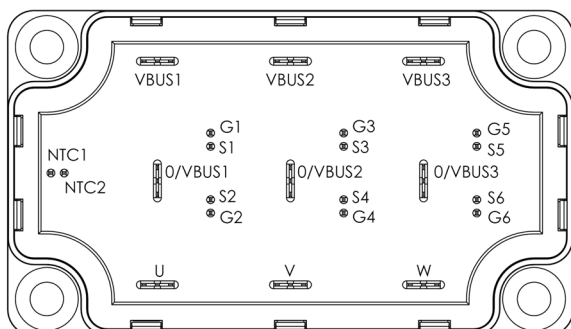
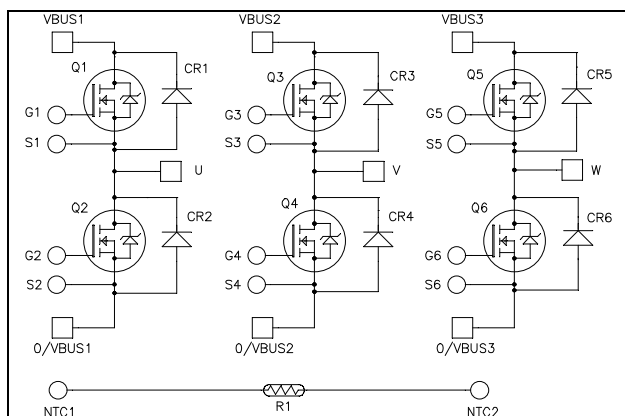


## Triple phase leg SiC MOSFET Power Module

$$V_{DSS} = 1200V$$

$$R_{DS(on)} = 12m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 220A \text{ @ } T_c = 25^\circ C$$



### Application

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

### Features

- **SiC Power MOSFET**
  - High speed switching
  - Low  $R_{DS(on)}$
  - Ultra low loss
- **SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Very low stray inductance
- Kelvin source for easy drive
- Internal thermistor for temperature monitoring
- High level of integration
- 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
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

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

**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)

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

Symbol	Parameter	Max ratings	Unit
$V_{DS}$	Drain - Source Voltage	1200	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ\text{C}$	A
		$T_c = 80^\circ\text{C}$	
$I_{DM}$	Pulsed Drain current	440	
$V_{GS}$	Gate - Source Voltage	-10/25V	V
$R_{DS(on)}$	Drain - Source ON Resistance	12	m $\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ\text{C}$	W

**Electrical Characteristics** (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1200V$			300	$\mu\text{A}$
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 20V$ $I_D = 150A$		8	12	m $\Omega$
		$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$		14	21	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 30mA$	2.1	2.4		V
$I_{GSS}$	Gate - Source Leakage Current	$V_{GS} = 20V, V_{DS} = 0V$			1.8	$\mu\text{A}$

**Dynamic Characteristics** (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 1MHz$		8.4		nF
$C_{oss}$	Output Capacitance			0.66		
$C_{rss}$	Reverse Transfer Capacitance			0.045		
$Q_g$	Total gate Charge	$V_{GS} = -5/+20V$ $V_{Bus} = 800V$ $I_D = 150A$		483		nC
$Q_{gs}$	Gate - Source Charge			138		
$Q_{gd}$	Gate - Drain Charge			150		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$ $V_{Bus} = 800V$ $I_D = 150A, T_j = 150^\circ\text{C}$ $R_L = 5.3\Omega; R_{Gext} = 6.7\Omega$		35		ns
$T_r$	Rise Time			40		
$T_{d(off)}$	Turn-off Delay Time			150		
$T_f$	Fall Time			70		
$E_{on}$	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$ $I_D = 150A$ $R_{Gext} = 6.7\Omega$	$T_j = 150^\circ\text{C}$	3.3		mJ
$E_{off}$	Turn off Energy		$T_j = 150^\circ\text{C}$	1.8		
$R_{Gint}$	Internal gate resistance			2		$\Omega$
$R_{thJC}$	Junction to Case Thermal Resistance				0.135	$^\circ\text{C/W}$

**Source - Drain diode ratings and characteristics** (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{SD}$	Diode Forward Voltage	$V_{GS} = -5V, I_{SD} = 75A$		3.3		V
		$V_{GS} = -2V, I_{SD} = 75A$		3.1		
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 150A; V_{GS} = -5V$ $V_R = 800V; di_F/dt = 3000A/\mu s$		45		ns
$Q_{rr}$	Reverse Recovery Charge			1.2		$\mu\text{C}$
$I_{rr}$	Reverse Recovery Current			40		A

