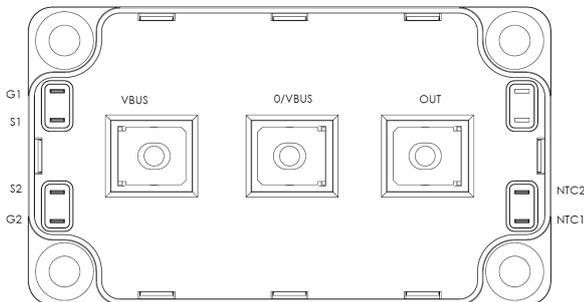
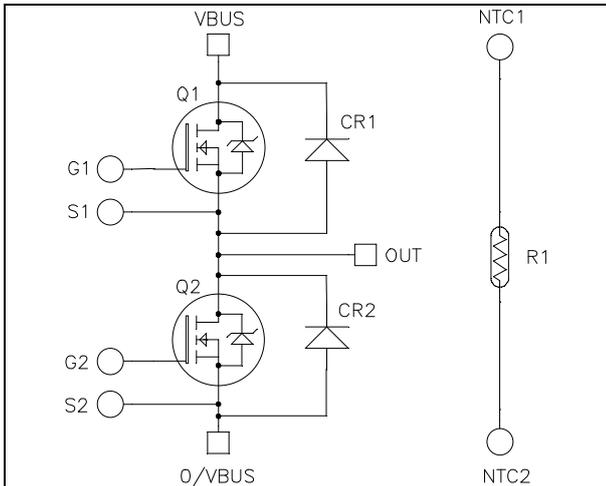


*Phase leg*  
**SiC MOSFET Power Module**

$V_{DSS} = 1200V$   
 $R_{DS(on)} = 8m\Omega \text{ typ @ } T_j = 25^\circ C$   
 $I_D = 370A \text{ @ } T_c = 25^\circ C$


**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
- Very low stray inductance
- M5 power connectors
- Internal thermistor for temperature monitoring
- AlN substrate for improved thermal performance

**Benefits**

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

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

**Absolute maximum ratings (per SiC MOSFET)**

| Symbol       | Parameter                    | Max ratings        | Unit       |
|--------------|------------------------------|--------------------|------------|
| $V_{DSS}$    | Drain - Source Voltage       | 1200               | V          |
| $I_D$        | Continuous Drain Current     | $T_c = 25^\circ C$ | 370        |
|              |                              | $T_c = 80^\circ C$ | 290        |
| $I_{DM}$     | Pulsed Drain current         | 740                |            |
| $V_{GS}$     | Gate - Source Voltage        | -10/+25            | V          |
| $R_{DS(on)}$ | Drain - Source ON Resistance | 10                 | m $\Omega$ |
| $P_D$        | Power Dissipation            | $T_c = 25^\circ C$ | 2300       |
|              |                              |                    | W          |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.  
 See application note APT0502 on [www.microsemi.com](http://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 | $V_{GS} = 0V$ ; $V_{DS} = 1200V$ |                     | 100        | 1000       | $\mu A$     |
| $R_{DS(on)}$  | Drain – Source on Resistance    | $V_{GS} = 20V$<br>$I_D = 200A$   | $T_j = 25^\circ C$  | 8          | 10         | m $\Omega$  |
|               |                                 |                                  | $T_j = 175^\circ C$ | 14         |            |             |
| $V_{GS(th)}$  | Gate Threshold Voltage          | $V_{GS} = V_{DS}$ ; $I_D = 10mA$ | 1.7                 | 3          |            | V           |
| $I_{GSS}$     | Gate – Source Leakage Current   | $V_{GS} = 20V$ , $V_{DS} = 0V$   |                     |            | 1          | $\mu A$     |

