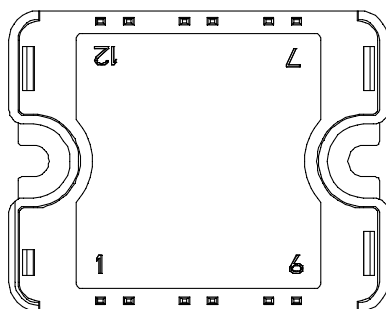
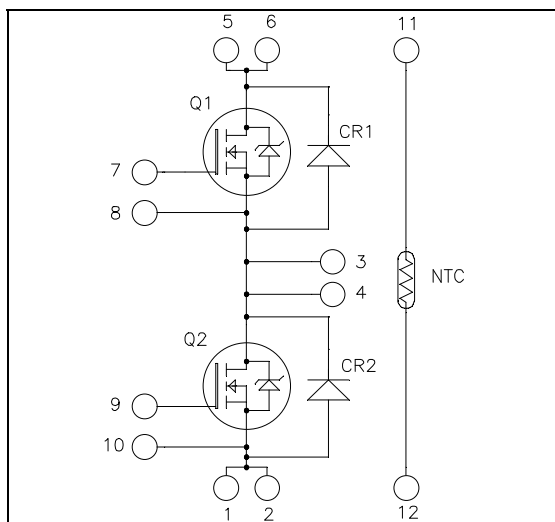


Phase leg SiC MOSFET Power Module



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

$V_{DSS} = 1200V$

$R_{DS(on)} = 49m\Omega \text{ max @ } T_j = 25^\circ C$

$I_D = 55A \text{ @ } T_c = 25^\circ C$

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
- 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)

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	1200	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	A
		$T_c = 80^\circ C$	
I_{DM}	Pulsed Drain current	110	
V_{GS}	Gate - Source Voltage	-10/+25	V
$R_{DS(on)}$	Drain - Source ON Resistance	49	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	W

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V$; $V_{DS} = 1200V$		25	200	μA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 40A$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	40 75	49 104	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$; $I_D = 2mA$	1.7	2.2		V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = 20V$, $V_{DS} = 0V$			500	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		1900		pF
C_{oss}	Output Capacitance	$V_{DS} = 1000V$		160		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		13		
Q_g	Total gate Charge	$V_{GS} = 20V$		98		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 800V$		22		
Q_{gd}	Gate – Drain Charge	$I_D = 40A$		36		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$		12		ns
T_r	Rise Time	$V_{Bus} = 800V$		14		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 40A$		23		
T_f	Fall Time	$R_L = 20\Omega$; $R_G = 25\Omega$		18		
E_{on}	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$	$T_j = 150^\circ C$	0.9		mJ
E_{off}	Turn off Energy	$I_D = 40A$ $R_G = 25\Omega$	$T_j = 150^\circ C$	0.5		mJ
R_{thJC}	Junction to Case Thermal Resistance				0.5	$^\circ C/W$

2. SiC diode characteristics (Per SiC diode)
SiC diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		1200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 1200V$	$T_j = 25^\circ C$ $T_j = 175^\circ C$	64 112	400 2000	μA
I_F	DC Forward Current		$T_c = 125^\circ C$	20		A
V_F	Diode Forward Voltage	$I_F = 20A$	$T_j = 25^\circ C$ $T_j = 175^\circ C$	1.6 2.3	1.8 3	V
Q_C	Total Capacitive Charge	$I_F = 20A$, $V_R = 120V$ $di/dt = 1000A/\mu s$		160		nC
C	Total Capacitance	$f = 1MHz$, $V_R = 200V$ $f = 1MHz$, $V_R = 400V$		192 138		pF
R_{thJC}	Junction to Case Thermal Resistance				0.8	$^\circ C/W$

3. Thermal and package characteristics

Package characteristics

Symbol	Characteristic				Min	Typ	Max	Unit
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		125	
Torque	Mounting torque	To heatsink	M4	2		3	N.m	
Wt	Package Weight						80	g

