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The smart way to save energy and boost performance



www.infineon.com/powermanagement
www.infineon.com/microcontroller



HOUSEHOLD APPLIANCES consume much valuable energy. According to an IEA study, all of the world's wind power stations combined produce far less energy than household appliances expend in standby mode alone. Now a new generation of consumers has come to value energy conservation. People want smart, efficient household equipment that delivers environmentally responsible performance while helping to cut their utility costs. Microchips feature in many of these appliances enabling reductions in power loss of up to 90%. At Infineon, we have made it our mission to tap vast potential of these microchips to produce energy savings.

Rank 2004	Rank 2005	Supplier	2005	2004	Change
(1)	1	Infineon (incl. eupec)	9.4 %	8.4 %	1.0 %
(3)	2	Fairchild	7.2 %	7.6 %	-0.4 %
(2)	3	IR	7.1 %	7.8 %	-0.7 %
(4)	4	STM	6.9 %	7.0 %	-0.1 %
(5)	5	Toshiba	6.2 %	6.5 %	-0.3 %

DEMAND FOR MORE EFFICIENT appliances is rising, and we can help you satisfy it with our microcontrollers and integrated power modules. The Infineon Power Management & Drives division leverages all its engineering excellence to provide technology that increases energy efficiency and brings the benefits of real savings to consumers. Our industry-leading technology and manufacturing know-how made us the no. 1 in power semiconductors three years running. So why not capitalize on this expertise to energize your business success.

* and representative offices



Never stop thinking



The Infineon portfolio at a glance

AT INFINEON, WE HAVE brought together our successful silicon with innovative packaging technologies (i.e. CiPoS™). Our combination of microcontrollers and power semiconductors provide all of the signal processing and power conversion performance you need to build even better products.

Application product matrix

Products	Air conditioner	Washing machine	Dishwasher	Fridge	Vacuum cleaner	Microwave	Induction heater	Page
CoolMOS™	✓	✓	✓	✓	✓			Page 6
CoolSET™	✓	✓	✓	✓		✓	✓	Page 6
Driver IC/ EiceDRIVER™	✓	✓	✓	✓	✓	✓	✓	Page 7
CiPoS™	✓	✓		✓	✓			Page 8
PFC-IC	✓	✓	✓	✓	✓			Page 8
Discrete IGBT/ TrenchStop®	✓	✓	✓	✓	✓	✓	✓	Page 9
Microcontroller	✓	✓	✓	✓				Pages 10, 11

