









We are the link  
between the real and  
the digital world.

# CoolSiC™ MOSFET 1700 V in SMD packages – "Less is the new more"

Infineon's virtual show 2020



# 1200 V – 1700 V CoolSiC™ MOSFET portfolio and upcoming products

|        | $R_{DS(on)}$<br>[mΩ] | TO-247 3  | TO-247 4  | D <sup>2</sup> PAK-7L   | D <sup>2</sup> PAK-7L extended creepage   |
|--------|----------------------|--|--|---|---|
| 1200 V | 30                   | IMW120R030M1H  | IMZ120R030M1H  | IMBG120R030M1H  |   |
|        | 45                   | IMW120R045M1   | IMZ120R045M1   | IMBG120R045M1H  |   |
|        | 60                   | IMW120R060M1H  | IMZ120R060M1H  | IMBG120R060M1H  |   |
|        | 90                   | IMW120R90M1H   | IMZ120R090M1H  | IMBG120R090M1H  |   |
|        | 140                  | IMW120R140M1H  | IMZ120R140M1H  | IMBG120R140M1H  |   |
|        | 220                  | IMW120R220M1H  | IMZ120R220M1H  | IMBG120R220M1H  |   |
|        | 350                  | IMW120R350M1H  | IMZ120R350M1H  | IMBG120R350M1H  |   |
| 1700 V | 450                  |  |  |   | IMBF170R450M1   |
|        | 650                  |  |  |   | IMBF170R650M1   |
|        | 1000                 |  |  |   | IMBF170R1K0M1   |

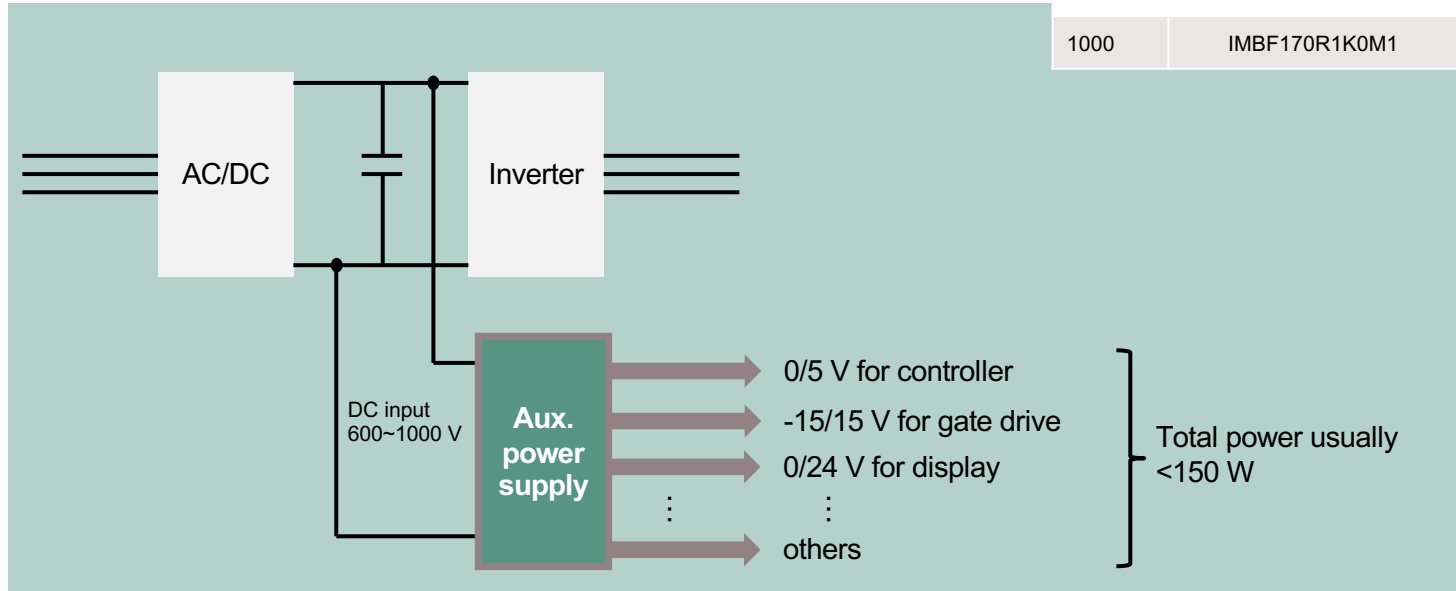
# Infiniteon's first CoolSiC™ MOSFET portfolio in 1700 V class targets the auxiliary power supply