**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                   | $V_{GS} = 0V$<br>$V_{DS} = 1000V$<br>$f = 1MHz$  |                     | 25         |            | nF           |
| $C_{oss}$     | Output Capacitance                  |  |                     | 1.2        |            |              |
| $C_{rss}$     | Reverse Transfer Capacitance        |  |                     | 0.2        |            |              |
| $Q_g$         | Total gate Charge                   | $V_{GS} = -5/20V$<br>$V_{Bus} = 600V$<br>$I_D = 200A$  |                     | 1360       |            | nC           |
| $Q_{gs}$      | Gate – Source Charge                |  |                     | 400        |            |              |
| $Q_{gd}$      | Gate – Drain Charge                 |  |                     | 400        |            |              |
| $T_{d(on)}$   | Turn-on Delay Time                  | Inductive Switching<br>$V_{GS} = -5/20V$ ; $V_{Bus} = 800V$<br>$I_D = 200A$ ; $T_j = 150^\circ C$<br>$R_G = 0.5\Omega$ |                     | 10         |            | ns           |
| $T_r$         | Rise Time                           |  |                     | 10         |            |              |
| $T_{d(off)}$  | Turn-off Delay Time                 |  |                     | 45         |            |              |
| $T_f$         | Fall Time                           |  |                     | 30         |            |              |
| $E_{on}$      | Turn on Energy                      | Inductive Switching<br>$V_{GS} = -5/+20V$<br>$V_{Bus} = 600V$<br>$I_D = 200A$<br>$R_{Gext} = 0.5\Omega$                | $T_j = 150^\circ C$ | 4.3        |            | mJ           |
| $E_{off}$     | Turn off Energy                     |  | $T_j = 150^\circ C$ | 2.4        |            | mJ           |
| $R_{Gint}$    | Internal gate resistance            |  |                     | 0.33       |            | $\Omega$     |
| $R_{thJC}$    | Junction to Case Thermal Resistance |  |                     |            | 0.065      | $^\circ C/W$ |

**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    | $V_{GS} = 0V$ , $I_{SD} = 200A$  |            | 3.9        |            | V           |
| $t_{rr}$      | Reverse Recovery Time    | $I_{SD} = 200A$ ; $V_{GS} = -2V$<br>$V_R = 800V$ ; $di_F/dt = 1000A/\mu s$ |            | 140        |            | ns          |
| $Q_{rr}$      | Reverse Recovery Charge  |  |            | 1150       |            | nC          |
| $I_{rr}$      | Reverse Recovery Current |  |            | 20         |            | A           |

**SiC diode ratings and characteristics** (Per SiC diode)

| Symbol            | Characteristic                      | Test Conditions  | Min | Typ  | Max  | Unit |
|-------------------|-------------------------------------|--|-----|------|------|------|
| V <sub>RRM</sub>  | Peak Repetitive Reverse Voltage     |  |     |      | 1200 | V    |
| I <sub>RM</sub>   | Reverse Leakage Current             | V <sub>R</sub> =1200V  |     | 0.1  | 2    | mA   |
|                   |                                     |  |     | 5    |      |      |
| I <sub>F</sub>    | DC Forward Current                  |  |     | 100  |      | A    |
| V <sub>F</sub>    | Diode Forward Voltage               | I <sub>F</sub> = 100A  |     | 1.5  | 1.8  | V    |
|                   |                                     |  |     | 2.3  |      |      |
| Q <sub>C</sub>    | Total Capacitive Charge             | I <sub>F</sub> = 100A ; V <sub>R</sub> =600V<br>di/dt = 5000A/μs |     | 1200 |      | nC   |
| C                 | Total Capacitance                   | f = 1MHz, V <sub>R</sub> = 200V                                  |     | 1150 |      | pF   |
|                   |                                     | f = 1MHz, V <sub>R</sub> = 400V                                  |     | 850  |      |      |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance |  |     |      | 0.11 | °C/W |

**Thermal and package characteristics**

| Symbol            | Characteristic   | Min           | Max                   | Unit |     |     |
|-------------------|--|---------------|-----------------------|------|-----|-----|
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz | 4000          |                       | V    |     |     |
| T <sub>J</sub>    | Operating junction temperature range                         | -40           | 175                   | °C   |     |     |
| T <sub>JOP</sub>  | Recommended junction temperature under switching conditions  | -40           | T <sub>Jmax</sub> -25 |      |     |     |
| T <sub>STG</sub>  | Storage Temperature Range                                    | -40           | 125                   |      |     |     |
| T <sub>C</sub>    | Operating Case Temperature                                   | -40           | 125                   |      |     |     |
| Torque            | Mounting torque  | To heatsink   | M6                    | 3    | 5   | N.m |
|                   |  | For terminals | M5                    | 2    | 3.5 |     |
| Wt                | Package Weight   |               |                       | 300  | g   |     |

