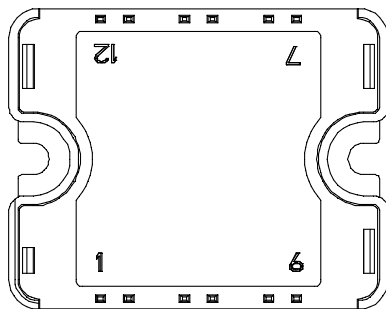
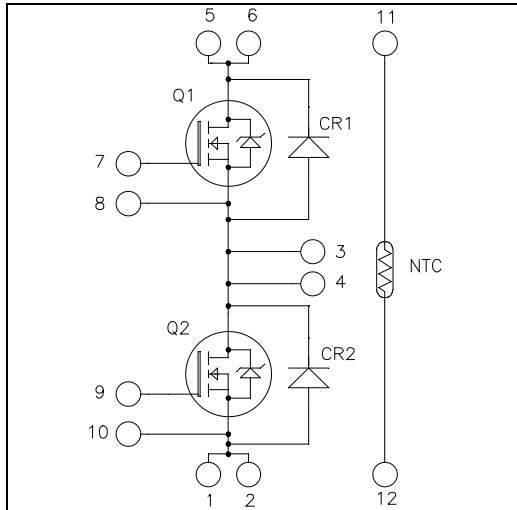


**Phase leg  
SiC MOSFET Power Module**

**$V_{DSS} = 1200V$   
 $R_{DS(on)} = 17m\Omega \text{ max @ } T_j = 25^\circ C$   
 $I_D = 143A \text{ @ } T_c = 25^\circ C$**



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**
  - 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
- Very low stray inductance
- 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**

### 1. SiC MOSFET characteristics (Per MOSFET)

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	1200	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	143
		$T_c = 80^\circ C$	108
$I_{DM}$	Pulsed Drain current	280	A
$V_{GS}$	Gate - Source Voltage	-10/+25	V
$R_{DS(on)}$	Drain - Source ON Resistance	17	m $\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	600
			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**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1200V$		20	200	$\mu A$
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 100A$	$T_j = 25^\circ C$	12.5	17	m $\Omega$
			$T_j = 150^\circ C$	22	32	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2mA$	1.9	2.3		V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = 20V, V_{DS} = 0V$			1	$\mu A$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		5960		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 1000V$		440		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		46		
$Q_g$	Total gate Charge	$V_{GS} = -2/+20V$		360		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 800V$		64		
$Q_{gd}$	Gate – Drain Charge	$I_D = 100A$		126		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -2/+20V$		21		ns
$T_r$	Rise Time	$V_{Bus} = 800V$		19		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 100A$		50		
$T_f$	Fall Time	$R_L = 8\Omega; R_G = 10\Omega$		30		
$E_{on}$	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$	$T_j = 150^\circ C$	2.2		mJ
$E_{off}$	Turn off Energy	$I_D = 100A$ $R_G = 10\Omega$	$T_j = 150^\circ C$	1.2		
$R_{thJC}$	Junction to Case Thermal Resistance				0.21	$^\circ C/W$

**2. SiC diode characteristics (Per SiC diode)**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 1200V$		70	400	$\mu A$
				130	800	
$I_F$	DC Forward Current			40		A
$V_F$	Diode Forward Voltage	$I_F = 40A$		1.5	1.8	V
				2.2	3	
$Q_C$	Total Capacitive Charge	$I_F = 40A, V_R = 1200V$ $di/dt = 1000A/\mu s$		260		nC
$C$	Total Capacitance	$f = 1MHz, V_R = 200V$		186		pF
		$f = 1MHz, V_R = 400V$		134		
$R_{thJC}$	Junction to Case Thermal Resistance				0.7	$^\circ C/W$

### 3. Thermal and package characteristics

#### Package characteristics

Symbol	Characteristic	Min	Typ	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>J,max</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

