-side gate-driver ICs

### Voltage and Current Details

- **Up to 1200 V**

### Gate-driver ICs Portfolio

- [www.infineon.com/gatedriver](https://www.infineon.com/gatedriver)

### Features

- Comparator
- Desaturation protection
- Enable
- Fault reporting
- Programmable dead time
- Programmable shutdown
- Self-oscillating
- Separate pin for logic ground
- Shoot-through protection
- Shutdown
- Soft over-current shutdown
- Two stage turn-on

### Contact Information

For more details on the product, contact our product support.

For more information on the product, click on the part number or visit the [Infineon website](https://www.infineon.com).
Full-bridge gate-driver ICs

**Typical connection**

![Full-bridge gate-driver ICs diagram](image)

<table>
<thead>
<tr>
<th>Voltage class [V]</th>
<th>I\textsubscript{O+}/I\textsubscript{O-} typ. [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0.18/0.26</td>
<td>11/9</td>
<td>N.A.</td>
<td>IRS2453DS</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IRS24531DS</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Single high-side gate-driver ICs

**Typical connection**

![Single high-side gate-driver ICs diagram](image)

<table>
<thead>
<tr>
<th>Voltage class [V]</th>
<th>I\textsubscript{O+}/I\textsubscript{O-} typ. [mA]</th>
<th>UVLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0.16/0.24</td>
<td>9/8</td>
<td>215/140</td>
<td>IRS25752L</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25/0.5</td>
<td>8.6/8.2</td>
<td>105/125</td>
<td>IRS2117S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25/0.5</td>
<td>8.6/8.2</td>
<td>105/125</td>
<td>IRS2118S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25/0.5</td>
<td>10/3/9</td>
<td>150/200</td>
<td>IRS2127S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25/0.5</td>
<td>10/3/9</td>
<td>150/200</td>
<td>IRS2128S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25/0.5</td>
<td>7.2/6.8</td>
<td>150/200</td>
<td>IRS21271S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.29/0.6</td>
<td>8.6/8.2</td>
<td>105/125</td>
<td>IRS2117S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.29/0.6</td>
<td>8.6/8.2</td>
<td>105/125</td>
<td>IRS2118S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.29/0.6</td>
<td>10/3/9</td>
<td>150/200</td>
<td>IRS2127S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.29/0.6</td>
<td>7.2/6.8</td>
<td>150/200</td>
<td>IRS21271S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>1.6/3.3</td>
<td>9.2/8.3</td>
<td>200/170</td>
<td>IRS2125S</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>0.16/0.24</td>
<td>9/8</td>
<td>215/140</td>
<td>IRS20752L</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.16/0.24</td>
<td>9/8</td>
<td>215/140</td>
<td>IRS10752L</td>
<td>JI ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
### Gate-driver ICs Portfolio

#### Galvanic isolated gate driver ICs

**www.infineon.com/gdfinder**

### 2-channel (Isolation only)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic VIORM = 500 V (rms); VIOTM = 3.2 kV; VISO = 2.3 kV (rms)</td>
<td>5 / 9</td>
<td>4.2/3.9</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.4 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>4 / 8</td>
<td>14.9/14.4</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>1/2</td>
<td>8/7</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>10/10</td>
<td>12.5/10.5</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>13.5/14</td>
<td>10/8</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>5.5/5.5</td>
<td>12.5/10.5</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>18/18</td>
<td>12.5/10.4</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>18/18</td>
<td>12.5/10.4</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>10/10</td>
<td>12.5/10.4</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>5.5/5.5</td>
<td>10/8</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.4 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>4/8</td>
<td>5.0/4.5</td>
</tr>
<tr>
<td>Reinforced VIORM = 1.7 kV (rms); VIOTM = 8 kV; VISO = 5.7 kV (rms)</td>
<td>3.8/2.5 Adjustable</td>
<td>236/244</td>
</tr>
</tbody>
</table>

### 1-channel

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>VISO = ± 1.2 kV</td>
<td>1.3/0.9</td>
</tr>
<tr>
<td>Functional</td>
<td>VISO = ± 1.2 kV</td>
<td>7.5/6.8</td>
</tr>
<tr>
<td>Functional</td>
<td>VISO = ± 1.2 kV</td>
<td>4/3.5</td>
</tr>
<tr>
<td>Functional</td>
<td>VISO = ± 1.2 kV</td>
<td>10/9.4</td>
</tr>
</tbody>
</table>

### 2-channel

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic VIORM = 1.4 kV; VIOTM = 6 kV; VISO = 3.7 kV (rms)</td>
<td>4/8</td>
<td>4.2/3.9</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = 460 V (rms); VISO = 1.5 kV (rms)</td>
<td>4/8</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = 510 V (rms); VISO = 1.5 kV (rms)</td>
<td>4/8</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = ± 1.2 kV</td>
<td>2.2/2.3</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = ± 1.2 kV</td>
<td>10/9.4</td>
</tr>
<tr>
<td>Functional</td>
<td>VISO = 2.5 kV (rms)</td>
<td>4/3.5</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = 510 V (rms); VISO = 1.5 kV (rms)</td>
<td>1/2</td>
</tr>
</tbody>
</table>

### Non-isolated

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>VIOWM = 460 V (rms); VISO = 1.5 kV (rms)</td>
<td>4/8</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = 510 V (rms); VISO = 1.5 kV (rms)</td>
<td>4/8</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = ± 1.2 kV</td>
<td>7.5/6.8</td>
</tr>
<tr>
<td>Functional</td>
<td>VISO = 2.5 kV (rms)</td>
<td>4/3.5</td>
</tr>
<tr>
<td>Functional</td>
<td>VIOWM = 510 V (rms); VISO = 1.5 kV (rms)</td>
<td>1/2</td>
</tr>
</tbody>
</table>

---

**Note:** For more details on the product, click on the part number or contact our product support.

**Further reading:** For a comprehensive list of gate-driver ICs, visit [www.infineon.com/gdfinder](http://www.infineon.com/gdfinder).
# Automotive gate-driver ICs

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Voltage class [V]</th>
<th>I_{CC}/I_{IL} typ. [mA]</th>
<th>U/VLO on/off typ. [V]</th>
<th>Prop delay off/on typ. [ns]</th>
<th>Base PN</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(12/12)</td>
<td>(12/12)</td>
<td>(60/60)</td>
<td>1EDI3020AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12/12)</td>
<td>(12/12)</td>
<td>(60/60)</td>
<td>1EDI3021AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12/12)</td>
<td>(12/12)</td>
<td>(60/60)</td>
<td>1EDI3030AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12/12)</td>
<td>(12/12)</td>
<td>(60/60)</td>
<td>1EDI3031AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.1/21)</td>
<td>(12/11)</td>
<td>(165/170)</td>
<td>1ED02012FA2</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/2)</td>
<td>(12/11)</td>
<td>(1900/1750)</td>
<td>1ED02012FTA</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/2)</td>
<td>(12.5/11.7)</td>
<td>(215/215)</td>
<td>1ED02004AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/2)</td>
<td>(12.5/11.7)</td>
<td>(215/215)</td>
<td>1ED02002AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/2)</td>
<td>(12.5/11.7)</td>
<td>(215/215)</td>
<td>1ED02010AS</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2/2)</td>
<td>(12/11)</td>
<td>(165/170)</td>
<td>1ED02012FA2</td>
<td>CT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2085S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR21811S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR21814S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR21818S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR21910S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2123S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2124S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2117S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2127S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1/1)</td>
<td>(7.3/6.8)</td>
<td>N.A.</td>
<td>AUR2118S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.29/0.3)</td>
<td>(4.1/3.8)</td>
<td>(200/220)</td>
<td>AUR2301S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3/0.3)</td>
<td>(4.1/3.8)</td>
<td>(200/220)</td>
<td>AUR2301S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.5/0.5)</td>
<td>(6.8/6.8)</td>
<td>(140/140)</td>
<td>AUR2123S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.5/0.5)</td>
<td>(6.8/6.8)</td>
<td>(140/140)</td>
<td>AUR2124S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.29/0.6)</td>
<td>(8.6/8.2)</td>
<td>(140/140)</td>
<td>AUR2117S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.29/0.6)</td>
<td>(8.6/8.2)</td>
<td>(140/140)</td>
<td>AUR2117S</td>
<td>JI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3/0.3)</td>
<td>(10/6.5)</td>
<td>(2500/2500)</td>
<td>AUR2341STR</td>
<td>N-ISO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3/0.3)</td>
<td>(10/6.5)</td>
<td>(2500/2500)</td>
<td>AUR2342STR</td>
<td>N-ISO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3/1.4)</td>
<td>(12.5/10.0)</td>
<td>(4000/7000)</td>
<td>1ED2410-EM</td>
<td>NEW N-ISO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3/1.0)</td>
<td>(7.0/6.6)</td>
<td>(3000/3000)</td>
<td>1ED4420-EM</td>
<td>NEW N-ISO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3/6)</td>
<td>(10.2/9.3)</td>
<td>(60/90)</td>
<td>AUR11705S</td>
<td>N-ISO</td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Addressing various application requirements, Infineon delivers solutions with an assortment of features intended to optimize performance, minimize size and reduce cost. Below is a table of additional gate-driver IC features available in the current portfolio.

<table>
<thead>
<tr>
<th>Features</th>
<th>Abbreviation</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Miller clamp</td>
<td>M-CLAMP</td>
<td>Protection against inadvertent dynamic turn-on because of parasitic Miller effects</td>
</tr>
<tr>
<td>Active shutdown</td>
<td>SD-ACT</td>
<td>Ensures a safe IGBT off-state in case the output chip is not connected to the power supply or an undervoltage lockout is in effect</td>
</tr>
<tr>
<td>Brake chopper</td>
<td>BRAKE</td>
<td>Integrated brake IGBT driver with protection</td>
</tr>
<tr>
<td>Comparator</td>
<td>CMP</td>
<td>General purpose comparator included</td>
</tr>
<tr>
<td>Desaturation protection</td>
<td>DESAT</td>
<td>Protects the IGBT at short circuit</td>
</tr>
<tr>
<td>Enable</td>
<td>EN</td>
<td>Dedicated pin terminates all outputs</td>
</tr>
<tr>
<td>Fault reporting</td>
<td>FAULT-RPT</td>
<td>Indicates an overcurrent or under-voltage shutdown has occurred</td>
</tr>
<tr>
<td>Fault reset</td>
<td>FAULT-RST</td>
<td>Dedicated pin resets the DESAT-FAULT state of the chip</td>
</tr>
<tr>
<td>High-voltage start-up</td>
<td>HVSTART</td>
<td>Provides easy and fast circuit start-up while enabling low circuit standby losses</td>
</tr>
<tr>
<td>Integrated bootstrap diode</td>
<td>BSD</td>
<td>Integrated bootstrap reduces BOM</td>
</tr>
<tr>
<td>Operational amplifier</td>
<td>OPAMP</td>
<td>An independent op-amp for current measurement or overcurrent detection</td>
</tr>
<tr>
<td>Oscillator</td>
<td>OSC</td>
<td>Integrated front end oscillator</td>
</tr>
<tr>
<td>Over-current protection</td>
<td>OCP</td>
<td>Ensures safe application operation in case of overcurrent</td>
</tr>
<tr>
<td>Programmable dead time</td>
<td>DT-PROG</td>
<td>Dead time is programmable with external resistor for flexible design</td>
</tr>
<tr>
<td>Programmable fault clear time</td>
<td>FLT-C</td>
<td>The length of the fault clear time period (tFCL) is programmed by external capacitor which connected between FLT-C and VSS (CFLT)</td>
</tr>
<tr>
<td>Programmable shutdown</td>
<td>SD-PROG</td>
<td>A shutdown feature has been designed into a pin</td>
</tr>
<tr>
<td>Separate pin for logic ground</td>
<td>SEP-GND</td>
<td>Dedicated pin or logic ground for improved noise immunity</td>
</tr>
<tr>
<td>Separate sink/source outputs</td>
<td>SEP-OUT</td>
<td>Simplifies gate resistor selection, reduces BOM, and improves dv/dt control</td>
</tr>
<tr>
<td>Shoot-through protection</td>
<td>STP</td>
<td>Additional shoot-through protection logic such as interlock</td>
</tr>
<tr>
<td>Short-circuit clamping</td>
<td>SC-CLAMP</td>
<td>During short circuit the IGBT’s gate voltage tends to rise because of the feedback via the Miller capacitance. An additional protection circuit connected to OUT+ limits this voltage to a value slightly higher than the supply voltage.</td>
</tr>
<tr>
<td>Shutdown</td>
<td>SD</td>
<td>Dedicated pin disables the IC outputs</td>
</tr>
<tr>
<td>Soft overcurrent shutdown</td>
<td>SD-SOFT</td>
<td>Dedicated pin turns off the desaturated transistor, preventing overvoltages</td>
</tr>
<tr>
<td>Truly differential inputs</td>
<td>TDI</td>
<td>#FEHLER!</td>
</tr>
<tr>
<td>Two-level turn-off</td>
<td>TTOF</td>
<td>Lowers VCE overshoots at turn-off during short circuits or overcurrent events</td>
</tr>
<tr>
<td>Under-voltage lockout</td>
<td>UVLO</td>
<td>Ensures safe application operation by avoiding unexpected driver behavior at low voltages</td>
</tr>
<tr>
<td>VDE 0884-10 or VDE 0884-11</td>
<td>VDE</td>
<td>Reinforced galvanic isolation certifications for non-optical couplers</td>
</tr>
</tbody>
</table>

www.infineon.com/gatedriver
www.infineon.com/gdfinder
### Infineon gate-driver IC package options

<table>
<thead>
<tr>
<th>Package Code</th>
<th>Package Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSO8 (SOIC-8N)</td>
<td>DSO-28 (SOIC-28WB)</td>
<td>TSSOP-8</td>
</tr>
<tr>
<td>DSO8 with power pad</td>
<td>DSO-36</td>
<td>TSSOP-28</td>
</tr>
<tr>
<td>DSO8 300-mil (SOIC-8WB)</td>
<td>LCC-32 (PLCC-44)</td>
<td>VDSON-8</td>
</tr>
<tr>
<td>DSO-14 (SOIC-14N)</td>
<td>LQFP-64</td>
<td>VQFN-14 (MLPQ 4X4 14L)</td>
</tr>
<tr>
<td>DSO-16</td>
<td>MQFP-64</td>
<td>VQFN-28 (MLPQ 5X5 28L)</td>
</tr>
<tr>
<td>DSO-16 300-mil (SOIC-16WB)</td>
<td>SOT23-5</td>
<td>VQFN-32</td>
</tr>
<tr>
<td>DSO-16 (fine pitch)</td>
<td>SOT23-6</td>
<td>VQFN-34 (MLPQ 7X7 48L)</td>
</tr>
<tr>
<td>DSO-18</td>
<td>SSOP-24</td>
<td>VQFN-48</td>
</tr>
<tr>
<td>DSO-19</td>
<td>TFLGA-13</td>
<td>VSON-10</td>
</tr>
<tr>
<td>DSO-20 (SOIC-20WB)</td>
<td>TQFN-48</td>
<td>WSON-6</td>
</tr>
<tr>
<td>DSO-20 (fine pitch)</td>
<td>TSDSO-24</td>
<td>WSON-8</td>
</tr>
<tr>
<td>DSO-20 WB</td>
<td>TSNP-6</td>
<td>CHIP</td>
</tr>
<tr>
<td>DSO-24 (DSO-28 without 4 pins)</td>
<td>TSNP-7</td>
<td></td>
</tr>
</tbody>
</table>
EiceDRIVER™ non-isolated low-side gate drivers

1ED4417x, 1-ch, low-side drivers with OCP, Enable, and Fault
2ED24427N01F, 10 A, 2-ch, low-side driver with Enable in DSO8 with thermal pad

EiceDRIVER™ 1ED4417x family are 1-channel low-voltage, non-inverting, low-side gate drivers designed for ground-referenced applications such as digitally controlled power-factor correction (PFC) circuits. This family provides an under-voltage lockout protection (UVLO) and integrates fault output reporting to the controller and driver enable functionality in one pin. In addition, EiceDRIVER™ 1ED44173/5/6 integrate the overcurrent protection (OCP) comparator, realizing up to 20% cost and 50% space savings. The comparator features a fast and accurate current-sensing threshold tolerance of ±5%. 1ED44176N01F has separate logic and power ground pins for operational robustness.

EiceDRIVER™ 2ED24427N01F is a high-current 10 A, 2-channel low-voltage, non-inverting, low-side gate driver in a DSO8 package with thermally efficient, exposed power pad. Propagation delays between two channels are matched. In half-bridge LLC or full-bridge ZVS topologies, 2ED24427N01F can easily drive low $R_{DS(on)}$ high-voltage MOSFETs at high switching frequencies. In synchronous rectification, more than two MOSFETs can be paralleled and driven from a single channel of the driver. One 2ED24427N01F device can efficiently drive both synchronous rectification legs. When higher current is needed, 2ED24427N01F can boost the current from a regular gate driver and drive high-current IGBTs and MOSFETs.

Simplified application diagram

Part Number | Package | $I_D$ [A] | UVLO [V] | $V_{OCTH}$ [mV] | $t_{I/O}$ [ns] | Ground pins | Feature
---|---|---|---|---|---|---|---
1ED4417N01B* | SOT23-5 | 2.6/2.6 | 11.9/11.4 | N/A | 50/50 ns | COM | Enable, Fault
1ED4417N01B | SOT23-6 | 2.6/2.6 | 8/7 | -250 mV | 34/34 ns | COM | OCP (negative current sensing), Enable, Fault
1ED44175N01B | SOT23-6 | 2.6/2.6 | 11.9/11.4 | -250 mV | 50/50 ns | COM | OCP (negative current sensing), Enable, Fault
1ED44176N01F | DSO8 | 0.8/1.75 | 11.9/11.4 | 500 mV | 50/50 ns | VSS / COM | OCP (positive current sensing), Enable, Fault, Programmable fault clear time
2ED24427N01F | DSO8 with Power Pad | 10/10 | 11.5/10 | N/A | 40/55 ns | COM | Enable

Evaluation and reference board

- EVAL-1ED44176N01F
- EVAL-1ED44175N01B
- EVAL-1ED44173N01B
- EVAL-PFC5KIKWWR5SYS
- EVAL-2ED2101-HB-LLC
- REF-AIRCON-C302A-IM564

www.Infineon.com/1ED44173
www.Infineon.com/1ED44175
www.Infineon.com/1ED44176
www.Infineon.com/2ED24427

*Coming soon
2EDN EiceDRIVER™ family
Rugged, fast, dual-channel low-side 4 A/5 A gate-driver ICs

EiceDRIVER™ 2EDN family overview
Dual-channel driver ICs are the crucial link between control ICs and powerful MOSFET, wide band gap (WBG) switching devices. Driver ICs enable high system level efficiencies, excellent power density and consistent system robustness.

EiceDRIVER™ 2EDN family: Fast, precise and compatible
› Highly efficient SMPS enabled by 19 ns propagation delay and 2 ns channel-to-channel mismatch precision for fast MOSFET, WBG switches
› Diversified applications driven by strong output current 4 A/5 A per channel
› Unique designs are supported by the availability of numerous packages

EiceDRIVER™ 2EDN family: The new reference in ruggedness and low power dissipation
› 4 V and 8 V UVLO (undervoltage lock out) options for instant FETs protection under abnormal conditions, further improved with active output voltage clamping
› -10 V robustness of control and enable inputs provides crucial safety margin when driving pulse transformers or driving FETs in various packages
› 5 A reverse output current robustness eliminates the need for Schottky switching diodes and reduces bill-of-material
› Cool driver ICs from true rail-to-rail low impedance output stages

Applications
› Server
› Telecom
› DC-DC Converters
› Power tools
› Industrial SMPS
› Low speed electrical vehicles
› Solar power inverter
› LED lighting

www.infineon.com/2EDN
EiceDRIVER™ 1EDN71x6G/U family
200 V 1-ch gate drivers with truly differential input (TDI)

The 1EDN71x6G/U is a 1-channel gate driver family optimized for Infineon CoolGaN™ Schottky-gate (SG) HEMTs, and also compatible with other GaN SG HEMTs and silicon MOSFETs. The TDI feature eliminates the risk of false triggering due to ground bounce in low-side applications and enable 1EDN71x6G/U to address even high-side applications. The TDI feature works by controlling the gate driver output state exclusively by the voltage difference between the two inputs, completely independent of the driver’s reference (ground) potential as long as the common-mode voltage is below 150 V (static) and 200 V (dynamic).

Application schematics

Features and benefits

Product features
- Truly differential logic input (TDI)
- Four driving strengths
- Active Miller clamp
- Optional negative charge pump
- Active bootstrap capacitor

Product benefits
- High-side driving and low-side ground bounce immunity
- Optimize switching speed without external gate resistors
- Prevent induced turn-on
- Additional induced turn-on immunity
- No overcharging the bootstrap capacitor during deadtime

Product family

<table>
<thead>
<tr>
<th>Product</th>
<th>Output current</th>
<th>Source/sink resistance</th>
<th>Input pulse blanking time</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>1EDN7116G</td>
<td>2 A</td>
<td>0.8 Ω</td>
<td>20 ms</td>
<td>VSON-10</td>
</tr>
<tr>
<td>1EDN7126G</td>
<td>1.5 A</td>
<td>1.0 Ω</td>
<td>40 ms</td>
<td>VSON-10</td>
</tr>
<tr>
<td>1EDN7136G</td>
<td>1 A</td>
<td>1.5 Ω</td>
<td>60 ms</td>
<td>VSON-10</td>
</tr>
<tr>
<td>1EDN7146G</td>
<td>0.5 A</td>
<td>3.0 Ω</td>
<td>80 ms</td>
<td>VSON-10</td>
</tr>
<tr>
<td>1EDN7116U*</td>
<td>2 A</td>
<td>0.8 Ω</td>
<td>20 ms</td>
<td>TSNP-7</td>
</tr>
<tr>
<td>1EDN7126U*</td>
<td>1.5 A</td>
<td>1.0 Ω</td>
<td>40 ms</td>
<td>TSNP-7</td>
</tr>
<tr>
<td>1EDN7136U*</td>
<td>1 A</td>
<td>1.5 Ω</td>
<td>60 ms</td>
<td>TSNP-7</td>
</tr>
<tr>
<td>1EDN7146U*</td>
<td>0.5 A</td>
<td>3.0 Ω</td>
<td>80 ms</td>
<td>TSNP-7</td>
</tr>
</tbody>
</table>

www.infineon.com/1edn

* Coming soon
EiceDRIVER™ 2EDL8x2x family
120 V, 3/4 A, junction-isolated high- and low-side gate drivers

The 2EDL8x2x is a family of high- and low-side gate driver designed for advanced switching DC-DC converters. The 2EDL802x takes in independent inputs while 2EDL812x takes in differential inputs with both having built-in hysteresis for enhanced noise immunity. The gate-driver family comes in two packages: VDSON-8 4x4 mm and VSON-10 3x3 mm.

Application schematics

Features and benefits

<table>
<thead>
<tr>
<th>Product features</th>
<th>Product benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 V integrated boot-strap diode with 10 ns reverse recovery time</td>
<td>Drive strength for fast Miller plateau transition</td>
</tr>
<tr>
<td>2 A to 4 A output source currents</td>
<td>Fast and robust</td>
</tr>
<tr>
<td>6 A output sink currents</td>
<td>Immunity against false triggering from ground bounce</td>
</tr>
<tr>
<td>-8 V / +15 V differential input robustness</td>
<td>No need for Schottky clamping diodes</td>
</tr>
<tr>
<td>5 A reverse current output robustness</td>
<td></td>
</tr>
<tr>
<td>±1 ns (typ.) channel-to-channel delay matching</td>
<td></td>
</tr>
</tbody>
</table>

Product family

<table>
<thead>
<tr>
<th>Part nu</th>
<th>Input</th>
<th>Source current</th>
<th>Sink current</th>
<th>Min. input pulse width</th>
<th>Propagation delay (typ.)</th>
<th>Matching delay (typ.)</th>
<th>ESD</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>2EDL8123G</td>
<td>Differential</td>
<td>3 A</td>
<td>6 A</td>
<td>40 ns</td>
<td>45 ns</td>
<td>2 ns</td>
<td>2 kV</td>
<td>VDSON-8 4x4 mm</td>
</tr>
<tr>
<td>2EDL8124G</td>
<td>4 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2EDL8023G</td>
<td>Independent</td>
<td>3 A</td>
<td>6 A</td>
<td>40 ns</td>
<td>45 ns</td>
<td>2 ns</td>
<td>2 kV</td>
<td>VSON-10 3x3 mm</td>
</tr>
<tr>
<td>2EDL8024G</td>
<td>4 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2EDL8123G*</td>
<td>Differential</td>
<td>3 A</td>
<td>6 A</td>
<td>40 ns</td>
<td>45 ns</td>
<td>2 ns</td>
<td>2 kV</td>
<td>VDSON-8 4x4 mm</td>
</tr>
<tr>
<td>2EDL8124G*</td>
<td>4 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2EDL8023G*</td>
<td>Independent</td>
<td>3 A</td>
<td>6 A</td>
<td>40 ns</td>
<td>45 ns</td>
<td>2 ns</td>
<td>2 kV</td>
<td>VSON-10 3x3 mm</td>
</tr>
<tr>
<td>2EDL8024G*</td>
<td>4 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluation board:
EVAL_HB_2EDL8x2xG*  
REF_600W_FBFB_QB*

www.infineon.com/2edl8

* Coming soon
MOTIX™ 6EDL7141 high performance motor control
Next-generation fully programmable three-phase gate driver

6EDL7141, Infineon’s latest three-phase motor control gate-driver IC allows our customers to develop their next generation of high performance battery operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 fully programmable parameters using built-in digital SPI interface, 6EDL7141 is fully configurable to drive a wide range of MOSFET’s to yield the best possible system efficiency. The integrated buck regulator provides the power for both the microcontroller and the Hall sensors in the motor, further reducing peripheral components and required PCB area. In addition, with a full suite of system protection features such as OCP, UVLO, over-temperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.

Block diagram
Three-phase BLDC battery-powered motor control

Features and benefits

Key features
- Integrated power supply
- Programmable slew rate
- Programmable gate drive supply
- 3x current shunt amplifier
- ADC ref. of 5 V
- Complete dedicated motor control protection suite

Key benefits
- Reduced external components and PCB area
- Optimized efficiency and EMI
- Maximum flexibility to use different inverter FETs
- Highly accurate current sense while saving external components
- Higher dynamic range to increase signal resolution
- Improve reliability and fault detection

EVAL_6EDL7141_TRAP_1SH
BC 1 shunt evaluation board
Parallel 40 V OptiMOS™5 PQFN
XMC1404 MCU
On-board programming dongle
Featured module IC: 6EDL7141

www.infineon.com/6edl7141
MOTIX™ 160 V SOI gate-driver family

2ED27xxS01G half-bridge and high- and low-side gate-driver family with integrated bootstrap diode

6ED2742S01Q three-phase driver with charge pump, current sense amplifier, OCP and bootstrap diode

MOTIX™ 160 V SOI gate driver family is designed for the BLDC motor drive applications. The SOI technology enables integrated bootstrap diodes, which can be used to supply the external high-side bootstrap capacitor. The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. MOTIX™ 2ED27xxS01G family consists of three half-bridge and three high- and low-side 160 V SOI gate drivers. The UVLO protection is on both Vcc and Vb pins. Fast propagation delays (50 ns) are suitable for motor drive and power conversion applications in VSON-10 (3x3 mm) package with exposed ground pad. MOTIX™ 6ED2742S01Q is a 160 V three-phase SOI gate driver, which supports 100% duty cycle operation by a trickle charge pump. Protection features include UVLO, OCP with configurable threshold, fault and automatic fault clear. A current sense operational amplifier (CSA) with selectable gain is integrated between the VSS and COM.

Simplified application diagram

Applications for MOTIX™ 160 V SOI gate driver family
- Servo/stepper drives in robotics and factory automation
- General purpose low-voltage drives
- Battery-operated small home appliances (SHA)
- Professional and consumer service robotics
- Logistics vehicles (e-forklifts, autonomous warehouse robotics)
- Commercial and agricultural drones
- Hand-held battery-operated power tools
- Garden or outdoor power equipment (OPE) tools
- e-scooters, e-bikes, and other e-vehicles that do not require automotive qualification (LSEV)

www.infineon.com/SOI

6ED2742S01Q key features
- Integrated power management with charge pump and pre-regulator supports wide input voltage range of 6 V to 140 V
- Integrated over-current protection comparator for single-shunt low side operation with programmable +/-5% reference threshold
- Integrated current sense amplifier with programmable voltage gain and ability to read output voltage offset during zero phase current
- Always positive output voltage offset to reduce need for +/- V_REF for downstream ADC in microcontroller.
- Integrated, per phase, high-side trickle charge pumps to enable 100% duty cycle operation
- Integrated, multi-function RFE pin combines FAULT, FAULT Clear, and Enable functionality
EiceDRIVER™ 650 V level-shift SOI gate driver family

2ED2101/3/4 and 2ED2110: EiceDRIVER™ fast level-shift SOI family with 90 ns prop delay
2ED2106/8/9 and 2ED2181/2/3/4: EiceDRIVER™ general purpose SOI family

EiceDRIVER™ 650 V SOI is a family of high-voltage, high-speed MOSFET and IGBT gate drivers. Based on Infineon’s SOI technology, this family features an integrated, ultra-fast, low $R_{DS(on)}$ bootstrap diode and offers excellent ruggedness and noise immunity with tolerance to negative transient voltages of up to -100 V. The absence of parasitic thyristor structures ensures superior latch up immunity. The level-shift loss is significantly reduced on the EiceDRIVER™ SOI gate drivers compared to other technologies.

Simplified application diagrams

Power dissipation of Infineon SOI

Evaluations board

<table>
<thead>
<tr>
<th>Product family</th>
<th>Part number</th>
<th>Output current</th>
<th>Prop. delay</th>
<th>Input logic</th>
<th>Configuration</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>EiceDRIVER™ fast level-shift SOI</td>
<td>2ED2101S06F</td>
<td>0.29/0.7 A</td>
<td>200/200 ns</td>
<td>HIN, LIN</td>
<td>High- and low-side</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2105506F</td>
<td></td>
<td></td>
<td>HIN, LIN</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED210506F</td>
<td></td>
<td></td>
<td>HIN, LIN</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2105706F</td>
<td></td>
<td></td>
<td>HIN, /SD</td>
<td>Half-bridge</td>
<td>DSO-16 WB</td>
</tr>
<tr>
<td></td>
<td>2ED2105506F</td>
<td></td>
<td></td>
<td>HIN, /LIN</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2108406J</td>
<td></td>
<td></td>
<td>HIN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td>EiceDRIVER™ general purpose SOI</td>
<td>2ED2109906F</td>
<td>0.29/0.7 A</td>
<td>740/200 ns</td>
<td>IN, SD</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2105506F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2109906F</td>
<td></td>
<td></td>
<td>IN, DT/SD</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2109706F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2109106F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2109206F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2109106F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2109206F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
<tr>
<td></td>
<td>2ED2109206F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO8</td>
</tr>
<tr>
<td></td>
<td>2ED2109206F</td>
<td></td>
<td></td>
<td>IN, /SD</td>
<td>Half-bridge</td>
<td>DSO-14</td>
</tr>
</tbody>
</table>

www.infineon.com/SOI
EiceDRIVER™ 1200 V level-shift SOI gate driver family

6ED223x: 1200 V three-phase SOI driver with OCP, bootstrap diode
2ED132x: 1200 V half-bridge and high- and low-side SOI driver with OCP, Miller clamp and bootstrap diode

The 6ED2231S12T is a 1200-V three-phase SOI gate driver, with 0.35 A / 0.65 A current in DSO-24 package (DSO-28 with 4 pins removed). The 2ED132x family consists of four 1200 V SOI gate drivers, in half-bridge or high- and low-side configurations. 2ED132x family offers 2.3 A output current in high creepage (5 mm)/clearance DSO-20 wide body package or higher sink option (4.6 A) in DSO-16 wide body package. Both 6ED2231S12T and the 2ED132x family integrates ultra-fast over-current protection (OCP) with ± 5% accuracy, and bootstrap diode. In addition, the 2ED132x family also integrates active Miller clamp.

### Key features
- Leading negative VS immunity
- > 50% lower level-shift switching losses
- Integrated bootstrap diode
- 1200 V breakdown voltage
- Integrated input filters

### Key benefits
- Increased robustness and reliability resulting in reduced manufacturing and field failures
- Reduced power dissipation, lower temperature
- Faster frequency switching
- Smaller PCB footprints
- Reduced BOM costs
- Improved noise sensitivity
- Latch-up immunity

### Customer value
- Increased profitability from lower lifecycle costs
- Faster time to market for higher share capture
- Enables new applications
- Increased flexibility
- Increased reliability

### Solutions and Applications

- **Solutions**
  - 20-300 V MOSFETs
  - 500-950 V MOSFETs
  - WBG semiconductors
  - IGBT discretes and silicon power diodes
  - Power management ICs
  - Intelligent power switches and modules
- **Packages**
  - Gate-driver ICs
  - Microcontrollers
  - Sensors
  - Digital isolators

### Current solutions
- 6 x opto-isolated drivers + 3 x 1200 V bootstrap diodes

### New 6ED2231S12T Integrates
- 6x gate-driver functionality and 3x bootstrap diodes
- Over-current protection
- IGBT/SiC MOSFET UVLOs

### 6ED2231S12T easily fits within EasyPIM™ 1B module footprint

### Product Name | Configuration | Package | Output current | Key features | Deadtime | $T_{on}$ / $T_{off}$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6ED2231S12T*</td>
<td>Three-phase</td>
<td>DSO-24</td>
<td>0.35 / 0.65 A</td>
<td>OCP, RFE</td>
<td>460 ns</td>
<td>700 / 650 ns</td>
</tr>
<tr>
<td>2ED1324S12P*</td>
<td>Half-Bridge</td>
<td>DSO-20</td>
<td>2.3 / 2.3 A</td>
<td>OCP, SOFF, AMC, RFE</td>
<td>380 ns</td>
<td>500 ns</td>
</tr>
<tr>
<td>2ED1323S12P*</td>
<td>HS+LS</td>
<td>DSO-20</td>
<td>2.3 / 2.3 A</td>
<td>OCP, SOFF, AMC, RFE</td>
<td>None</td>
<td>350 ns</td>
</tr>
<tr>
<td>2ED1322S12M*</td>
<td>Half-Bridge</td>
<td>DSO-16</td>
<td>2.3 / 4.6 A</td>
<td>OCP, SOFF, RFE</td>
<td>400 ns</td>
<td>500 ns</td>
</tr>
<tr>
<td>2ED1321S12M*</td>
<td>HS+LS</td>
<td>DSO-16</td>
<td>2.3 / 4.6 A</td>
<td>OCP, SOFF, RFE</td>
<td>None</td>
<td>350 ns</td>
</tr>
</tbody>
</table>

*Coming soon

2EDi EiceDRIVER™ family
Fast, robust, dual-channel galvanic isolated gate-driver ICs

Galvanic isolated EiceDRIVER™ family overview
The 2EDi is a family of dual-channel isolated gate driver ICs designed to drive Si MOSFETS, SiC MOSFETs and GaN power switches. Isolation is achieved by means of Infineon’s coreless transformer (CT) technology which guarantees robust operation and industry benchmark common-mode rejection (CMTI). The high propagation delay accuracy and low channel-to-channel mismatch makes the product ideal for use in fast-switching power system. In addition, high CMTI, high reverse current capability and fast clamping of the output below UVLO guarantees reliable operation in the application.

2EDi Gen 2: What is new?
› DSO-14 packages with increased channel-to-channel creepage to easier the layout or enable the use with higher working voltages or worst pollution layout
› New LGA 4 mm x 4 mm package enabling 70 percent space saving
› Fulfills the latest component standard for magnetic couplers (IEC 60747-17)
› Programmable dead-time and shoot-through functionality

Applications
› Server
› Telecom
› DC-DC converters
› Power tools
› Industrial SMPS
› Low speed electrical vehicles
› Solar power inverter
› LED lighting

Features and benefits

Key features
Fast power switching with accurate timing
› 5 A/9 A source/sink currents
› Propagation delay typ. 38 ns with 6 ns channel-to-channel precision
Optimized for area and system BOM
› < 1 Ω source and sink output resistance
› Output stages with S A reverse current capability
Robust
› CMTI >150 V/ns
› Under voltage lockout function for switch protection
› Deadtime control and shoot through protection
Output-to-output channel isolation
› Functional level galvanic isolation
Input-to-output channel isolation
› Functional, basic and reinforced galvanic isolation

Key benefits
Efficiency gain and lower losses
› Strong driving enables reduced switching losses
› Accurate timing enables deadtime optimization or synchronized driving in case of parallel MOSFETs
Improved thermal behavior at smaller form factor
› Most of the driving power is dissipated externally with reduced thermal stress on the driver
› Eliminates two costly protection diodes on the gate driver outputs
Protection and safe operation
› Reliable driver operation against fast switching transients
› MOSFET is protected from thermal stress in abnormal conditions
› Protection against noise and spurious pulses
Flexible configurations
› High-side + low-side, high-side + high-side, low-side + low-side
Regulatory safety
› Functional for level-shifting and ground bounce immunity
› Reinforced for control of primary-side MOSFETs from secondary-side controller

Customer value
Enabling higher system efficiency and higher power density designs
Improving long term competitive cost position, integration and mass manufacturability
Extending end-product lifetime by improving safe operation of power switches in normal and abnormal field (grid) conditions
Lower EMI by ground isolation
Simplified safety approval through component standards (UL1577, IEC60747-17) and system standards (IEC62368) certificates

www.infineon.com/2edi
EiceDRIVER™ X3 Compact and 2L-SRC Compact
5.7 kV, 18 A, 1-ch, isolated drivers with Miller clamp and two-level slew rate control

The EiceDRIVER™ X3 Compact family (1ED31xx) provides Miller clamp or separate output options with up to 14 A current, in DSO8 150 mil and 300 mil package. The EiceDRIVER™ 2L-SRC Compact family (1ED32xx) provides Miller clamp or 2-level slew rate control options with up to 18 A current, in DSO8 300 mil package. The Miller clamp function is highly recommended for SiC MOSFET 0 V turn off and IGBT7 against parasitic turn on. The two-level slew rate control function allows customers to change the output current on the fly. It is highly recommend for industrial drives application, where customer suffer from the EMI and switching loss optimization. Both EiceDRIVER™ X3 Compact and 2L-SRC Compact families are rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs in applications like solar inverter, EV charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

Simplified application diagram

Two-level slew rate control (1ED3241MC12H)

Active Miller clamp (1ED3122MC12H)

Evaluation board

EVAL-1ED3121MX12H
EVAL-1ED3122MX12H
EVAL-1ED3124MX12H
EVAL-1ED3241MC12H
EVAL-1ED3251MC12H
REF-22K-GPD-INV-EASY3B

www.infineon.com/gdcompact
www.infineon.com/src

* Coming soon
EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog

5.7 kV, 9 A, 1-ch, isolated drivers with DESAT, Miller clamp and soft-off

The EiceDRIVER™ Enhanced 1ED-F3 family (1ED332x) provides DESAT, Miller clamp and soft-off features with up to 6 A current, in DSO-16 300 mil package. The EiceDRIVER™ Enhanced X3 Analog family (1ED34xx) provides Miller clamp, resistor configurable DESAT and soft-off function with up to 9 A current, in DSO-16 300 mil fine pitch package.

The 1ED-F3 family (1ED332x) is pin-to-pin with our previous generation 1ED020I12-F2 (1ED-F2), with higher current, shorter propagation delay, higher isolation ratings and additional soft-off function. The X3 Analog family (1ED34xx) offers best-in-class DESAT protection accuracy with the resistor configurability on DESAT filter and leading edge blanking time and soft-off current.

Both EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog families are rated up to 2300 V functional isolation and 200 kV/μs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs in applications like solar inverter, EV charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

Simplified application diagram

1ED-F3 (1ED332x)

X3 Analog (1ED34xx)

Evaluation board

EVAL-1ED3321MC12N
EVAL-1ED3491MX12M

www.infineon.com/gdenhanced
EiceDRIVER™ Enhanced X3 Digital

5.7 kV, 9 A, 1-ch, isolated drivers with I2C configurability for DESAT, Miller clamp, soft-off and many more

The EiceDRIVER™ Enhanced X3 Digital family (1ED38xx) provides I2C configurability for DESAT, soft-off, UVLO, Miller clamp, two-level turn off (TLTO), and fault function to simplify the design of highly reliable systems. All adjustments are done from the input side via the I2C interface (pin SDA and SCL). The 1ED38xx offers up to 9 A current, in DSO-16 300 mil fine-pitch package.

The EiceDRIVER™ Enhanced X3 Digital family is rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs especially due to the configurability of DESAT and UVLO. This family is recommended in applications like solar inverter, EV charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc. Two noticeable advantages of the digitally configurable approach for customers are predictive maintenance in sophisticated industrial systems and rapid prototyping for fast solution development.

Predictive maintenance
Using the I2C interface, the 1ED38xx is able to register the counts of UVLO spikes, monitor the supply voltage and temperature increase. With the long-term analysis of the collected data, customers are able to decide when is the best time to schedule a maintenance cycle before the system fails.

Rapid prototyping
The I2C interface enables rapid prototyping without hardware changes. Using a traditional gate driver, customers have to first design an initial PCB board, and then adjust and replace the components on the board during evaluation. However, with the 1ED38xx I2C interface, customers can configure up to 27 parameters to optimize the board without replacing the components. This feature extremely shortens the development flow.

Evaluation board
EVAL-1ED3890Mx12M
EVAL-1ED38x0DCT

Simplified application diagram
X3 Digital (1ED38xx)

www.infineon.com/gdenhanced
EiceDRIVER™ APD 2ED4820-EM

48 V smart high-side MOSFET gate driver with SPI for automotive applications

The EiceDRIVER™ 2ED4820-EM is a smart high side N-channel MOSFET gate driver with two outputs controlled via SPI. The integrated powerful charge pump allows external MOSFETs to stay continuously on. Thanks to the enhanced turn-on and turn-off ability of the driver, the number of MOSFETs could be easily scaled up to manage large currents in the order of several hundred amps, while ensuring fast switch on and off. The MOSFETs could be controlled in a back to back configuration either common mode or common source. The integrated current sense amplifier supports high-side and even load-side current measurement with a dedicated monitoring output. The 2ED4820-EM comes along with several latching failure detections, to implement protections for the external MOSFETs, the load and the power source. Parameters can be adjusted by SPI; monitoring data, configuration, warning and failure detection registers can be read.

Summary of features
› Extended supply voltage range: 20 - 70 V
› Two independent high-side gate driver outputs with 1 A pull down, 0.3 A pull up for fast switch off/on
› Low supply current in sleep mode IBAT_Q < 5 µA
› Device control, configuration and diagnostic via SPI
› Configurable overcurrent/short circuit protection
› Configurable Drain-Source overvoltage protection
› Gate undervoltage lockout (VGS)
› Ground loss detection
› AEC-Q100 qualification

Benefits
› Supports back-to-back MOSFET topologies (common drain or common source)
› SAFESTATEN input to trigger safe state mode in case of µC failure
› One bidirectional high or low side analog current sense interface with configurable gain to optimize power losses
› Robust against Vbat voltages up to 105 V and Vsource voltages versus Vbat of -90 V

Potential applications
› Battery protection switch
› Input protection switch
› Static load and supply switch for high currents

Products and evaluation boards

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Ordering code</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>2ED4820-EM</td>
<td>48 V smart high-side MOSFET gate driver with SPI</td>
<td>SP005629911</td>
<td>PG-TSDSO-24</td>
</tr>
<tr>
<td>2ED4820 EB2 2HSV48</td>
<td>2ED4820 dual high-side switch – 48 V evaluation board</td>
<td>SP005353778</td>
<td>BOARD</td>
</tr>
<tr>
<td>R 48V BATT Switch10</td>
<td>48 V battery disconnect switch - reference design</td>
<td>SP005595834</td>
<td>BOARD</td>
</tr>
</tbody>
</table>

www.infineon.com/url
The **EiceDRIVER™ 1EDI302xAS/1EDI303xAS** is a family of automotive qualified single-channel high-voltage gate drivers optimized for IGBT and SiC technologies. The robust Infineon coreless transformer (CT) technology is used to provide bidirectional signal transfer across the galvanic isolation barrier. Comprehensive safety features and ISO26262 compliance enable ASIL D classification on the system level. Accompanying safety documents ease and speed-up FMEDA analysis in the application. The compact package design and the high level of feature integration save valuable PCB space and system cost, while the pre-configured settings reduce design efforts. Pin-compatible product variants make it easy to switch between variants and swiftly adjust ECUs to different application needs (i.e., SiC MOSFET vs IGBT).

### Product features
- Single-channel isolated IGBT driver
- For IGBTs up to 1200 V
- High CMTI up to 150 V/ns
- 8 kV basic insulation according to DIN VDE V 0884-11:2017-01
- Basic insulation according to UL 1577
- Min. 12 A peak current rail-to-rail output
- Propagation delay 60 ns typical
- Typ. 10 A integrated active Miller clamp supports unipolar switching
- Integrated, accurate 12 bit ADC for temperature measurements
- Integrated safety features to support ASIL B(D):
  - DESAT and differential OCP protection
  - Gate and output stage monitoring
  - Shoot-through protection
  - Primary/secondary supply monitoring
  - Internal supervision
- Advanced driver diagnosis with duty cycle coded DATA pin
- AEC-Q100 qualified
- Compact DSO-20 fine pitch package

### Potential applications
- Traction inverters for HEV and EV
- Auxiliary inverters for HEV and EV
- High-power DC-DC converters

### Evaluation board
- **1EDI30XXAS EVALBOARD**
- **1EDI303XAS EVALBOARD**
- **1EDI302XAS EVALBOARD**

### Product family overview

<table>
<thead>
<tr>
<th>Product variant</th>
<th>Driver support</th>
<th>Additional functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1EDI3020AS</td>
<td>IGBT</td>
<td>ADC for temperature Diode</td>
</tr>
<tr>
<td>1EDI3021AS</td>
<td>IGBT</td>
<td>Active short circuit</td>
</tr>
<tr>
<td>1EDI3023AS</td>
<td>SiC</td>
<td>ADC for NTC and DC-link</td>
</tr>
<tr>
<td>1EDI3030AS</td>
<td>SiC</td>
<td>ADC for temperature diode</td>
</tr>
<tr>
<td>1EDI3031AS</td>
<td>SiC</td>
<td>Active short circuit</td>
</tr>
<tr>
<td>1EDI3033AS</td>
<td>SiC</td>
<td>ADC for NTC and DC-link</td>
</tr>
</tbody>
</table>

www.infineon.com/url

*Coming soon*
Nomenclature

Naming convention for existing families of gate-driver ICs

- **Automotive rating**
  - AU

- **Technology generation**
  - IR = Gen2 high-voltage driver IC
  - IRS = Gen5 high-voltage driver IC

- **Voltage class**
  - 20 = 200 V
  - 21 = 600 V
  - 22 = 1200 V
  - 26 = 600 V feature adder
  - 44 = low-side driver

- **Driver type**
  - 3 = 3-phase driver
  - 7 = current-sense IC
  - Other: half-bridge, high-side/low-side, etc.

- **Number of channels**
  - 1 = 1-ch EiceDRIVER™
  - 2 = 2-ch (half-bridge) EiceDRIVER™
  - 6 = 6-ch (3-phase) EiceDRIVER™

- **Isolation technology**
  - S = reinforced galvanic isolation
  - B = basic galvanic isolation
  - I = functional galvanic isolation
  - L = level-shifting (SOI)
  - N = non-isolated driver

- **Package type**
  - S = SOIC
  - S = SOIC
  - J = PLCC44
  - M = MLPQ
  - Q = MFQP
  - L = SOT-23
  - B/F = die part
  - Blank: PDIP
  - **Additional features**
    - D = bootstrap
    - Blank = without bootstrap

- **Minimum drive strength**
  - in hundreds of milliamps

- **Optimal switch Type**
  - H = high-speed IGBT
  - I = IGBT
  - J = JFET
  - N = MOSFET

- **Package type**
  - F = DS08-150 mil
  - H = DS08-300 mil

- **Key features**
  - A = separate sink/source
  - B = Bootstrap diode
  - D = DESAT
  - M = active Miller clamp
  - S = slew rate control
  - T = two-level turn-off

- **Voltage class**
  - 06 = 600 V
  - 12 = 1200 V
Gate-driver ICs nomenclature

Naming convention for existing and upcoming families of gate-driver ICs

Number of channels
1 = 1-ch EiceDRIVER™
2 = 2-ch (half-bridge) EiceDRIVER™
6 = 6-ch (3-phase) EiceDRIVER™

Isolation class
N = non-isolated driver (low-side drivers)
F = functional isolation
B = basic isolation
S = reinforced isolation

UVLO threshold
6 = reserved
7 = ~4.2 V
8 = ~8 V
9 = reserved

Package type, e.g.
B = SOIC-8
F = DSO-150 mil
H = DSO-300 mil
C = Bare die single chip
J = SOIC-150 mil
M = SOIC-300 mil
P = SOIC-300 mil
R = TSSOP28-140 mil
T = SOIC-28-300 mil
V = SOIC-36-300 mil

Voltage class, e.g.
01 = <200 V
02 = 200 V
06 = 600 V
07 = 700 V
12 = 1200 V
16 = 1600 V
17 = 1700 V

Family ID
xx = 2 digits

Number of channels
1 = 1-ch EiceDRIVER™
2 = 2-ch (half-bridge) EiceDRIVER™
6 = 6-ch (3-phase) EiceDRIVER™

Isolation class
N = non-isolated
F = functional isolation
B = basic isolation
S = reinforced isolation

UVLO threshold
6 = reserved
7 = ~4.2 V
8 = ~8 V
9 = reserved

Package type / technology
EM = exposed pad DSO – 150mil

Voltage class
01 = <200 V
02 = 200 V
06 = 600 V
07 = 700 V
12 = 1200 V
16 = 1600 V
17 = 1700 V

Family ID
xx = 2 digits

Number of channels
1 = 1-ch EiceDRIVER™
2 = 2-ch (half-bridge) EiceDRIVER™
6 = 6-ch (3-phase) EiceDRIVER™

Isolation class
N = non-isolated
F = functional isolation
B = basic isolation
S = reinforced isolation

UVLO threshold
6 = reserved
7 = ~4.2 V
8 = ~8 V
9 = reserved

Package type / technology
EM = exposed pad DSO – 150mil

Optional
A = ISO 26262 compliant

Product number
flexible
Infineon support for gate-driver ICs
Useful links and helpful information

Further information, datasheets and documents

- www.infineon.com/200vhvic
- www.infineon.com/700vhvic
- www.infineon.com/1200vhvic
- www.infineon.com/gdsic
- www.infineon.com/gdsic-cn (CN)
- www.infineon.com/gdcompact

- www.infineon.com/gdenhanced
- www.infineon.com/src
- www.infineon.com/src-cn (CN)
- www.infineon.com/1EDN
- www.infineon.com/2EDN
- www.infineon.com/tdi

- www.infineon.com/2edl8
- www.infineon.com/gatedriver
- www.infineon.com/gatedriver-cn (CN)
- www.infineon.com/ifxdesigner
- www.infineon.com/gdevalboards

Gate driver IC community FAQs
www.infineon.com/gdforum

Gate driver selection tools
www.infineon.com/gdfinder

Gate driver simulation (SPICE) models
www.infineon.com/gdmodel

Cross reference tool
www.infineon.com/crs
Digital isolators

ISOFACE™ digital isolators

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
ISOFACE™ digital isolators
Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon’s coreless transformer (CT) technology and provide robust isolation for high voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART or CAN.

The 2DIBx4xxF family features
› Dual-channel digital isolators with eight variants and data rates up to 40 Mbits/s
› 3 kV_{RMS} isolation voltage
› CMOS/TTL input thresholds
› High common-mode transient immunity (CMTI)
› Accurate timing performance
› Wide operating supply voltage from 2.7 V to 6.5 V

Product variants

<table>
<thead>
<tr>
<th>Part number</th>
<th>Isolation rating</th>
<th>Channel configuration</th>
<th>Input thresholds</th>
<th>Default output state</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>2DIB0400F</td>
<td>V_{ISO} = 3000 V_{RMS} (UL1577 Ed. 5)</td>
<td>2 forward 0 reverse (2+0)</td>
<td>Variable (CMOS)</td>
<td>Low</td>
<td>PG-DSO8 5 x 4 mm</td>
</tr>
<tr>
<td>2DIB0401F</td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Fixed (TTL)</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB1400F</td>
<td></td>
<td>2 forward 0 reverse (2+0)</td>
<td>Variable (CMOS)</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB1401F</td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Fixed (TTL)</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2DIB0410F</td>
<td></td>
<td>2 forward 0 reverse (2+0)</td>
<td>Variable (CMOS)</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2DIB0411F</td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Fixed (TTL)</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2DIB1410F</td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Fixed (TTL)</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>2DIB1411F</td>
<td></td>
<td>1 forward 1 reverse (1+1)</td>
<td>Fixed (TTL)</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Features and benefits

Key features
› High CMTI > 100 V/ns
› Wide supply voltage range 2.7 V – 6.5 V (abs. max. 7.5 V)
› TTL or CMOS input threshold
› Typical propagation delay 26 ns with -4/+6 ns spread
› Both high and low fail-safe default output state
› Both component and system level certification
› Pin-to-pin compatibility

Key benefits
› High immunity against system noise or high dv/dt
› Reliable performance in SMPS with switching noise on IC power supply
› Optimized noise margin for different applications
› For high system power efficiency
› Reliable high or low default output state in case of failures
› Simplified system certification process
› For easy device replacement and alternative sourcing

Infineon ISOFACE™ dual-channel digital isolators are used to transfer gate driving and communication signals like CAN and UART over the isolation barrier. With high robustness and accurate switching characteristics, they are suitable for high power density designs and isolated communication systems.
**ISOFACE™ digital isolators**

**Dual-channel digital isolator 2DIB0410F in SOIC-8 narrow body package**

Infineon **ISOFACE™** dual-channel digital isolator 2DIB0410F (with 2 forward channels) provides robust isolation for high voltage applications. With a wide supply voltage range, TTL input thresholds and default output state low, it is the perfect fit for high-power density DC-DC brick applications.

### Block diagram of 2DIB041xF with two forward data channels

- **VDD1**
- **UVLO**
- **LogiTX**
- **RX**
- **Logic**
- **WDT**
- **Logic**
- **OUTA**
- **VDD2**
- **IN1**
- **Logic**
- **IN2**
- **GND1**
- **Logic**
- **GND2**

### Features and benefits

**Key features**
- High CMTI > 100 V/ns
- Wide operating supply voltage range 2.7 V ~ 6.5 V (abs. max. 7.5 V)
- TTL input threshold
- Integrated glitch filter
- Default low fail-safe output state
- Both component and system-level certification

**Key benefits**
- High immunity against system noise
- Reliable performance in SMPS with switching noise on IC power supply
- Optimized noise margin for SMPS applications
- Effective noise suppression in SMPS applications
- Reliable low output state in case of failures
- Simplified system certification process

**2DIB0410F** used in isolated DC-DC brick application

Infineon **ISOFACE™** dual-channel digital isolator 2DIB0410F is a perfect fit for isolated DC-DC brick applications to transfer half- or full-bridge gate driving signals. The two-channel configuration allows transfer of low- and high-side gate-signals over the isolation barrier.

www.infineon.com/isoface
Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F (with one forward and one reverse channel) provides robust isolation for high voltage applications. With high common-mode transient immunity (>100 V/ns), TTL input threshold, and default low output state, it is the perfect match for GaN-IPS with high dv/dt in high-density power designs (GaN with integrated non-isolated gate driver).

**Features and benefits**

**Key features**
- High CMTI > 100 V/ns
- Wide supply voltage range 2.7 ~ 6.5 V (abs. max. 7.5 V)
- TTL input threshold
- Integrated glitch filter
- Default low fail-safe output state
- Both component and system-level certification

**Key benefits**
- For GaN with integrated non-isolated gate driver
- Reliable performance in SMPS with switching noises on IC power supply
- Optimized noise margin for SMPS applications
- Effective noise suppression in SMPS applications
- Reliable low output state in case of failures
- Simplified system certification process

2DIB1410F used in totem-pole PFC with GaN IPS

Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F can be used together with GaN IPS for high-side floating drive. One forward channel is used to transfer the gate signal. The reverse channel can be used for protection signal.

www.infineon.com/isoface
Infineon support for digital isolators

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/isoface
Discrete IGBTs and silicon power diodes

› Discrete IGBTs
› 650 V TRENCHSTOP™ 5 IGBT
› 1200 V IGBT families
› Lower power drive IGBT portfolio
› 650 V Reverse Conducting R6 IGBT
› TRENCHSTOP™ advanced isolation

› TRENCHSTOP™ 5 selection tree
› IGBT selection tree
› Discrete IGBTs product portfolio
› Silicon power diodes
› IGBT nomenclature
› Silicon power diodes nomenclature
Discrete IGBTs

Market leadership through groundbreaking innovation and application focus

Resolute to achieve the highest standards in performance and quality, Infineon offers a comprehensive portfolio of application-specific discrete IGBTs. From 600 V up to 1600 V, we offer a wide range of IGBT voltage classes to meet different voltage requirements in each application.

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>5 µs</th>
<th>3 µs</th>
<th>5 µs</th>
<th>5 µs</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 V TRENCHSTOP™ 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V HighSpeed™ H3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ IGBT7 T7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ IGBT6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V RC-D2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V TRENCHSTOP™</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V RC-DF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 V RC-D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

< 1 k voltage rating

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>f_{sw} [kHz] (typical used up to)</th>
<th>Short circuit withstand time [µs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 V TRENCHSTOP™ 5</td>
<td>10 – 100 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V HighSpeed™ H3</td>
<td>40 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ IGBT7 T7</td>
<td>30 kHz</td>
<td>3 µs</td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ IGBT6</td>
<td>20 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V TRENCHSTOP™ Performance</td>
<td>15 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V RC-D2</td>
<td>20 kHz</td>
<td>3 µs</td>
</tr>
<tr>
<td>600 V TRENCHSTOP™</td>
<td>15 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V RC-DF</td>
<td>10 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>600 V RC-D</td>
<td>10 kHz</td>
<td>5 µs</td>
</tr>
</tbody>
</table>

> 1 k voltage rating

<table>
<thead>
<tr>
<th>Voltage Class</th>
<th>f_{sw} [kHz] (typical used up to)</th>
<th>Short circuit withstand time [µs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200 V TRENCHSTOP™ H3</td>
<td>10 µs</td>
<td>10 µs</td>
</tr>
<tr>
<td>1200 V TRENCHSTOP™ IGBT6</td>
<td>3 µs</td>
<td>8 µs</td>
</tr>
<tr>
<td>1200 V TRENCHSTOP™ Performance</td>
<td>10 µs</td>
<td>10 µs</td>
</tr>
<tr>
<td>NEW: 1200 V TRENCHSTOP™ IGBT7 S7</td>
<td>8 µs</td>
<td>10 µs</td>
</tr>
<tr>
<td>NEW: 1200 V TRENCHSTOP™ 2</td>
<td>10 µs</td>
<td>10 µs</td>
</tr>
<tr>
<td>1200 V Reverse Conducting R6</td>
<td>75 kHz</td>
<td>5 µs</td>
</tr>
<tr>
<td>1200 V Reverse Conducting RS</td>
<td>60 kHz</td>
<td>40 kHz</td>
</tr>
<tr>
<td>1200/1350/1600 V Reverse Conducting RS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200 V Reverse Conducting E1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/igbtdiscretes
www.infineon.com/gatedriver
High-power drive IGBT portfolio

Did you know that you could potentially save 20% of energy or 17 million tons of CO₂ if only half of all industrial drives had an electric speed control? Infineon has designed the 7th generation of TRENCHSTOP™ IGBTs, especially for variable speed drives. Based on the new micro-pattern trench technology, which offers a high level of controllability. These features bring significant loss reduction in the application, especially for industrial drives, which usually operate at moderate switching frequency.

650 V TRENCHSTOP™ 7 T7

If you still use old technology, like the short-circuit IGBT 3 or the non short-circuit TRENCHSTOP™ 5, then it is about time to change that.

Why? Because:
› The flexible family IGBT7 T7 is a benchmark in performance with state-of-the-art quality and best price/performance ratio.
› IGBT7 T7 is the best-in-class device for industrial motor drives, namely uninterruptable power supplies for photovoltaic and air conditioning PFC topologies.

1200 V TRENCHSTOP™ 7 S7

The new 1200 V IGBT generation TRENCHSTOP™ IGBT7 is designed to meet requirements of high efficiency, lowest conduction and switching losses in hard switching and resonant topologies operating at switching frequencies up to 20 kHz. Very soft, fast recovery anti-parallel emitter controlled diode is optimized for fast recovery while still maintaining a high level of softness complementing to an excellent EMI behavior.

Target applications:
› Industrial drives
› Solar
› UPS

The best-in-class MPT technology of the TRENCHSTOP™ IGBT7 S7 allows reduction of both \( V_{CE(sat)} \) by ~ 10% and total switching losses of > 10% compared to the TRENCHSTOP™ 2 family.

www.infineon.com/discreetIGBT7
www.infineon.com/igbtdiscretes
www.infineon.com/gatedriver
650 V TRENCHSTOP™ 5 IGBT

In terms of switching and conduction losses, there is no other IGBT in the market that can match the performance of the TRENCHSTOP™ 5. Wafer thickness has been reduced by more than 25 percent, which enables a dramatic improvement in both switching and conduction losses while providing an increased breakthrough voltage of 650 V. Based on TRENCHSTOP™ 5 IGBT technology, Infineon has developed six different product families optimized for specific applications, allowing designers to optimize for high efficiency, system cost or reliability demands of the market. The quantum leap of efficiency improvement provided by the TRENCHSTOP™ 5 IGBT families opens up new opportunities for designers to explore. EiceDRIVER™ isolated gate driver such as the 1ED compact family 650 V IGBT in solar and UPS applications. EiceDRIVER™ low side gate driver with overcurrent protection is widely used in induction cooking application and PFC stage.

www.infineon.com/trenchstop5
www.infineon.com/gatedriver
1200 V IGBT families

The 1200 V TRENCHSTOP™ 2 IGBT is optimized for low conduction losses with the lowest saturation voltage $V_{CE(sat)}$ of 1.75 V. A soft fast recovery emitter controlled diode further minimizes the turn-on losses.

The 1200 V HighSpeed 3 discrete IGBTs provides the lowest losses and the highest reliability for switching above 20 kHz. Transition to fast switching high-speed devices allows reduction in the size of the active components (25-70 kHz).

The new 1200 V IGBT generation, TRENCHSTOP™ IGBT7 S7, is designed to meet requirements of high efficiency, lowest conduction and switching losses in hard switching and resonant topologies, operating at switching frequencies up to 20 kHz. The IGBT7 S7 devices can be used as direct replacement for the TRENCHSTOP™ T2 and alternative to HighSpeed 3 H3 series.

The Reverse Conducting R5 is the latest generation in the RC-H series of reverse conducting IGBT. With a monolithically integrated diode, they offer optimized performance for resonant switching applications such as induction cooking. R5 devices are also available in 1350 V and 1600 V blocking voltage.

EiceDRIVER™ isolated gate driver like 1ED Compact family and EiceDRIVER™ 1200 V level shift gate driver family are perfect match for the 1200 V IGBT in motor control, general purpose inverter, solar, and UPS applications. EiceDRIVER™ low-side gate driver with over current protection is widely used in induction cooking application.
Lower power drive IGBT portfolio

650 V TRENCHSTOP™ IGBT6 and 600 V RC-D2

Motor drives up to 1 kW are used in a wide variety of applications, from home appliance fans and compressors to pumps. The market for these products demands design flexibility, EMI performance, and easy controllability. Therefore, these compact motors require power electronics with the lowest losses and best thermal performance. The TRENCHSTOP™ IGBT6 family of discrete devices has been designed for the lowest switching losses, which is particularly important in systems with higher switching frequencies (up to 30 kHz). Additionally, the IGBTs are co-packed with the soft, fast-recovery Rapid 1 anti-parallel diodes for the lowest total losses. With a higher blocking voltage at 650 V, and short-circuit rating, TRENCHSTOP™ IGBT6 is a key contributor to robust motor designs.