Leading-edge technology for the utmost energy efficiency

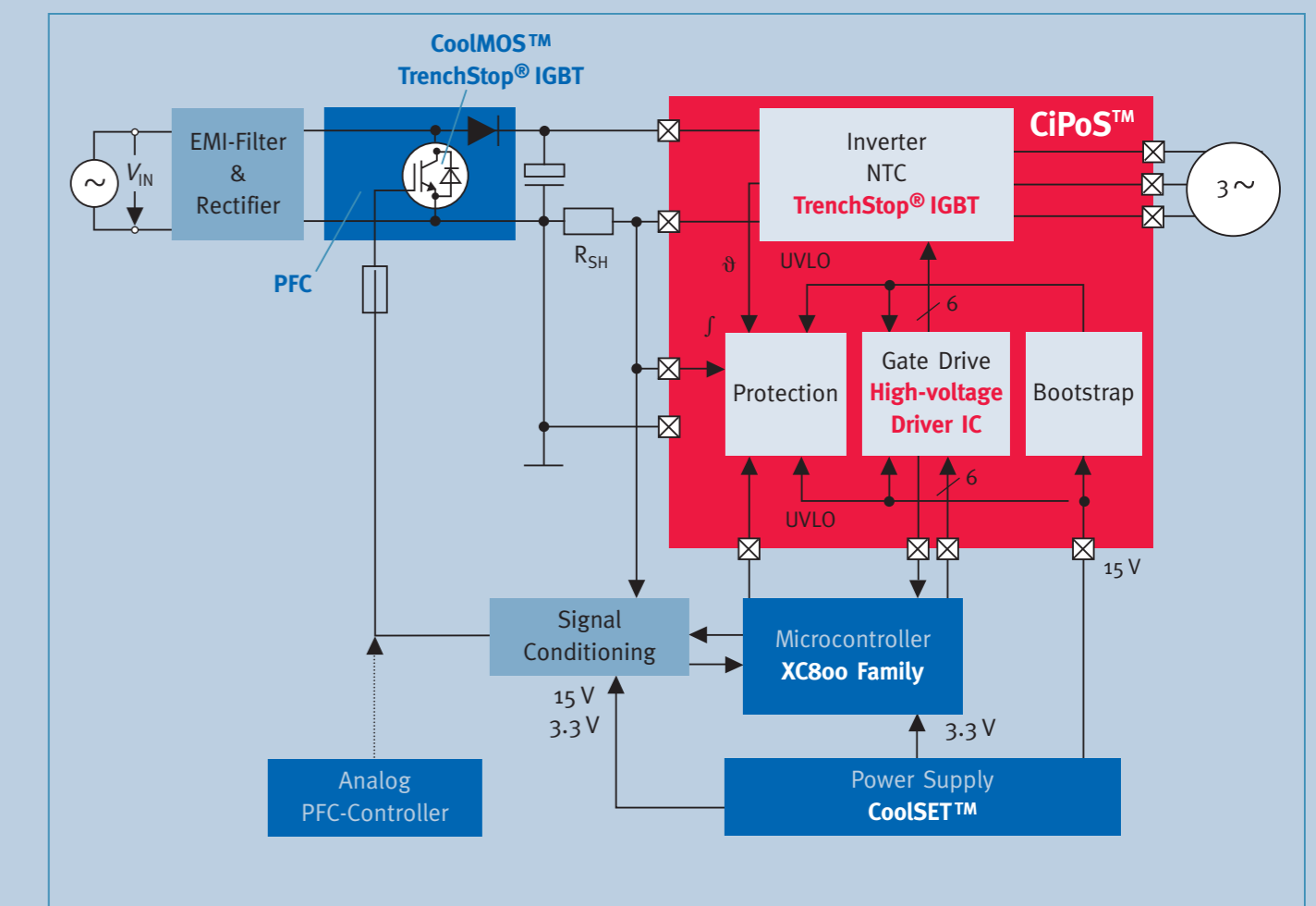
PRODUCT DESIGNERS are facing the daunting challenge of delivering smaller, smarter, more powerful and more energy-efficient appliances. The state-of-the-art technology that powers our CoolMOS™, CoolSET™, EiceDRIVER™, TrenchStop® IGBT, CiPoS™ and PFC-IC products are here to help meet this challenge.

THIS IS WHY WE INVEST so much in research and development to bring you the most advanced technology engineered to maximize efficiency. Our solutions satisfy today's demands for energy conservation – without sacrificing comfort and convenience. Based on industry-leading technology and manufacturing expertise, our line of innovative components for household appliances meets and exceeds even the most rigorous requirements for reliability and quality.

YOU WANT TO SPEED up development efforts and cut your costs. We have the technology and people to help you do both – ultra-advanced and cost-effective reference solutions and a regional team that provides you with in-depth technical and system expertise.

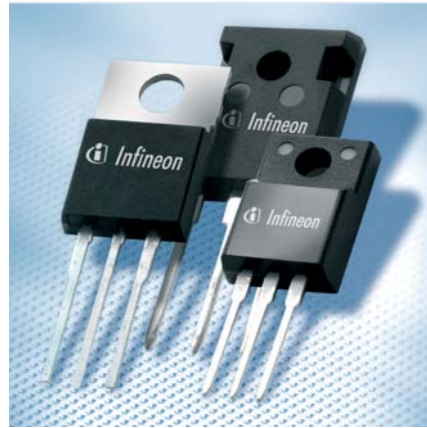
Complete solutions for home appliances

HOME APPLIANCES harbor huge potential for markedly reducing energy consumption all over the world. Depending on the appliance, energy savings of up to 30% may be realized simply by using variable speed drives (VSD) and frequency converters rather than single-speed drives.



CoolMOS™

Cool & Fast



www.infineon.com/coolmos

The revolutionary CoolMOS™ power MOSFET family enables a significant reduction of conducting and switching losses in Switched Mode Power Supplies (SMPS). Our latest generation of high-voltage power MOSFETs will make AC/DC power supplies even more efficient, more compact, lighter and cooler. This target is achieved by offering the lowest on-state resistance per package outline, the fastest switching speed and the lowest gate-drive requirements of high-voltage MOSFETs commercially available.