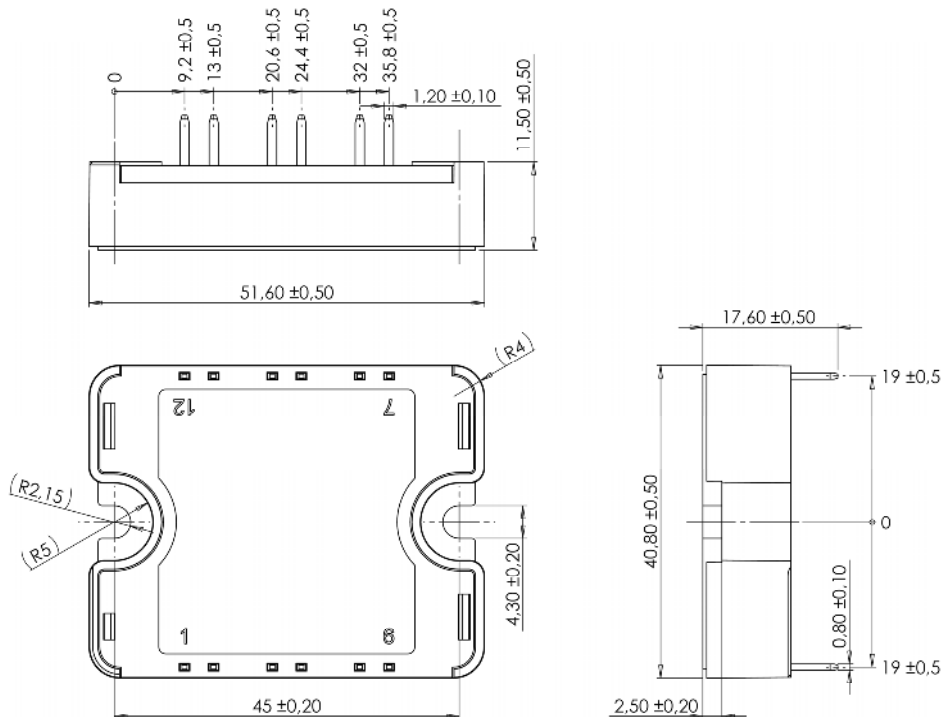
#### Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

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		%

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

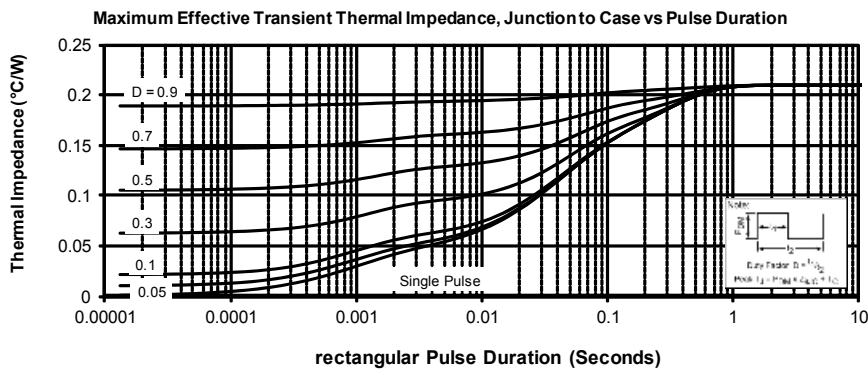
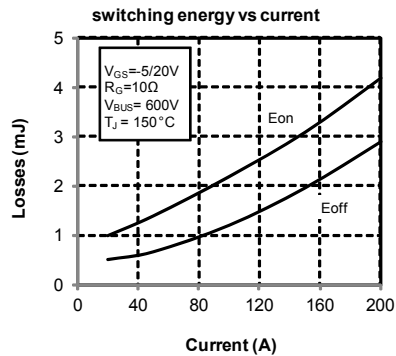
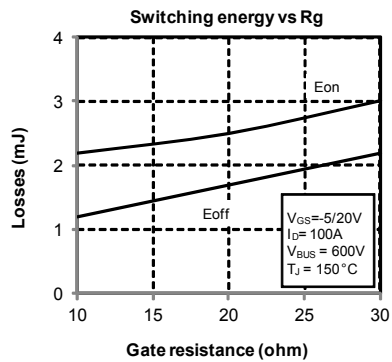
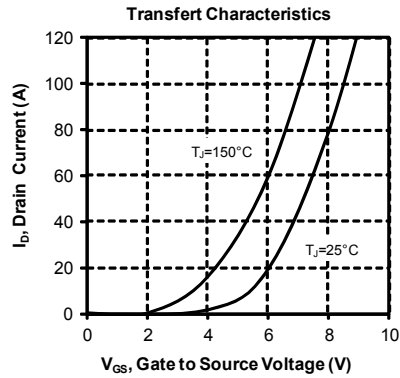
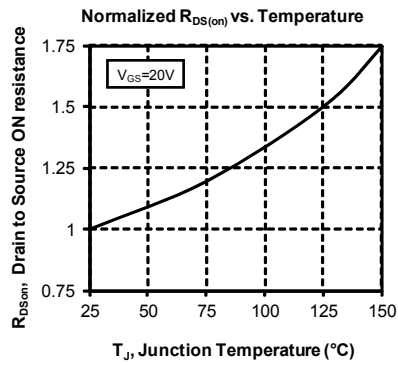
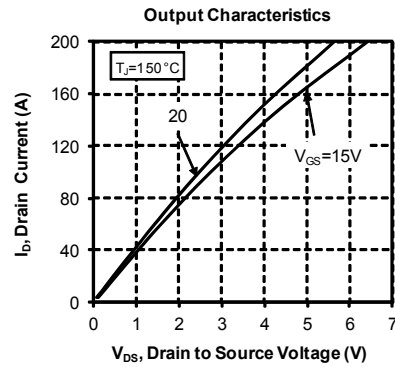
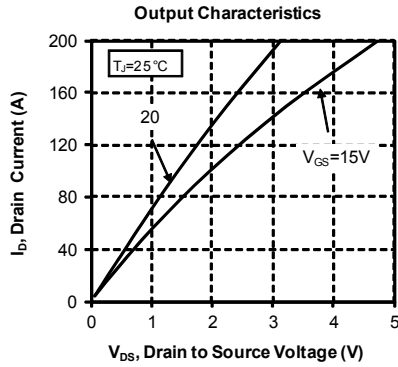
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