The new RC-D2 family of discrete devices has been cost-optimized in surface-mounted packages. The device contains a monolithically integrated diode and has HV-H3TRB ruggedness capability. With a blocking voltage at 600 V, and 3 µs short-circuit rating, the RC-D2 is a key contributor to cost-effective motor designs.

Switch selection for low power drives < 300 W

Features and benefits

Key available

- Available in surface-mounted packages
- IGBT6 co-packed with and without diodes (DPAK, TO-220FP)
- RC-D2 monolithically integrated diode (DPAK, SOT-223)
- SC rating up to 3 µs
- Low EMI due to easy controllability

Key benefits

- Enable space limited application
- Performance improvement
- Cost-optimized solution
- SC protection
- No need for additional components on PCB

EMI performance

- $R_{(on)}$ and $R_{(off)}$ are selected to meet $\frac{dv}{dt}$ of 2 V/ns at 500 mA and $T_j$ of 100°C
- IGBTs (IKD04N60RC2) are easily controllable by optimizing $R_g$ values
- CoolMOS™ (IPS60R1K0PFD7S) EMI performance can be enhanced with additional passive components

www.infineon.com/IGBT6
www.infineon.com/rcd2
www.infineon.com/gatedriver
Reverse Conducting for soft-switching applications

650 V Reverse Conducting R6 IGBT in TO-247 package

The 650 V R6 IGBT offers the lowest $V_{CE(sat)}$ and optimized $E_{off}$ for best efficiency, minimized power losses and cooling effort. The good EMI behavior simplifies filtering design, reduces system costs and effort for the designers. Thanks to the best system performances and high compatibility with the existing gate driver solution, 650 V R6 IGBT represents the optimal choice for soft switching topologies.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Very low $V_{CE(sat)}$ and low $E_{off}$</td>
<td>› Lowest losses on IGBT, high system efficiency for higher power output</td>
</tr>
<tr>
<td>› High ruggedness and stable temperature behavior</td>
<td>› Fast and easy replacement of predecessor R5 portfolio</td>
</tr>
<tr>
<td>› Maximum operating $T_J$ of 175 °C</td>
<td>› High device reliability</td>
</tr>
<tr>
<td>› Good EMI behavior</td>
<td></td>
</tr>
</tbody>
</table>

Package innovations

Discrete IGBT package overview

Infineon discrete IGBT package portfolio contains SMD (surface mount device) packages, for example, DPAK, D2PAK, SOT-223, and through-hole packages, for example, TO-220, TO-220 FP, TO-247, TO-247-3-HCC, TO-247-4, TO-247PLUS, TO-247PLUS-4, and TO-247 advanced isolation packages. It provides discrete IGBTs solutions with and without anti-parallel diode, which is an excellent fit to use in industrial, home appliance, and automotive applications.

<table>
<thead>
<tr>
<th>Package options</th>
<th>SOT-223</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 4-pin</th>
<th>TO-247PLUS</th>
<th>TO-247PLUS 4-pin</th>
<th>TRENCH-STOP™ advanced isolation TO-247</th>
<th>TO-247-3-HCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>600 V, 650 V, 1100 V, 1200 V, 1350 V, 1600 V</td>
<td>600 V, 650 V</td>
<td>650 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration</td>
<td>DuoPack (with diode), single IGBTs</td>
<td>DuoPack IGBTs (with diode) and single diodes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous collector current $T_J = 100°C$</td>
<td>3-120 A</td>
<td>40-90 A</td>
<td>20-70 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/rch6
www.infineon.com/latest-discrete-packages
TRENCHSTOP™ advanced isolation

Fully isolated TO-247 package with industry leading IGBTs

TRENCHSTOP™ advanced isolation solution breaks the limits reached by traditional packaging and isolation techniques. This new isolated package enables the highest power density, the best performance and the lowest cooling effort thanks to an effective and reliable thermal path from the IGBT die to the heatsink.

In addition to providing 100 percent electrical isolation, TRENCHSTOP™ advanced isolation also eliminates the need for thermal grease or thermal interface sheets. The new package delivers at least 35 percent lower thermal resistivity, helping designers to increase power density, as well as lower system complexity and assembling costs.

This new package solution allows industrial and home appliance designs to fully utilize the high performance of TRENCHSTOP™ IGBTs without compromises for isolation and cooling.

Features and benefits

**Thermal resistivity of package and isolation types**

<table>
<thead>
<tr>
<th>Package Type</th>
<th>Thermal Resistivity</th>
<th>Thermal Resistivity Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-247</td>
<td></td>
<td>35% lower</td>
</tr>
<tr>
<td>TO-247 with isolation film</td>
<td></td>
<td>50% lower</td>
</tr>
<tr>
<td>Advanced isolation</td>
<td></td>
<td>100% lower</td>
</tr>
</tbody>
</table>

1) Isolation material: standard polyimide based reinforced carrier insulator film with 152 μm thickness, 1.3 W/mK thermal conductivity

**Key features**

- 2500 Vrms electrical isolation, 50/60 Hz, t = 1 min
- 100 percent tested isolated mounting surface
- Lowest $R_{th(j-h)}$
- Low coupling capacitance, 38 pF
- No need for isolation film or thermal interface material

**Key benefits**

- Up to 35 percent reduction in assembly time reduces manufacturing cost
- Increased power density
- Improved reliability from higher yield and no isolation film misalignment
- Less EMI filter design effort
- Decreased heatsink size

www.infineon.com/advanced-isolation
www.infineon.com/gatedriver
**TRENCHSTOP™ 5 selection tree**

<table>
<thead>
<tr>
<th>650 V</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free wheeling diode (FWD)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 50 Hz-20 kHz
- **Low V_{CE(sat)}**
  - **TRENCHSTOP™ 5 LS5 H5/F5/S5**

### 30 kHz-120 kHz
- **High speed**

### > 20 kHz-60 kHz
- **High speed**

### 10 kHz-40 kHz
- **High speed**

### 30 kHz-100 kHz
- **High speed**

### > 60 kHz-120 kHz
- **Ultra-high speed**

### Corresponding best fit IGBT

- IGW30N65LS5
- IGB15N65S5
- IGB20N65S5
- IGB50N65S5
- IGB50N65H5
- IGP20N65H5/F5
- IGP30N65H5/F5
- IGP40N65H5/F5
- IGW30N65H5/F5
- IGW40N65H5/F5
- IGW50N65H5/F5
- IGZ50N65H5
- IGZ75N65H5
- IGZ100N65H5

- IKW30N65EL5
- IKW30N65NL5
- IKW75N65EL5
- IKW75N65EL5
- IKW30N65WR5
- IKW40N65WR5
- IKW50N65WR5
- IKW30N65H5
- IKW40N65H5
- IKW50N65H5
- IWH30N65WR5
- IWH40N65WR5
- IWH50N65WR5
- IWH60N65WR5
- IWH70N65WR5
- IKZ50N65ES5
- IKZ75N65ES5
- IKZ40N65ES5

- IKP08N65H5
- IKP15N65H5
- IKP20N65H5
- IKP30N65H5
- IKP40N65H5
- IKA08N65H5
- IKA15N65H5
- IKW30N65H5
- IKW40N65H5
- IKW50N65H5
- IKW75N65EH5
- IKZ50N65EH5
- IKZ75N65EH5
- IKB30N65EH5
- IKB40N65EH5

- IKP08N65FS5
- IKP15N65FS5
- IKP20N65FS5
- IKP30N65FS5
- IKP40N65FS5
- IKA08N65FS5
- IKA15N65FS5
- IKW30N65FS5
- IKW40N65FS5
- IKW50N65FS5
- IKW75N65EH5
- IKZ50N65EH5
- IKZ75N65EH5
- IKB30N65EH5
- IKB40N65EH5

### RC TRENCHSTOP™ 5
- WRS / WR6

### TRENCHSTOP™ 5 HS5

### Corresponding best fit IGBT

- IKW30N65EL5
- IKW30N65NL5
- IKW75N65EL5
- IKW75N65EL5
- IKW30N65WR5
- IKW40N65WR5
- IKW50N65WR5
- IKW30N65H5
- IKW40N65H5
- IKW50N65H5
- IWH30N65WR5
- IWH40N65WR5
- IWH50N65WR5
- IWH60N65WR5
- IWH70N65WR5
- IKZ50N65ES5
- IKZ75N65ES5
- IKZ40N65ES5

- IKP08N65H5
- IKP15N65H5
- IKP20N65H5
- IKP30N65H5
- IKP40N65H5
- IKA08N65H5
- IKA15N65H5
- IKW30N65H5
- IKW40N65H5
- IKW50N65H5
- IKW75N65EH5
- IKZ50N65EH5
- IKZ75N65EH5
- IKB30N65EH5
- IKB40N65EH5

### Corresponding best fit IGBT

- IKP08N65H5
- IKP15N65H5
- IKP20N65H5
- IKP30N65H5
- IKP40N65H5
- IKA08N65H5
- IKA15N65H5
- IKW30N65H5
- IKW40N65H5
- IKW50N65H5
- IKW75N65EH5
- IKZ50N65EH5
- IKZ75N65EH5
- IKB30N65EH5
- IKB40N65EH5

### RC TRENCHSTOP™ 5 FS5

### Corresponding best fit IGBT

- IKP08N65FS5
- IKP15N65FS5
- IKP20N65FS5
- IKP30N65FS5
- IKP40N65FS5
- IKA08N65FS5
- IKA15N65FS5
- IKW30N65FS5
- IKW40N65FS5
- IKW50N65FS5
- IKW75N65EH5
- IKZ50N65EH5
- IKZ75N65EH5
- IKB30N65EH5
- IKB40N65EH5

[www.infineon.com/trenchstop5](http://www.infineon.com/trenchstop5)
[www.infineon.com/gatedriver](http://www.infineon.com/gatedriver)
**IGBT selection tree**

### Frequency range

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>IGBT</th>
<th>Diode commutation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-75 kHz</td>
<td>Soft</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>2-40 kHz</td>
<td>Soft</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>10-40 kHz</td>
<td>Medium speed</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>&gt; 18-60 kHz</td>
<td>High speed</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>10-100 kHz</td>
<td>High speed</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>&gt; 18-60 kHz</td>
<td>High speed</td>
<td>Hard/soft for IG** parts</td>
</tr>
<tr>
<td>50 Hz-20 kHz</td>
<td>Low speed</td>
<td>Hard/soft for IG** parts</td>
</tr>
</tbody>
</table>

### Voltage range

|---------------|---------------------------------------|---------------|---------------|-------|---------------|-------|-------|-------|

### Part number

| Part number | IHpccNvvr3 | IHpccNvvr5 | IHpccN65R6 | IHpccN120E1 | IHFW40N65R5S | IKpccN60R | IKpccN60RC2 | IKpccN60RF | IKpccN60ET7 | IKpccN60DTP | IKpc1N120CS7 | IKpccN60DTP | IKpc1N120d6 | IKpccN65ET6 | IKpccN65T6 | IKpccN65d55 | IKpc1N65H3 | IKpc1N65H5 | IKpc1N65WR5 | IKpc1N65dL5 | IKpc1N65L5 |
|-------------|------------|------------|------------|------------|-------------|----------|-------------|------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|

### Applications

- **Induction cooking**
  - Microwave
  - Multifunction printers
- **Half-bridge resonant** (Voltage resonance < 650 V)
  - Single switch (Voltage resonance > 650 V)
- **Conduction loss optimized**
  - Solar inverter
    - Asymmetrical bridge
    - Symmetrical full-bridge
    - Three-level type I or three-level type II converter
- **Motor control**
  - Three-phase inverter
  - Full-bridge inverter
  - Single-phase inverter
- **Uninterruptable power supply**
  - UPS bridge
    - Three-level type II converter
- **Major and small home appliances**
  - Symmetrical full-bridge
  - Single-phase inverter
- **UPS**
  - Energy storage
  - Battery charger
  - Welding
  - Solar inverter
- **PFC**
  - Battery charger
  - Welding
  - UPS
  - Solar
  - Energy storage
  - SMPS
  - Air conditioning
  - HVDC (telecom/data centers)
  - Totem pole PFC
- **PFC**
  - RAC/CAC PFC outdoor compressor
  - Welding inverse
  - Full-bridge
  - Half-bridge
  - Two transistor forward
- **UPS**
  - Three-level NPC1 and NPC2 topology, inner switches
  - Solar
  - Three-level NPC1 and NPC2 topology, inner switches
  - Welding
  - AC output (Al/Mag welding)

[www.infineon.com/igbtdiscretes](http://www.infineon.com/igbtdiscretes)
[www.infineon.com/gatedriver](http://www.infineon.com/gatedriver)
## TRENCHSTOP™ and RC-drives

### 600 V/650 V product family together with 650 V SOI gate driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ T = 100°C [A]</th>
<th>TO-251 (IPAK)</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 advanced isolation</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247PLUS/ Super 247 (TO-247AA)</th>
<th>SOT-223</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>IGU04N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IG06N60T</td>
<td>IG06N60TST6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW30N60T</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IG10N60T</td>
<td>IGB10N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW50N60T</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>IG15N60T</td>
<td>IGB15N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW50N60T</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>IGB30N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGBW50N60TP</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IGB50N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>IGB50N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW50N60T</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>IGB75N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Single IGBT

<table>
<thead>
<tr>
<th>Collector current [A]</th>
<th>IGU04N60T</th>
<th>IGU06N60T</th>
<th>IGU10N60T</th>
<th>IGU15N60T</th>
<th>IGU30N60T</th>
<th>IGU50N60T</th>
<th>IGU75N60T</th>
<th>IGU100N60T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW04N60T</td>
</tr>
<tr>
<td>3</td>
<td>IKD03N60RF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW03N60T</td>
</tr>
<tr>
<td>4</td>
<td>IKD04N60RC2</td>
<td>IKD04N60RF</td>
<td>IKD04N60R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW04N60TP</td>
</tr>
<tr>
<td>6</td>
<td>IKD06N60RC2</td>
<td>IKD06N60RF</td>
<td>IKD06N60R</td>
<td>IKD06N60SET6</td>
<td>IKB06N60T</td>
<td>IKB06N60T</td>
<td>IKA06N60T</td>
<td>IGW06N60TP</td>
</tr>
<tr>
<td>8</td>
<td>IKD08N60ET6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW08N60TP</td>
</tr>
<tr>
<td>10</td>
<td>IKD10N60RC2</td>
<td>IKD10N60RF</td>
<td>IKD10N60R</td>
<td>IKB10N60T</td>
<td>IKB10N60T</td>
<td>IKB10N60T</td>
<td>IKA10N60T</td>
<td>IGW10N60TP</td>
</tr>
<tr>
<td>15</td>
<td>IKD15N60RC2</td>
<td>IKD15N60RF</td>
<td>IKD15N60R</td>
<td>IKB15N60T</td>
<td>IKB15N60T</td>
<td>IKB15N60T</td>
<td>IKA15N60T</td>
<td>IGW15N60TP</td>
</tr>
<tr>
<td>20</td>
<td>IKB20N60T</td>
<td>IKB20N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW20N60T</td>
</tr>
<tr>
<td>30</td>
<td>IKB30N60T</td>
<td>IKB30N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW30N60TP</td>
</tr>
<tr>
<td>40</td>
<td>IKB40N60T</td>
<td>IKB40N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW40N60TP</td>
</tr>
<tr>
<td>50</td>
<td>IKB50N60T</td>
<td>IKB50N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW50N60TP</td>
</tr>
<tr>
<td>75</td>
<td>IKB75N60T</td>
<td>IKB75N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW75N60TP</td>
</tr>
<tr>
<td>100</td>
<td>IKB100N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGQ100N60T</td>
</tr>
<tr>
<td>120</td>
<td>IKB120N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGQ120N60T</td>
</tr>
</tbody>
</table>

### IGBT and diode

<table>
<thead>
<tr>
<th>Collector current [A]</th>
<th>IGU04N60T</th>
<th>IGU06N60T</th>
<th>IGU10N60T</th>
<th>IGU15N60T</th>
<th>IGU30N60T</th>
<th>IGU50N60T</th>
<th>IGU75N60T</th>
<th>IGU100N60T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW04N60T</td>
</tr>
<tr>
<td>3</td>
<td>IKD03N60RF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW03N60T</td>
</tr>
<tr>
<td>4</td>
<td>IKD04N60RC2</td>
<td>IKD04N60RF</td>
<td>IKD04N60R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW04N60TP</td>
</tr>
<tr>
<td>6</td>
<td>IKD06N60RC2</td>
<td>IKD06N60RF</td>
<td>IKD06N60R</td>
<td>IKB06N60T</td>
<td>IKB06N60T</td>
<td>IKB06N60T</td>
<td>IKB06N60T</td>
<td>IGW06N60TP</td>
</tr>
<tr>
<td>8</td>
<td>IKD08N60ET6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW08N60TP</td>
</tr>
<tr>
<td>10</td>
<td>IKD10N60RC2</td>
<td>IKD10N60RF</td>
<td>IKD10N60R</td>
<td>IKB10N60T</td>
<td>IKB10N60T</td>
<td>IKB10N60T</td>
<td>IKB10N60T</td>
<td>IGW10N60TP</td>
</tr>
<tr>
<td>15</td>
<td>IKD15N60RC2</td>
<td>IKD15N60RF</td>
<td>IKD15N60R</td>
<td>IKB15N60T</td>
<td>IKB15N60T</td>
<td>IKB15N60T</td>
<td>IKB15N60T</td>
<td>IGW15N60TP</td>
</tr>
<tr>
<td>20</td>
<td>IKB20N60T</td>
<td>IKB20N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW20N60T</td>
</tr>
<tr>
<td>30</td>
<td>IKB30N60T</td>
<td>IKB30N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW30N60TP</td>
</tr>
<tr>
<td>40</td>
<td>IKB40N60T</td>
<td>IKB40N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW40N60TP</td>
</tr>
<tr>
<td>50</td>
<td>IKB50N60T</td>
<td>IKB50N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW50N60TP</td>
</tr>
<tr>
<td>75</td>
<td>IKB75N60T</td>
<td>IKB75N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGW75N60TP</td>
</tr>
<tr>
<td>100</td>
<td>IKB100N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGQ100N60T</td>
</tr>
<tr>
<td>120</td>
<td>IKB120N60T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IGQ120N60T</td>
</tr>
</tbody>
</table>

**www.infineon.com/600V-1200V-trenchstop**
### TRENCHSTOP™ IGBT6

650 V product family together with 650 V SOI gate driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ $T_c=100^\circ C$ [A]</th>
<th>TO-252 (DPAK)</th>
<th>TO-220 FullPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>IKD06N65ET6</td>
<td>IKA06N65ET6</td>
</tr>
<tr>
<td>8</td>
<td>IKD08N65ET6</td>
<td>IKA08N65ET6</td>
</tr>
<tr>
<td>10</td>
<td>IGD10N65T6</td>
<td>IKA10N65ET6</td>
</tr>
<tr>
<td>15</td>
<td>IGD15N65T6</td>
<td>IKA15N65ET6</td>
</tr>
</tbody>
</table>

### TRENCHSTOP™ IGBT6

1200 V fast speed IGBT product family together with isolated gate driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ $T_c=100^\circ C$ [A]</th>
<th>TO-247</th>
<th>TO-247PLUS 3-pin</th>
<th>TO-247PLUS 4-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>IKW15N120BH6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IKW40N120CS6</td>
<td>IKY40N120CS6</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>IKQ75N120CS6</td>
<td>IKY75N120CS6</td>
<td></td>
</tr>
</tbody>
</table>

### TRENCHSTOP™ IGBT6

1200 V product family together with isolated driver and 1200 V level shift driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ $T_c=100^\circ C$ [A]</th>
<th>TRENCHSTOP™</th>
<th>TRENCHSTOP™ 7 S7</th>
<th>TRENCHSTOP™ 7 S7</th>
<th>TRENCHSTOP™ 7 S7</th>
<th>TRENCHSTOP™ 7 S7</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>IGW08T120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>IGW15T120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>IGW25T120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IGW40T120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IGW60T120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>IKW08T120</td>
<td>IKW08N120CS7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>IKW15T120</td>
<td>IKW15N120CS7</td>
<td>IKW15N120T2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>IKW25T120</td>
<td>IKW25N120CS7</td>
<td>IKW25N120T2</td>
<td>IKW25N120CS7</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IKW40T120</td>
<td>IKW40N120CS7</td>
<td>IKW40N120CT2</td>
<td>NEW IKQ40N120CS7</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>IKW50N120CS7</td>
<td>IKQ50N120CT2</td>
<td>IKQ50N120CS7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>IKQ75N120CT2</td>
<td>IKQ75N120CS7</td>
<td>IKY75N120CS7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TRENCHSTOP™ 7 T7

Together with isolated driver, 650 V SOI driver, and low side driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ $T_c=100^\circ C$ [A]</th>
<th>TO-220 FullPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>IKW20N65SET7</td>
</tr>
<tr>
<td>30</td>
<td>IKW30N65SET7</td>
</tr>
<tr>
<td>40</td>
<td>IKW40N65SET7</td>
</tr>
<tr>
<td>50</td>
<td>IKW50N65SET7</td>
</tr>
<tr>
<td>75</td>
<td>IKW75N65SET7</td>
</tr>
</tbody>
</table>

www.infineon.com/igbt6  
www.infineon.com/discreteigbt7
### Induction heating series

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-247 advanced isolation</th>
<th>TO-247 Halogen-Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td>IHW15N120E1</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>IHW20N120RS</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>IHW25N120E1</td>
</tr>
<tr>
<td>30</td>
<td>IHW30N65RSR</td>
<td>IHW30N110RS</td>
</tr>
<tr>
<td>40</td>
<td>IHW40N65RSR</td>
<td>IHW40N110RS*</td>
</tr>
<tr>
<td>50</td>
<td>IHW50N65RSR</td>
<td>IHW50N110RS</td>
</tr>
</tbody>
</table>

#### HighSpeed 3

Together with isolated driver, 650 V SOI driver, and low side driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-263 (D2PAK) advanced isolation</th>
<th>TO-220 advanced isolation</th>
<th>TO-247 advance isolation</th>
<th>TO-247 Halogen-Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>IGB20N60H3</td>
<td>IGP20N60H3</td>
<td>IGW20N60H3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>IGB30N60H3</td>
<td>IGP30N60H3</td>
<td>IGW30N60H3</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td>IGW40N60H3</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td>IGW50N60H3</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td>IGW60N60H3</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td>IGW75N60H3</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td>IGW100N60H3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>IKB20N60H3</td>
<td>IKP20N60H3</td>
<td>IKW20N60H3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td>IKW30N60H3</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td>IKW40N60H3</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>IKFW40N60DH3E</td>
<td>IKW50N60H3</td>
<td>IKW50N60H3</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>IKFW60N60DH3E</td>
<td>IKF60N60H3</td>
<td>IKW60N60H3</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
<td>IKW75N60H3</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td>IKW90N60H3</td>
<td></td>
</tr>
</tbody>
</table>

#### DuoPack

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-247 advanced isolation</th>
<th>TO-247 Halogen-Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>IKW15N120H3</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>IKW25N120H3</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IKW40N120H3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>IKQ40N120CH3</td>
<td>IKY40N120CH3</td>
</tr>
<tr>
<td>25</td>
<td>IKQ50N120CH3</td>
<td>IKY50N120CH3</td>
</tr>
<tr>
<td>40</td>
<td>IKQ75N120CH3</td>
<td>IKY75N120CH3</td>
</tr>
</tbody>
</table>

---

www.infineon.com/rch5
www.infineon.com/rch6
www.infineon.com/rc-e
www.infineon.com/advanced-isolation

* coming soon
## TRENCHSTOP™ 5 F5, H5 and S5
Together with isolated driver, 650 V SOI driver, and low side driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-263 (DPAK)</th>
<th>TO-220</th>
<th>TO-247 advanced isolation</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 4-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGBT</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>20  IGB20N65S5</td>
<td>IGP20N65FS/IGP20N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30  IGB30N65S5</td>
<td>IGP30N65FS/IGP30N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40  IGP40N65FS/IGP40N65HS</td>
<td>IGP40N65FS/IGP40N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50  IGB50N60HS</td>
<td>IGP50N60FS/IGP50N60HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75  IGB50N60S5</td>
<td>IGP50N60S5/IGP50N60S5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 IGB50N60S5</td>
<td>IGP50N60S5/IGP50N60S5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DropPack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8   IKP08N65FS/IKP08N65HS</td>
<td>IKA08N65FS/IKAO8N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15  IKP15N65FS/IKP15N65HS</td>
<td>IKA15N65FS/IKAO15N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20  IKP20N65FS/IKP20N65FS</td>
<td>IKA20N65FS/IKAO20N65FS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30  IKP30N65F5/IKP30N65F5</td>
<td>IKA30N65F5/IKAO30N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40  IKP40N65F5/IKP40N65F5</td>
<td>IKA40N65F5/IKAO40N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50  IKP50N65F5/IKP50N65F5</td>
<td>IKA50N65F5/IKAO50N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60  IKF60N65F5/IKF60N65F5</td>
<td>IKA60N65F5/IKAO60N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75  IKF75N65F5/IKF75N65F5</td>
<td>IKA75N65F5/IKAO75N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90  IKF90N65F5/IKF90N65F5</td>
<td>IKA90N65F5/IKAO90N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## TRENCHSTOP™ 5 L5 low VCE(sat)
650 V product family together with low side driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-251 (IPAK)</th>
<th>TO-252 (DPAK)</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 (IPAK)</th>
<th>TO-262 (IPAK)</th>
<th>TO-220 (IPAK)</th>
<th>TO-220 (IPAK)</th>
<th>TO-220 (IPAK)</th>
<th>TO-247</th>
<th>TO-247</th>
<th>TO-247</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGBT</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30  IGW30N65LS</td>
<td></td>
<td></td>
<td></td>
<td>IGP30N65FS/IGP30N65HS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30  IGW30N65EL5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75  IGW75N65LS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DropPack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50  IKFW50N65FS/IKFW50N65FS</td>
<td>IKA50N65FS/IKAO50N65FS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60  IKFW60N65F5/IKFW60N65F5</td>
<td>IKA60N65F5/IKAO60N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75  IKFW75N65F5/IKFW75N65F5</td>
<td>IKA75N65F5/IKAO75N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90  IKFW90N65F5/IKFW90N65F5</td>
<td>IKA90N65F5/IKAO90N65F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## TRENCHSTOP™ 5 WR5/WR6
650 V product family together with low side driver family

<table>
<thead>
<tr>
<th>Continuous collector current @ Tc=100°C [A]</th>
<th>TO-247</th>
<th>TO-247 HCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DropPack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20  IKWH20N65WR6</td>
<td>IKWH20N65WR6</td>
<td></td>
</tr>
<tr>
<td>30  IKWH30N65WR6</td>
<td>IKWH30N65WR6</td>
<td></td>
</tr>
<tr>
<td>40  IKWH40N65WR6</td>
<td>IKWH40N65WR6</td>
<td></td>
</tr>
<tr>
<td>50  IKWH50N65WR6</td>
<td>IKWH50N65WR6</td>
<td></td>
</tr>
<tr>
<td>60  IKWH60N65WR6</td>
<td>IKWH60N65WR6</td>
<td></td>
</tr>
<tr>
<td>70  IKWHT0N65WR6</td>
<td>IKWHT0N65WR6</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/trenchstop5
Silicon power diodes

Filling the gap between SiC diodes and emitter controlled diodes

The Rapid diode family complements Infineon’s existing high-power 600 V/650 V diode portfolio by filling the gap between SiC diodes and previously released emitter controlled diodes. They offer a perfect cost/performance balance and target high-efficiency applications switching between 18 and 100 kHz. Rapid 1 and Rapid 2 diodes are optimized to have excellent compatibility with CoolMOS™ and high speed IGBTs (insulated gate bipolar transistor) such as the TRENCHSTOP™ IGBT7 and TRENCHSTOP™ 5.

The Rapid 1 diode family
Rapid 1 is forward voltage drop (V_f) optimized to address low switching frequency applications between 18 kHz and 40 kHz, for example, air conditioner and welder PFC stages.

› 1.35 V temperature-stable forward voltage (V_f)
› Lowest peak reverse recovery current (I_{rmm})
› Reverse recovery time (t_{rr}) < 100 ns
› High softness factor

The Rapid 2 diode family
Rapid 2 is Q_{r}/t_{rr} optimized hyperfast diode to address high-speed switching applications between 40 kHz and 100 kHz, typically found in PFCs in high efficiency switch mode power supplies (SMPS) and welding machines.

› Lowest reverse recovery charge (Q_{rr}): V_f ratio for best-in-class performance
› Lowest peak reverse recovery current (I_{rmm})
› Reverse recovery t_{rr} < 50 ns
› High softness factor

www.infineon.com/rapiddiodes
www.infineon.com/ultrasoftdiodes
Silicon power diodes

### Rapid 1 diodes
650 V product family

<table>
<thead>
<tr>
<th>Continuous current $I_F$ @ $T_C=100°C$ [A]</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 common cathode</th>
<th>TO-247 advanced isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>IDP08E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>15</td>
<td>IDP15E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>20</td>
<td>IDV20E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>30</td>
<td>IDP30E65D1</td>
<td>IDW30E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>40</td>
<td>IDW40E65D1</td>
<td>IDW40E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>60</td>
<td>IDW60E65D1</td>
<td>IDW60E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>75</td>
<td>IDW75E65D1</td>
<td>IDW75E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>80</td>
<td>IDW80E65D1</td>
<td>IDW80E65D1</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
</tbody>
</table>

### Rapid 2 diodes
650 V product family

<table>
<thead>
<tr>
<th>Continuous current $I_F$ @ $T_C=100°C$ [A]</th>
<th>TO-220</th>
<th>TO-220 FullPAK</th>
<th>TO-247</th>
<th>TO-247 common cathode</th>
<th>TO-247 advanced isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>IDP08E65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>15</td>
<td>IDP15E65D2</td>
<td>IDV15E65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>20</td>
<td>IDP20E65D2</td>
<td>IDP20C65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>30</td>
<td>IDP30E65D2</td>
<td>IDV30E65D2</td>
<td>IDP30C65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>40</td>
<td>IDP40E65D2</td>
<td>IDP40E65D2</td>
<td>IDW40E65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>80</td>
<td>IDW80C65D2</td>
<td>IDW80C65D2</td>
<td>IDW80C65D2</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
</tbody>
</table>

### Emitter controlled diodes
600 V and 1200 V product families

<table>
<thead>
<tr>
<th>Continuous current $I_F$ @ $T_C=100°C$ [A]</th>
<th>TO-263 (DPAK)</th>
<th>TO-220 Real 2-pin</th>
<th>TO-247</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>600 V</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>50</td>
<td>600 V</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>75</td>
<td>600 V</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>100</td>
<td>1200 V</td>
<td>Halogen-Free</td>
<td>Halogen-Free</td>
</tr>
<tr>
<td>12</td>
<td>1200 V</td>
<td>IDP12E120</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1200 V</td>
<td>IDP18E120</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1200 V</td>
<td>IDP30E120</td>
<td></td>
</tr>
</tbody>
</table>

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Nomenclature

IGBT (after 03/2013)

Company
I = Infineon
S = Formerly Siemens

Device
E = Enhanced
G = Single IGBT
H = Reverse conducting
K = DuoPack

Package type
A = TO-220-3 FullPAK
B = TO-263-3 (D2PAK)
CP2 = EDT2™ series
D = TO-252-3 (DPAK)
P = TO-220-3
N = SOT-223
Q = TO-247PLUS
QB = TO-247PLUS 3-pin SMD
U = TO-251-3 (IPAK)
W = TO-247-3
Y = TO-247PLUS 4-pin
Z = TO-247-4
FW = TO-247-3 advanced isolation
WH = TO-247-3 high creepage
WS = TO-247 6-pin
ZA = TO-247 4-pin asymmetric

Nominal current
[A] @ 100°C

Technology
N = N-channel
P = P-channel

E1 = Reverse conducting E-series
F5 = TRENCHSTOP™ 5 ultra fast
H3 = HighSpeed 3
H5 = TRENCHSTOP™ 5 fast
H6 = 1200 V TRENCHSTOP™ IGBT6
IPD = Integrated Power Device Protect
L5 = TRENCHSTOP™ 5 low V_{diss}
R = Reverse conducting Drives (RC-D)
R3 = Reverse conducting R3 series
R5 = Reverse conducting R5 series
R6 = Reverse conducting R6 series
RC2 = Reverse conducting Drives Gen2
RF = Reverse conducting Drives Fast
S5 = TRENCHSTOP™ 5 medium speed
S6 = 1200 V TRENCHSTOP™ IGBT6
ST = 1200 V TRENCHSTOP™ IGBT7
T = TRENCHSTOP™
T2 = TRENCHSTOP™ 2
T6 = 650 V TRENCHSTOP™ IGBT6
T7 = TRENCHSTOP™ IGBT7
TP = TRENCHSTOP™ Performance
WR5 = TRENCHSTOP™ 5 WR5
WR6 = TRENCHSTOP™ 5 WR6

Diode (for DuoPack only)
B = Emitter controlled 1200 V half rated diode
C = Emitter controlled 1200 V full rated diode
D = Rapid 1 650 V half rated diode
E = Rapid 1 650 V full rated diode
R = CoolSiC™ 650 V half rated diode
S = CoolSiC™ 650 V full rated diode

Nominal voltage
Divided by 10 (650 V/10 = 65)

www.infineon.com/igbtdiscretes
Nomenclature

Silicon power diodes

Company
I = Infineon

Device
D = Diode

Package type
B = TO-263 3-pin
D = TO-252 3-pin
P = TO-220 2-pin/3-pin
V = TO-247 3-pin
W = TO-247 3-pin
FW = TO-247 3-pin advanced isolation

Current
- Nominal current @ 100°C [A]
- Equivalent collector current for advanced isolation

**E** = Replacement for TO-247 with medium performance insulator or FullPAK

C = Common cathode
D = Dual anode
E = Standard configuration

Nominal voltage
Divided by 10 (650 V/10 = 65)

Optimization
Blank = Emmitter controlled
D1 = Rapid 1
D2 = Rapid 2

* Only for advanced isolation

www.infineon.com/rapiddiodes

Solutions and Applications

Packages
20-300 V MOSFETs
500-950 V MOSFETs
WBG semiconductors

Power management ICs
Intelligent power switches and modules
Gate-driver ICs
Microcontrollers
Sensors
Digital isolators

IGBT discretes and silicon power diodes
Infineon support for discrete IGBTs and silicon power diodes

Useful links and helpful information

Further information, datasheets and documents
www.infineon.com/igbt
www.infineon.com/igbtdiscretes
www.infineon.com/rapiddiodes
www.infineon.com/discreteIGBT7

www.infineon.com/ultrasoftdiodes
www.infineon.com/discrete-automotive-igbt
www.infineon.com/latest-discrete-packages

Evaluationboards and simulation models
www.infineon.com/eval-TO-247-4pin
www.infineon.com/igbtdiscrete-simulationmodels
Intelligent power switches and modules

› CIPOS™ IPM family
› iMOTION™ IPM
› ISOFACE™ isolated industrial interface
› Industrial PROFET™
› HITFET™
› CIPOS™, iMOTION™, ISOFACE™, industrial PROFET™ and HITFET™ product portfolio

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
CIPOS™ IPM family

CIPOS™ intelligent power modules in different packages, voltage and current classes

Infineon has a broad portfolio of intelligent power modules (IPMs) with different semiconductors combined in various packages in varying voltage and current classes. These IPMs are separated into Compact, Standard and Performance families.

Part of the IPMs is divided into CIPOS™ Nano, CIPOS™ Micro, CIPOS™ Tiny, CIPOS™ Mini and CIPOS™ Maxi families. CIPOS™ IPMs are families of highly integrated, compact power modules designed to drive motors in applications ranging from home appliances, fans, pumps, HVAC to industrial drives. These energy-efficient intelligent power modules integrate the latest power semiconductor and ICs technologies from Infineon.

### CIPOS™ product overview

<table>
<thead>
<tr>
<th>CIPOS™ Nano</th>
<th>CIPOS™ Micro</th>
<th>CIPOS™ Tiny</th>
<th>CIPOS™ Mini</th>
<th>CIPOS™ Maxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSFET: 40/100/250/500/600 V</td>
<td>IGBT: 600 V, 2/4/6 A</td>
<td>IGBT: 600 V, 15 A</td>
<td>IGBT: 600 V, 4-30 A</td>
<td>MOSFET: 600 V</td>
</tr>
<tr>
<td>7 x 8 x 0.9 mm</td>
<td>29 x 12 x 2.9 mm</td>
<td>33 x 19 x 3.6 mm</td>
<td>36 x 21 x 3.1 mm</td>
<td>36 x 23 x 3.1 mm</td>
</tr>
</tbody>
</table>

**Compact IPM** → **Standard IPM** → **Performance IPM**

0.1 A<sub>rms</sub> → 30 A<sub>rms</sub>

**Key benefits**
- Fast time-to-market
- Increased reliability
- Reduced system design complexity
- Improved manufacturability

www.infineon.com/ipm
CIPOS™ Nano
Ultra compact three-phase or half-bridge MOSFET IPMs

The ultra-compact CIPOS™ Nano is a family of highly integrated power modules for high-efficiency consumer and light industrial applications. With half-bridge and three-phase configurations, CIPOS™ Nano is designed for the rectifier, converter, and inverter stage in power management circuits and motor drives for applications like fans, hair dryers, air purifiers, and circulation pumps. By implementing an innovative Power QFN package, which utilizes PCB copper traces to dissipate heat from the module, CIPOS™ Nano family delivers a new benchmark in device size, offering up to a 60 percent smaller footprint than existing three-phase motor control power IPMs.

The family is comprised of a series of fully integrated three-phase, half-bridge and H-bridge surface-mount motor control circuit solutions. The new alternative approach utilizes PCB copper traces to dissipate heat from the module, providing cost savings through a smaller package design and even eliminating the need for an external heat sink.

Features and benefits

**Key benefits**

- Various switch technologies such as HEXFETs, Trench FREDs, Trench MOSFETs, CoolMOS™ and OptiMOS™ apply to motor drivers
- Multiple package platforms with various topologies to suitable for a variety of application scenarios
- Integrated bootstrap functionality and gate drivers
- Realize a variety of protection (overcurrent protection, under-voltage lockout, over-temperature protection, fault reporting and etc.)
- Accessible for heat sink-less operation

**Key advantages**

- Smallest modules in the market
- Cost savings from smaller footprint and reduced PCB space
- Easy implementation of 2 or 3-phase motor drives
- Half bridge configuration enables more flexible board design w/better thermal performance
- Same PCB footprint to address multiple application markets (100 VAC – 230 VAC)

**Key applications**

- Hair dryer
- Fan motor
- Pump
- Air conditioner Indoor Unit
- Air purifiers
- Small kitchen appliances
- CPAP machine

**Package overview**

<table>
<thead>
<tr>
<th>Package Size</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>QFN 7x8</td>
<td>7 x 8 x 0.9 mm</td>
</tr>
<tr>
<td>QFN 8x9</td>
<td>8 x 9 x 0.9 mm</td>
</tr>
<tr>
<td>QFN 12x10</td>
<td>12 x 10 x 0.9 mm</td>
</tr>
<tr>
<td>QFN 12x12</td>
<td>12 x 12 x 0.9 mm</td>
</tr>
</tbody>
</table>

www.infineon.com/ipm
CIPOS™ Micro
Solution for low power motor drive applications

CIPOS™ Micro is a family of compact, three-phase IPMs (intelligent power modules) for low-power (i.e., up to 500 Watts with heatsink) motor drive applications, including ventilation fans, circulation pumps, air purifiers, dish washer and refrigerator compressor drives. CIPOS™ Micro has several protection features, including precise overcurrent protection and a UL-certified temperature sensor. Available in both surface mount and through-hole configurations, the family features rugged and efficient high voltage IGBTs specially optimized for variable frequency drives with a 600 V rating. Also, these IPMs utilize high-voltage gate drivers tuned to achieve an optimal balance between EMI and switching losses.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide range of product coverage</td>
<td>Save system space and cost through the enhanced power capability</td>
</tr>
<tr>
<td>Optimized dv/dt for loss and EMI trade offs</td>
<td>Offer application-optimized solution for both fast switching and low EMI version</td>
</tr>
<tr>
<td>HV H3TRB qualified</td>
<td>Improve system ruggedness thru enhanced protection features &amp; isolation voltage</td>
</tr>
<tr>
<td>Compatible with mass-market TO-2xx heat sinks and clips</td>
<td></td>
</tr>
<tr>
<td>Power capability up to 500 W at isolation 2000 VRMS, 1 min</td>
<td></td>
</tr>
</tbody>
</table>

Key applications
› RAC outdoor fan
› Dish washer
› Fan motor and pump
› Washing machine
› Refrigerator
› General purpose drive

Package overview

<table>
<thead>
<tr>
<th>Package Type</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIP 29x12</td>
<td>29 x 12 x 3.1 mm</td>
</tr>
<tr>
<td>SOP 29x12</td>
<td>29 x 12 x 3.1 mm</td>
</tr>
</tbody>
</table>

www.infineon.com/ipm
**CIPOS™ Tiny IM323 series**

Best optimized solution for RAC compressor up to 1.5 HP

CIPOS™ Tiny IM323 is a series of high efficient intelligent power modules that has enhanced package robustness based on the proven package technology as well as the latest gate driver and RCD2 switch technology from Infineon. It integrates best-optimized performance for 600 V IPM and the best efficiency for motor drives in major home appliances.

The family of the products is applicable to wide applications to control variable speed drives, and such as room air conditioners, fans, pumps, washing machines, compressors, and drives up to 1.5 HP.

### Features and benefits

#### Key features
- Latest TRENCHSTOP™ Reverse Conducting (RC) technology
- IGBT's maximum junction temperature 175 °C
- Rugged new SOI gate driver technology
- Proven & enhanced package robustness
- Compatible pin out design

#### Key benefits
- Fast time to market with pin-compatibility
- Robust and reliable solution
- Reliable in-house supply chain

### Key applications
- Room air conditioning
- Washing machine
- HVAC outdoor fan
- Fans and pumps
- General purpose drives

### Package overview

**DIP 33x19**

32.8 x 18.8 mm

www.infineon.com/ipm
**CIPOS™ Mini**

**Broad range of configurations from PFC to inverter**

CIPOS™ Mini is a family of highly efficient intelligent power modules that has the highest power density with 4 A to 30 A rated products built into a single package platform. It integrates various power and control components to increase reliability, and optimize PCB size and system costs. Utilizing multiple configurations, CIPOS™ Mini IPMs apply to a wide range of applications to control variable speed drives, such as air conditioners, washing machines, refrigerators, vacuum cleaners, compressors, and industrial drives up to 3 kW.

The configurations offered within the CIPOS™ Mini family are 2-phase MOSFET, 3-phase MOSFET, and IGBT, integrated PFC, and 2-phase and 3-phase interleaved PFC. All options include an integrated gate driver and a built-in temperature sensor. CIPOS™ Mini provides optimized performance for power applications, which need good thermal conduction and electrical isolation, but also EMI-safe control, innovative FAULT indication, and overload protection.

Infineon’s TRENCHSTOP™ IGBTs, reverse-conducting IGBTs, or CoolMOS™ power MOSFETs are combined with newly optimized Infineon SOI gate driver IC for excellent electrical performance. Also, CIPOS™ Mini family offers IPMs with DCB substrates, improving heat dissipation to provide higher power capability.

### Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide range of current rating: 4 A to 30 A</td>
<td>Lower PCB size and system cost</td>
</tr>
<tr>
<td>High integration (bootstrap circuit, thermistor, single boost PFC)</td>
<td>Easy power extension from 300 W to 3 kW</td>
</tr>
<tr>
<td>Optimized for target application requirements (separate version for washing machine and air conditioner)</td>
<td>Optimized performance for each application</td>
</tr>
<tr>
<td></td>
<td>UL certified package and temp sensor</td>
</tr>
</tbody>
</table>

### Key applications

- Refrigerator
- Washing machine
- Room air conditioning
- Fans and pumps
- HVAC outdoor fan
- General purpose drives

### Package overview

<table>
<thead>
<tr>
<th>Package Overview</th>
<th>DIP 36x21</th>
<th>DIP 36x21D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>36 x 21 x 3.1 mm</td>
<td>36 x 21 x 3.1 mm</td>
</tr>
</tbody>
</table>

www.infineon.com/ipm
The high-performance CIPOS™ Maxi intelligent power modules (IPMs) integrate various switching devices and control components to increase reliability, optimize PCB size and system costs. CIPOS™ Maxi IPMs are designed to control three-phase AC motors and permanent magnet motors in variable speed drive applications such as low-power industrial motor drives, pumps, fan drives, and active filters for HVAC (heating, ventilation, and air conditioning). The product concept is specially adapted to power applications, which need excellent thermal performance and electrical isolation as well as meeting EMI requirements and overload protection.

The existing IGBT-based portfolio IM818 series offers 5 A and 15 A in 1200 V class up to 3.0 kW power rating, while the newly released IM828 series offers superior efficiency up to 99% and optimal reliability up to 4.8 kW power rating through the 6 revolutionary CoolSiC™ MOSFETs with an optimized 1200 V 6-channel SOI gate driver. IM828 series provides the exceptional power density with a wide switching speed range up to 80 kHz to adapt to fast-switching applications with superior lower power losses.

**Features and benefits**

**Key benefits**
- Fully isolated dual in-line molded module with DCB
- 1200 V TRENCHSTOP™ IGBT 4
- 1200 V CoolSiC™ MOSFET
- Rugged 1200 V SOI gate driver technology
- Integrated bootstrap functionality
- Overcurrent shutdown
- Under-voltage lockout at all channels
- All of six switches turn-off during protection
- Cross-conduction prevention
- Independent NTC for temperature monitoring
- Allowable negative VS potential up to -11 V for signal transmission at $V_{SS}$ of 15 V
- Low side emitter pins accessible for all phase current monitoring (open emitter)
- Programmable fault clear timing
- Enable input

**Key advantages**
- The smallest package size in 1200 V IPM class with high power density and best performance
- Enhanced robustness of gate driver technology for excellent protection
- High efficiency
- Adapted to high switching application with lower power loss
- Simplified design and manufacturing
- Time-to-market

**Key applications**
- Fan and pump
- HVAC outdoor fan
- Low-power general purpose drives (GPI, servo drive)
- Active filter (active power factor correction) for HVAC

**Package overview**

DIP36x23D
36 x 22.7 x 3.1 mm

www.infineon.com/ipm
iMOTION™ IPM

Fully integrated iMOTION™ IPM for BLDC motor control

iMOTION™ IPM is a family of fully integrated modules for the control of three-phase motors, optimized for low-power devices. Within the iMOTION™ IPM family, there are two different series: The IMM100 and IMI110, which combine the motor controller IC and a three-phase inverter stage in a single package, minimizing external components count and PCB area. The three-phase inverter stage is based either on six MOSFETs or six IGBTs. These iMOTION™ IPMs offer the highest integration level by making use of the field-proven iMOTION™ Motion Control Engine (MCE) in combination with providing all required hardware functions: From single shunt current sensing to bootstrap capability, signal filtering and several hardware protections like dead-time insertion and shoot through prevention. An iMOTION™ IPM does not require a heatsink and addresses motor drives with a rated output power between 30 W and 80 W with 600 V maximum DC blocking voltage, depending on the chosen product variant. All IMM100 and IMI110 devices support the functional safety requirements according to the IEC/UL 60730-1 (“class B”).

Features and benefits

Key benefits

- Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series
- Up to 80 W without heatsink
- Support for IEC 60335-1 (“Class B”)
- Controller, gate driver and power stage in one package
- IMI in DSO-22 package with single layer layout option

Key advantages

- Fastest time to market with easy parametrization and tuning of motor and PFC control
- Applicable for fans and small pumps
- Support for functional safety integrated
- Minimizing BOM count and PCB area
- Reducing PCB and production costs

EVAL-IMM101T-046 is a Starter Kit for iMOTION™ IMM101T-046M IPMs. Together with the iMOTION™ Solution Designer the board can be used for an easy system configuration, controlling, tuning and monitoring. EVAL-IMM101T-046 enables rapid prototyping of various inverterized motor control systems, for example fans, pumps and compressors.

Product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Function</th>
<th>Integration</th>
<th>Description</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMM111T-026H</td>
<td>Motor inverter</td>
<td>MCE incl Scripting, gate driver, IGBT based inverter</td>
<td>Output rating: 600 V / 2 A, single shunt sensorless operation</td>
<td>PG-DSO-22-1</td>
</tr>
<tr>
<td>IMM111T-046H</td>
<td>Motor inverter</td>
<td>MCE incl Scripting, gate driver, IGBT based inverter</td>
<td>Output rating: 600 V / 4 A, single shunt sensorless operation</td>
<td>PG-DSO-22-1</td>
</tr>
<tr>
<td>IMM121T-046M</td>
<td>Motor inverter</td>
<td>MCE incl Scripting, gate driver, MOSFET based inverter</td>
<td>Output rating: 600 V / 1.4 D_RDS(ON), single/leg shunt, sensorless/hall</td>
<td>PG-IQFN-38-2</td>
</tr>
<tr>
<td>IMM121T-056M</td>
<td>Motor inverter</td>
<td>MCE incl Scripting, gate driver, MOSFET based inverter</td>
<td>Output rating: 500 V / 6 D_RDS(ON), single/leg shunt, sensorless/hall</td>
<td>PG-IQFN-38-3</td>
</tr>
<tr>
<td>IMM121T-046M</td>
<td>Motor inverter + PFC control</td>
<td>MCE incl Scripting, gate driver, MOSFET based inverter</td>
<td>Output rating: 600 V / 1.4 D_RDS(ON), single/leg shunt, sensorless/hall</td>
<td>PG-IQFN-38-4</td>
</tr>
<tr>
<td>IMM121T-056M</td>
<td>Motor inverter + PFC control</td>
<td>MCE incl Scripting, gate driver, MOSFET based inverter</td>
<td>Output rating: 600 V / 0.95 D_RDS(ON), single/leg shunt, sensorless/hall</td>
<td>PG-IQFN-38-5</td>
</tr>
</tbody>
</table>

www.infineon.com/IMM100
www.infineon.com/IMI110
**ISOFACE™ isolated industrial interface**

Output switches and digital input ICs offering unmatched system uptime, reliability and shortened product launch time by 50%

The **ISOFACE™** product family provides robust and intelligent galvanic isolation for industrial control applications such as programmable logic controllers, sensor input modules, control panels and general control equipment. The output switches are compact in design, enabling robust and reliable operation at a low system cost. Ideal for high-speed applications, digital input ICs are equally robust, reliable and compact – also offering superior EMI robustness and setting a new standard in diagnostics.

**ISOFACE™ galvanic-isolated 8-channel output switches**

The ISO1H81xG product family integrates:

- Robust galvanic isolation (UL508 and C22.2 NO14 certified) to protect the 3.3 V/5 V control domain of an industrial control system from the harsh 24 V process side
- 8-channel high-side power-switching capabilities of up to 1.2 A per channel
- Active current limitation and over-temperature protection
- Common diagnostic feedback for overtemperature and for Vbb undervoltage

**Isolated output switch block diagram**

<table>
<thead>
<tr>
<th>Features and benefits</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated galvanic isolation (500 Vbb)</td>
<td>Robust and reliable</td>
</tr>
<tr>
<td>Eight channels (0.6 or 1.2 A, each)</td>
<td>Compact system solution</td>
</tr>
<tr>
<td>Inductive load switching</td>
<td>Lower system cost</td>
</tr>
<tr>
<td>Diagnostic feedback [overtemperature, overload]</td>
<td>System status feedback</td>
</tr>
<tr>
<td>Serial and parallel MCU interface</td>
<td>Directly interfacing with all MPUs and MCUs</td>
</tr>
</tbody>
</table>

www.infineon.com/isoface
The ISO2H823V establishes a new standard in diagnostics for industrial control applications. For example, in industrial plants with capital-intensive single-tool equipment at work or with time-critical chemical processes running, obtaining in real-time differentiated feedback from the factory floor enables both, preventive maintenance and drastic reduction of the time to fix a problem. This is why the ISO2H823V is a highly desirable system solution. System designers benefit from the ISO2H823V through short time to market, reduced PCB area and uncompromised product reliability.

The ISO2H823V integrates:
› Robust 2.5 kV AC galvanic isolation:
  – UL508 and CSA C22.2 No.14 certified
  – Protecting the 3.3 V control domain of an industrial control system from the harsh 24 V process side
  – Exceeding the IEC 61131-2 requirements for reinforced isolation
› 8-channel high-side power-switching capabilities of up to 0.6 A per channel with active current limitation and overtemperature protection
› 10-fold diagnostic feedback
  – 5 types of feedback which are available individually for each of the eight outputs
  – 5 types of IC-level feedback
› Common diagnostic feedback for overtemperature and for Vbb undervoltage

Typical application

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Robust 2.5 kV AC galvanic isolation</td>
<td>› Reliable and UL certified</td>
</tr>
<tr>
<td>› Eight channels (up to 0.6 A per channel)</td>
<td>› Small form factor solution</td>
</tr>
<tr>
<td>› 10-fold diagnostic feedback (over-temperature, overload)</td>
<td>› Preventive maintenance and short down times</td>
</tr>
</tbody>
</table>

www.infineon.com/isoface
**ISOFACE™ galvanic-isolated digital input ICs**

The UL1577 certified ISO1i81xT digital input IC family is an intelligent system solution offering robust galvanic isolation between the microcontroller on the “control side” and the 24 V factory floor environment, frequently referred to as the “process side”.

**Digital input switch block diagram**

**Galvanic-isolated digital input ICs**

**Features and benefits**

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Integrated galvanic isolation (500 VAC)</td>
<td>› Robust and reliable</td>
</tr>
<tr>
<td>› Eight channels (IEC type 1/2/3)</td>
<td>› Compact system solution</td>
</tr>
<tr>
<td>› Up to 500 kHz sampling speed</td>
<td>› High-speed applications</td>
</tr>
<tr>
<td>› Programmable input filters</td>
<td>› Superior EMI robustness</td>
</tr>
<tr>
<td>› Channel-specific diagnostics (wire-break, undervoltage)</td>
<td>› System status feedback</td>
</tr>
<tr>
<td></td>
<td>› Valuable maintenance support</td>
</tr>
</tbody>
</table>

www.infineon.com/isoface
Infineon’s market-proven high-side switch Industrial PROFET™ products have been designed to target various industrial applications that drive all types of resistive, inductive and capacitive loads. Due to their outstanding energy robustness, they are perfectly suitable for switching challenging inductive loads and driving relays. Their main application areas include high-voltage and \( V_{\text{supply}} \) up to 60 V and PWM applications up to 1 kHz. Industrial PROFET™ can be applied to drive any kind of sensor units, indicators, displays, LEDs, relays, valves and magnetic actuators or replace electromechanical relays, fuses and discrete circuitry. Industrial PROFET™ products are also perfect for applications with long wiring or any other kind of inductive loads or applications with space constraints. Failsafe systems do make use of them as well.

![PROFET™ typical block diagram](image)

**Key applications**

- Industrial automation
- Programmable logic controller (PLC)
- Digital DCS and PC I/O modules
- Robotics
- Building and home automation
- Solar applications
- Wind energy systems
- Failsafe systems
- Smart grid
- Motor control and drives
- Power supplies

**Features and benefits**

**Key features**

- Right fit for digital output modules, motor or robot control, protected switching of decentralized loads like sensors or auxiliary supply
- Outstanding robustness and reliability as required by industrial mission profiles
- Thermally optimized products with low \( R_{\text{DS(on)}} \) to deal with the high ambient temperatures in applications with limited or even no cooling
- Diagnosis and protection for safe system operation
- Small and compact design for higher integration and applications with space constraints

**Key benefits**

- Small system form factor
- No/little downtime of system in operation
- Low heating up of a system
- System cost saving by built-in protection and tailored featureset
- Reduced system maintenance efforts by providing optimized diagnostics

**PLC – programmable logic controller digital output modules**

PROFET™ as actuators typically address I/O modules supplying nominal currents of 2 A or 0.5 A. However, PROFET™ portfolio also provides devices for lower and higher currents. PROFET™ parts are suitable for switching resistive, capacitive and, by featuring high EAS, inductive loads. Corresponding PROFET™ evaluation boards are available on request.

www.infineon.com/industrial-profet
HITFET™
Low-side smart protected switches

HITFET™ stands for highly-integrated temperature-protected MOSFET. These well-established low-side switches offer a compelling feature set with protection against overtemperature, short circuit and overload conditions as well as ESD robustness. The HITFET™ + family is the new generation based on new technology, enabling a significant shrink compared to the existing Classic HITFET™ portfolio (up to 50 percent shrink). This novel generation consists of standard and fully-featured protected low-side switches (11 to 125 mΩ) in the TO-252-3 DPAK/TO-252-5 DPAK and TDSO8 packages. Classic HITFET™ and HITFET™ + devices address a wide range of applications, including resistive, inductive and capacitive loads.