Features:

- Lowest area specific $R_{DS(on)}$
- Low gate charge
- Low internal gate resistance
- Compatible gate control
- Outstanding power-handling capability

Benefits:

- Low conduction losses, small package, no/less heat sink
- Lower driving requirements
- Lowest switching losses, controllable EMI-noise
- Compatible with all types of driving ICs
- Less system cost, less volume

EiceDRIVER™

600V SOI thin-film technology

The new EiceDRIVER™ 6ED003L06-F is a full bridge driver to control power devices such as IGBTs or MOS-transistors in 3-phase systems, with a blocking voltage up to +600V. Based on Silicon-On-Insulator (SOI) technology, this device is very resistant to negative transient voltages. Compared to standard monolithic high-voltage IC technology, the Infineon SOI thin-film technology does not have parasitic thyristor structures. This leads to outstanding robustness against latch-up when exposed to extreme temperature and voltage conditions.

Features:

- Ruggedness of the bridge output to negative transient voltages down to -50V as a result of SOI technology
- Power supply of the high-side drivers via bootstrap
- CMOS- and LSTTL-compatible input (inverted logic)
- RoHS-compliant PG-DSO-28 package
- Signal interlocking of every phase to prevent cross-conduction
- Overcurrent protection
- Undervoltage lockout
- “Shutdown” of all switches during error conditions
- Programmable restart after overcurrent detection



www.infineon.com/gatedriver

Benefits:

- High system reliability
- Industry-standard footprint
- Safe operation
- Reduced component count

CoolSET™

Integrating control IC and CoolMOS™ in one package



www.infineon.com/coolset

A revelation for power in consumer appliances – highly suited for power supplies design in consumer appliances, CoolSET™ continues to mark a new dimension in design agility and miniaturization. The CoolSET™ F3 family provides the highest output power with the lowest losses available in the industry.

Features:

- Active burst mode
- Adjustable blanking window for peak loads
- 650V integrated start-up cell
- Frequency jittering
- Enhanced integrated protection
- Peak-power limitation
- Modulated gate drive
- 650V integrated CoolMOS
- Latch enable feature

Benefits:

- Very low standby power < 100 mW (best in class)
- Very low output ripple
- Start-up time is independent of input voltage
- Reduce EMI noise
- Eliminate 1 X-cap and reduce line choke size
- Increased robustness and safety of the SMPS
- Reduce component count
- Transformer oversizing is not required
- No need to overrate power devices
- Reduced system size, weight and cost
- Reduced EMI
- Less heat generation

EiceDRIVER™

1,200V coreless transformer

Introducing the 2ED02012-FI, a half-bridge driver IC, Infineon Technologies offers a reliable and cost-effective solution for driving IGBT and MOSFET power stages up to 1,200V breakdown voltage. The IC, part of the EiceDRIVER™ family, is included in a PG-DSO-18-1 package. It is based on the new coreless transformer technology, which combines the advantages of inductive signal transmission and isolation with compact IC driver stage design. The driver is able to handle dv/dts up to 50 kV per μs . In addition, the driver features a rail-to-rail OP with a gain bandwidth of 20 MHz and a separate comparator. Compared to optocouplers, no degradation over time takes place. Targeted applications are switched reluctance drives and various fast switching applications using 600 V and 1,200 V transistors.

Features:

- Matched propagation delay for both channels
- Floating channel designed for direct supply and bootstrap operation
- Tolerant to negative transient voltage
- Undervoltage lockout for both channels
- 3.3V and 5V TTL compatible inputs
- CMOS Schmitt-triggered inputs with pull-down
- Non-inverting inputs
- Interlocking inputs
- Dedicated shutdown input with pull-up
- Integrated op-amp and comparator
- IEC 61000-4-4 compliant
- RoHS compliant



www.infineon.com/gatedriver

Benefits:

- Fully operational up to 1,200V DC
- Robustness against EMI leads to increased reliability
- Detecting overcurrents and short-circuit-currents → reduced system costs
- Avoids overvoltages and device problems
- Reduced system costs due to saving of components
- High price competitiveness

CiPoS™



www.infineon.com/cipos

The new CiPoS™ module family integrates various power and control components in a single package, increasing reliability of the design and optimizing PCB size and system costs. This simplifies the power design and reduces significantly the time to market. The configuration controls AC motors in variable speed drives for applications such as air conditioners, compressors or vacuum cleaners. The package concept is specially adapted to power applications, which need excellent thermal conduction and electrical isolation, but also EMI-reduction and overload protection. TrenchStop® IGBTs and diodes are controlled by a new optimized SOI gate driver. This combination offers excellent electrical performance and leading-edge ruggedness against negative transient voltage.

