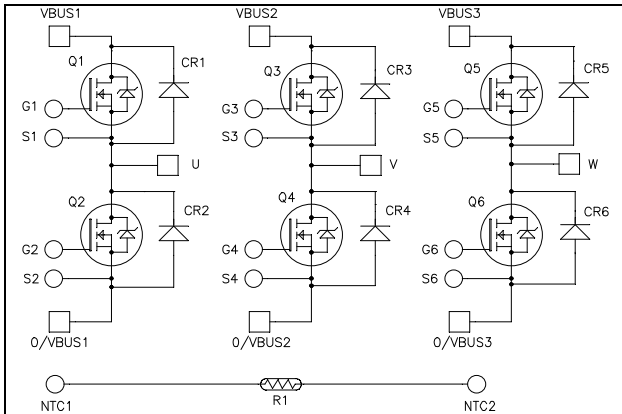


**Triple phase leg
SiC MOSFET Power Module**

$V_{DSS} = 1200V$
 $R_{DS(on)} = 12m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 220A \text{ @ } T_c = 25^\circ C$

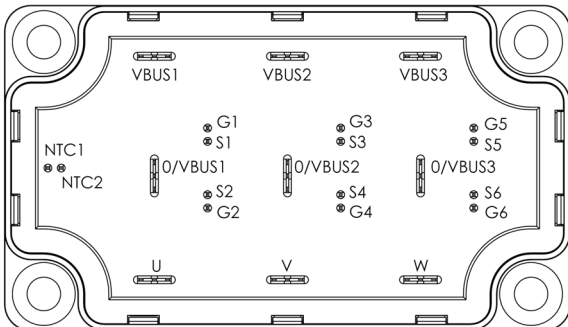


Application

- 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

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°C	220
		T _c = 80°C	165
I _{DM}	Pulsed Drain current	440	A
V _{GS}	Gate - Source Voltage	-10/25V	V
R _{DS(on)}	Drain - Source ON Resistance	12	mΩ
P _D	Maximum Power Dissipation	T _c = 25°C	925

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			300	μA
R _{DS(on)}	Drain - Source on Resistance	V _{GS} = 20V I _D = 150A	T _j = 25°C	8	12	mΩ
			T _j = 150°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} = 20 V, V _{DS} = 0V			1.8	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 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°C R _L = 5.3Ω ; R _{Gext} = 6.7Ω		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} = 6.7Ω	T _J = 150°C	3.3		mJ
E _{off}	Turn off Energy			T _J = 150°C	1.8	
R _{Gint}	Internal gate resistance			2		Ω
R _{thJC}	Junction to Case Thermal Resistance				0.135	°C/W

Source - Drain 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} = 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/μs		45		ns
Q _{rr}	Reverse Recovery Charge			1.2		μC
I _{rr}	Reverse Recovery Current			40		A

SiC schottky diode ratings and characteristics (per SiC diode)

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V _{RRM}	Peak Repetitive Reverse Voltage					1200	V
I _{RRM}	Reverse Leakage Current	V _R =1200V	T _j = 25°C		100	515	μA
			T _j = 175°C		483	1920	
I _F	DC Forward Current		T _C = 125°C		50		A
V _F	Diode Forward Voltage	I _F = 50A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.3	2.7	
Q _C	Total Capacitive Charge	I _F = 50A, V _R = 1200V di/dt = 500A/μs			170		nC
C	Total Capacitance	f = 1MHz, V _R = 200V			320		pF
		f = 1MHz, V _R = 400V			230		
R _{thJC}	Junction to Case Thermal Resistance					0.45	°C/W