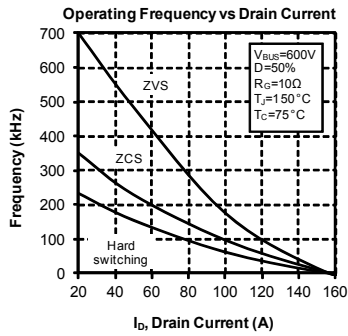
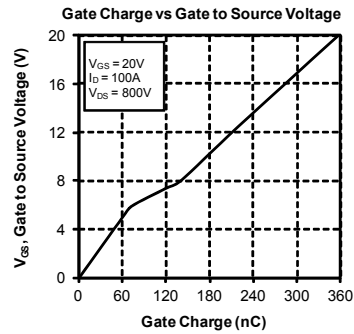
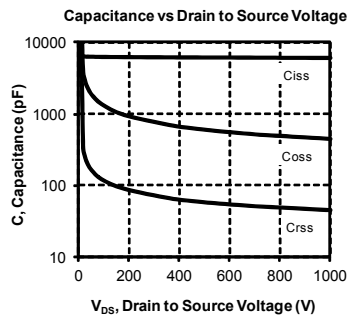
#### SP1 Package outline (dimensions in mm)



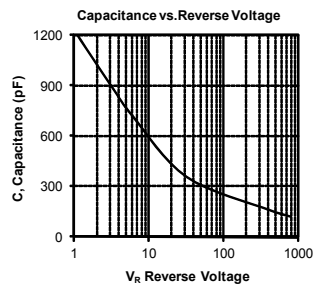
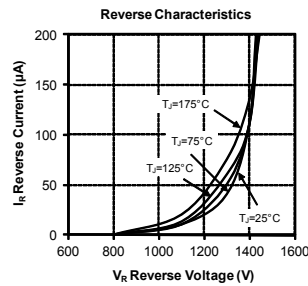
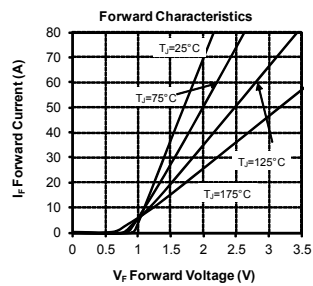
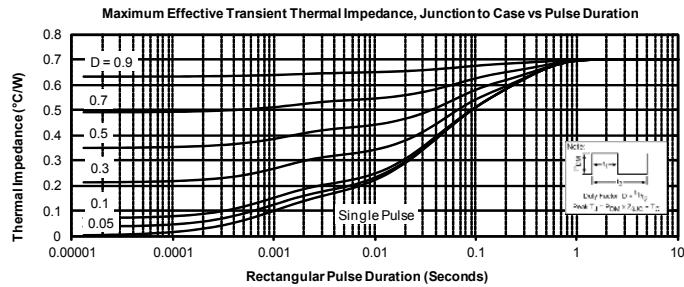
See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## 4. Typical Performance Curves SiC MOSFET





## SiC diode



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