Features:

- Fully isolated package
- Best-in-class thermal resistance
 $R_{th} = 3 \text{ K/W}$
- TrenchStop® IGBTs with lowest saturation voltage:
 $V_{CEsat} = 1.5 \text{ V @ } 25^\circ\text{C}$
- Rugged SOI gate driver technology with stability against negative transient voltage: $-50 \text{ V} \leq V_s \leq 600 \text{ V}$
- Complete protection function (UVLO, OT, OC and interlock)
- Open emitter for shunt current measurement

Benefits:

- Small heat sink
- High reliability
- High efficiency
- No thermal runaway
- Complete protection

TrenchStop® IGBT: DuoPack™

Lowest losses in drives

The new TrenchStop® IGBT for 600 V is setting a new benchmark for pulse frequencies up to 10 kHz for hard-switching applications and up to 30 kHz for soft switching. It combines Infineon's outstanding Trench and Fieldstop Technologies. This unique technology enables a breakthrough in energy efficiency. TrenchStop® IGBTs provide significantly lower saturation voltage than competing standard NPT IGBTs.

Features:

- Significant lower V_{CEsat} compared to previous series, at same E_{off}
- Positive temperature coefficient of V_{CEsat}
- Short-circuit-rated
- Latch-up free
- Soft-switching behavior
- EmCon™ diode offers fast recovery time and very soft behavior

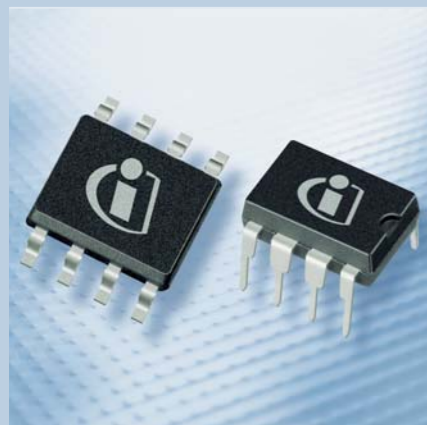
Benefits:

- High ruggedness
- No thermal runaway
- Easy paralleling for 600 V devices
- Reduced need for cooling
- Highest current class (50 A DuoPack™)



www.infineon.com/igbts

PFC-ICs



www.infineon.com/pfc

The market continually demands more reliable and efficient home appliances. Furthermore, SMPS designers are challenged to reduce the power supply units' size and performance as the power consumption for these home appliances increases constantly. These demands are reflected in the increasing number of legal requirements governing the efficiency ratings of the power supply units in these home appliances. Infineon Technologies has been able to provide the solution to these designers through our PFC-IC. This has enabled design of the power supply to fulfill existing and upcoming regulations and requirements for power-factor correction (PFC).

Features:

- Easy to use
- Programmable switching (50 – 250 kHz)
- Max. duty cycle of 95 % at 125 kHz
- Highly accurate reference $3 \text{ V} \pm 2\%$
- Vcc undervoltage lockout
- Cycle-by-cycle peak current limit
- Over-voltage, open loop and brown-out protection
- Enhanced dynamic response
- Unique soft-start to limit current
- Meets class D spec. of IEC1000-3-2

Benefits:

- Simple circuitry
- Precision control
- Excellent system performance
- Fast response during load jump
- Easy to use

TrenchStop® reverse conducting IGBTs

900 V – 1,600 V

We report on the latest series of optimized TrenchStop® reverse-conducting (RC-)IGBT products in the voltage range from 900 V – 1,600 V. These are specially designed for soft-switching applications such as induction cooking, rice cookers and microwave ovens. RC-IGBTs combine in a single-chip solution the advantages of the well proven TrenchStop® Technology for IGBTs with a monolithically integrated powerful reverse diode. The integrated reverse diode is rated for the same nominal current as the IGBT and has very low values for the forward voltage V_F of down to 1.45 V at nominal current.

Features:

- Reverse conducting technology in 900 V – 1,600 V
- Best-in-class conduction properties in V_{CEsat} and V_F
- Higher system efficiency
- Easier design
- Soft current turn-off waveforms

Benefits:

- Smaller package, less system costs, less volume
- Lowest power dissipation, best thermal management
- No/less heat sink or fan
- Faster time to market
- Low EMI, less filter costs



www.infineon.com/igbts

8-bit family

Cost-effective 8-bit μ Cs with 16-bit motor-control performance



www.infineon.com/XC800

With our brand-new XC800 8-bit microcontroller family, we address a wide range of motor controls used in today's energy-efficient and reliable home appliances. Competitively priced XC800 products are optimally suited for controlling brushless DC and induction motors, taking into account single- or 3-phase and sensor-based or sensorless control techniques. The computing performance of the family's high-end members like XC886, XC888 is boosted by a 16-bit vector computer performing vector rotation, normalization and scaling.