... and all kinds of 400 V<sub>AC</sub> industrial equipment



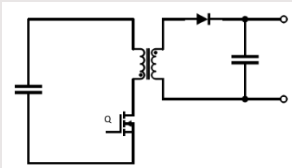
| $R_{DS(on)}$ [mOhm] | 1700 V CoolSiC™ MOSFET D <sup>2</sup> PAK-7 extended creepage | Output power range |
|---------------------|---|--------------------|
| 450                 | IMBF170R450M1   | 100 ~ 150 W        |
| 650                 | IMBF170R650M1   | 60 ~ 100 W         |
| 1000                | IMBF170R1K0M1   | < 70 W             |



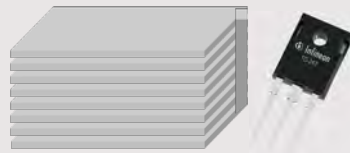
# 1700 V CoolSiC™ MOSFET is industry solution of choice for low-power auxiliary circuits



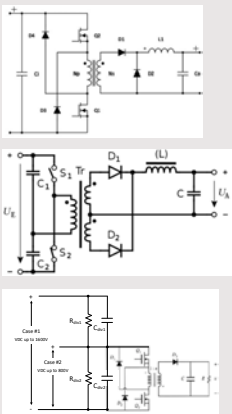
## Reality with silicon devices



**Low efficiency** and challenges with  $V_{DS}$  derating margin limit the use



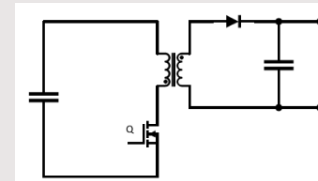
Main switch assembly:  
**Heatsink + TO-247**



Main switch assembly: **Heatsink + 2 pcs TO-247 + 2 pcs TIM**

**Complex work-around** designs for efficiency  
 $V_{DS}$  derating margin limits the use to  
 $V_{DC} \leq 800$  V systems

## 1700 V CoolSiC™ simplicity



**Simple converter at high efficiency**  
Up to  $V_{DC}$  1000 V systems  
 $V_{DS}$  derating margin up to 15%



Main switch assembly: **TO-263-7 SMD soldering, thermal vias in PCB**



# Perfect fit gate-source voltage compatible with PWM controller

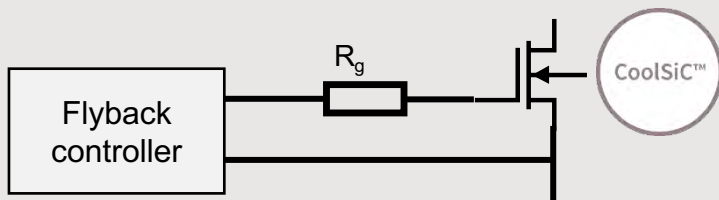
## Best match



| 1700 V SiC MOSFETs | Recommended gate voltage |
|--------------------|--------------------------|
| Infineon CoolSiC™  | 0/12 V~15 V              |

### Available flyback controllers have 12 V-14.5 V gate voltage output

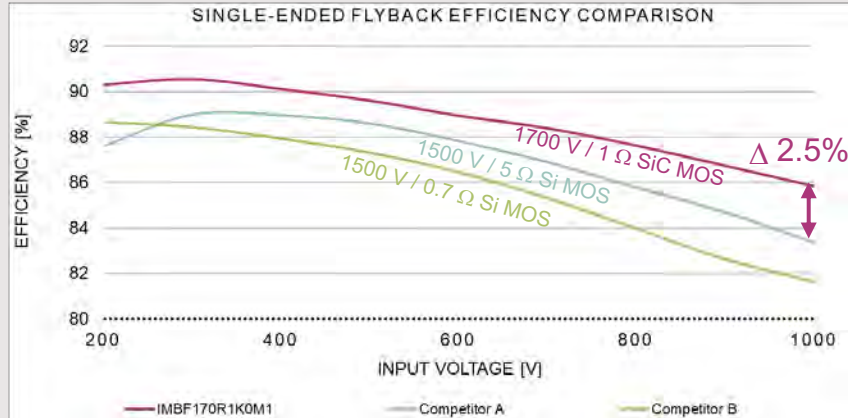
|          |                         |
|----------|-------------------------|
| NCP1207  | Increases with $V_{cc}$ |
| NCP1339  | 0/12 V                  |
| NCP1379  | 0/13 V                  |
| FAN604H  | 0/14.5 V                |
| L6565    | $0/V_{cc} - 2$ V        |
| UCC28600 | 0/13 V                  |
| UCC28C44 | Change with $V_{cc}$    |
| LM5023   | 0/12.9 V                |



- › Directly driven with flyback controller
- › No gate driver needed!

