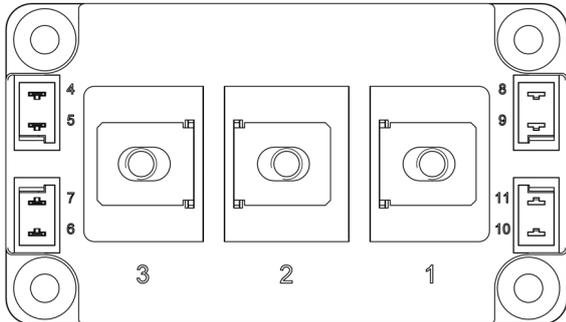
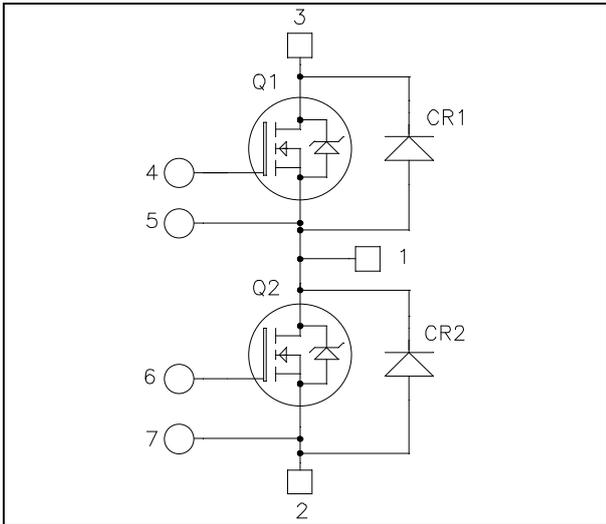


*Phase leg
SiC MOSFET Power Module*

$V_{DSS} = 1200V$
 $R_{DS(on)} = 8m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 250A \text{ @ } T_c = 25^\circ C$


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- **SiC Power MOSFET**
 - Low $R_{DS(on)}$
 - High temperature performance
- **SiC Schottky Diode**
 - Zero reverse recovery
 - Zero forward recovery
 - Temperature Independent switching behavior
 - Positive temperature coefficient on VF
- Kelvin source for easy drive
- High level of integration
- AlN substrate for improved thermal performance
- M6 power connectors

Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- RoHS Compliant

All ratings @ $T_j = 25^\circ C$ unless otherwise specified

Absolute maximum ratings (per SiC MOSFET)

| <i>Symbol</i> | <i>Parameter</i> | <i>Max ratings</i> | <i>Unit</i> |
|---------------|------------------------------|--------------------|-------------|
| V_{DSS} | Drain - Source Voltage | 1200 | V |
| I_D | Continuous Drain Current | $T_c = 25^\circ C$ | 250 |
| | | $T_c = 80^\circ C$ | 190 |
| I_{DM} | Pulsed Drain current | 550 | A |
| V_{GS} | Gate - Source Voltage | -10/25V | V |
| $R_{DS(on)}$ | Drain - Source ON Resistance | 10 | m Ω |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 1100 |
| | | | W |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com



Electrical Characteristics (per SiC MOSFET)

| <i>Symbol</i> | <i>Characteristic</i> | <i>Test Conditions</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|---------------|---------------------------------|--------------------------------|---------------------|------------|------------|-------------|
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{GS} = 0V, V_{DS} = 1200V$ | | 120 | 1000 | μA |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS} = 20V$ $I_D = 200A$ | $T_j = 25^\circ C$ | 8 | 10 | m Ω |
| | | | $T_j = 150^\circ C$ | 15 | 21 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}; I_D = 10mA$ | 1.7 | 2.2 | | V |
| I_{GSS} | Gate – Source Leakage Current | $V_{GS} = 20V, V_{DS} = 0V$ | | | 2.5 | μA |