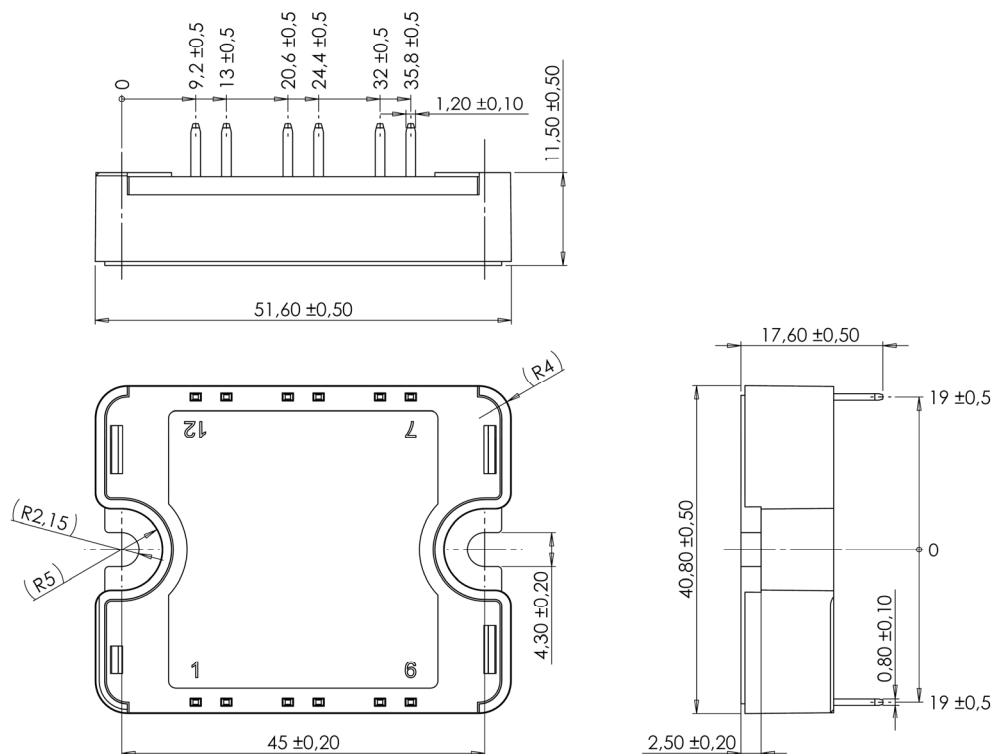
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B	T _C = 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_T: Thermistor value at T

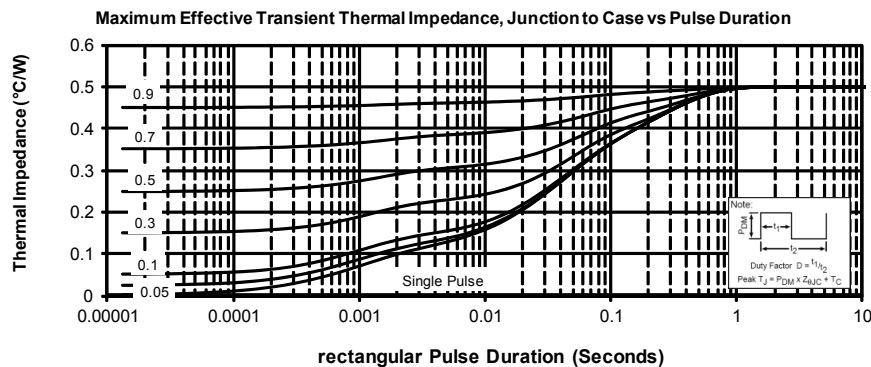
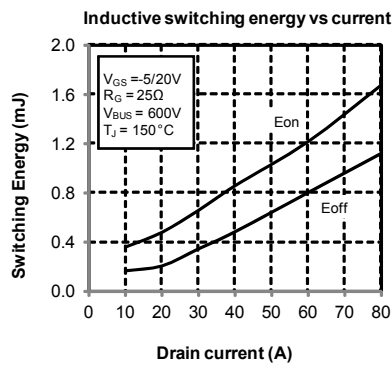
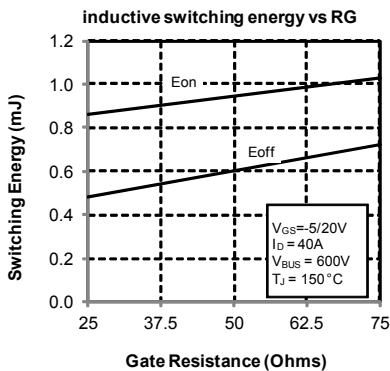
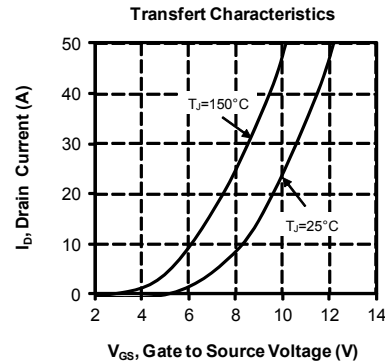
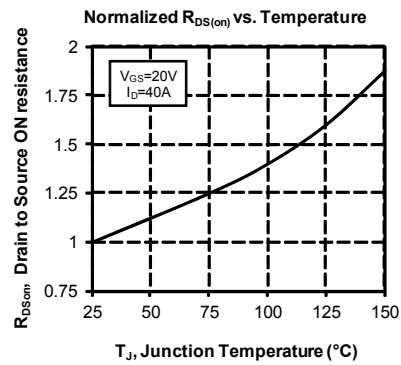
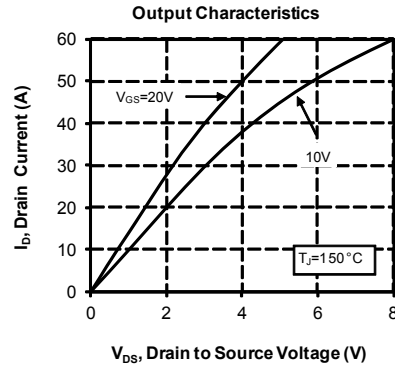
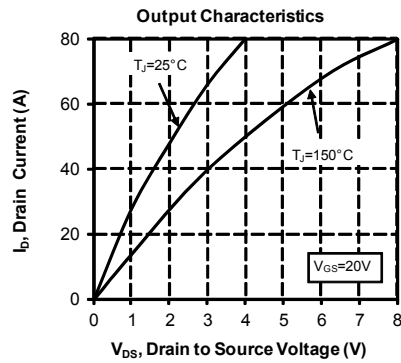
SP1 Package outline (dimensions in mm)