Features:

- High system integration: flash, embedded voltage regulator, on-chip oscillator and EEPROM functionality
- 4/8/16/24/32 Kbytes of scalable flash memory with built-in ECC
- PWM unit with 16-bit resolution for high-precision space vector PWM generation (3-phase)
- Hardware overload protection
- Integrated dead-time control
- Fast high-precision 10-bit ADC
- Hardware synchronization of ADC and PWM unit to offload CPU

- A rich set of communication interfaces including LIN, CAN, SSC and UART

Benefits:

- System cost savings
- Single MCU solution for both motor- and system-level control
- 16-bit vector computer accelerates advanced control like field oriented control (FOC)
- Security of R & D investment due to reuse of 8051 legacy code and long lifetime of a brand-new family

16-bit family

High-performance 16-bit μ Cs



www.infineon.com/XC164CMseries

For even more computing performance and embedded flash requirements, our XC164CM 16-bit family is the solution of choice. With more than 40 MIPS compute performance, ultra-fast interrupt response and the integrated multiply and accumulate (MAC) unit it covers even the highest-end motor-control requirements.

Features:

- Established standard 16-bit architecture
- Impressive DSP capabilities through MAC unit
- 32/64/128 Kbytes of scalable flash memory with built-in ECC
- Ultra-fast interrupt and context switch
- PWM unit with 16-bit resolution for high-precision space vector PWM generation (3-phase)
- Hardware overload protection
- Integrated dead-time control
- Fast high-precision 10-bit ADC

- Hardware synchronization of ADC and PWM unit reduce CPU load
- A rich set of communication interfaces including LIN, CAN, SSC and UART
- Zigbee support

Benefits:

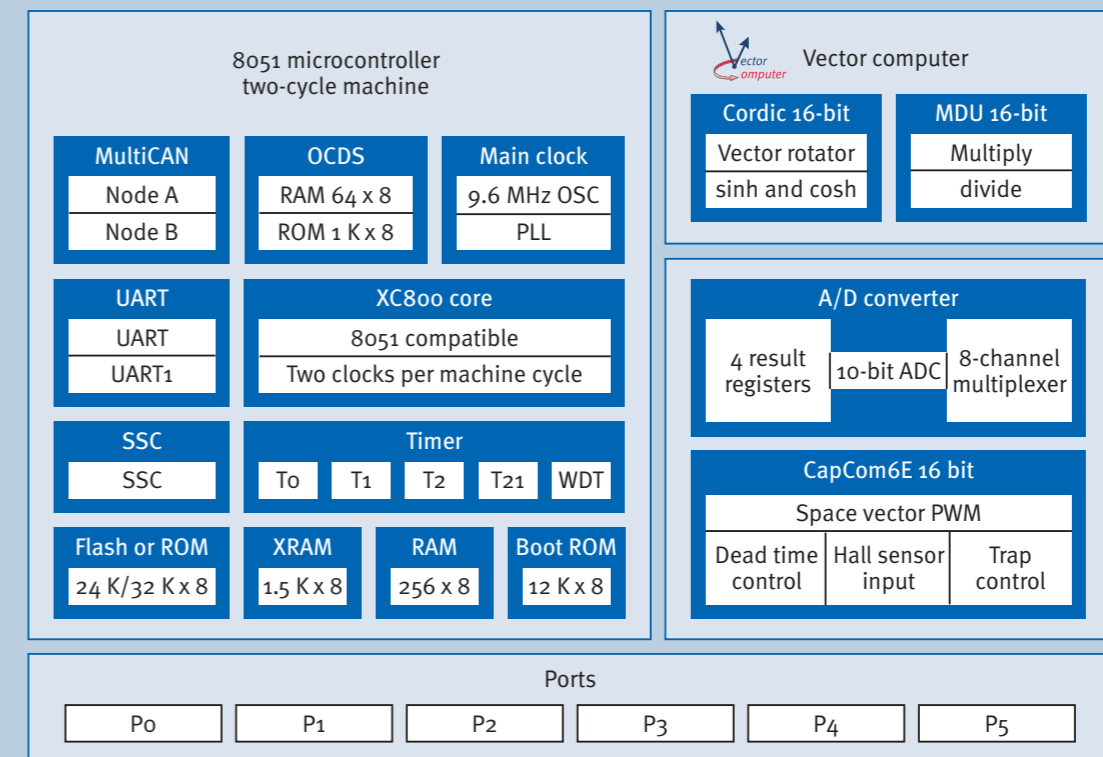
- Superior DSP performance for high-end appliances
- Outstanding peripherals to offload CPU
- Scalable memory up to 128 kB flash and 12 kB RAM