Application diagramm example for HITFET™ +

Key applications
› Industrial automation*
› Programmable logic controller (PLC)**
› Digital I/O modules
› Building and home management
› All kind of solenoid or valve driving
› Power modules
› Solar power inverters

Key features
› Low-side switches with integrated protection features
› Scalable in RDS(on) ranges from 800 mΩ down to 11 mΩ
› Adjustable slew rate control (BTFxxx and BTT30xxEJ)
› Thermal shutdown with auto restart or latch behavior
Status feedback via
› Increased input current (HITFET™ 2nd gen.)
› Digital readout via SRP (BTF3050TE)
› Via status pin (BTF3xxxEJ)

Key benefits
› High design flexibility with scalable RDS(on) and package
› Driving applications with high switching speed requirements up to 25 kHz (e.g. valve, solenoid)
› Easy to design-in
› Choice of packages to match individual application needs

Low-side switch shield with BTF3050TE for Arduino

Featured products: Three BTF3050TE low-side switches of the HITFET™ + family
Combative with: Microcontroller boards using the Arduino form factor and the corresponding Infineon’s kits with Arm® powered XMC™ microcontroller
Orderable part number: SHIELDBTF3050TETOBO1

Evaluation board based on BTT3050EJ

Featured products: One single-channel low-side switch of BTT3050EJ
Combative with: Can be used as single stand and is also pin-compatible with microcontroller boards using the Arduino form factor (e.g. XMC1100 Boot Kit, Arduino Uno)
Orderable part number: BTT3050EJDEMOBOARDOBO1

www.infineon.com/hitfet
www.infineon.com/shields-for-arduino

*See block diagram on page 278
** See block diagram on page 279
# ISOFACE™ product portfolio

## ISOFACE™ output switches

<table>
<thead>
<tr>
<th>Product overview</th>
<th>ISO1H801G</th>
<th>ISO1H811G</th>
<th>ISO1H812G</th>
<th>ISO1H815G</th>
<th>ISO1H816G</th>
<th>ISO2H823V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>V_{IN} operational range: 11 V to 35 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Max. continuous load current per channel</td>
<td>0.6 A</td>
<td>0.6 A</td>
<td>0.6 A</td>
<td>1.2 A</td>
<td>1.2 A</td>
<td>0.6 A</td>
</tr>
<tr>
<td>Load current increase by using outputs in parallel</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Inductive clamping energy per channel: 1 Joule</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>150 mJ</td>
</tr>
<tr>
<td>Microcontroller Interface</td>
<td>Parallel</td>
<td>Parallel</td>
<td>Serial</td>
<td>Parallel</td>
<td>Serial</td>
<td>Serial/Parallel</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltages</td>
<td>5 V</td>
<td>3.3 V/5 V</td>
<td>3.3 V/5 V</td>
<td>3.3 V/5 V</td>
<td>3.3 V/5 V</td>
<td>3.3 V</td>
</tr>
<tr>
<td>Safety features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation voltage: V_{ISO} = 500 VAC UL508 and EN 61131-2 certified</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>2.5 kW AC</td>
</tr>
<tr>
<td>Active current limitation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thermal shutdown</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Common output disable pin</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diagnostics feedback</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Overtemperature</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>V_{IN} undervoltage</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Package DSO-36 (16x14 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ordering code</td>
<td>ISO1H801GAUMA1</td>
<td>ISO1H811GAUMA1</td>
<td>ISO1H812GAUMA1</td>
<td>ISO1H815GAUMA1</td>
<td>ISO1H816GAUMA1</td>
<td>ISO2H823V25XUMA1</td>
</tr>
</tbody>
</table>

## ISOFACE™ digital input IC

<table>
<thead>
<tr>
<th>Product overview</th>
<th>ISO1H811T</th>
<th>ISO1H813T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input characteristics</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>IEC type: I, II, III</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Input status LED</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Max. sampling frequency</td>
<td>125 kHz</td>
<td>500 kHz</td>
</tr>
<tr>
<td>Deglitching filter setting</td>
<td>Hard wired</td>
<td>Software, individual per channel</td>
</tr>
<tr>
<td>Synchronous data acquisition</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>µC interface</td>
<td>3.3 V/5 V</td>
<td>✓</td>
</tr>
<tr>
<td>Serial and parallel</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Safety features</td>
<td>500 VAC isolation voltage</td>
<td>✓</td>
</tr>
<tr>
<td>Diagnostic feedback</td>
<td>Wire break, channel-specific</td>
<td>✓</td>
</tr>
<tr>
<td>V_{IN} undervoltage</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Support for external V_{IN} supply</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Package TSSOP-48 (8x11.5 mm)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ordering code</td>
<td>ISO1H811TXUMA1</td>
<td>ISO1H813TXUMA1</td>
</tr>
</tbody>
</table>

www.infineon.com/isoface
# Industrial PROFET™ product portfolio

## Load current

**Typical, per channel**
- **1-channel**
- **2-channel**
- **4-channel**
- **8-channel**

<table>
<thead>
<tr>
<th>Load current</th>
<th>Product</th>
<th>Number of channels</th>
<th>( R_{\text{ON}} ) (( \text{typ} )) ([\text{mΩ}] )</th>
<th>Nominal load current ([\text{A}] )</th>
<th>( E_{\text{AS}} ) ([\text{mJ}] )</th>
<th>Recommended operating voltage range ([\text{V}] )</th>
<th>( I_{\text{SC}} ) (( \text{typ} )) ([\text{A}] )</th>
<th>Diagnosis</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 A</td>
<td>ITS428L2</td>
<td>1</td>
<td>7 A, 60 mΩ, TO-252-5</td>
<td>3.1 A, 60 mΩ DSO8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DSO8</td>
</tr>
<tr>
<td>3 A</td>
<td>ITS4000S-SJ-N, ISP772T</td>
<td>1</td>
<td>2.4 A, 300 mΩ, DSO8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 A ... 3 A</td>
<td>ITS4100S-SJ-N, ISP762T</td>
<td>1</td>
<td>1.3 A, 200 mΩ, DSO8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 A ... 2 A</td>
<td>ITS4020S-EP-F, ITS4124N</td>
<td>1</td>
<td>2.6 A, 40 mΩ, DSO8S144</td>
<td>2 A, 90 mΩ, DSO-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 A ... 1 A</td>
<td>ITS4020S-EP-N, ITS4124N</td>
<td>1</td>
<td>2 A, 200 mΩ, DSO8S144</td>
<td>2 A, 90 mΩ, DSO-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 0.5 A</td>
<td>ITS4140S-ME-N, ITS4140N</td>
<td>1</td>
<td>1 A, 300 mΩ, DSO8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Per one channel*

## Products

- **ITS4060S-SJ-N**, \( 1 \text{ A, 50 mΩ, TO-252-5} \)
- **ITS4075Q-EP-D**, \( 2.6 \text{ A, 75 mΩ, DSO8S144} \)
- **ITS4130Q-EP-D**, \( 0.65 \text{ A, 130 mΩ, DSO-36} \)
- **ITS4075Q-EP-D**, \( 2.6 \text{ A, 75 mΩ, DSO8S144} \)
- **ITS4090Q-EP-D**, \( 0.41 \text{ A, 90 mΩ, TSON-10} \)
- **ITS4130Q-EP-D**, \( 0.65 \text{ A, 130 mΩ, DSO-36} \)
- **ITS4130Q-EP-D**, \( 0.65 \text{ A, 130 mΩ, DSO-36} \)

## Evaluation board

- **ITS4040**
- **ITS4075**
- **ITS4090**
- **ITS4130**

**www.infineon.com/industrial-profet**

---

*For more details on the product, click on the part number, visit infineon.com or contact our product support.*
## HITFET™ product portfolio

<table>
<thead>
<tr>
<th>Product type</th>
<th>Product family</th>
<th>Channels</th>
<th>$R_{DS(ON)}$ @ 25°C [mW]</th>
<th>Nominal load current [A]</th>
<th>EAS [mJ]</th>
<th>Operating voltage range [V]</th>
<th>$I_{DSS}$ (typ) [A]</th>
<th>$I_{TH}$(TRIGGER) (typ) [A]</th>
<th>Diagnosis</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTS3011TE</td>
<td>HITFET™ +</td>
<td>1</td>
<td>10.7</td>
<td>10</td>
<td>300 @ 5 A</td>
<td>up to 28</td>
<td>35</td>
<td>70</td>
<td>Status pin</td>
<td>TO-252-5 (DPAK 5-leg)</td>
</tr>
<tr>
<td>BTS3018EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>16</td>
<td>7.0</td>
<td>150</td>
<td>up to 36</td>
<td>45</td>
<td>–</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3035EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>28</td>
<td>5.00</td>
<td>105 @ 5 A</td>
<td>up to 31</td>
<td>20.00</td>
<td>–</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3035TF</td>
<td>HITFET™ +</td>
<td>1</td>
<td>30</td>
<td>5.00</td>
<td>106 @ 5 A</td>
<td>up to 31</td>
<td>20.00</td>
<td>–</td>
<td>–</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTF3035EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>28</td>
<td>5.00</td>
<td>95 @ 5 A</td>
<td>up to 32</td>
<td>14.00</td>
<td>41.00</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTF3050TE</td>
<td>HITFET™ +</td>
<td>1</td>
<td>40</td>
<td>3.00</td>
<td>120 @ 3 A</td>
<td>up to 28</td>
<td>8.00</td>
<td>30.00</td>
<td>Through SRP pin</td>
<td>TO-252-5 (DPAK 5-leg)</td>
</tr>
<tr>
<td>BTS3050EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>40</td>
<td>4.00</td>
<td>62 @ 3 A</td>
<td>up to 31</td>
<td>15.00</td>
<td>–</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3050FF</td>
<td>HITFET™ +</td>
<td>1</td>
<td>44</td>
<td>4.00</td>
<td>64 @ 4 A</td>
<td>up to 31</td>
<td>15.00</td>
<td>–</td>
<td>–</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTF3050EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>40</td>
<td>4.00</td>
<td>62 @ 4 A</td>
<td>up to 32</td>
<td>10.00</td>
<td>29.00</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3060FF</td>
<td>HITFET™ +</td>
<td>1</td>
<td>50</td>
<td>3.00</td>
<td>55 @ 3 A</td>
<td>up to 35</td>
<td>10.50</td>
<td>–</td>
<td>–</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTS3080EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>64</td>
<td>3.00</td>
<td>35 @ 3 A</td>
<td>up to 31</td>
<td>10.00</td>
<td>–</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3080TF</td>
<td>HITFET™ +</td>
<td>1</td>
<td>69</td>
<td>3.00</td>
<td>38 @ 3 A</td>
<td>up to 31</td>
<td>10.00</td>
<td>–</td>
<td>–</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTF3080EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>64</td>
<td>3.00</td>
<td>33 @ 3 A</td>
<td>up to 32</td>
<td>7.00</td>
<td>18.00</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3125EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>100</td>
<td>2.00</td>
<td>30 @ 2 A</td>
<td>up to 31</td>
<td>7.00</td>
<td>–</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3125TF</td>
<td>HITFET™ +</td>
<td>1</td>
<td>108</td>
<td>2.00</td>
<td>24 @ 2 A</td>
<td>up to 31</td>
<td>7.00</td>
<td>–</td>
<td>–</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTF3125EJ</td>
<td>HITFET™ +</td>
<td>1</td>
<td>100</td>
<td>2.00</td>
<td>23 @ 2 A</td>
<td>up to 32</td>
<td>5.00</td>
<td>12.00</td>
<td>Status pin</td>
<td>TDS08</td>
</tr>
<tr>
<td>BTS3181TC</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>14</td>
<td>6.00</td>
<td>1900</td>
<td>up to 36</td>
<td>30.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-263-3-2 (TO-220-3 (SMD))</td>
</tr>
<tr>
<td>BTS4141TC</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>25</td>
<td>5.10</td>
<td>4000</td>
<td>up to 36</td>
<td>25.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-263-3-2 (TO-220-3 (SMD))</td>
</tr>
<tr>
<td>BTS3285SDL</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>28</td>
<td>5.00</td>
<td>350</td>
<td>up to 35</td>
<td>18.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 5-leg)</td>
</tr>
<tr>
<td>BTS3285SDR</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>28</td>
<td>5.00</td>
<td>350</td>
<td>up to 36</td>
<td>18.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 5-leg)</td>
</tr>
<tr>
<td>BTS1331TC</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>40</td>
<td>3.80</td>
<td>2000</td>
<td>up to 36</td>
<td>21.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-263-3-2 (TO-220-3 (SMD))</td>
</tr>
<tr>
<td>BTS3046SDL</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>46</td>
<td>3.60</td>
<td>140</td>
<td>up to 36</td>
<td>10.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTS3046SDR</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>46</td>
<td>3.60</td>
<td>140</td>
<td>up to 36</td>
<td>10.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTS1171TC</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>80</td>
<td>3.50</td>
<td>1000</td>
<td>up to 36</td>
<td>7.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-263-3-2 (TO-220-3 (SMD))</td>
</tr>
<tr>
<td>BTS3104SDL</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>104</td>
<td>2.00</td>
<td>50</td>
<td>up to 36</td>
<td>6.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTS3104SDR</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>104</td>
<td>2.00</td>
<td>50</td>
<td>up to 36</td>
<td>6.00</td>
<td>–</td>
<td>Through input pin</td>
<td>TO-252-3 (DPAK 3-leg)</td>
</tr>
<tr>
<td>BTS3408G</td>
<td>Classic HITFET™</td>
<td>2</td>
<td>480</td>
<td>0.55</td>
<td>800</td>
<td>up to 36</td>
<td>1.00</td>
<td>–</td>
<td>Through input pin</td>
<td>DSO8</td>
</tr>
<tr>
<td>BSP75N</td>
<td>Classic HITFET™</td>
<td>1</td>
<td>490</td>
<td>0.70</td>
<td>550</td>
<td>up to 36</td>
<td>1.00</td>
<td>–</td>
<td>Through input pin</td>
<td>SOT-223</td>
</tr>
</tbody>
</table>
### CIPOS™ IPM product portfolio

#### MOSFET based CIPOS™ IPMs

<table>
<thead>
<tr>
<th>Product family</th>
<th>Voltage [V]</th>
<th>Configuration</th>
<th><strong>R\text{DS(on),max}</strong> [Ω]</th>
<th>Package</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIPOS™ Nano</td>
<td>40</td>
<td>Half-bridge</td>
<td>0.005</td>
<td>QFN 7x8</td>
<td>IRSM005-800MH</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Half-bridge</td>
<td>0.021</td>
<td>QFN 7x8</td>
<td>IRSM005-301MH</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>Half-bridge</td>
<td>0.063</td>
<td>QFN 12x10</td>
<td>IM111-X3Q1B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H-bridge</td>
<td>0.15</td>
<td>QFN 8x9</td>
<td>IRSM808-204MH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.45 ~ 2.40</td>
<td>QFN 12x12</td>
<td>IRSM836-024MA/IRSM836-044MA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IRSM836-084MA</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Half-bridge</td>
<td>0.80/1.70</td>
<td>QFN 8x9</td>
<td>IRSM808-105MH / IRSM807-045MH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.70 ~ 6.00</td>
<td>QFN 12x12</td>
<td>IRSM836-015MA/IRSM836-025MA/IRSM836-035MA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IRSM836-045MA</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>H-bridge</td>
<td>0.28</td>
<td>QFN 12X10</td>
<td>IM111-X6Q1B</td>
</tr>
<tr>
<td>CIPOS™ Mini</td>
<td>600</td>
<td>2/3-phase inverter</td>
<td>0.33</td>
<td>DIP 36x21</td>
<td>IM512-L6A/IM513-L6A</td>
</tr>
<tr>
<td>CIPOS™ Maxi</td>
<td>1200</td>
<td>3-phase inverter</td>
<td>0.055</td>
<td>DIP 36x23D</td>
<td>IM828-XCC</td>
</tr>
</tbody>
</table>

#### IGBT based CIPOS™ IPMs

<table>
<thead>
<tr>
<th>Product family</th>
<th>Voltage [V]</th>
<th>Configuration</th>
<th>Rated current [A]</th>
<th>Package</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIPOS™ Micro</td>
<td>600</td>
<td>3-phase inverter</td>
<td>2.0/4.0/6.0</td>
<td>DIP 29x12</td>
<td>IM241-S6T2B*/IM241-M6T2B*/IM241-L6T2B*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.0/4.0/6.0</td>
<td>SOP 29x12</td>
<td>IM241-S6T2J*/IM241-M6T2J*</td>
</tr>
<tr>
<td>CIPOS™ Tiny</td>
<td>600</td>
<td>3-phase inverter</td>
<td>6.0/10.0/15.0</td>
<td>DIP 33x19</td>
<td>IM323-L6G*/IM323-L6G2*</td>
</tr>
<tr>
<td>CIPOS™ Mini</td>
<td>600</td>
<td>PFC integrated</td>
<td>10.0 ~ 20.0</td>
<td>DIP 36x21D</td>
<td>IFCM10S60GD/IFCM10P60GD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-phase inverter</td>
<td>DIP 36x21</td>
<td>IFCM15S60GD/IFCM15P60GD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.0 ~ 30.0</td>
<td>DIP 36x21</td>
<td>IFCM20F60GA/IFCM20G60GA/IFCM20H60GA/IFCM20L60GA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15.0 ~ 30.0</td>
<td>DIP 36x21D</td>
<td>IKCM15L60GD/IKCM15P60GD/IKCM15W60GD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single boost PFC + inverter</td>
<td>10.0 ~ 20.0</td>
<td>DIP 36x21D</td>
<td>IKCM15L60GD/IKCM20L60GD/IKCM30L60GD</td>
</tr>
<tr>
<td></td>
<td>650</td>
<td>3-phase interleaved PFC</td>
<td>20.0/30.0</td>
<td>DIP 36x23D</td>
<td>IFCM20T65GD/IFCM30T65GD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-phase interleaved PFC</td>
<td>30.0</td>
<td>DIP 36x23D</td>
<td>IFCM30T65GD/IFCM30U65GD</td>
</tr>
<tr>
<td>CIPOS™ Maxi</td>
<td>1200</td>
<td>3-phase inverter</td>
<td>5.0 ~ 15.0</td>
<td>DIP 36x23D</td>
<td>IM818-SCC/IM818-MCC/IM818-LCC</td>
</tr>
</tbody>
</table>

* Coming soon

www.infineon.com/ipm
Infineon support for intelligent switches and modules

Useful links and helpful information

Further information, datasheets and documents

www.infineon.com/isoface
www.infineon.com/hitfet
www.infineon.com/industrial-profet
www.infineon.com/shields-for-arduino
Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
Infineon's XMC™ 32-bit industrial microcontroller portfolio is designed for efficiency and demanding industrial applications.

### XMC™ MCU portfolio
- **RAM:** 8 kB up to 352 kB
- **Flash:** 16 kB up to 2 MB
- **Accurate analog mixed-signal peripherals**
- **Fast timer/PWM peripherals**
- **Rich communication interfaces**
- **16-pin to 196-pin count packages**

### XMC1000 family
- Arm® Cortex®-M0 up to 48 MHz
- Peripherals up to 96 MHz
- One-time event request unit (ERU)
- VDD: 1.8 to 5.5 V
- TAmbient: -40°C to 105°C

### XMC4000 family
- Arm® Cortex®-M4 up to 144 MHz
- Built-in DSP, SFPU
- Peripherals up to 144 MHz
- Event request unit (ERU)
- TAmbient: -40°C to 125°C

---

**www.infineon.com/xmc**
A comprehensive set of tools, products, components, and services are available for fast and efficient design with XMC™ microcontrollers.

**Infineon enablement for XMC™ MCUs**

**DAVE™** – www.infineon.com/dave

Professional and free-of-charge development platform

**XMC™ library for Embedded Coder®** – www.infineon.com/matlab

Model-based design from MATLAB® and Simulink® environment, download free of charge

**IEC60730 class B library for XMC™** – www.infineon.com/iec60730

Available for XMC™ industrial microcontrollers free of charge

**Microcontroller/Probe™ XMC™** – www.infineon.com/ucprobexmc

Free-of-charge version of microcontroller/Probe™ for XMC™ MCUs to build user interfaces for visualizing, observing, and control of the internals of XMC™ MCUs

**XMC™ link** – www.infineon.com/xmclink

Functional isolated debug probe, based on SEGGER J-Link technology

In addition to a rich third party ecosystem and enablement landscape, which support the entire development cycle from evaluation to production.

For more www.infineon.com/xmc-ecosystem
Infineon’s XMC™ 32-bit industrial microcontroller portfolio is designed for system cost and efficiency for demanding industrial applications. It comes with the most advanced peripheral set in the industry. Fast and largely autonomous peripherals can be configured to support individual needs.

Highlights include analog mixed-signal, timer/PWM and communication peripherals powered by either an Arm® Cortex®-M0 core (XMC1000 family) or an Arm® Cortex®-M4 core with a floating point unit (XMC4000 family).

<table>
<thead>
<tr>
<th>Arm® Cortex®-M0</th>
<th>Capabilities</th>
<th>Clocks</th>
<th>Memory</th>
<th>Analog</th>
<th>Timer/PWM</th>
<th>Connectivity</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMC11x</td>
<td>-</td>
<td>32</td>
<td>64</td>
<td>Flash</td>
<td>8-64 kB</td>
<td>1/1 Up to 12</td>
<td>-</td>
</tr>
<tr>
<td>XMC12x</td>
<td>-</td>
<td>32</td>
<td>64</td>
<td>Flash</td>
<td>16-200 kB</td>
<td>1/2 Up to 12</td>
<td>1x</td>
</tr>
<tr>
<td>XMC13x</td>
<td>✓</td>
<td>32</td>
<td>64</td>
<td>Flash</td>
<td>8-200 kB</td>
<td>1/2 Up to 12</td>
<td>1x</td>
</tr>
<tr>
<td>XMC14x</td>
<td>✓</td>
<td>48</td>
<td>96</td>
<td>Flash</td>
<td>32-200 kB</td>
<td>1/2 Up to 12</td>
<td>2x</td>
</tr>
</tbody>
</table>

Supply voltage range 1.8-5.5 V
Temperature range -40°C … 85°C/105°C

For more details on the product, click on the part number, visit infineon.com or contact our product support.
XMC™ digital power explorer kit

The new digital power explorer kit is designed with the particular goal of making it easy for engineers to take the first steps into digital power control with XMC™ microcontrollers. It showcases both XMC™ families Arm® Cortex-M microcontrollers: XMC4000 and XMC1000, 30 V dual n-channel OptiMOS™ MOSFETs and IRS2011S gate drivers. The kit includes two different control card options, XMC1300 control card (Arm® Cortex®-M0) and XMC4200 control card (Arm® Cortex®-M4F), which allow designers to evaluate both XMC™ microcontroller families and make the right price/performance choice for their application.

Features and benefits

**Key features**

- Synchronous buck converter evaluation kit controlled with XMC4200 or XMC1300 Arm® Cortex®-M MCUs
- Onboard resistive load banks
- Featuring BSC0924NDI dual n-channel OptiMOS™ MOSFET and IRS2011S high- and low-side gate driver
- Different control schemes possible
  - Voltage mode control
  - Peak current mode control (with slope compensation)

**Key benefits**

- Easy entry in digital power control applications
- Understand the details of voltage/peak current control and how to extract the maximum of XMC™ devices
- DAVE™ v4 APPs for buck converter and many more example

www.infineon.com/xmc
High power density 800 W 130 kHz platinum server design with XMC1300

The 800 W PFC CCM evaluation board demonstrates design and practical results of an 800 W 130 kHz platinum server PFC evaluation board based on Infineon devices, in terms of power semiconductors, non-isolated gate drivers, analog and digital controllers for the PFC converter, as well as flyback controller for the auxiliary supply. This evaluation board verifies the performance of the latest 600 V CoolMOS™ C7 superjunction MOSFET technology working at 130 kHz in a PFC CCM boost converter along with EiceDRIVER™ ICs and CoolSiC™ Schottky diode 650 V G5 using digital control.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic PFC boost stage digitally controlled with XMC1302 including voltage and current loops</td>
<td>High efficient PFC stage with a complete systemsolution from Infineon</td>
</tr>
<tr>
<td>Protections, including cycle-by-cycle current protection</td>
<td>HW and SW available</td>
</tr>
<tr>
<td>Run time debug with isolated UART to PC interface and PC software</td>
<td>Higher switching frequency permits higher power density</td>
</tr>
</tbody>
</table>

### 800 W PFC CCM with XMC1300

<table>
<thead>
<tr>
<th>Specification</th>
<th>Infineon components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vin</td>
<td>90-265 VDC</td>
</tr>
<tr>
<td>Vout_nom</td>
<td>380 VDC</td>
</tr>
<tr>
<td>Iout</td>
<td>2 A</td>
</tr>
<tr>
<td>PWM frequency</td>
<td>130 kHz</td>
</tr>
<tr>
<td>THD</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>Power factor</td>
<td>&gt;0.9 from 20% load</td>
</tr>
</tbody>
</table>

600 W half-bridge LLC evaluation board with 600 V CoolMOS™ C7 SJ MOSFET with digital control

The 600 W LLC digital control evaluation board shows how to design the half-bridge LLC stage of a server SMPS with the target to meet 80+ Titanium standard efficiency requirements. For this purpose, the latest CoolMOS™ technologies, 600 V CoolMOS™ C7 or P6 superjunction MOSFETs have been used on the primary side, and OptiMOS™ low-voltage power MOSFET in SuperS08, BSC010N04LS, in the synchronous rectification secondary stage in combination with QR CoolSET™ ICE2QR2280Z, high- and low-side driver 2EDL05N06PF, low-side gate driver 2EDN7524F and a XMC4200 microcontroller.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 W LLC half-bridge stage with synchronous rectification (SR)</td>
<td>Learn LLC topology with a complete systemsolution from Infineon</td>
</tr>
<tr>
<td>All controlled with XMC4200 including:</td>
<td>HW and SW available</td>
</tr>
<tr>
<td>› Start up (PWM to PFM) and burst-mode algorithms</td>
<td>Close to customer solution</td>
</tr>
<tr>
<td>› Adaptive dead time and capacitive-mode detection</td>
<td>› High efficiency &gt; 97.6%</td>
</tr>
<tr>
<td>› No hard commutation at any condition</td>
<td>› Reliability and power density</td>
</tr>
</tbody>
</table>

### 600 W LLC digital control

<table>
<thead>
<tr>
<th>Specification</th>
<th>Infineon components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vin</td>
<td>350-410 VDC</td>
</tr>
<tr>
<td>Vout_nom</td>
<td>12 VDC</td>
</tr>
<tr>
<td>Iout</td>
<td>50 A</td>
</tr>
<tr>
<td>Pout</td>
<td>600 W</td>
</tr>
<tr>
<td>fres</td>
<td>157 kHz</td>
</tr>
</tbody>
</table>

3 kW dual-phase LLC converter using XMC4400

The 3 kW dual-phase LLC demonstration board is an example of a high efficiency isolated DC-DC converter using the state-of-the-art Infineon components, both power devices and controller/driver ICs. The use of an advanced digital control using the XMC4400 microcontroller, together with the latest generation of CoolMOS™ and OptiMOS™ devices, allows achieving a very flat efficiency curve in the entire load range. The demonstration board is targeting the high voltage DC-DC stage of high-end telecom rectifiers.

Features and benefits

### Key features
- Full digital control by XMC4400 on the secondary side
- Digital current sharing with phase shedding
- Accurate algorithm able to prevent hard commutation and capacitive load mode in LLC operation

### Infineon components
- MCU: XMC4400 (LQFP64)
- SR MOSFET: OptiMOS™ BSC093N15NS5
- Drivers: 1EDI60N12AF, 2EDN7524R
- LLC Half-bridge MOSFET: CoolMOS™ P6 IPW60R041P6
- Auxiliary PSU: ICE2QR2280Z
- Peak efficiency: >98.4%

RGB LED lighting shield with XMC1202 for Arduino

The RGB LED lighting shield with XMC1202 for Arduino uses a DC-DC buck topology and is able to drive up to three LED channels with constant current. The shield itself is powered by a programmable XMC™ 32-bit Arm® MCU with embedded brightness color control unit (BCCU, XMC1200 MCU series), for flicker-free LED dimming and color control.

### Features
- Compatible with Arduino Uno R3 and XMC1100 boot kit from Infineon
- Easily configurable for various light engines and any input voltage (within operating conditions)
- Wide DC input voltage range
- Simple I2C interface

### Operating conditions
- Nominal: 12-48 V input voltage (max. 6-60 V)
- Average LED current up to 700 mA (max. peak current 1 A)

The Infineon shields mentioned above are hardware compatible with Arduino and Infineon’s XMC™ boot and relax kits.

www.infineon.com/shields-for-arduino
3 kW dual-phase LLC converter

XMC4800 automation board V2 – explore XMC4800 microcontroller based on Arm® Cortex®-M4

The XMC4800 automation board V2 uses Infineon’s industry leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon’s supply, interface, communication and safety products. The XMC4800 automation board V2 is designed to evaluate the capabilities of the XMC4800 microcontroller especially in EtherCAT® slave applications and can be used with a wide range of development tools including Infineon’s free-of-charge Eclipse based IDE, DAVE™.

Features and benefits

Key features

- XMC4800-E196 MCU based on Arm® Cortex®-M4 at 144 MHz
- EtherCAT® slave controller, 2 MB flash and 352 kB RAM
- OPTIGA™ Trust E embedded security solution (CC EAL6+)
- Real time clock crystal
- SPI FRAM (64 kB non-volatile memory)
- EtherCAT® slave node (2 EtherCAT™ PHY and RJ45 Jacks)
- 24 V ISOFACE™ 8-channel inputs and 8-channel outputs CAN transceiver
- CAN transceiver

Customer benefits

- Complete automation kit gateway
- Combined MCU with EtherCAT slave application
- Isolated interfaces with diagnose
- Ethernet connectivity with software examples available
- 24 V supply
- CAN connectivity
- Full software DAVE™ examples

XMC4800 automation board V2

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>OPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIT_XMC48_AUT_BASE_V2</td>
<td>The XMC4800 automation board V2 utilizes Infineon’s industry leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon’s supply, interface/communication and safety products</td>
<td>KITXMC48AUTBASEV2TOBO1</td>
</tr>
<tr>
<td>XMC4800-E196K2048</td>
<td>Arm® Cortex®-M4 microcontroller</td>
<td>XMC4800E196K2048AAXQMA1</td>
</tr>
<tr>
<td>ISO2H823V2.5</td>
<td>24 V 8-channel isolated output</td>
<td>ISO2H823V25XUMA1</td>
</tr>
<tr>
<td>ISO1U813T</td>
<td>24 V 8-channel isolated input</td>
<td>ISO1U813TXUMA1</td>
</tr>
<tr>
<td>SLS 32AIA020A4 USON10</td>
<td>OPTIGA™ Trust E - embedded security solution</td>
<td>SLS32AIA020A4USON10XTMA2</td>
</tr>
<tr>
<td>TLE6250iV33</td>
<td>Infineon CAN transceiver</td>
<td>TLE6250iV33XUMA1</td>
</tr>
<tr>
<td>IFX54411DV</td>
<td>Infineon voltage regulator</td>
<td>IFX54411DVXUMA1</td>
</tr>
</tbody>
</table>

www.infineon.com/automationkit
XMC™ wireless power controller – enabling wireless charging transmitter applications

Infineon’s XMC™ wireless power controller, based on the Arm® Cortex®-M0 core, provides a powerful and cost-effective platform for high performance, smart and safe wireless charging applications. The XMC™ wireless power controller helps the next-generation wireless charging systems to meet strict safety, environmental and regulatory requirements, while still enabling industry-leading charging performance and efficiency. This controller works seamlessly with Infineon’s power devices in a scalable architecture to provide a complete charging solution for everything from a fast-charge smartphone, to a 20 W robot, or a 60 W drone and beyond.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Supports inductive and resonant charging methods</td>
<td>› Supports 15 W charging and existing standards, including fast charging of smartphones</td>
</tr>
<tr>
<td>› Power levels up to 60 W</td>
<td>› Full power 15 W without exotic thermal management</td>
</tr>
<tr>
<td>› Multiple industry standard and custom charging profiles using the same hardware architecture</td>
<td>› Achieves charging rates equivalent to wired charging</td>
</tr>
<tr>
<td>› Single- and multi-coil transmitters</td>
<td>› Supports custom-charging profiles and industry standards on the same hardware</td>
</tr>
<tr>
<td>› Half- and full-bridge support</td>
<td>› Foreign object detection (FOD) with improved accuracy quality-factor monitoring</td>
</tr>
<tr>
<td>› Variable and fixed-frequency transmitter types</td>
<td>› Foreign object detection capability can be extended beyond existing standards to improve detection</td>
</tr>
<tr>
<td>› Buck and boost topologies</td>
<td>› Supports custom coils, and greater than three coils</td>
</tr>
<tr>
<td>› Integrated flash for parameter storage</td>
<td></td>
</tr>
<tr>
<td>› Voltage supply 1.8-5.5 V</td>
<td></td>
</tr>
<tr>
<td>› Space saving VQFN-40 package</td>
<td></td>
</tr>
</tbody>
</table>

For a detailed overview of Infineon’s wireless charging solutions, check the Wireless charging chapter.

www.infineon.com/wirelesscharging
XMC™ starter kits

Kits and evaluation boards

**Xtreme2Go**

Order number: KIT_XMC_2GO_XTR_XMC1400

- **XMC1400** family kit with ADAFRUIT, MikroE and Shields2Go connectivity.
  - Extension for IoT and other cloud applications.
- The **XMC1400** series devices are optimized for motor control, power conversion and LED Lighting applications and Human-Machine Interface (HMI)

For more information on this product, please contact our product support.

**Platform2Go XMC4400**

Order number: KIT_XMC_PLT_2GO_XMC4400

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller, the **XMC4400** Platform2Go is designed to evaluate the capabilities of Infineon's **XMC4400** microcontroller. It can be used with a wide range of development tools including Infineon’s free of charge Eclipse based IDE DAVE™
- This kit has the **XMC4400** device with debugger plus Ethernet, CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:
www.infineon.com/XMC4400platform2go

**XMC1400 Arduino**

Order number: KIT_XMC1400_ARDUINO

- This kit utilizes Infineon’s industry leading Arm® Cortex® M0 microcontroller in combination with Arduino form factor.
- It can be used with a wide range of development tools including Infineon’s free of charge Eclipse based IDE, DAVE™ and much more.

Click on the following to find/purchase the kit:
www.infineon.com/xmc1400_ARDUINO
Platform2Go XMC4200

Order number: KIT_XMC_PLT_2GO_XMC_4200

› Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller from Infineon Technologies AG, the XMC4200 Platform2Go is designed to evaluate the capabilities of Infineon’s XMC4200 microcontroller.
› It can be used with a wide range of development tools including Infineon’s free of charge Eclipse based IDE DAVE™.
› This kit has the XMC4200 device with debugger plus CAN, Arduino, MikroBUS and Shields2Go form factor.

Click on the following to find/purchase the kit:
www.infineon.com/XMC4200platform2go

RGB LED Lighting Shield

Order number: KIT_XMC_LED.DALI_20_RGB

› One of the first intelligent evaluation boards compatible with Arduino as well as Infineon’s XMC1100 BOOT KIT.
› Designed to be easily configurable and combinable for different LED light engines and lamps, for fast prototyping and in-expensive evaluation of LED lighting applications.
› The RGB LED lighting shield with XMC1302 uses a DC-DC buck topology.

Click on the following to find/purchase the kit:
XMC™ peripherals
IEC60730 class B library for XMC™

Supporting the XMC1xxx and XMC4xxx families
In collaboration with the consultancy Hitex, Infineon developed the IEC60730 – class B software library for XMC™ industrial microcontrollers for household electrical appliances. This is a dedicated software library for XMC™ MCUs with routines for internal supervisory functions and for self-diagnostics.

Extended documentation and pre-certified software libraries to XMC™ Cortex® Arm® based controllers are free of charge. For more information, please check: www.hitex.com/classb

Documentation

- Safety application note
- Failure mode report
- FMEDA tool

by Infineon, revised in workshops by TÜV Süd

Consultancy

hitex
EMBEDDED TOOLS & SOLUTIONS

Implementation support by Hitex

Embedded security for XMC™ MCUs

Infineon and its partners provide solutions which support with data protection, allowing authentication and encryption and securing firmware file updates to prevent cloning and downtimes.

Security solutions

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure bootloader by Infineon, XMC1000</td>
<td>OPTIGA™ family by Infineon</td>
</tr>
<tr>
<td>CodeMeter µEmbedded by WIBU, XMC4000 exclusive</td>
<td>Hardware-based security solutions</td>
</tr>
<tr>
<td>KMS/CycurKEYS by ESCRYP RT, XMC4000</td>
<td>OPTIGA™ Trust family</td>
</tr>
<tr>
<td>emSecure by SEGGER</td>
<td>OPTIGA™ TPM family</td>
</tr>
<tr>
<td></td>
<td>Turnkey and programmable security solutions</td>
</tr>
<tr>
<td></td>
<td>Standardized certified turnkey solution</td>
</tr>
</tbody>
</table>

www.infineon.com/xmc
AURIX™ – 32-bit microcontrollers
32-bit multicore TriCore™ – safety joins performance

AURIX™ is Infineon's family of microcontrollers serving the needs of industrial applications in terms of performance and safety. Its innovative multicore architecture, based on up to six independent 32-bit TriCore™ CPUs at 300 MHz, has been designed to meet the highest safety standards while increasing the performance at the same time. Using the AURIX™ scalable platform, developers will be able to implement applications such as motor control and drives, PLC or any other automation application. Developments using AURIX™ require less effort to achieve the SIL/ IEC61508 standard based on its innovative safety concept and multiple HW safety features. Furthermore, AURIX™ has enhanced communication capabilities to support communication between CAN, LIN, FlexRay and Ethernet buses.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TriCore™ with DSP functionality</td>
<td>High scalability gives the best cost-performance fit</td>
</tr>
<tr>
<td>Best-in-class real-time performance: up to six TriCore™ with up to 300 MHz per core</td>
<td>High integration leads to significant cost savings</td>
</tr>
<tr>
<td>Supporting floating point and fix point with all cores</td>
<td>High integration leads to reduced complexity</td>
</tr>
<tr>
<td>Up to 6.9 MB of internal RAM, up to 16 MB of flash</td>
<td>Innovative supply concept leads to best-in-class power consumption</td>
</tr>
<tr>
<td>Innovative single supply 5 V or 3.3 V</td>
<td></td>
</tr>
<tr>
<td>IEC61508 conformance to support safety requirements up to SIL 3</td>
<td></td>
</tr>
<tr>
<td>Embedded EEPROM</td>
<td></td>
</tr>
<tr>
<td>Advanced communication peripherals: CAN FD, LIN, SPI, FlexRay, Ethernet</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/aurix
AURIX™ TC2xx family system architecture

Powerful 1st generation AURIX™ TC2xx system architecture

AURIX™ TC2xx family package scalability

<table>
<thead>
<tr>
<th>Series</th>
<th>Flash Memory</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>9x</td>
<td>up to 8 MB</td>
<td>TQFP-80, TQFP-100, LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
<tr>
<td>7x</td>
<td>up to 4 MB</td>
<td>LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
<tr>
<td>6x</td>
<td>up to 2.5 MB</td>
<td>LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
<tr>
<td>3x</td>
<td>up to 2 MB</td>
<td>LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
<tr>
<td>2x</td>
<td>up to 1 MB</td>
<td>LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
<tr>
<td>1x</td>
<td>up to 512 KB</td>
<td>LQFP-144, TQFP-144, LQFP-176, LFBGA-292, BGA-416, LFBGA-516</td>
</tr>
</tbody>
</table>

Upgrade/downgrade with pin-compatible packages

www.infineon.com/aurix
AURIX™ microcontroller

### AURIX™ TC2xx portfolio

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Max. clock frequency [MHz]</th>
<th>Program memory [kB]</th>
<th>SRAM (incl. cache) [kB]</th>
<th>Co-processor 1)</th>
<th>Co-processor 2)</th>
<th>Timed I/O</th>
<th>Number of ADC channels</th>
<th>External bus interface</th>
<th>CAN nodes</th>
<th>Communication interface 2)</th>
<th>Temperature ranges 3)</th>
<th>Packages</th>
<th>Additional features/remarks 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC299TX</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>yes</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-116</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC299TP</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>yes</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-116</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC298TP</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>yes</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-416</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC297TA</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU, FTT, CIF</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>no</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC297TX</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>yes</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC297TP</td>
<td>300</td>
<td>800</td>
<td>2728</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>no</td>
<td>6</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, STBU, HSM</td>
<td></td>
</tr>
<tr>
<td>TC277TP</td>
<td>200</td>
<td>400</td>
<td>472</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>no</td>
<td>4</td>
<td>4aASC, 4xQSPI, 2xMSC, HSSL, 2x12C, 1xSENT, 3xPSII, FlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
<td></td>
</tr>
<tr>
<td>TC264DA</td>
<td>200</td>
<td>250</td>
<td>752</td>
<td>FPU, FTT, CIF</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>no</td>
<td>5</td>
<td>4aASC, 4xQSPI, 2xMSC, 2x12C, 1xSENT, 3xPSII, HSSL, 7xPSII, FlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, STBU</td>
<td></td>
</tr>
<tr>
<td>TC264D</td>
<td>200</td>
<td>250</td>
<td>472</td>
<td>FPU</td>
<td>4aASC, 4xQSPI, 3xMSC, 2x12C, 1xSENT, HSSL, 7xPSII, 2xFlexRay, Ethernet, CAN FD</td>
<td>360/10 DS</td>
<td>no</td>
<td>5</td>
<td>4aASC, 4xQSPI, 2xMSC, 2x12C, 1xSENT, 3xPSII, HSSL, 7xPSII, FlexRay, Ethernet, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, STBU</td>
<td></td>
</tr>
<tr>
<td>TC275P</td>
<td>200</td>
<td>200</td>
<td>392</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>6</td>
<td>2xASC, 4xQSPI, 4xSENT, FlexRay, Ethernet</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC234LA</td>
<td>200</td>
<td>200</td>
<td>704</td>
<td>FPU, FTT</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>6</td>
<td>2xASC, 4xQSPI, 4xSENT, FlexRay, Ethernet</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC234LX</td>
<td>200</td>
<td>200</td>
<td>704</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>6</td>
<td>2xASC, 4xQSPI, 4xSENT, FlexRay, Ethernet</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC234LP</td>
<td>200</td>
<td>200</td>
<td>392</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>6</td>
<td>2xASC, 4xQSPI, 4xSENT, FlexRay, Ethernet</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC234LA</td>
<td>200</td>
<td>200</td>
<td>704</td>
<td>FPU, FTT</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>6</td>
<td>2xASC, 4xQSPI, 4xSENT, FlexRay, Ethernet</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC214L</td>
<td>133</td>
<td>100</td>
<td>96</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>3</td>
<td>2xASC, 4xQSPI, 4xSENT, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC212L</td>
<td>133</td>
<td>100</td>
<td>96</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>3</td>
<td>2xASC, 4xQSPI, 4xSENT, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC211L</td>
<td>133</td>
<td>100</td>
<td>96</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>3</td>
<td>2xASC, 4xQSPI, 4xSENT, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
<tr>
<td>TC210L</td>
<td>133</td>
<td>100</td>
<td>96</td>
<td>FPU</td>
<td>1/1</td>
<td>120</td>
<td>24</td>
<td>no</td>
<td>3</td>
<td>2xASC, 4xQSPI, 4xSENT, CAN FD</td>
<td>K</td>
<td>LF9GA-292-2</td>
<td>EVR, WUT, HSM</td>
</tr>
</tbody>
</table>

2) CIF = camera and external ADC Interface, FFT = fast fourier transform accelerator, FPU = floating point unit, PCP = peripheral control processor
3) ASC = asynchronous serial channel, ASCLIN = asyn/synchronous local interconnect network, HSSL= high-speed serial link, I²C = inter-integrated circuit, LIN = local interconnect network, MLI = micro link interface, MSC = micro second channel, PSII = peripheral sensor interface 5, QSPI = queued serial peripheral interface, SENT = single edge nibble transmission, SSC = synchronous serial channel, CAN FD ISO11898-1:2015
4) Ambient temperature range: A = -40°C ... 140°C, B = 0°C ... 70°C, F = -40°C ... 85°C, H = -40°C ... 110°C, K = -40°C ... 125°C, L = -40°C ... 150°C, X = -40°C ... 105°C
5) EVR = embedded voltage regulator, HSM = hardware security module, STBU = stand-by control unit, WUT = wake-up timer

### Evolution from TC2xx to TC3xx - Easy migration with focus on reuse

- Fast conversion of existing AURIX™ TC2xx designs
  - Backwards compatibility
  - High AURIX™ TC3xx compatibility to pinout of existing QFP100/144/176 and BGA packages
- Flexibility - scalability within the AURIX™ TC3xx family
  - Up-/Downgrade paths for devices in identical packages
  - Compatible pin-out of QFP/BGA package options enabling combination designs
- Pin-to-pin compatibility between the devices of AURIX™ TC2xx/TC3xx and from generation to generation
- A high scalability with a very large portfolio for both AURIX™ TC2xx and TC3xx

www.infineon.com/aurix
AURIX™ TC3xx family system architecture

AURIX™ TC3xx – scalable family - from low-cost to high-performance applications

AURIX™ TC3xx provides an upgrade on key parameters with focus on SW and HW reuse

- **Performance increase and reduction of power**: Increased from 3 to 6 cores. Developed in 40 nm for power consumption reduction.
- **Scalable & backwards compatible to TC2xx**: Fully compatible devices with focus on HW & SW reuse.
- **Functional safety**: IEC61508 compliant enabling SIL-3 level.
- **Enhanced security**: Upgraded to Full EVITA support.
- **Improved networking**: Richer peripheral set.
- **SOTA**: Full support of SOTA A/B swap.

www.infineon.com/aurix
### AURIX™ TC3xx package scalability

| 6x 300 MHz | 9x A series 16 MB | TC397XA 300 MHz |
| 6x 300 MHz | 9x series 16 MB | TC357x 300 MHz |
| 4x 300 MHz | Ex series 12 MB | TC387QX 300 MHz |
| 4x 300 MHz | 8x series 10 MB | TC387Q 300 MHz |
| 3x 300 MHz | 7x X series 6 MB | TC377T 300 MHz |
| 3x 300 MHz | 7x series 6 MB | TC377T 300 MHz |
| 2x 300 MHz | 6x series 4 MB | TC364D 300 MHz, TC366D 300 MHz, TC365D 300 MHz |
| 4x 300 MHz | Ax series 4 MB | TC38AQ 300 MHz |
| 3x 300 MHz | 5x A series 4 MB | TC356TA 300 MHz |
| 2x 300 MHz | 3x A series 2 MB | TC360A 200 MHz |
| 1x 300 MHz | 3x series 2 MB | TC332L 160 MHz |
| 1x 300 MHz | 2x series 2 MB | TC322L 160 MHz |

Flash Package: TQFP-80, TQFP-100, T/LQFP-144, BGA-180, LQFP-176, BGA-233, LFBGA-292, LFBGA-516

- **L** - Single lockstep core
- **D** - Dual core
- **T** - Triple core
- **Q** - Quadruple core
- **X** - Sextuple core

### Advanced package technologies deliver the best price/performance ratio

- Customers can choose between different devices in the same pin-compatible package

### MCU scalability
- Performance and flash
- Pin compatibility
- Binary-compatible cores

### Safety/security concept
- ISO 26262 compliance
- IEC61508 compliant

### Power consumption
- On-chip SC DC-DC high-efficiency power supply
- Integrated standby controller

### Connectivity
- Ethernet: up to 2x1 GB
- CAN FD: up to 12 channels
- eMMC IF

---

www.infineon.com/aurix
### AURIX™ TC3xx portfolio

#### AURIX™ TC3xx family

<table>
<thead>
<tr>
<th>Product type</th>
<th>Core/lockstep</th>
<th>Max clock frequency [MHz]</th>
<th>Program memory [kB]</th>
<th>SRAM (incl. cache) [kB]</th>
<th>CAN/CAN FD nodes</th>
<th>Ethernet</th>
<th>GMSK*</th>
<th>Radiator</th>
<th>4-wire interface</th>
<th>Communication interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC99XX</td>
<td>6/4</td>
<td>300</td>
<td>1600</td>
<td>6912</td>
<td>no</td>
<td>12</td>
<td>1</td>
<td>6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC399XP</td>
<td>6/4</td>
<td>300</td>
<td>1600</td>
<td>2816</td>
<td>no</td>
<td>12</td>
<td>1</td>
<td>6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC397XX</td>
<td>6/4</td>
<td>300</td>
<td>1600</td>
<td>6912</td>
<td>no</td>
<td>12</td>
<td>1</td>
<td>6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC397XP</td>
<td>6/4</td>
<td>300</td>
<td>1600</td>
<td>2816</td>
<td>no</td>
<td>12</td>
<td>1</td>
<td>6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC397XA</td>
<td>6/4</td>
<td>300</td>
<td>1600</td>
<td>6912</td>
<td>2x SPU, 8x 400 Mbit/s LVDS</td>
<td>12</td>
<td>1</td>
<td>6x SPI, 2x FlexRay, 12x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC389QP</td>
<td>4/2</td>
<td>300</td>
<td>1000</td>
<td>1568</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC387QP</td>
<td>4/2</td>
<td>300</td>
<td>1000</td>
<td>1568</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>5x SPI, 2x FlexRay, 24x LIN, 25x SENT, 4x PSIS, 2x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC377TX</td>
<td>3/3</td>
<td>600</td>
<td>4208</td>
<td>no</td>
<td>12</td>
<td>2</td>
<td>5x SPI, 1x FlexRay, 12x LIN, 13x SENT, 2x PSIS, 1x I2C, 2x MSC</td>
<td>EVA full, K, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC377TP</td>
<td>3/2</td>
<td>600</td>
<td>1136</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>5x SPI, 1x FlexRay, 12x LIN, 13x SENT, 2x PSIS, 1x I2C, 2x MSC</td>
<td>EVA full, K, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC375TP</td>
<td>3/2</td>
<td>600</td>
<td>1136</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>5x SPI, 1x FlexRay, 12x LIN, 13x SENT, 2x PSIS, 1x I2C, 2x MSC</td>
<td>EVA full, K, L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC376TP</td>
<td>2/2</td>
<td>300</td>
<td>400</td>
<td>672</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSIS, 1x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC366DP</td>
<td>2/2</td>
<td>300</td>
<td>400</td>
<td>672</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSIS, 1x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC365DP</td>
<td>2/2</td>
<td>300</td>
<td>400</td>
<td>672</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSIS, 1x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC364DP</td>
<td>2/2</td>
<td>300</td>
<td>400</td>
<td>672</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSIS, 1x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC363DP</td>
<td>2/2</td>
<td>300</td>
<td>400</td>
<td>672</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 10x SENT, 2x PSIS, 1x I2C, 6x MSC</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC357TA</td>
<td>3/2</td>
<td>300</td>
<td>400</td>
<td>3664</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 4x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC356TA</td>
<td>3/2</td>
<td>300</td>
<td>400</td>
<td>3664</td>
<td>no</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 4x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC337DA</td>
<td>2/1</td>
<td>200</td>
<td>200</td>
<td>1568</td>
<td>1x SPU, 4x 400 Mbit/s LVDS</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC366DA</td>
<td>2/1</td>
<td>200</td>
<td>200</td>
<td>1568</td>
<td>1x SPU, 4x 400 Mbit/s LVDS</td>
<td>8</td>
<td>1</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC337LP</td>
<td>1/1</td>
<td>200</td>
<td>200</td>
<td>248</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC336LP</td>
<td>1/1</td>
<td>200</td>
<td>200</td>
<td>248</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC334LP</td>
<td>1/1</td>
<td>200</td>
<td>200</td>
<td>248</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC333LP</td>
<td>1/1</td>
<td>200</td>
<td>200</td>
<td>248</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC332LP</td>
<td>1/1</td>
<td>200</td>
<td>200</td>
<td>248</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 1x FlexRay, 12x LIN, 6x SENT</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC321LP</td>
<td>1/1</td>
<td>160</td>
<td>100</td>
<td>96</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 6x SENT, 6x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC324LP</td>
<td>1/1</td>
<td>160</td>
<td>100</td>
<td>96</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 6x SENT, 6x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC323LP</td>
<td>1/1</td>
<td>160</td>
<td>100</td>
<td>96</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 6x SENT, 6x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
<tr>
<td>TC322LP</td>
<td>1/1</td>
<td>160</td>
<td>100</td>
<td>96</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>4x SPI, 6x SENT, 6x LIN</td>
<td>EVA full, K, L</td>
<td></td>
</tr>
</tbody>
</table>

1) SPU – Signal processing unit
2) HSSL – High-speed serial link
3) 8-bit SCR – Standby controller for low power modes
4) EVR – Embedded voltage regulator

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/aurix
AURIX™ starter and application kits
Infineon starter kits – 32-bit microcontrollers

AURIX™ Triboards Kits
› Full evaluation board for development to write and debug your 1st programs
› Includes getting started advice, free TriCore™ entry tool chain, technical documentation, compiler and debugger
› TriBoard available for all productive silicon
www.infineon.com/aurix-kits

AURIX™ TFT Kits
› Low cost board for early evaluation with limited access to signals
› Additional touchscreen display for convenient handling
› TFT board available for every silicon
Click on the following to find/purchase the kit:
www.infineon.com/aurix-kits

Arduino AURIX™ TC275 ShieldBuddy Kit
› The Hitex TC275/TC375 ShieldBuddy follows the Arduino standard
› Compatible with 100’s of Arduino application shields
› Evaluation licenses available
› Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists
www.infineon.com/aurixlowcostarduinokits

Arduino AURIX™ TC375 ShieldBuddy Kit
Order number: KIT_A2G_TC375_ARD_SB
› Compatible with 100’s of Arduino application shields
› Evaluation licenses available
› Ethernet
› Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists
www.infineon.com/aurixlowcostarduinokits
AURIX™ microcontroller

AURIX™ TC275 Lite kit
- AURIX™ TC275 device in LQFP-176 package
- FTDI based debugger with micro USB
- Use of Arduino Uno/compatible platform
  www.infineon.com/aurixlowcostarduinokits

AURIX™ TC375 Lite kit
- AURIX™ TC375 device in LQFP-176 package
- Ethernet PHY
- FTDI based debugger with micro USB
- Use of Arduino Uno/compatible platform
  www.infineon.com/aurixlowcostarduinokits

Discover our AURIX™ kits platform for more starter and application kits
www.infineon.com/aurixkits
Infineon application kits – 32-bit microcontrollers

24 GHZ Radar
Based on the Infineon AURIX™ and MMIC BGT24A families
› BGT24A transceiver MMIC family, e.g. BGTA24ATR12,
› 2-bit radar microcontroller family, e.g. SAK-TC264DA-40F200
› FFT acceleration engine and extended memory for radar image storage
› Ethernet as measurement interface
www.infineon.com/aurixapplicationkits

60 GHZ Radar
XENSIV™ BGT60ATR24C
+ AURIX™ TC356TA
+ OPTIREG™ TLS4120D0EPV33/TLS715B0EJV50
› Modular architecture
› Automotive qualified components
› Virtual array processing (TDM MIMO)
› Ultra-wideband operation of 4 GHz
› Optimized performance versus power with SPU
www.infineon.com/aurixapplicationkits

Motor control
Order number: KIT_AURIX_TC234_MOTORCTR
› TC234 application kit with TFT display incl. safety supply TLF35584
› Driving of a 3-phase PMSM/BLCD (12 V/max. 50 W)
› BLDC motor from Nanotec integrated
› Software available with flexible configuration
www.infineon.com/aurixapplicationkits

Motor control board AURIX™ TC387
Order number: KIT_AURIX_TC234_MOTORCTR
› TC387 Application Kit with TFT Display incl. safety supply TLF35584
› eMotor Power board: 3-phase motor control power board with TLE9180D-31QK 3-phase gate driver IC, MOSFET power stage, and auxiliary components
› Commands and monitoring via TFT touch screen
› Field oriented control (FOC) algorithm using 3-phase current sensing (EVADC) encoder as position sensor (GPT12) and AURIX™ GTM as PWM generator
www.infineon.com/aurixapplicationkits

www.infineon.com/aurix
Infineon application kits – 32-bit microcontrollers

Wireless charging: the beast 1.0

› WPC Qi v1.2.4 certified
› Support fast charging enabled devices (7.5W and 9W)
› AUTOSAR support
› Improved accuracy Foreign Object Detection (FOD)
www.infineon.com/aurixapplicationkits

Wireless charging: the beast 2.0

› Beast 2.0 is powered by the high-performance Infineon AURIX™ or Traveo™ II
› Latest WPC Qi functionality
› Supports 15W charging for Qi-certified devices
› Improved accuracy Foreign Object Detection (FOD)
› Supports future products and standards with field-upgradeable Pantheon™ software
www.infineon.com/aurixapplicationkits
Industrial robotics

Application example

Application features
- High computing performances
- High level of accuracy, integration and efficiency
- Safety management in line with current norms
- Various topologies for axis, joints and motors
- Security features that protect intellectual property from counterfeiting

System benefits
- High computing performance: up to 6x 300 MHz
- High flexibility thanks to tailored peripherals
- Integrated safety support (EN ISO 10218 and ISO/TS15066)
- Integrated security with hardware security module
- Robust 3 V-, 5 V-, LVDS – PortPins
- Large portfolio with long-term availability

Suggested products
- TC23x
- TC33x
- TC36x
- TC37x
- TC38x
- TC39x
- XMC4xxx

www.infineon.com/aurix
Microcontroller PDH partner

Preferred Design Houses (PDH) and software resellers – AURIX™ Traveo and PSoC, AURIX™ tools and software

AURIX™ Tools and Software

To enable customers to achieve optimal performance when using the powerful AURIX™ architecture, Infineon has built up a network of strong partnerships with companies highly specialized in multicore software development. Infineon’s multicore partners can offer the best multicore expertise and tools on the market for each stage of the software design process, covering everything from the initial multicore knowledge acquisition phase right up to final optimization of the multicore software.

AURIX™ Embedded Software

- AURIX™ Applications software
- Autosar
- Non-Autosar OS/RTOS
- Middleware
- Communication and connectivity
- Bootloader/OTA
- Safety

AURIX™ Tools

- AURIX™ Free Tools
- Calibration/Measurement/Prototyping
- Compilers
- Debugger, Test Tools
- Flash Tools
- Simulation/Modelling
- SW Automation/Autocoding

Discover our new AURIX™ Tools and Software ecosystems where you can find everything you need within easy reach www.infineon.com/aurixtools and www.infineon.com/aurixsoftware

www.infineon.com/aurix
## Preferred Design Houses (PDH)

The preferred design house extends the support force by specifying and customizing the know-how. Furthermore, it brings an additional value for customer service. The preferred design house supports the set up for systems using AURIX™ and XMC™, including software and other Infineon products. Our partners are trained to use AURIX™ and XMC™.

<table>
<thead>
<tr>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic (Free of charge)</td>
</tr>
<tr>
<td>Premium (Consultancy mode)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1st level customer support covering Infineon products/solutions</td>
</tr>
<tr>
<td>Technical interface and support to the customer</td>
</tr>
<tr>
<td>Driving design at customer</td>
</tr>
<tr>
<td>Basic training for design teams at customer</td>
</tr>
<tr>
<td>24 h response time to the customer</td>
</tr>
<tr>
<td>Project management and project-specific application support</td>
</tr>
<tr>
<td>Specification of general software architecture, defining required layers, control and data flow structure etc.</td>
</tr>
<tr>
<td>Specification and implementation of custom device drivers</td>
</tr>
<tr>
<td>Optimization of software components with regard to speed/code size</td>
</tr>
<tr>
<td>Software testing</td>
</tr>
<tr>
<td>Support for project-specific functional safety engineering</td>
</tr>
<tr>
<td>Project-specific support for security solution</td>
</tr>
<tr>
<td>Safety support</td>
</tr>
<tr>
<td>Security support</td>
</tr>
<tr>
<td>Multicore support</td>
</tr>
<tr>
<td>Basic principles and elementary know-how to support a customer; provision of basic training for design teams</td>
</tr>
<tr>
<td>Advanced High-level project-specific application support/consulting</td>
</tr>
<tr>
<td>Expert Extensive knowledge and ability to fully support development</td>
</tr>
</tbody>
</table>

www.infineon.com/aurix
Thanks to its special features the Traveo™ II family is the perfect match for industrial applications. With processing power and network connectivity built into a single Arm® Cortex®- M4F and dual Cortex®- M7F, the Traveo™ II family comes up with an enhanced performance up to 1500 DMIPS and a high-performance CPU operating up to 350 MHz.

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Supply Voltage [V]</th>
<th>Main Core Frequency [MHz]</th>
<th>Flash Code + Work [kB]</th>
<th>SRAM [kB]</th>
<th>GPIO</th>
<th>ADC Channels</th>
<th>CAN/CAN FD Channels</th>
<th>Ethernet 100/1000 Mbit</th>
<th>SCI Channel</th>
<th>CMD Channel</th>
<th>SMBusI2C</th>
<th>LIN Channel</th>
<th>I2S Channel</th>
<th>eMMC Channels</th>
<th>HSM</th>
<th>Temperature Range</th>
<th>Packages</th>
<th>SIL Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYT2B75CAQQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>160</td>
<td>1088 + 96</td>
<td>128</td>
<td>78</td>
<td>39</td>
<td>6</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>7</td>
<td>-</td>
<td>0</td>
<td>Yes</td>
<td>E</td>
<td>100-LQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT2B78CAQQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>160</td>
<td>1088 + 96</td>
<td>128</td>
<td>152</td>
<td>64</td>
<td>6</td>
<td>no</td>
<td>8</td>
<td>0</td>
<td>8</td>
<td>-</td>
<td>0</td>
<td>Yes</td>
<td>E</td>
<td>176-LQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT2B95CAQQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>160</td>
<td>2112 + 128</td>
<td>256</td>
<td>78</td>
<td>39</td>
<td>8</td>
<td>no</td>
<td>8</td>
<td>4</td>
<td>9</td>
<td>-</td>
<td>0</td>
<td>Yes</td>
<td>E</td>
<td>100-LQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT2B98CAQQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>160</td>
<td>2112 + 128</td>
<td>256</td>
<td>152</td>
<td>64</td>
<td>8</td>
<td>no</td>
<td>8</td>
<td>4</td>
<td>12</td>
<td>-</td>
<td>0</td>
<td>Yes</td>
<td>E</td>
<td>176-LQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT3BB8CEBQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>250</td>
<td>4160 + 256</td>
<td>768</td>
<td>148</td>
<td>64</td>
<td>8</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td>Yes</td>
<td>S</td>
<td>176-TQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT3BBBCEBQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>250</td>
<td>4160 + 256</td>
<td>768</td>
<td>220</td>
<td>72</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td>1</td>
<td>Yes</td>
<td>E</td>
<td>272-BGA</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT4BF8CEDQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>350</td>
<td>8384 + 256</td>
<td>1024</td>
<td>148</td>
<td>81</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td>1</td>
<td>Yes</td>
<td>E</td>
<td>176-TQFP</td>
<td>ASIL-B</td>
<td></td>
</tr>
<tr>
<td>CYT4BFCCDQAGAESGS</td>
<td>2.7 to 5.5</td>
<td>350</td>
<td>8384 + 256</td>
<td>1024</td>
<td>240</td>
<td>86</td>
<td>10</td>
<td>2</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>Yes</td>
<td>E</td>
<td>320-BGA</td>
<td>ASIL-B</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/traveo
TRAVEO™ II kits

**CYTVII-B-E-BB**

- The **CYTVII-B-E-BB** is a generic base board that can be connected to compatible Traveo™ II entry or high-end evaluation boards so as to extend its functionality.
- Connects to most CYTVII-B-E-xxx and CYTVII-B-H-xxx evaluation boards.
  

**CYTVII-B-E-176-SO**

- The **CYTVII-B-E-176-SO** evaluation board is based on the Traveo™ II entry family of devices.
- Traveo™ II is CYT2B78CADES.
  

**CYTVII-B-E-1M-SK**

- The **CYTVII-B-E-1M-SK** is a low-cost easy to use evaluation board based on the Traveo™ II entry family of devices.
- Traveo™ II CYT2B75CADES MCU.
- Designed in an Arduino form factor so that users can connect many off-the-shelf Arduino shields to it, to expand its functionality.
  

**CYTVII-B-H-8M-320-CPU**

- The **CYTVII-B-H-8M-320-CPU** evaluation board is based on the Traveo™ II high-end family of devices.
- Traveo™ II CYT4BFCCHCES MCU.
- Audio, Ethernet, SD Card, SMIF.
  

www.infineon.com/traveo
MOTIX™ MCU – Embedded Power ICs

System-on-chip solution for motor control applications

Infineon’s MOTIX™ Embedded Power ICs include a 32-bit Arm® Cortex®-M microcontroller, a voltage regulator, the communication interfaces, along with the driving stages for motor control applications. These system-on-chip solutions offer an unmatched level of integration of all functions required to sense, control and actuate a motor. They save space and energy, improve the overall system reliability through advanced diagnosis features and reduce the overall cost due to a minimum number of external components. They perfectly fit with a range of motor control applications where a small package form factor and a minimum number of external components are essential.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>TLE984x</th>
<th>TLE9845</th>
<th>TLE9850/1</th>
<th>TLE985x</th>
<th>TLE986x</th>
<th>TLE987x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>Arm® Cortex®-M0</td>
<td></td>
<td></td>
<td>Arm® Cortex®-M3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core frequency</td>
<td>25-40 MHz</td>
<td>40 MHz</td>
<td>24-40 MHz</td>
<td>48 KB</td>
<td>48 KB – 96 KB</td>
<td>36 KB – 256 KB</td>
</tr>
<tr>
<td>Flash size</td>
<td>36 KB – 64 KB</td>
<td>48 KB</td>
<td>48/64 KB</td>
<td>48 KB – 96 KB</td>
<td>36 KB – 256 KB</td>
<td></td>
</tr>
<tr>
<td>Driver stage</td>
<td>Relay</td>
<td>Half-bridge</td>
<td>H-bridge</td>
<td>B6-bridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HV monitor inputs</td>
<td>Relay</td>
<td>PN FET half-bridge</td>
<td>NN FET half-bridge</td>
<td>N FET H-bridge</td>
<td>N FET B6-bridge</td>
<td></td>
</tr>
<tr>
<td>Junction temperature levels</td>
<td>4-5</td>
<td>150°C</td>
<td>150°C and 175°C</td>
<td>150°C and 175°C</td>
<td>150°C and 175°C</td>
<td></td>
</tr>
</tbody>
</table>

Features and benefits

Key features

- Extensive diagnostics and protections embedded within the system-on-chip
- Minimum number of external components needed
- Platform based approach with compatible software between the product families
- Data processing, actuation and sensing integrated into the product with 32-bit Arm® Cortex®-M
- Compact package with 7x7 mm footprint (VQFN-48/TQFP-48)
- Intelligent power saving modes including stop and sleep mode and energy management for external sensors (on demand)

Customer benefits

- High levels of system reliability
- Reduced cost
- Support multiple and flexible designs with minimal effort
- Space saving
- Energy saving

MOTIX™ Embedded Power ICs enable mechatronic motor control solutions for either relay, half-bridge or full-bridge DC and BLDC motor applications

They are supported by a complete development tool chain provided by Infineon and third party vendors. The tool chain includes compilers, debuggers, evaluation boards, LIN low level drivers and configuration tools as well as variety of example software code.

www.infineon.com/embeddedpower
BLDC Motor Control Shield for Arduino

3-phase motor control shield with MOTIX™ TLE9879QXA40

The BLDC Shield for Arduino uses TLE9879QXA40, which is a part of the MOTIX™ TLE987x family of the Infineon MOTIX™ MCU portfolio. It enables the shield to drive 3-phase BLDC motors with a variety of different features. One Arduino base board can control up to four BLDC shields via SPI. The BLDC Shield firmware provides an auto-addressing functionality. Every shield in the stack can be controlled independently and run completely different motor control algorithms if desired.

The shield implements three different advanced motor control algorithms:
› Sensorless field-oriented control (FOC),
› Block commutation with back EMF (BEMF)
› Hall based block commutation (HALL)

The firmware can be changed using the SWD Interface
Additional connectors for voltage supply, motor- phases and hall sensors speed up the evaluation.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Customer benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Implemented motor control algorithms (FOC, BEMF, Hall)</td>
<td>› Easy to use API, allowing the user to quickly setup an application</td>
</tr>
<tr>
<td>› Controlled over Arduino via SPI</td>
<td>› High performance BLDC motor control in form of the TLE987x chip</td>
</tr>
<tr>
<td>› Compatible with the Arduino Uno or the Infineon XMC™ baseboard</td>
<td></td>
</tr>
<tr>
<td>› Up to four shields can be used simultaneously</td>
<td></td>
</tr>
<tr>
<td>› Each shield can be controlled independently</td>
<td></td>
</tr>
<tr>
<td>› Motor parameters can be set for each shield individually</td>
<td></td>
</tr>
</tbody>
</table>

Our BLDC Shield for Arduino comes with a library which includes a collection of code that makes it easy for you to run your project. The Arduino library offers an intuitive API to quickly setup and configure an application.

www.infineon.com/bldcmotorshield
www.infineon.com/shields-for-arduino
CAN-FD transceivers

High- and low-speed CAN-FD Transceivers for automotive and many other applications

Recently the automotive industry newly established the CAN-FD (Flexible Data-rate) protocol for faster CAN communication up to 5Mbit/s and CAN PN (Partial Networking) for improved energy efficiency.

Dependent on the respective network architecture and the related ECU supply path, different transceiver types are used. Infineon transceivers ensure reliable communication and help minimizing the current consumption. The products provide the best value by its high performance, ruggedness and reliability.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission rates up to 5 Mbit/s ISO11898 compliant</td>
<td>Low current consumption</td>
</tr>
<tr>
<td>Low-power modes</td>
<td>Excellent EMI performance &amp; robustness</td>
</tr>
<tr>
<td>Receive-only mode</td>
<td>Pin-to-pin replacements for industry-standard parts</td>
</tr>
<tr>
<td>Standby/sleep mode</td>
<td></td>
</tr>
<tr>
<td>Bus wake up</td>
<td></td>
</tr>
<tr>
<td>Thermal protection</td>
<td></td>
</tr>
<tr>
<td>CAN FD compliance</td>
<td></td>
</tr>
</tbody>
</table>

Block diagram TLE9250V

Key benefits:
- Low current consumption
- Excellent EMI performance & robustness
- Pin-to-pin replacements for industry-standard parts

www.infineon.com/can-transceivers
Infineon support for industrial microcontrollers
One platform, countless solutions

Further information, datasheets and documents
www.infineon.com/xmc
www.infineon.com/xmc1000
www.infineon.com/xmc4000
www.infineon.com/aurix
www.infineon.com/makers

XMC SC Wireless power controller:
www.infineon.com/xmcsewirelesspowercontrollers

XMC™ MCUs ecosystem and enablement –
kits, board, tools and software
Boards and kits:
www.infineon.com/xmc-dev
www.infineon.com/connectivitykit
www.infineon.com/ethercat
Ecosystem and tools:
www.infineon.com/xmc-ecosystem
DAVE™ IDE:
www.infineon.com/dave
Power management ICs

- XDP™ SMPS controllers
- DC-DC digital multiphase controllers
- AC-DC power management ICs
- PFC controllers
- PWM controllers and climate saver systems
- Resonant LLC half-bridge controller ICs
- NCF tag-side controllers
- OptiMOS™ integrated power stages
- Switching regulators
- Voltage regulators
- Digital power controller
- 3-phase smart gate drive controller IC
- Audio amplifier ICs
- AC-DC LED driver ICs
- DC-DC LED driver ICs
- iMOTION™ integrated motor control solutions
- MOTIX™ motor control ICs

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
XDP™ SMPS

IDP2308 and IDP2303A – digital multimode PFC+LLC combo controller

The IDP2308 and IDP2303A are high-performance digital combo controllers with integrated drivers and a 600 V depletion cell designed for boost PFC and half-bridge LLC targeting switched mode power supplies (SMPS) from 75 W to 300 W.

