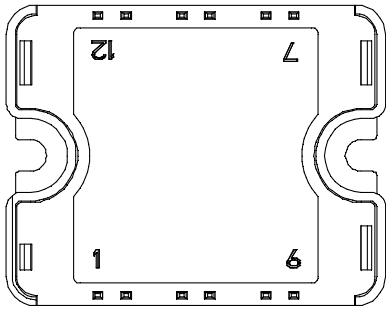
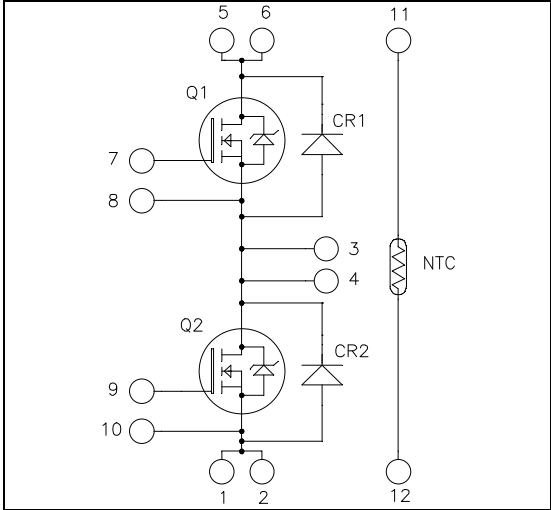


Phase leg  
SiC MOSFET Power Module

**$V_{DSS} = 1700V$**   
 **$R_{DS(on)} = 35m\Omega \text{ max @ } T_j = 25^\circ C$**   
 **$I_D = 100A \text{ @ } T_c = 25^\circ C$**



Pins 1/2 ; 3/4 ; 5/6 must be shorted together

**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**

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

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Voltage	1700	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	100
		$T_c = 80^\circ C$	74
$I_{DM}$	Pulsed Drain current	200	A
$V_{GS}$	Gate - Source Voltage	-10/25	V
$V_{GSOP}$	Gate - Source Voltage ; recommended operation values	-5/20	
$R_{DS(on)}$	Drain - Source ON Resistance	35	m $\Omega$
$P_D$	Power Dissipation	$T_c = 25^\circ C$	700
			W

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

**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	$V_{GS} = 0V, V_{DS} = 1700V$			200	$\mu A$	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 100A$	$T_j = 25^\circ C$		22.5	35	m $\Omega$
			$T_j = 150^\circ C$		45		
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}; I_D = 36mA$	2	2.4	4	V	
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = 20V, V_{DS} = 0V$			1.2	$\mu A$	

**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	$V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 1MHz$		7344		pF
$C_{oss}$	Output Capacitance			342		
$C_{rss}$	Reverse Transfer Capacitance			14		
$Q_g$	Total gate Charge	$V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 100A$		380		nC
$Q_{gs}$	Gate – Source Charge			74		
$Q_{gd}$	Gate – Drain Charge			140		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 100A$ $R_{Gext} = 10\Omega$		105		ns
$T_r$	Rise Time			75		
$T_{d(off)}$	Turn-off Delay Time			210		
$T_f$	Fall Time			55		
$E_{on}$	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 100A$ $R_{Gext} = 10\Omega$	$T_j = 150^\circ C$		4.4	mJ
$E_{off}$	Turn off Energy			$T_j = 150^\circ C$		
$R_{Gint}$	Internal gate resistance			3.15		$\Omega$
$R_{thJC}$	Junction to Case Thermal Resistance				0.18	$^\circ C/W$

**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	$V_{GS} = -5V$ $I_{SD} = 50A$	$T_j = 25^\circ C$		4.1	V
			$T_j = 150^\circ C$		3.6	
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 100A; V_{GS} = -5V$ $V_R = 900V; di_F/dt = 2800A/\mu s$		70		ns
$Q_{rr}$	Reverse Recovery Charge			1		$\mu C$
$I_{rr}$	Reverse Recovery Current				28	