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

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B			4		%

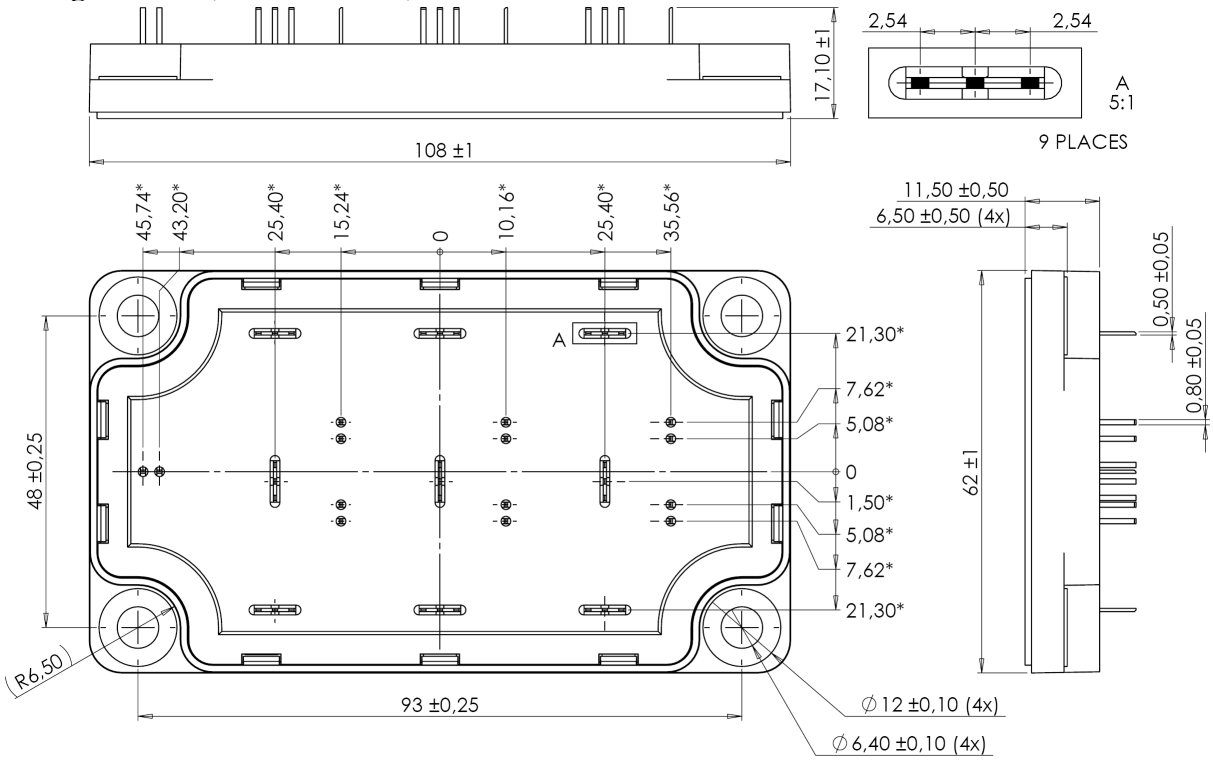
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>		
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	To heatsink	M6	3	5	N.m
Wt	Package Weight				250	g

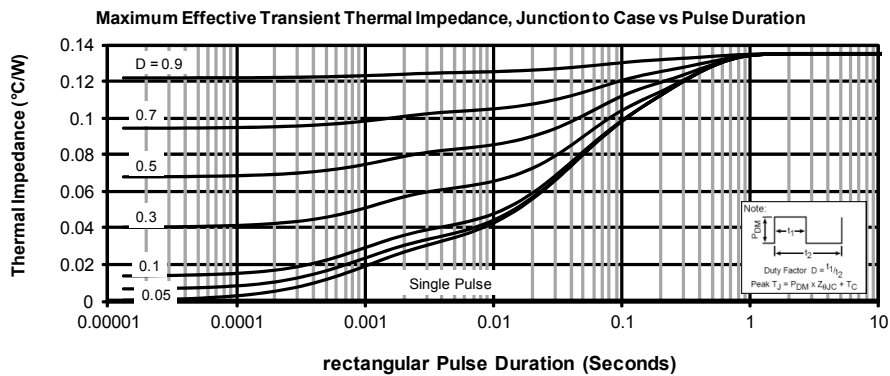
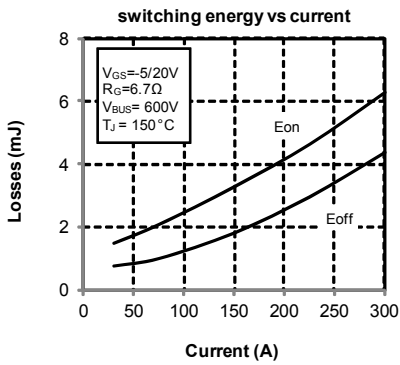
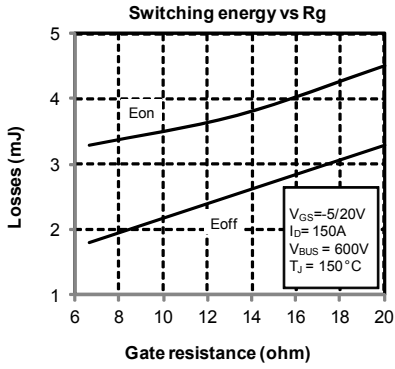
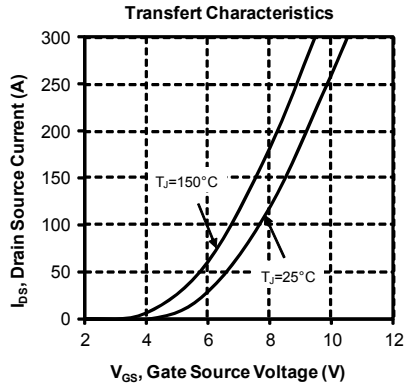
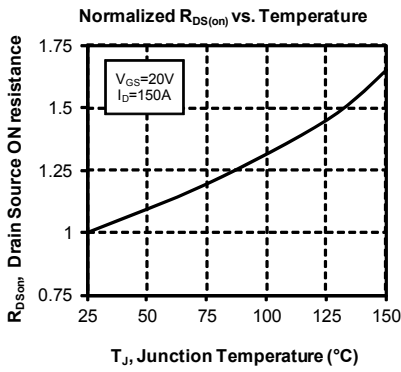
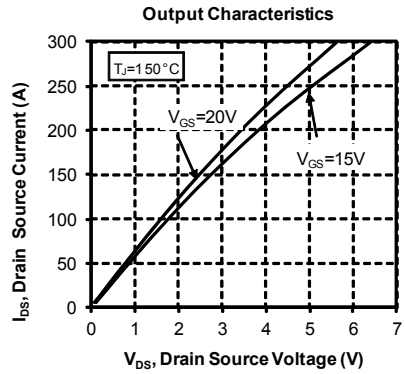
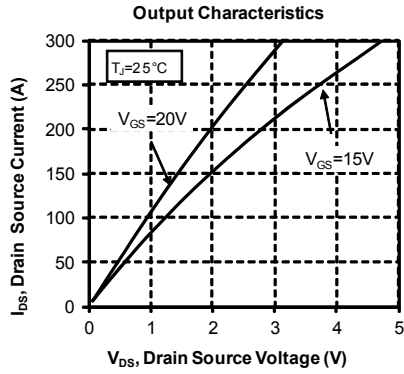
Package outline (dimensions in mm)