› Support non-AUX operation with the lowest standby performance and start-up cell
› Support multimode PFC operation for optimized efficiency curve
› Configurable frequency setting for LLC soft-start and normal operation
› Synchronous PFC and LLC burst mode control with soft-start to prevent acoustic noise
› Excellent dynamic response by adaptive LLC burst mode
› Configurable and comprehensive protections for PFC/LLC/IC temperature
› IEC62368-1 certified active X-cap discharge function
› Flexible IC parameter setting with digital UART interface supports PSU platform approach

Key benefits
› Low BOM count due to high integration of digital control
› No auxiliary power supply needed
› Easy design of system schematic and PCB layout
› Small form factor design
› Higher system reliability
› Shorter development cycles and higher design and production flexibility

<table>
<thead>
<tr>
<th>Product</th>
<th>Target application</th>
<th>Major difference</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDP2308</td>
<td>TV embedded PSU</td>
<td>2nd redundant PFC output overvoltage protection</td>
<td>DSO-14 (with enhanced HV creepage distance)</td>
</tr>
<tr>
<td>IDP2303A</td>
<td>Adapter, general SMPS</td>
<td>Constant output voltage</td>
<td>DSO-16</td>
</tr>
</tbody>
</table>

IDP2303A – power adapter

www.infineon.com/xdp-smps
IDP2308 – embedded PSU

Target applications
› LCD TV power supply
› General SMPS
› Power adapter

www.infineon.com/xdp-smps
XDP™ SMPS

XDP21081 – digital FQR flyback controller

XDP21081 is a flyback controller with zero voltage switching (ZVS) on the primary side to achieve high efficiency with simplified circuitry and economical switches. By driving an external low-voltage switch to induce a negative current to discharge the main high-voltage MOSFET, switching losses can be reduced further than the traditional valley by switching the type of switching scheme. To achieve high efficiency with synchronous rectification, the XDP21081 multimode digital forced quasi-resonant (FQR) flyback controller IC ensures discontinued conduction mode (DCM) operation via valley detection for a safe and robust operation.

Features and benefits

Key features
- Zero voltage switching
- Frequency law optimization
- Active burst mode operation with multi-entry/exit threshold
- Integrated dual MOSFET gate driver
- Easy ZVS implementation with an external 60 V MOSFET
- Multiple peak current threshold offset for different output
- CrCM operation with valley detection

Key benefits
- Reduce switching loss and achieve high efficiency
- Optimize efficiency across various line/load conditions
- Optimize light and no-load efficiency
- Save BOM count and cost with no messy external driver
- Easy to drive, low cost and widely available off the shelf 60 V MOSFET
- Fail-safe mechanism to limit output power in the event of PD controller failure
- Avoid CCM operation and no potential of shoot-through with SR MOSFET

65 W USB-PD Type-C reference design in a small form factor based on XDP21081.
- Up to 65 W output power with 25 W/in³ power density
- Universal input range 90~264 VAC
- Supported output: 5 V/3 A, 9 V/3 A, 12 V/3 A, 15 V/3 A and 20 V/3.25 A
- Peak efficiency > 93 percent
- Low no-load standby input power < 65 mW

Ordering code: REFXDP2108165W1TOBO1

www.infineon/xdps21081
**XDP™ SMPS**

**XDP2201 – digital hybrid flyback controller**

XDP2201 is a multimode, digital configurable hybrid flyback controller that combines the simplicity of a traditional flyback topology with the performance of a resonant converter. By utilizing two high-voltage MOSFETs, such as CoolMOS™, the controller can drive both high- and low-side MOSFETs in an asymmetric half-bridge flyback topology. Both zero voltage and current switching are achieved through means of regulating the polarity of the magnetizing current to increase efficiency. Also, transformer leakage energy is recycled, thereby further increasing efficiency.

**Features and benefits**

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero voltage and current switching across all line and load conditions</td>
<td>Reduce switching loss and achieve high efficiency</td>
</tr>
<tr>
<td>Multimode operation (active burst mode, DCM, 2V-RCS and CRM)</td>
<td>Optimize efficiency across various line/load conditions</td>
</tr>
<tr>
<td>Integrated high-side driver and 600 V start-up cell</td>
<td>Optimize light and no-load efficiency</td>
</tr>
<tr>
<td>Single auxiliary transformer winding and resonant cap to supply power to IC</td>
<td>Save BOM count and cost with no messy external driver</td>
</tr>
<tr>
<td>Comprehensive suite of protection feature sets</td>
<td>Easy to drive, low cost and widely available off the shelf 60 V MOSFET</td>
</tr>
<tr>
<td>Digital platform with configurable parameters</td>
<td>Fail-safe mechanism to limit output power in the event of PD controller failure</td>
</tr>
<tr>
<td>Avoid CCM operation and no potential of shoot-through with SR MOSFET</td>
<td></td>
</tr>
</tbody>
</table>

**DEMO_XDPS2201_65W1**

65 W USB-PD PPS Type-C demo board in a miniature form factor based on XDP2201.
- Up to 65 W output power with 31 W/in³ power density
- Universal input range 90~264 VAC
- Supported output: 5 V/3 A, 9 V/3 A, 12 V/3 A, 15 V/3 A and 20 V/3.25 A, 5~20 V/3 A
- Peak efficiency > 93.8 percentage
- Low no-load standby input power < 75 mW

**Ordering code:** DEMOXDPS220165W1TOBO1

www.infineon/xdps2201
DC-DC digital multiphase controllers
Point-of-load power management

Infineon’s digital multiphase and multi-rail controllers provide power for today’s medium- and high-current POL applications used in telecom/datacom, server, and storage environments. Infineon’s digital controller family enables OEMs and ODMs to improve efficiency and total cost of ownership while increasing power density and optimizing the total system footprint of the voltage regulator. The products highlighted in the table below represent our fifth-generation digital controller family and support up to two rails with 1-6 phases on individual rails. The I2C/PMBus interface connects the digital controllers to the application system and provides real-time telemetry information, monitoring, and control capabilities. The digital controllers are fully configurable through our PowerCode and PowerClient graphical user interfaces that allow for easy-to-use and simplified design optimization.

### Multiphase configurations are supported for best power optimization

<table>
<thead>
<tr>
<th>Feature</th>
<th>Controller family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configurable output rails</td>
<td>Dual rail</td>
</tr>
<tr>
<td>Dual rail</td>
<td></td>
</tr>
<tr>
<td>Dual/single rail</td>
<td></td>
</tr>
<tr>
<td>Dual/rail</td>
<td></td>
</tr>
<tr>
<td>Dual/single rail</td>
<td></td>
</tr>
<tr>
<td>Dual/rail</td>
<td></td>
</tr>
<tr>
<td>Dual/rail</td>
<td></td>
</tr>
<tr>
<td>Dual/rail</td>
<td></td>
</tr>
<tr>
<td>Dual/rail</td>
<td></td>
</tr>
<tr>
<td>Part number</td>
<td>PMBus</td>
</tr>
<tr>
<td>PXE1610C*</td>
<td></td>
</tr>
<tr>
<td>IXS2112</td>
<td></td>
</tr>
<tr>
<td>XDPE10280B*</td>
<td></td>
</tr>
<tr>
<td>XDPE10281B*</td>
<td></td>
</tr>
<tr>
<td>IR35204MTRPBF</td>
<td></td>
</tr>
<tr>
<td>IR35201MTRPBF</td>
<td></td>
</tr>
<tr>
<td>IR35223*</td>
<td></td>
</tr>
<tr>
<td>XDEPE112JGSC*</td>
<td></td>
</tr>
<tr>
<td>Phase configuration</td>
<td>Main</td>
</tr>
<tr>
<td>7 ph</td>
<td></td>
</tr>
<tr>
<td>7 ph</td>
<td></td>
</tr>
<tr>
<td>8 ph</td>
<td></td>
</tr>
<tr>
<td>8 ph</td>
<td></td>
</tr>
<tr>
<td>4 ph</td>
<td></td>
</tr>
<tr>
<td>8 ph</td>
<td></td>
</tr>
<tr>
<td>10 ph</td>
<td></td>
</tr>
<tr>
<td>16 ph</td>
<td></td>
</tr>
<tr>
<td>Subconfigurations</td>
<td>6+1</td>
</tr>
<tr>
<td>6+1</td>
<td></td>
</tr>
<tr>
<td>8+0, 6+2, 4+4</td>
<td></td>
</tr>
<tr>
<td>8+0, 6+2, 4+4</td>
<td></td>
</tr>
<tr>
<td>3+1</td>
<td></td>
</tr>
<tr>
<td>8+0, 7+1, 6+2</td>
<td></td>
</tr>
<tr>
<td>10+0, 5+5</td>
<td></td>
</tr>
<tr>
<td>8+8</td>
<td></td>
</tr>
<tr>
<td>V_{out max}</td>
<td>2.5 V</td>
</tr>
<tr>
<td>3.3 V</td>
<td></td>
</tr>
<tr>
<td>3.04 V</td>
<td></td>
</tr>
<tr>
<td>3.04 V</td>
<td></td>
</tr>
<tr>
<td>3.3 V</td>
<td></td>
</tr>
<tr>
<td>3.3 V</td>
<td></td>
</tr>
<tr>
<td>3.3 V</td>
<td></td>
</tr>
<tr>
<td>Switching frequency</td>
<td>Up to 2 MHz</td>
</tr>
<tr>
<td>Up to 2 MHz</td>
<td></td>
</tr>
<tr>
<td>Up to 2 MHz</td>
<td></td>
</tr>
<tr>
<td>Up to 2 MHz</td>
<td></td>
</tr>
<tr>
<td>Up to 2 MHz</td>
<td></td>
</tr>
<tr>
<td>Up to 2 MHz</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-5°C to 85°C</td>
</tr>
<tr>
<td>-40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>-40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>-40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>-40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>-40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>VQFN package</td>
<td>48-lead (6x6)</td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>48-lead (6x6)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>56-lead (7x7)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>56-lead (7x7)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>40-lead (5x5)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>48-lead (6x6)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>56-lead (7x7)</td>
<td></td>
</tr>
<tr>
<td>0.4 mm pitch</td>
<td></td>
</tr>
<tr>
<td>Typical application</td>
<td>Intel server, high-end desktop</td>
</tr>
<tr>
<td>Intel server, workstation, high-end desktop</td>
<td></td>
</tr>
<tr>
<td>Intel server, workstation, high-end desktop</td>
<td></td>
</tr>
<tr>
<td>AMD server, workstation, high-end desktop</td>
<td></td>
</tr>
<tr>
<td>AMD server, memory and SOC</td>
<td></td>
</tr>
<tr>
<td>AMD server, GPU, ASSP, networking</td>
<td></td>
</tr>
<tr>
<td>AMD server, CPU, Phase redundant based system</td>
<td></td>
</tr>
</tbody>
</table>

### Advantages of a digital controller

The protection features include a set of sophisticated overvoltage, undervoltage, overtemperature, and overcurrent protection. Each of the controllers in the table above also detects and protects against an open circuit on the remote sensing inputs. These attributes provide a complete and advanced protection feature set for microprocessor, DSP, FPGA, or ASIC power systems. Accurate current sense telemetry achieved through internal calibration that measures and corrects current sense offset error sources upon start-up. Programmable temperature compensation provides accurate current sense information even when using DCR current sense.

*For more information on the product, contact our product support*
Typical multiphase application circuit

Digital multiphase controllers

Solutions and Applications

Packages

20-300 V MOSFETs

500-950 V MOSFETs

WBG semiconductors

IGBT discretes and silicon power diodes

Power management ICs

Intelligent power switches and modules

Gate-driver ICs

Microcontrollers

Sensors

Digital isolators

Power management ICs

WBG semiconductors
AC-DC power management ICs
Technology leadership in power supply

By offering a wide variety of highly efficient control ICs we enable our customer to meet new demands like PFC regulations and ultralow standby power requirements in a very cost-effective way. A comprehensive array of safety features helps to minimize the number of external components, reduces design in time and improves the reliability of the SMPS.

**AC-DC power management ICs**

**PFC controller**
- Continuous conduction mode (CCM) PFC
  - Fixed-frequency
    - ICE2PCS02G (65 kHz)
    - ICE2PCS03G (100 kHz)
  - Adjustable frequency
    - ICE2PCS01G (50-250 kHz)
    - ICE3PCS01G (OVP+brown-out)
    - ICE3PCS02G (OVP)
    - ICE3PCS03G (Brown-out)
- Critical conduction mode (CrCM) PFC
  - IRS2505L

**PWM controller**
- Stand-alone PWM
  - Fixed-frequency
    - ICE5GSAG (125 kHz)
    - ICE5ASAG (100 kHz)
    - ICE3A03LJG (100 kHz)
    - ICE3B03LJG (65 kHz)
  - Quasi-resonant
    - ICE5QS8G
    - ICE2QS02G
    - ICE2QS03G
    - XDPS21081
  - Half-bridge and LLC resonant
    - ICE1HS01G-1
    - ICE2HS01G
    - XDPS2201
- Combi (PFC+PWM)
- Fixed-frequency (FF) CoolSET™
  - ICE3GRxx80AG
  - ICE3GRxx80BZS
- Quasi-resonant (QR) CoolSET™
  - ICE2QRxx65(Z)/(G)
  - ICE2QRxx80Z/G
  - ICE5QRxx80BG

For more details on the product, contact our product support

www.infineon.com/acdc

*For more information on the product, contact our product support*
Continuous conduction mode (CCM) PFC ICs

High efficiency and very low system cost

Compared to the first generation of ICE1PCS01/02, the second generation of CCM PFC controller ICs, ICE2PCS01/02, have lower internal reference trimmed at 3 V. They also have other advantages such as wider Vcc operating range, an improved internal oscillator and additional direct bulk capacitor overvoltage protection. Compared to the first and second generation of ICE1PCS0x and ICE2PCS0x, the third generation of CCM PFC has the lowest internal reference trimmed at 2.5 V and integrated digital control voltage loop. The third generation also features low peak current limit at 0.2 V, an adjustable gate switching frequency range from 21 kHz to 100 KHz and is able to synchronize with an external frequency range from 50 kHz to 100 kHz. The third generation is now able to now able to achieve 95 percent efficiency at full load for the entire input voltage range.

Application diagram

2nd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Lowest count of external components
- Adjustable and fixed switching frequencies
- Frequency range from 20 to 250 kHz
- Versions with brown-out protection available
- Wide input range supported
- Enhanced dynamic response during load jumps
- Cycle-by-cycle peak current limiting
- Integrated protections OVP, OCP
- DIP-8 and DSO8
- Lead-free, RoHS compliant

3rd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Integrated digital voltage loop compensation
- Boost follower function
- Bulk voltage monitoring signals, brown-out
- Multi protections such as double OVP
- Fast output dynamic response during load jump
- External synchronization
- Extra-low peak current limitation threshold
- SO8 and SO-14
- Lead-free, RoHS compliant

<table>
<thead>
<tr>
<th>ICE2PCS01G</th>
<th>ICE2PCS02G</th>
<th>ICE3PCS03G</th>
<th>ICE3PCS02G</th>
<th>ICE3PCS01G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital control voltage loop</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Variable frequency</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Synchronous frequency</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Open loop protection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Low peak current limit</td>
<td>-1 V</td>
<td>-1 V</td>
<td>-0.4 V</td>
<td>-0.4 V</td>
</tr>
<tr>
<td>Brown-out protection</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Second overvoltage protection</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PFC enable function</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Boost follower mode</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5 V regulator</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Critical conduction mode (CrCM) PFC
Easy design and lowest system cost

Fully compatible with the world standard, these devices are optimized to offer extremely compact and cost-effective PFC solutions for electronic ballast and off-line SMPS.

Application diagram

IRS2505LPBF
- Critical conduction mode PFC control
- High power factor and ultralow THD
- Wide load and line range
- Regulated and programmable DC bus voltage
- No secondary winding required
- MOSFET cycle-by-cycle overcurrent protection
- DC bus overvoltage protection
- Low EMI gate drive
- Ultralow start-up current
- 20.8 V internal Zener clamp on VCC
- Excellent ESD and latch immunity
- RoHS compliant
- 5-pin SOT-23 package

www.infineon.com/acdc
PFC controller portfolio

Critical conduction mode (CrCM) PFC IC portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>$V_{CC}$ min.</th>
<th>$V_{CC}$ max.</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS2505L</td>
<td>9 V</td>
<td>20.8 V</td>
<td>SOT-23</td>
</tr>
</tbody>
</table>

Continuous conduction mode PFC ICs

2nd generation continuous conduction mode PFC IC product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Frequency – $f_{SW}$</th>
<th>Current drives</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICE2PCS01G</td>
<td>50-250 kHz</td>
<td>2.0 A</td>
<td>DSO8</td>
</tr>
<tr>
<td>ICE2PCS02G</td>
<td>65 kHz</td>
<td>2.0 A</td>
<td></td>
</tr>
<tr>
<td>ICE2PCS03G</td>
<td>100 kHz</td>
<td>2.0 A</td>
<td></td>
</tr>
<tr>
<td>ICE2PCS05G</td>
<td>20-250 kHz</td>
<td>2.0 A</td>
<td></td>
</tr>
</tbody>
</table>

3rd generation continuous conduction mode PFC IC product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Frequency – $f_{SW}$</th>
<th>Current drives</th>
<th>Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICE3PCS01G</td>
<td>Adjustable</td>
<td>0.75 A</td>
<td>OVP+brown-out</td>
<td>SO-14</td>
</tr>
<tr>
<td>ICE3PCS02G</td>
<td></td>
<td>0.75 A</td>
<td>OVP</td>
<td>SO8</td>
</tr>
<tr>
<td>ICE3PCS03G</td>
<td></td>
<td>0.75 A</td>
<td>Brown-out</td>
<td>SO8</td>
</tr>
</tbody>
</table>
5th generation fixed-frequency PWM IC and CoolSET™

- Integrated CoolMOS™ in 700 V, 800 V and 950 V MOSFETs
- Cascade configuration for brown-in protection, fast and robust start-up
- Available in 65 kHz, 100 kHz and 125 kHz fixed switching frequency
- Frequency reduction in tandem with load reduction to increase efficiency

5th generation fixed-frequency CoolSET™

<table>
<thead>
<tr>
<th>Output power</th>
<th>15 W</th>
<th>17 W</th>
<th>23 W</th>
<th>27 W</th>
<th>40 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{DCM\text{max}}$</td>
<td>5.18 Ω</td>
<td>4.05 Ω</td>
<td>3.23 Ω</td>
<td>1.75 Ω</td>
<td>0.80 Ω</td>
</tr>
<tr>
<td>700 V</td>
<td>ICE5AR4770BZS</td>
<td>ICE5AR4770AG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800 V</td>
<td>ICE5AR4780BZS</td>
<td>ICE5AR4780AG</td>
<td>ICE5AR2280CZ</td>
<td>ICE5AR2280BZ</td>
<td>ICE5AR0680BZS</td>
</tr>
<tr>
<td>950 V</td>
<td>ICE5GR4780AG</td>
<td>ICE5GR4780BZ</td>
<td>ICE5GR1680AG</td>
<td>ICE5GR0680AG</td>
<td></td>
</tr>
</tbody>
</table>

3rd generation fixed-frequency CoolSET™

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{DCM\text{max}}$</td>
<td>11.1–5.44 Ω</td>
<td>1.42–2.62 Ω</td>
<td>1.96–1.71 Ω</td>
<td>1.11–1.05 Ω</td>
<td>0.75–0.71 Ω</td>
</tr>
<tr>
<td>650 V</td>
<td>ICE3BR4765JZ</td>
<td>ICE3BR4765JG</td>
<td>ICE3BR1765JZ</td>
<td>ICE3BR1765JG</td>
<td></td>
</tr>
<tr>
<td>800 V</td>
<td>ICE3AR4780JZ</td>
<td>ICE3AR4780VJZ</td>
<td>ICE3AR1580VJZ</td>
<td>ICE3AR1080VJZ</td>
<td>ICE3AR0680JZ</td>
</tr>
<tr>
<td>950 V</td>
<td>ICE3AR4780CJZ</td>
<td>ICE3AR2280CJZ</td>
<td>ICE3AR1280CJZ</td>
<td>ICE3AR2280CJZ</td>
<td>ICE3AR10080CJZ</td>
</tr>
</tbody>
</table>

VCC pin short-to-ground protection
- Selectable active burst mode entry/exit profile to optimize standby power and ability to disable
- Supports CCM flyback operation with built-in slope compensation
- Integrated error amplifier for direct feedback non-isolated flyback and buck
- Adjustable line input overvoltage protection (only ICE5xRxxxxAG and ICE5xRxxxxCZ)

www.infineon.com/coolset

1) Calculated DCM maximum output power in an open-frame design based on $T_i=50\,^\circ C$ and $T_j=125\,^\circ C$ without copper area as heatsink
## Fixed-frequency PWM IC

<table>
<thead>
<tr>
<th>Feature</th>
<th>Gen5</th>
<th>Gen3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FF PWM IC</strong></td>
<td>ICESASAG</td>
<td>ICE5GSAG</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>DSO–8</td>
<td>DSO–8</td>
</tr>
<tr>
<td><strong>Switching frequency</strong></td>
<td>100 kHz</td>
<td>125 kHz</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>-40°C~129°C</td>
<td>-25°C~130°C</td>
</tr>
<tr>
<td><strong>Start-up cell</strong></td>
<td>Cascode</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Vcc on/off threshold</strong></td>
<td>16 V/10 V</td>
<td>18 V/10.5 V</td>
</tr>
<tr>
<td><strong>Soft-start time</strong></td>
<td>12 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td><strong>Frequency jittering</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Modulated gate drive</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Active burst mode</strong></td>
<td>✓ (3-level selectable)</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Slope compensation for CCM</strong></td>
<td>✓</td>
<td>–</td>
</tr>
<tr>
<td><strong>Frequency reduction</strong></td>
<td>✓</td>
<td>–</td>
</tr>
<tr>
<td><strong>Integrated error amplifier for direct feedback</strong></td>
<td>✓ with auto restart</td>
<td>–</td>
</tr>
<tr>
<td><strong>Adjustable line input overvoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>–</td>
</tr>
<tr>
<td><strong>Adjustable brown-in protection</strong></td>
<td>✓ with auto restart</td>
<td>–</td>
</tr>
<tr>
<td><strong>Vcc pin short-to-ground protection</strong></td>
<td>✓ (no start–up)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Vcc undervoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with latch–up</td>
</tr>
<tr>
<td><strong>Vcc overvoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with latch–up</td>
</tr>
<tr>
<td><strong>Overload/open loop protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>Overtemperature protection</strong></td>
<td>✓ with auto restart and hysteresis</td>
<td>✓ with latch–up</td>
</tr>
<tr>
<td><strong>External blanking time extension</strong></td>
<td>–</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>External protection enable pin</strong></td>
<td>–</td>
<td>✓ with latch–up</td>
</tr>
</tbody>
</table>

[www.infineon.com/coolset](http://www.infineon.com/coolset)
## Fixed-frequency CoolSET™

<table>
<thead>
<tr>
<th>Package</th>
<th>Output power range</th>
<th>Operating temperature range</th>
<th>Switching frequency</th>
<th>Frequency reduction</th>
<th>Integrated error amplifier</th>
<th>Slope compensation for CCM mode</th>
<th>VCC on/off threshold</th>
<th>Soft-start time</th>
<th>Active burst mode selection</th>
<th>VCC pin short-to-ground protection</th>
<th>Overtemperature protection</th>
<th>External protection enable pin</th>
<th>Adjustable brown-in/-out protection</th>
<th>Adjustable line input overvoltage protection</th>
<th>Fast AC reset</th>
<th>Product available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen5</td>
<td>DIP-7, DSO-12</td>
<td>-40°C~129°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>16 V/10 V</td>
<td>12 ms</td>
<td>3 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>Brown-in only</td>
<td>–</td>
<td>–</td>
<td>ICE5AR70AG/70BZ, ICE5AR4770AG/4770BZ</td>
</tr>
<tr>
<td>Gen3</td>
<td>DIP-8</td>
<td>-25°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓ (except ICE5ARxx80CZ)</td>
<td>✓</td>
<td>18 V/10.5 V</td>
<td>20 ms</td>
<td>1 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>Auto restart</td>
<td>Only ICE5BRxx95BZ</td>
<td>✓</td>
<td>ICE3A1065ELJ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>1 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3A1065ELJ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>1 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>ICE3A1065ELJ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓ (except ICE5ARxx80CZ)</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>1 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3A1065ELJ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>1 level</td>
<td>–</td>
<td>Auto restart</td>
<td>Latch</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3A1065ELJ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
</tbody>
</table>

## 800 V CoolSET™

<table>
<thead>
<tr>
<th>Package</th>
<th>Output power range</th>
<th>Operating temperature range</th>
<th>Switching frequency</th>
<th>Frequency reduction</th>
<th>Integrated error amplifier</th>
<th>Slope compensation for CCM mode</th>
<th>VCC on/off threshold</th>
<th>Soft-start time</th>
<th>Active burst mode selection</th>
<th>VCC pin short-to-ground protection</th>
<th>Overtemperature protection</th>
<th>External protection enable pin</th>
<th>Adjustable brown-in/-out protection</th>
<th>Adjustable line input overvoltage protection</th>
<th>Fast AC reset</th>
<th>Product available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen3R</td>
<td>DIP-7</td>
<td>-25°C~130°C</td>
<td>100 kHz/65 kHz</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080JZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080CZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080JZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>10 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓ (except ICE5ARxx80BZ)</td>
<td>✓</td>
<td>–</td>
<td>10 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
</tbody>
</table>

## 950 V CoolSET™

<table>
<thead>
<tr>
<th>Package</th>
<th>Output power range</th>
<th>Operating temperature range</th>
<th>Switching frequency</th>
<th>Frequency reduction</th>
<th>Integrated error amplifier</th>
<th>Slope compensation for CCM mode</th>
<th>VCC on/off threshold</th>
<th>Soft-start time</th>
<th>Active burst mode selection</th>
<th>VCC pin short-to-ground protection</th>
<th>Overtemperature protection</th>
<th>External protection enable pin</th>
<th>Adjustable brown-in/-out protection</th>
<th>Adjustable line input overvoltage protection</th>
<th>Fast AC reset</th>
<th>Product available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen3R</td>
<td>DIP-7</td>
<td>-25°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080JZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080CZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen3R</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE3AR10080JZ, ICE3AR0680JZ, ICE3AR4780JZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓ (except ICE5ARxx80BZ)</td>
<td>✓</td>
<td>–</td>
<td>10 ms</td>
<td>4-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DSO-12</td>
<td>-40°C~129°C</td>
<td>65 kHz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>12 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
<tr>
<td>Gen5</td>
<td>DIP-7</td>
<td>-40°C~130°C</td>
<td>100 kHz</td>
<td>✓</td>
<td>✓ (except ICE5ARxx80BZ)</td>
<td>✓</td>
<td>–</td>
<td>10 ms</td>
<td>3-level</td>
<td>–</td>
<td>Auto restart</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>ICE5AR0680BZ, ICE5AR4780BZ, ICE5AR2280BZ</td>
</tr>
</tbody>
</table>

www.infineon.com/coolset
Climate saver systems
Climate saver 80 PLUS® and 80 PLUS® Bronze

80 PLUS® and 80 PLUS® Bronze

<table>
<thead>
<tr>
<th>PFC block</th>
<th>ICE3PCS01G</th>
<th>ICE3PCS02G</th>
<th>ICE3PCS03G</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWM block</td>
<td>ICE2HS01G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standby block</td>
<td>ICE5GR4780AG</td>
<td>ICE5GR2280AG</td>
<td>ICE5GR1680AG</td>
</tr>
<tr>
<td>FF CoolSET™</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Climate saver 80 PLUS® Silver

80 PLUS® Silver

<table>
<thead>
<tr>
<th>PFC block</th>
<th>ICE2PC501G</th>
<th>ICE2PC502G</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWM block</td>
<td>ICE1HS01G-1</td>
<td></td>
</tr>
<tr>
<td>Standby block</td>
<td>ICE5GR4780AG</td>
<td>ICE5GR2280AG</td>
</tr>
<tr>
<td>FF CoolSET™</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/pcpower
www.infineon.com/acdc
www.infineon.com/coolset
Climate saver 80 PLUS® Gold

Certification for Infineon’s PC power reference design

PFC block
- ICE3PCS01G
- ICE3PCS02G
- ICE3PCS03G

PWM block
- ICE2HS01G

Standby block
- FF CoolSET™
  - ICE5GR4780AG
  - ICE5GR2280AG
  - ICE5GR1680AG
  - ICE3AR1080JG
  - ICE5AR0680AG

80 PLUS® Platinum

Certification for Infineon’s PC power reference design

PFC block
- ICE3PCS01G
- ICE3PCS02G
- ICE3PCS03G

PWM block
- ICE2HS01G

Standby block
- QR CoolSET™
  - ICE5QR4780BG
  - ICE5QR2280BG
  - ICE5QR1680BG
  - ICE2QR1080G
  - ICE5QR0680BG

www.infineon.com/pcpower
www.infineon.com/acdc
www.infineon.com/coolset

For more details on the product, click on the part number, visit infineon.com or contact our product support.
5th generation quasi-resonant PWM IC and CoolSET™

- Integrated CoolMOS™ in 800 V MOSFET with cascode configuration
- Digital frequency reduction with reduced load
- Novel quasi-resonant to minimize the spread of switching frequency between low and high line AC input
- Selectable active burst mode entry/exit profile
- Auto restart mode for line overvoltage protection
- Auto restart mode for brown-out protection
- Auto restart mode for Vcc under-/overvoltage protection
- Auto restart mode for open loop and output overload protection
- Auto restart mode for overtemperature protection with hysteresis
- Auto restart mode for output overvoltage
- Limited charging current during Vcc pin short-to-ground protection
- Peak power limitation with input voltage compensation
- Minimum switching frequency limitation (no audible noise on power units on/off)
- DSO package (controller) and DSO-12 (CoolSET™)

5th generation quasi-resonant CoolSET™

<table>
<thead>
<tr>
<th>Output power 1)</th>
<th>85 V~300 V</th>
<th>Ta=50°C</th>
<th>15 W</th>
<th>22 W</th>
<th>27 W</th>
<th>41 W~42 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDS(on),max.</td>
<td>5.18 Ω</td>
<td>2.35 Ω</td>
<td>1.75 Ω</td>
<td>0.80 Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800 V DSO-12</td>
<td>ICE5QR4780BG</td>
<td>ICE5QR2280BG</td>
<td>ICE5QR1680BG</td>
<td>ICE5QR0680BG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2nd generation quasi-resonant CoolSET™

<table>
<thead>
<tr>
<th>Output power 1)</th>
<th>85 V~300 V</th>
<th>Ta=50°C</th>
<th>14 W~15 W</th>
<th>20 W~21 W</th>
<th>23 W~26 W</th>
<th>31 W</th>
<th>38 W~42 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDS(on),max.</td>
<td>5.44 Ω~5.18 Ω</td>
<td>2.62 Ω</td>
<td>1.96 Ω</td>
<td>1.11 Ω</td>
<td>0.75 Ω~0.71 Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650 V DIP-7</td>
<td>ICE2QR4765Z</td>
<td>ICE2QR1765Z</td>
<td>ICE2QR0665Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIP-8</td>
<td>ICE2QR4765</td>
<td>ICE2QR1765</td>
<td>ICE2QR0665</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSO-12</td>
<td>ICE2QR4765G</td>
<td>ICE2QR1765G</td>
<td>ICE2QR0665G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800 V DIP-7</td>
<td>ICE2QR2280Z</td>
<td>ICE2QR0680Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSO-12</td>
<td>ICE2QR4780G</td>
<td>ICE2QR2280G</td>
<td>ICE2QR1080G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/coolset

1) Calculated maximum output power in an open-frame design at Ta=50°C, Tj=125°C and without copper area as heat sink
### Quasi-resonant PWM IC

<table>
<thead>
<tr>
<th>Feature</th>
<th>ICE5QSBG</th>
<th>ICE2Q502G</th>
<th>ICE2Q503G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Package</strong></td>
<td>DSO8</td>
<td>DSO8</td>
<td>DSO8</td>
</tr>
<tr>
<td><strong>Switching scheme</strong></td>
<td>Novel QR with 10 zero crossing counters</td>
<td>QR with 7 zero crossing counters</td>
<td>QR with 7 zero crossing counters</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>-40°C~129°C</td>
<td>-25°C~130°C</td>
<td>-25°C~130°C</td>
</tr>
<tr>
<td><strong>Start-up cell</strong></td>
<td>Cascade</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Vcc on/off</strong></td>
<td>16 V/10 V</td>
<td>12 V/11 V</td>
<td>18 V/10.5 V</td>
</tr>
<tr>
<td><strong>Power saving during standby</strong></td>
<td>✓ active burst mode in QR switching 2-level selectable burst mode entry/exit level</td>
<td>✓ active burst mode 52 kHz</td>
<td>✓ active burst mode 52 kHz</td>
</tr>
<tr>
<td><strong>Digital frequency reduction for high average efficiency</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>OLP blanking time</strong></td>
<td>Fixed</td>
<td>Adjustable</td>
<td>Fixed</td>
</tr>
<tr>
<td><strong>Auto restart timer</strong></td>
<td>Through (V_{cc}) charging/discharging</td>
<td>Setting with external components</td>
<td>Through (V_{cc}) charging/discharging</td>
</tr>
<tr>
<td><strong>Maximum input power limitation</strong></td>
<td>(V_{in}) pin voltage dependent</td>
<td>Adjustable through ZC resistor</td>
<td>Adjustable through ZC resistor</td>
</tr>
<tr>
<td><strong>(V_{cc}) undervoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with latch</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>Adjustable output overvoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with latch</td>
<td>✓ with latch</td>
</tr>
<tr>
<td><strong>Adjustable line input overvoltage protection</strong></td>
<td>✓</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Brown-out feature</strong></td>
<td>✓</td>
<td>✓</td>
<td>–</td>
</tr>
<tr>
<td><strong>(V_{cc}) pin short-to-ground protection</strong></td>
<td>✓</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Target application</strong></td>
<td>Home appliances, set-top-box, AUX SMPS</td>
<td>AUX power supply to (V_{cc}) eg., LCD TV multi/main, audio main, PDP TV multi/address</td>
<td>Self-power supply to (V_{cc}) eg., smart meter, industrial applications</td>
</tr>
</tbody>
</table>

### Quasi-resonant CoolSET™

<table>
<thead>
<tr>
<th>Feature</th>
<th>2nd generation ICE2QRxxxZ/G</th>
<th>2nd generation ICE2QRxxx80G-1</th>
<th>5th generation ICE5QRxx80BG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching scheme</strong></td>
<td>QR with 7 zero crossing counters</td>
<td>Novel QR with 10 zero crossing counters</td>
<td></td>
</tr>
<tr>
<td><strong>Integrated MOSFET</strong></td>
<td>650 V and 800 V</td>
<td>800 V</td>
<td>800 V</td>
</tr>
<tr>
<td><strong>High-voltage start-up cell</strong></td>
<td>✓</td>
<td>Cascade</td>
<td></td>
</tr>
<tr>
<td><strong>Power saving during standby</strong></td>
<td>Active burst mode (f_{sw}) at 52 kHz</td>
<td>2 level selectable active burst mode quasi-resonant</td>
<td></td>
</tr>
<tr>
<td><strong>(V_{cc}) on/off threshold (typ.)</strong></td>
<td>18 V/10.5 V</td>
<td>18 V/9.85 V</td>
<td>16 V/10 V</td>
</tr>
<tr>
<td><strong>Adjustable output overvoltage protection</strong></td>
<td>✓ with latch</td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>(V_{cc}) over/undervoltage protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>Overload/open loop protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>Overtemperature protection</strong></td>
<td>✓ with auto restart</td>
<td>✓ with auto restart</td>
<td>✓ (Auto restart with hysteresis)</td>
</tr>
<tr>
<td><strong>Adjustable line input overvoltage protection</strong></td>
<td>–</td>
<td>–</td>
<td>✓ with auto restart</td>
</tr>
<tr>
<td><strong>Brown-out</strong></td>
<td>–</td>
<td>✓ with auto restart</td>
<td></td>
</tr>
<tr>
<td><strong>(V_{cc}) pin short to ground</strong></td>
<td>–</td>
<td>–</td>
<td>✓ (No start-up)</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>DIP-7</td>
<td>DIP-7</td>
<td>DIP-7</td>
</tr>
<tr>
<td></td>
<td>DIP-8</td>
<td>DSO-12</td>
<td>DSO-12</td>
</tr>
<tr>
<td></td>
<td>DSO-12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/coolset
Resonant LLC half-bridge controller ICs

Best-in-class converters and controllers to support LLC HB resonant mode topology

Resonant mode power supplies are a variation over SMPS circuits where the switching losses are significantly reduced by adapting zero-voltage or zero-current switching techniques, also known as soft-switching techniques. In non-resonant mode SMPS circuits, the switches are subjected to hard switching. LLC HB resonant operates in ZVS mode, whereby switching loss is reduced to operate the converter at a higher switching frequency. In addition, the converter can be further optimized at a high input voltage. This topology allows to eliminate the secondary filter inductor, adopt better rectifier diodes and reduce secondary conduction loss. The converter utilizes the leakage and magnetizing inductance of a transformer. With the magnetic integration concept, all the magnetic components can be built in one magnetic core.

LLC resonant (no SR)

Application diagram – LLC resonant (no SR)

› Novel and simple design (12 components + HB driver)
› Minimum operating frequency is adjustable externally
› Burst mode operation for output voltage regulation during no load and/or bus overvoltage
› Multiple protections in case of fault
› Input voltage sense for brown-out protection
› Open loop/overload fault detection by FB pin with auto restart and adjustable blanking/restart time
› Frequency shift for overcurrent protection
› Lead-free, RoHS compliant package
› DSO8 package

Resonant LLC half-bridge controller IC with integrated synchronized rectifier control

› Novel LLC/SR operation mode and controlled by primary-side controller
› Multiple protections for SR operation
› Tight tolerance control
› Accurate setting of switching frequency and dead time
› Simple system design
› Optimized system efficiency
› Multiple converter protections: OTP, OLP, OCP, latch-off enable
› External disable for either SR switching or HB switching
› Lead-free, RoHS compliant package
› DSO-20 package

www.infineon.com/acdc
### Product Frequencies – fSW

<table>
<thead>
<tr>
<th>LLC half-bridge controller IC</th>
<th>ICE1HS01G-1</th>
<th>ICE2HS01G</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>DSO8</td>
<td>DSO-20</td>
<td></td>
</tr>
<tr>
<td>Switching frequency range</td>
<td>up to 600 kHz</td>
<td>up to 1 MHz</td>
<td></td>
</tr>
<tr>
<td>LLC soft-start</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>LLC burst mode</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Adjustable minimum frequency</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Overload/open loop protection</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Mains undervoltage protection with hysteresis</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Overcurrent protection</td>
<td>2-level</td>
<td>3-level</td>
<td></td>
</tr>
<tr>
<td>Drive signal for synchronous rectification</td>
<td>–</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Adjustable dead time</td>
<td>–</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>External latch-off and OTP</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Target application</td>
<td>LCD-TV, audio, etc.</td>
<td>Server, PC, LCD-TV, etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICE1HS01G-1</th>
<th>ICE2HS01G</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLC resonant (no SR)</td>
<td>LLC resonant half-bridge controller IC with integrated synchronized rectifier control (LLC resonant + SR)</td>
</tr>
<tr>
<td>30 kHz–600 kHz</td>
<td>30 kHz–1 MHz</td>
</tr>
<tr>
<td>380 ns</td>
<td>100 ns–1000 ns</td>
</tr>
<tr>
<td>1.5 A</td>
<td>0.3 A</td>
</tr>
<tr>
<td>DSO8</td>
<td>DSO-20</td>
</tr>
</tbody>
</table>

www.infineon.com/coolset
NAC1080 – NFC smart actuation controller

The NAC1080* is an NFC actuation controller with integrated half-bridge and energy harvesting modules, enabling cost effective development of passive smart actuators like passive locks. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC frontend, motor driver, and energy harvesting function enables customers to develop smart actuation devices with minimum system BOM requirement.

The flexible IC architecture and the smart partitioning between hardware and software enable customers to maximize software-defined functions. Furthermore, the NAC1080 includes hardware security functions such as a secure area in flash, a 128 bit AES accelerator, and a true random generator. A separate secure element can be connected via the digital interface on demand.

Users can program this NAC1080 with the industry-wide standard solutions for Cortex®-M0 processors. Especially for the smart lock application, SDK packages for firmware and mobile application development in both Android and iOS systems are available to support a fast development cycle.

Applications
› Passive/active NFC lock
› Emergency power source for battery devices
› NFC configuration of electronic devices

Features and benefits

Key features
› NFC interface compliant to ISO 14443 type A
› Arm® 32 bit Cortex®-M0 microcontroller core
› Dual-operation mode: passive or battery mode
› 60 kB NVM, 16 kB RAM, 16 kB boot ROM
› Integrated H-bridge
› Energy harvesting output
› 128-bit AES accelerator, true random number generator

Key benefits
› A single-chip solution to build batteryless NFC actuators, like passive lock
› Batteryless IoT devices without battery exchange efforts and costs
› Intuitive connection via smartphone to enable cloud-based business models
› Minimum system BOM for easy and cost effective implementation

www.infineon.com/cps

*Coming soon
NGC1081 – NFC smart sensing controller

The NGC1081* is an NFC sensing controller with an integrated temperature sensor and ADC/DAC sensing unit in addition to the features provided by NAC1080. The low-power Arm® Cortex®-M0 based microcontroller with integrated NFC connectivity, sensing unit, and energy harvesting function in one device enables customers to develop miniaturized smart edge computing/sensing devices with minimum system BOM requirement.

NGC1081 works in both passive mode and battery mode. In passive mode, it can communicate with a mobile phone wirelessly while at the same time harvesting energy from the NFC field to power the whole sensing system including the IC and its connected sensors. Working in battery mode, it simplifies the implementation of many sensing applications like temperature, humidity, and vibration tracking devices. With the smartphone as the human interaction interface, the system functions are widely extended to cloud functionalities, such as uploading data and data analysis on the cloud.

NGC1081 has a 12-bit SAR ADC and a 10-bit DAC. It provides one analog output (DAC) and four analog inputs (ADC). The ADC has three sample and hold stages, which allow parallel signal sampling. A temperature sensor is integrated as well. Users can program the NGC1081 with the industry-wide standard solutions for Cortex®-M0 processors.

Applications
› Passive sensor device, inlay
› Medical, healthcare sensor patch
› Data logger, temperature logger
› Radiator thermostat
› Galvanic isolated sensor front end

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC interface compliant to ISO 14443 type A</td>
</tr>
<tr>
<td>Arm® 32-bit Cortex®-M0 microcontroller core</td>
</tr>
<tr>
<td>Dual-operation mode: passive or battery mode</td>
</tr>
<tr>
<td>60 kB NVM, 16 kB RAM, 16 kB boot ROM</td>
</tr>
<tr>
<td>12-bit SAR ADC, 10-bit DAC</td>
</tr>
<tr>
<td>Integrated temperature sensor</td>
</tr>
<tr>
<td>Integrated H-bridge</td>
</tr>
<tr>
<td>Energy harvesting output</td>
</tr>
<tr>
<td>128-bit AES accelerator, true random number generator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A single-chip solution to build a batteryless smart sensor for miniaturized design with low BOM cost</td>
</tr>
<tr>
<td>Multiple power supply options for sensors: GPIO for low current or energy harvesting output for high current</td>
</tr>
<tr>
<td>Natural galvanic isolated sensing interface for applications with direct human body contact</td>
</tr>
<tr>
<td>Intuitive connection via smartphone to enable cloud-based business models</td>
</tr>
</tbody>
</table>

www.infineon.com/cps

*Coming soon
As the innovation leader for power semiconductor and energy efficiency technologies, we are continually developing and working on the best solutions for your applications. Our DC-DC converter portfolio includes integrated power stages, switching regulators, integrated POL converters and integrated POL voltage regulators, as well as digital multiphase controllers and digital power controllers (see XDPP1100 digital power controller family).
OptiMOS™ powerstage
60 A and 70 A integrated power stages with integrated current and temperature telemetry

Infineon’s integrated OptiMOS™ power stage family contains a synchronous buck gate driver IC which is co-packed with control and synchronous MOSFETs and a Schottky diode to further improve efficiency. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU, ASIC, and DDR memory designs. The TDA21472 integrated power stages internal MOSFET current sense algorithm, with integrated temperature compensation, achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Up to 1.0 MHz switching frequency enables high performance transient response, allowing miniaturization of output inductors, as well as input and output capacitors while maintaining industry-leading efficiency. The TDA21472 is optimized for CPU core power delivery in server applications. The ability to meet the stringent requirements of the server market also makes the TDA21472 ideally suited for powering GPU, ASIC, DDR memory, and other high current designs.

Features
› Integrated driver, Schottky diode, control MOSFET and synchronous MOSFET
› 5 mV/A on-chip MOSFET current sensing with temperature compensated reporting
› Input voltage (Vin) range of 4.5 to 15 V
› Vcc and VDR V supply of 4.5 to 7 V
› Output voltage range from 0.25 up to 5.5 V
› Output current capability of 70 A
› Operation up to 1.0 MHz
› Vcc undervoltage lockout (UVLO)
› 8 mV/°C temperature analog output and thermal flag pull-up to 3.3 V
› Overtemperature protection (OTP)
› Cycle-by-cycle self-preservation overcurrent protection (OCP)
› MOSFET phase fault detection and flag
› Preliminary overvoltage protection (pre-OVP)
› Compatible with 3.3 V tri-state PWM input
› Body-Braking™ load transient support through PWM tri-state
› Diode emulation mode (DEM) for improved light-load efficiency
› Efficient dual-sided cooling
› Small 5.0 x 6.0 x 0.9 mm PQFN package

Applications
› High-frequency, high-current, low-profile DC-DC converters
› Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

<table>
<thead>
<tr>
<th>Part type</th>
<th>Package</th>
<th>Iout [A]</th>
<th>Vin [V]</th>
<th>Vout [V]</th>
<th>Switching frequency [MHz]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA21472</td>
<td>5x6 x 0.9 mm PQFN</td>
<td>70</td>
<td>4.5 to 15</td>
<td>0.25 to 5.5</td>
<td>1.0</td>
</tr>
<tr>
<td>TDA21462*</td>
<td>5x6 x 0.9 mm PQFN</td>
<td>60</td>
<td>4.5 to 15</td>
<td>0.25 to 5.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

www.infineon.com/integrated-powerstages
*For more information on the product, contact our product support
OptiMOS™ power stage
70 A power stage with exposed top for improved thermal performance

Infineon’s TDA21475 exposed-top power stage contains a low quiescent-current synchronous buck gate driver IC co-packaged with high-side and low-side MOSFETs. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The gate driver and MOSFET combination enables higher efficiency at the lower output voltages required by cutting-edge CPU, GPU, and DDR memory designs. The TDA21475 internal MOSFET current sense algorithm with temperature compensation achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Protection includes cycle-by-cycle overcurrent protection with programmable threshold, \( V_{CC}/V_{DS} \) \( \text{UVLO} \) protection, bootstrap capacitor undervoltage protection, phase fault detection, IC temperature reporting, and thermal shutdown. The TDA21475 also features auto replenishment of the bootstrap capacitor to prevent over-discharge. The TDA21475 features a deep-sleep power-saving mode, which greatly reduces the power consumption when the multiphase system enters PS3/PS4 mode. Operation at switching frequency as high as 1.5 MHz enables high performance transient response, allowing reduction of output inductance and output capacitance while maintaining industry-leading efficiency. The TDA21475 is optimized for CPU core power delivery in server applications. The ability to meet the stringent requirements of the server market also makes the TDA21475 ideally suited for powering GPU and DDR memory designs.

Features
- Co-packaged driver, high-side and low-side MOSFETs
- 5 m\( \text{A} \)/A on-chip MOSFET current sensing with temperature compensated reporting input voltage \( V_{in} \) range of 4.25 to 16 V
- \( V_{CC} \) and \( V_{DS} \) supply of 4.25 to 5.5 V
- Output voltage range from 0.25 up to 5.5 V output current capability of 70 A operation up to 1.5 MHz
- \( V_{CC}/V_{DS} \) \( \text{UVLO} \) bootstrap capacitor undervoltage protection 8 m\( \text{V}/^\circ \text{C} \) temperature analog output
- Thermal shutdown and fault flag
- Cycle-by-cycle overcurrent protection with programmable threshold and fault flag MOSFET phase fault detection and flag
- Auto replenishment of bootstrap capacitor
- Deep-sleep mode for power saving
- Compatible with 3.3 V tri-state PWM input Body-Braking™ load transient support Small 5x6 x 0.65 mm PQFN package
- Lead-free RoHS compliant package
- Integrated driver, Schottky diode, control MOSFET and synchronous MOSFET

Applications
- High-frequency, high-current, low-profile DC-DC converters
- Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

<table>
<thead>
<tr>
<th>Part type</th>
<th>Package</th>
<th>( I_{out} ) [A]</th>
<th>( V_{in} ) [V]</th>
<th>( V_{DS} ) [V]</th>
<th>Switching frequency [MHz]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA21475</td>
<td>5x6 x 0.9 mm PQFN</td>
<td>70</td>
<td>4.25 to 16</td>
<td>0.25 to 5.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

www.infineon.com/integrated-powerstages
OptiMOS™ power stage
20 A power stage with integrated current sense

Infineon’s IR35401 integrated power stage contains a synchronous buck gate driver IC, which is co-packaged with control and synchronous MOSFETs and a Schottky diode to further improve efficiency. The package is optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing when layout guidelines are followed. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU, and DDR memory designs. The IR35401 power stage features an integrated current sense amplifier to achieve superior current sense accuracy against best-in-class controller-based inductor DCR sense methods while delivering the clean and accurate current report information. The protection features inside IR35401 include $V_{CC}$ UVLO and thermal flag. IR35401 also features an auto replenishment of the bootstrap capacitor to prevent the bootstrap capacitor from overdischarging. The IR35401 supports deep-sleep mode and consumes $<100 \mu A$ $V_{CC}$ bias current when the EN pin is pulled low. Up to 1.5 MHz switching frequency enables high-performance transient response, allowing miniaturization of output inductors, as well as input and output capacitors while maintaining industry-leading efficiency. When combined with Infineon’s digital controllers, the IR35401 incorporates the Body-Braking™ feature through PWM tri-state which enables reduction of output capacitors. The IR35401 is optimized for low current CPU rails in server applications. The ability to meet the stringent requirements of the server market also makes the IR35401 ideally suited for powering GPU and DDR memory rails.

Features
- Integrated driver, control MOSFET and synchronous MOSFET
- Integrated bootstrap synchronous PFET
- Inductor DCR current sensing with temperature compensation
- Input voltage ($V_{IN}$) range from 4.25 to 16 V
- $V_{CC}$ supply of 4.25 to 5.5 V
- Output voltage range from 0.5 to 3 V or up to 5.5 V if the internal current sense amplifier is not used
- Local lossless inductor current sensing with improved noise immunity and accuracy
- Single reference based current reporting output
- Output current capability of 20 A
- Operation up to 1.5 MHz
- $V_{CC}$ undervoltage lockout
- Overtemperature and $V_{CC}$ UVLO fault communication to controller via TOUT pin
- Compatible with 3.3 V tri-state PWM input
- Body-Braking™ load transient support through PWM tri-state
- Auto replenishment on BOOST pin
- Low operating quiescent current and $<100 \mu A$ when disabled
- Small 4 x 5 x 0.9 mm PQFN package
- Lead-free RoHS compliant package

Applications
- General purpose POL DC-DC converters
- Voltage regulators for CPUs, GPUs, ASICs, and DDR memory arrays

<table>
<thead>
<tr>
<th>Part type</th>
<th>Package</th>
<th>$I_{IN}$ [A]</th>
<th>$V_{IN}$ [V]</th>
<th>$V_{CC}$ [V]</th>
<th>$V_{MAX}$ [V]</th>
<th>Switching frequency [MHz]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR35401</td>
<td>4 x 5 x 0.9 mm PQFN</td>
<td>20</td>
<td>4.25 to 16</td>
<td>0.5 to 5.5</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/integrated-powerstages
OptiMOS™ power stage
25 A, 35 A, 40 A integrated power stages with highest efficiency on smallest form factor

Infineon’s TDA21240 power stage is a multi-chip module that incorporates Infineon’s premier MOSFET technology for a single high-side and a single low-side MOSFET coupled with a robust, high-performance, high switching frequency gate driver in a single PG-IQFN-30-2 package. The optimized gate timing allows for significant light-load efficiency improvements over discrete solutions. When combined with Infineon’s family of digital multiphase controllers, the TDA21240 forms a complete core voltage regulator solution for advanced micro and graphics processors as well as point-of-load applications.

Features
› For synchronous buck converter step down voltage applications
› Maximum average current of 40 A
› Input voltage range +4.5 V to +16 V
› Power MOSFETs rated 25 V
› Fast switching technology for improved performance at high switching frequencies (> 500 kHz)
› Remote driver disable function
› Includes bootstrap diode
› Undervoltage lockout
› Shoot through protection
› +5 V high-side and low-side MOSFETs driving voltage
› Compatible to standard +3.3 V PWM controller integrated circuits
› Tri-state PWM input functionality
› Small package: PG-IQFN-30-2 (4 x 4 x 1 mm)
› RoHS compliant
› Thermal warning

Applications
› Desktop and server VR buck converter
› Single-phase and multiphase POL
› CPU/GPU regulation in notebook, desktop graphics cards, DDR memory, graphic memory
› High power density voltage regulator modules (VRM)
› Qualified for DC-DC industrial applications based on JEDEC (JESD47, JESD22, J-STD20)
› General purpose POL DC-DC converters

<table>
<thead>
<tr>
<th>Part type</th>
<th>Package</th>
<th>I_{out} [A]</th>
<th>V_{in} [V]</th>
<th>Switching frequency [MHz]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA21242</td>
<td>4 x 4 x 1 mm PQFN</td>
<td>25</td>
<td>4.5 to 16</td>
<td>1.0</td>
</tr>
<tr>
<td>TDA21241</td>
<td>4 x 4 x 1 mm PQFN</td>
<td>35</td>
<td>4.5 to 16</td>
<td>1.0</td>
</tr>
<tr>
<td>TDA21240</td>
<td>4 x 4 x 1 mm PQFN</td>
<td>40</td>
<td>4.5 to 16</td>
<td>1.0</td>
</tr>
</tbody>
</table>

www.infineon.com/integrated-powerstages
Integrated POL voltage regulators

Highest density high efficiency integrated POL (IPOL) for smart enterprise systems

Infineon’s integrated POL switching converters deliver benchmark efficiency and dramatically reduce system size. Solutions up to 35 A are available in compact PQFN packages. Target applications include server, storage, routers and switches, telecom base stations, digital home media, mobile computing and embedded data processing. Solutions with and without PMBus digital communication are available in single output and multi-rail format.

Point-of-load products – how to choose

<table>
<thead>
<tr>
<th>DC-DC products</th>
<th>1 to 35 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMBus digital IPOL</td>
<td></td>
</tr>
<tr>
<td>IPOL with digital interface</td>
<td></td>
</tr>
</tbody>
</table>

• Telemetry
• Margining
• Intel SVID support
• Parallel VID
• IR3806x: 6-35 A with PMBus
• IR3816x: 15 A, 30 A with PMBus and Intel SVID
• IR38263: 30 A with PVID and PMBus

Digital mode: I2C/PMBus interface

PMBus IC capabilities

- Inventory: Device ID
- Configuration: On/off configuration, fault/warnings
- Control: Sequencing delay/ramp fault response
- Telemetry: V_{in}, I_{out}, power temperature, peak values
- Status: Comms, data, temps

Differential remote sense for optimum output accuracy

Ready-to-go reference designs and the on-line PowerDesk simulator simplify the task of designing regulated voltage rails. Different control topologies are available to meet an application’s specific requirements.

www.infineon.com/ipol
www.infineon.com/analog-ipol

*Coming soon
Integrated point-of-load converters IR3806x series (6 A/15 A/25 A/35 A)

Digital interface IPOL voltage regulators

The digital interface IPOL devices are easy-to-use, fully integrated and highly efficient DC-DC regulator offering 12C/PMBus, parallel VID, Intel SVID. The on-board PWM controller and MOSFETs make the family a space-efficient solution, providing accurate power delivery for low output voltage and high current applications.

The IR3806x family of PMBus enabled IR MOSFET™ IPOL based IR MOSFET™ IPOL voltage regulators offers:

- Compactness of integrated controller, driver and MOSFETs
- High-performance analog voltage mode engine
- Flexibility of a rich PMBus interface

The IR381(2/3)6x family features OptiMOS™ 5 for the highest efficiency and adds Intel SVID support (IR381(3)6x) for Intel based systems or parallel VID (IR3826x) for voltage scaling or 8 programmable output voltages booting options to avoid programming at start up. Pin compatible options with and without PMBus are available to allow the flexibility of using PMBus only during evaluation or easily upgrade a system to PMBus without re-layout.

Features and benefits

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMBus revision 1.2 compliant</td>
<td>Only single-chip solution with extensive PMBus, parallel VID, Intel SVID support allows 50 percent space saving versus external power competition</td>
</tr>
<tr>
<td>≥ 66 PMBus commands</td>
<td>Intel SVID support for Intel-based systems</td>
</tr>
<tr>
<td>Wide input voltage range and single 5 V – 16 V input operations</td>
<td>Parallel VID or PMBus for voltage setting and margining</td>
</tr>
<tr>
<td>Differential remote sense</td>
<td>Telemetry status via digital bus</td>
</tr>
<tr>
<td>Ultralow jitter voltage mode engine</td>
<td>Remote monitoring and update</td>
</tr>
<tr>
<td>Operation temp: -40° to 125°C</td>
<td>Parameter changes by register</td>
</tr>
<tr>
<td></td>
<td>Flexible sequencing</td>
</tr>
<tr>
<td></td>
<td>High accuracy low ripple</td>
</tr>
<tr>
<td></td>
<td>Integrated sequencing, margin, current and voltage monitoring</td>
</tr>
</tbody>
</table>

Digital interface IPOL

<table>
<thead>
<tr>
<th>Part number</th>
<th>Max. current [A]</th>
<th>Package size [mm]</th>
<th>Max. Vin</th>
<th>Max. fsw</th>
<th>Distinctive features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR38064MTRPBF</td>
<td>35</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 kHz</td>
<td>PMBus</td>
</tr>
<tr>
<td>IR38063M</td>
<td>25</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 kHz</td>
<td></td>
</tr>
<tr>
<td>IR38062M</td>
<td>15</td>
<td>5 x 7</td>
<td>21 V</td>
<td>1500 kHz</td>
<td></td>
</tr>
<tr>
<td>IR38060M</td>
<td>6</td>
<td>5 x 6</td>
<td>16 V</td>
<td>1500 kHz</td>
<td></td>
</tr>
<tr>
<td>IR38163M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID</td>
</tr>
<tr>
<td>IR38165M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus</td>
</tr>
<tr>
<td>IR38363M</td>
<td>15</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus</td>
</tr>
<tr>
<td>IR38365M</td>
<td>15</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus</td>
</tr>
<tr>
<td>IR38263M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus</td>
</tr>
<tr>
<td>IR38265M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus</td>
</tr>
<tr>
<td>IR38164M</td>
<td>30</td>
<td>5 x 7</td>
<td>16 V</td>
<td>1500 kHz</td>
<td>OptiMOS™ 5, SVID++PMBus, enhanced lmon</td>
</tr>
<tr>
<td>IRPS5401M</td>
<td>4 x 4 x 2 x 2 x 0.5</td>
<td>7 x 7</td>
<td>14 V</td>
<td>1500 kHz</td>
<td>5 output PMIC, PMBus</td>
</tr>
</tbody>
</table>

www.infineon.com/ipol
OptiMOS™ IPOL voltage regulators with COT

OptiMOS™ IR3883MTRPBF, IR3887MTRPBF*, IR3889MTRPBF, and IR3888MTRPBF integrated point-of-load DC-DC devices are easy-to-use, fully integrated and highly efficient DC-DC regulators that operate from a wide input voltage range and provide up to 30 A continuous current. The devices increase efficiency and power density and simplify design for POL applications in server, enterprise storage, netcom router and switches, datacom and telecom base stations.

Block diagram IR3883M

Block diagram IR3887M (30 A)

Main benefits

- Compensation free and stable with all ceramic caps
- Scalable solution from 3 A up to 40 A
- For designs requiring high density, low cost and easy design, the family includes a 3 A device with enhanced stability constant-on-time (COT) engine that does not require external compensation enabling easy designs and fast time to market.
- Quiescent current down to 5 µA
- Overload, overtemperature, short circuit and reverse-polarity protection
- Low current consumption
- Extended temperature range -40°C ... +125°C

Analog interface IPOL

<table>
<thead>
<tr>
<th>Part number</th>
<th>Max. current [A]</th>
<th>Package size [mm]</th>
<th>Max. $V_{in}$</th>
<th>Max. $f_{sw}$</th>
<th>Distinctive features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR3883MTRPBF</td>
<td>3</td>
<td>3 x 3</td>
<td>14 V</td>
<td>800 kHz</td>
<td>Constant-on-time (COT)</td>
</tr>
<tr>
<td>IR3822AMTRPBF</td>
<td>3</td>
<td>3.5 x 3.5</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3899AMTRPBF</td>
<td>9</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>TDA38820</td>
<td>20</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3888MTRPBF</td>
<td>25</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3447AMTRPBF</td>
<td>25</td>
<td>5 x 6</td>
<td>17 V</td>
<td>600 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3887MTRPBF</td>
<td>30</td>
<td>4 x 5</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3889MTRPBF</td>
<td>30</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>TDA38840</td>
<td>40</td>
<td>5 x 6</td>
<td>17 V</td>
<td>2000 kHz</td>
<td></td>
</tr>
<tr>
<td>IR3846AMTRPBF</td>
<td>40</td>
<td>5 x 7</td>
<td>17 V</td>
<td>600 kHz</td>
<td></td>
</tr>
</tbody>
</table>

*Coming soon

www.infineon.com/ipol
OPTIREG™ switcher power supply ICs
High-efficiency solutions for harsh environments

Infineon offers optimized DC-DC converters that are designed specifically for harsh automotive environments. Wide input voltage range, optimized feature set, and extended qualification make our DC-DC converters perfectly suitable for multiple applications. Our DC-DC portfolio contains various products that operate in step-down (buck), step-up (boost), or a combination of those (buck-boost/sepic). High integration, efficiency, and flexibility are the main benefits of our products.