Dynamic Characteristics (per SiC MOSFET)

| <i>Symbol</i> | <i>Characteristic</i> | <i>Test Conditions</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|---------------|-------------------------------------|---|---------------------|---------------------|------------|--------------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ | | 9500 | | pF |
| C_{oss} | Output Capacitance | $V_{DS} = 1000V$ | | 800 | | |
| C_{rss} | Reverse Transfer Capacitance | $f = 1MHz$ | | 65 | | |
| Q_g | Total gate Charge | $V_{GS} = 20V$ | | 490 | | nC |
| Q_{gs} | Gate – Source Charge | $V_{Bus} = 800V$ | | 110 | | |
| Q_{gd} | Gate – Drain Charge | $I_D = 200A$ | | 180 | | |
| $T_{d(on)}$ | Turn-on Delay Time | $V_{GS} = -2/+20V$ $V_{Bus} = 800V$ $I_D = 200A ; T_j = 150^\circ C$ $R_L = 4\Omega ; R_G = 5\Omega$ | | 20 | | ns |
| T_r | Rise Time | | | 20 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 75 | | |
| T_f | Fall Time | | | 35 | | |
| E_{on} | Turn on Energy | Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$ $I_D = 200A$ $R_G = 5\Omega$ | $T_j = 150^\circ C$ | 4.3 | | mJ |
| E_{off} | Turn off Energy | | | $T_j = 150^\circ C$ | 2.4 | |
| R_{Gint} | Internal gate resistance | | | 1 | | Ω |
| R_{thJC} | Junction to Case Thermal Resistance | | | | 0.11 | $^\circ C/W$ |

Body diode ratings and characteristics (per SiC MOSFET)

| <i>Symbol</i> | <i>Characteristic</i> | <i>Test Conditions</i> | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|---------------|--------------------------|--|------------|------------|------------|-------------|
| V_{SD} | Diode Forward Voltage | $V_{GS} = -5V, I_{SD} = 100A$ | | 3.3 | | V |
| | | $V_{GS} = -2V, I_{SD} = 100A$ | | 3.1 | | |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 200A ; V_{GS} = -5V$ $V_R = 800V ; di_F/dt = 3500A/\mu s$ | | 40 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 1650 | | nC |
| I_{rr} | Reverse Recovery Current | | | | 64 | |



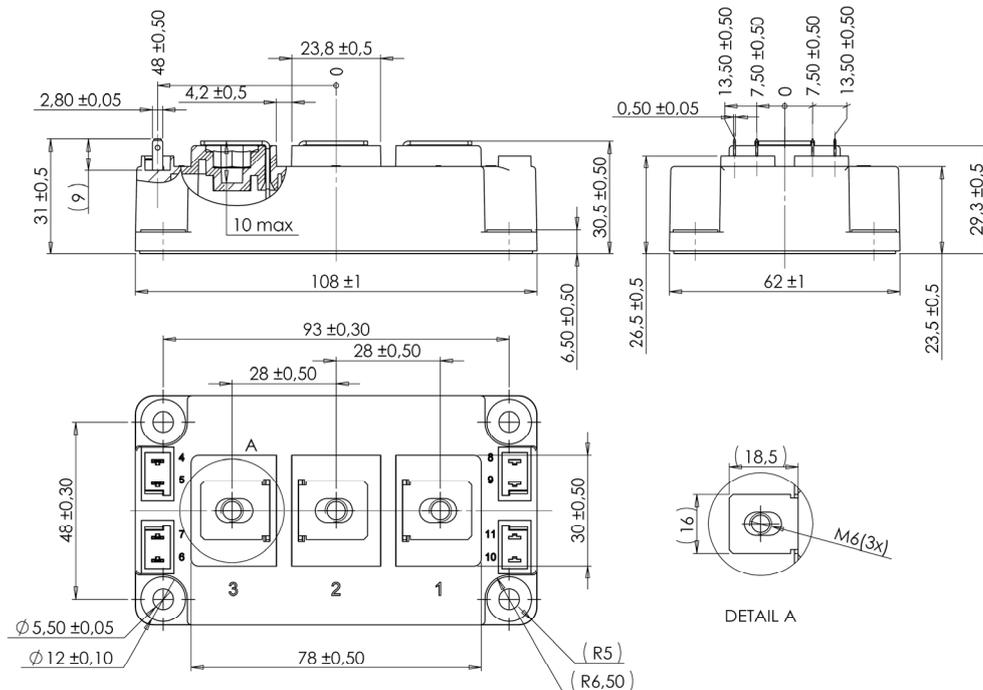
SiC schottky diode ratings and characteristics (per SiC diode)

