



## Product Brief

# CoolSiC™ MOSFET. Revolution to rely on.

Infineon's CoolSiC™ technology enables radical new product designs.

Silicon Carbide (SiC) opens up new degrees of freedom for designers to harness never before seen levels of efficiency and system flexibility. In comparison to traditional silicon (Si) based switches like IGBTs and MOSFETs, the SiC MOSFET offers a series of advantages. These include, the lowest gate charge and device capacitance levels seen in 1200 V switches, no reverse recovery losses of the internal commutation proof body diode, temperature independent low switching losses, and threshold-free on-state characteristics. Infineon's unique 1200 V SiC MOSFET adds additional advantages. Superior gate oxide reliability enabled by state-of-the-art trench design, best in class switching and conduction losses, highest transconductance level (gain), threshold voltage of  $V_{th} = 4\text{ V}$  and short-circuit robustness. This is the revolution you can rely on.

All this results in a robust SiC MOSFET, ideal for hard- and resonant-switching topologies like LLC and ZVS converters, which can be driven like an IGBT using standard drivers. Delivering the highest level efficiency at switching frequencies unreachable by Si based switches allowing for system size reduction, power density increases and high lifetime reliability.

### Key features

- > Low device capacitances
- > Temperature independent switching losses
- > Intrinsic diode with low reverse recovery charge
- > Threshold-free on-state characteristics

### Advantages

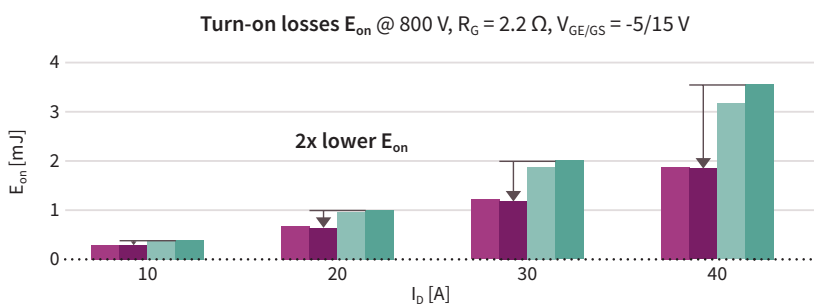
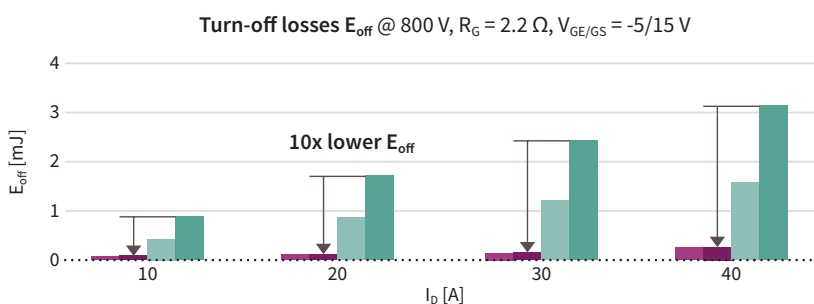
- > Superior gate oxide reliability
- > Best in class switching and conduction losses
- > IGBT compatible driving (+15V)
- > Threshold voltage,  $V_{th} = 4\text{ V}$
- > Short-circuit robustness

### Benefits

- > Highest efficiency for reduced cooling effort
- > Longer lifetime and higher reliability
- > Higher frequency operation
- > Reduction in system cost
- > Increased power density
- > Reduced system complexity
- > Ease of design and implementation

### Applications

- > Photo-Voltaic inverters (PV)
- > Energy storage / Battery charging
- > Un-interruptable Power Supplies (UPS)
- > Switch Mode Power Supplies (SMPS)
- > Industrial drives
- > Medical



■ CoolSiC™ MOSFET, 45 m $\Omega$ , 25°C     ■ HighSpeed 3 Si IGBT 40 A, 25°C  
■ CoolSiC™ MOSFET, 45 m $\Omega$ , 175°C     ■ HighSpeed 3 Si IGBT 40 A, 175°C

Note: SiC FWD diode used during testing



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CoolSiC™ MOSFET first products are targeted for photovoltaic inverters, battery charging and energy storage.

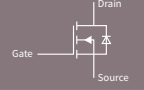

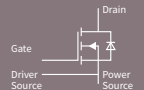

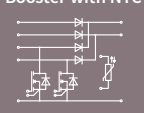



TO-247 4pin package contains an additional connection to the source (Kelvin connection) that is used as a reference potential for the gate driving voltage, thereby eliminating the effect of voltage drops over the source inductance. The result is even lower switching losses than for TO-247 3pin version, especially at higher currents and higher switching frequencies.

## Gate driver selection

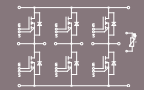





Ultrafast switching 1200 V power transistors such as CoolSiC™ MOSFETs can be easier handled by means of isolated gate output sections. Therefore, galvanically isolated gate driver ICs based on Infineon's coreless transformer technology are recommended as most suitable.

Easy1B modules offer a very good thermal interface, a low stray inductance and robust design as well as PressFIT connections. The products portfolio will be extended within the next years. The first step is a roll-out of different topologies like Sixpack and Halfbridge covering a power range from 2 kW until 200 kW.

The drivers incorporate most important key features and parameters for SiC MOSFET driving such as tight propagation delay matching, precise input filters, wide output side supply range, negative gate voltage capability, and extended CMTI capability.

Lead products				
Schematic	Type	$R_{DS(on)}$ [mΩ]	$V_{DS}$ [V]	Package
	IMW120R045M1	45	1200	TO-247 3pin 
	IMZ120R045M1	45	1200	TO-247 4pin 
	DF11MR12W1M1_B11	11	1200	Easy1B 
	DF23MR12W1M1_B11	23	1200	
	FF11MR12W1M1_B11	11	1200	62 mm 
	FF23MR12W1M1_B11	23	1200	

Samples available

Roll-out products phase 1				
Schematic	Type	$R_{DS(on)}$ [mΩ]	$V_{DS}$ [V]	Package
	FS45MR12W1M1_B11	45	1200	Easy1B 
	FF8MR12W2M1_B11	8	1200	Easy2B 
	FF6MR12KM1	6	1200	62 mm 

Selectively sampling in 2017

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