Features and benefits

Key features

- Input voltage up to 60 V
- Output currents going from 500 mA up to 10 A
- Switching frequencies ranging from 100 kHz to 2.2 MHz
- Shutdown quiescent current down to below 2 µA
- Current limitation and overtemperature protection
- Enable feature

Key benefits

- High-efficiency regulation
- Only a few external components needed for stable regulation
- Perfectly suited for regulation in pre-/post-regulation power supply architectures

OPTIREG™ switcher

<table>
<thead>
<tr>
<th>Product name</th>
<th>Input voltage (V)</th>
<th>Output current (mA)</th>
<th>Quiescent current (mA)</th>
<th>Output voltage (V)</th>
<th>Switching frequency (PWM) (kHz)</th>
<th>Enable</th>
<th>Pinout</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE6355</td>
<td>8.00 ... 40.00</td>
<td>400</td>
<td>1500</td>
<td>5.00</td>
<td>2</td>
<td></td>
<td></td>
<td>DSO-8</td>
</tr>
<tr>
<td>TLE6366</td>
<td>4.75 ... 45.00</td>
<td>1800</td>
<td>7000</td>
<td>Adj. 3.30, 5.00</td>
<td>2(4)</td>
<td>200 .530</td>
<td></td>
<td>DSO-8 EP</td>
</tr>
<tr>
<td>TLS4120D0</td>
<td>3.70 ... 36.00</td>
<td>2000</td>
<td>0.032</td>
<td>Adj. 3.30, 5.00</td>
<td>2</td>
<td>380 .2800</td>
<td></td>
<td>TSSO14 EP</td>
</tr>
<tr>
<td>TLS4125D0</td>
<td>3.70 ... 36.00</td>
<td>2500</td>
<td>0.032</td>
<td>Adj. 3.30, 5.00</td>
<td>2</td>
<td>380 .2800</td>
<td></td>
<td>TSSO14 EP</td>
</tr>
<tr>
<td>TLF52281</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
<tr>
<td>TLF52251</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
<tr>
<td>TLF52241</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
<tr>
<td>TLF52211</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
<tr>
<td>TLF52011</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
<tr>
<td>TLF52021</td>
<td>4.75 ... 45.00</td>
<td>500</td>
<td>0.045</td>
<td>5.00</td>
<td>2</td>
<td>800 .2200</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
</tbody>
</table>

Buck controller (external MOSFET)

<table>
<thead>
<tr>
<th>Product name</th>
<th>Input voltage (V)</th>
<th>Output current (mA)</th>
<th>Quiescent current (mA)</th>
<th>Output voltage (V)</th>
<th>Switching frequency (PWM) (kHz)</th>
<th>Enable</th>
<th>Pinout</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE8389-20V</td>
<td>5.00 ... 60.00</td>
<td>2300</td>
<td>0.120</td>
<td>Adj.</td>
<td>3</td>
<td>250 ... 530</td>
<td></td>
<td>DSO-14</td>
</tr>
<tr>
<td>TLE8389-20VG</td>
<td>5.00 ... 60.00</td>
<td>2300</td>
<td>0.120</td>
<td>5.00</td>
<td>3</td>
<td>250 ... 530</td>
<td></td>
<td>DSO-14</td>
</tr>
<tr>
<td>TLE8389-30VG</td>
<td>5.00 ... 60.00</td>
<td>2300</td>
<td>0.120</td>
<td>5.00</td>
<td>3</td>
<td>250 ... 530</td>
<td></td>
<td>DSO-14</td>
</tr>
<tr>
<td>TLF51801</td>
<td>4.75 ... 45.00</td>
<td>Adj. max. 10,000 &lt; 2.000 µA</td>
<td>1.20 ... 0.60 V&lt;sub&gt;in&lt;/sub&gt;</td>
<td>Adj. (max. 9 times of V&lt;sub&gt;in&lt;/sub&gt;)</td>
<td>2</td>
<td>100 ... 700</td>
<td>SSOP-14 EP</td>
<td></td>
</tr>
</tbody>
</table>

Boost controller

<table>
<thead>
<tr>
<th>Product name</th>
<th>Input voltage (V)</th>
<th>Output current (mA)</th>
<th>Quiescent current (mA)</th>
<th>Output voltage (V)</th>
<th>Switching frequency (PWM) (kHz)</th>
<th>Enable</th>
<th>Pinout</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE8386-2B</td>
<td>4.75 ... 45.00</td>
<td>dep. on V&lt;sub&gt;in&lt;/sub&gt;</td>
<td>7000</td>
<td>Adj. max. 9 times of V&lt;sub&gt;in&lt;/sub&gt;</td>
<td>4</td>
<td>100 ... 500</td>
<td></td>
<td>SSOP-14 EP</td>
</tr>
</tbody>
</table>

www.infineon.com/optireg-switcher

1) Different voltage reset hysteresis
2) LS-sense-booster

For more details on the product, click on the part number, visit infineon.com or contact our product support.
OPTIREG™ linear voltage regulators

Energy-efficient voltage regulators and trackers

Our linear voltage regulators and trackers help to reduce energy consumption, extending operating time and minimizing operating costs across all kinds of systems. The wide supply voltage range, low quiescent current, rich protective feature set and choice of packages make our devices the perfect fit across a broad application spectrum, apart from automation systems as well for heath care, traffic, power tools, lighting and many other multi-market systems. Our trackers are ideal as additional supplies for off-board loads to increase system reliability.

OPTIREG™ linear voltage regulators (selection tree)

Features and benefits

Key features

- Input voltage up to 60 V
- Output current up to 1.5 A
- Output voltage adjustable or fixed to specific values
- Quiescent current down to 5 µA
- Overload, overtemperature, short circuit and reverse-polarity protection
- Low current consumption
- Extended temperature range -40°C ... +125°C

Key benefits

- Pin-to-pin compatibility with industry-standard parts
- Very low dropout voltage trackers for optimized heat distribution and external protection
- Trackers for maximum system cost reduction
- Small robust packages

Infineon’s microcontroller families and industrial voltage regulators

<table>
<thead>
<tr>
<th>Microcontroller family</th>
<th>Input voltage [V]</th>
<th>Input current (max.) [mA]</th>
<th>Voltage regulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMC1000 family</td>
<td>1.8 to 5.5</td>
<td>&lt;100</td>
<td>TLS810B1EJ, TLS810A1LD, TLE4266-2G, TLS820D3EL</td>
</tr>
<tr>
<td>XMC4000 family</td>
<td>3.3</td>
<td>&lt;500/300</td>
<td>TLF80511x, TLE42764D, TLE4762EL, TLS850FXTA</td>
</tr>
<tr>
<td>XC8xx</td>
<td>3.3 to 5.0</td>
<td>200</td>
<td>TLS810A1LD, TLS810B1EJ, TLE42764D, TLE4296-2G</td>
</tr>
<tr>
<td>XE166/XC2000</td>
<td>1.5 and 3.3 or 5.0</td>
<td>100</td>
<td>TLS810A1LD, TLS810B1EJ, TLE42764D, TLE4296-2G</td>
</tr>
<tr>
<td>TriCore™</td>
<td>1.5 to 3.3</td>
<td>&gt;400</td>
<td>TLF80511TF/EJ/TC, TLE42764D, TLS850FXTA</td>
</tr>
</tbody>
</table>

www.infineon.com/optireg-linear
XDPP1100
The smallest digital power controller with PMBus interface

The XDPP1100 is Infineon’s highly integrated and programmable digital power supply controller. This device offers advanced power control solution for 48 V DC-DC power applications with isolated topologies. The XDPP1100 device features many optimized power-processing blocks and pre-programmed peripherals to enhance the performance of isolated DC-DC converters, reduce external components and minimize firmware development effort. The controller also provides an accurate telemetry and power management bus (PMBus 1.3) interface for system communication, advance power conversion and monitoring. Integrated current sensing capability and compact chip size (24-pin 4 mm²) can greatly reduce the solution size by eliminating various external components. A combination of high-performance AFE, state machine based digital control loop and an Arm® Cortex® M0 integrated in a single chip makes the XDPP1100 a highly integrated, fully programmable and fastest time-to-market technology for modern high-end power systems, employed in telecom infrastructure, 48 V server motherboards, datacenter and industrial 4.0 applications.

The XDPP1100 device can be configured to support different DC-DC topologies including:
› Hard-switched full-bridge and half-bridge
› Phase shifted full-bridge
› Active clamp forward
› Interleaved FB, HB and ACF
› Current-doubler
› Pre-buck or post-buck configuration

Infineon offers support tools such as a complementary graphical user interface (GUI) that allows customers to configure and monitor key parameters. In addition, developers have full control of their application and FW development process with commonly used Arm® based compilers.

Typical applications
› Isolated DC-DC brick modules
› Telecom radio power
› 48 V point of loads
› Non-isolated buck boost converters
› 48 V server motherboard

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>State machine based digital control for up to 2 independent voltage loops</td>
<td>Ease of use thanks to firmware-based system configuration with GUI support</td>
</tr>
<tr>
<td>Configurable feedback control</td>
<td>User-specific customization and software-based design changes</td>
</tr>
<tr>
<td>Arm® Cortex®-M0 processor</td>
<td>Enhanced control and excellent dynamic transient performance</td>
</tr>
<tr>
<td>Up to 16 configurable GPIOs</td>
<td>Sophisticated system level fault handling</td>
</tr>
<tr>
<td>Up to 12 high resolution digital modulated PWM outputs</td>
<td>System housekeeping i.e., fan control, LED control, sequencing, with configurable GPIOs</td>
</tr>
<tr>
<td>Input voltage feed-forward control scheme</td>
<td>High efficiency at light-load management</td>
</tr>
<tr>
<td>3 high-speed voltage sense ADCs: 50 MHz 11-bit ADC with set point accuracy within ±1% over temperature range</td>
<td></td>
</tr>
<tr>
<td>2 current sense ADCs: 25 MHz, 9-bit with 100 µV and 1.45 mV LSB</td>
<td></td>
</tr>
<tr>
<td>Communication: 1 MHz I²C/PMBus,</td>
<td></td>
</tr>
<tr>
<td>Operating temperature from -40°C to 125°C</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/xdpp1100
**XDPP1100** implementation in 48 V to 12 V full-bridge isolated DC-DC converter

- **Primary side**
  - Gate driver: 2EDL8114
  - PGND
  - VCC_Pri
  - CIN
  - GND
  - Copper trace

- **Secondary side**
  - Gate driver: 2EDL8014
  - PGND
  - VCC_Sec
  - VCC
  - COUT
  - 12 VOUT

---

The **XDPP1100** device is offered in two packages

<table>
<thead>
<tr>
<th>Package</th>
<th>VQFN 24-pin</th>
<th>VQFN 40-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>4 x 4 mm</td>
<td>6 x 6 mm</td>
</tr>
<tr>
<td>PWM</td>
<td>6 PWM</td>
<td>12 PWM</td>
</tr>
<tr>
<td>Loop</td>
<td>Single loop</td>
<td>Dual loop</td>
</tr>
</tbody>
</table>

---

For more details on the product, visit [infineon.com/xdpp1100](http://infineon.com/xdpp1100) or contact our product support.
MOTIX™ 6EDL7141

Three-phase smart gate drive controller IC

The MOTIX™ 6EDL7141 is Infineon’s latest three-phase motor control gate driver IC that enables development of high-performance-battery-operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using built-in digital SPI interface, the MOTIX™ 6EDL7141 is fully configurable to drive a wide range of MOSFET’s to yield the best possible system efficiency. The MOTIX™ 6EDL7141 is also designed for maximum flexibility. With an operating voltage from 5.5-70 V and configurable gate drive sink and source current up to 1.5 A, it has the ability to drive a wide range of MOSFETs effectively to best fit the application. It has an adjustable gate driver supply voltage setting between 7 V, 10 V, 12 V and 15 V even at low battery voltage thanks to built-in dual charge pumps. The MOTIX™ 6EDL7141 also has adjustable gate driver parameters to enable control of the slew rate to minimize system EMI. All of the MOTIX™ 6EDL7141 settings can be quickly changed with the available easy-to-use GUI. The integrated buck regulator requires only an external capacitor and inductor to provide power for both the microcontroller and the Hall sensors in the motor, further reducing fault conditions.

EVAL_6EDL7141_TRAP_1SH
› Single shunt evaluation board for trapezoidal commutation of BLDC motors with 40 V OptiMOS™ 5 PQFN and XMC1404 MCU
› On-board programming dongle
› Featured IC: MOTIX™ 6EDL7141

Features and benefits

Key features
› Integrated power supplies
› Adjustable slew rate
› Programmable gate drive parameters
› 3x current shunt amplifier
› Complete dedicated motor control protection suite

Key benefits
› Reduced external components and PCB area
› Optimized efficiency and EMI
› Maximum flexibility to use different inverter FETs
› Highly accurate current sense while saving external components
› Higher dynamic range to increase signal resolution
› Improve reliability and fault detection

Block diagram

Product portfolio

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package</th>
<th>Voltage [V]</th>
<th>$R_{ON,SINK,MAX}$ [mΩ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6EDL7141</td>
<td>PG-VQFN-48-78</td>
<td>5.5 – 70 V</td>
<td>2.2</td>
</tr>
</tbody>
</table>

www.infineon.com/6edl7141
Integrated class D audio amplifier ICs

Cooler, smaller and lighter class D audio amplifiers for great sounding products

Infineon’s MERUS™ audio solutions enable audio designers to improve the performance of their products, while increasing efficiency and reducing solution size. Advances in semiconductor processes in combination with new innovative architectures are behind a portfolio of class D technologies that allow professional, commercial/home and portable audio applications to benefit from unparalleled performance, power density and reliability. The broad portfolio covers power ranges from 20 W to 2 kW per channel from the smallest single-chip devices and multi-chip module (MCMs) to highly scalable discrete audio amplifier solutions consisting of powerful MOSFET/CoolGaN™ GIT HEMT and driver ICs combinations.

By combining our core principles, competencies, and leadership in groundbreaking power semiconductors with revolutionary audio amplifier technologies, such as MERUS™, we provide solutions that are smaller, lighter, more robust and flexible, running with less heat dissipation. In addition to outstanding quality and reliability, Infineon’s amplifier solutions are designed to maximize power efficiency and dynamic range while providing best-in-class performance in product form factors that make them an optimal fit for any high-end application. These include portable/battery-powered applications, voice controlled active speakers, television sets, stereo HiFi, soundbars, monitors, power over ethernet (PoE) and multichannel systems.

Design with Infineon’s solutions to benefit from:

- Exceptional audio performance
- Maximized power efficiency
- Maximized output power
- Design freedom
- Fast time to market

www.infineon.com/merus
Integrated MERUS™ multilevel amplifier ICs for class D audio solutions

High power efficiency and density in small packages

With its revolutionary MERUS™ integrated multilevel class D audio amplifier ICs, Infineon is leading in efficiency and power density. Compared to traditional class D amplifier ICs, which produce only two voltage output levels, multilevel amplifier ICs use additional on-chip MOSFETs and capacitors to produce outputs with a higher signal granularity, i.e., higher switching frequencies and/or multiple output signal levels – typically up to five voltage levels.

Features and benefits

**Key features**
- Multilevel switching technology
- Scalable signal "granularity"
- Proprietary circuits architecture

**Key benefits**
- Highest efficiency and power density
- Potential LC filter removal
- Low THD+N
- Cooler operation
- Low power loss
- Virtually no switching loss measurable in idle mode

Efficiency where it matters for audio reproduction

For MERUS™ integrated multilevel audio amplifier ICs, amplifier efficiency at average output power is key. As the graph on the left shows, MERUS™ multilevel amplifier is much more effective than the traditional class D amplifier, which translates into less power consumption in AC input and in battery-powered audio applications.

www.infineon.com/merus
MERUS™ integrated audio amplifier multi-chip modules (MCM)

Integrated components for scalable output power and superb audio performance

Multi-chip modules integrate PWM controller and power MOSFETs in a single package to offer a highly efficient, compact solution that reduces component count, shrinks PCB size up to 70 percent, and simplifies class D amplifier design.

Multi-chip audio amplifier module

Features and benefits

**Key features**

- Single package with integrated PWM controller and audio-performance-optimized power MOSFET
- Overcurrent protection
- Thermal shutdown
- Floating differential input
- Clip detection
- Best-in-class power efficiency and audio performance
- Lower component count, leading to design simplification
- Compatible with single supply or split rail configuration
- Click noise reduction

**Key benefits**

- Extended battery playback time
- Unrivaled audio performance
- Smaller solution size (BOM reduction, system level cost savings)
- Eliminated need for heatsink
- High noise immunity
- Reliable operation
- Thermal efficiency

www.infineon.com/merus
Discrete MERUS™ audio amplifier driver ICs with MOSFET and gallium nitride CoolGaN™ GIT HEMT 400 V

Scalable output power with a unified design platform

Infineon’s discrete audio solutions are scalable to various output power levels, simply by replacing the external MOSFETs or CoolGaN™ GIT HEMTs of the driver-transistor combinations. Key parameters for the transistors used in discrete class D audio applications include on-state resistance ($R_{\text{DS(on)}}$), gate charge ($Q_G$), and reverse recovery charge ($Q_{\text{rr}}$). Our products are specifically suitable for class D audio applications and optimized for these parameters to achieve maximized efficiency, THD and EMI amplifier performance. The CoolGaN™ GIT HEMT 400 V portfolio is specifically built for class D audio requirements, with high-performing SMD packages to fully utilize the benefits of gallium nitride.

Audio solution overview

Features and benefits

<table>
<thead>
<tr>
<th>Key benefits</th>
<th>Key advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unified design platform</td>
<td>Superior audio performance</td>
</tr>
<tr>
<td>Scalable output power up to over 2 kW per channel</td>
<td>Increased reliability</td>
</tr>
<tr>
<td>Simple yet effective - exchange of external MOSFET triggers alteration in output power level</td>
<td>Unique audio experience</td>
</tr>
<tr>
<td>Best-in-class power efficiency</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/merus
www.infineon.com/gan
### Integrated class D audio amplifier IC portfolio

**MERUS™ Gen2 integrated multilevel audio amplifier IC product portfolio**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>MA2304DN</th>
<th>MA2304PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of audio channels</td>
<td>2x8TTL</td>
<td>2x37 W</td>
</tr>
<tr>
<td>Max. peak power at 4Ω 10% THD</td>
<td>2x37 W</td>
<td>10-20 V</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>10-20 V</td>
<td>10-20 V</td>
</tr>
<tr>
<td>3-level and 5-level modulation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Selectable power mode profiles:</td>
<td>Low power consumption (LPC) or high audio performance (HAP)</td>
<td>Digital</td>
</tr>
<tr>
<td>Audio input</td>
<td>Digital</td>
<td>I2S/TDM</td>
</tr>
<tr>
<td>Integrated DSP</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Volume and dynamic range control</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Idle power dissipation</td>
<td>50 mW (LPC mode)</td>
<td>50 mW (LPC mode)</td>
</tr>
<tr>
<td>Audio performance (PMP2)</td>
<td>105 dB DNR 55 μVrms output noise &lt;0.03% THD+N</td>
<td>105 dB DNR 55 μVrms output noise &lt;0.03% THD+N</td>
</tr>
</tbody>
</table>

**Features**

<table>
<thead>
<tr>
<th>MA2304DN</th>
<th>MA2304PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample rates</td>
<td>32, 44.1, 48, 88.2, 96, 176.4, 192 kHz</td>
</tr>
<tr>
<td>Comprehensive protection scheme*</td>
<td>✓</td>
</tr>
<tr>
<td>Configurable for SE or PBTL operation</td>
<td>✓</td>
</tr>
<tr>
<td>I²C communication</td>
<td>✓</td>
</tr>
<tr>
<td>Filterless implementation</td>
<td>✓</td>
</tr>
<tr>
<td>Package type</td>
<td>40-pin QFN package with exposed thermal pad</td>
</tr>
</tbody>
</table>

*All ICs carry a full protection scheme comprising undervoltage lockout, overtemperature warning/error, short circuit/overload protection, power stage pin-to-pin short circuit, error reporting through serial interface (I²C), and DC protection

### MERUS™ integrated audio amplifier multi-chip modules (MCMs)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>IR4301M</th>
<th>IR4311M</th>
<th>IR4321M</th>
<th>IR4302M</th>
<th>IR4322M</th>
<th>IR4312M</th>
<th>MAS322MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of audio channels</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Max. power per channel</td>
<td>160 W</td>
<td>90 W</td>
<td>45 W</td>
<td>130 W</td>
<td>100 W</td>
<td>40 W</td>
<td>200 W</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>± ± 3 V or 62 V</td>
<td>± ± 3 V or 62 V</td>
<td>± ± 3 V or 62 V</td>
<td>± ± 25 V or 50 V</td>
<td>± ± 25 V or 50 V</td>
<td>± ± 15 V or 30 V</td>
<td>± ± 16 V or 32 V</td>
</tr>
<tr>
<td>Max. PWM frequency</td>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
</tr>
</tbody>
</table>

**Features**

<table>
<thead>
<tr>
<th>IR4301M</th>
<th>IR4311M</th>
<th>IR4321M</th>
<th>IR4302M</th>
<th>IR4322M</th>
<th>IR4312M</th>
<th>MAS322MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential audio input</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Overcurrent protection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Integrated power MOSFET</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Voltage</td>
<td>80 V</td>
<td>60 V</td>
<td>40 V</td>
<td>80 V</td>
<td>60 V</td>
<td>40 V</td>
</tr>
<tr>
<td>PWM controller</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thermal shutdown</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Click noise reduction</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Clip detection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Package type</td>
<td>5x6 mm QFN</td>
<td>5x6 mm QFN</td>
<td>5x6 mm QFN</td>
<td>7 x 7 mm QFN</td>
<td>7 x 7 mm QFN</td>
<td>7 x 7 mm QFN</td>
</tr>
<tr>
<td>Evaluation boards</td>
<td>IRAUDAMP12</td>
<td>IRAUDAMP19</td>
<td>IRAUDAMP21</td>
<td>IRAUDAMP15</td>
<td>IRAUDAMP16</td>
<td>IRAUDAMP17</td>
</tr>
</tbody>
</table>

www.infineon.com/merus
## MERUS™ discrete audio amplifier driver IC product portfolio

<table>
<thead>
<tr>
<th>Specifications</th>
<th>MA2492WE</th>
<th>IRS20965S</th>
<th>IRS20957SPBF</th>
<th>IRS2092SPBF</th>
<th>IRS2052M</th>
<th>IRS2093MPBF</th>
<th>IRS2452AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of audio channels</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Max. power per channel</td>
<td>500 W</td>
<td>500 W</td>
<td>500 W</td>
<td>300 W</td>
<td>300 W</td>
<td>500 W</td>
<td>500 W</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>± 100 V</td>
<td>± 100 V</td>
<td>± 100 V</td>
<td>± 100 V</td>
<td>± 100 V</td>
<td>± 200 V</td>
<td>± 200 V</td>
</tr>
<tr>
<td>Gate sink/source current</td>
<td>2.0/2.0 A</td>
<td>1.2/1.0 A</td>
<td>1.2/1.0 A</td>
<td>0.6/0.5 A</td>
<td>0.6/0.5 A</td>
<td>0.6/0.5 A</td>
<td>0.6/0.5 A</td>
</tr>
</tbody>
</table>

### Features

- **Overcurrent protection:** ✓ ✓ ✓ ✓ ✓ ✓
- **Overcurrent flag:** ✓
- **PWM input:** ✓ ✓
- **Floating input:** ✓ ✓ ✓ ✓ ✓ ✓
- **Dead time:** ✓ ✓ ✓ ✓ ✓
- **Protection control logic:** ✓ ✓ ✓ ✓ ✓ ✓
- **PWM controller:** ✓ ✓ ✓ ✓
- **Clip detection:** ✓
- **Click noise reduction:** ✓ ✓ ✓ ✓
- **Temperature sensor input:** ✓ ✓
- **Thermal shutdown:** ✓
- **Clock input:** ✓ ✓

### Recommended MOSFET (through-hole) product portfolio

<table>
<thead>
<tr>
<th>Output power</th>
<th>Recommended discrete audio driver IC</th>
<th>2 Ω</th>
<th>4 Ω</th>
<th>8 Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 W</td>
<td>IRS2093MPBF</td>
<td>IRFB4019</td>
<td>IRFB4019</td>
<td>IRF4020H-117P</td>
</tr>
<tr>
<td>200 W</td>
<td>IRS2052M</td>
<td>IRFB5615</td>
<td>IRFB4019</td>
<td>IRF4020H-117P</td>
</tr>
<tr>
<td>300 W</td>
<td>IRS2092SPBF</td>
<td>IRFB4228PBF</td>
<td>IRFB4227</td>
<td>IRFB4229</td>
</tr>
<tr>
<td>500 W</td>
<td>IRS20957SPBF</td>
<td>IRFB4228PBF</td>
<td>IRFB4227</td>
<td>IRFB4229</td>
</tr>
<tr>
<td>750 W</td>
<td>IRS20957SPBF</td>
<td>IRFB4227</td>
<td>IRFB4229</td>
<td></td>
</tr>
<tr>
<td>1000 W</td>
<td>IRS20957SPBF</td>
<td>IRFB4668</td>
<td>IRFB4229 x 2</td>
<td></td>
</tr>
</tbody>
</table>

**IRS2093MPBF** works up to 150 W and **IRS2052M** works up to 300 W. **IRS2092SPBF** and **IRS20957SPBF** work with all power levels listed above.

### Recommended MOSFET (DirectFET™) product portfolio

<table>
<thead>
<tr>
<th>Output power</th>
<th>Recommended discrete audio driver IC</th>
<th>2 Ω</th>
<th>4 Ω</th>
<th>8 Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 W</td>
<td>IRS2093MPBF</td>
<td>IRF6645</td>
<td>IRF6665</td>
<td>IRF6775M</td>
</tr>
<tr>
<td>200 W</td>
<td>IRS2052M</td>
<td>IRF6644</td>
<td>IRF6775M</td>
<td>IRF6775M</td>
</tr>
<tr>
<td>300 W</td>
<td>IRS2092SPBF</td>
<td>IRF6643</td>
<td>IRF6775M</td>
<td>IRF6785</td>
</tr>
<tr>
<td>500 W</td>
<td>IRS20957SPBF</td>
<td>IRF6641</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Recommended CoolGaN™ GIT HEMT 400 V product portfolio

<table>
<thead>
<tr>
<th>Package</th>
<th>CoolGaN™ GIT HEMT 400 V</th>
<th>Recommended discrete audio amplifier driver IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pmax</td>
<td>HSOF-8-3 (TO-Leadless)</td>
<td>IRS20957SPBF</td>
</tr>
<tr>
<td>RDS(on)</td>
<td>Up to 200 W</td>
<td></td>
</tr>
<tr>
<td>OPN</td>
<td>70 mΩ</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/merus
www.infineon.com/gan
Recommended audio evaluation boards

Enabling fast time to market and device performance evaluation

MERUS™ integrated multilevel audio amplifier IC evaluation boards

**EVAL_AUDIO_MA2304DN**

The demonstration board EVAL_AUDIO_MA2304DN is an evaluation and demonstration board for MERUS™ audio MA2304DN. It contains a digital input and a variety of output and setup/selection features. It also contains an on-board power supply generator (selectable 1.8 or 3.3 V buck-converted) so only one external power supply (PVDD) is necessary. It can be controlled and programmed with its software GUI.

The board can be used for evaluating or demonstrating key features/advantages of the MERUS™ technology:

- Energy efficiency: power losses at typical audio listening levels/ultralow idle power consumption
- Adaptive power management system
- Minimum output filter components: significant cost and size reduction
- THD performance and audio quality
- Integrated MERUS™ DSP

**EVAL_AUDIO_MA2304PN**

The demonstration board EVAL_AUDIO_MA2304PN is an evaluation and demonstration board for MERUS™ audio MA2304PN. It contains a digital input and a variety of output and setup/selection features. It also contains an on-board power supply generator (selectable 1.8 or 3.3 V buck-converted) so only one external power supply (PVDD) is necessary. It can be controlled and programmed with its software GUI.

The board can be used for evaluating or demonstrating key features/advantages of the MERUS™ technology:

- Energy efficiency: power losses at typical audio listening levels/ultralow idle power consumption
- Adaptive power management system
- Minimum output filter components: significant cost and size reduction
- THD performance and audio quality
- Integrated volume and limiter processors

www.infineon.com/merus

*Coming soon
KIT_40W_AMPHAT_ZW
Kit board - MERUS™ audio amplifier
HAT ZW class D audio amplifier 40 W for Raspberry Pi Zero W featuring MA12070P

Summary of features
› Equipped with MERUS™ MA12070P proprietary multilevel amplifier
› Compatible with Raspberry Pi Zero and Raspberry Pi Zero wireless
› Power input: 5 V/2.5 A - sourced from the same single supply as the Raspberry Pi
› No need for external or extra power supplies
› Up to 40 W instantaneous peak output power with the Raspberry Pi official 5 V/2.5 A supply

Benefits
› Compatibility with major streaming applications for Raspberry Pi (Volumio, JustBoom Player, Max2Play)
› Up to 48 kHz of sample rate and 24-bit of music playback
› Full hardware control, customization, and error monitoring trough Linux Alsamixer

Potential Applications
› DIY on the go wireless speakers
› DIY intelligent home audio systems

KIT_ARDMKR_AMP_40W
Kit board MA12070P audio amplifier - compatible with Arduino MKR boards

Summary of features
› Equipped with MERUS™ MA12070P proprietary multilevel amplifier
› Power input: 5 V/2.5 A - sourced from the same single USB-C power supply or battery pack
› No need for external or extra power supplies
› Up to 40 W instantaneous peak output power with a USB-C power supply or battery pack

Benefits
› Compatible with Arduino MKRZERO and MKR1000 WIFI
› Full hardware control and customization
› Error monitoring through Arduino programming framework

DEMO_BASSAMP_60W_MA12070
Reference design demoboard
MERUS™ MA12070 as musical instrument bass amplifier

Summary of features
› 1 x 60 W at 4 Ω speaker output
› Powered by off-the-shelf regulated wall adapter
› 12AU7 vacuum-tube preamplifier
› Stereo 3.5 mm AUX input
› XLR D.I. output with ground lift switch
› Bright switch for slap-bass sound
› Low idle power consumption

Benefits
› Superior sound quality
› Modelled after classic bass amplifier topology
› Genuine vacuum-tube preamplifier
› Small size and scalable platform
› Excellent efficiency

www.infineon.com/merus
MERUS™ integrated audio amplifier multi-chip module (MCM) evaluation boards

IRAUDAMP12
Number of audio channels: 2
Output power per channel [RMS]: 130 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP12

IRAUDAMP17
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4302M
Input: Analog
OPN: IRAUDAMP17

IRAUDAMP19
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP19

IRAUDAMP21
Number of audio channels: 2
Output power per channel [RMS]: 135 W
Featured class D IC: IR4321M
Input: Analog
OPN: IRAUDAMP21

IRAUDAMP22
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4322M
Input: Analog
OPN: IRAUDAMP22

Discrete MERUS™ audio amplifier driver IC and MOSFET evaluation boards

IRAUDAMP4A
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF664STRP6F
OPN: IRAUDAMP4A

IRAUDAMP5
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS2092S
Featured MOSFET: IRF6645TRP6F
OPN: IRAUDAMP5

IRAUDAMP6
Number of audio channels: 2
Output power per channel [RMS]: 250 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6785MTRP6F
OPN: IRAUDAMP6

IRAUDAMP7S
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IPP60R180C7
OPN: IRAUDAMP7S

IRAUDAMP9
Number of audio channels: 1
Output power per channel [RMS]: 1700 W
Featured driver IC: IRS2092S
Featured MOSFET: IRF6645TRP6F
OPN: IRAUDAMP9

IRAUDAMP10
Number of audio channels: 2
Output power per channel [RMS]: 370 W
Featured driver IC: IRS2052M
Featured MOSFET: IRF6775MTRP6F
OPN: IRAUDAMP10

IRAUDAMP23
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IPP60R180C7
OPN: IRAUDAMP23

www.infineon.com/merus
Discrete audio amplifier driver IC and CoolGaN™ GIT HEMT 400 V evaluation board

**EVAL_AUDAMP24**
- **Number of audio channels**: 2
- **Output power per channel [RMS]**: 300 W at 1%
- **Featured HEMT**: IGT40R070D1
- **Featured driver IC**: IRS20957S
- **OPN**: EVAL_AUDAMP24

Power supply units for audio evaluation boards

**IRAUDPS1**
- **Input voltage**: 12 VDC
- **Output voltage**: ± 35 V
- **Output power per channel [RMS]**: 100 W
- **Featured driver IC**: IR2085
- **Description**: 250-1000 W scalable audio power supply
- **OPN**: IRAUDPS1

**IRAUDPS3**
- **Input voltage**: 110/220 VAC
- **Output voltage**: ± 30 V
- **Output power per channel [RMS]**: 200 W
- **Featured driver IC**: IRS27952S
- **Description**: Power supply for class D audio amplifier
- **OPN**: IRAUDPS3

www.infineon.com/merus
www.infineon.com/gan
AC-DC LED driver ICs

Digital and mixed-signal, single- and dual-stage high-voltage control ICs for LED drivers

**XDP™ digital power – digital single- and dual-stage flyback combo controllers**

The XDP™ portfolio of high-performance digital power control ICs addresses today’s challenges such as smart or connected lighting, meeting demanding LED driver requirements with a unique set of features.

**Mixed-signal control ICs for solid-state lighting luminaires**

Infineon's mixed-signal control ICs for LED drivers deliver excellent power quality and high efficiency for LED lighting applications supporting dimming levels down to 1 percent. The integration of advanced functions saves external components and minimizes system cost. The wide variety of features and functions gives the option to choose the best fitting part for the application.

www.infineon.com/offline-led-driver
ICL8800/ICL8810/ICL8820
Single-stage flyback LED controllers for constant voltage output

The ICL88xx family of single-stage flyback controllers for constant voltage output is tailored for LED lighting applications to meet the required performance cost-effectively. All three ICs offer benchmarking performance for power factor correction and total harmonic distortion at full-load as well as at low-load conditions. With their comprehensive set of protection features (compare table below) and bottom-up design, they are easy to design-in and require a minimum number of external components. The controllers are optimized as secondary-side regulated (SSR) constant voltage (CV) output flyback controllers and are also well suited for primary-side regulation (PSR).

Additionally, the controllers’ low standby power due to the integrated BM (in ICL8810, ICL8820) is ideally suited for smart lighting systems’ requirements. The jitter function (in ICL8820) eases the design of emergency lighting LED drivers without additional circuitry. It fulfills EMI requirements in DC operation and improves the EMI performance.

Typical application schematic

Features and benefits
Key benefits
- Optimized for SSR CV output flyback operation, additionally suited for PSR
- PF > 0.9 and THD < 10% across a wide load range (AC input up to 277 V_{in})
- CCM and QRM with smart valley hopping
- ICL8810 also contains burst mode (BM) to ensure low standby power (< 100 mW)
- ICL8820 also contains built-in jitter function

Key advantages
- Low BOM for wide range of applications with PFC functionality where dual-stage topologies are required
- Enables platform design and window drivers
- Optimum efficiency and low EMI at low BOM without compromising light quality
- ICL8810 enables in addition: smart lighting in connection with microcontrollers (standby power < 500mW, i.e., more power budget for additional components)
- ICL8820 enables in addition: Fulfillment complying with EMI regulations in DC operation at low cost and effort

Order information for ICL88xx

<table>
<thead>
<tr>
<th>Board name</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICL8800</td>
<td>Single-stage flyback controller for constant voltage output</td>
<td>ICL8800XUMA1</td>
</tr>
<tr>
<td>REF_ICL8800_LED_43W*</td>
<td>Demoboard with ICL8800</td>
<td>REFICL8800LED43W</td>
</tr>
<tr>
<td>ICL8810</td>
<td>Single-stage flyback controller for constant voltage output with low standby power</td>
<td>ICL8810XUMA1</td>
</tr>
<tr>
<td>REF_ICL8810_LED_43W_BM*</td>
<td>Demoboard with ICL8810 with burst mode</td>
<td>REFICL8810LED43WBM</td>
</tr>
<tr>
<td>REF_ICL8810_LED_42W_PSR</td>
<td>Demoboard with ICL8810 for primary side regulation</td>
<td>REFICL8810LED42WPSR</td>
</tr>
<tr>
<td>ICL8820</td>
<td>Single-stage flyback controller for constant voltage output with low standby power and jitter function</td>
<td>ICL8820XUMA1</td>
</tr>
<tr>
<td>REF_ICL8820_LED_43W_JT*</td>
<td>Demoboard with ICL8820 with jitter function</td>
<td>REFICL8820LED43WJT</td>
</tr>
</tbody>
</table>

www.infineon.com/offline-led-driver

*See Plug & LEDs play, ideally to be combined with secondary-side boards
ICL5102
High-performance PFC + resonant controller for LCC and LLC

With ICL5102 Infineon offers a highly integrated combo controller IC with a universal input of 70 V to 325 V, which allows manufacturers to realize global designs, keeping cost for product variety and stock low. Highest efficiency of up to 94 percent by resonant topology, a THD factor less than 3.5 percent and a high power factor of more than 0.95 allow for more lumen output and less thermal load, enabling cost-effective designs and keeping cost for LEDs and heat sink low. Thanks to the high integration, there is no need for additional expensive components in PFC and LLC stage, reducing the overall BOM cost. In addition, integrated protection features complement the ICL5102 features.

Typical application schematic

Features and benefits

<table>
<thead>
<tr>
<th>Key features and benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Small form factor LED driver and low BOM</td>
</tr>
<tr>
<td>The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications</td>
</tr>
<tr>
<td>› High performance, digital PFC and advanced HB driver</td>
</tr>
<tr>
<td>The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditions down to 0.1 percent of the nominal power without audible noise</td>
</tr>
<tr>
<td>› Fast time-to-light and low standby</td>
</tr>
<tr>
<td>With a start-up current of less than 100 µA the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW</td>
</tr>
<tr>
<td>› Safety first</td>
</tr>
<tr>
<td>The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature and capacitive load operation</td>
</tr>
</tbody>
</table>

Order information for ICL5102

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICL5102</td>
<td>PFC and resonant controller for LCC and LLC</td>
<td>ICL5102KUMA2</td>
</tr>
<tr>
<td>REF-ICL5102-U130W-CC</td>
<td>PFC/LCC-CC constant current evaluation board 130 W LED driver</td>
<td>REFICL5102U130WCCTOBO1</td>
</tr>
<tr>
<td>REF-ICL5102-U52W-CC</td>
<td>Low-cost PFC/LCC reference design 52 W LED driver, non-dimmable</td>
<td>REFICL5102U52WCCTOBO1</td>
</tr>
<tr>
<td>REF_ICL5102_U100W_LCC</td>
<td>Low-cost PFC/LCC reference design 100 W, dimmable</td>
<td>REFICL5102U100WLC</td>
</tr>
<tr>
<td>REF_LLCC_BUCK_4CH_320W*</td>
<td>Scalable 320 W multichannel high-power LED driver (using ICL5102 board and ILD6150E board)</td>
<td>REFLLCBUCK4CH320WTOBO1</td>
</tr>
</tbody>
</table>

www.infineon.com/icl5102

*See Plug & LEDs play, ideally to be combined with secondary-side boards
**ICL5102HV**

High-performance PFC + resonant controller for LCC and LLC, supporting 980 V high side

**ICL5102HV** control IC for LED drivers offers a unique one-package solution for lighting applications up to 350 W, supporting LLC/LCC topology. It is particularly designed to deliver best performance of total harmonic distortions (THD) and power factor (PF). Compared to level-shifter technology, the integrated coreless transformer not only further reduces the loss at high operation frequency, but also enhances the capability of handling a huge negative voltage (-600 V on HSGND). Reduce the number of external components to optimize the form factor and reduce the bill of materials (BOM) with the integrated two-stage combination controller (PFC + LLC/LCC) for lighting applications. Simplify your design and shorten time-to-market.

**Typical application schematic**

![Typical application schematic](image)

**Features and benefits**

**Key features and benefits**

- **Small form factor LED driver and low BOM**
  The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED driver for indoor and outdoor applications.

- **High performance, digital PFC and advanced HB driver**
  The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditions down to 0.1 percent of the nominal power without audible noise.

- **Fast time-to-light and low standby**
  With a start-up current of less than 100 µA the controller provides very fast time-to-light within less than 300 ms, while in standby the controller changes into active burst mode which reduces power consumption to less than 300 mW.

- **Safety first**
  The controller has a comprehensive set of protection features built in to increase the system safety. In run mode it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature and capacitive load operation.

**Order information for ICL5102HV**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICL5102HV</td>
<td>PFC and resonant controller for LCC and LLC</td>
<td>ICL5102HVXUMA1</td>
</tr>
<tr>
<td>REF-ICL5102HV-U150W</td>
<td>PFC/LCC evaluation board 150 W, CC LED driver</td>
<td>REFICL5102HVU150WT0801</td>
</tr>
</tbody>
</table>

www.infineon.com/icl5102hv
**XDP™ LED**

The IC family XDP™ is the first all-in-one package solution combining a digital controller with key power peripherals. Such integration provides exceptional flexibility and performance. The XDP™ family addresses essential features for advanced LED driver.

**XDPL8105 – digital flyback controller IC for LED driver**

The XDPL8105 is a digital, single-stage flyback controller with high power factor for constant current LED driver. The device offers versatile functions for different indoor and outdoor lighting applications. The IC is available in a DSO8 package and it provides a wide feature set, requiring a minimum of external components. The advanced control algorithms in the digital core of the XDPL8105 provide multimode operation for high efficiency. Configurable parameters allow last minute changes, shorten the product development time and reduce hardware variants. The extensive set of configurable standard and sophisticated protection mechanisms ensure a safe, reliable and robust LED driver device for diverse use cases.

**Typical application schematic**

![Typical application schematic](image)

**Features and benefits**

<table>
<thead>
<tr>
<th>Key features and benefits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant current with primary-side regulation</td>
<td></td>
</tr>
<tr>
<td>Supports AC and DC input</td>
<td></td>
</tr>
<tr>
<td>Nominal input voltage range 90–305 V&lt;sub&gt;AC&lt;/sub&gt; or 120–350 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Integrated 600 V start-up cell</td>
<td></td>
</tr>
<tr>
<td>Power factor &gt; 0.9 and THD &lt; 15 percent over wide load range</td>
<td></td>
</tr>
<tr>
<td>Highly accurate primary-side control output current typ. ± 3 percent</td>
<td></td>
</tr>
<tr>
<td>Reference board efficiency &gt; 90 percent</td>
<td></td>
</tr>
<tr>
<td>Internal temperature guard with adaptive thermal management</td>
<td></td>
</tr>
<tr>
<td>Multimode operation</td>
<td></td>
</tr>
<tr>
<td>QRM (quasi-resonant mode)</td>
<td></td>
</tr>
<tr>
<td>DCM (discontinuous conduction mode)</td>
<td></td>
</tr>
<tr>
<td>ABM (active burst mode)</td>
<td></td>
</tr>
<tr>
<td>Digital parameters</td>
<td></td>
</tr>
<tr>
<td>Relevant error conditions are monitored and protected</td>
<td></td>
</tr>
<tr>
<td>Undervoltage</td>
<td></td>
</tr>
<tr>
<td>Overvoltage</td>
<td></td>
</tr>
<tr>
<td>Open load</td>
<td></td>
</tr>
<tr>
<td>Output shorted</td>
<td></td>
</tr>
</tbody>
</table>

**Order information for XDPL8105**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDPL8105</td>
<td>Digital flyback constant controller IC</td>
<td>XDPL8105XUMA1</td>
</tr>
<tr>
<td>REF-XDPL8105-CDM10V</td>
<td>40 W reference design with CDM10V isolated 0 V–10 V dimming interface</td>
<td>REFXDPL8105CDM10VTOBO1</td>
</tr>
</tbody>
</table>

[322]
XDPL8210 – digital flyback constant current controller IC for LED driver with 1 percent dimming

The XDPL8210 is a digital, single-stage, quasi-resonant flyback controller with high power factor and high precision primary-side controlled constant current output. The IC is available in a DSO8 package and it provides a wide feature set, which requires only a small number of external components. Sophisticated algorithms provide flicker-free dimming below one percent. The driver fully supports IEC61000-3-2 class C designs. The limited power mode improves functional safety, while configurable parameters allow last minute changes, shorten the product development time and reduce hardware variants. The extensive set of configurable standard and sophisticated protection mechanisms ensure a safe, reliable and robust LED driver for a large set of use cases.

### Typical application schematic

![Typical application schematic](image)

### Features and benefits

<table>
<thead>
<tr>
<th>Key features and benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>‣ Constant current with primary-side regulation</td>
</tr>
<tr>
<td>‣ Supports AC and DC input</td>
</tr>
<tr>
<td>‣ Nominal input voltage range 90-305 ( V_{AC} ) or 90-430 ( V_{DC} )</td>
</tr>
<tr>
<td>‣ Reference board efficiency &gt; 90 percent</td>
</tr>
<tr>
<td>‣ Power factor &gt; 0.9 and THD &lt; 15 percent over wide load range</td>
</tr>
<tr>
<td>‣ Standby power &lt; 100 mW</td>
</tr>
<tr>
<td>‣ Internal temperature guard with adaptive thermal management</td>
</tr>
</tbody>
</table>

**Multimode operation**

| QRM (quasi-resonant mode) |
| DCM (discontinuous conduction mode) |
| ABM (active burst mode) |

**Digital parameters**

| Relevant error conditions are monitored and protected |
| Undervoltage |
| Overvoltage |
| Open load |
| Output shorted |

### Order information for XDPL8210

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDPL8210</td>
<td>Digital flyback constant current controller IC</td>
<td>XDPL8210XUMA1</td>
</tr>
<tr>
<td>REF-XDPL8210-U35W</td>
<td>35 W reference design with CDM10V isolated 0-10 V dimming interface</td>
<td>REFXDPL8210U3SWTOBO1</td>
</tr>
</tbody>
</table>

www.infineon.com/xdpl8210
XDPL8219 – PFC/flyback controller with enhanced total harmonic distortion

The XDPL8219 is a digital high-performance secondary-side regulated flyback controller with constant voltage output. With its high power factor the controller is the perfect fit for cost-effective, dual-stage LED drivers and enables for instance smart lighting applications. The device operates in quasi-resonant mode (QRM) to maximize the efficiency and minimize the electromagnetic interference (EMI) over a wide load range. It enters active burst mode (ABM) at light load to prevent audible noise from being heard, while achieving no-load standby power as low as <100mW. The XDPL8219 is available is available in a DSO8 package.

Typical application schematic

Features and benefits

<table>
<thead>
<tr>
<th>Key benefits</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Secondary-side-regulated (SSR) constant voltage (CV) output</td>
<td>› Supporting wide load range and fast and stable reaction to dynamic load changes</td>
</tr>
<tr>
<td>› Flyback controller with power factor correction</td>
<td>› PF &gt; 0.9 and THD &lt; 10% across a wide load range (AC input up to 277 Vrms)</td>
</tr>
<tr>
<td>› Depending on load condition, either quasi-resonant, discontinuous conduction mode or active burst mode (ABM)</td>
<td>› Optimal efficiency, power factor and THD can be achieved by best-suited mode. In addition, DCM eases compliance with EMI at low-load condition</td>
</tr>
<tr>
<td>› Integrated 600 V start-up cell</td>
<td>› Very low standby power &lt; 100 mW can be achieved</td>
</tr>
<tr>
<td></td>
<td>› Integrated start-up cell enables very high efficiency</td>
</tr>
</tbody>
</table>

Order information for XDPL8218

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDPL8219</td>
<td>Digital flyback CV output controller IC</td>
<td>XDPL8219XUMA1</td>
</tr>
<tr>
<td>REF-XDPL8219-U40W*</td>
<td>Efficient 40 W reference circuit design for XDPL8219 with high power factor and low THD. It is built for universal input voltage 120–277 V AC or 127–432 V DC</td>
<td>REFXDPL8219U40WTOBO1</td>
</tr>
</tbody>
</table>

www.infineon.com/xdpl8219

*See Plug & LEDs play, ideally to be combined with secondary-side boards
**XDPL8221** - digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming and serial interface

The **XDPL8221** is a digital, highly integrated, future-proof device combining a quasi-resonant PFC with a quasi-resonant flyback controller with primary-side regulation. A serial communication interface supports direct communication with an external microcontroller unit (MCU). The **XDPL8221** is especially designed for advanced LED driver in smart lighting or IoT applications, featuring flicker-free dimming down to 1 percent of the nominal current. The device enables customizable LED driver and simplifies the generation and maintenance of different variants without increasing the number of stock keeping units. The IC is available in a DSO-16 package.

**Typical application schematic**

![Typical application schematic](image)

**Features and benefits**

<table>
<thead>
<tr>
<th>Key features and benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal input voltage range 100-305 V&lt;sub&gt;ac&lt;/sub&gt; or 90-430 V&lt;sub&gt;dc&lt;/sub&gt;</td>
</tr>
<tr>
<td>Reference board efficiency &gt; 90 percent</td>
</tr>
<tr>
<td>Power factor &gt; 0.9 and THD &lt; 15 percent over wide load range</td>
</tr>
<tr>
<td>UART interface for control and real-time monitoring</td>
</tr>
<tr>
<td>Constant current, constant voltage, limited power with primary-side regulation</td>
</tr>
<tr>
<td>1 percent dimming</td>
</tr>
<tr>
<td>Dim-to-off with low standby power &lt; 100 mW</td>
</tr>
<tr>
<td>Internal temperature guard with adaptive thermal management</td>
</tr>
<tr>
<td>The UART interface and the command set enable to control the function of the XDPL8221 or inquire status information</td>
</tr>
</tbody>
</table>

**Multimode operation**

- QRM (quasi-resonant mode)
- DCM (discontinuous conduction mode)
- ABM (active burst mode)

**Digital parameters**

- Relevant error conditions are monitored and protected
  - Undervoltage
  - Overvoltage
  - Open load
  - Output shorted

**Order information for XDPL8221**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDPL8221</td>
<td>Digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming</td>
<td>XDPL8221XUMA1</td>
</tr>
<tr>
<td>REF-XDPL8221-U50W</td>
<td>50 W reference board with CDM10V isolated 0 V-10 V dimming interface</td>
<td>REF-XDPL8221U50WTOBO1</td>
</tr>
<tr>
<td>REF-XDPL8221-U100W</td>
<td>100 W reference board with CDM10V isolated 0 V-10 V dimming interface</td>
<td>REF-XDPL8221U100WTOBO1</td>
</tr>
</tbody>
</table>

[www.infineon.com/xdpl8221](http://www.infineon.com/xdpl8221)
Infineon offers highly integrated DC-DC LED driver ICs that support currents up to 1.5 A, making these drivers the ideal choice for high- and ultrahigh-power LEDs. These highly integrated DC to DC driver ICs achieve efficiency levels as high as 98 percent across a wide range of operation conditions. Integrated smart thermal protection, along with overvoltage and overcurrent protection contribute to a longer LED lifetime.

DC-DC LED driver ICs

DC-DC switch mode LED driver ICs with efficiencies up to 98 percent, dimming level down to 0.5 percent

Infineon’s BCR linear driver ICs are the best choice for driving LED strings supplied by a DC voltage source. The BCR regulators are suitable for driving currents from 10 mA to 250 mA. That is why they are the best solution for low- and mid-power LEDs. For high-power LEDs instead, the linear controller ICs in combination with an external power stage allow for the greatest design flexibility.
ILD8150/ILD8150E – 80 V DC-DC buck LED driver IC for high-power LEDs and high-performance hybrid dimming

The ILD8150 is an 80 V DC-DC converter IC, designed to be used in LED applications to drive high-power LEDs. For applications operating close to safe extra low voltage (SELV) limits, it provides a high safety voltage margin. The buck LED driver IC is tailored for LEDs in general lighting applications with average currents up to 1.5 A using a high-side integrated switch. Several performance and protection features provide the right fit for professional LED lighting.

The hysteretic current control provides an extremely fast regulation and stable LED current combined with good EMI performance. The efficiency of the LED driver IC is remarkably high, reaching more than 95 percent efficiency over a wide range. A PWM input signal between 250 Hz and 20 kHz controls dimming of the LEDs current in analog mode from 100 to 12.5 percent and 12.5 to 0.5 percent in PWM mode with flicker-free modulation frequency of 3.4 kHz.

Digital PWM dimming detection with high resolution makes ILD8150/E the perfect LED driver IC for use together with microcontrollers. Precise output current accuracy from device to device under all loads and input voltage conditions makes it perfect for tunable white and flat panel designs where the current must be identical string to string.

Features and benefits

**Key benefits**
- Wide input voltage ranging from 8–80 VDC
- Up to 1.5 A average output current, adjustable via shunt resistor
- Efficiency > 95 percent
- Up to 2 MHz switching frequency
- Soft-start
- PWM dimming input, with 250 Hz to 20 kHz PWM dimming frequency

**Key advantages**
- Hybrid dimming for flicker-free light down to 0.5 percent
- Analog dimming 100 percent - 12.5 percent
- PWM dimming 12.5 percent - 0.5 percent with 3.4 kHz flicker-free modulation, dim-to-off
- Typical 3 percent output current accuracy
- Overtemperature protection
- Pull-down transistor to avoid LED glowing in dim-to-off
- DSO8 package to enable wave soldering
- DSO8 with exposed pad for higher thermal performance (ILD8150E)

www.infineon.com/ild8150

*See Plug & LEDs play, ideally to be combined with secondary-side boards*
Linear current regulators

60 V linear LED controller IC with active headroom control for power- and cost-efficient linear regulation on DC-DC side

A unique feature of BCR601 is to provide feedback to the primary side via an optocoupler to control the output voltage of the primary-side converter, e.g., XDPL8219 or ICL88xx. The integrated control loop minimizes the voltage overhead and power dissipation of the external driver transistor. This capability, coupled with the adjustment of voltage overhead by external configuration according to application needs, leads to power- and cost-efficient LED systems. AC line ripple suppression, analog dimming option and various protection features round up this device for LED drivers allowing for flicker-free light and longevity of LEDs.

Typical application schematic

![Typical application schematic diagram]

Features and benefits

Key features and benefits

- Active headroom control (supports an optocoupler feedback loop to primary side minimizing power losses)
- Dimming in pure analog mode down to 3%
- Suppresses the voltage ripple of the power supply driving a constant LED current for high light quality
- The embedded hot-plug protection allows plug in and plug out of any LED load during operation without damaging the LEDs
- Supports wide current range depending on external driver transistor
- Supply voltage range up to 60 V
- Gate driver current 10 mA
- LED current can be adjusted by Rset functionality
- Overtemperature protection and adjustable overvoltage protection

Order information for BCR601

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCR601</td>
<td>60 V linear LED controller IC with voltage feedback to primary side</td>
<td>BCR601XUMA1</td>
</tr>
<tr>
<td>DEMO_BCR601_60V_IVCTRL*</td>
<td>Demonstration board BCR601 current and voltage control, 700 mA</td>
<td>DEMOBCR60160IVCTRL0B01</td>
</tr>
<tr>
<td>REF_TW_BCR601_55V_0.5A*</td>
<td>Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers, 500 mA</td>
<td>REFITWBCR60155V05ATOBO01</td>
</tr>
</tbody>
</table>

www.infineon.com/bcr601

*See Plug & LEDs play, ideally to be combined with secondary-side boards

For more details on the product, click on the part number, visit infineon.com or contact our product support.
BCR601/BCR602 – 60 V linear LED controller ICs for tunable white plus active headroom control and flexible dimming

**BCR601** is a linear controller that enables high efficiency at low cost as a second-stage LED controller to replace DC-DC buck converters especially in low- to mid-power LED drivers. The cost-effectiveness especially in multichannel designs can be further enhanced by using **BCR602** in a tiny SOT-23-6 package regulating the LED current for flicker-free deep dimming performance.

### Features and benefits

#### Key benefits
- **BCR601** as the master controller controls voltage overhead of both channels and current of one channel
- **BCR602** as slave controller regulates current of second channel
- Input voltage up to 60 V
- Can be operated with either BJT or N-channel MOSFET
- Analog dimming down to 3%, PWM dimming down to 1% (BCR602)
- Current precision ±3%
- OTP, OVP, hot-plug protection

#### Key advantages
- Linear regulators give considerable cost advantage over buck topology
- Cost advantage increases with additional channels
- Efficiency can be on par with buck (depends on output ripple of first stage)
- Highest light quality, zero ripple
- Deep, full analog dimming
- Easy to extend to additional outputs (e.g., RGBW)

### Order information

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF_TW_BCR601_55V_0.5A*</td>
<td>Demoboard for design evaluation of tunable white applications with cost-effective linear LED controllers BCR601/BCR602, 500 mA</td>
<td>REFTWBCR60155V05ATOB01</td>
</tr>
<tr>
<td>BCR601</td>
<td>60 V linear LED controller IC, with voltage feedback to primary side</td>
<td>BCR601XUMA1</td>
</tr>
<tr>
<td>DEMO_BCR601_60V_VCTRL*</td>
<td>Demonstration board BCR601 current and voltage control, 700 mA</td>
<td>DEMOBBCR60160VVCCTRLTOBD01</td>
</tr>
<tr>
<td>BCR602</td>
<td>60 V linear LED controller IC</td>
<td>BCR602XTSA1</td>
</tr>
<tr>
<td>DEMO_BCR602_60V_ICCTRL*</td>
<td>Demoboard for design evaluation of cost-efficient, highly reliable, dimmable LED engines/modules, 60 V, 200 mA</td>
<td>DEMOBBCR60260VVCCTRLTOBD01</td>
</tr>
</tbody>
</table>

www.infineon.com/cms/en/product/evaluation-boards/ref_tw_bcr601_55v_0.5a  
www.infineon.com/bcr602

*See Plug & LEDs play, ideally to be combined with secondary-side boards*
BCR43x linear LED driver ICs for low-power LEDs

The BCR3x family is the smallest size and lowest cost series of LED drivers. These products are perfectly suited for driving low-power LEDs in general lighting applications.

The advantage over resistor biasing is:
› Long lifetime of LEDs due to constant current in each LED string
› Homogenous LED light output independent of LED forward voltage binning, temperature increase and supply voltage variations

The advantage versus discrete semiconductors is:
› Reduced part count and assembly effort
› Pretested output current
› Defined negative temperature co-efficient protection

Features and benefits

<table>
<thead>
<tr>
<th>Key features and benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current from 8 to 100 mA (adjustable by external resistor)</td>
</tr>
<tr>
<td>Supply voltage up to 40 V (BCR430U, BCR431U*)</td>
</tr>
<tr>
<td>Reduction of output current at high temperature, contributing to long lifetime LED systems</td>
</tr>
<tr>
<td>Extra low voltage drop for more voltage headroom and flexibility in designs (BCR430U, BCR431U)</td>
</tr>
<tr>
<td>Excellent ESD performance on device and system level for BCR43xU</td>
</tr>
<tr>
<td>Very small form factor packages with up to 600 mW max. power handling capability</td>
</tr>
</tbody>
</table>

LED current versus voltage drop ($V_s = 24$ V)

The voltage drop at the integrated LED driver stage can go down to 135 mV at 50 mA and less improving the overall system efficiency and providing extra voltage headroom to compensate for tolerances of LED forward voltage or supply voltage. With the BCR430U and BCR431U, additional LEDs can be added to lighting designs or longer LED strips can be created without changing the supply voltage.

Low-power LED driver ICs (5-100 mA)

<table>
<thead>
<tr>
<th>Type</th>
<th>Group</th>
<th>Topology</th>
<th>$V_{in}$ (min.) [V]</th>
<th>$V_{in}$ (max.) [V]</th>
<th>$I_{out}$ (typ.) [mA]</th>
<th>$I_{out}$ (max.) [mA]</th>
<th>Dimming</th>
<th>Package</th>
<th>$P_{tot}$ (max.) [mW]</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCR430U*</td>
<td>LED drivers for low-power LEDs</td>
<td>Linear</td>
<td>6</td>
<td>42</td>
<td>Defined by $R_{set}$</td>
<td>100</td>
<td>PWM by external transistor</td>
<td>SOT-23</td>
<td>600</td>
<td>BCR430UXTSA2</td>
</tr>
<tr>
<td>BCR431U**</td>
<td>LED drivers for low-power LEDs</td>
<td>Linear</td>
<td>6</td>
<td>42</td>
<td>Defined by $R_{set}$</td>
<td>42</td>
<td></td>
<td>SOT-23</td>
<td>600</td>
<td>BCR431UXTSA1</td>
</tr>
</tbody>
</table>

www.infineon.com/bcr

* Ultralow voltage drop version BCR430U with only 135 mV at 50 mA
** Ultralow voltage drop version BCR431U with only 115 mV at 15 mA
CDM10V and CDM10VD – most flexible dimming interface ICs for 0-10 V input

Infineon’s fully integrated dimming solutions

Infineon’s CDM10V and CDM10VD are the industry’s first single-chip lighting interface ICs. They are capable of transforming an analog 0–10 V input into a PWM or dimming input signal, required by a lighting controller IC. CDM10V and CDM10VD devices are dedicated for commercial and industrial LED lighting applications. The compact and highly integrated devices allow designers to replace up to 25 discrete components, used in conventional 0–10 V dimming schemes, with a single device. Supplied in an ultra-miniature 6-pin SOT package, the CDM10Vx and CDM10VDx perfectly match small PCBs with high component densities.

Typical application schematic using CDM10V

Features and benefits

<table>
<thead>
<tr>
<th>Key benefits</th>
<th>Key advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Active dimming (0–10 V) and passive dimming (resistor)</td>
<td>› Single-device solution leading to low BOM and PCB savings</td>
</tr>
<tr>
<td>› Embedded digital signal processing which maintains minimum variations from device to device</td>
<td>› Dimming ICs in small SOT-23 package for high power density designs</td>
</tr>
<tr>
<td>› PWM input</td>
<td>› Granular portfolio for highest flexibility and easy design-in</td>
</tr>
<tr>
<td>› One-time configurable device: CDM10V and preconfigured devices with various feature sets</td>
<td>› Wide input VCC range 11–25 V, extended range down to 6 V for CDM10V</td>
</tr>
<tr>
<td></td>
<td>› Attractive pricing and faster time to market</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product type</th>
<th>I_{out} [mA]</th>
<th>Min. duty cycle [%]</th>
<th>PWM output frequency [kHz]</th>
<th>Dimmer/resistor bias current [μA]</th>
<th>Dimg-to-off</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDM10V</td>
<td>5</td>
<td>1/2/5/10</td>
<td>0.2/0.5/1/2</td>
<td>50/100/200/500</td>
<td>Disabled/enabled</td>
<td>CDM10VXTSA1</td>
</tr>
<tr>
<td>CDM10V-2</td>
<td>5</td>
<td>n.a.</td>
<td>1</td>
<td>200</td>
<td>Enabled</td>
<td>CDM10V2XTSA1</td>
</tr>
<tr>
<td>CDM10V-3</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>200</td>
<td>Disabled</td>
<td>CDM10V3XTSA1</td>
</tr>
<tr>
<td>CDM10V-4</td>
<td>5</td>
<td>n.a.</td>
<td>2</td>
<td>100</td>
<td>Enabled</td>
<td>CDM10V4XTSA1</td>
</tr>
<tr>
<td>CDM10VD</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>120</td>
<td>Enabled</td>
<td>CDM10V5XTSA1</td>
</tr>
<tr>
<td>CDM10VD-2</td>
<td>5</td>
<td>10</td>
<td>1</td>
<td>120</td>
<td>Enabled</td>
<td>CDM10V2DXTSA1</td>
</tr>
<tr>
<td>CDM10VD-3</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>120</td>
<td>Enabled</td>
<td>CDM10V3DXTSA1</td>
</tr>
<tr>
<td>CDM10VD-4</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>120</td>
<td>Enabled</td>
<td>CDM10V4DXTSA1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Board name</th>
<th>Description</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF-XDPL8105-CDM10V</td>
<td>40 W single-stage PFC FB digital power reference design with CDM10V</td>
<td>REFXDPL8105CDM10VTOBO1</td>
</tr>
</tbody>
</table>

www.infineon.com/cdm10V
NFC-PWM configuration ICs
Dual-mode NFC wireless configuration ICs with CLO function and pulse width modulation (PWM) output for lighting applications

The NLM0011 is a dual-mode NFC wireless configuration IC with PWM output. It is compatible with existing analog LED driver designs and with the NFC-programming specification from the module-driver interface special interest group (MD-SIG). This device is primarily designed for LED applications to enable NFC programming. In addition, advanced features such as the constant lumen output (CLO) as well as the on/off counting are integrated, and there is no need for an additional microcontroller. Since the NLM0011 is designed to work together with mainstream analog driver ICs, there are no firmware development efforts needed. It can be easily adapted into existing designs to replace the “plug-in resistor” current configuration concept. The NLM0010 is a light version without CLO function.

Typical example of NFC lighting application

Features and benefits

<table>
<thead>
<tr>
<th>Key benefits</th>
<th>Key advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Configurable pulse width modulation (PWM) output</td>
<td>› Fast and cost-effective implementation of NFC programming and CLO without the need of an additional microcontroller</td>
</tr>
<tr>
<td>› NFC contactless interface compliant to ISO/IEC 18000-3 mode 1 (ISO/IEC 15963)</td>
<td>› Compatible with most analog LED driver designs using the “plug-in resistor” method</td>
</tr>
<tr>
<td>› Constant light output (CLO) with 8 configurable points</td>
<td>› Stable PWM output with fixed 2.8 V amplitude and ±0.1% duty cycle accuracy</td>
</tr>
<tr>
<td>› Integrated operation-time counter (OTC) and on/off counter</td>
<td>› Internal voltage regulator (LDO) to avoid influence of instable external supply voltage</td>
</tr>
<tr>
<td>› Non-volatile memory (NVM) including UID and 20 bytes free memory for user data</td>
<td></td>
</tr>
</tbody>
</table>

EVAL_NLM0011_DC – evaluation board demo kit
This evaluation board not only enables fast demonstration of NFC-PWM configuration ICs with NLM0011 through the NFC-PWM mobile app, but also accelerates the development of the NFC-reader software. EVAL_NLM0011_DC does not require a full system, but allows NFC configuration for existing LED driver boards.