**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com).

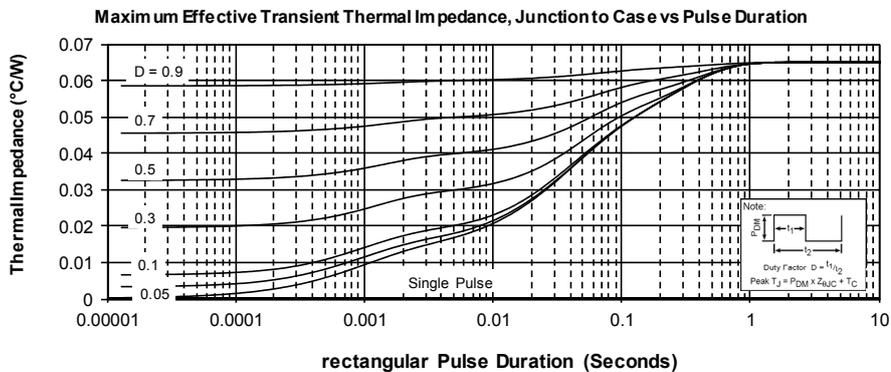
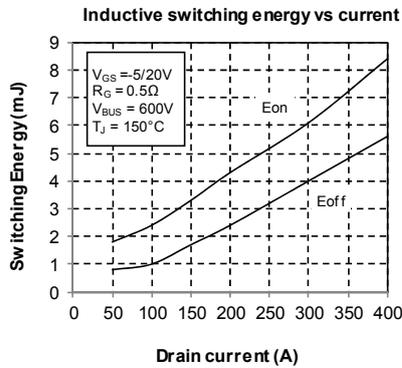
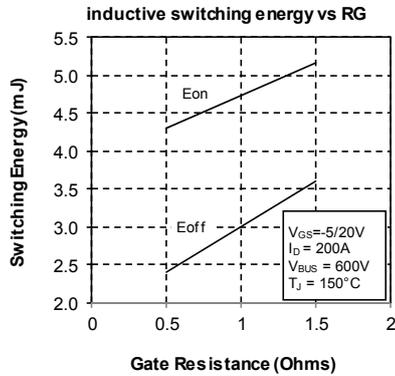
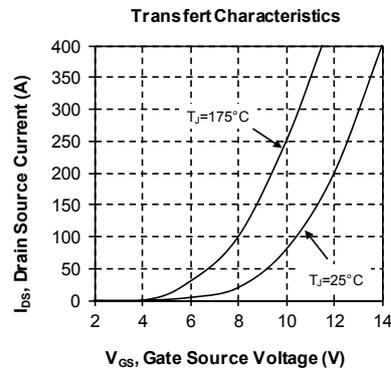
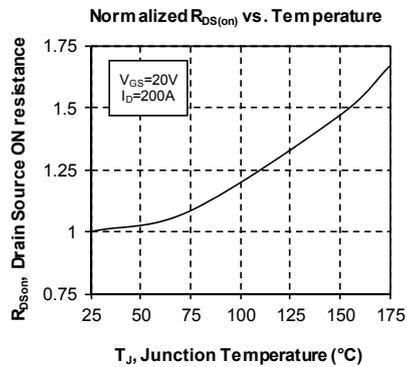
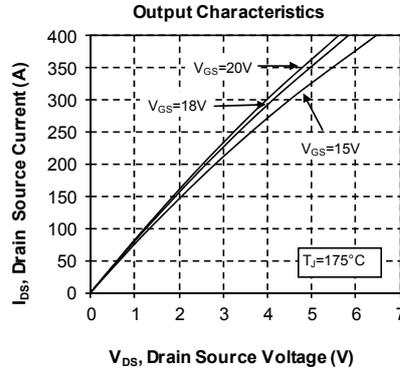
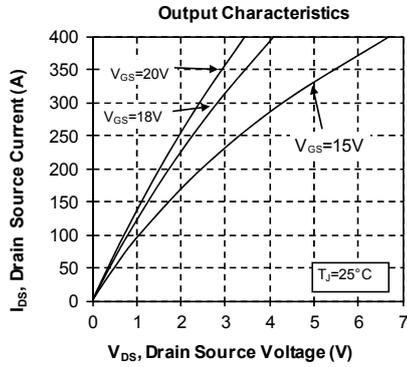
| Symbol                            | Characteristic             | Min | Typ  | Max | Unit |
|-----------------------------------|----------------------------|-----|------|-----|------|
| R <sub>25</sub>                   | Resistance @ 25°C          |     | 50   |     | kΩ   |
| ΔR <sub>25</sub> /R <sub>25</sub> |                            |     | 5    |     | %    |
| B <sub>25/85</sub>                | T <sub>25</sub> = 298.15 K |     | 3952 |     | K    |
| ΔB/B                              | T <sub>C</sub> =100°C      |     | 4    |     | %    |