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------------|-------------------------------------|---|------------------------|------|------|------|
| V _{RRM} | Peak Repetitive Reverse Voltage | | | | 1200 | V |
| I _{RRM} | Reverse Leakage Current | V _R =1200V | T _j = 25°C | 0.38 | 2.4 | mA |
| | | | T _j = 175°C | 0.68 | 12 | |
| I _F | Forward Current | | | 120 | | A |
| V _F | Diode Forward Voltage | I _F = 120A | T _j = 25°C | 1.6 | 1.8 | V |
| | | | T _j = 175°C | 2.3 | 3 | |
| Q _C | Total Capacitive Charge | I _F = 120A, V _R = 1200V di/dt = 5000A/μs | | 960 | | nC |
| C | Total Capacitance | f = 1MHz, V _R = 200V | | 1152 | | pF |
| | | f = 1MHz, V _R = 400V | | 828 | | |
| R _{thJC} | Junction to Case Thermal Resistance | | | | 0.10 | °C/W |

Thermal and package characteristics

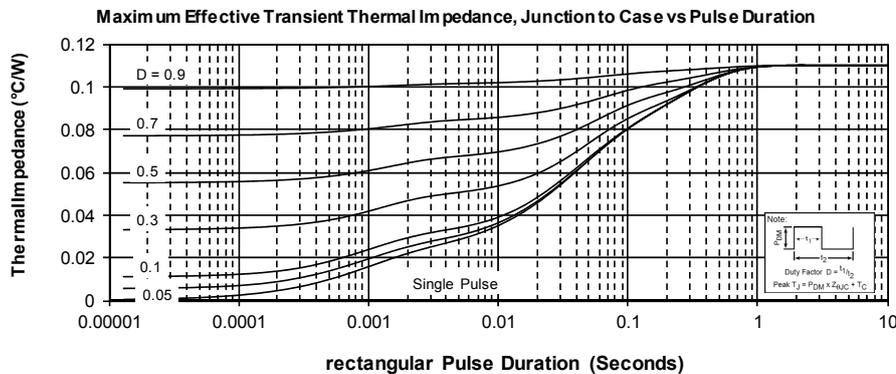
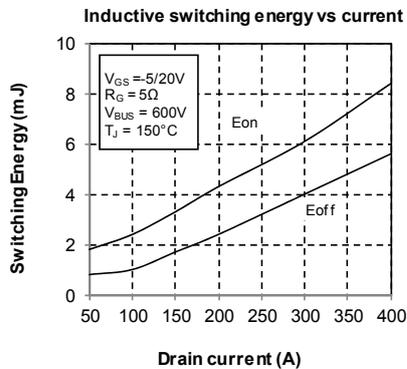
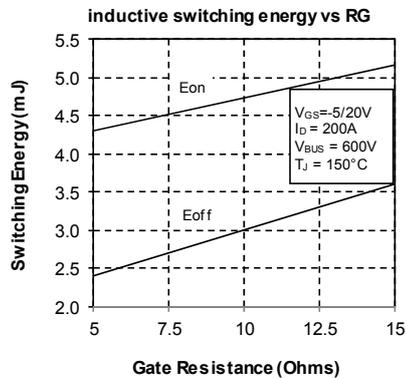
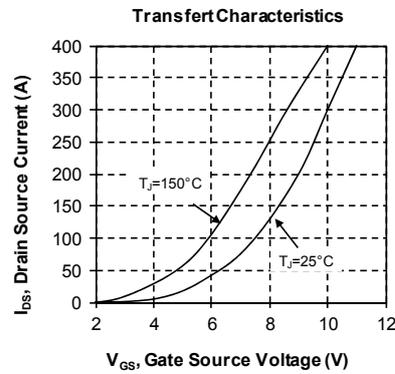
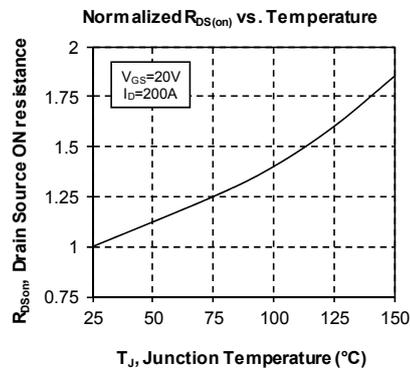
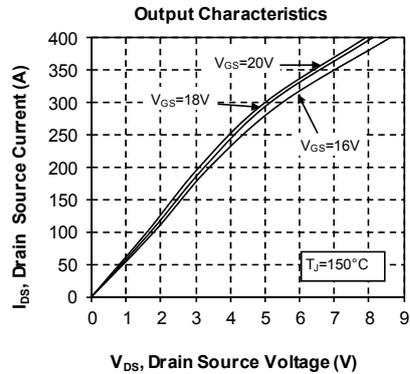
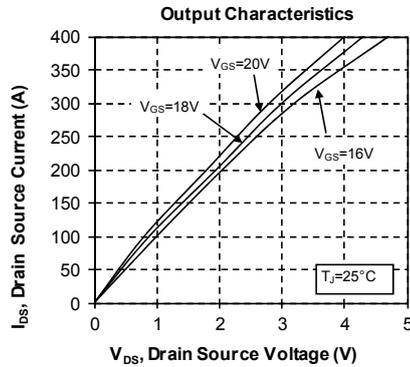
| Symbol | Characteristic | Min | Max | Unit | |
|-------------------|--|---------------|-----------------------|------|-----|
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | 4000 | | V | |
| T _J | Operating junction temperature range | SiC MOSFET | -40 | 150 | °C |
| | | SiC diode | -40 | 175 | |
| T _{JOP} | Recommended junction temperature under switching conditions | -40 | T _{jmax} -25 | | |
| T _{STG} | Storage Temperature Range | -40 | 125 | | |
| T _C | Operating Case Temperature | -40 | 100 | | |
| Torque | Mounting torque | For terminals | M6 | 3 | N.m |
| | | To Heatsink | M6 | 3 | |
| Wt | Package Weight | | | 350 | g |