Ordering code: EVALNLM0011DCTOBO1

www.infineon.com/NFC-PWM
iMOTION™ integrated motor control solutions
A family of highly integrated products for the control of a variable speed drive

iMOTION™ products are offered in several integration levels including hardware as well as software. The hardware integration comprises stand-alone motor controllers, motor controllers with integrated gate drivers (iMOTION™ driver) and fully integrated inverters-in-a-package (iMOTION™ IPM). In terms of software, Infineon offers full turnkey solutions as well as freely programmable modules.

Infineon’s field-proven motion control engine (MCE) eliminates software coding from the motor control development process reducing the effort to the configuration for the respective motor and power stage.

The MCE implements highly efficient control of the motor and an optional power factor correction (PFC) and integrates all necessary protections and a flexible scripting engine. Assisted by powerful tools like the solution designer it is possible to have the motor up and running in less than an hour. Integrated support for functional safety for home appliances paves the way to meet regulations in the global market.

Infineon provides complete solutions for motor control with its combined offering of iMOTION™ together with EiceDRIVER™ gate drivers, TRENCHSTOP™ IGBTs, CoolMOS™ MOSFETs and CIPOS™ IPMs.

www.infineon.com/motor-control-ics
iMOTION™ controller
Motor/PFC controller plus optional MCU for maximum flexibility

The iMOTION™ controller consists of two different families: iMOTION™ IMC100 is a series of highly integrated ICs for the control of variable speed drives. By integrating both the required hardware and algorithm to perform control of a three-phase motor they provide the shortest time to market for any motor system at the lowest system and development cost. By combining the iMOTION™ IMC100 with an additional microcontroller based on the Arm® Cortex®-M0 core iMOTION™ IMC300 series is the perfect fit for applications requiring application flexibility beyond pure motor and PFC control.

Infineon's field-proven motion control engine (MCE) implements field-oriented control (FOC) using single or leg shunt current feedback and uses space vector PWM with sinusoidal signals to achieve highest energy efficiency. The MCE can run sensorless as well as using Hall sensors for low speed operation. It also integrates multiple protection features like over- and undervoltage, overcurrent, rotor lock etc. The integrated scripting engine grants flexibility for a wide range of applications. The IMC100/300 series are offered in several device variants. All devices can be used in applications requiring functional safety acc. to IEC 60730-1 ("Class B"). With this wide application scope the iMOTION™ controller is the perfect choice for any highly efficient variable speed drive - from low to high voltage.

Features and benefits

Key features
- Completely self-sustaining motion control engine
- Option for boost or totem pole PFC
- Integrated protection features
- Scripting engine for application flexibility
- Additional independent microcontroller
- Support for IEC 60335-1 ("Class B")

Key benefits
- Easy motor parametrization and tuning
- Low BOM cost for active PFC applications
- Safeguard power stage and motor
- Maximum flexibility for customer functions
- Full flexibility for custom functions or communication
- Support for functional safety integrated

The REF-VACUUM_C101_2ED is a reference design kit featuring IMC101T iMOTION™ controller, 2ED2304 SOI half-bridge gate driver and BSC030N04NS OptiMOS™. It demonstrates our thin-film-SOI and advanced MCE technologies for low-voltage, permanent-magnet motors drive up to 120 KRPM speed, and inverter section rating of 30 V and 25 A. It is optimized for major low-voltage home appliances like vacuums, fans, pumps and compressors.

www.infineon.com/iMOTION
iMOTION™ driver

Motor/PFC controller with gate driver and voltage regulator

The iMOTION™ IMD110 is a series of highly integrated ICs for the control of three-phase motors. The IMD110 drivers are an optimal combination of a ready-to-use motor and (optional) PFC controller with a high-voltage three-phase SOI gate driver and a voltage regulator. They can be combined with almost any low- to high-voltage MOSFET or IGBT to create a very compact yet still highly flexible drive solution. The full set of protections, improved clearance and creepage makes the IMD110 a highly robust and reliable driver family.

The family implements the identical field-proven Motion Control Engine (MCE) as the iMOTION™ controller family. The scripting engine that executes customer scripts with access to the MCE, a high number of GPIOs, analog inputs and a configurable UART grants flexibility for a wide range of applications. Based on Infineon’s latest SOI technology the three-phase gate driver exhibits market-leading robustness and lowest failure rates. The very low level-shift losses reduce thermal stress and allow high-frequency operation while the built-in bootstrap diodes help to reduce PCB space and cost. Protections like over- and undervoltage lockout and cross conduction prevention safeguard the power stage during erroneous conditions. All IMD110 devices support the functional safety requirements according to the IEC/UL 60730-1 (‘Class B’).

Block diagram

Features and benefits

Key features
- Completely self-sustaining motion control engine with identical feature set as the IMC100 series
- Option for boost or totem pole PFC
- High-voltage three-phase gate driver and built-in bootstrap diodes
- Single layer design possible
- Support for IEC 60335-1 (‘Class B’)

Key benefits
- Fastest time to market with easy parametrization and tuning of motor and PFC control
- Low BOM cost for active PFC applications
- Reducing BOM and PCB space
- Reducing PCB and production costs
- Support for functional safety integrated

The REF_FRIDGE_D111T_MOS board is a ready-to-use three-phase inverter designed for refrigerator compressors featuring the iMOTION™ driver. The 600 V CoolMOS™ PFD7 super junction MOSFET demonstrates market-leading light-load efficiency. The board provides a single-phase AC-connector, rectifier, and three-phase output for the motor. Targeting low-cost applications, the motor is run with sensorless field-oriented control (FOC) using single shunt current sensing. The direct sensing of all voltages and currents does not require any OpAmp.

www.infineon.com/IMD110
iMOTION™ tools and development support
The easy way to get started with motor control

The iMOTION™ solution designer is the new all-in-one PC tool supporting the iMOTION™ products in all stages of a motor control project. A new project can either be started by choosing one of the preconfigured applications or via selecting an evaluation board or a specific device. Solution designer offers individual views for all design steps from configuration up to the final tuning of the control loop.

Drive configuration is assisted by the integrated help describing all parameters in detail. After downloading the parameter sets into the iMOTION™ device customer configurable dashboards help with starting and running the motor and tuning the control loop parameters to the desired behavior. All relevant parameters like voltages, currents, torque, speed can be visualized in real time on the 8-channel oscilloscope. Going one step beyond the configuration of the motor and PFC the integrated editor, compiler and debugger help with the development of scripts for the iMOTION™ script engine.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated PC tool for all devices in all project phases</td>
<td>One common tool and consistent workflow for all iMOTION™ products</td>
</tr>
<tr>
<td>Configuration wizard for motor and PFC parameter sets</td>
<td>Easy handling of parameter sets with fully integrated help system</td>
</tr>
<tr>
<td>Dashboards for typical design steps, customer configurable</td>
<td>Fully configurable for individual testing and tuning stages</td>
</tr>
<tr>
<td>Oscilloscope with 8 channels</td>
<td>Real-time insight into all motor and PFC parameters</td>
</tr>
<tr>
<td>Full IDE for editing, compiling and debugging or for scripting</td>
<td>Assisted creation of scripts and live debugging including breakpoints</td>
</tr>
<tr>
<td>Programmer for firmware, parameter sets and scripts</td>
<td>Unified data handling from project to device</td>
</tr>
<tr>
<td>Catalogs for devices, boards, loads and projects</td>
<td>Project centric work and ease of creating derived projects</td>
</tr>
</tbody>
</table>

iMOTION2Go
Getting familiar with iMOTION™ firmware, features and tools

The iMOTION2go kit contains a complete motor control system on a small form factor board and is powered via USB. It is particularly useful for a first evaluation of the iMOTION™ firmware and tools like the iMOTION™ solution designer. This combination of the IMC101 motor control IC with the solution designer supports all project stages from drive configuration up to optimization and tuning using dashboards and oscilloscope. Scripting can be practiced by downloading and debugging via the IDE integrated in the solution designer.

www.infineon.com/iMOTION-software
www.infineon.com/iMOTION2go
iMOTION™ modular application design kit

Get a motor running in less than 1 hour!

The iMOTION™ modular application design kit (MADK) is an evaluation platform targeting variable speed-drive applications up to 10 kW. The platform offers a modular and scalable system solution with different control board options and a wide range of power boards. Using the iMOTION™ MADK standardized platform interfaces, different control and power boards can be combined into a system that perfectly meets the requirements of the final application. This modular approach allows developers the maximum flexibility and scalability during the evaluation and development phase at affordable costs.

While the M1 platform provides control of a permanent magnet synchronous motor (PMSM), the M3 platform additionally includes an active power factor correction (PFC) implemented as a CCM boost PFC. The M7 platform is based on the iMOTION™ driver series IMD110. The gate driver is contained on the control board and the power boards use different types of discrete power devices thus covering a wide voltage range from 20 V to 600 V with either MOSFETs or IGBTs. Boards with M7 connector are available with and without active PFC.

iMOTION™ Link
Isolated debug interface for final application boards

iMOTION™ Link is an isolated debug probe for all iMOTION™ motor control products. It connects to the user’s target board (final application board) or any other evaluation or reference board via a galvanically isolated interface. iMOTION™ solution designer is then used for configuring, parameterizing and tuning of the respective iMOTION™ device. In addition to the serial interface iMOTION™ Link also provides a standard Arm® SWD debug connection for programming the MCU core in devices like the IMC300 series.

www.infineon.com/MADK
www.infineon.com/iMOTION-link
Single half-bridge IC
Protected high-current half-bridge for industrial applications

The NovalithIC™ provides a complete, low-ohmic protected half-bridge in a single package (typ. path resistance at 25°C down to 10 mΩ). It can also be combined with an additional NovalithIC™ to create a H-bridge or three-phase bridge. The NovalithIC™ family has the capability to switch high-frequency PWM while providing overcurrent, overvoltage and overtemperature protection. The NovalithIC™ family offers cost-optimized, scalable solutions for protected high-current PWM motor drives with very restrictive board space. Due to the P-channel high-side switch the need for a charge pump is eliminated thus minimizing EMI. The latest addition to the NovalithIC™ family is the IFX007T, which is optimized for industrial applications.

Application example for high-current PWM motor drives

![High-current H-bridge circuit diagram]

Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Basic features</th>
<th>Protection features</th>
<th>Diagnostic features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low quiescent current</td>
<td>Overtemperature shutdown</td>
<td>Overtemperature</td>
</tr>
<tr>
<td></td>
<td>Capable for high PWM frequency</td>
<td>Overvoltage shutdown</td>
<td>Overvoltage</td>
</tr>
<tr>
<td></td>
<td>Logic level input</td>
<td>Undervoltage</td>
<td>Current sense and status</td>
</tr>
<tr>
<td></td>
<td>Adjustable slew rate</td>
<td>Overcurrent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross-current protection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>IFX007T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product number</td>
<td>IFX007T</td>
</tr>
<tr>
<td>Operating range [V]</td>
<td>5.5 ... 40.0</td>
</tr>
<tr>
<td>RDS(on) path [mΩ]</td>
<td>10.0</td>
</tr>
<tr>
<td>IDD (typ.) [mA]</td>
<td>70</td>
</tr>
<tr>
<td>I1 (typ.) [µA]</td>
<td>7</td>
</tr>
<tr>
<td>Switch time (typ.) [µs]</td>
<td>0.25</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>OT, OC, CS</td>
</tr>
<tr>
<td>Protection</td>
<td>UV, OT, OC</td>
</tr>
<tr>
<td>Package</td>
<td>PG-TO-263-7</td>
</tr>
<tr>
<td>Qualification</td>
<td>JESD471</td>
</tr>
</tbody>
</table>

www.infineon.com/novalithic

CS = Current sense       OC = Overcurrent       OT = Overtemperature   UV = Undervoltage

For more details on the product, click on the part number, visit infineon.com or contact our product support.
BLDC motor control shield with **IFX007T** for Arduino

The BLDC motor control shield is a high-current motor control board compatible with Arduino and Infineon’s XMC4700 boot kit. It is equipped with three smart **IFX007T** half-bridges. The BLDC motor control shield is capable to drive one BLDC motor. Alternatively, it can be used to drive one or two bidirectional DC motors (H-bridge configuration, cascaded to support second motor) or up to three unidirectional DC motors (half-bridge configuration). The implemented integrated **NovalithIC™ IFX007T** half-bridges can be controlled by a PWM via the IN-pin.

**Features**

<table>
<thead>
<tr>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capable of high-frequency PWM, e.g., 30 kHz</td>
</tr>
<tr>
<td>Adjustable slew rates for optimized EMI by changing external resistor</td>
</tr>
<tr>
<td>Driver circuit with logic level inputs</td>
</tr>
<tr>
<td>Diagnosis with current sense</td>
</tr>
</tbody>
</table>

**Target applications**

› Brushed DC motor control up to 250 W continuous load
› 24 V nominal input voltage (max. 6 V–40 V)
› Average motor current 30 A restricted due to PCB (**IFX007T** current limitation at 55 A min.)

**BLDC-SHIELD_IFX007T**

BLDC motor control with half-bridge **IFX007T**

Infineon’s shields for Arduino are compatible with microcontroller boards using the Arduino-compatible form factor, e.g., Infineon’s XMC™ microcontroller kits. **Ordering code**: BLDCSHIELDIFX007TTOBO1

www.infineon.com/bldc-shield-ifx007t
www.infineon.com/shields-for-arduino
MOTIX™ multi half-bridge ICs

Extensive offering ranging from two-fold half-bridge ICs to twelve-fold half-bridge ICs

The MOTIX™ TLE94xyz products are protected half-bridge drivers designed for 12 V motion control applications such as small DC motors for heating, ventilation and air conditioning (HVAC), as well as automotive mirror adjustment and fold. The family offers two-, three-, four-, six-, eight-, ten-, and twelve-fold integrated half-bridge driver. All devices can drive DC motor loads up to 0.9 A per output or the outputs can be used stand-alone or combined to increase driving capability up to 3.6 A. They provide diagnosis of short circuit, open load, power supply failure and overtemperature for each half-bridge to ensure safe operation in HVAC or other systems. The TLE94xyz offers enhanced EMC performance, as small DC motors for heating, ventilation and air conditioning (HVAC), as well as automotive mirror adjustment and fold capability up to 3.6 A. They provide diagnosis of short circuit, open load, power supply failure and overtemperature for each half-bridge to ensure safe operation in HVAC or other systems.

Infineon’s portfolio of MOTIX™ multi half-bridge ICs

Features and benefits

Key features and benefits

- Three-, four-, six-, eight-, ten-, and twelve-fold half-bridge stages with integrated output stages and PWM
- 16-bit SPI or direct inputs for control and diagnosis
- Voltage supply range: 5.5 to 20 V
- Variable driving schemes for up to 11 motors

Key applications

- 12 V automotive and industrial applications
- Flap motors in HVAC systems
- Mirror adjustment and fold
- Small DC motors (≤ 0.9 A/output)
- Bistable relays
- Bipolar stepper motors in full-step and half-step mode

Table of MOTIX™ multi half-bridge ICs

<table>
<thead>
<tr>
<th>Product name</th>
<th>Config.</th>
<th>(I_{\text{LIM}}) [A]</th>
<th>(I_{\text{LIM}}) [A]</th>
<th>(I_{\text{Q}}) [mA]</th>
<th>(V_{\text{IHD}}) [V]</th>
<th>Protection</th>
<th>Diagnostic interface</th>
<th>Highlights</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE94003EP</td>
<td>3 x half-bridge</td>
<td>3.3 x 0.30</td>
<td>3 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + small package</td>
<td>TSOSO-14</td>
</tr>
<tr>
<td>TLE94004EP</td>
<td>4 x half-bridge</td>
<td>4.3 x 0.30</td>
<td>4 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + small package</td>
<td>TSOSO-14</td>
</tr>
<tr>
<td>TLE94104EP</td>
<td>8 x half-bridge</td>
<td>8.3 x 0.30</td>
<td>8 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept</td>
<td>TSOSO-14</td>
</tr>
<tr>
<td>TLE94106ES</td>
<td>6 x half-bridge</td>
<td>6.3 x 0.30</td>
<td>6 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + small package</td>
<td>TSOSO-14</td>
</tr>
<tr>
<td>TLE94108ES</td>
<td>8 x half-bridge</td>
<td>8.3 x 0.30</td>
<td>8 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + small package</td>
<td>TSOSO-14</td>
</tr>
<tr>
<td>TLE94110ES</td>
<td>10 x half-bridge</td>
<td>10.3 x 0.30</td>
<td>10 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + backwards compatible to TLE84110</td>
<td>TSOSO-24</td>
</tr>
<tr>
<td>TLE94112ES</td>
<td>12 x half-bridge</td>
<td>12.3 x 0.30</td>
<td>12 x 0.90</td>
<td>0.6</td>
<td>5.5 to 20</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error flag</td>
<td>TLE94xyz family concept + 12 outputs in one package</td>
<td>TSOSO-24</td>
</tr>
<tr>
<td>TLE4207G</td>
<td>2 x half-bridge</td>
<td>2 x 0.80</td>
<td>2 x 1.50</td>
<td>20</td>
<td>8 to 18</td>
<td>OC, OT, VS, UV/OV</td>
<td>Error detection</td>
<td>Status flag</td>
<td>DSON-14</td>
</tr>
</tbody>
</table>

www.infineon.com/multi-half-bridge-ics
DC motor control HAT with MOTIX™ TLE94112ES

Complies with Raspberry Pi HAT specification

The Infineon motor control HAT with MOTIX™ TLE94112ES complies with Raspberry Pi HAT specification and provides you with unique evaluation experience. It is equipped with 12-fold half-bridge driver TLE94112ES and comes with a ready-to-use software library. The HAT is also equipped with an Infineon TLS4125D0EP V50, a synchronous step-down converter which can power the Raspberry Pi.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Twelve half-bridge power outputs, 0.9 A each (combinable to up to 3.6 A)</td>
<td>› Compact design for multi-motor applications</td>
</tr>
<tr>
<td>› Wide input voltage range of 5.5 V to 20 V</td>
<td>› Quick and easy setup for evaluation and demo applications</td>
</tr>
<tr>
<td>› Powering of Raspberry Pi by TLS4125D0EP V50</td>
<td>› Wide range of applications</td>
</tr>
<tr>
<td>› Reverse polarity protection</td>
<td></td>
</tr>
<tr>
<td>› Driver is protected against overtemperature, overcurrent, overvoltage, undervoltage and enables diagnosis of overcurrent, overvoltage, undervoltage</td>
<td></td>
</tr>
<tr>
<td>› SPI interface with zero clock diagnosis</td>
<td></td>
</tr>
<tr>
<td>› Enhanced EMC performance</td>
<td></td>
</tr>
<tr>
<td>› Integrated PWM generator with 3 different frequencies (80 Hz, 100 Hz, 200 Hz)</td>
<td></td>
</tr>
</tbody>
</table>

Target applications

› Automotive motor control: HVAC flap control
› Multi-motor applications
› DC motors and voltage controlled bipolar stepper motors
› Toys

Ordering code: TLE94112ESRPIHATTOBO1
MOTIX™ full-bridge ICs
General purpose 6 A H-bridges

MOTIX™ IFX9201SG is a general purpose 6 A H-bridge for industrial applications, home appliance and building automation, power tools battery management and medical applications, designed to control small DC motors and inductive loads. The outputs can be pulse width modulated at frequencies up to 20 kHz, which enables operation above the human sonic range by means of PWM/DIR control. While the signal at the DIR input defines the direction of the DC motor, the PWM signal controls the duty cycle. For load currents above the current limitation threshold (8 A typically), the H-bridges switch into chopper current limitation mode.

Applications examples

![Application example H-bridge with SPI interface](image)

Features

Key features

- Up to nominal 36 V supply voltage
- Short circuit, overtemperature protection and undervoltage shutdown
- Detailed SPI diagnosis or simple error flag
- Simple design with few external components
- Small and robust DSO-12-17 (IFX9201SG) and DSO-36-72 (IFX9202ED) packages

<table>
<thead>
<tr>
<th>Product number</th>
<th>Operating voltage</th>
<th>Current limit (min.) [A]</th>
<th>Quiescent current (typ.) [µA]</th>
<th>Operating range [V]</th>
<th>ResRDS (typ./switch) [mΩ]</th>
<th>Package</th>
<th>RthJC (max.) (K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFX9201SG</td>
<td>4.5 to 36 V</td>
<td>6.0</td>
<td>19.0</td>
<td>5 to 36</td>
<td>100</td>
<td>PG-DSO-12 (power)</td>
<td>2.0</td>
</tr>
</tbody>
</table>

www.infineon.com/ifx9201sg
H-BRIDGE KIT 2GO with MOTIX™ IFX9201SG

Build your own DC motor control with the H-bridge Kit 2GO, a ready-to-use evaluation kit. It is fully populated with all electronic components equipped with the H-bridge MOTIX™ IFX9201 combined with XMC1100 microcontroller based on Arm® Cortex®-M0 CPU. It is designed for the control of DC motors or other inductive loads up to 6 A or up to 36 V of supply.

Target applications
- DC motor control for industrial applications
- Home and building automation
- Power tools battery management
- Industrial robotic applications
- Electric toys applications

Ordering code: HBRIDGEBIT2GOTOBO1

KIT_XMC1300_IFX9201
Stepper motor control shield with MOTIX™ IFX9201SG and XMC1300 for Arduino

The stepper motor control shield from Infineon is one of the first high-current stepper motor control boards being compatible to Arduino as well as to Infineon’s XMC1100 boot kit. The stepper motor control shield is capable to drive the two coils in a stepper motor featuring dual-half-bridge configuration. The implemented integrated MOTIX™ IFX9201 half-bridges can be controlled by a STEP-signal via the STEP pin. Interfacing to a microcontroller is made easy by the integrated XMC1300 microcontroller that holds the peripherals to allow high-speed current control. Microstepping of the stepper motor can be achieved using the internal comparators, while operational amplifiers are installed to adapt the motor current sense signal to the microcontroller’s input levels.

Features and benefits

Key features
- Compatible with microcontroller boards using the Arduino form factor, e.g., Infineon’s XMC™ microcontroller kits
- Capable of high-frequency PWM, e.g., 30 kHz
- Adjustable slew rates for optimized EMI by changing external resistor
- Driver circuit with logic level inputs
- Diagnosis with current sense

Key benefits
- Fast and inexpensive prototyping of stepper motor control
- Simple testing of microstepping algorithms
- Diagnose pin to allow hardware feedback during development
- Overtemperature shutdown with latch behavior and undervoltage shutdown of the power section

Target applications
- Stepper motors up to 5 A phase current
- 24 V nominal input voltage for the power stage
- Average motor current 3 A without additional cooling effort, 5 A possible with proper cooling

Ordering code: KITXMC1300IFX9201TOBO1

www.infineon.com/h-bridge-kit-2go
www.infineon.com/kit-xmc1300-ifx9201
www.infineon.com/makers
MOTIX™ SBC

(BL)DC motor system IC combines power supply, communication and multiple half-bridge MOSFET drivers

Infineon’s MOTIX™ SBC family offers high integration and high performance with optimized system cost for DC and BLDC motor control applications. All devices of the motor system IC family feature a low-dropout voltage regulator with an output current of 250 mA/5 V. The communication interface incorporates a CAN FD transceiver up to 5 Mbit/s according to ISO 11898-2:2016 (including partial networking (PN) option) and/or a LIN transceiver.

Features

- 5 V linear regulator up to 250 mA
- CAN FD up to 5 Mbps - CAN PN and FD tolerant (“-3” variants)
- LIN2.2B/22602
- MOTIX™ TLE9560/1/2: up to 4 half-bridge gate drivers with adaptive MOSFET control up to 100 mA constant gate charge
- MOTIX™ TLE9563/4: three-phase gate driver with CSA and adaptive MOSFET control up to 150 mA constant gate charge
- Up to 4 high-side switches (with 7 on-resistance) - Up to 5 wake inputs
- Up to 6 PWM inputs

Benefits

- PCB savings up to 50 percent due to unique integration approach
- Lower switching losses and EMC optimization due to adaptive MOSFET control
- Automatic regulation of MOSFET pre-charge currents diminish need for production MOSFET calibration
- VS monitoring in sleep mode activates MOSFET to prevent from ECU damage when motor is in generator mode

www.infineon.com/bldc-motor-system-ics
www.infineon.com/bdc-motor-system-ics
Application diagram MOTIX™ TLE9560/1/2 for DC motor control

Product table

<table>
<thead>
<tr>
<th>Product variant</th>
<th>VCC1</th>
<th>CAN FD</th>
<th>CAN PN</th>
<th>LIN</th>
<th>HS switches</th>
<th>PWM input</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE9560-3QX</td>
<td>5 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>4</td>
<td>1</td>
<td>2x half-bridges (100 mA const.)</td>
</tr>
<tr>
<td>TLE9561QX</td>
<td>5 V</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>4</td>
<td>4</td>
<td>4x half-bridges (100 mA const.)</td>
</tr>
<tr>
<td>TLE9561-3QX</td>
<td>5 V</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>4</td>
<td>4</td>
<td>4x half-bridges (100 mA const.)</td>
</tr>
<tr>
<td>TLE9562QX</td>
<td>5 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>4</td>
<td>2</td>
<td>4x half-bridges (100 mA const.)</td>
</tr>
<tr>
<td>TLE9562-3QX</td>
<td>5 V</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>3</td>
<td>6</td>
<td>3x half-bridges (150 mA const.)</td>
</tr>
<tr>
<td>TLE9563-3QX</td>
<td>5 V</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>3</td>
<td>6</td>
<td>3x half-bridges (150 mA const.)</td>
</tr>
<tr>
<td>TLE9564QX</td>
<td>5 V</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>3</td>
<td>3</td>
<td>3x half-bridges (150 mA const.)</td>
</tr>
</tbody>
</table>

Application diagram MOTIX™ TLE9563/4 for BLDC motor control

For more details on the product, click on the part number, visit infineon.com or contact our product support.

www.infineon.com/infineon.com/bldc-motor-system-ics
www.infineon.com/infineon.com/bdc-motor-system-ics
DC and BLDC motor control shields and evaluation boards with MOTIX™ TLE9562-3QX and with MOTIX™ TLE9563-3QX

The purpose of these boards is to provide a quick evaluation solution for lab assessments. The evaluation boards offer a unique two in one solution: they can be connected via a UIO stick with the computer to evaluate features via config wizard (a graphical user interface) which can be found in the Infineon Developer Center. In addition, the evaluation boards feature an Arduino shield interface for rapid prototyping.

Summary of features BLDC motor control shield with MOTIX™ TLE9563-3QX

› Operating voltage range 5.5-28 V with 5 V compatible logic input
› Integrated reverse polarity protection with on-board EMC filter
› Three integrated half-bridges MOSFET (2 in 1 MOSFET package)
› 5 mΩ low-side current sense
› High-power RGB LED driven by integrated high-side switches
› On-board back-EMF detection circuit and connector for Hall-sensor
› Arduino example codes available

Sales product name: BLDC SHIELD_TLE956X
Ordering code: BLDCSHIELDTLE956XT0BO1

Summary of features DC motor control shield with MOTIX™ TLE9562-3QX

› Operating voltage range 5.5-28 V with 5 V compatible logic input
› Integrated reverse polarity protection with on-board EMC filter
› Four integrated half-bridge MOSFETs (2 in 1 MOSFET package)
› Easy interfacing of CAN and LIN transceiver
› Miniaturization/shrink of the PCB area
› Arduino example codes available

Sales product name: DC SHIELD_TLE956X
Ordering code: DCSHIELDTLE956XT0BO1

Benefits of DC and BLDC motor control shields

› 2 in 1 board with GUI and Arduino interface for evaluation and rapid prototyping
› 50 percent reduced internal operating current consumption
› Simplified and cost efficient ground network
› Smaller package size for area savings
› Very low quiescent current in sleep-mode

www.infineon.com/bldc-shield_tle956x
www.infineon.com/bdc-shield_tle956x
MOTIX™ multi-MOSFET driver

Infineon’s MOTIX™ TLE9210x is a family of multi-MOSFET drivers, designed to control up to eight half-bridges (up to 16 N-channel MOSFETs) with one packaged device. Having only one device for several half-bridges enables further savings, such as less pick and place costs as well as less required PCB area compared to discrete solutions. The MOTIX™ TLE92108 and MOTIX™ TLE92104 multiple MOSFET driver offer a reliable and cost-optimized solution with state-of-the-art diagnostic and protection. The devices of the MOTIX™ TLE9210x family are pin and software compatible. Furthermore, the product family allows motor cascading: with TLE92108 (8 half-bridges), up to 7 bidirectional DC motors motors can be driven.

Product table

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Brake mode</th>
<th>Package</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE92108-231QX</td>
<td>8-fold multi-MOSFET driver IC</td>
<td>No</td>
<td>PG-VQFN-48</td>
<td>TLE92108231QXXUMA1</td>
</tr>
<tr>
<td>TLE92108-232QX</td>
<td>8-fold multi-MOSFET driver IC</td>
<td>Yes</td>
<td>PG-VQFN-48</td>
<td>TLE92108232QXXUMA1</td>
</tr>
<tr>
<td>TLE92104-131QX</td>
<td>4-fold multi-MOSFET driver IC</td>
<td>No</td>
<td>PG-VQFN-48</td>
<td>TLE92104131QXXUMA1</td>
</tr>
<tr>
<td>TLE92104-232QX</td>
<td>4-fold multi-MOSFET driver IC</td>
<td>Yes</td>
<td>PG-VQFN-48</td>
<td>TLE92104232QXXUMA1</td>
</tr>
</tbody>
</table>

www.infineon.com/multi-mosfet-driver
MOTIX™ TLE92104-23QX APPKIT and MOTIX™ TLE92108-23QX APPKIT

Infineon’s evaluation boards to measure and evaluate the hardware and software functionalities of the MOTIX™ multi-MOSFET driver family

The TLE92104-23QX APPKIT contains the multi-MOSFET driver IC TLE92104-232QX, and a typical application circuit, including 4 MOSFET half-bridges (OptiMOS™ 40 V MOSFETs in S3O8 package) to drive up to 3 bidirectional DC motors.

The TLE92108-23QX APPKIT contains the multi-MOSFET driver IC the TLE92108-232QX and a typical application circuit, including 8 MOSFET half-bridges (OptiMOS™ 40 V in S3O8 package) to drive up to 7 bidirectional DC motors.

The application boards can be connected via a UIO stick with the computer to evaluate their features via config wizard (a graphical user interface) which can be found in the Infineon Developer Center.

Ordering code: TLE9210423QXAPPKITTOBO1
Ordering code: TLE9210823QXAPPKITTOBO1

www.infineon.com/tle92104-23qx-appkit
www.infineon.com/tle92108-23qx-appkit
Infineon support for power ICs
Useful links and helpful information

Further information, datasheets and documents

- www.infineon.com/acdc
- www.infineon.com/coolset
- www.infineon.com/integrated-powerstages
- www.infineon.com/digital-controller
- www.infineon.com/lighting-ics
- www.infineon.com/isoface
- www.infineon.com/eicedriver
- www.infineon.com/novalithic
- www.infineon.com/shields-for-arduino
- www.infineon.com/ipol
- www.infineon.com/analog-ipol
- www.infineon.com/xdp
- www.infineon.com/motix
- www.infineon.com/madk
- www.infineon.com/optireg-linear
- www.ifineon.com/optireg-switcher
- www.infineon.com/motor-control-ics
- www.infineon.com/imotion
Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
Wide bandgap semiconductors

Gallium nitride (GaN) and silicon carbide (SiC)

The key to the next essential step towards an energy-efficient world is the use of new materials, such as wide bandgap semiconductors that allow for greater power efficiency, smaller size, lighter weight, lower overall cost – or all of these together. As the leading and trusted power supplier, Infineon offers the broadest product and technology portfolio of silicon (Si) and wide bandgap (WBG) solutions with more than 40 years of heritage in silicon, and several decades of heritage in wide bandgap technology development.

CoolGaN™ – ultimate efficiency and reliability

Compared to silicon (Si) MOSFETs, the breakdown field of Infineon’s CoolGaN™ gate injection transistor (GIT) enhancement mode (e-mode) HEMTs is ten times higher, and the electron mobility is double. Both the output charge and gate charge are ten times lower than with Si and the reverse recovery charge is almost zero, which is key to high-frequency operations. GaN is the best-suited technology in hard-switching and resonant topologies, enabling new approaches in current modulation. Infineon’s GaN solution is based on the most robust and performing concept in the market – the enhancement-mode concept - offering fast turn-on and turn-off speed. CoolGaN™ products focus on high performance and robustness, and add significant value to a wide variety of systems across many applications such as server, telecom, hyperscale data centers, wireless charging, adapter/charger, and audio. CoolGaN™ switches are easy to design-in with the matching EiceDRIVER™ gate driver ICs optimized for CoolGaN™ 600 V from Infineon.

CoolSiC™ - revolution to rely on

Silicon carbide (SiC) has a wide bandgap of 3 electronvolts (eV) and a much higher thermal conductivity compared to silicon. SiC-based MOSFETs are best-suited for high-breakdown, high-power applications that operate at higher frequencies compared to traditional IGBTs. CoolSiC™ MOSFETs come along with a fast internal freewheeling diode, thus making hard commutation without additional diode chips possible. Due to its unipolar character, the MOSFETs show very low temperature-independent switching and low conduction losses, especially under partial load conditions. Based on proven, high-quality volume manufacturing, Infineon’s silicon carbide solutions combine revolutionary technology with benchmark reliability – for our customers’ success today and tomorrow. The offering is completed by EiceDRIVER™ SiC MOSFET gate driver ICs based on Infineon’s successful coreless transformer technology.

www.infineon.com/wbg
CoolGaN™ GIT HEMTs

Tailor-made for the highest efficiency and power density in switch-mode power supplies

Compared to the next best silicon alternative, CoolGaN™ enables higher power density and the highest efficiency, especially in the partial load range, through novel topologies such as the CCM totem-pole PFC stage. GaN e-mode HEMT performance features a low reverse recovery charge and excellent dynamic performance in reverse conduction compared to silicon FET solutions. This characteristic enables more efficient operation at established frequencies and much higher frequency operation, improving power density by shrinking the size of passive components. CoolGaN™ enables doubled output power in a given energy storage slot size, freeing up space and realizing higher efficiency simultaneously. Infineon’s CoolGaN™ comes with industry-leading reliability. During the quality management process, it is not only the device that is thoroughly tested but also its behavior in the application environment. The performance of CoolGaN™ goes beyond other GaN products in the market.

Features
› Low output charge and gate charge
› No reverse recovery charge

Design benefits
› High power density, small and light design
› High efficiency in resonant circuits
› New topologies and current modulation
› Fast and (near-)lossless switching

Advantages
› Operational expenses (OPEX) and capital expenditure (CAPEX) reduction
› BOM and overall cost savings

Infineon’s high- and low-voltage MOSFETs, gate-driver ICs and digital controllers complement the CoolGaN™ (discrete and integrated power stage) offering to fully exploit the benefits of GaN technology in systems.

The highest quality
The qualification of GaN switches requires a dedicated approach, well above existing silicon standards
› Infineon qualifies GaN devices well beyond industry standards
› Application profiles are an integral part of the qualification process
› Failure models, based on accelerated test conditions, ensure target lifetime and quality are met
› Infineon sets the next level of wide bandgap quality

CoolGaN™ GIT HEMTs overview

www.infineon.com/gan
CoolGaN™ GIT HEMTs 400 V and 600 V – bringing GaN technology to the next level

Infineon’s CoolGaN™ 400 V and 600 V GIT e-mode HEMTs enable more than 98 percent system efficiency and help customers make their end products smaller and lighter. Driving enhancement-mode devices requires additional features when choosing the correct gate driver IC. With the EiceDRIVER™ 1EDx56x3x family, Infineon offers dedicated single-channel galvanically isolated gate driver ICs, which are a perfect fit for e-mode GaN HEMTs with non-isolated gate (diode input characteristic) and low threshold voltage, such as CoolGaN™. However, CoolGaN™ technology does not require customized ICs, and in many applications, CoolGaN™ can be driven by standard gate drivers when coupled to an RC interface.

Complete support of all requirements specific to e-mode GaN HEMTs operation:
- Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink)
- Resistor programmable gate current for steady on-state (typically 10 mA)
- Programmable negative gate voltage to completely avoid spurious turn-on in half-bridges

Block diagram: high-efficiency GaN switched-mode power supply (SMPS)

*Single-channel EiceDRIVER™ ICs dedicated for CoolGaN™ GIT HEMTs

www.infineon.com/gan
CoolGaN™ GIT HEMT 400 V

Class D output stage offering the best audio experience

Compared to silicon solutions, the CoolGaN™ GIT HEMT 400 V normally-off switch enables smoother switching and a more linear class D output stage by offering low/linear Coss and zero Qrr. Ideal class D audio amplifiers offer 0 percent distortion and 100 percent efficiency. What impairs the linearity and power loss is highly dependent on the switching characteristics of the switching device. Infineon’s CoolGaN™ GIT HEMT 400 V breaks through the technology barrier by introducing zero reverse recovery charge in the body diode and minimal, linear input and output capacitances.

In addition, the e-mode concept offers fast turn-on and turn-off speed. This feature also simplifies pairing CoolGaN™ GiT with the IRS20957SPBF class D controller and therefore enables faster go-to-market.

CoolGaN™ GIT for class D audio solutions

CoolGaN™ GIT HEMT 400 V is tailored for premium HiFi home audio, professional, and aftermarket car audio systems where end-users demand every detail of their high-resolution soundtracks. These have been conventionally addressed by bulky linear amplifiers or tube amplifiers. With CoolGaN™ GIT HEMT 400 V as the class D output stage, audio designers will be able to deliver the best audio experience to their prospective audio fans.

The IGT40R070D1, CoolGaN™ GIT HEMT 400 V device in HSOF-8-3 (TO-leadless) package has been tested in class D audio amplifier applications on 200 W + 200 W dual-channel system designs.

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultralow and linear Coss 400 V power devices</td>
</tr>
<tr>
<td>Zero Qrr</td>
</tr>
<tr>
<td>E-mode transistor – normally-off switch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean switching performance</td>
</tr>
<tr>
<td>Narrow dead time for better THD</td>
</tr>
<tr>
<td>Easy to use: compatible with the IRS20957SPBF class D audio control IC</td>
</tr>
</tbody>
</table>

The CoolGaN™ GIT HEMT 400 V device benefits from Infineon’s engineering expertise in challenging applications, such as telecom rectifiers and SMPS servers, where CoolGaN™ technology proved to be highly reliable. It is the most robust and performing concept in the market. The CoolGaN™ GIT HEMT 400 V addresses class D audio requirements and comes in a high-performing SMD package to fully exploit the benefits of GaN technology.

www.infineon.com/hemt
CoolGaN™ GIT HEMTs 600 V
The highest efficiency and power density with reduced system costs

The e-mode concept offers fast turn-on and turn-off speed, as well as a better path towards integration. CoolGaN™ GIT HEMTs 600 V enable simpler and more cost-effective half-bridge topologies. As e-mode based products reach maturity, CoolGaN™ GIT HEMTs 600 V are gaining growing prominence thanks to their potential. Infineon manufactures their CoolGaN™ 600 V series according to a specific, GaN-tailored qualification process that goes far beyond the standard for silicon power devices. CoolGaN™ GIT HEMT 600 V is designed for datacom and server SMPS, telecom rectifiers, as well as mobile chargers and adapters, and can be used as a general switch in many other industrial and consumer applications. It is the most rugged and reliable solution in the market. The CoolGaN™ portfolio is built around high-performing SMD packages to fully exploit the benefits of GaN.

CoolGaN™ GIT for PFC
CoolGaN™ enables the adoption of simpler half-bridge topologies (including the elimination of the lossy input bridge rectifier). The result is record efficiency (>99%) with a potential for BOM savings.

CoolGaN™ GIT for resonant topologies
› In resonant applications, ten times lower Qoss and Qg enables high-frequency operations (>1 MHz) at the highest efficiency levels
› Linear output capacitance leads to 8 to 10 times lower dead time
› Devices can be easily paralleled
› Power density can be pushed even further by optimizing the thermal performance
› CoolGaN™ enables to push the efficiency forward, thus enabling high power density e.g., in low-power chargers/adapters

Applications
› Telecom
› Server
› Datacom
› Adapter and charger
› Wireless charging
› SMPS

Full-bridge totem pole

Demonstration board
2.5 kW totem-pole PFC board:
EVAL_2500W_PFC_GAN_A

› 2 x 70 mΩ CoolGaN™ GIT HEMT in DSO-20-85
› 2 x 33 mΩ CoolMOS™

www.infineon.com/hemt
CoolGaN™ IPS half-bridge 600 V
Ease of use with integrated drivers for highest efficiency and power density

The CoolGaN™ IPS half-bridge 600V combines a half-bridge power stage consisting of two CoolGaN™ GIT HEMTs and a dedicated gate driver IC in one thermally enhanced 8 x 8 mm QFN-28 package. The CoolGaN™ IPS HB family is available in 2x 140/200/270/500 mΩ, R_{DS(on)} typ. It is thus ideally suited to support the design of compact appliances in the low- to-medium power area. Infineon’s CoolGaN™ and power switches provide a very robust gate structure. When driven by a continuous gate current of a few mA in the on-state, a minimum on-resistance R_{DS(on)} is always guaranteed, independent of temperature and parameter variations.

Due to the GaN-specific low threshold voltage and the fast switching transients, a negative-gate drive voltage is required in certain applications to avoid spurious turn-on effects. This can be achieved by the well-known RC interface between the driver and the switch. A few external SMD resistors and capacitors allow for easy adaptation to different applications (low/medium power, hard/soft switching).

The built-in driver utilizes an on-chip coreless transformer (CT) technology to achieve level-shifting to the high side. Besides, CT guarantees excellent robustness even for extremely fast switching transients above 150 V/ns.

The CoolGaN™ IPS 600V family today, is available in various configurations such as half-bridge and single-channel.

Features and benefits

**Key features**
- Digital-in, power-out building block
- Application configurable switching behavior
- Highly accurate and stable timing
- Thermally enhanced 8 x 8 mm QFN-28 package

**Key benefits**
- Easy to drive with 2x digital PWM input
- Low system BOM
- Configurability of gate path with low inductance loop on PCB
- Allows short dead-time setting in order to maximize system efficiency
- Small package for compact system designs

www.infineon.com/gan-ips
Unlock the full potential of GaN by driving CoolGaN™ HEMTs with dedicated single-channel isolated gate driver ICs from the EiceDRIVER™ family.

**EiceDRIVER™ family optimized for CoolGaN™ GIT HEMTs 600 V**

<table>
<thead>
<tr>
<th>Product</th>
<th>Package</th>
<th>Input to output isolation</th>
<th>Propagation delay accuracy</th>
<th>Typ. high level (sourcing) output resistance</th>
<th>Typ. low level (sinking) output resistance</th>
<th>SP number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1EDF5673K</td>
<td>LGA, 13-pin, 5x5 mm</td>
<td>functional $V_D = 1.5 \text{ kV}$</td>
<td>-6 ns/+7 ns</td>
<td>0.85 Ω</td>
<td>0.35 Ω</td>
<td>SP002447622</td>
</tr>
<tr>
<td>1EDF5673F</td>
<td>DSO, 16-pin, 300 mil</td>
<td>reinforced $V_{CBO} = 8 \text{ kV}$</td>
<td>-6 ns/+7 ns</td>
<td>0.85 Ω</td>
<td>0.35 Ω</td>
<td>SP003194020</td>
</tr>
<tr>
<td>1EDS663H</td>
<td>DSO, 16-pin, 160 mil</td>
<td>single protection $V_{CBO} = 3.0 \text{ kV}$</td>
<td>4 V</td>
<td>8 V</td>
<td>8 V</td>
<td>-5 ns/+9 ns</td>
</tr>
<tr>
<td>1ED8258X</td>
<td>DSO, 14-pin, 150 mil</td>
<td>single protection $V_{CBO} = 3.0 \text{ kV}$</td>
<td>4 V</td>
<td>8 V</td>
<td>8 V</td>
<td>-4 ns/+6 ns</td>
</tr>
<tr>
<td>1EDB7259F</td>
<td>DSO, 8-pin, 150 mil</td>
<td>single protection $V_{CBO} = 3.0 \text{ kV}$</td>
<td>4 V</td>
<td>8 V</td>
<td>8 V</td>
<td>-7 ns/+10 ns</td>
</tr>
<tr>
<td>1EDN7550B</td>
<td>SOT23, 6-pin</td>
<td>non-isolated</td>
<td>4 V</td>
<td>8 V</td>
<td>8 V</td>
<td>-4 ns/+10 ns</td>
</tr>
<tr>
<td>1EDT8550B</td>
<td>SOT23, 6-pin</td>
<td>non-isolated</td>
<td>4 V</td>
<td>8 V</td>
<td>8 V</td>
<td>-4 ns/+10 ns</td>
</tr>
<tr>
<td>1EDG960R042D1*</td>
<td>8x8 mm</td>
<td>QFN-28</td>
<td>42 mΩ</td>
<td>4 V</td>
<td>8 V</td>
<td>-5 ns/+9 ns</td>
</tr>
<tr>
<td>1EDG960R070D1</td>
<td>8x8 mm</td>
<td>QFN-21</td>
<td>70 mΩ</td>
<td>4 V</td>
<td>8 V</td>
<td>-5 ns/+9 ns</td>
</tr>
</tbody>
</table>

Unlock the full potential of GaN by driving CoolGaN™ HEMTs with dedicated single-channel isolated gate driver ICs from the EiceDRIVER™ family.
Silicon carbide
Revolution to rely on

Silicon carbide (SiC) devices belong to the so-called wide bandgap semiconductor group, which offers many attractive characteristics for high voltage power semiconductors remove compared to commonly used silicon (Si). In particular, the much higher breakdown field strength and thermal conductivity of silicon carbide allow developing devices which by far outperform the corresponding silicon-based ones, and enable efficiency levels unattainable otherwise. Infineon’s portfolio of SiC devices covers 600 V to 1200 V Schottky diodes as well as the revolutionary CoolSiC™ MOSFETs 650 V, 750 V, 1200 V and 1700 V.

EiceDRIVER™ SiC MOSFET gate-driver ICs are well-suited to drive SiC MOSFETs, especially Infineon’s ultra-fast switching CoolSiC™ SiC MOSFETs. These gate drivers incorporate the most important key features and parameters for driving SiC, such as tight propagation delay matching, precise input filters, wide output-side supply range, negative gate voltage capability, active Miller clamp, DESAT protection, and extended CMTI capability.

www.infineon.com/sic
CoolSiC™ silicon carbide MOSFETs 650 V

Delivering reliable and cost-effective top performance

Silicon carbide physical characteristics, from wide bandgap to electron mobility and thermal conductivity, provide the basis to engineer high-performance semiconductor technologies and products. The CoolSiC™ MOSFETs from Infineon maximize the advantages of silicon carbide, offering a high-performance product that also meets power electronics design requirements, like reliability and ease of use. As per performance, the CoolSiC™ MOSFETs show low \( R_{\text{DS(on)}} \) dependency with temperature and low switching losses. The reliability is built on technological strengths and on flawless quality processes. Some aspects of Infineon’s SiC technology, like superior gate oxide reliability, excellent thermal behavior, advanced avalanche ruggedness and short circuit capabilities, contribute to the robustness of the device. Infineon’s benchmark quality was further improved for silicon carbide, with an application-focused qualification scope exceeding standards, complemented by SiC-specific screening measures. Additional unique features, like 0 V turn-off \( V_{\text{GS}} \), wide \( V_{\text{GS}} \) range, and the use of silicon MOSFET drivers and driving schemas make CoolSiC™ MOSFETs 650 V easy to integrate and use.

CoolSiC™ MOSFETs can enable streamlined and cost-optimized system designs with fewer components, weight and size, reaching high energy efficiency and power density. For instance, the CoolSiC™ MOSFETs boast a low level of \( Q_{\text{i}} \), roughly 80% less of the best CoolMOS™ reference in the market, the CoolMOS™ CFD7. This ensures the robustness of the body diode, making the CoolSiC™ MOSFETs suitable for topologies with continuous hard commutation, like the high-efficiency totem-pole PFC, a topology that enables > 99% of efficiency.

High-efficiency CoolSiC™ totem-pole PFC in server SMPS (switched-mode power supply)

Leveraging SiC’s material properties

Robustness for continuous hard commutation topologies

CoolSiC™ MOSFETs

www.infineon.com/coolsic-mosfet-discretes

www.infineon.com/SiCgd
### CoolSiC™ MOSFET 650 V

<table>
<thead>
<tr>
<th>$R_{\text{DS(on),typ.}}$ [mΩ]</th>
<th>$R_{\text{DS(on),max.}}$ [mΩ]</th>
<th>TO-247 4-pin</th>
<th>TO-247</th>
<th>D’PAK-7</th>
<th>TOLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>27</td>
<td>IMZA65R027M1H</td>
<td>IMW65R027M1H</td>
<td>IMBG65R027M1H</td>
<td>IMT65R027M1H*</td>
</tr>
<tr>
<td>42</td>
<td>30</td>
<td>IMZA65R030M1H</td>
<td>IMW65R030M1H</td>
<td>IMBG65R030M1H</td>
<td>IMT65R030M1H*</td>
</tr>
<tr>
<td>50</td>
<td>39</td>
<td>IMZA65R039M1H</td>
<td>IMW65R039M1H</td>
<td>IMBG65R039M1H</td>
<td>IMT65R039M1H*</td>
</tr>
<tr>
<td>64</td>
<td>48</td>
<td>IMZA65R048M1H</td>
<td>IMW65R048M1H</td>
<td>IMBG65R048M1H</td>
<td>IMT65R048M1H*</td>
</tr>
<tr>
<td>74</td>
<td>57</td>
<td>IMZA65R057M1H</td>
<td>IMW65R057M1H</td>
<td>IMBG65R057M1H</td>
<td>IMT65R057M1H*</td>
</tr>
<tr>
<td>94</td>
<td>72</td>
<td>IMZA65R072M1H</td>
<td>IMW65R072M1H</td>
<td>IMBG65R072M1H</td>
<td>IMT65R072M1H*</td>
</tr>
<tr>
<td>111</td>
<td>83</td>
<td>IMZA65R083M1H</td>
<td>IMW65R083M1H</td>
<td>IMBG65R083M1H</td>
<td>IMT65R083M1H*</td>
</tr>
<tr>
<td>141</td>
<td>107</td>
<td>IMZA65R107M1H</td>
<td>IMW65R107M1H</td>
<td>IMBG65R107M1H</td>
<td>IMT65R107M1H*</td>
</tr>
<tr>
<td>217</td>
<td>163</td>
<td>IMZA65R163M1H</td>
<td>IMW65R163M1H</td>
<td>IMBG65R163M1H</td>
<td>IMT65R163M1H*</td>
</tr>
<tr>
<td>346</td>
<td>260</td>
<td>IMZA65R260M1H</td>
<td>IMW65R260M1H</td>
<td>IMBG65R260M1H</td>
<td>IMT65R260M1H*</td>
</tr>
</tbody>
</table>

### CoolSiC™ MOSFET 750 V

<table>
<thead>
<tr>
<th>$R_{\text{DS(on),typ.}}$ [mΩ]</th>
<th>$R_{\text{DS(on),max.}}$ [mΩ]</th>
<th>QOPAK TSC</th>
<th>TO263-7 (D’PAK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>8</td>
<td>AIMQ75R008M1H*</td>
<td>AIM75R008M1H*</td>
</tr>
<tr>
<td>23</td>
<td>17</td>
<td>AIMQ75R017M1H*</td>
<td>AIM75R017M1H*</td>
</tr>
<tr>
<td>57</td>
<td>42</td>
<td>AIMQ75R042M1H*</td>
<td>AIM75R042M1H*</td>
</tr>
<tr>
<td>197</td>
<td>146</td>
<td>AIMQ75R146M1H*</td>
<td>AIM75R146M1H*</td>
</tr>
</tbody>
</table>

* Coming soon

www.infineon.com/coolsic-mosfet-discretes
www.infineon.com/SiCgd
CoolSiC™ silicon carbide MOSFETs 1200 V

Infineon’s CoolSiC™ technology enables radically new product designs

Silicon carbide (SiC) opens up new degrees of freedom for designers to harness unseen levels of efficiency and system flexibility. Compared to traditional silicon-based switches like IGBTs and MOSFETs, SiC MOSFETs offer many advantages. These include the low switching losses with 1200 V and 650 V switches, very low reverse recovery losses of the internal commutation proof body diode, temperature-independent low switching losses, and threshold-free on-state characteristics. Based on volume experience and compatibility know-how, Infineon presents the revolutionary CoolSiC™ technology which enables radically new product designs with high performance and high reliability. CoolSiC™ MOSFET products are targeted for automotive, photovoltaic inverters, battery charging, EV charging, industrial drives, UPS, SMPS, and energy storage.

Features and benefits

Key features
- Very low switching losses
- Superior gate-oxide reliability
- Threshold-free on-state characteristic
- Wide gate-source voltage range
- Benchmark gate threshold voltage, $V_{GTH} = 4.5\,\text{V}$
- Fully controllable $\frac{dV}{dt}$
- Commutation robust body diode, ready for synchronous rectification

Key benefits
- Best-in-class system performance
- Efficiency improvement and reduced cooling effort
- Longer lifetime and higher reliability
- Enables higher frequency operation, allowing the increase in power density
- Reduction in system cost
- Ease of use

TO-247 4-pin package contains an additional connection to the source (Kelvin connection) used as a reference potential for the gate driving voltage, thereby eliminating the effect of voltage drops over the source inductance. The result is even lower switching losses than for the TO-247 3-pin version, especially at higher currents and higher switching frequencies.

The gate-source pin of the TO-263 7-pin package, similar to the TO-247 4-pin, eliminates the effect of voltage drops over the source inductance, further reducing turn-on switching loss. TO-263 7-pin package minimizes the leakage inductance between drain and source, reducing the risk of high turn-off voltage overshoot.

www.infineon.com/coolsic-mosfet-discretes
CoolSiC™ silicon carbide MOSFETs 1700 V

CoolSiC™ MOSFET 1700 V SMD enables best efficiency and reduced complexity for high voltage auxiliary power supplies

The CoolSiC™ 1700 V MOSFET in a TO-263-7 high-creepage package is optimized for fly-back topologies to be used in auxiliary power supplies connected to DC-link voltages 600 V up to 1000 V in numerous power applications.

Features and benefits

Key features

- Optimized for flyback topologies
- Extremely low switching loss
- 12 V/0 V gate source voltage compatible with fly-back controllers
- Fully controllable dv/dt for EMI optimization
- SMD package with enhanced creepage and clearance distances, >7 mm

Key benefits

- The CoolSiC™ 1700 V MOSFET enables simple single-ended flyback topology at high efficiency level for use in auxiliary power supplies
- SMD package enables direct integration into PCB, with natural convection cooling without extra heatsink
- Reduced isolation efforts due to extended creepage and clearance distance of package
- Reduced system complexity
- High power density
CoolSiC™ Schottky diodes

The differences in material properties between silicon carbide and silicon limit the fabrication of practical silicon unipolar diodes (Schottky diodes) to a range up to 100-150 V, with a relatively high on-state resistance and leakage current. With SiC, Schottky diodes can reach a much higher breakdown voltage. With more than 20 years of field experience in SiC, Infineon is the world’s first SiC discrete power supplier. Infineon offers products up to 1200 V in discrete packages and up to 1700 V in modules.

The long market presence and experience enable Infineon to deliver highly reliable, industry-leading SiC performance. With over ten years of pioneering experience in developing and manufacturing SiC diodes, Infineon’s latest CoolSiC™ Schottky diode generation 6 family sets a benchmark in quality, efficiency and reliability.

Features
- No reverse recovery charge
- Purely capacitive switching
- High operating temperature ($T_{j, \text{max}}$ 175°C)

Advantages
- Low turn-off losses
- Reduction of CoolMOS™ or IGBT turn-on loss
- Switching losses independent from load current, switching speed and temperature

Benefits
- System efficiency improvement compared to Si diodes
- Reduced cooling requirements
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature
- Reduced EMI

Applications
- Server
- Telecom
- Solar
- UPS
- EV charging
- Energy storage
- PC power
- Motor drives
- Lighting
- CAV

Reverse-recovery charge of SiC Schottky diodes versus Si-pin diodes
The majority of carrier characteristics imply no reverse recovery charge and the only contribution to the switching losses comes from the tiny displacement charge of capacitive nature. In the same voltage range, silicon devices have a bipolar component resulting in much higher switching losses. The graph shows the comparison between various 600 V devices.

Improved system efficiency (PFC in CCM mode operation, full load, low line)
The fast switching characteristics of the SiC diodes provide clear efficiency improvements at a system level. The performance gap between SiC and high-end silicon devices increases with the operating frequency.
CoolSiC™ Schottky diodes 650 V

The CoolSiC™ Schottky diode 650 V G6 product family is built over the strong characteristics of the previous G5 generation, fully leveraging technology and process innovation to propose the best efficiency and zero price/performance products to date.

Foundation technology – CoolSiC™ Schottky diodes 650 V G5

The established CoolSiC™ Schottky diodes G5 product family has been optimized after all key aspects including junction structure, substrate and die attach. It represents a well-balanced product family which offers state-of-the-art performance and high surge current capability at a competitive cost level.

Innovation: optimized junction, substrate and die attach

Infineon’s SiC Schottky diode generation 5 is optimized with regard to all key aspects relevant for high-power and high-efficiency SMPS applications.

Junction: merged PN structure

On the junction level, it has an optimized merged PN structure. Compared to competitors, Infineon’s SiC diode has an additional P-doped area, which, together with the N-doped EPI layer, forms a PN junction diode. Thus, it is a combination of Schottky diode and PN junction diode. Under normal conditions it works like a standard Schottky diode. Under abnormal conditions such as lighting, AC line drop-out, it works like a PN junction diode. At high current level, the PN junction diode has a significantly lower forward voltage ($V_f$) than the Schottky diode, which leads to less power dissipation, thus significantly improving the surge current capability.

Substrate: thin wafer technology

On the substrate level, Infineon introduced the thin wafer technology. At the later stage of our SiC diode production, the thin wafer process is used to reduce the wafer thickness by about two-thirds, which significantly reduces the substrate resistance contribution, thus, improving both forward voltage ($V_f$) and thermal performance.

Die attach: diffusion soldering

On the backside, package level diffusion soldering is introduced, which significantly improves the thermal path between the lead frame and the diode, enhancing the thermal performance. With the same chip size and power dissipation, the junction temperature is reduced by 30°C.

www.infineon.com/sic-diodes
Latest development - CoolSiC™ Schottky diodes 650 V G6

The CoolSiC™ Schottky diodes G6 product family introduces a novel and proprietary Schottky metal system. This contributes to reducing the forward voltage (VF) to challenging levels, determining a measurable decrease of conduction losses. Infineon’s CoolSiC™ Schottky diodes enable optimum efficiency and ruggedness. Lower forward voltage (VF) means lower conduction loss, and lower capacitive charge (Qc) means lower switching loss. Qc x VF is the figure of merit for efficiency, and comparison indicates that the latest generation 6 products have the lowest Qc x VF on the market. Infineon’s CoolSiC™ Schottky diodes offer a surge current robustness far better than the one offered by the most efficient products. Thus, under abnormal conditions, this surge current capability offers excellent device robustness.

Efficiency comparison

In terms of efficiency, the 8 A G6 device has been tested in CCM PFC. The maximum output power is 3.5 kW. The left figure shows the relative efficiency at 65 kHz, while the figure on the right shows the relative efficiency at 130 kHz. This shows that Infineon’s CoolSiC™ Schottky diode G6 delivers better efficiency over the full load range, keeping this advantage even at 130 kHz, therefore meeting the needs of designers who want to increase the switching frequencies in their designs to attain more power density.

The best price performance

CoolSiC™ Schottky diodes G6 are the outcome of Infineon’s continuous technological and process improvements, which enable the design and development of SiC-based products, making them more price-competitive and increasing performance across generations. As a result, G6 is Infineon’s best price/performance CoolSiC™ Schottky diode generation, offering the highest cost-efficiency. In addition, Infineon offers the reliability of collaborating with the industry leader. Customers can leverage Infineon’s proven quality and supply chain reliability. They can benefit from “one-stop-shop” advantages and maximize system performance, combining CoolSiC™ Schottky diodes with the SJ MOSFETs of the CoolMOS™ 7 family, such as 600 V C7, 650 V C7, 600 V G7, 650 V G7 and 600 V P7.

A comprehensive portfolio

The combined G6 and G5 CoolSiC™ Schottky diode 650 V diode portfolio offers a wide choice of packages and ampere class granularity to allow the best fit to applications. G6 comes in double DPAK, the first top-side cooled surface mount package, which allows thermal decoupling of PCB to chip junction and enables higher power dissipation and improved system lifetime thanks to the reduced board temperature.

www.infineon.com/coolsic-g6
CoolSiC™ Schottky diodes 1200 V

A new level of system efficiency and reliability

By using hybrid Si power switch/SiC diode sets, industrial application designers will gain flexibility for system optimization compared to purely silicon-based solutions. SiC diodes enable system improvements such as higher output power, greater efficiency or higher switching frequency. By implementing CoolSiC™ diodes generation 5, for example, in Vienna rectifier topology, in combination with Infineon’s 650 V TRENCHSTOP™ IGBTs and 650 V CoolMOS™ MOSFETs, designers can achieve outstanding system-level performance and reliability.

One of the most commonly used topologies for EV DC charging

Features and benefits

Key features
- Zero Qrr, leading to no reverse recovery losses
- High surge current capability up to fourteen times of the nominal current
- Tight forward voltage distribution
- Temperature-independent switching behavior
- Low forward voltage (VF = 1.4 V) even at high operating temperature
- Available in both through-hole and SMD packages
- Up to 40 A rated diode

Key benefits
- System efficiency improvement over Si-based diodes
- Enabling higher frequency/increased power density solutions
- High system reliability by extended surge current
- Reduced cooling requirements through lower diode losses and lower case temperatures
- System size/cost saving due to reduced heatsink requirements and smaller magnetics

650 V Si IGBT/Si SJ MOSFET and 1200 V SiC diode/ultrafast Si diode in a Vienna rectifier topology, fsw=48 kHz

SiC vs. Si diode
- +0.8% higher efficiency
- Increased output power is possible

www.infineon.com/sicdiodes1200v
### CoolSiC™ Schottky diodes 650 V G6

**ACTIVE & PREFERRED**

<table>
<thead>
<tr>
<th>$I_p$ [A]</th>
<th>TO-220 R2L</th>
<th>TO-247 R2L</th>
<th>Double DPAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>IDH04G65C6</td>
<td>IDDD04G65C6</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IDH06G65C6</td>
<td>IDDD06G65C6</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>IDH08G65C6</td>
<td>IDDD08G65C6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IDH10G65C6</td>
<td>IDDD10G65C6</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>IDH12G65C6</td>
<td>IDDD12G65C6</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>IDH16G65C6</td>
<td>IDDD16G65C6</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>IDH20G65C6</td>
<td>IDDD20G65C6</td>
<td></td>
</tr>
</tbody>
</table>

### CoolSiC™ Schottky diodes 650 V G5

**ACTIVE**

<table>
<thead>
<tr>
<th>$I_p$ [A]</th>
<th>TO-220 R2L</th>
<th>TO-247 Dual Die</th>
<th>TO-247</th>
<th>DPAK R2L</th>
<th>ThinPAK 8x8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>IDH02G65C5</td>
<td></td>
<td></td>
<td>IDK02G65C5</td>
<td>IDL02G65C5</td>
</tr>
<tr>
<td>3</td>
<td>IDH03G65C5</td>
<td></td>
<td></td>
<td>IDK03G65C5</td>
<td>IDL03G65C5</td>
</tr>
<tr>
<td>4</td>
<td>IDH04G65C5</td>
<td></td>
<td></td>
<td>IDK04G65C5</td>
<td>IDL04G65C5</td>
</tr>
<tr>
<td>5</td>
<td>IDH05G65C5</td>
<td></td>
<td></td>
<td>IDK05G65C5</td>
<td>IDL05G65C5</td>
</tr>
<tr>
<td>6</td>
<td>IDH06G65C5</td>
<td></td>
<td></td>
<td>IDK06G65C5</td>
<td>IDL06G65C5</td>
</tr>
<tr>
<td>8</td>
<td>IDH08G65C5</td>
<td></td>
<td></td>
<td>IDK08G65C5</td>
<td>IDL08G65C5</td>
</tr>
<tr>
<td>9</td>
<td>IDH09G65C5</td>
<td></td>
<td></td>
<td>IDK09G65C5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IDH10G65C5</td>
<td>IDW10G65C5</td>
<td></td>
<td>IDK10G65C5</td>
<td>IDL10G65C5</td>
</tr>
<tr>
<td>12</td>
<td>IDH12G65C5</td>
<td>IDW12G65C5</td>
<td></td>
<td>IDK12G65C5</td>
<td>IDL12G65C5</td>
</tr>
<tr>
<td>16</td>
<td>IDH16G65C5</td>
<td>IDW16G65C5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>IDH20G65C5</td>
<td>IDW20G65C5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>IDW24G65C5B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30/32</td>
<td>IDW32G65C5B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IDW40G65C5B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/coolsic-diodes

*For more information on the product, contact our product support.*

"B" in product name refers to dual die with the common-cathode configuration.
### CoolSiC™ Schottky diodes 600 V G3  
**ACTIVE**

<table>
<thead>
<tr>
<th>$I_F$ [A]</th>
<th>TO-220 R2L</th>
<th>DPAK R2L</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>IDH03SG60C</td>
<td>IDD03SG60C</td>
</tr>
<tr>
<td>4</td>
<td>IDH04SG60C</td>
<td>IDD04SG60C</td>
</tr>
<tr>
<td>5</td>
<td>IDH05SG60C</td>
<td>IDD05SG60C</td>
</tr>
<tr>
<td>6</td>
<td>IDH06SG60C</td>
<td>IDD06SG60C</td>
</tr>
<tr>
<td>8</td>
<td>IDH08SG60C</td>
<td>IDD08SG60C</td>
</tr>
<tr>
<td>9</td>
<td>IDH09SG60C</td>
<td>IDD09SG60C</td>
</tr>
<tr>
<td>10</td>
<td>IDH10SG60C</td>
<td>IDD10SG60C</td>
</tr>
<tr>
<td>12</td>
<td>IDH12SG60C</td>
<td></td>
</tr>
</tbody>
</table>

*B* in product name refers to dual die with the common-cathode configuration.