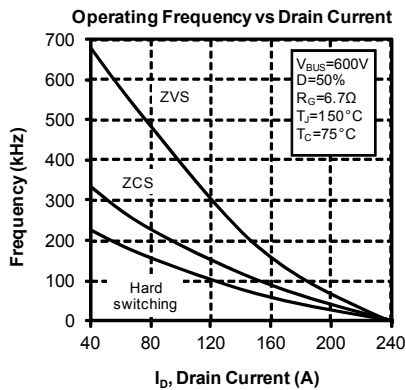
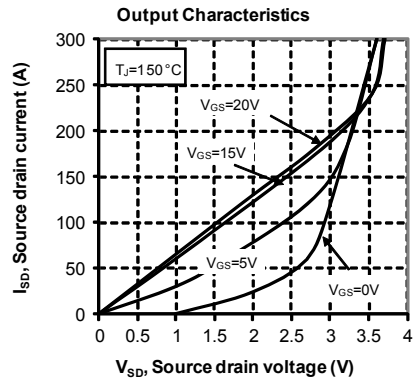
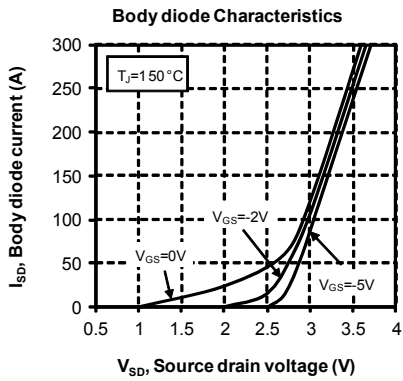
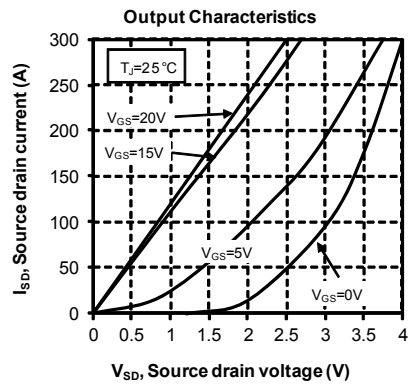
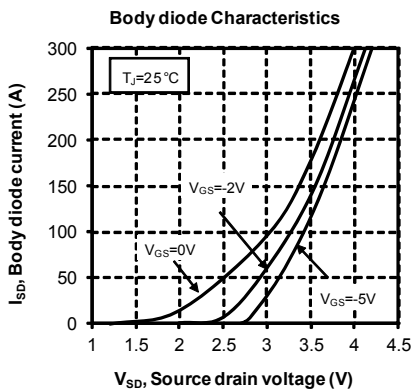
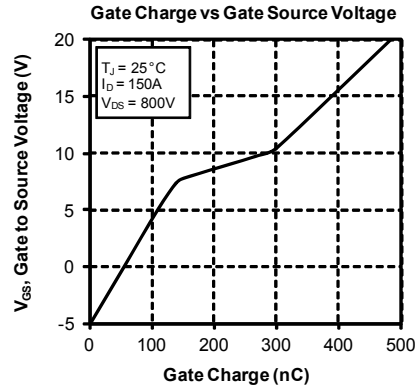
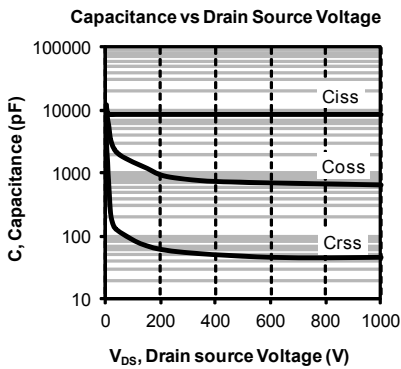