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

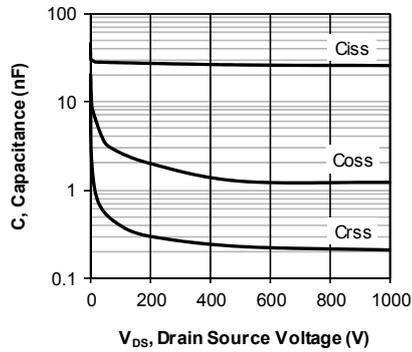
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T



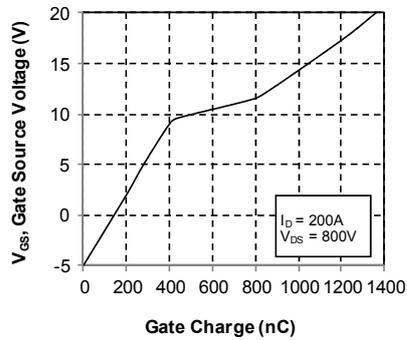
**Typical SiC MOSFET Performance Curve**



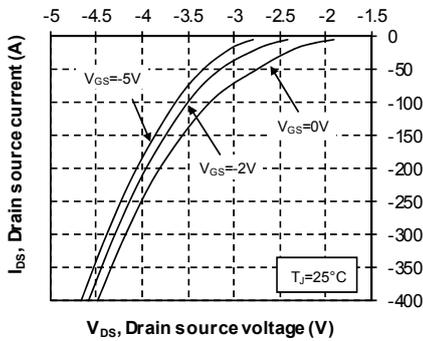
Capacitance vs Drain Source Voltage



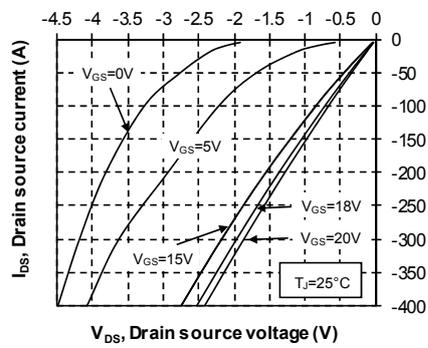
Gate Charge vs Gate Source Voltage



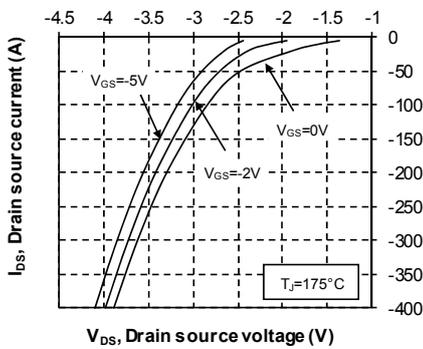
Body diode Characteristics