### CoolSiC™ Schottky diodes 1200 V G5  
**ACTIVE & PREFERRED**

<table>
<thead>
<tr>
<th>$I_F$ [A]</th>
<th>TO-220 R2L</th>
<th>TO-247 Dual Die</th>
<th>TO-247 R2L</th>
<th>DPAK R2L</th>
<th>DPAK R2L</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>IDH02G120C5</td>
<td></td>
<td>IDM02G120C5</td>
<td>IDK02G120C5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IDH05G120C5</td>
<td></td>
<td>IDM05G120C5</td>
<td>IDK05G120C5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>IDH08G120C5</td>
<td></td>
<td>IDM08G120C5</td>
<td>IDK08G120C5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IDH10G120C5</td>
<td>IDW10G120C5B</td>
<td>IDW10G120C5</td>
<td>IDM10G120C5</td>
<td>IDK10G120C5</td>
</tr>
<tr>
<td>12/16</td>
<td>IDH12G120C5</td>
<td></td>
<td>IDW12G120C5</td>
<td>IDK12G120C5</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>IDH20G120C5</td>
<td>IDW20G120C5B</td>
<td>IDW20G120C5</td>
<td>IDK20G120C5</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>IDH30G120C5</td>
<td></td>
<td>IDW30G120C5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>IDH40G120C5</td>
<td>IDW40G120C5B</td>
<td>IDW40G120C5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For more information on the product, contact our product support.*

[www.infineon.com/coolsic-diodes](http://www.infineon.com/coolsic-diodes)

*For more details on the product, click on the part number, visit infineon.com or contact our product support.*
Nomenclature

CoolSiC™ Schottky diodes G2 and G3

<table>
<thead>
<tr>
<th>I</th>
<th>D</th>
<th>H</th>
<th>X</th>
<th>S</th>
<th>G</th>
<th>X</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>D = Diode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package type</td>
<td>D = DPAK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H = TO-220 R2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B = DPAK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V = TO-220 FullPAK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W = TO-247</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continuous forward current [A]

Specifications

C = Surge current stable

Breakdown voltage

60 = 600 V

G = Low thermal resistance (diffusion soldering)

Technology

S = SiC diode

CoolSiC™ Schottky diodes G5 and G6

<table>
<thead>
<tr>
<th>I</th>
<th>D</th>
<th>K</th>
<th>X</th>
<th>G</th>
<th>X</th>
<th>C</th>
<th>5</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>D = Diode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package type</td>
<td>H = TO-220 R2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W = TO-247</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>K = DPAK R2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L = ThinPAK 8x8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M = DPAK R2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WD = TO-247 R2L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continuous forward current [A]

Specifications

C = Surge current stable*

Breakdown voltage

65 = 650 V

G = Low thermal resistance

*Generation

---

www.infineon.com/coolsic-diodes
Infineon support for wide bandgap semiconductors
Useful links and helpful information

Further information, datasheets and documents
www.infineon.com/wbg
www.infineon.com/gan
www.infineon.com/gan-ips
www.infineon.com/gan-eicedriver

www.infineon.com/sic
www.infineon.com/sic-diodes
www.infineon.com/SiCgd
community.infineon.com
XENSIV™ sensor technologies for automotive, industrial and consumer applications

› Barometric (BAP) and manifold (MAP) sensors
› Current sensors
› Magnetic position sensors
› Magnetic speed sensors
› MEMS microphones for automotive
› Intuitive sensing
› XENSIV™ MEMS microphone for consumer applications
› Pressure sensors for IoT
› PAS CO2 sensor
› 60 GHz radar sensor ICs
› 24 GHz radar sensor ICs
› Shield2Go
› Sensor 2GO kits

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

Feedback
Infineon XENSIV™ – sensing the world

Infineon XENSIV™ sensors are exceptionally precise thanks to industry-leading technologies.

From a world leader in sensing technology, XENSIV™ sensors smartify lives by enabling things to “see”, “hear”, “feel”, and “smell” and therefore intuitively “understand” their environment. As a result of proven quality and outstanding reliability, customers can count on XENSIV™ for system stability, durability and integrity. Providing high accuracy and best-in-class measurement performance, XENSIV™ sensors add great value to customer applications. More than 40 years of experience in sensing solutions and a deep-rooted system understanding result in the broadest portfolio of ready-to-use sensor solutions on the market. Ecosystem partners and our customers partner with us for leading technologies, perfect-fit solutions and continuous innovation.

In the Internet of Things, sensors are omnipresent and mark the starting point of each and every IoT system. They collect all kinds of data on their surroundings, providing the entry point for all subsequent functions and features. Building on its well-founded systems expertise, Infineon’s broad portfolio in the XENSIV™ family contains ready-to-use solutions to enable a fast time-to-market and reliable functionality for applications in the area of smart home & smart building, smart things, smart factory or smart cars.

We inspire the next generation of smart environments, capable of understanding and responding to human communication. Infineon’s semiconductors are at the very heart of machine-to-machine (M2M), human-machine interface (HMI), mobile and wireless infrastructure technologies. As the technological boundary between humans and machines gradually disappears, these devices need even more advanced intelligence, enriched with voice assistance capabilities and the latest sensor fusion innovations, not to mention robust security technologies to protect personal data. Infineon’s sensors and microphones already deliver this intelligent functionality and inspiring the next step in mobile connectivity.

www.infineon.com/xensiv
Barometric (BAP) and manifold (MAP) sensors

Infineon’s pressure sensors offer the highest quality and accuracy for safety-relevant automotive, industrial, or consumer lifestyle applications. Typical safety-related automotive pressure sensing applications such as side-impact and pedestrian protection call for the highest quality and accuracy standards with full ISO 26262 compliance. Our XENSIV™ family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for a safety-critical use case. Discover our highlight product dedicated to 2-wheelers: KP212 enables lower CO2 emissions, as well as lower fuel consumption, which makes it the right fit product worldwide to fulfill emission regulation requirements such as CN6 and Bharat 6. Of course, these sensors can also be used in industrial control, consumer applications, as well as medical applications.

KP21x/KP22x – Analog manifold air pressure sensor IC family (MAP + turbo MAP)

Features
› Manifold air pressure measurement – MAP and turbo MAP
› Excellent accuracy of up to 1.0 kPa over a large temperature range
› Ratiometric analog voltage output proportional to the applied pressure
› Output signal fully compensated over pressure and temperature
› Pressure range from 10 to 400 kPa
› Temperature range from -40 to +140°C
› Output clamping (optional)
› Complete product family available with multiple transfer function
› Reverse polarity protection
› Green SMD package

KP23x – Analog barometric air pressure (BAP) sensor IC family

Features
› Absolute air pressure measurement
› Excellent accuracy of 1.0 kPa over a large temperature range
› Ratiometric analog voltage output proportional to the applied pressure
› Output signal fully compensated across pressure and temperature range
› Pressure range from 40 to 165 kPa
› Temperature range from -40 to +125°C
› Serial service interface
› Open bond detection (OBD) for supply and GND
› Inverse polarity protection
› Green SMD package

KP25x/KP264 – Digital barometric air pressure (BAP) sensor IC family

Features
› Absolute air pressure measurement
› Excellent accuracy of 1.0 kPa over a large temperature range
› Real 10-bit pressure resolution
› Integrated temperature sensor
› Real 10-bit temperature resolution
› Power-down mode for reduced power consumption
› Self diagnosis features
› Output signal fully compensated across pressure and temperature range
› Pressure range from 40 to 165 kPa
› Temperature range from -40 to +125°C
› Green SMD package

ISO 26262 ready

www.infineon.com/pressure
KP276
Media robust MAP sensor with digital interface

Features
› Media robustness for current automotive requirements
› Digital single edge nibble transmission (SENT) interface (282 clock ticks)
› Excellent accuracy of ±0.77 percent FSS
› Green SMD package
› Temperature range -40 to +170°C
› Integrated NTC temperature sensor functionality with fast start up time (typ. 10ms)

Block diagram

Integrated pressure sensor ICs for manifold and barometric air pressure

<table>
<thead>
<tr>
<th>Product</th>
<th>Max. accuracy [kPa]</th>
<th>Max. operating temperature [°C]</th>
<th>Automotive</th>
<th>Industrial</th>
<th>ISO 26262</th>
<th>Pressure range [kPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>KP21x*</td>
<td>1.0</td>
<td>140</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>10 ... 150</td>
</tr>
<tr>
<td>KP22x*</td>
<td>2.5</td>
<td>140</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>10 ... 400</td>
</tr>
<tr>
<td>KP23x*</td>
<td>1.0</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>15 ... 115</td>
</tr>
<tr>
<td>KP236N6165</td>
<td>1.0</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>60 ... 165</td>
</tr>
<tr>
<td>KP253</td>
<td>1.0</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>60 ... 165</td>
</tr>
<tr>
<td>KP254</td>
<td>1.5</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>40 ... 115</td>
</tr>
<tr>
<td>KP255*</td>
<td>1.4</td>
<td>140</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>10 ... 125</td>
</tr>
<tr>
<td>KP256</td>
<td>1.0</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>60 ... 165</td>
</tr>
<tr>
<td>KP264 2)</td>
<td>1.5</td>
<td>125</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>40 ... 115</td>
</tr>
<tr>
<td>KP276*</td>
<td>3.0</td>
<td>170</td>
<td>✓</td>
<td>✓</td>
<td>Ready</td>
<td>10 ... 400</td>
</tr>
</tbody>
</table>

*For more information on the product, contact our product support
2) Package with small 4-hole lid

www.infineon.com/pressure

For more details on the product, click on the part number, visit infineon.com or contact our product support.
XENSIV™ – high-precision coreless current sensors

The Infineon current sensors provide accurate and stable current measurement up to 120A for sensors with integrated current rail, or 31mT respectively for sensors for external current rails. The integrated current rail is preferred for currents from 25A to 120A peak, whereas the external current rail sensors achieve currents up to 2500A. The products are intended for use in 48V environments as well as for high voltage applications such as traction inverters, industrial drives, photovoltaic inverters, or battery disconnect systems.

The coreless open-loop sensors are based on Infineon’s precise and stable Hall technology, thus the output signal is highly linear over temperature and lifetime. With the lack of an iron core the sensor signal shows neither hysteresis nor does it suffer from saturation.

The differential measurement with two Hall cells ensures highest accuracy even in noisy environments with cross-talk from adjacent current lines or magnetic stray fields. Designers can program the sensitivity of the sensor, as well as the threshold levels of the two dedicated overcurrent signals to adapt them to individual requirements without any external components. The sensor also provides a signal in case of an over- or under-voltage condition for the supply voltage.

Highlights of the XENSIV TLx4971 family include best-in-class thermal performance for the designated operating currents due to its innovative TISON-8 package as well as isolation against high voltages. Due to the different pre-programmed derivatives there is no need for external calibration. The very low insertion resistance of 220 µW and insertion inductance of less than 1nH allows the usage of these sensors is modern GaN or SiC applications in industrial or automotive applications.

Highlights of the XENSIV TLE4972 include a full scale up to ±31mT it is possible to measure currents up to 2.500 amperes. All negative effects (e.g. saturation, hysteresis) commonly known from open loop sensors using flux concentration techniques are avoided.

The sensor is an ISO 26262 Safety Element out of Context for safety requirements up to ASIL B and is equipped with internal self-diagnostics.

www.infineon.com/current-sensors
**TLI4971**

High-precision coreless sensors for industrial applications

**Features**

› Integrated current rail with typical 220 μΩ insertion resistance enables ultralow power loss  
› Small form factor, 8x8 mm SMD, for easy integration and board area saving  
› Highly accurate, scalable, DC and AC current sensing  
› Bandwidth of 240 kHz enables wide range of applications  
› Very low sensitivity error over temperature (< 2.5%)  
› Excellent stability of offset over temperature and lifetime  
› Galvanic functional isolation up to 1150 V peak VIORM; partial discharge capability of at least 1200 V; 4 mm clearance and creepage  
› Differential sensor principle ensures superior magnetic stray field suppression  
› Two independent fast over-current detection (OCD) pins with configurable thresholds enable protection mechanisms for power circuitry (typical < 1.5 μs)  
› Pre-calibrated sensor

**Applications**

› Electrical drives (up to 690 V)  
› Photovoltaic inverter  
› General purpose & GaN-based inverters  
› Chargers  
› Power supplies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TLI4971-A02ST5-U-E0001</td>
<td>3.45%</td>
<td>25</td>
<td>240 kHz typ.</td>
<td>48</td>
<td>UL</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A02ST5-E0001</td>
<td>3.45%</td>
<td>25</td>
<td>240 kHz typ.</td>
<td>48</td>
<td>–</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A05ST5-U-E0001</td>
<td>3.45%</td>
<td>50</td>
<td>240 kHz typ.</td>
<td>24</td>
<td>UL</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A05ST5-E0001</td>
<td>3.45%</td>
<td>50</td>
<td>240 kHz typ.</td>
<td>24</td>
<td>–</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A07ST5-U-E0001</td>
<td>3.45%</td>
<td>75</td>
<td>240 kHz typ.</td>
<td>16</td>
<td>UL</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A07ST5-E0001</td>
<td>3.45%</td>
<td>75</td>
<td>240 kHz typ.</td>
<td>16</td>
<td>–</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A120ST5-U-E0001</td>
<td>3.45%</td>
<td>120</td>
<td>240 kHz typ.</td>
<td>10</td>
<td>UL</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLI4971-A120ST5-E0001</td>
<td>3.45%</td>
<td>120</td>
<td>240 kHz typ.</td>
<td>10</td>
<td>–</td>
<td>✓</td>
<td>3.3</td>
<td>TISON-8</td>
</tr>
</tbody>
</table>

1) Total error over lifetime and temperature

www.infineon.com/current-sensors

For more details on the product, click on the part number, visit infineon.com or contact our product support.
TLE4971
High-precision coreless current sensor for automotive applications

The Infineon TLE4971 is a high-precision current sensor for bi-directional AC and DC measurements. The device has an analog interface and two fast overcurrent detection outputs that support the power circuitry’s protection. Galvanic isolation is provided due to magnetic sensing principle.

Infineon’s well-established and robust monolithic Hall technology enables accurate and highly linear measurement of currents with a full scale up to 120 A. Negative effects, like saturation and hysteresis, commonly known from core-based sensor techniques, are not present in the Infineon open loop, coreless sensors principle. The smart current rail design (double U-shape) combined with a differential signal sensing makes the current sensor robust against stray fields. The sensor is shipped as a fully calibrated product without requiring any customer end-of-line calibration. It comes in a small 8 mm x 8 mm TISON-8 leadless package, which allows standard SMD assembly. The sensor can be reprogrammed for many parameters enabling the customer to achieve maximal adaption for his application requirements.

Features and benefits

- Ultra-low power loss due to minimal resistance of current rail
- Reliable current measurement over lifetime (no re-calibration)
- Functional isolation for high-voltage application
- Easy and compact package allows high-power density design
- Pre-programmed variants for 25 A, 50 A, 75 A and 120 A
- High accuracy, low noise analog output

Block diagram

The integrated primary conductor (current rail) with very low insertion resistance and inductance minimizes the power loss and enables miniaturization of the sensing circuit. The analog output (AOUT) can be configured in single-ended, semi-differential, and fully-differential mode together with the voltage reference pin (VREF). Two separate overcurrent pins (OCD1/OCD2) provide a fast output signal in case the current exceeds a pre-set threshold.

<table>
<thead>
<tr>
<th>Product</th>
<th>Accuracy</th>
<th>Current [A]</th>
<th>Bandwidth [kHz]</th>
<th>Sensitivity [mV/A]</th>
<th>Certification</th>
<th>Automotive</th>
<th>Industrial</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4971-A02SN5-U-E0001</td>
<td>3.45%</td>
<td>25</td>
<td>210 kHz typ.</td>
<td>48</td>
<td>UL</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A02SN5-E0001</td>
<td>3.45%</td>
<td>25</td>
<td>210 kHz typ.</td>
<td>48</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A05SN5-U-E0001</td>
<td>3.45%</td>
<td>50</td>
<td>210 kHz typ.</td>
<td>24</td>
<td>UL</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A05SN5-E0001</td>
<td>3.45%</td>
<td>50</td>
<td>210 kHz typ.</td>
<td>24</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A07SN5-U-E0001</td>
<td>3.45%</td>
<td>75</td>
<td>210 kHz typ.</td>
<td>16</td>
<td>UL</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A07SN5-E0001</td>
<td>3.45%</td>
<td>75</td>
<td>210 kHz typ.</td>
<td>16</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A120SN5-U-E0001</td>
<td>3.45%</td>
<td>120</td>
<td>210 kHz typ.</td>
<td>10</td>
<td>UL</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
<tr>
<td>TLE4971-A120SN5-E0001</td>
<td>3.45%</td>
<td>120</td>
<td>210 kHz typ.</td>
<td>10</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>TISON-8</td>
</tr>
</tbody>
</table>

1) Available Q2/2022

www.infineon.com/current-sensors
TLE4972
Magnetic current sensor for automotive applications

The Infineon TLE4972 product family of core-less magnetic current sensors specifically addresses requirements for current sensing in automotive applications. The well-established and robust Hall technology enables accurate and highly linear current measurements of the magnetic field induced by the current. With its compact design and diagnosis modes, the TLE4972 is ideal for xEV applications like traction inverters used in hybrid and battery-driven vehicles, as well as for battery main switches.

Block diagram

Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>✷ Hall based core-less magnetic current sensor</td>
<td>✷ High accuracy up to 2 kA</td>
</tr>
<tr>
<td>❉ AC and DC sensing</td>
<td>✷ Very low error over temperature and lifetime</td>
</tr>
<tr>
<td>✷ Two dedicated pins for overcurrent detection</td>
<td>✷ Protection against overcurrent events for fast switching technologies, e.g. SiC</td>
</tr>
<tr>
<td>✷ Scalable sensitivity</td>
<td>✷ No saturation or hysteresis effects</td>
</tr>
<tr>
<td>✷ ISO 26262 compliant</td>
<td>✷ Very low power losses through sensing structure</td>
</tr>
<tr>
<td>✷ ASIL B as SAEoC</td>
<td>✷ Ideal for platform designs</td>
</tr>
<tr>
<td>✷ Typical bandwidth of 210 kHz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Meas. range [±%]</th>
<th>Total drift over temperature &amp; lifetime [±%]</th>
<th>Bandwidth typ. [kHz]</th>
<th>Diagnosis</th>
<th>Interface</th>
<th>ATV</th>
<th>IND</th>
<th>Supply [V]</th>
<th>Package (footprint) [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4972-AE35DS</td>
<td>High precision core-less current sensor with diagnosis capability. External current rail packages for high current measurement.</td>
<td>up to 31</td>
<td>Typ: ±1.4% ±3σ (25 – 125°C) Min/Max: ± 2% (25 – 125°C)</td>
<td>210</td>
<td>OCD 1, OCD 2, OV, UV, diagnosis mode</td>
<td>analog</td>
<td>✓</td>
<td>✓</td>
<td>3.3</td>
<td>TDSO-16 (5x6)</td>
</tr>
<tr>
<td>TLE4972-AE35SS</td>
<td>Typ: ±1.3% ±3σ (25 – 150°C) Min/Max: ± 2% (25 – 150°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VSON-6 (3.5x4.5)</td>
</tr>
</tbody>
</table>

www.infineon.com/currents-sensors
Magnetic switches
The energy-saving option with excellent accuracy, robustness, and quality

**TLE/TLI/TLV4961/64/6: Energy-efficient Hall switch family for up to 32 V**

The TLE/TLI/TLV496x-xM/L family of Hall switches saves energy and enables designers to create precise, compact systems. With an operational current consumption of just 1.6 mA, TLE/TLI/TLV496x-xM/L products can cut energy consumption up to 50 percent when compared with similar competitor products. Thanks to its small magnetic hysteresis, the family paves the way for precise switching points in systems. The integrated temperature profile compensates magnetic drifts and enables stable performance over temperature and lifetime. TLE/TLI/TLV496x-xM products come in the small SOT23 package. The sensors also feature an integrated functionality test for better system control.

**Features**
- Current consumption of just 1.6 mA
- 3 to 32 V supply voltage range (over voltage up to 42 V)
- 7 kV ESD protection (HBM)
- Overtemperature and overcurrent protection
- Temperature compensation
- Smallest SOT23 package
- Dedicated products for industrial applications (TLI496x)
- AEC-Q100 qualified
- Electrical drives

**Applications**
- Window lift (index counting)
- Power closing (index counting)
- Gear stick (position detection)
- Seat belt (position detection)
- BLDC commutation
  (e.g. wiper seat belt pretentioner, pump, seating)
- Service robots
- Power tools
- White goods
- Electrical drives

<table>
<thead>
<tr>
<th>Product</th>
<th>Type</th>
<th>Operating point BOP [mT]</th>
<th>Release point BRP [mT]</th>
<th>Hysteresis ΔBHY [mT]</th>
<th>Automotive</th>
<th>Industrial</th>
<th>Consumer</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4961-1M/L</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23/SSO-3-2</td>
</tr>
<tr>
<td>TLE4961-2M</td>
<td>Latch</td>
<td>5.0</td>
<td>-5.0</td>
<td>10.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4961-3M/L</td>
<td>Latch</td>
<td>7.5</td>
<td>-7.5</td>
<td>15.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23/SSO-3-2</td>
</tr>
<tr>
<td>TLE4964-1M</td>
<td>Switch</td>
<td>18.0</td>
<td>12.5</td>
<td>5.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4964-2M</td>
<td>Switch</td>
<td>28.0</td>
<td>22.5</td>
<td>5.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4964-3M</td>
<td>Switch</td>
<td>12.5</td>
<td>9.5</td>
<td>3.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4964-5M</td>
<td>Switch</td>
<td>7.5</td>
<td>5.0</td>
<td>2.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4968-1M/L</td>
<td>Bipolar</td>
<td>1.0</td>
<td>-1.0</td>
<td>2.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23/SSO-3-2</td>
</tr>
<tr>
<td>TLE4961-5M</td>
<td>Latch</td>
<td>15.0</td>
<td>-15.0</td>
<td>30.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4961-6M</td>
<td>Latch</td>
<td>10.0</td>
<td>-10.0</td>
<td>20.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4964-3M</td>
<td>Switch</td>
<td>10.0</td>
<td>8.5</td>
<td>1.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4964-6M</td>
<td>Switch</td>
<td>3.5</td>
<td>2.5</td>
<td>1.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLV4964-1M</td>
<td>Switch</td>
<td>18.0</td>
<td>12.5</td>
<td>5.5</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLV4964-2M</td>
<td>Switch</td>
<td>28.0</td>
<td>22.5</td>
<td>5.5</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>SOT23/SSO-3-2</td>
</tr>
<tr>
<td>TLI4961-1M/L</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLI4961-3M</td>
<td>Latch</td>
<td>7.5</td>
<td>-7.0</td>
<td>15.0</td>
<td>–</td>
<td>–</td>
<td>✓</td>
<td>SOT23</td>
</tr>
</tbody>
</table>

www.infineon.com/Hall-switches
Magnetic position sensors

**TLE/TLI4963/65-xM**

5 V high-precision automotive/industrial Hall-effect sensors

By offering an excellent magnetic behavior Infineon’s switches are ideally suited for:
- Index counting application with a pole wheel
- Rotor position detection (BLDC motors)
- Open/close detection

**Features**
- 3.0 to 5.5 V operating supply voltage
- Low current consumption 1.4 mA
- ESD protection 4 kV HBM
- Active error compensation (chopped)
- High stability of magnetic thresholds
- Low jitter (typ. 0.35 μs)
- Operating temperature range:
  - from -40 to +170°C (TLE496x-xM)
  - from -40 to +125°C (TLI496x-xM)
- Small SMD package SOT23
- TLE: AEC-Q100 qualified
- TLI: JESD47 qualified

**TLV496x-xTA/B**

Precision Hall-effect sensor for consumer applications in leaded package

**Features**
- 3.0 to 26 V operating supply voltage
- Low current consumption 1.6 mA
- ESD protection 4 kV HBM
- Operating temperature range from -40 to +125 °C
- Ledged package TO92S

**Applications**
- BLDC motor commutation for consumer devices (e.g. e-bikes, fans, aircons)
- Position detection e.g. flaps and control buttons

**Table 1: Magnetic position sensors TLE/TLI4963/65-xM**

<table>
<thead>
<tr>
<th>Product</th>
<th>Type</th>
<th>Operating point BoP [mT]</th>
<th>Release point BoR [mT]</th>
<th>Hysteresis ΔBHY [mT]</th>
<th>Automotive</th>
<th>Industrial</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4963-1M</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4963-2M</td>
<td>Latch</td>
<td>5.0</td>
<td>-5.0</td>
<td>10.0</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLE4965-5M</td>
<td>Unipolar switch</td>
<td>7.5</td>
<td>5.0</td>
<td>2.5</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLI4963-1M</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLI4963-2M</td>
<td>Latch</td>
<td>5.0</td>
<td>-5.0</td>
<td>10.0</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
<tr>
<td>TLI4965-5M</td>
<td>Unipolar switch</td>
<td>7.5</td>
<td>5.0</td>
<td>2.5</td>
<td>✓</td>
<td>✓</td>
<td>SOT23</td>
</tr>
</tbody>
</table>

**Table 2: Magnetic position sensors TLV496x-xTA/B**

<table>
<thead>
<tr>
<th>Product</th>
<th>Type</th>
<th>Operating point BoP [mT]</th>
<th>Release point BoR [mT]</th>
<th>Hysteresis ΔBHY [mT]</th>
<th>Consumer</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV4961-1TA</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>TO92S-3-1</td>
</tr>
<tr>
<td>TLV4961-1TB</td>
<td>Latch</td>
<td>2.0</td>
<td>-2.0</td>
<td>4.0</td>
<td>✓</td>
<td>TO92S-3-2</td>
</tr>
<tr>
<td>TLV4961-3TA</td>
<td>Latch</td>
<td>7.5</td>
<td>-7.5</td>
<td>15.0</td>
<td>✓</td>
<td>TO92S-3-1</td>
</tr>
<tr>
<td>TLV4961-3TB</td>
<td>Latch</td>
<td>7.5</td>
<td>-7.5</td>
<td>15.0</td>
<td>✓</td>
<td>TO92S-3-2</td>
</tr>
<tr>
<td>TLV4964-4TA</td>
<td>Unipolar switch</td>
<td>10.0</td>
<td>8.5</td>
<td>1.5</td>
<td>✓</td>
<td>TO92S-3-1</td>
</tr>
<tr>
<td>TLV4964-4TB</td>
<td>Unipolar switch</td>
<td>10.0</td>
<td>8.5</td>
<td>1.5</td>
<td>✓</td>
<td>TO92S-3-2</td>
</tr>
<tr>
<td>TLV4964-5TA</td>
<td>Unipolar switch</td>
<td>7.5</td>
<td>5.0</td>
<td>2.5</td>
<td>✓</td>
<td>TO92S-3-1</td>
</tr>
<tr>
<td>TLV4964-5TB</td>
<td>Unipolar switch</td>
<td>7.5</td>
<td>5.0</td>
<td>2.5</td>
<td>✓</td>
<td>TO92S-3-2</td>
</tr>
<tr>
<td>TLV4968-1TA</td>
<td>Latch</td>
<td>1.0</td>
<td>-1.0</td>
<td>2.0</td>
<td>✓</td>
<td>TO92S-3-1</td>
</tr>
<tr>
<td>TLV4968-1TB</td>
<td>Latch</td>
<td>1.0</td>
<td>-1.0</td>
<td>2.0</td>
<td>✓</td>
<td>TO92S-3-2</td>
</tr>
</tbody>
</table>

www.infineon.com/Hall-switches

For more details on the product, click on the part number, visit infineon.com or contact our product support.
TLx4966
Two-in-one double Hall sensor

Features
› Two Hall probes for information on speed and direction
› Excellent matching between the two Hall probes
› Hall plate distance of 1.45 mm
› High resistance to mechanical stress by Active Error Compensation
› TSOP6 package
› TLE: AEC-Q100 qualified
› TLI: JESD47 qualified

Applications
› Window lift
› Sunroof
› Automatic tailgate
› Automated doors
› Sun blinds
› Garage doors

---

<table>
<thead>
<tr>
<th>Product</th>
<th>Production samples</th>
<th>Temperature range [°C]</th>
<th>Operating voltage [V]</th>
<th>Magnetic thresholds</th>
<th>Output</th>
<th>Comment</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLx4966G</td>
<td>Available</td>
<td>-40 to +125</td>
<td>2.7-24</td>
<td>Bop: +7.5 mT</td>
<td>Speed and direction</td>
<td>Horizontal Hall plates for industrial applications</td>
<td>TSOP6-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -7.5 mT</td>
<td></td>
<td>SMD package</td>
<td></td>
</tr>
<tr>
<td>TLE4966G</td>
<td>Available</td>
<td>-40 to +150</td>
<td>2.7-24</td>
<td>Bop: +7.5 mT</td>
<td>Speed and direction</td>
<td>Horizontal Hall plates</td>
<td>TSOP6-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -7.5 mT</td>
<td></td>
<td>SMD package</td>
<td></td>
</tr>
<tr>
<td>TLE4966-2G</td>
<td>Available</td>
<td>-40 to +150</td>
<td>2.7-24</td>
<td>Bop: +7.5 mT</td>
<td>Speed and speed</td>
<td>Horizontal Hall plates</td>
<td>TSOP6-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -7.5 mT</td>
<td></td>
<td>SMD package</td>
<td></td>
</tr>
<tr>
<td>TLE4966-3G</td>
<td>Available</td>
<td>-40 to +150</td>
<td>2.7-24</td>
<td>Bop: +2.5 mT</td>
<td>Speed and direction</td>
<td>Horizontal Hall plates</td>
<td>TSOP6-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -2.5 mT</td>
<td></td>
<td>SMD package</td>
<td></td>
</tr>
<tr>
<td>TLE4966V-1G</td>
<td>Available</td>
<td>-40 to +150</td>
<td>3.5-32</td>
<td>Bop: +2.5 mT</td>
<td>Speed and direction</td>
<td>Horizontal Hall plates</td>
<td>TSOP6-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -2.5 mT</td>
<td></td>
<td>SMD package</td>
<td></td>
</tr>
<tr>
<td>TLE4966L</td>
<td>Available</td>
<td>-40 to +150</td>
<td>2.7-24</td>
<td>Bop: +7.5 mT</td>
<td>Speed and direction</td>
<td>Horizontal Hall plates</td>
<td>SS0-4-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brp: -7.5 mT</td>
<td></td>
<td>Leaded package</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/Hall-switches
Linear sensors

Programmable dual channel linear Hall sensor with fast SPC interface for high precision applications

Infineon’s TLE4999C8 is a programmable dual channel linear Hall sensor designed to meet the requirements of safety critical automotive and industrial applications. It is developed in full compliance with ISO 26262 by means of two sensor elements included within one monolithic silicon design. In order to fulfill the state-of-the-art safety requirements on system level and enable ASIL D system developments the sensor cells are designed in a complementary way. Their signals follow two independent analog paths. Each signal path has its own digital signal processing unit to ensure maximum independency - redundancy, respectively. The sensor offers a multi-point calibration with up to 9 selectable set points for enhanced linearization of the output signal. For an easy and flexible adaptation to non-linearity of magnetic circuit design, the chip provides 5 different calibration characteristics.

TLE4999C features a digital Short-PWM-Code (SPC) interface, with a bus-capability for up to 4 sensor ICs on a single data output. The communication interface with min. 0.5 μs unit time guarantees a fast transmission of complete 2 channel data signal in less than 500 μs. The additionally implemented frame holder circuit enables the synchronicity of multiple sensors (e.g. in combinations of angle sensors) via a SPC bus. The chip offers a 12, 14 and 16 Bit resolution of the output signal, ensuring highest flexibility and superior noise performance. Highest accuracy over a wide temperature range and lifetime is achieved by an integrated digital temperature- and stress-compensation. The chip is available in a thin 8-pin SMD single sensor package.

www.infineon.com/linear-halls
Features
› Fully ISO 26262 compliant, supports ASIL D systems
› < 2 % sensitivity drift, < 100 μT offset drift overtemperature and life time specification
› Integrated digital temperature- and stress-compensation
› Fast digital SPC interface with a unit time down to 0.5 μs
› Multi-point calibration with up to 9 linearization set points

Key benefits
› High diagnostic coverage, ISO 26262-compliancy and dual sensor cell integration enable development of fail operational systems
› Multi-point calibration for better fit into various magnetic circuit designs
› Easy system integration due to programmability of several sensor parameters

Applications
Automotive safety critical applications
› Electric power steering
› Linear movement position sensing
› Pedal position
› Electric throttle control
› Seat rail adjustment
› Headlight adjustment

Industrial applications
› Small home appliances
› Joystick applications

Sales name Interface Magnetic linear range [mT] Sensitivity Sensitivity drift [%] Gain Magnetic offset drift [μT] ISO 26262 Ordering code Package
TLE4997A8D Analog ratiometric 50, 100, 200 ±60 mV/mT default for 100 mT range, with gain 1.5 ±3 ±4 < ±400 Ready SP000902760 TDSO8
TLE4998P8D Digital interface PWM 50, 100, 200 ±48 LSB/mT default for 100 mT range, with gain 1.5 ±2 ±4 < ±400 Ready SP000902776 TDSO8
TLE4998S8D Digital interface SENT 50, 100, 200 ±48 LSB/mT default for 100 mT range, with gain 1.5 ±2 ±4 < ±400 Ready SP000902784 TDSO8
TLE4998C8D Digital interface SPC 50, 100, 200 ±48 LSB/mT default for 100 mT range, with gain 1.5 ±2 ±4 < ±400 Ready SP000902768 TDSO8
TLE4999I3 Digital interface PSI5 12.5, 25 ±147.5 LSB/mT default for 25 mT range, with gain 1.0 ±2 ±5 < ±100/< ±200 Compliant SP001689862 SSO-3
TLE4999C6/4 Digital interface SPC 25, 50 ±36.875 LSB/mT default for in 50 mT range, with gain 1.0 ±2 ±5 < ±100/< ±200 Compliant SP002662500 TDSO8 SSO-4

1) Maximum over drift overtemperature and life time
2) Main channel/sub channel

www.infineon.com/linear-halls
Infineon's family of TLE499x linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. These programmable linear Hall sensors come with different interface options: TLE4997 features ratiometric analog output, while TLE4998P comes with pulse width modulation (PWM), TLE4998S with single edge nibble transmission (SENT), and TLE4998C with short PWM codes (SPC). These high-precision 12-bit resolution linear Hall sensors feature EEPROM memory for flexible programming across a wide range of parameters. Thanks to digital signal processing based on a 20-bit DSP architecture plus digital temperature compensation, these sensors deliver outstanding temperature stability compared with similar compensation methods. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-in-class accuracy over the device's lifetime.

### Features
- Best-in-class accuracy with low drift of output signal temperature range lifetime (including stress compensation in TLE4998)
- Programmable transfer function (gain, offset), clamping, bandwidth, and temperature characteristics
- AEC-Q100 qualified
- Available in various packages including SSO-3-9 with two integrated capacitors to improve ESD and ESC behavior
- Dual-die SMD package
- TLE4997, TLE4998 ISO 26262 ready
- TLE4999 fully ISO 26262 compliant for highest ASIL-levels

### Applications
- Detecting linear and angular position
- Detecting pedal and throttle position
- Steering torque measurement
- Headlight leveling
- High-current sensing
- Seat position and occupant detection
- Suspension control
- Detecting gear stick/lever positions
- Detecting fuel tank levels
- Current sensing e.g. for battery management

### TLE499x family

<table>
<thead>
<tr>
<th>Product</th>
<th>Programmable</th>
<th>Number of pins</th>
<th>Sensitivity (programmable range)</th>
<th>Magnetic offset</th>
<th>Supply voltage (extended range)</th>
<th>Automotive</th>
<th>ISO 26262</th>
<th>Interface</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4997</td>
<td>EEPROM</td>
<td>3/Single die SMD 8</td>
<td>±12.5 to ±300 mV/mT</td>
<td>&lt; ±400 µT</td>
<td>5 V ±10% (7 V)</td>
<td>✓</td>
<td>-</td>
<td>Analog</td>
<td>SSO-3-10 TDSO8</td>
</tr>
<tr>
<td>TLE4998P</td>
<td>EEPROM</td>
<td>3/4/Single die SMD 8</td>
<td>±0.2 to ±6%/mT</td>
<td>&lt; ±400 µT</td>
<td>5 V ±10% (16 V)</td>
<td>✓</td>
<td>Ready</td>
<td>PWM</td>
<td>SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8</td>
</tr>
<tr>
<td>TLE4998S</td>
<td>EEPROM</td>
<td>3/4/Single die SMD 8</td>
<td>±8.2 to ±245 LSB_{12}/mT</td>
<td>&lt; ±400 µT</td>
<td>5 V ±10% (16 V)</td>
<td>✓</td>
<td>Ready</td>
<td>SENT</td>
<td>SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8</td>
</tr>
<tr>
<td>TLE4998C</td>
<td>EEPROM</td>
<td>3/4/Single die SMD 8</td>
<td>±8.2 to ±245 LSB_{12}/mT</td>
<td>&lt; ±400 µT</td>
<td>5 V ±10% (16 V)</td>
<td>✓</td>
<td>Ready</td>
<td>SPC</td>
<td>SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8</td>
</tr>
<tr>
<td>TLE49993</td>
<td>EEPROM</td>
<td>3</td>
<td>±73.72 to ±147.44 LSB_{13}/mT</td>
<td>&lt; ±300 µT</td>
<td>5.5–7 V ±10% (16 V)</td>
<td>✓</td>
<td>Compliant</td>
<td>PSI5</td>
<td>SSO-3-12 TDSO8</td>
</tr>
<tr>
<td>TLE4999C8/4</td>
<td>EEPROM</td>
<td>Single die SMD 8</td>
<td>±36.85 to ±73.7 LSB12/mT</td>
<td>&lt; ±300 µT</td>
<td>5 V ±10% (16 V)</td>
<td>✓</td>
<td>Compliant</td>
<td>SPC</td>
<td>TDSO8</td>
</tr>
</tbody>
</table>

1) 147.44 LSB_{13} converts to 294.88 LSB_{12}

www.infineon.com/linear-halls
Dual linear sensors
Two sensors in one SMD package

The SMD package (TDSO) includes two independent sensors with separate power supplies and separate signal outputs. Due to special mounting technology, Infineon can keep dual-sensor package sizes very small to enable compact PCB layouts and small magnet sizes.

Infineon offers a wide range of Hall sensors in the TDSO package. The combination of two sensors in one package offers sensors redundancy, a feature that is especially interesting for new generation EPS steering systems with increased ISO 26262 requirements and other safety-critical applications. All sensors are automotive qualified.

Most products are also available as a single-sensor solution with only one sensor. The newest member of the TLE499x family, the TLE4999I3, is a fully ISO 26262-compliant linear Hall sensor that includes 2 sensor channels on one chip. The SSO-3 package allows PCB-less application flexibility and the PSI5 interface enables low EMI at high-speed communication with minimum wiring.

**Features**
- Two sensors in one package
- Separate power supply and signal output
- AEC-Q100 qualified
- Temperature range from -40 to +125°C
- Outstanding quality
- Single-sensor versions available
- 16-pin and 8-pin versions available
- ISO 26262-ready
- TLE4999I3 ISO 26262-compliant

**Automotive applications**
- Steering torque systems
- Pedal position
- Any other safety-critical application

### Features
<table>
<thead>
<tr>
<th>Product</th>
<th>Interface</th>
<th>Dual-/single-sensor available</th>
<th>ISO 26262</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4997A8D</td>
<td>Analog</td>
<td>yes/yes</td>
<td>Ready</td>
<td>TDSO8</td>
</tr>
<tr>
<td>TLE4998P8D</td>
<td>PWM</td>
<td>yes/yes</td>
<td>Ready</td>
<td>TDSO8</td>
</tr>
<tr>
<td>TLE4998S8D</td>
<td>SENT</td>
<td>yes/yes</td>
<td>Ready</td>
<td>TDSO8</td>
</tr>
<tr>
<td>TLE4998C8D</td>
<td>SPC</td>
<td>yes/yes</td>
<td>Ready</td>
<td>TDSO8</td>
</tr>
<tr>
<td>TLE4999I3</td>
<td>PSI5</td>
<td>monolithic 1)</td>
<td>Compliant</td>
<td>SSO-3</td>
</tr>
<tr>
<td>TLE4999C8/4</td>
<td>SPC</td>
<td>monolithic 1)</td>
<td>Compliant</td>
<td>TDSO8</td>
</tr>
</tbody>
</table>

1) 2 sensor channels on one chip

www.infineon.com/linear-halls
Angle sensors
Compact designs in small outline packages

Highest variety - low end to high end, standardized and specialized in all four magnetic technologies: Hall, GMR, AMR and TMR

Infineon’s magnetic sensor products TLE5501, are fast analog TMR-based angle sensors dedicated to automotive applications. Their fields of use range from steering angle applications, with the highest functional safety requirements, to motors for wipers, pumps and actuators, and electric motors in general. They are also ready to be used in industrial and consumer applications like robotics or gimbal. Angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magnetoresistive elements.

Infineon’s iGMR sensors are ideal for applications with a wide-angle range, such as BLDC motors or steering sensors. They are pre-calibrated and ready to use. Different levels of signal processing integration enable designers to optimize system partitioning. The XENSIV™ iAMR sensors also perfectly fit applications with the highest accuracy requirements, as they offer the best performance over temperature, lifetime, and magnetic field range.

iGMR, iAMR and iTMR based angle sensors
Diverse redundant sensor with analog and digital interface

<table>
<thead>
<tr>
<th>Product</th>
<th>Technology</th>
<th>Die configuration</th>
<th>ISO 26262</th>
<th>Sin/cos output</th>
<th>Angle output</th>
<th>Second interface</th>
<th>Accuracy</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE5009*</td>
<td>GMR</td>
<td>Single die</td>
<td>Ready</td>
<td>Analog sin/cos</td>
<td>–</td>
<td>–</td>
<td>0.9°</td>
<td>DSO8</td>
</tr>
<tr>
<td>TLE5009A16(D)*</td>
<td>GMR</td>
<td>Dual die</td>
<td>Ready</td>
<td>Analog sin/cos</td>
<td>–</td>
<td>–</td>
<td>1.0°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5011</td>
<td>GMR</td>
<td>Single die</td>
<td>Ready</td>
<td>SSC (SPI)</td>
<td>–</td>
<td>–</td>
<td>1.6°</td>
<td>DSO8</td>
</tr>
<tr>
<td>TLE5012B*</td>
<td>GMR</td>
<td>Single die</td>
<td>QM</td>
<td>SSC (SPI)</td>
<td>SSC (SPI)</td>
<td>PWM/IIF/SPC/HSM</td>
<td>1.9°</td>
<td>DSO8</td>
</tr>
<tr>
<td>TLE5012B(D)*</td>
<td>GMR</td>
<td>Single and dual die</td>
<td>Ready</td>
<td>SSC (SPI)</td>
<td>SSC (SPI)</td>
<td>PWM/IIF/SPC/HSM</td>
<td>1.0°</td>
<td>DSO8/TDSO-16</td>
</tr>
<tr>
<td>TLE5014C16(D)</td>
<td>GMR</td>
<td>Single and dual die</td>
<td>Compliant</td>
<td>–</td>
<td>SPC</td>
<td>–</td>
<td>1.0°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5014P16(D)</td>
<td>GMR</td>
<td>Single and dual die</td>
<td>Compliant</td>
<td>–</td>
<td>PWM</td>
<td>–</td>
<td>1.0°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5014S16(D)</td>
<td>GMR</td>
<td>Single and dual die</td>
<td>Compliant</td>
<td>–</td>
<td>SENT</td>
<td>–</td>
<td>1.0°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5014SP16(D)*</td>
<td>GMR</td>
<td>Single and dual die</td>
<td>Compliant</td>
<td>–</td>
<td>SPI</td>
<td>–</td>
<td>1.0°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5019A16(D)*</td>
<td>AMR</td>
<td>Single and dual die</td>
<td>Ready</td>
<td>Analog sin/cos</td>
<td>–</td>
<td>–</td>
<td>0.5°</td>
<td>TDSO-16</td>
</tr>
<tr>
<td>TLE5309D*</td>
<td>AMR + GMR</td>
<td>Dual die</td>
<td>Ready</td>
<td>Analog sin/cos</td>
<td>SSC (SPI)</td>
<td>AMR 0.5°, GMR 1.0°</td>
<td>TDSO-16</td>
<td></td>
</tr>
<tr>
<td>TLE5501*</td>
<td>TMR</td>
<td>Single die</td>
<td>Compliant</td>
<td>Analog sin/cos</td>
<td>–</td>
<td>–</td>
<td>1.0°</td>
<td>DSO8</td>
</tr>
</tbody>
</table>

SPI = Serial peripheral interface
IIF = Incremental interface
PWM = Pulse width modulation
SENT = Single Edge Nibble Transmission
HSM = Hall Switch Mode

For more information on the product, contact our product support
iTMR based angle sensors

Tunneling Magneto Resistive (iTMR) technology is offering high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification. In addition, iTMR technology shows a very low temperature drift, reducing external calibration and compensation efforts. The iTMR technology is also well known for its low current consumption.

TLE5501

With the TLE5501 products, Infineon is currently launching the first angle sensor products based on iTMR technology. TLE5501 is available in two versions.

TLE5501 - product versions with different pinout:
- TLE5501 E0001: pin-compatible to TLE5009 automotive qualified acc. AEC-Q100
- TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D

Features
- Large output signals of up to 0.37 V/V for direct microcontroller connection
- Discrete bridge with differential sine and cosine output
- Very low supply current: ~2 mA
- Magnetic field range (20-100 mT)
- Typ. angle error ~ 1.0 ° (over temperature and lifetime)
- DSO8 package
- AEC-Q100, grade 0: TA = -40°C to 150°C (ambient temperature)
- For TLE5501 E0002:
  - Reaching ASIL D with just one single sensor chip
  - ISO 26262-compliant development ASIL D

Applications
- Steering angle sensor
- BLDC motor commutation (e.g. wipers, pumps and actuators)
- Angular position sensing for e.g. robotics or gimbal
- Electric motors
- Industrial automation
- Safety applications

www.infineon.com/angle-sensors
iGMR based angle sensors

TLE5014(D)

Digital iGMR sensor with an easy-to-use plug-and-play concept for the highest functional safety applications

All XENSIV™ TLE5014 angle sensors are available as single and dual die products. The products come pre-configured and pre-calibrated as plug-and-play sensors and are easy to use. Customers can choose between the interfaces SENT, PWM, SPC, and SPI. On top of those protocol options, the sensors can be adapted to any kind of application setup via their programmable E²PROM interfaces. TLE5014 magnetic angle sensors meet ISO 26262 ASIL C for the single die and ISO 26262 ASIL D for the dual die versions. All products are ready for applications with the highest functional safety requirements. The sensors show an extremely small angle error of less than 1° across the entire temperature profile and lifetime. This is particularly helpful in applications with the need for very accurate position sensing such as steering angle sensing or motor commutation. Further application areas range from rotor position measurement, electric power steering (EPS), pedal position to any other kind of position measurement.

Features
- Easy-to-use, plug-and-play sensors, pre-configured and pre-calibrated
- Offering high flexibility:
  - Available as single and dual die products
  - 12 bit digital interface with protocol options PWM, SENT, SPC and SPI
  - E2 PROM and look-up table for customer configuration and calibration
- High angle accuracy: max. 1.0° over temperature and lifetime
- High voltage capability up to 26 V
- Development fully compliant with ISO 26262
  - Developed acc. ASIL D level
  - Dual die sensors reaching ASIL D, single die sensors ASIL C metrics
- Safety manual and safety analysis summary report available on request

Applications
- Steering angle sensing (SAS)
- Motor commutation
- Rotor position measurement
- Pedal position
- Safety applications
- Any other kind of high-accuracy position measurement

iAMR based angle sensors

TLE5109A16(D)

Analog iAMR sensor with temperature compensation

Features
- Features a differential or single-ended analog interface for sine and cosine values
- Internal temperature drift compensation for gain and offset
- Also available as a dual-sensor package
- ISO 26262-ready
- Typical 0.1° angle error over lifetime and temperature range after compensation (max 0.5°)
- Available as single and dual die product

www.infineon.com/angle-sensors

*Giant Magneto resistance
3D magnetic sensors for consumer industrial markets

The **TLV493D-A1B6** sensor realizes accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package. Capable of detecting the magnetic field in the x, y, and z-direction, the sensor is ideally suited for the measurement of linear, rotation, or 3-dimensional movements. Thanks to its small package and low power consumption, the 3D magnetic sensor can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high-temperature stability of the magnetic threshold, the sensor allows systems to get smaller, more accurate, and more robust.

### Features

- 3D magnetic sensing
- Integrated temperature sensing
- Low current consumption
  - 7 nA in power-down mode
  - 10 μA in ultralow power mode
- 2.8 to 3.5 V operating supply voltage
- Digital output via a 2-wire standard I²C interface
- \( B_x, B_y \), and \( B_z \) linear field measurement up to ±160 mT
- JESD47 qualified
- 12-bit data resolution for each measurement direction
- High sensitivity up to 30.8 LSB\(_{12}/mT\).
- Operating temperature range from -40 to +125°C

### New features

- Sensor address read back
- Short mode range setting, focusing on the half of the magnetic range, ensuring higher accuracy
- Higher update frequency allows for an application field that requires faster update speed
- Angular mode (for x and y read-out only)

### Applications

- Anti tempering protection in smart meters
- Joysticks e.g. for medical equipment, cranes,
- Game consoles
- Control elements e.g. white goods multifunction knobs
- Industrial joysticks
- Ergonomic push and control buttons on domestic appliances and power tools
- Position control in robotics

---

![Rotation movement](image1)

![3D movement](image2)

![Linear movement](image3)

---

**Table: Product Specifications**

<table>
<thead>
<tr>
<th>Product</th>
<th>Temperature range</th>
<th>Qualification</th>
<th>Linear magnetic range</th>
<th>Sensitivity</th>
<th>( I_{DD} )</th>
<th>Update rate</th>
<th>Package</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLI493D-A2B6</td>
<td>-40...105°C</td>
<td>JESD47</td>
<td>±160 mT (min)</td>
<td>7.7 or 15.4 LSB(_{12}/mT)</td>
<td>7 nA – 3.3 mA</td>
<td>10 Hz – 8.4 kHz</td>
<td>TSOP6</td>
<td>SP00168944</td>
</tr>
<tr>
<td>TLI493D-A2BW A0</td>
<td>-40...125°C</td>
<td>JESD47</td>
<td>±50, ±100 or ±160 mT</td>
<td>7.7, 15.4 or 30.8 LSB(_{12}/mT)</td>
<td>7 nA – 3.4 mA</td>
<td>0.05 Hz – 8.4 kHz</td>
<td>WLB</td>
<td>SP005409964</td>
</tr>
<tr>
<td>TLI493D-A2BW A1</td>
<td>-40...125°C</td>
<td>JESD47</td>
<td>±130 mT (typ)</td>
<td>10.2 LSB(_{12}/mT)</td>
<td>7 nA – 3.7 mA</td>
<td>10 Hz – 3.3 kHz</td>
<td>TSOP6</td>
<td>SP001236056</td>
</tr>
<tr>
<td>TLI493D-A2BW A2</td>
<td>-40...125°C</td>
<td>JESD47</td>
<td>±50, ±100 or ±160 mT</td>
<td>7.7, 15.4 or 30.8 LSB(_{12}/mT)</td>
<td>7 nA – 3.4 mA</td>
<td>6 Hz – 11.6 kHz</td>
<td>WLB</td>
<td>SP005409968</td>
</tr>
<tr>
<td>TLI493D-A2BW A3</td>
<td>-20°C...85°C</td>
<td>JESD47</td>
<td>±50, ±100 or ±160 mT</td>
<td>7.7, 15.4 or 30.8 LSB(_{12}/mT)</td>
<td>7 nA – 3.4 mA</td>
<td>6 Hz – 11.6 kHz</td>
<td>WLB</td>
<td>SP000542151</td>
</tr>
</tbody>
</table>

1) Half range mode

While the **TLV493D-A1B6** just supports a typical value for the linear magnetic range of ±130 mT, the **TLI493D-A2B6** specification includes also a minimum value of ±160 mT.

With the **TLI493D-A2B6**, broader microcontroller compatibility, as well as an enhanced feature set, is included.

---

**www.infineon.com/3d-magnetics**
3D magnetic sensors for automotive low-power applications

Infineon’s XENSIV™ TLE493D-x2B6 enables all kind of automotive control element applications within the passenger compartment or under the hood with a temperature range of -40 to +125°C, with linear magnetic range requirements up to ±160 mT.

**Features**

- 3D magnetic sensing
- Integrated temperature sensing
- 2.8 to 3.5 V operating supply voltage
- Low current consumption
  - 0.007 μA in power-down mode
  - 10 μA in ultralow power mode
  - Up to 10 power modes
- Digital output via a 2-wire standard I2C interface
- \( B_x, B_y \), and \( B_z \) linear field measurement ±160 mT
- AEC-Q100 qualified
- 12-bit data resolution for each measurement direction
- Various resolution options from 67 μT/LSB to 134 μT
- Operating temperature range from -40 to +125°C

The XENSIV™ sensor TLE493D-A2B6 features include a sensor address read-back feature for additional communication verification, a half range mode focusing to half of the magnetic range, ensuring higher accuracy, and an angular mode (for \( x \) and \( y \) readout only).

With the TLE493D-W2B6/ P2B6 A0-A3, a 3D sensor family with an enhanced dynamic wake-up feature was developed. Four pre-programmed address options (A0-A3) are available, enabling for a fast start-up initialization when used in I2C bus configurations. Our sensors include enhanced test options, and safety documentation is available to enable the usage of this sensor in the context of ASIL B systems.

Compared to the previous products of this family the new TLE493D-P2B6 A0-A3 family offers enhance precision in \( x \)-, \( y \)-, \( z \)-sensing direction, while otherwise featuring the same dynamic wake-up features, programmability, and test options like TLE493D-W2B6 A0-A3. We provide safety documentation on request for usage of the sensor in the context of ASIL B systems.

**Applications**

- Control elements for infotainment/navigation systems, air conditioners, multifunctional steering wheels, seat controls
- Top column modules e.g. direction indicator, wiper control
- Gear stick position sensing

www.infineon.com/3dmagnetics
Magnetic speed sensors

Easy to use, robust and cost-effective sensors for speed measurement

Infineon's Hall and GMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as speedometers, ABS, camshafts, crankshafts, and automatic transmissions. They are also used in similar applications in the industrial sector. The sensors use a ferromagnetic gear tooth or encoder structure to measure linear or rotational speed and position. Hall sensor measuring rotational speed with a gear tooth and a magnetic encoder wheel. The majority of sensors also feature additional benefits such as integrated capacitors for high EMC robustness and the highest levels of ESD protection.

TLE4922

Highly robust, easy-to-use mono-Hall speed sensor with twist-independent mounting

This sensor is specially designed to provide an easy-to-use, robust and cost-effective solution for vehicle or industrial speed sensing applications. The TLE4922 can, therefore, be back-biased using a simple, low-cost bulk magnet, while providing a good air gap performance and switching accuracy. Its hidden adaptive hysteresis and calibration algorithm enable good accuracy over air gap jumps and immunity to vibration and run-out events.

Features

› Large operating air gap capability
› Flexible mounting (also known as Twist-independent mounting)
› Hidden adaptive hysteresis
› Low current consumption
› Reverse magnetic polarity capability
› Advanced protection technology
  – Reverse voltage protection at VS-pin
  – Short-circuit protection
  – Overtemperature protection
› Wide operating temperature ranges of -40°C ≤ Tj ≤ ±150°C
› High ESD robustness up to ±4 kV HBM
› 3-wire PWM voltage interface

Applications

› Industrial applications
› Two-wheeler and automotive vehicle speed

www.infineon.com/speed-sensors
TLE4929
Fully programmable crankshaft sensor

The TLE4929 is an active Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as a speedometer or any speed sensor with high accuracy and low jitter capabilities.

Features
› Differential Hall speed sensor to measure speed and position of tooth/pole wheels
› Switching point in the middle of the tooth enables backward compatibility
› Robustness over magnetic stray-field due to the differential sensing principle
› Precise miss fire detection through excellent jitter performance
› Dedicated hybrid engine algorithm keeps combustion engine calibrated during an electric drive cycle
› Digital output signal with programmable output-protocol including diagnosis interface
› Direction detection and stop-start-algorithm
› High accuracy and low jitter
› High sensitivity enables large air gap
› End-of-line programmable to adapt engine parameters
› Can be used as a differential camshaft sensor
› Automotive operating temperature range

<table>
<thead>
<tr>
<th>Product</th>
<th>Sensor technology</th>
<th>AEC-Q100 qualified</th>
<th>Automotive</th>
<th>Industrial</th>
<th>RoHS</th>
<th>HAL free</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE4922</td>
<td>Mono-Hall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>TLE4929</td>
<td>Differential Hall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

www.infineon.com/speed-sensors
As part of our comprehensive XENSIV™ sensor family, we now also offer high-performance MEMS microphones, qualified according to the state-of-the-art automotive quality standard AEC-Q103-003. These microphones close the gap in the automotive industry, providing the best possible fit for automotive applications. These automotive XENSIV™ MEMS microphones combine our proven expertise in the automotive industry with our technical leadership in high-end MEMS microphones. They are suited to all applications inside and outside the car, where the best audio performance in harsh automotive environments is required.

**Speech: Hands free / e-call / ICC**
Enabling distortion free audio capturing for all speech related application thanks to their high SNR and low distortions

**Speech: Microphone arrays – beamforming voice command**
Making it possible to operate infotainment systems with voice commands due to their narrow sensitivity matching for enhanced performance of beam-forming arrays

**Active and road noise cancellation**
Enabling a quite environment for comfortable travels, the microphones are a good fit for ANC applications thanks to their flat frequency and stable phase response

www.infineon.com/mems-automotive
In addition, they will enhance autonomous driving features … and even allow interaction from outside of the vehicle.

- Event sound detection / sirens detection / contact detection
- Road condition detection
Contributing to road safety, by detecting sounds like sirens from emergency vehicles or even dangerous road conditions thanks their large dynamic range and acoustic overload point.

Voice recognition / external interaction
Allowing external interaction e.g. for controlling certain functions via voice commands due to their good suitability for voice recognition use cases.

Customer benefit
- Automotive qualification according to AEC-Q103, together with long term availability reduces design-in risk and effort
- Increased operating temperature range allows flexible usage in automotive environment up to +105°C
- Best in class audio performance (SNR, AOP, THD) for optimum speech quality and capture of distortion-free audio signals in loud environments such as inside a car
- Narrow sensitivity matching for enhanced performance of beam-forming (noise suppression) arrays
- Flat frequency and stable phase response for optimal fit in acoustic noise cancellation use cases

<table>
<thead>
<tr>
<th>Parametrics</th>
<th>IM67D130A / IM67D120A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic overload point</td>
<td>130 dB SPL (IM67D130A) / 120.0 dB SPL</td>
</tr>
<tr>
<td>Current consumption</td>
<td>980 μA</td>
</tr>
<tr>
<td>Interfaces</td>
<td>PDM</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>-36 dBFS</td>
</tr>
<tr>
<td>Signal to noise</td>
<td>&gt; 67 dB(A)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>1.62–3.6 V</td>
</tr>
<tr>
<td>Ordering code</td>
<td>SP005582032 (IM67D130A)/SP005550431 (IM67D120A)</td>
</tr>
</tbody>
</table>

www.infineon.com/mems-automotive
For more details on the product, click on the part number, visit infineon.com or contact our product support.

XENSIV™ sensors for consumer and IoT applications

Intuitive sensing: giving things human-like senses for a better contextual awareness

Imagine a world where technology is unobtrusive and seamlessly integrated into our lives. Where intentional and deliberate communication between people and devices is no longer necessary. In this world, there is no need to push buttons or issue commands in order to activate devices because technology is capable of interpreting implicit intentions and context. This enhances the user experience and makes it more natural - it would seem as if the devices around us intuitively understand what we want them to do. At Infineon, this future is already becoming reality. We develop sensor solutions that enable simple and effortless user interactions with all kinds of smart devices. Bridging the gap between the real and digital worlds, our technology is developed to make life easier, safer, greener and more efficient. Our intuitive sensing solutions are at the very core of this mission. Reflecting our belief that the essential value of sensor technology lies in making our lives more convenient through seamless, natural interactions between people and sensing devices, our aim is to leave you free to focus on what really matters in life.

Choose your type of sense

Thanks to industry-leading technologies Infineon, XENSIV™ sensors are exceptionally precise. They are the perfect fit for various customer applications in automotive, industrial and consumer markets.

Pressure sensors
Our digital barometric pressure sensors give designers the best choice when it comes to small form factors, highest precision and accuracy over a wide temperature range, fast read-out speeds and low power consumption.

Radar sensors
Radar supports existing applications while providing features that enable completely new use cases. It measures velocity, range and angle, both horizontal and vertical, for precise position mapping and 3D tracking.

MEMS microphones
MEMS microphones overcome existing audio chain limitations and are designed for applications where low self-noise (high SNR), wide dynamic range, low distortions and a high acoustic overload point are required.

PAS CO2 sensor
Leveraging photoacoustic spectroscopy (PAS), Infineon has developed an exceptionally small CO2 sensor that overcomes existing size, cost and performance challenges.

Today, sensors already enable interactions between people and devices

This interaction often depends on the interpretation and merging of information from different sources. Machines cannot yet read our minds and do not always have the information necessary to correctly evaluate a given situation. So, we sometimes have to explicitly tell devices what we want them to do. This can be inconvenient and time-consuming. Inspired by human nature, Infineon intuitive sensing solutions are designed to take the complexity out of our interaction with devices.

Reflecting a holistic approach, we combine different sensors with state-of-the-art software to create a comprehensive picture of the world around us. By fusing several smart sensors into one coherent intelligent system, our intuitive sensing solutions simplify complex technical processes and enable people to effortlessly interact with devices. These smart devices intuitively sense the world around them, determining what is expected and needed from them.
The XENSIV™ connected sensor kit enables rapid development of a custom solution built on Infineon products. The CSK supports customers in testing sensor-driven IoT products and use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud-based sensor data visualization with sensor fusion.

The development kit supports use cases based on XENSIV™ 60GHz radar and PAS CO2 with DPS368 pressure sensor (Sense), PSoC™ 6 microcontroller embedded processing (Compute), connectivity via Infineon AIROC™ CYW43012 Wi-Fi and Bluetooth® Combo (Connect) and hardware security with OPTIGA™ Trust M (Secure). Code examples and sensor libraries are available in the Infineon software ecosystem ModusToolbox™ to help customers create use case-specific application codes for new product offerings.