**SiC schottky 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>RRM</sub>	Reverse Leakage Current	V <sub>R</sub> =1200V		100	515	μA
		T <sub>j</sub> = 25°C				
		T <sub>j</sub> = 175°C		483	1920	
I <sub>F</sub>	DC Forward Current	T <sub>C</sub> = 125°C		50		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 50A		1.6	1.8	V
		T <sub>j</sub> = 25°C				
		T <sub>j</sub> = 175°C		2.3	2.7	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 50A, V <sub>R</sub> = 1200V di/dt = 500A/μs		170		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V		320		pF
		f = 1MHz, V <sub>R</sub> = 400V		230		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.45	°C/W

**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			4		%
					T <sub>C</sub> =100°C

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

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

**Thermal and package characteristics**

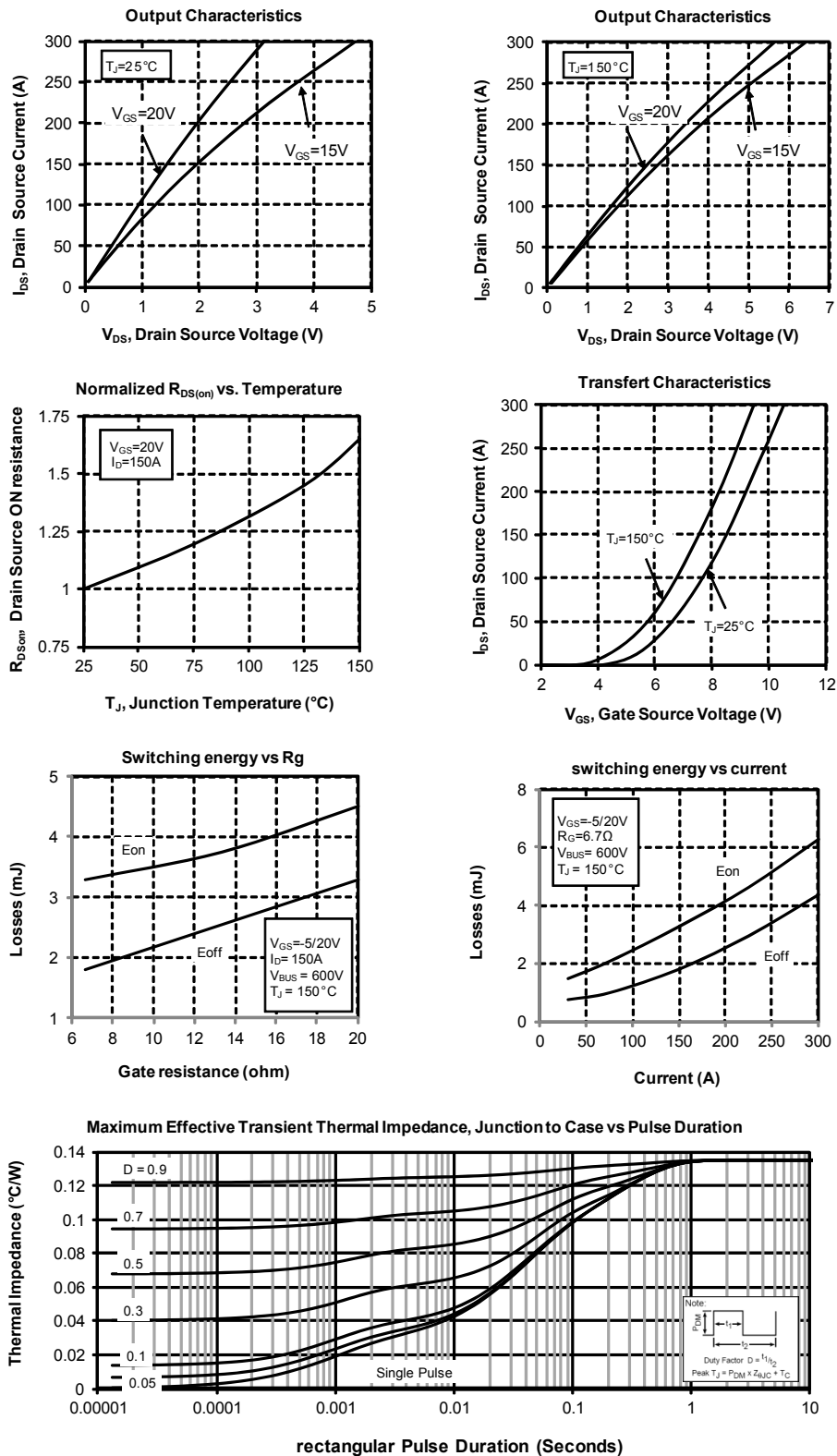
Symbol	Characteristic			Min	Max	Unit
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz			4000		V
T <sub>J</sub>	Operating junction temperature range		SiC MOSFET	-40	150	°C
			SiC diode	-40	175	
T <sub>JOP</sub>	Recommended junction temperature under switching conditions			-40	T <sub>Jmax</sub> -25	
T <sub>STG</sub>	Storage Temperature Range			-40	125	
T <sub>C</sub>	Operating Case Temperature			-40	100	
Torque	Mounting torque	To heatsink	M6	3	5	N.m
Wt	Package Weight				250	g