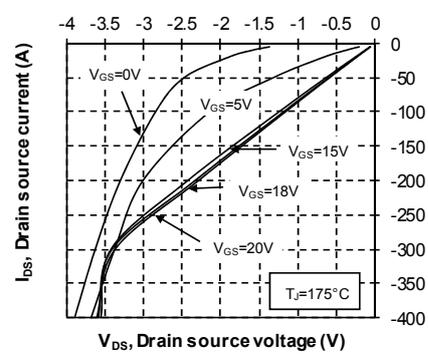
3rd quadran Characteristics



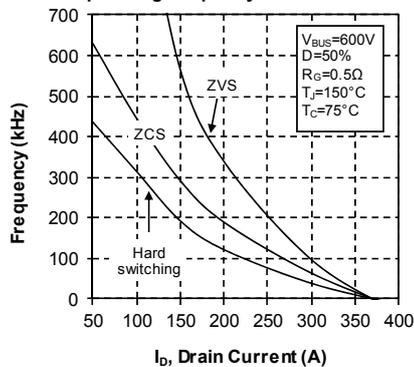
Body diode Characteristics

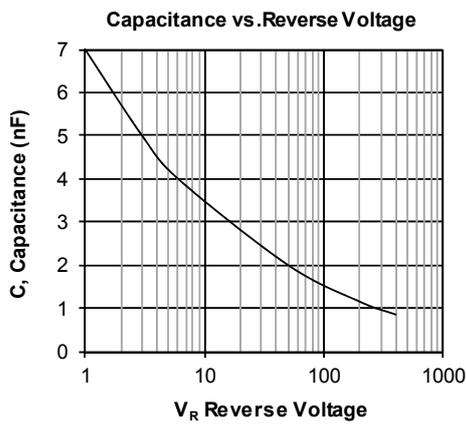
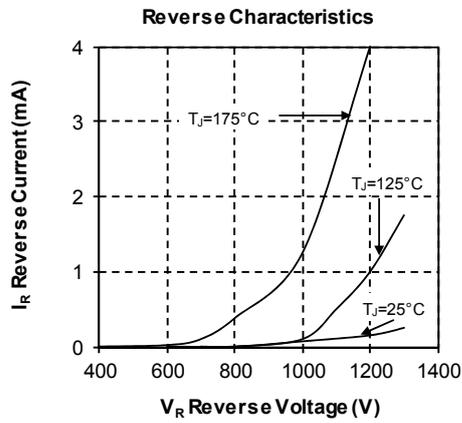
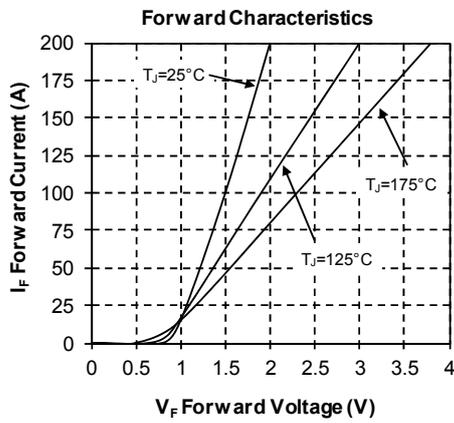
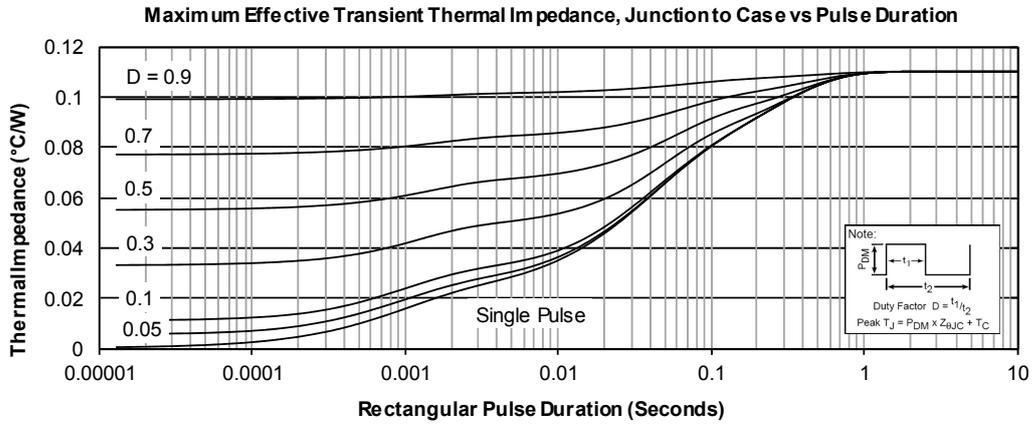


3rd quadran Characteristics



Operating Frequency vs Drain Current



**Typical SiC diode Performance Curve**


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