**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 <sub>RRM</sub>	Peak Repetitive Reverse Voltage					1700	V
I <sub>RRM</sub>	Reverse Leakage Current	V <sub>R</sub> =1700V	T <sub>j</sub> = 25°C		40	200	μA
			T <sub>j</sub> = 175°C		200	800	
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	T <sub>j</sub> = 25°C		1.8	2	V
			T <sub>j</sub> = 175°C		3.2	4	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 50A, V <sub>R</sub> = 1700V di/dt = 800A/μs			340		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V			400		pF
		f = 1MHz, V <sub>R</sub> = 400V			280		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.24	°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 <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		%

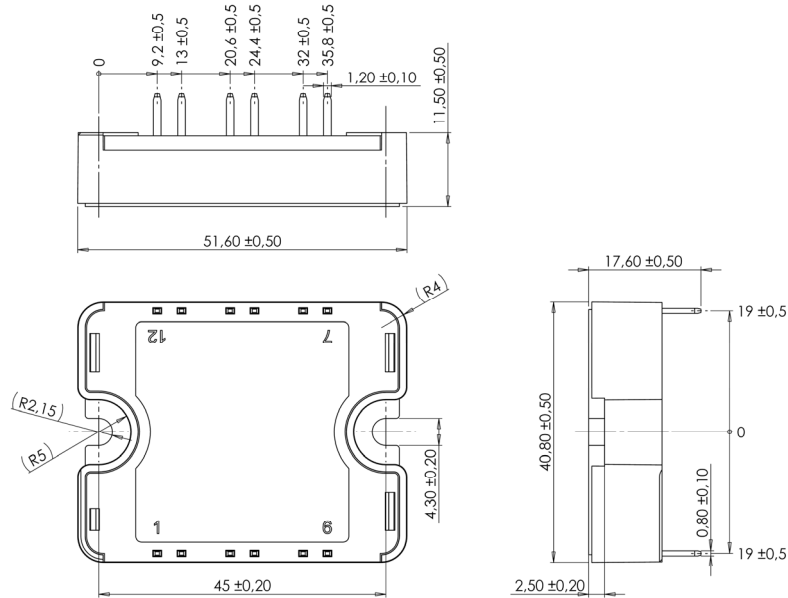
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

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

**Thermal and package characteristics**

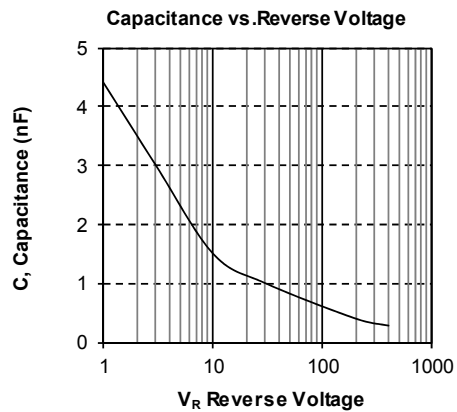
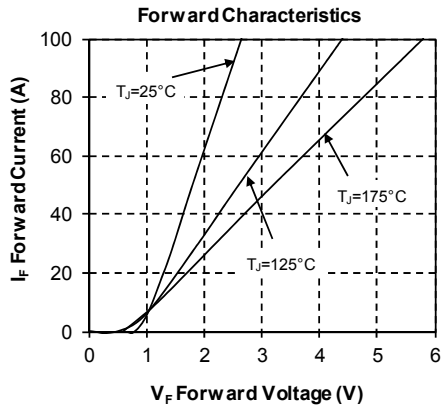
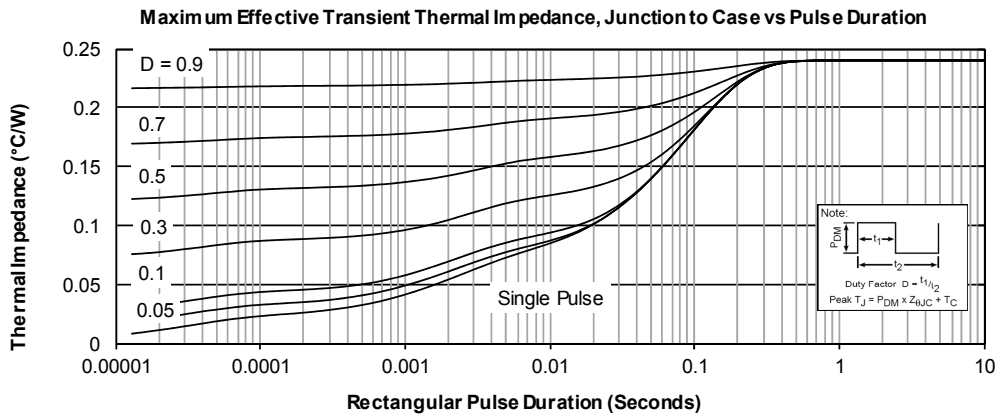
<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	SiC MOSFET	-40	150	°C	
		SiC diode	-40	175		
T <sub>JOP</sub>	Recommended junction temperature 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	125			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				80	g