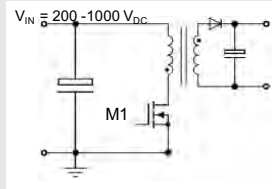
# Combining the best of SiC in new Infineon SMD package: Low losses with extended creepage and clearance

## Optimized switching performance 2.5% higher efficiency



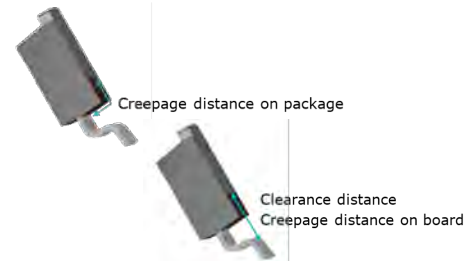
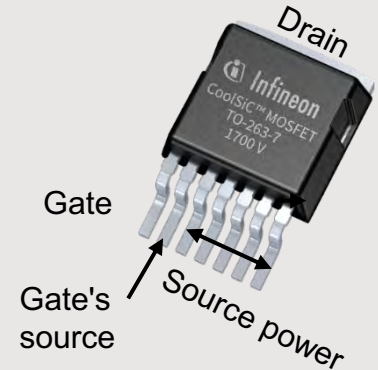
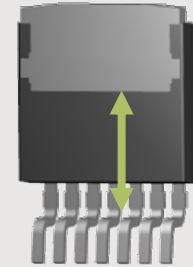
### Test conditions:

- 62 W evaluation board:  
"REF\_62W\_FLY\_1700V\_SiC"
- $V_{in}$ : 200 – 1000 V<sub>DC</sub>
- $F_{sw}$  = 80 kHz, QR mode
- DUT M1,  $R_G$ : 47 Ω(SiC), 4.7 Ω(Si)



## Reduced isolation effort on PCB due to extended creepage and clearance

Extended creepage distance > 7 mm



1700 V D<sup>2</sup>PAK-7L

IMBF170RxxxM1

Creepage: >7.1 mm

Clearance: >7.1 mm

| Key features   | Benefits   | Value   |
|--|--|---|
| 1700 V blocking voltage  | <ul style="list-style-type: none"> <li>› <b>No concerns on voltage stress margins</b></li> <li>› <b>Optimized for flyback topologies</b></li> <li>› Perfect fit <b>gate-source voltage</b>, <b>compatible</b> with common <b>flyback controllers</b></li> <li>› <b>50% lower losses and 2.5% higher efficiency</b> versus 1500 V Si MOSFETs</li> <li>› <b>0.6% higher efficiency</b> compared to other 1700 V SiC MOSFETs</li> <li>› <b>SMD assembly with natural convection cooling</b> without the need for a heatsink</li> <li>› <b>Reduced isolation effort</b></li> </ul> | Simple single-ended flyback even up to 1000 V <sub>DC</sub> |
| 0 V / +12...15 V gate source voltage                                     |  | No gate driver needed                                       |
| CoolSiC™ trench technology for lowest FOM $R_{DS(on)} * Q_g$             |  | Reliable system   |
| SMD package with enhanced creepage and clearance distances, >7 mm on PCB |  | Easy assembly with no heatsink                              |

# 62.5 W auxiliary supply for three-phase power converter

## What have we got for you?

### Key features of the evaluation board

- › Wide input voltage range (200 – 1000 V)
- › Multiplexed output of +/-15 V and +24 V
- › Simple QR flyback topology with low EMI noise
- › Compact layout with high power density
- › Maximum efficiency up to 90.56% at full load
- › Optimized reference PCB layout with good thermal performance and reinforced insulation

### Content

- › **Sales product name:**  
REF\_62W\_FLY\_1700V\_SiC
- › **OPN:** REF62WFLY1700VSIC
- › **SP number:** SP005422632

*See the benefits for yourself*





# Summary



CoolSiC™ MOSFET 1700 V in SMD packages – a new level of simplicity and safety in high-voltage auxiliary circuitry

**Less** losses enabled by CoolSiC™ trench technology

**Less** complicated designs – **Less** parts on your BOM

**Less** is the new more

For more product information, please visit

Webpage: [www.infineon.com/coolbic-mosfet](http://www.infineon.com/coolbic-mosfet)

Forum: [www.infineonforums.com/forums/34-silicon-carbide-\(SiC\)-forum](http://www.infineonforums.com/forums/34-silicon-carbide-(SiC)-forum)



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