**Features and benefits**

**Key features**
- Small form-factor (22.5 mm x 63 mm x 30 mm)
- Adafruit feather compatible design
- Wi-Fi and Bluetooth 5.0-compliant combo radio module
- Power optimized design, deployable with battery
- Interchangeable sensor wings – 60GHz Radar, PAS CO2
- Seamless integration into ModusToolbox™
- FCC and CE certified

**Key benefits**
- Ideal for prototyping battery-powered IoT devices due to optimized power consumption. Suited for customer field trials.
- Rapid development and deployment via code examples in ModusToolbox™ for presence detection, entrance counter, air quality measurements. Enabler for Multi-sensor data fusion.
- Secure cloud device onboarding and management with OPTIGA™ Trust M. Secure kit provisioning (unique user ID).

www.infineon.com/connectedsensorkit
XENSIV™ MEMS microphones for consumer applications

High performance analog and digital MEMS microphones for consumer electronics

Infineon’s XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones are comprised of Infineon’s MEMS microphone chips and ASICs which are not without reason the world’s best-selling microphone components.

XENSIV™ MEMS microphones feature ultra-low self-noise (high SNR), extremely low distortions (THD) even at high sound pressure levels (SPL), very tight part-to-part phase, and sensitivity matching, a flat frequency response with a low LFRO (low frequency roll-off) and an ultra-low group delay. Combined with selectable power modes and their very small package size, Infineon XENSIV™ MEMS microphones are a perfect match for consumer electronics with excellent audio capturing functionalities and also for selected industrial applications such as predictive maintenance and security.

Infineon’s Sealed Dual Membrane (SDM) MEMS technology

Infineon’s latest Sealed Dual Membrane MEMS technology delivers high ingress protection (IP57) at a microphone level. The sealed MEMS design prevents water or dust from entering between membrane and backplate, preventing mechanical blockage or electric leakage issues commonly observed in MEMS microphones. Microphones built with the sealed dual membrane technology can be used to create IP68 devices, requiring only minimal mesh protection.

www.infineon.com/mems
### Features, applications and use cases

#### Features
- Ultra-low self-noise/ultra-high SNR
- Selectable power modes
- Sealed Dual Membrane (SDM) technology with ingress protection at microphone level
- Extremely low distortions (THD) even at high sound pressure levels
- High dynamic range and very high acoustic overload points (AOP)
- Very tight part-to-part phase and sensitivity matching
- Flat frequency response with a low LFRO (low frequency roll-off)
- Ultra-low group delay
- Very small package sizes

#### Typical use cases
- Studio quality audio capturing for communication devices
- Low latency wide band audio signal capturing for Active Noise Cancellation (ANC) and transparent hearing functionality
- Battery and size constraint devices
- Multi-microphone (array) based beamforming and source separation for audio zoom features and multi user audio capturing
- High range, far field voice pickup for multi room applications
- Capturing of audio signals in loud environments
- Audio pattern detection for predictive maintenance and security

#### Typical application
- TWS earbuds
- ANC headphones
- Smart speakers
- Conference speakers
- Laptops/tablets
- Wearables
- AR/VR devices
<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM69D130</td>
<td>IM69D130 is a high-performance digital MEMS microphone making use of Infineon’s Dual Backplate MEMS technology to deliver 105 dB dynamic range and high output linearity up to 130 dBSPL. The application benefits are crystal clear audio signals, extended pick-up distance and sensitivity to both soft and loud signals - from whispered speech to rock concerts.</td>
</tr>
<tr>
<td>IM69D120</td>
<td>IM69D120 is a high-performance digital MEMS microphone making use of Infineon’s Dual Backplate MEMS technology to deliver 95 dB dynamic range and high output linearity up to 120 dBSPL. If IM69D130 is used in a 16 bit audio signal chain, the full SNR performance would not be realized as the noise floor will be limited by the system dynamic range. IM69D120 has been specifically designed to preserve 69 dB(A) SNR in a 16 bit system. This is achieved by increasing the microphone sensitivity to -26 dBFS, and reducing the acoustic overload point to 120 dBSPL.</td>
</tr>
<tr>
<td>IM69D127</td>
<td>IM69D127 is a digital high-performance MEMS microphone based on Infineon’s new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. Its small size of only 3.60 x 2.50 x 1.00 mm³ makes it a perfect match for compact audio devices, such as TWS earbuds.</td>
</tr>
<tr>
<td>IM73A135</td>
<td>Infineon’s XENSIV™ MEMS analog microphone IM73A135 sets a new performance benchmark in MEMS microphones. A best-in-class signal to noise ratio (SNR) of 73 dB and a high acoustic overload point of 135 dBSPL enable clear audio pick up of the quietest and the loudest sounds. This microphone is based on Infineon’s new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. The IM73A135 allows designers to reach a level of high audio performance that was previously only achievable by ECMs while at the same time reaping the benefits inherent in MEMS technology.</td>
</tr>
<tr>
<td>IM72D128</td>
<td>The IM72D128V01 is an ultra-high-performance digital microphone designed for applications which require a very high SNR (low self-noise) and low distortions (high AOP). This microphone is based on Infineon’s new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. The flat frequency response (20Hz low-frequency roll-off) and tight manufacturing tolerance improve performance of multi-microphone (array) applications. The digital microphone ASIC contains an extremely low-noise preamplifier and a high-performance sigma-delta ADC. Different power modes can be selected in order to suit specific clock frequency and current consumption requirements. Each IM72D128V01 microphone is calibrated with an advanced Infineon calibration algorithm, resulting in very low sensitivity tolerances (±1dB).</td>
</tr>
<tr>
<td>IM70A135</td>
<td>Infineon’s XENSIV™ MEMS analog microphone IM70A135 is a compact high performance microphone with a very high acoustic overload point of 135 dBSPL and a size of only 3.50 x 2.65 x 1.00 mm³. This microphone is based on Infineon’s new Sealed Dual Membrane MEMS technology which delivers high ingress protection (IP57) at a microphone level. The small size makes this microphone especially suited for TWS earbud applications.</td>
</tr>
</tbody>
</table>
EVAL AHNB IM69D130V01

Enables the evaluation of Infineon digital XENSIV™ MEMS microphones

The Infineon Audiohub Nano enables the evaluation of Infineon digital PDM XENSIV™ MEMS microphones. The kit includes an Infineon Audiohub Nano and four IM69D130 digital microphones on flex board. Up to two Infineon digital XENSIV™ MEMS microphones can be connected to the evaluation board in mono or stereo output. The evaluation board provides a USB audio interface to stream audio data from the microphone with any audio recording and editing software.

Summary of Features
› Audio streaming over USB interface
› 48 kHz sampling rate
› 24-bit audio data (stereo)
› Mode switch for toggling between normal mode and low power mode with 4 pre-defined gain configurations
› LEDs indication for the configured gain level in normal mode and low power mode
› Volume unit meter display with on board LEDs
› Powered through Micro-USB

Product | SP No. | OPN No. |
--- | --- | --- |
EVAL AHNB IM69D130V01 | SP005285852 | EVALAHNBIM69D130V01TOBO1 |

www.infineon.com/mems
Building upon the superior XENSIV™ MEMS microphone performance, Infineon’s extensive network of global partners offers customers a comprehensive portfolio of XENSIV™ MEMS microphone-based reference designs, as well as Infineon inside MEMS microphones that will propel audio performance to the next level even for the most demanding applications. Click on the buttons below to learn more about our partner solutions.
XENSIV™ digital barometric pressure sensor for mobile and wearable devices

Infineon’s digital barometric pressure sensor family is the best choice for mobile and wearable devices due to its small form factor, high precision, and low power consumption. Pressure sensing is based on capacitive technology, which guarantees ultra-high precision (±2 cm) and excellent relative accuracy (±0.06 hPa) over a wide temperature range. The sensor’s internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The coefficients are used in the application to convert the measurement results to true pressure and temperature values. All sensors have a FIFO that can store the last 32 measurements. Since the host processor can remain in a sleep mode for a longer period between readouts, a FIFO can reduce the system power consumption. Sensor measurements and calibration coefficients are available via the serial I2C/SPI interface.

**DPS310**
A barometric pressure sensor with very low power consumption is recommended for applications where power consumption is critical and the highest precision in pressure metering is required.

**DPS368**
DPS368 offers the best-in-class resolution (±2 cm), a very fast read-out speed, and low current consumption. The sensor can be used in harsh environments, as it is robust against water (IPx8 - 50 m underwater for 1 hour), dust and humidity. The small package size saves up to 80 percent of the space and makes the DPS368 ideal for mobile applications and wearable devices.

**Typical applications**
- Drones: altitude detection and height stability
- Health and fitness: accurate elevation gain and step counting (e.g. for smartwatches)
- Outdoor Navigation: GPS start-up time/accuracy improvement; dead reckoning (e.g. in tunnels)
- Indoor navigation: floor detection e.g. in shopping malls and parking garages
- Smart home: micro weather forecasting; room temperature control; intruder detection
- Airflow control: Smart filter replacement alarm (e.g. in home appliances); predictive maintenance
- Health care: fall detection; respiratory devices; smart inhalers

<table>
<thead>
<tr>
<th>Key product features</th>
<th>DPS310</th>
<th>DPS368</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package size</td>
<td>2.0 x 2.5 x 1.0 mm</td>
<td>2.0 x 2.5 x 1.1 mm</td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>300 … 1200 hPa</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-40 … 85°C</td>
<td></td>
</tr>
<tr>
<td>Pressure level precision</td>
<td>± 0.002 hPa (or ±0.02 m)</td>
<td></td>
</tr>
<tr>
<td>Relative accuracy</td>
<td>± 0.06 hPa (or ±0.5 m)</td>
<td></td>
</tr>
<tr>
<td>Absolute accuracy</td>
<td>± 1 hPa (or ±1 m)</td>
<td></td>
</tr>
<tr>
<td>Temperature accuracy</td>
<td></td>
<td>0.5°C</td>
</tr>
<tr>
<td>Pressure temperature sensitivity</td>
<td></td>
<td>0.5 Pa/K</td>
</tr>
<tr>
<td>Measurement time</td>
<td>3.6 ms (low precision); 27.6 ms (standard mode)</td>
<td></td>
</tr>
<tr>
<td>Average current consumption @ 1 Hz sampling rate</td>
<td>1.7 μA pressure measurement, 1.5 μA temp. measurement, standby 0.5 μA</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>$V_{DD_{in}}$: 1.2 – 3.6 V; $V_{DD}$: 1.7 – 3.6 V</td>
<td></td>
</tr>
<tr>
<td>Operating modes</td>
<td>Command (manual), background (automatic), standby</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>I2C and SPI, both with optional interrupt</td>
<td></td>
</tr>
</tbody>
</table>

www.infineon.com/pressure-sensors-iot
Infineon inside pressure sensor partners

Building upon its best-in-class technology, Infineon offers a full range of barometric pressure sensors as chipsets. Infineon’s network of global partners offers customers a comprehensive portfolio of Infineon inside pressure sensors that will propel performance to the next level even for the most demanding applications.

Visit www.infineon.com/pressure-sensor-partners to learn more and purchase our partner solutions.

www.infineon.com/pressure-sensors-iot
XENSIV™ PAS CO2

High performance in a small size – Introducing a disruptive CO₂ sensor based on photoacoustic spectroscopy (PAS)

Infineon’s XENSIV™ PAS CO2 breaks the boundaries of CO₂ sensing with its exceptionally small form factor and highest accuracy in its class.

Measure what matters with our XENSIV™ PAS CO2 sensor

CO₂ measurement contributes to improvements in health, comfort and productivity as well as energy efficiency. Even at moderate levels, CO₂ can have a negative impact on health and productivity, causing drowsiness and headaches. Fortunately, smart indoor air quality sensors can “smell” rising levels of CO₂ and either alert the user or trigger a system response. Awareness of indoor air quality is further increasing as a result of the COVID-19 pandemic, making accurate, affordable monitoring solutions like XENSIV™ PAS CO2 more important than ever. Given the correlation between CO₂ and aerosol concentration, CO₂ sensors can contribute to mitigating the transmission of not only COVID-19 but also other airborne illnesses such as the common cold and influenza. Furthermore, CO₂ sensors can facilitate demand-controlled ventilation, leading to improvements in energy efficiency and significant savings on energy bills.

Accurate, real-time CO₂ measurement thanks to superior MEMS technology

Widespread adoption of real CO₂ sensors has so far been hampered by size, performance and cost constraints. Infineon’s XENSIV™ PAS CO2 sensor leverages photoacoustic spectroscopy (PAS) technology to provide an exceptionally small, real CO₂ sensor that is both highly accurate and cost-effective. Infineon’s leading position in MEMS technology is the foundation for this unique and accurate CO₂ detection approach. Reliable CO₂ measurement enables smart monitoring of indoor air quality, facilitating improvements in health, productivity and overall well-being. These features make the XENSIV™ PAS CO2 sensor ideal for demand-controlled ventilation and air conditioning applications (HVAC) as well as for integration into consumer IoT devices such as air purifiers, thermostats, baby monitoring devices, wake-up alarms and smart speakers.

Disruptive environmental sensor technology from Infineon

XENSIV™ PAS CO2 integrates on the PCB a photoacoustic transducer, including an acoustic detector, infrared source and optical filter; a microcontroller for signal processing and a MOSFET chip to drive the infrared source. The exceptional sensitivity of the acoustic detector coupled with the integrated PCB design reduce space requirements by more than 75 percent compared to nowadays state-of-the-art NDIR CO₂ sensors.

www.infineon.com/CO2
The PAS (photoacoustic spectroscopy) principle
The sensor is characterized by a disruptive measurement principle called PAS (photoacoustic spectroscopy). It works as follows: pulses of infrared light pass through an optical filter tuned to the CO₂ absorption wavelength. The CO₂ molecules absorb the filtered light, causing them to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low frequency operation and converted to a CO₂ concentration reading by the microcontroller.

Application
- HVAC (Heating, Ventilation and Air Conditioning) systems
- Smart home appliances such as air purifiers, air conditioners and thermostats
- Consumer devices for air quality monitoring such as personal assistants and CO₂ traffic lights
- Smart indoor lighting

Features and benefits

**Key features**
- Exceptionally small form factor (14 x 13.8 x 7.5 mm³)
- High accuracy (±30 ppm ±3% of reading)
- SMD package delivered in tape and reel
- Advanced compensation and self-calibration algorithms
- Various configuration options (e.g. sampling rate, baseline calibration) and interfaces (UART, I²C, PWM)

**Key benefits**
- Space savings in customers’ end products
- High-quality data and compliance with smart building standards
- Cost-effective high-volume assembly and easy system integration
- Plug & play for fast design-to-market
- Customer flexibility

Applications

- HVAC (Heating, Ventilation and Air Conditioning) systems
- Smart home appliances such as air purifiers, air conditioners and thermostats
- Consumer devices for air quality monitoring such as personal assistants and CO₂ traffic lights
- Smart indoor lighting

XENSIV™ PAS CO2 sensor community

Learn more or ask questions

www.infineon.com/CO2
XENSIV™ radar sensors for consumer and IoT applications

As market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ sensor family – including Doppler radar as well as FMCW radar systems. This portfolio includes the smallest 24 GHz MMIC in the market as well as the most integrated and largest 24 GHz radar transceiver family currently available. These radar chips are designed to support different industrial, smart home, and consumer applications. In addition, we also offer radar sensors in the 60 GHz range, which are used in consumer products such as the Google Pixel 4 smartphone.

Motion detection with radar offers significant advantages over PIR and other motion-sensing technologies

With our 24 and 60 GHz radar sensors, we cover a wide range of applications. Many of them are based on motion detection triggering systems like lighting solutions, automatic doors, camera and security systems, or smart home devices. In contrast to other motion detection technologies like PIR, radar technology offers significant advantages. These include smaller system sizes, greater accuracy, and more precise measurements of detected objects. In addition, radar can also determine the direction of a moving object, speed of an object, distance, and depending on the antenna configuration, even the position of a moving object.

Applications for Infineon’s radar sensors

www.infineon.com/radar-for-iot
Key benefits of radar sensing
› Direction, proximity, and speed detection
› Segmentation and tracking functionalities
› Target positioning
› Detection through non-conductive materials
  – Product design flexibility
  – Anonymous sensing
› Maintains operation through harsh environmental conditions such as rain, snow, fog, dust, etc.
› Sensitive enough to capture breathing and heartbeat
  – Radar can feel presence & vital functions
› Radar performance parameters can be adjusted
  – Adaptable to different application requirements

New application or simple PIR replacement? Radar has it covered.

Radar, used in motion detection applications, increases accuracy when compared to passive infrared (PIR) technology, allowing more precise measurement of object detection, and providing new capabilities such as the detection of speed and the direction of moving objects. Radar is also superior to camera-based systems by allowing detection of the objects while keeping identities anonymous.

Example applications that can benefit from radar technology

www.infineon.com/radar-for-iot
When to use 24 GHz or 60 GHz radar technology

In the 24 GHz range, the bandwidth for FMCW radar operations covers 250 MHz within the regulated ISM band. In the 60 GHz regime, an unlicensed ultra-wideband of up to 7 GHz can be used for short-range applications. Consequently, 60 GHz FMCW radar systems can offer a better resolution and therefore allow additional use cases such as human tracking and segmentation. Even gesture control, material classification, or the monitoring of various vital functions (respiration, heartbeat, or even blood pressure) is possible with radar technology due to micromotion detection.

Partners

Click this link to view our network of partners who provide modules and design support for all 24GHz industrial applications:

Have questions?

Visit our Community to inquire, share, and connect:
XENSIV™ 60 GHz radar sensor IC

Infineon’s innovative XENSIV™ 60 GHz radar chip enables things to see and revolutionizes the human-machine interface.

BGT60LTR11AIP for consumer and IoT applications

The BGT60LTR11AIP is a fully integrated microwave motion sensor including Antennas in Package (AIP) as well as built-in detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low power consumption of less than 2 mW. The BGT60LTR11AIP enables radar technology for everyone, since it does not require know-how in RF, antenna design, or radar signal processing. These features make the small-sized radar solution a compelling smart and cost-effective replacement for conventional PIR sensors in low power or battery-powered applications. Also, with its small form factor, Infineon’s highly integrated radar sensor solutions bring innovative, intuitive sensing capabilities to many applications.

Radar has been demonstrated to be a powerful sensor for short-range motion detection. Through reliable presence and absence detection, smart devices equipped with radar sensors become more energy efficient and therefore smart and more sustainable. Users can also benefit from vacancy detection in applications such as televisions. For example BGT60LTR11AIP has been implemented in Samsung’s Frame TV 2021, which puts the TV from art mode into sleep mode when there is no person nearby for a user-specified time. This function not only saves energy, but also displays lifetime.

BGT60LTR11AIP has a high sensitivity and can detect if a person is present and if the device needs to be ready – similar to a screensaver that deactivates the PC monitor after a certain time without mouse or keyboard input and reactivates it as soon as new input is noticed. Through this reliable presence and absence detection, Infineon’s 60 GHz radar powers the design of truly smart, energy-saving devices. Find out more at: www.infineon.com/green-energy

www.infineon.com/BGT60LTR11AIP
**Block diagram of the BGT60LTR11AIP**

**Key features**
- 3.3 x 6.7 x 0.56 mm package size
- 1Tx 1Rx Antennas in Package (AIP) with 80 ° field of view
- Built-in motion detector
- Built-in direction of motion detector
- Multiple modes of operation including a completely autonomous mode
- Adjustable performance parameters: detection sensitivity, hold time and frequency of operation
- FR4 material for PCB design is sufficient

**Key benefits**
- Autonomous mode:
  - Up to 7 m detection range
  - Less than 2 mW power consumption
  - Requires minimal external circuitry incl. crystal, LDO and some resistors/capacitors
- **Adding a M0 MCU extends flexibility**
  - Up to 14 m detection range (SPI mode)
  - Less than 2 mW power consumption possible

**Target application**
- Smart Building and Smart Home
- Home appliances
- Smart home security
- Room air conditioners
- Automated door openers
- Smart entrance counter solution
- Displays such as TVs, monitors, laptops or tablets
- Lighting systems and lighting control

www.infineon.com/BGT60LTR11AIP
**60 GHz radar sensor ICs**

### Product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>SP</th>
<th>OPN</th>
<th>Package</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGT 60LTR11AIP</td>
<td>SP005537624</td>
<td>BGT60LTR11AIPE6327XUMA2</td>
<td></td>
<td>Chip samples</td>
<td>Available</td>
</tr>
<tr>
<td>DEMO BGT60LTR11AIP</td>
<td>SP005422969</td>
<td>DEMOBGT60LTR11AIPTOBO1</td>
<td>PG-UF2BGA-42-1</td>
<td>Demonstration Kit (Shield + 60 GHz baseboard)</td>
<td>Available</td>
</tr>
<tr>
<td>SHIELD_BGT60LTR11AIP</td>
<td>SP005422968</td>
<td>SHIELDBGT60LTR11AIPTOBO1</td>
<td></td>
<td>Shield fitting on 60 GHz baseboard</td>
<td>Available</td>
</tr>
<tr>
<td>SHIELD_AUTONOM_BGT60</td>
<td>SP005630363</td>
<td>SHIELDAUTONOMBGT60TOBO1</td>
<td></td>
<td>Shield for autonomous operation of BGT60LTR11AIP; directly fits on Arduino MKR board</td>
<td>Available</td>
</tr>
<tr>
<td>REF BGT60LTR11AIP</td>
<td>SP005636053</td>
<td>REFBG60LTR11AIPTOBO1</td>
<td></td>
<td>Reference design</td>
<td>Upcoming</td>
</tr>
<tr>
<td>S2GO RADAR BGT60LTR11</td>
<td>SP005594890</td>
<td>S2GORADARBGT60LTR11TOBO1</td>
<td></td>
<td>Shield2Go version</td>
<td>Upcoming</td>
</tr>
</tbody>
</table>

---

**DEMO BGT60LTR11AIP**

**For evaluation of the completely autonomous 60 GHz radar sensor MMIC for motion sensing**

This demo features Infineon’s first completely autonomous radar sensor – the BGT60LTR11AIP. The 60 GHz radar MMIC is a fully integrated microwave motion sensor including Antennas in Package (AIP) as well as integrated detectors for motion and direction of motion. A state machine enables operation of the device without any external microcontroller. In this autonomous mode, it detects a human target up to 7 m with a low-power consumption of less than 2 mW. These features make the small-sized radar solution a compelling, smart and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications.

For evaluation of the BGT60LTR11AIP MMIC, this demo includes the BGT60LTR11AIP shield as well as the Infineon Radar Baseboard MCU7.

The BGT60LTR11AIP shield can be attached to an Arduino MKR board or the included Infineon Radar Baseboard MCU7. Infineon’s Toolbox supports this platform with a demonstration software and a Radar GUI to display and analyze acquired data in time and frequency domain. It further enables to change various performance parameters of the BGT60LTR11AIP in order to evaluate this radar sensor.

[www.infineon.com/BGT60LTR11AIP](http://www.infineon.com/BGT60LTR11AIP)
BGT60TR13C – XENSIV™ 60 GHz radar sensor for advance sensing

Enablement of horizontal and vertical angular measurement
The BGT60TR13C MMIC is a 60 GHz radar sensor with integrated antennas and comes with one transmitting and three receiving antennas. Thanks to the Antennas in Package (AIP) concept, the antenna design complexity at the user end can be eliminated and the PCB designed with standard FR4 materials.

BGT60TR13C offers innovative and intuitive sensing capabilities
With its small form factor and low power consumption, BGT60TR13C MMIC brings innovative, intuitive sensing capabilities to many applications. Based on the developed algorithm the MMIC can serve established as well as new applications and use cases without intruding on privacy. Thanks to its feature-set, the MMIC can measure velocity, angle, horizontal as well as vertical.

BGT60TR13C has been demonstrated to be a powerful sensor for:
› Presence detection/segmentation/tracking: BGT60TR13C enables human presence detection, tracking, and segmentation while providing extremely high accuracy in detecting micro and macro motions
› Gesture Sensing: BGT60TR13C ensures detection of submillimeter motions
› Vital sensing: BGT60TR13C is able to track vital signs in consumer electronics, healthcare as well as industrial applications

Target applications

www.infineon.com/BGT60TR13C
Features and benefits

<table>
<thead>
<tr>
<th>Key features</th>
<th>Key benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Integrated Finite-State-Machine (FSM)</td>
<td>› Allows semi-autonomous operation</td>
</tr>
<tr>
<td>› Very fast chirp speed: 400 MHz/µs</td>
<td>› Highly configurable modulation and power modes</td>
</tr>
<tr>
<td>› High Signal-To-Noise Ratio (SNR)</td>
<td>› MCU only needs to configure sensor and fetch data</td>
</tr>
<tr>
<td>› Ultra-wide bandwidth &gt;5 GHz</td>
<td>› High velocity resolution</td>
</tr>
<tr>
<td>› FMCW operation</td>
<td>› People can be detected up to 15 m</td>
</tr>
<tr>
<td>› Integrated L-shaped antennas + small package size (6.5 x 5.0 x 0.9 mm³)</td>
<td>› High sensitivity allows submillimeter level motion detection</td>
</tr>
<tr>
<td>› &lt;5 mW (duty cycling according to released FCC waiver)</td>
<td>› Allows simultaneous measurement of target range and velocity</td>
</tr>
<tr>
<td></td>
<td>› High accuracy of range measurements</td>
</tr>
<tr>
<td></td>
<td>› Reduced interference with other sensors</td>
</tr>
<tr>
<td></td>
<td>› L-shape enables horizontal and vertical angular measurements</td>
</tr>
<tr>
<td></td>
<td>› Thanks to small package size, PCB area can be saved + design-in process simplified</td>
</tr>
<tr>
<td></td>
<td>› Reduces average power consumption</td>
</tr>
<tr>
<td></td>
<td>› Optimized power modes for low power consumption</td>
</tr>
</tbody>
</table>

Product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>SP No.</th>
<th>OPN No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEMO BGT60TR13C</td>
<td>SP005728718</td>
<td>DEMOBGT60TR13CTOBO1</td>
</tr>
<tr>
<td>BGT60TR13C</td>
<td>SP002262606</td>
<td>BGT60TR13CE6327XUMA1</td>
</tr>
</tbody>
</table>

DEMO BGT60TR13C

Getting started with the XENSIV™ 60GHz demo board for advanced sensing

**BGT60TR13C offers innovative and intuitive sensing capabilities**

This demo board features Infineon’s 60GHz XENSIV™ radar sensor BGT60TR13C and consists of a radar baseboard as well as a BGT60TR13C shield.

The radar baseboard is a 40.64 mm x 25.4 mm printed circuit board (PCB). Its main purpose is to provide a generic sensor interface for BGT60TR13C MMIC. The central microcontroller unit (MCU) can perform radar data processing or forward the sensor data to a USB interface or an Arduino MKR interface.

The BGT60TR13C shield presents a minimized form factor of 17 x 12.7 mm² and comes with an integrated BGT60TR13C Antenna-in-Package (AIP) radar chip of 6.5 x 5.0 x 0.85 mm³. Moreover, the shield contains a digital interface for configuration and transfer of the acquired radar data to a microcontroller board. The shield is optimized for fast prototyping designs and system integrations as well as initial product feature evaluations. In addition, it offers developers the flexibility to choose their own platform depending on their preferred use cases.

**Several benefits come along with the BGT60TR13C demo board:**

› Flexible platform selection
› Variable connector options, and option to solder onto other PCBs
› Highly flexible configuration on FMCW modulation
› Power consumption can be optimized according to use case

www.infineon.com/BGT60TR13C
XENSIV™ 24 GHz radar sensor ICs
Infineon BGT24M/L family of MMIC chips

Infineon’s range of 24 GHz industrial radar chips provides five configurations of transmit and receiver channels, ensuring that there is a chip to support your specific application. From basic applications such as motion detection in security systems, which only requires one transmit and one receive channel, to more complex applications like 3D positioning, which requires two or more receive channels, our range of radar chips supports all of your requirements.

<table>
<thead>
<tr>
<th>Features</th>
<th>Infineon MMIC</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 GHz ISM band operation for motion, speed, direction movement and distance measurements</td>
<td><img src="image" alt="Image of Infineon MMIC" /></td>
<td>Long-range distance detection of moving objects up to 50 m</td>
</tr>
<tr>
<td>Five 24 GHz chips available</td>
<td><img src="image" alt="Image of Infineon MMIC" /></td>
<td>Wide range speed detection up to ±100 km/h</td>
</tr>
<tr>
<td>Highly integrated MMICs</td>
<td><img src="image" alt="Image of Infineon MMIC" /></td>
<td>Low BOM costs</td>
</tr>
</tbody>
</table>

### The BGT24LTR22 key features

- 24 GHz transceiver MMIC
- Fully integrated low phase noise VCO
- Integrated analog base band stage with programmable gain and filter settings
- Bi-directional pin for synchronization
- Built in temperature compensation circuit for VCO stabilization, no PLL needed
- Low power consumption
- Fully ESD protected device
- Single ended RF and IF terminals
- Single supply voltage 1.5 V

www.infineon.com/24GHz
24 GHz evaluation and demonstration boards

In addition to the BGT24M/L family of MMIC chips, Infineon provides a continuously expanding range of evaluation and demonstration boards to support the testing and development of radar in multiple applications of our customers. All boards are provided with base-level software to support the ease of use and faster time-to-market integration.

- Four system boards available
- All include 24 GHz radar chip and XMC™ microcontroller
- Kit contains user manual, GUI, MATLAB compiler and Gerber files
- Software available via Infineon Toolbox

Demonstrator with SW support

<table>
<thead>
<tr>
<th>Features</th>
<th>Infineon development kit</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Capability to detect motion, speed, and direction of movement (approaching or retreating)</td>
<td>› Capability to detect the distance of multiple targets</td>
<td>› Capability to detect motion, speed, and direction of movement (approaching or retreating)</td>
</tr>
<tr>
<td>› Detection range of 18 m for a human target at a power consumption &lt; 5 mW</td>
<td>› Capabilities to detect motion, speed, and direction of movement (approaching or retreating)</td>
<td>› Operates in harsh environments and detects through non-metallic materials</td>
</tr>
<tr>
<td>› High sensitivity of detection in comparison to PIR</td>
<td>› Operates in harsh environments and detects through non-metallic materials</td>
<td>› BGT24TR11 – 24 GHz highly integrated RF MMIC</td>
</tr>
<tr>
<td>› Arduino compatible microcontroller board (Arduino standard connectors)</td>
<td>› Debug over Cortex 10 pin debug connector</td>
<td>› XMC4700 Arm® Cortex®-M4 – 32-bit industrial microcontroller</td>
</tr>
<tr>
<td>› Multiple current sensors for current consumption monitoring and optimization</td>
<td>› Integrated multiple-element patch antennas</td>
<td>› Distance2GoL with SW support</td>
</tr>
<tr>
<td>› Integrated multiple-element patch antennas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Main applications
- Security
- Indoor and outdoor lighting
- Smart home
- Automatic door opener
- Intelligent switches
- Speed measurement

Main applications
- Drone: soft landing/obstacle avoidance
- Smart toilets
- Tank level sensing
- Intelligent switches

Main applications
- Smart Home devices
- Indoor and outdoor lighting systems
- Unmanned aerial vehicles (UAV)
- Security systems from commercial surveillance to low-power IP cameras
- HVAC products like smart air conditioners
- Smart sanitary facilities (eg Smart Toilets)
- Security systems incl. surveillance cameras
- People tracking (IoT, smart home)
- Vital sensing

Board dimensions
- Board 55 mm x 85 mm
- Shield: 55 mm x 66 mm

Board dimensions
- Board 36 mm x 45 mm

Board dimensions
- Board 55 mm x 85 mm
- Shield: 55 mm x 66 mm

Board dimensions
- Board 50 mm x 45 mm

Kit contents
- RF radar shield: SHIELD_BGT24LTR11
- Programmed controller board: RADAR BB XMC4700
- Micro USB cable
- SW GUI to operate kit
- Doppler FW and SW
- Schematic and bill-of-materials of module

Kit contents
- User’s manual
- Demonstration board
- SW GUI to operate kit
- FMCFW FW and SW
- Schematic and bill-of-materials of module

Kit contents
- RF radar shield: SHIELD_BGT24LTR11
- Programmed controller board: RADAR BB XMC4700
- Micro USB cable
- SW GUI to operate kit
- Doppler FW and SW

Kit contents
- User’s manual
- Demonstration board
- Corner reflector
- SW GUI to operate kit
- FMCFW FW and SW
- Doppler FW and SW
- Schematic and bill-of-materials of module

www.infineon.com/24GHz

1) Usage of the FMCW and/or Doppler FW and SW requires agreeing to Infineon’s user’s agreement and licensing terms.
24 GHz modules

Partnering with the leading radar solution providers enables Infineon to connect our customers looking for turnkey solutions and design support for a complete range of applications. Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules. Each of them contains Infineon’s 24 GHz MMIC.

<table>
<thead>
<tr>
<th>Features</th>
<th>Partner modules using Infineon chips</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available)</td>
<td>Module (RF module; RF module + MCU including SW)</td>
<td>Ease of design</td>
</tr>
<tr>
<td>Turnkey solution, no need for test and certification</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By integrating Infineon’s 24GHz MMIC chip into the partners easy-to-use and simple-to-integrate modules the complexity and time to market for a range of applications such as smart home automation, camera & security systems, air conditioners, UAVs, robotics, and smart lighting, are reduced.

Learn radar with Infineon on www.infineon.com/MakeRadar

For the first time, we bring radar to makers and developers. Here you can test, develop, and learn radar and its applications. At www.infineon.com/makeradar, you will see how simple it has become to work with ultrasmall radar sensors. The board and data will flow to your browser for testing, and this is not all, if you want to take the next step just take the available Arduino code examples and start your project.

www.infineon.com/24GHz
Shield2Go

Infineon’s Shield2Go boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining 2GO boards together with Infineon MyIoT adapters. MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of the IoT system.

Security

**OPTIGA™ Trust E Security Shield2Go**
Product name: S2GO_Security_OPTIGA_E
SP: SP001820138

**OPTIGA™ Trust X Security Shield2Go**
Product name: S2GO_SECURITY_OPTIGA_X
SP: SP002349576

Sensors

**PASCO2V01 Shield2Go**
Product name: SHIELD_PASCO2_SENSOR
SP: SP005569590

**IM69D130 Microphone Shield2Go**
Product name: S2GO_MEMSMIC IM69D
SP: SP002851544

**S2GO Pressure Sensor DPS310**
Product name: S2GO_PRESSURE_DPS310
SP: SP001777630

**S2GO Pressure Sensor DPS368**
Product name: S2GO_PRESSURE DPS368
Featured product: XENSIV™ pressure sensor DPS368
SP: SP005338022

**TLI4971 Current Sense Shield2Go**
Product name: S2GO_CUR-SENSE_TLI4971
SP: SP005345472

www.infineon.com/sensors2go  www.infineon.com/s2go-myiot
 Shield2Go

Sensors

- **TLE493DW2B6 3DSense Shield2Go**
  - Product name: S2GO_3D_TLE493DW2B6-A0
  - SP: SP004308594

- **TLI493D 3DSense Shield2Go in small WLB-5 package (1.13 mm x 0.93 mm x 0.59 mm)**
  - Product name: S2GO_3D_TLI493DW2BW-A0
  - SP: SP001823678

- **TLV493D 3DSense Shield2Go**
  - Product name: S2GO_3D-SENSE_TLV493D
  - SP: SP005410385

- **TLE4964-3M Hall Sense Shield2Go**
  - Product name: S2GO_HALL_TLE4964-3M
  - SP: SP004308590

- **TLE4966K Double Hall Shield2Go**
  - Product name: S2GO_2_HALL_TLE4966K
  - SP: SP004308598

Microcontroller

- **XMC 2Go Kit**
  - Product name: KIT_XMC_2GO_XMC1100_V1
  - SP: SP001199544

MyIoT – Adapter

- **MyIoT Adapter**
  - Sales name: MYIOTADAPTERTOBO1
  - SP: SP002434972

Infineon’s 2Go boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining 2Go boards together with Infineon MyIoT adapters. MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of IoT system.

www.infineon.com/s2go-myiot
Sensor 2GO kits

Infineon’s XENSIV™ Sensor 2GO kits are budget-priced evaluation boards that are already equipped with a sensor combined with an Arm® Cortex®-M0 CPU. The Sensor 2GO kits provide a complete set of on-board devices, including an on-board debugger. Build your own application and gadget with the Sensor 2GO kits. Our 2GO kits are ready-to-use plug-and-play boards.

### 3D Magnetic Sensor 2GO kit
**Product name:** TLE493D-A2B6 MS2GO/TLE493D-W2B6 MS2GO/TLV493D-A1B6 MS2GO
**SP:** SP001707582/SP001707578/SP001707574

**Features**
- We offer three different derivatives
  - TLE493D-A2B6 (three dimensional magnetic sensor)
  - TLE493D-W2B6 (three dimensional magnetic sensor)
  - TLV493D-A1B6 (three dimensional magnetic sensor)
- XMC1100 (Arm® Cortex™-M0 based)
- On-board J-Link Lite Debugger (Realized with XMC4200 Microcontroller)
- Power over USB (Micro USB), ESD and reverse current protection
- GUI for free download

### Automotive Pressure Sensor 2GO kit
**Product name:** KP215F1701-PS2GO-KIT/KP229E3518-PS2GO-KIT/KP236-PS2GO-KIT/KP254-PS2GO-KIT/KP275-PS2GO-KIT
**SP:** SP002676652/SP002676656/SP002676664/SP002676668/SP002676670

**Features**
- We offer three different derivatives
  - KP215F1701 MAP: Analog Manifold Air Pressure Sensor
  - KP229E3518 TurboMAP: Analog Turbo Manifold Air Pressure Sensor
  - KP236 BAP: Analog Barometric Air Pressure
  - KP254 dBAP: Digital Barometric Air Pressure (SPI)
  - KP275 dMAP: Digital Manifold Air Pressure Sensor (SENT)
- Pressure and external temperature measurement - ONLY KP275dMAP
- CSV file can be generated for each derivative
- External NTC included KP275-PS2GO-KIT
- Configuration of different transfer functions possible, KP215F1701-PS2GO-KIT and KP229E3518-PS2GO-KIT
- A pressure connector consisting of a fast connector for 6mm tubes, pressure couple, and sealing is included
- GUI software for free download
- Power over USB (micro USB), ESD and reverse current protection
- GUI for free download

### TLI4971 Current Sensor 2GO kit
**Product name:** TLI4971_MS2GO
**SP:** SP00534547

**Features**
- XENSIV™ magnetic current sensor TLI4971-A20T
- Sensor board for high current capability (≥20 A)
- Complete evaluation set including control and debug
- First measurements possible within minutes

[www.infineon.com/sensors2go](http://www.infineon.com/sensors2go)
Sensor 2GO kits

Speed Sensor 2GO kit
Product name: TLE4922 Speed-2-Go-Kit
SP: SP001624692
Features
› Budget-priced evaluation board for speed sensing
› Complete speed sensor incl. back-bias magnet, fixing and cable
› TLE4922 (active mono cell Hall sensor)
› XMC1100 (Arm® Cortex™-M0 based)
› On-board J-Link Lite Debugger (realized with XMC4200 microcontroller)
› Power over USB (Micro USB), ESD and reverse current protection
› GUI based tool for real in-application evaluation for free download

Angle Sensor 2GO kit
Product name: TLE5012B_E1000_MS2GO/TLI5012B_E1000_MS2GO/
TLE5012B_E5000_MS2GO /TLE5012B_E9000_MS2GO
SP: SP002133956/SP002133964/SP002133968/SP002133968
Features
› Budget-priced evaluation board for angle and position sensing
› We offer four derivatives:
   – TLE5012B_E1000 version: automotive predefined variant with SSC and IIF communication protocols
   – TLE5012B_E5000 version: automotive predefined variant with SSC and PWM communication protocols
   – TLE5012B_E9000 version: automotive predefined variant with SSC and SPC communication protocols
   – TLI5012B_E1000 version: industrial predefined variant with SSC and IIF communication protocols
› TLE5012B/TLI5012B GMR digital angle sensor
› XMC1100 (Arm® Cortex™-M0 based)
› On-board J-Link Lite Debugger (realized with XMC4200 microcontroller)
› The kit is compatible with the angle rotate knob for fast evaluation
› GUI based tool for real in-application evaluation for free download
Microphone flex evaluation kits

Product name: EVAL_IM69D130_FLEXKIT
Product name: EVAL_IM69D120_FLEXKIT
Product name: EVAL_IM69D127_FLEXKIT
Product name: EVAL_IM73D135_FLEXKIT
Product name: EVAL_IM72D128_FLEXKIT
Product name: EVAL_IM70A135_FLEXKIT
Product name: EVAL_IM67D120_FLEXKIT
Product name: EVAL_IM67D130_FLEXKIT

The flex evaluation kits allow simple and easy evaluation of XENSIV™ MEMS microphones. One microphone of the respective type is mounted on each flex board. A flex board can be easily connected to an audio testing setup with the included adapter board via a 6-position ZIF connector. Each kit includes five flex boards and one adapter board. All digital flex kits can be connected to Infineon's EVAL AHNB IM69D130V01 evaluation board.

Features
- Quick and easy connection to evaluation system
- Small size: 25 mm x 4.5 mm
- Pre-soldered MEMS microphone
- Configurable select pin configuration for digital microphones

XENSIV™ - TLE4966 Hall switches 2GO kit

Product name: TLE4966 MS2GO

The board features our 3D magnetic sensor, TLE493D-W2BW used as reference magnetic probe for correlating magnetic switching points with magnetic field strength. Mechanically, the board is compatible with the Out-of-Shaft mechanical Add on, which must be ordered separately.

Features
- TLE4966V-1G, double vertical Hall latch with direction detection
- TLE4966G, double lateral Hall latch with direction detection
- XMC1100 (Arm® Cortex™-M0 based)
- On-board J-Link Lite Debugger (Realized with XMC4200 Microcontroller)
- Power over USB (Micro USB), ESD and reverse current protection
- GUI for free download
Add ons for Sensor 2GO kits and Shield2Go

Joystick for all 3D Magnetic Sensor 2GO kits and Shield2Go
Product name: JOYSTICK FOR 3D 2 GO KIT
SP: SP001491834
Features
› Easy mounting on all 3D magnetic sensor 2GO kits and Shield2Go
› First magnetic joystick measurements within minutes

Rotate knob for all 3D Magnetic Sensor 2GO kits, angle sensor 2GO kits and 3D magnetic sensor Shield2Go
Product name: ROTATE KNOB 3D 2 GO KIT
SP: SP001504602
Features
› Easy mounting on all 3D magnetic and angle sensor 2GO kits as well as 3D magnetic sensor Shield2Go
› Rotate knob with magnet as used in control elements and push buttons
› Use cases 3D magnetic sensors: rotational and vertical movements of control elements and push buttons
› Use cases angle sensors: simulates rotational movements for angle measurements

Linear slider for all 3D Magnetic Sensor 2GO kits and Shield2Go
Product name: LINEAR-SLIDER 2GO
SP: SP002043034
Features
› Easy mounting on all 3D magnetic sensor 2GO kits and Shield2Go
› First magnetic linear evaluations within minutes
› Use case: linear movements
› Linear slider with magnet – flexible setup: adaptable air-gaps, two different magnetic strengths/materials and distance limiters

Out of shaft adapter for all 3D Magnetic Sensor 2GO kits and Shield2Go
Product name: OUT OF SHAFT FOR 3D 2 GO
SP: SP003475178
Features
› Easy mounting on all 3D magnetic sensor 2GO kits and Shield2Go
› Use case: angle measurement in out of shaft configuration with 3D Hall sensor
› Three different out of shaft configurations possible (x-z, y-z and x-y axis)
› Magnetic rotation bar with ring magnet included

www.infineon.com/sensors2go
Add-ons for Sensor 2GO kits and Shield2Go

**Linear control trigger for all 3D Magnetic Sensor 2GO Kits and Shield2Go**

**Product name:** POWER_DRILL2GO

**Features**
- Easy mounting on all 3D magnetic sensor 2GO Kits and Shield2Go
- Use case: control trigger for e.g. power drill (linear position measurements with 3D Hall sensor)
- Magnetic slider with magnet included

**Human Machine Interface (HMI) direction indicator for all 3D Magnetic Sensor 2GO Kits and Shield2Go**

**Product name:** DIR_INDICATOR2GO

**Features**
- Easy mounting on all 3D magnetic sensor 2GO Kits and Shield2Go
- Use case: human-machine interface (3x3 position matrix) for e.g. automotive direction indicator
- Magnetic direction indicator with magnet included in handle bar

**HMI mini control with 4 directions and 360° rotation for all 3D Magnetic Sensor 2GO Kits and Shield2Go**

**Product name:** MINI_CONTROL2GO

**Features**
- Easy mounting on all 3D magnetic sensor 2GO Kits and Shield2Go
- Use case: left/right/forward and backward including 360° rotation at all positions
- Control element includes magnet

**OpenClose Adapter for Hall switch Shield2Go**

**Product name:** OPENCLOSE2GO_HSTOB01

**Features**
- Open & Close detection with magnet for positions detection
- Presence and non-presence detection

www.infineon.com/sensors2go
Play2Go for 3D magnetic sensor

Product name: PLAY2GO
Ordering code: SP005731811

The Infineon PLAY2GO is a very small joystick that can be actuated with your thumb. In terms of size it is a direct replacement to those potentiometer joysticks often used in gaming controllers and similar devices. The joystick itself comes with a pre-mounted magnet and is especially made to be combined with the TLI493D-W2BW 3D magnetic sensor Shield2Go in order to evaluate three dimensional movements of consumer or also industrial joysticks.

Features
› Easy mounting on TLI493D-W2BW Shield2Go
› First magnetic joystick measurements within minutes
› GUI for free download

Contactless switch array for all 3D magnetic sensor 2GO kits and Shield2Go

Product name: Contactless switch array
Ordering code: SP005731811

Features
› Contactless magnetic based „4-bit DIP Switch“ for configuration using a magnetic 3D sensor for detection
› Four movable tiny magnets are used to configure a four bit value

Complementary magnets
› TRU COMPONENTS 505944 Permanent Magnet Würfel

For more details on the product, click on the part number, visit infineon.com or contact our product support.
Infineon support for sensors
Useful links and helpful information

Further information, datasheets and documents
www.infineon.com/sensors
www.infineon.com/microphones
www.infineon.com/magnetic-sensors
www.infineon.com/current-sensor
www.infineon.com/hall-switches
www.infineon.com/angle-sensors
www.infineon.com/3dmagnetic
www.infineon.com/pressuresensor
www.infineon.com/24GHz
www.infineon.com/pressure
www.infineon.com/CO2

2GO evaluation kits
www.infineon.com/sensors2go

Online simulation tools
www.infineon.com/cms/en/product/sensor/#!/simulation
Packages

- Surface mount device (SMD) technology
- Through-hole device (THD) technology

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.
## Packages

### Surface mount device (SMD) technology

<table>
<thead>
<tr>
<th>DPAK (TO-252-2)</th>
<th>DPAK (TO-252)</th>
<th>DPAK 5-pin (TO-252)</th>
<th>HDSOP-10-1</th>
<th>QDPAK TSC</th>
<th>D’PAK (TO-263)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 9.9 x 6.5 x 2.3</td>
<td>3 9.9 x 6.5 x 2.3</td>
<td>5 9.9 x 6.5 x 2.3</td>
<td>10 20.96 x 6.5 x 2.3</td>
<td>22 20.96 x 15.0 x 2.3</td>
<td>3 15.0 x 10.0 x 4.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D’PAK (TO-263-2)</th>
<th>TO263-7-11</th>
<th>TO263-7-12</th>
<th>TO263-7-13</th>
<th>D’PAK 7-pin (TO-263)</th>
<th>TO-Leadless (TOLL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 15.0 x 10.0 x 4.4</td>
<td>7 15.0 x 10.0 x 4.4</td>
<td>7 15.0 x 10.0 x 4.4</td>
<td>7 15.0 x 10.0 x 4.4</td>
<td>8 11.7 x 9.9 x 2.3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOLT (top-side cooling)</th>
<th>TOLG (Gullwing leads)</th>
<th>sTOLL</th>
<th>SC59</th>
<th>SOT-23</th>
<th>SOT-23-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 15.0 x 9.9 x 2.3</td>
<td>8 11.7 x 9.9 x 2.3</td>
<td>5 8.0 x 7.0 x 2.3</td>
<td>3 3.0 x 2.8 x 1.1</td>
<td>3 2.9 x 2.4 x 1.0</td>
<td>5 2.9 x 1.6 x 1.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOT-23-6</th>
<th>SOT-89</th>
<th>SOT-223</th>
<th>SOT223-3-1</th>
<th>SOT-323</th>
<th>SOT-363</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 2.9 x 1.6 x 1.3</td>
<td>3 4.5 x 4.0 x 1.5</td>
<td>4 6.5 x 7.0 x 1.6</td>
<td>3 7.0 x 6.5 x 1.6</td>
<td>3 2.0 x 2.1 x 0.9</td>
<td>6 2.0 x 2.1 x 0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TSOP6</th>
<th>PQFN 2x2</th>
<th>PQFN 2x2 dual</th>
<th>PQFN 3.3x3.3</th>
<th>SuperSO8</th>
<th>SuperSO8 dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 2.9 x 2.5 x 1.1</td>
<td>6 2.0 x 2.0 x 0.9</td>
<td>6 2.0 x 2.0 x 0.9</td>
<td>8 3.3 x 3.3 x 1.0</td>
<td>8 5.15x6.15 x 1.0</td>
<td>8 5.15x6.15 x 1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SuperSO8 fused leads</th>
<th>SuperSO8 super cool</th>
<th>LSON-8-1</th>
<th>TDSON-8-47</th>
<th>TDSON-10-2</th>
<th>TDSON-10-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 5.15x6.15 x 1.0</td>
<td>8 6.0 x 5.0 x 0.75</td>
<td>8 8.0 x 8.0 x 1.35 (max.)</td>
<td>8 5.15x6.15 x 1.0</td>
<td>10 3.0 x 3.0 x 0.9</td>
<td>10 3.0 x 3.0 x 0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TDSON-8-25 fused leads</th>
<th>TISON-8</th>
<th>TISON-8-5/TISON-8-6</th>
<th>TISON-8 (power stage 5x6)</th>
<th>TISON-8-4 (Power Block)</th>
<th>TSON-8-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 3.3 x 3.3 x 1.0</td>
<td>8 7.0 x 7.0 x 1.0</td>
<td>8 8.0 x 8.0 x 1.0</td>
<td>8 5.0 x 6.0 x 1.0</td>
<td>8 5.0 x 6.0 x 1.0</td>
<td>8 3.0 x 3.0 x 1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TSON-8-3</th>
<th>ThinPAK 5x6 (TSON-8)</th>
<th>LLGA-5-4</th>
<th>TSON-10</th>
<th>TDSO-16-30</th>
<th>TSNP-6-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 5.0 x 6.0 x 1.0</td>
<td>8 6.15 x 5.33 x 1.0</td>
<td>5 4.0 x 3.0 x 1.2</td>
<td>10 3.3 x 3.3 x 1.0</td>
<td>16 5.0 x 6.1 x 1.2</td>
<td>6 1.5 x 1 x 0.375</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ThinPAK 8x8 (VSON-4)</th>
<th>VDSON-8</th>
<th>DSOF-8-16</th>
<th>DSOF-8-164</th>
<th>DFN-8-1</th>
<th>DSOSP-14-82</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 8.0 x 8.0 x 1.0</td>
<td>8 4.0 x 4.0 x 0.9</td>
<td>8 7.0 x 7.0 x 2.8</td>
<td>8 4.5 x 4.3 x 1.55</td>
<td>14 5.4 x 3.7 x 3.4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WSON-6-1</th>
<th>WSON-8-3</th>
<th>WSON-10</th>
<th>DirectFET™ Small Can</th>
<th>DirectFET™ Medium Can</th>
<th>DirectFET™ Large Can</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 3 x 3 x 0.75</td>
<td>8 3 x 3 x 0.75</td>
<td>10 4.0 x 4.0 x 0.8</td>
<td>V 4.8 x 3.8 x 0.65</td>
<td>V 6.3 x 4.9 x 0.65</td>
<td>V 9.1 x 6.9 x 0.71</td>
</tr>
</tbody>
</table>

For more information, visit [www.infineon.com/packages](http://www.infineon.com/packages).

All products are RoHS Compliant.
<table>
<thead>
<tr>
<th>Package Type</th>
<th>Pin-Count</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSOF-8-1 (TOLL)</td>
<td>8</td>
<td>10.375 x 9.9 x 2.3</td>
</tr>
<tr>
<td>IQFN-27-2</td>
<td>27</td>
<td>3.3 x 6.0 x 0.9</td>
</tr>
<tr>
<td>IQFN-30 (DrMOS 4x4)</td>
<td>30</td>
<td>4.0 x 4.0 x 1.0</td>
</tr>
<tr>
<td>IQFN-31 (DrMOS 5x5)</td>
<td>31</td>
<td>5.0 x 5.0 x 0.8</td>
</tr>
<tr>
<td>IQFN-36</td>
<td>36</td>
<td>7.5 x 6.0 x 0.9</td>
</tr>
<tr>
<td>IQFN-39</td>
<td>39</td>
<td>5.0 x 6.0 x 0.9</td>
</tr>
<tr>
<td>IQFN-40</td>
<td>40</td>
<td>6.0 x 6.0 x 0.8</td>
</tr>
<tr>
<td>TIQFN-21-1</td>
<td>21</td>
<td>8.0 x 8.0 x 1.15</td>
</tr>
<tr>
<td>TIQFN-28-1</td>
<td>28</td>
<td>8.0 x 8.0 x 1.15</td>
</tr>
<tr>
<td>SO8/SO8 dual</td>
<td>8</td>
<td>5.0 x 6.0 x 1.75</td>
</tr>
<tr>
<td>SO-16/12</td>
<td>12</td>
<td>10.0 x 6.0 x 1.75</td>
</tr>
<tr>
<td>SO-14</td>
<td>14</td>
<td>8.75 x 6.0 x 1.75</td>
</tr>
<tr>
<td>SO-16</td>
<td>16</td>
<td>10.0 x 6.0 x 1.75</td>
</tr>
<tr>
<td>SO-18</td>
<td>18</td>
<td>12.8 x 10.3 x 2.65</td>
</tr>
<tr>
<td>DSO-12</td>
<td>12</td>
<td>10.3 x 7.8 x 2.65</td>
</tr>
<tr>
<td>DSO-16-30 (300 mil)</td>
<td>16</td>
<td>10.3 x 7.5 x 2.35</td>
</tr>
<tr>
<td>DSO-20-85</td>
<td>20</td>
<td>15.9 x 11.0 x 3.25</td>
</tr>
<tr>
<td>DSO-20-87</td>
<td>20</td>
<td>15.9 x 11.0 x 3.25</td>
</tr>
<tr>
<td>DSO-24</td>
<td>24</td>
<td>10.5 x 15.6 x 2.65</td>
</tr>
<tr>
<td>SSOP-24</td>
<td>24</td>
<td>6 x 8.65 x 1.75</td>
</tr>
<tr>
<td>TDSO-16</td>
<td>16</td>
<td>5.0 x 6.0 x 1.2</td>
</tr>
<tr>
<td>SO-19</td>
<td>19</td>
<td>12.8 x 10.3 x 2.65</td>
</tr>
<tr>
<td>SO-20</td>
<td>20</td>
<td>12.8 x 10.3 x 2.65</td>
</tr>
<tr>
<td>DSO-28</td>
<td>28</td>
<td>18.1 x 10.3 x 2.65</td>
</tr>
<tr>
<td>SO-36</td>
<td>36</td>
<td>15.9 x 11.0 x 3.5</td>
</tr>
<tr>
<td>TSSOP-28</td>
<td>28</td>
<td>9.7 x 6.4 x 1.2</td>
</tr>
<tr>
<td>TSSOP-48</td>
<td>48</td>
<td>12.5 x 6.1 x 1.1</td>
</tr>
<tr>
<td>LFBSA-516-5</td>
<td>516</td>
<td>25.3 x 25.3 x 2.8</td>
</tr>
<tr>
<td>LFBSA-292-6</td>
<td>292</td>
<td>17.3 x 17.3 x 2.35</td>
</tr>
<tr>
<td>BGA-416-26</td>
<td>416</td>
<td>27.3 x 27.3 x 3.2</td>
</tr>
<tr>
<td>TFLGA-13-1</td>
<td>13</td>
<td>5 x 5 x 0.96</td>
</tr>
<tr>
<td>LQFP-176-22</td>
<td>176</td>
<td>26.7 x 26.7 x 2.11</td>
</tr>
<tr>
<td>LQFP-144-22</td>
<td>144</td>
<td>22.4 x 22.4 x 2.2</td>
</tr>
<tr>
<td>TQFP-144-27</td>
<td>144</td>
<td>18.7 x 18.7 x 1.6</td>
</tr>
<tr>
<td>TQFP-100-23</td>
<td>100</td>
<td>14.5 x 14.5 x 1.5</td>
</tr>
<tr>
<td>TQFP-80-7</td>
<td>80</td>
<td>12.6 x 12.6 x 1.5</td>
</tr>
<tr>
<td>VQFN-40-13</td>
<td>40</td>
<td>5 x 5 x 0.85</td>
</tr>
<tr>
<td>VQFN-48-60</td>
<td>48</td>
<td>6 x 6 x 0.85</td>
</tr>
<tr>
<td>VQFN-48-78 (LTI)</td>
<td>48</td>
<td>7 x 7 x 0.85</td>
</tr>
<tr>
<td>VQFN-56-5/-6</td>
<td>56</td>
<td>7 x 7 x 0.9</td>
</tr>
</tbody>
</table>

*Note: All dimensions in mm.*
## Through-hole device (THD) technology

<table>
<thead>
<tr>
<th>Package</th>
<th>IPAK (TO251)</th>
<th>IPAK SL (TO251 SL)</th>
<th>IPAK short lead w/ ISO standoff</th>
<th>IPAK (TO262)</th>
<th>TO-220 real 2-pin</th>
<th>TO-220 2-pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Type</td>
<td>3</td>
<td>16.5 x 6.5 x 2.3</td>
<td>3</td>
<td>10.5 x 6.5 x 2.3</td>
<td>3</td>
<td>9.5 x 6.6 x 2.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>TO-220 3-pin</th>
<th>TO-220 FullPAK</th>
<th>TO-220 FullPAK Narrow Lead</th>
<th>TO-220 FullPAK Wide Creepage</th>
<th>TO-220-6-46</th>
<th>TO-220-6-47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Type</td>
<td>3</td>
<td>28.8 x 10 x 4.4</td>
<td>3</td>
<td>29.2 x 10.3 x 4.7</td>
<td>3</td>
<td>29.6 x 10.5 x 4.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>TO-247</th>
<th>TO-247-3-AI</th>
<th>TO-247 4-pin</th>
<th>DIP-7</th>
<th>DIP-8</th>
<th>DIP-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Type</td>
<td>3</td>
<td>41 x 16 x 5</td>
<td>3</td>
<td>41.3 x 10.9 x 5.18</td>
<td>4</td>
<td>40.15 x 15.9 x 5.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>DIP-20</th>
<th>Super220</th>
<th>Super247</th>
<th>SSO-3-9</th>
<th>SSO-3-10</th>
<th>SSO-4-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Type</td>
<td>20</td>
<td>24.6 x 9.9 x 4.2</td>
<td>3</td>
<td>28.25 x 10.5 x 4.5</td>
<td>3</td>
<td>34.6 x 15.6 x 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>TO92S-3-1</th>
<th>TO92S-3-2</th>
<th>Package (JEITA-code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Type</td>
<td>3</td>
<td>4.0 x 1.52 x 3.15</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin Count</th>
<th>V = Variable number of pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dimensions</td>
<td>in mm</td>
</tr>
</tbody>
</table>

All products are RoHS Compliant.
Infineon support for packages
Useful links and helpful information

Further information, datasheets and documents
www.infineon.com/packages
Infineon powerful support
Useful links and helpful information

General support
www.infineon.com/support
www.infineon.com/wheretobuy
www.infineon.com/quality
www.infineon.com/packages
www.infineon.com/green
www.infineon.com/opn

Tools, desks and more
www.infineon.com/solutionfinder
www.infineon.com/lightdesk
www.infineon.com/evaluationboards
www.infineon.com/webinars

Request reliability (FIT) data
http://infineon-community.com/FIT_1

Register for the Newsletter4Engineers
http://infineon-community.com/Newsletter4Engineers
Infineon Customized Solutions

Your specific needs, realized.

A customized solution (commonly known in the industry as an ASIC – Application Specific IC or CSP – Customer Specific Product) is one that is designed, planned, developed and used for a specific purpose, with the mission of being optimized, efficient, and having all the required functionalities and features to be used in a specific application for a single customer.

Working with Infineon from design through to delivery

Infineon as a market leader in customized solutions, believe innovation comes through collaboration and exploring new paths. Working closely with our customer’s, understanding their needs, and combining with our cutting edge solutions, we know there is always a benefit for every customer and application. Whether the challenge is related to IP, BOM constraints, or simply required higher integration, an ASIC can be the solution.

More than just a product

A customized solution enabled by Infineon’s extensive knowledge, experience and partner network, provides several more advantages, such as IP protection, trusted Infineon quality and supply guarantee.

www.infineon.com/asic
A process streamlined through efficiency, expertise and experience

The journey begins together with a focus on feasibility where we match early on your needs with our 40 years expertise in building world-class industry leading semiconductors, ensuring we can successfully implement your requirements.

Technology advantage through to supply stability

Whether it’s digital, analog, mixed signal devices an embedded processor or integrated sensors. We have the experience and product know-how. Being one of the largest semiconductor companies, we also have a vast array of IPs. We can integrate almost anything into your chip from the vast variety of our sensors, discrete devices, drivers and much more, including support for higher voltage levels. Our in-house fabrication facilities and design centers around the globe are known for highest quality standards. We also have well established partnerships with all major silicon foundries and assembly test fabs to complement our in-house technologies. At every step along the way, we take pride in the highest quality Infineon is known for.

Interested to learn more?

Visit our web page: www.infineon.com/asic where you can find further information about our customized solutions, videos, and if interested, use the “contact us” feature to connect with us.
The Infineon Partner Program
Together we win

Find solutions from our partners to accelerate your business of tomorrow. Infineon’s global network of partners are experts in designing products, solutions or services leveraging Infineon components in 5 key areas: software, hardware, services, tools & end-applications.

The Infineon partner program is a global ecosystem of qualified companies, offering knowledge and experience to enable and implement Infineon products. Partners from the Infineon partner ecosystem help design your device and application based on our components. They have been selected by us on the basis of their competence and ability to design and deliver strong and trustworthy solutions, especially for new technologies and use cases. Their knowledge and experience spans areas as diverse as hardware, software, tools, services and target applications.

Find out more information about the partner program and the latest news around our partners at Infineon Partner Ecosystem Website.

Looking for specific partner solution in your region? Our partner finder provides an overview of our partners and their offerings. Simply specify your search in the dropdown menu and browse through the texts, company logo, and partner signet to navigate directly to the respective website for further information.

Further information about Infineon partner solutions, you can also find under the “partner tab” on the product and application pages.

www.infineon.com/partners
Service hotline

Infineon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

- Germany .......................... 0800 951 951 951 (German/English)
- China, mainland ........ 4001 200 951 (Mandarin/English)
- India .............................. 000 800 4402 951 (English)
- USA .............................. 1-866 951 9519 (English/German)
- Other countries ........ 00* 800 951 951 951 (English/German)
- Direct access ........ +49 89 234-0 (interconnection fee, German/English)

* Please note: Some countries may require you to dial a code other than "00" to access this international number.

Please visit www.infineon.com/service for your country!

Dear users!

Our customers are at the heart of everything we do. Please give us feedback on how we can improve to meet your expectations with this document the best.

www.infineon.com

Published by
Infineon Technologies Austria AG
9500 Villach, Austria

© 2022 Infineon Technologies AG.
All Rights Reserved.

Please note!
This Document is for information purposes only and any information given herein shall in no event be regarded as a warranty, guarantee or description of any functionality, conditions and/or quality of our products or any suitability for a particular purpose. With regard to the technical specifications of our products, we kindly ask you to refer to the relevant product data sheets provided by us. Our customers and their technical departments are required to evaluate the suitability of our products for the intended application.

We reserve the right to change this document and/or the information given herein at any time.

Additional information
For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office (www.infineon.com).

Warnings
Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.