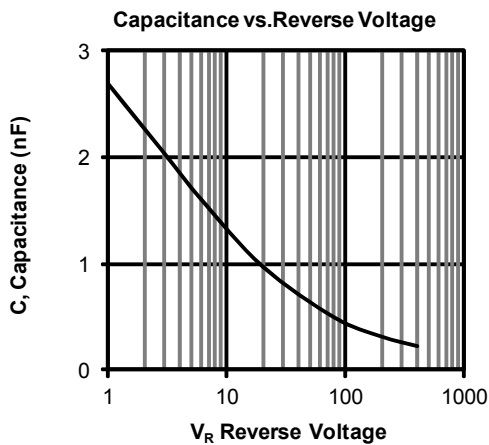
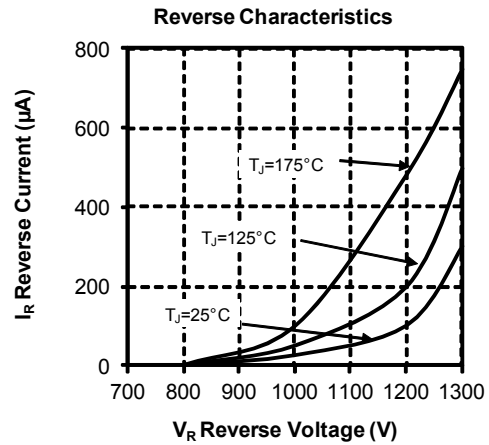
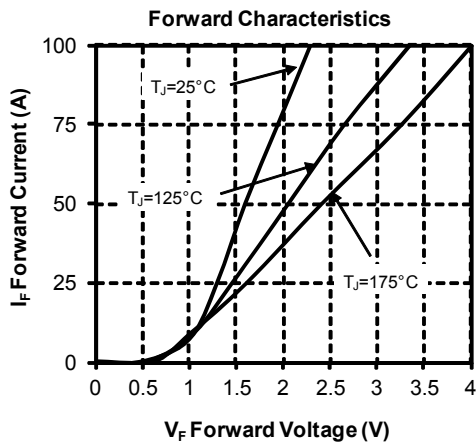
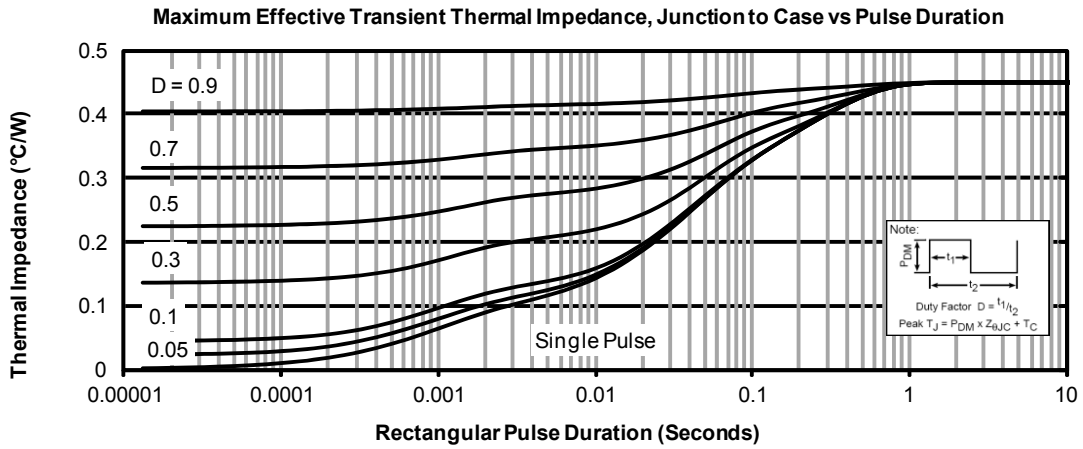
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS : $\pm 0,1$

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

Typical SiC MOSFET Performance Curve





Typical SiC diode Performance Curve


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