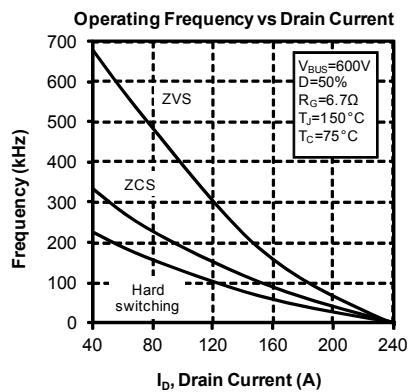
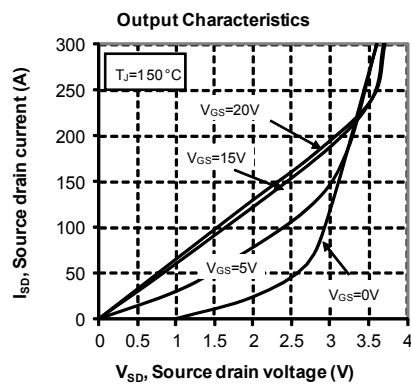
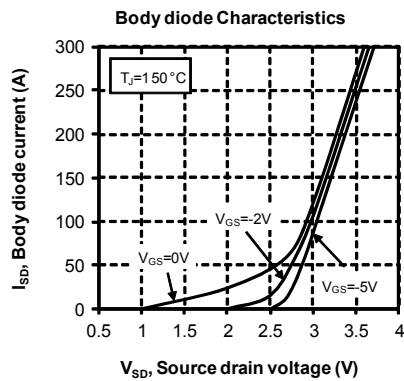
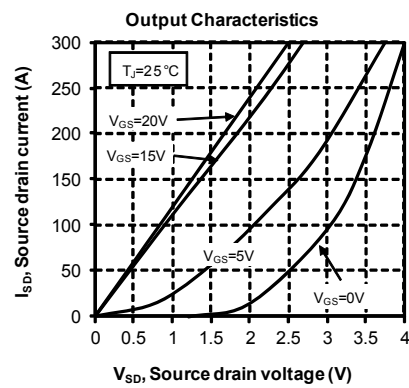
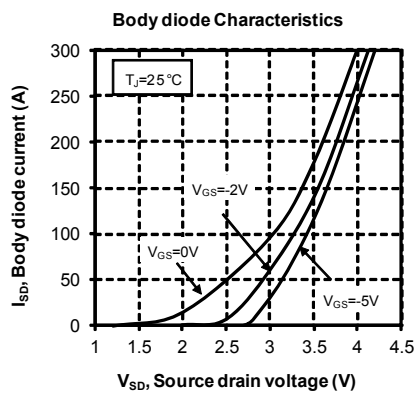
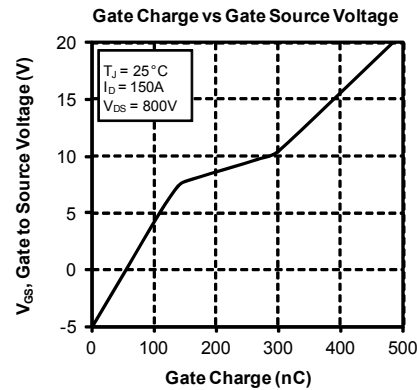
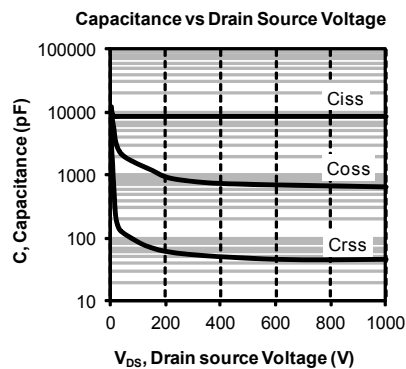
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ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS :  $\pm 0.1$  mm