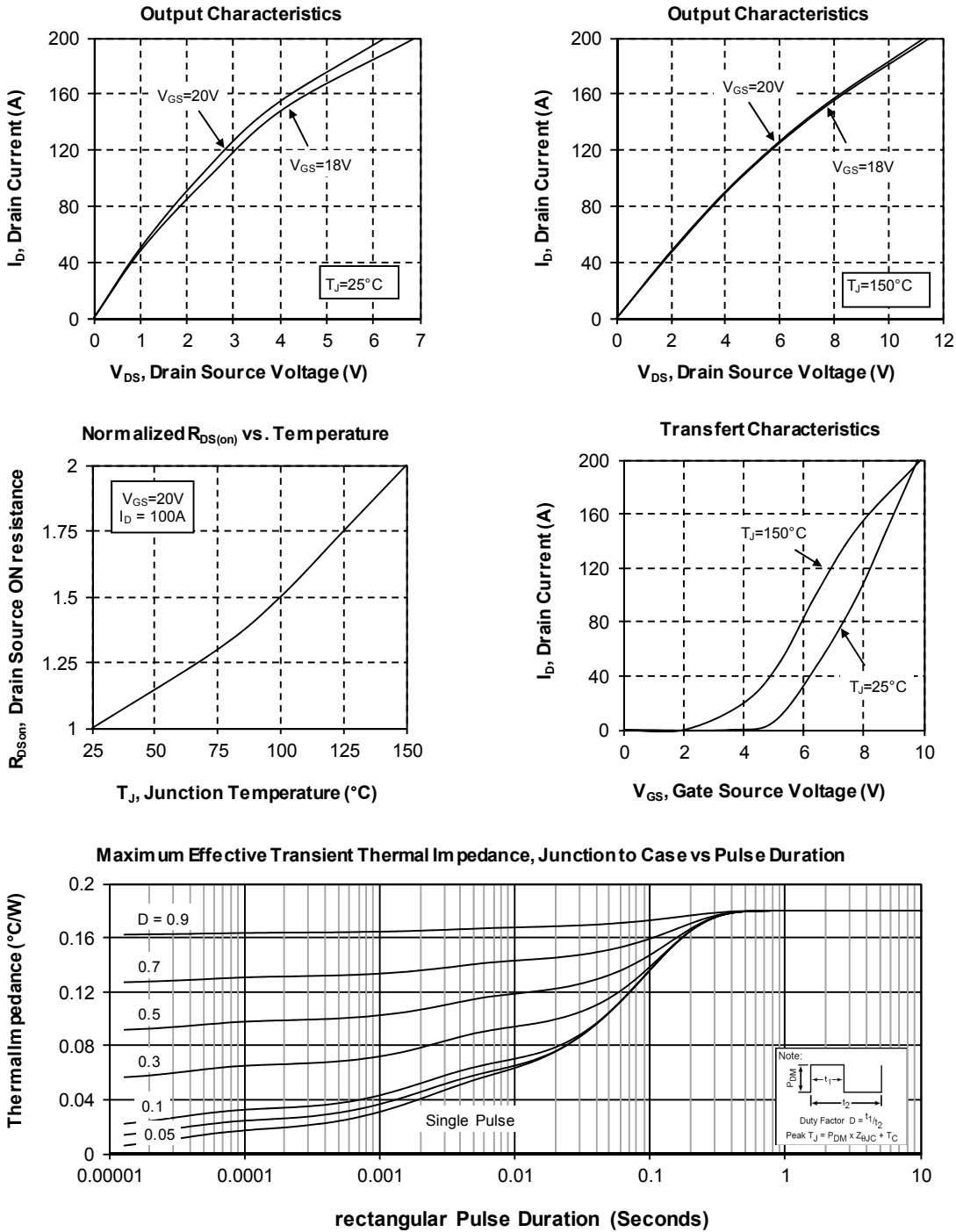
## Package outline (dimensions in mm)

