

SiC MOSFETs



The three key elements to pushing power density boundaries in power electronic inverter systems are increasing switching frequency, improving efficiency, and optimizing thermal management. Wolfspeed SiC MOSFETs are high-speed, majority-carrier devices, which feature less turn-on and turn-off switching loss than silicon IGBTs and super-junction MOSFETs. In hard-switched converters/inverters, this advantage enables the designer to achieve higher efficiency for the same switching frequency or higher switching frequency for the same net loss. Power converters made with silicon carbide (SiC) MOSFETs result in higher power density due to their higher blocking voltage, lower on-state resistance and higher thermal conductivity when compared to their silicon counterparts.

Higher performance devices enabling lower cost systems mean nothing without best in class reliability. Our MOSFET products start with a robust design built upon a proven and reliable SiC technology platform. All MOSFETs are avalanche-rated and resistant to latch-up. The results speak for themselves: we are the industry leader with the widest portfolio of commercially qualified SiC-based MOSFETs.

“We selected Wolfspeed SiC Planar MOSFETs for our new HF9 battery charger family because they enabled us to improve our battery chargers while achieving operational savings, increased productivity and increased safety. This was not possible with the best IGBTs in the market.”

Giancarlo Ceo, R&D Engineer at Gruppo PBM.

FEATURES

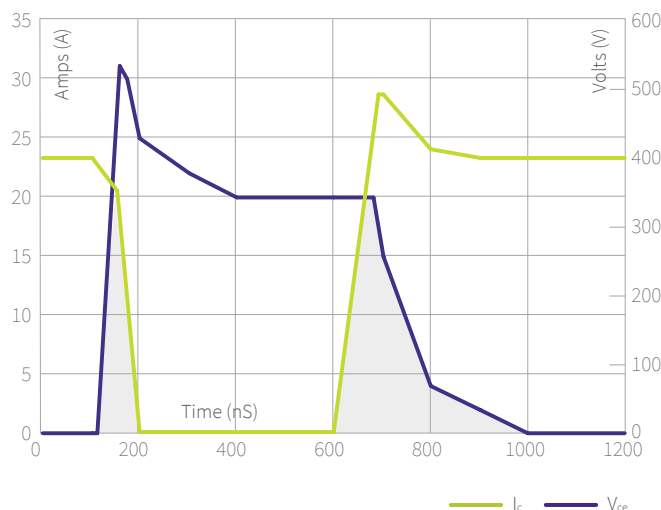
- Rugged and reliable with more than five years of commercial SiC MOSFET production
- High-speed switching with low capacitance
- High-blocking voltage with low $R_{DS(on)}$
- Fast intrinsic diode with low reverse recovery

BENEFITS

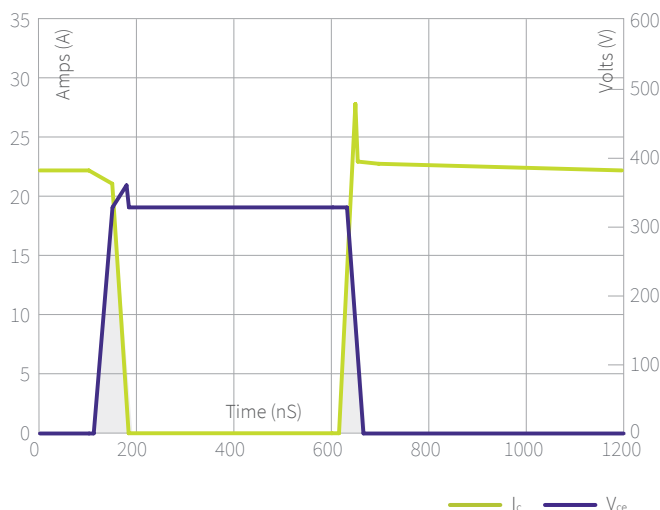
- Increase system reliability while reducing size, weight and cost
- Achieve higher system efficiency
- Reduce cooling requirements
- Implement new topologies not previously possible