Field oriented control

Boosting performance and cutting costs with FOC-enabled microcontrollers

Appliance manufacturers keen to cut the costs of motor control are looking to Field Oriented Control (FOC), a way of running electric motors smoothly and efficiently at all speeds, to boost efficiency, improve dynamic response and lower torque ripple. Infineon is the first supplier to offer standard 8-bit MCUs supporting FOC. Bringing the full benefits of FOC to your products, Infineon offers XC886 and XC888 microcontrollers that handle complex trigonometric equations at a fraction of the cost of DSC/DSP solutions. Conventional FOC solutions monopolize the CPU. XC886 and XC888 MCs engage just 58 percent of the CPU's performance, leaving ample resources to devote to other applications. Most competitive FOC implementations are hard-coded and thus inflexible. Infineon offers the added benefit of software reprogrammability to give you more versatile application options. If you are seeking ways to meet energy regulations and contain pricing pressure, look no further than Infineon for Field Oriented Control implemented on an 8-bit MCU.

XC 886/888 block diagram



Features:

- High-performance 16-bit vector computer (CORDIC + MDU)
 - Fully programmable co-processor
 - Key functions
 - Vector rotation and transformations such as Park transform
 - Normalizing and scaling
 - Interrupt-based operation with minimum CPU load
- PWM unit for advanced motor control (CapCom6E)
 - 16-bit resolution for high-precision space vector PWM generation
 - Dead-time control for minimum hardware effort (direct control of MOSFET/IGBT)
 - CTRAP provides hardware overload protection
- A fast 10-bit A/D converter (conversion time of less than 1.5 μ s)
 - Enables single shunt current measurement
 - Reduced torque ripple due to minimized blind angle
 - Hardware synchronization to PWM unit reduces CPU load
 - Two result registers to maximize sampling performance

INFINEON TAKES A LEADING CUSTOMER-FOCUSED APPROACH – your application requirements dictate our solutions. We design with your needs in mind, building compact, competitively priced modules and integrated systems to cut your costs and save space. Powerful, reliable, easy to use and robust, our line of power semiconductors and microcontrollers bring big benefits to your products, and ultimately your business.

WHEREVER YOU MAY BE, and whatever your special requirements for electrical compliance, noise and vibration immunity, accurate and cost-effective motor control, we can deliver a solution that fits. With an application-focused portfolio and roadmaps charting the course for our designs, we are the supplier you can rely for many tomorrows to come. Don't hesitate to get in touch if you wish to learn more about what our home appliance products and services can do for your business.

The Infineon home appliance solution approach

Requirements	Infineon's solution concept	Customer benefits
System and product cost reduction	<ul style="list-style-type: none"> Offering low-cost modules and integrated design to save system costs Designs for multi-chip packages 	<ul style="list-style-type: none"> Reduced space by compact designs Competitive pricing Secured IP
Performance optimization	<ul style="list-style-type: none"> RCD development/thinner ceramic CiPoS FOC with high-end 8-bit MCU 	<ul style="list-style-type: none"> Increased power efficiency Higher motor speeds and smaller motor size Advanced diagnostics for additional safety
Ease of use	<ul style="list-style-type: none"> Tool chain Software instead of MCE Reference designs 	<ul style="list-style-type: none"> Design efficiency, reduced time to market Electrical compliance Mechanical handling advantages
Committed reliability	<ul style="list-style-type: none"> SOI 0.25 µm CMOS embedded flash technology, designed for zero defect EMI 	<ul style="list-style-type: none"> Reliability in supply Noise and vibration immunity
Customization	<ul style="list-style-type: none"> Sustainable, application-focused power and microcontroller roadmaps DIL, low-cost concept, 1,200 V 	<ul style="list-style-type: none"> Application-focused portfolio/roadmaps Sustainable supplier Application competence
Customer-focused support	<ul style="list-style-type: none"> Onsite design support by global FAE/AE force One-stop shopping 	<ul style="list-style-type: none"> Global support