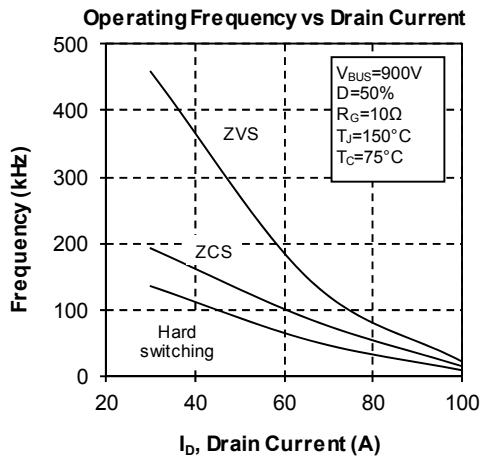
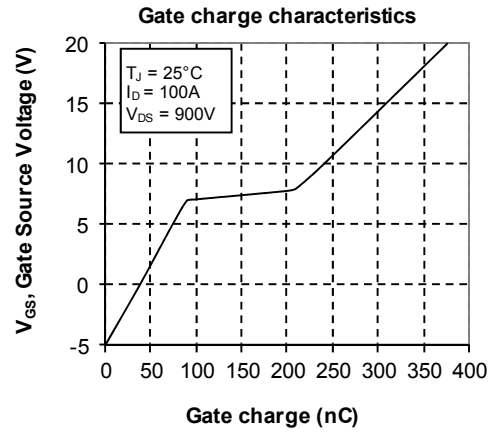
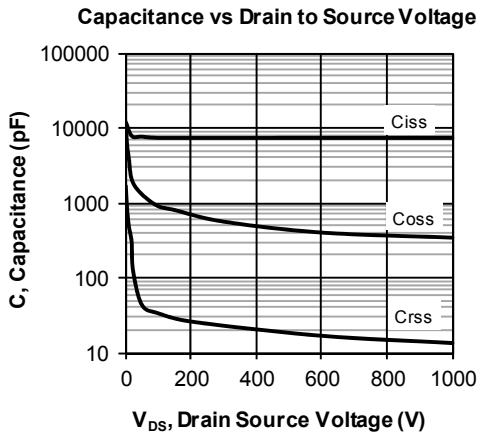
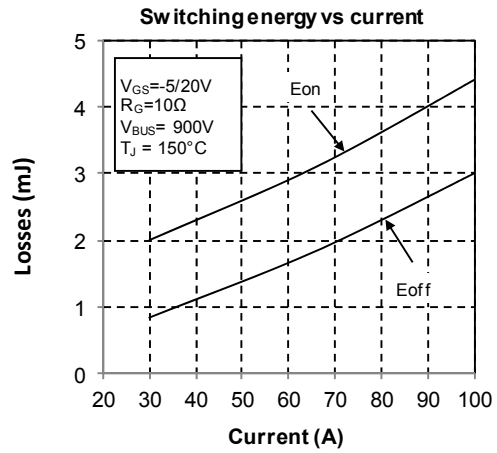
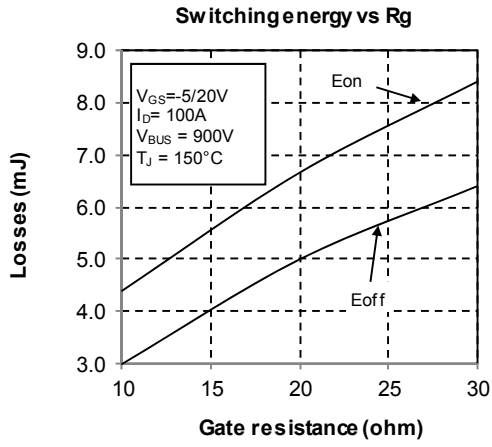


See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical SiC diode Performance Curve



**Typical SiC MOSFET Performance Curve**




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