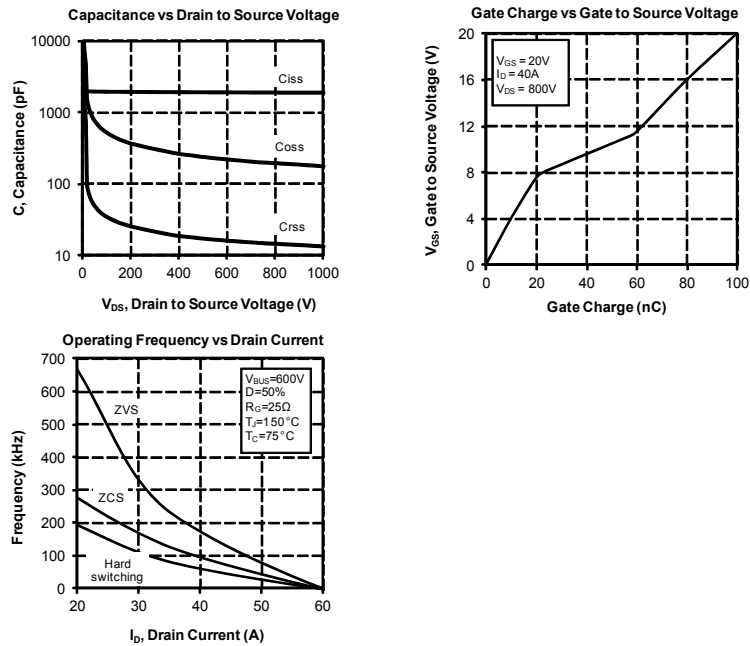


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

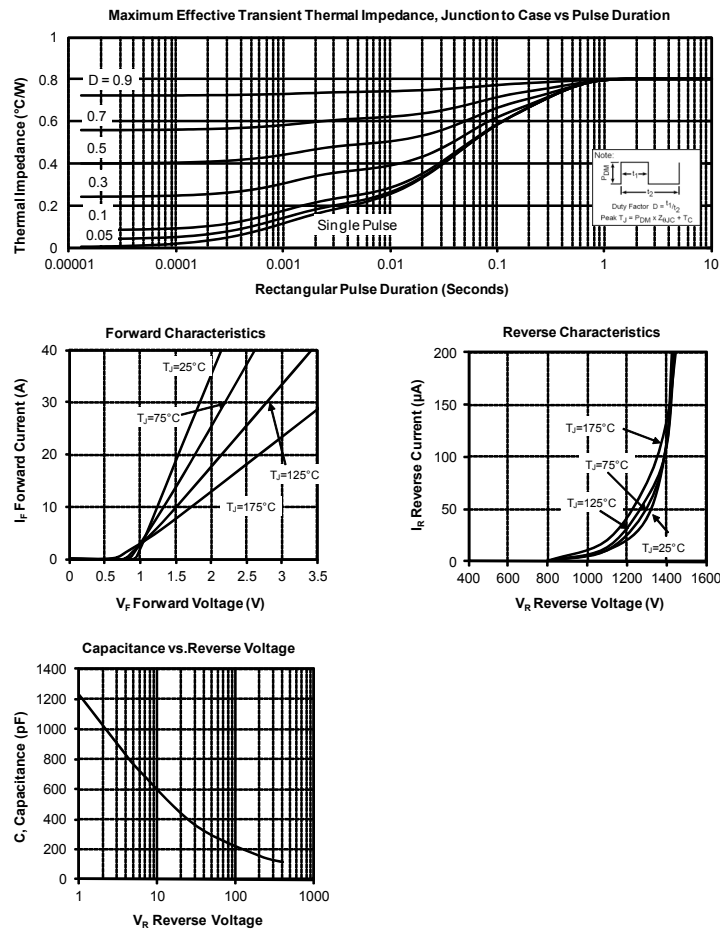
4. Typical Performance Curves

SiC MOSFET





SiC diode



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