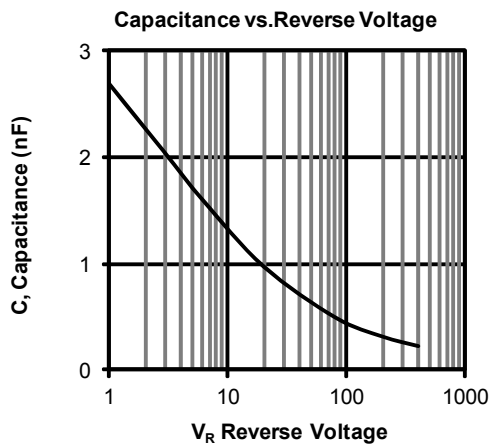
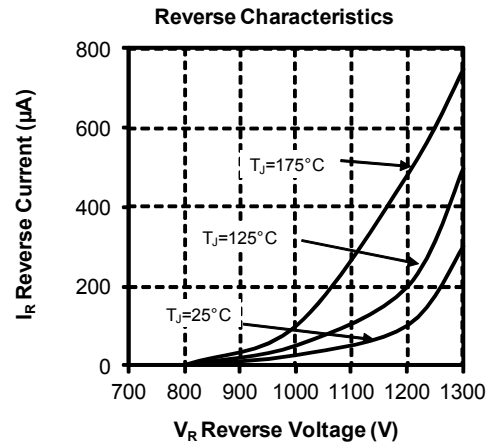
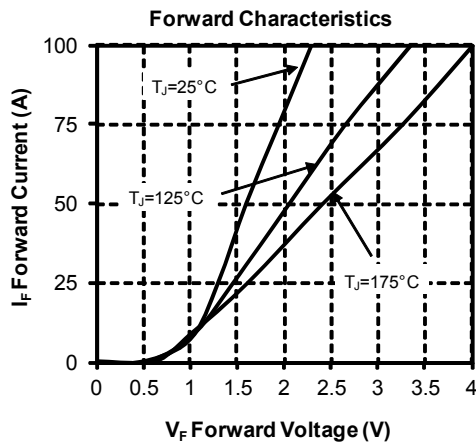
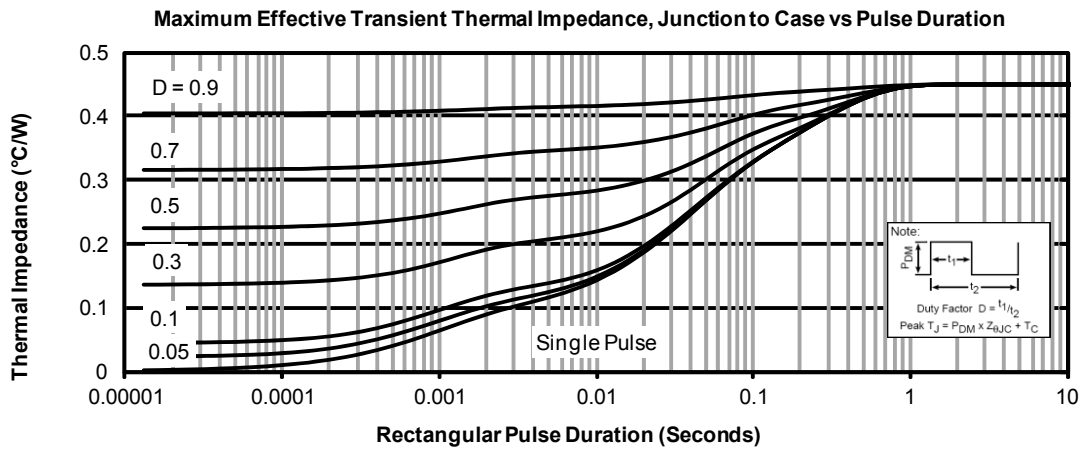
See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical SiC MOSFET Performance Curve





## Typical SiC diode Performance Curve



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