1200V IGBT vs. SiC MOSFETs

IGBT + Si FRD



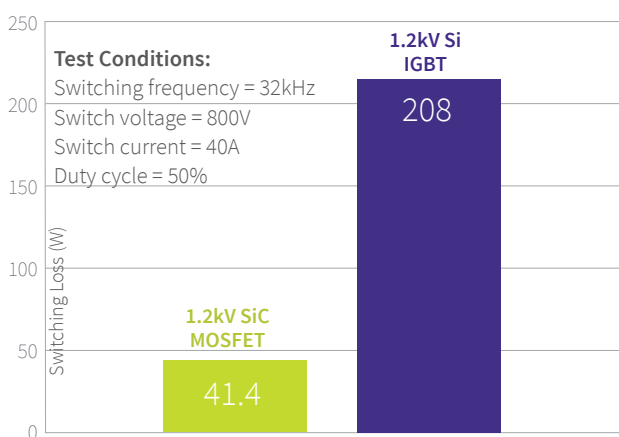
Wolfspeed SiC MOSFET + Diodes



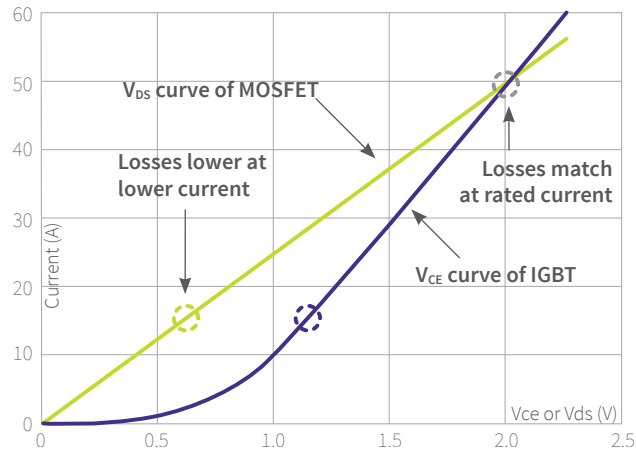
IGBT + Si Fast Recovery Diode → +10% to +25%
 Wolfspeed MOSFET + Z-Rec Diode → -8% to -25%

Wolfspeed SiC switching losses DECREASE at higher temperatures.

SiC vs. IGBT Switching Loss



SiC vs. IGBT Conduction Loss



Wolfspeed 1200V 25 Ω MOSFET

Lower switching losses

The lower switching losses are the result of Wolfspeed's revolutionary silicon carbide technology.

Competitive Device: 1200V IGBT 80A @ $T_c=25^\circ\text{C}$

Wolfspeed Device: C2M0025120D 90A @ $T_c=25^\circ\text{C}$

Lower conduction losses

At the normal operating point of most applications, the curve of an IGBT behaves more like the PIN diode while the MOSFET acts more like a true resistor. This results in lower conduction losses in real applications.

Discrete

Part Number	Blocking Voltage (V)	$R_{ds(on)}$ (m Ω)	Current Rating at 25°C (A)	Package
C3M0065090J	900	65	35	TO-263-7
C3M0065090D	900	65	36	TO-247-3
C3M0120090J	900	120	22	TO-263-7
C3M0120090D	900	120	23	TO-247-3
C3M0280090J	900	280	11	TO-263-7
C3M0280090D	900	280	11.5	TO-247-3
C3M0065100K	1000	65	35	TO-247-4
C3M0065100J	1000	65	35	TO-263-7
C3M0120100K	1000	120	22	TO-247-4
C3M0120100J	1000	120	22	TO-247-4
C2M0025120D	1200	25	90	TO-263-7
C2M0040120D	1200	40	60	TO-247-3
C3M0075120K	1200	75	30	TO-247-4
C2M0080120D	1200	80	36	TO-247-3
C2M0160120D	1200	160	19	TO-247-3
C2M0280120D	1200	280	10	TO-247-3
C2M0045170D	1700	45	72	TO-247-3
C2M1000170D	1700	1000	5	TO-247-3
C2M1000170J	1700	1000	5.3	TO-263-7

Bare Die

CPM3-0900-0010A	900	10	196	Bare Die
CPM3-0900-0065B	900	65	36	Bare Die
CPM3-1000-0065B	1000	65	36	Bare Die
CPM2-1200-0025B	1200	25	98	Bare Die
CPM2-1200-0040B	1200	40	63	Bare Die
CPM2-1200-0080B	1200	80	36	Bare Die
CPM2-1200-0160B	1200	160	19	Bare Die
CPM2-1700-0045B	1700	45	72	Bare Die
CPM2-1700-0080B	1700	80	40	Bare Die

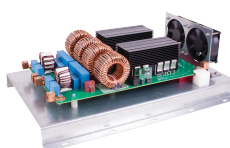
Tools and Support


SILICON CARBIDE DISCRETE EVALUATION BOARD KIT8020-CRD-8FF1217P-1

- Universal evaluation board for SiC MOSFETs and diodes
- Includes easy access to critical test points, such as V_{GS} , V_{DS} and I_{DS}
- Provides a good layout example for properly driving MOSFETs and diodes with minimal ringing


UNIVERSAL GATE DRIVER CRD-001

- Wolfspeed designed universal gate driver for all C2M™ SiC MOSFETs
- Supports 1200V or 1700V MOSFETs
- Compatible with 1W and 2W DC-DC converters
- Full reference design files available


50KW BOOST CONVERTER

- SiC MOSFET-based converter for PV applications
- 4-phase interleaved
- V_{in} = 400-600V, V_{out} = 800V
- Reference design includes schematic and detailed PowerPoint presentation

Learn More:

Visit **wolfspeed.com/power** to learn more about our MOSFETs as well as other products and services.

There you can access our reference designs, models, evaluation tools and more.

Have additional questions? Contact us at **power@wolfspeed.com**