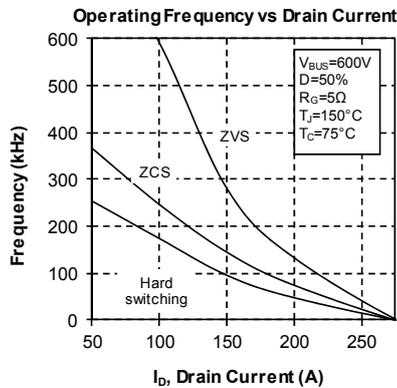
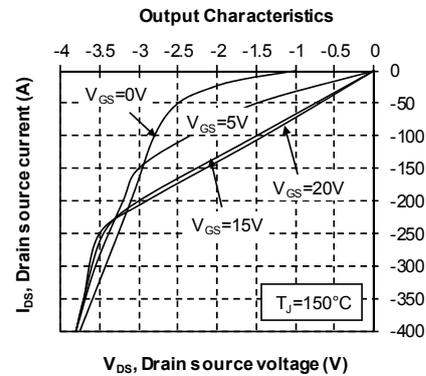
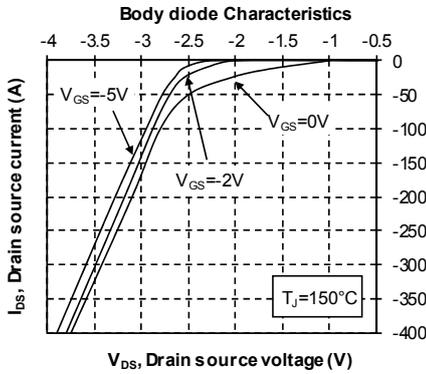
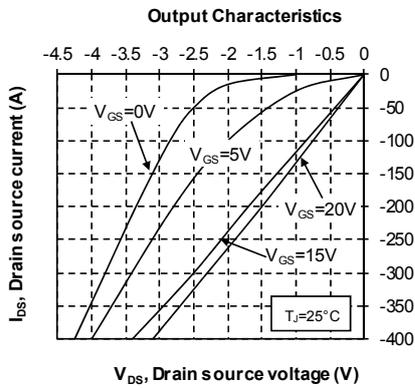
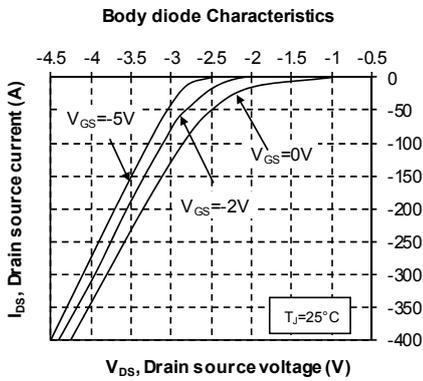
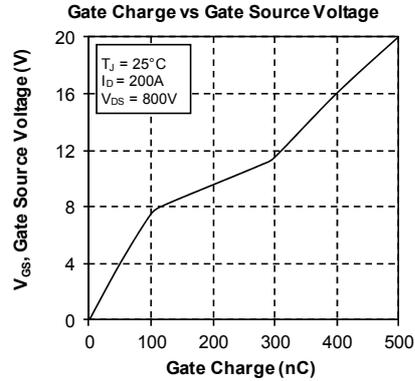
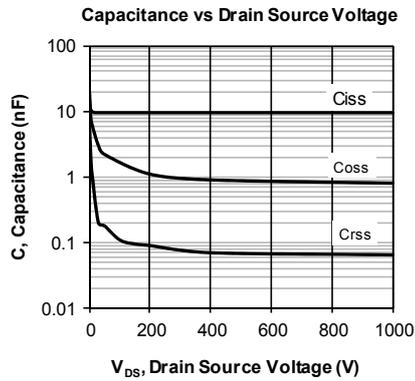
D3 Package outline (dimensions in mm)





Typical SiC MOSFET Performance Curve

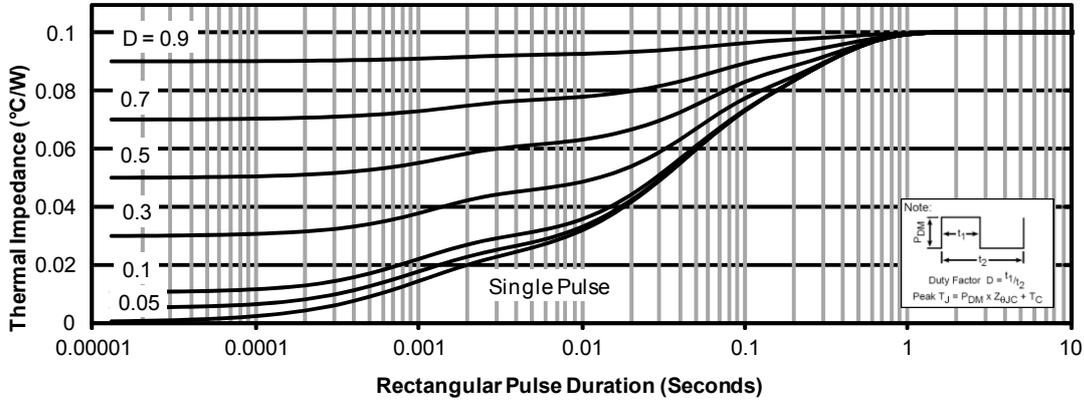




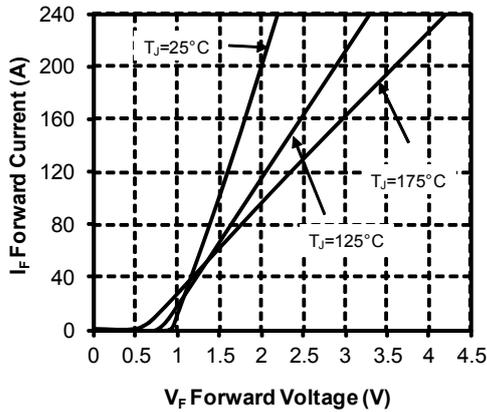


Typical SiC diode Performance Curve

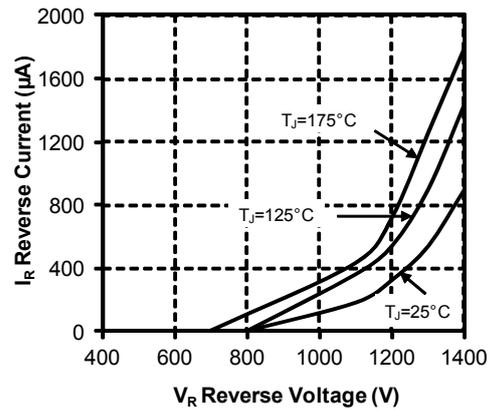
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



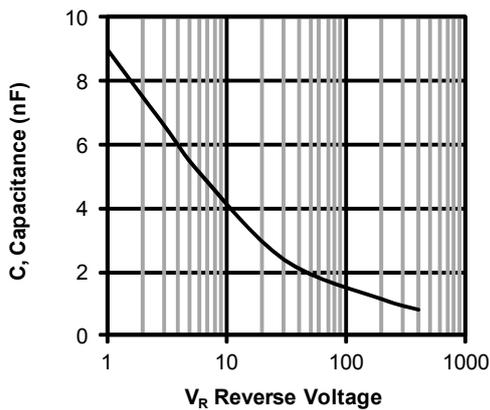
Forward Characteristics



Reverse Characteristics



Capacitance vs. Reverse Voltage





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