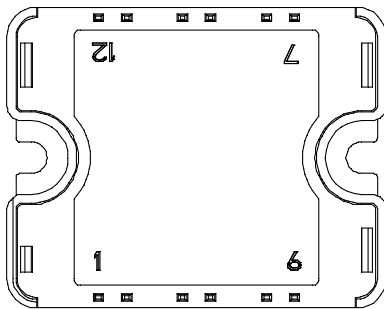
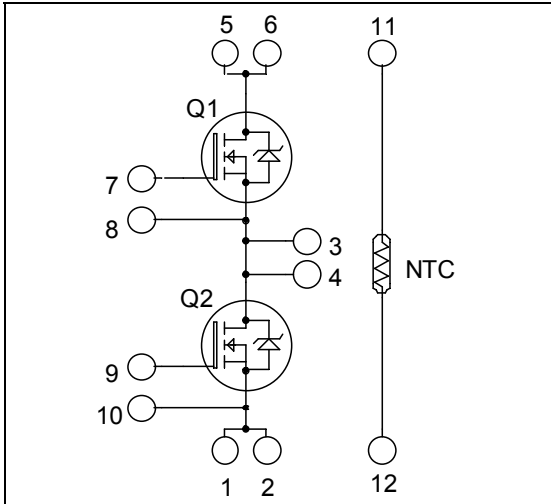


*Phase leg
SiC MOSFET Power Module*

$V_{DSS} = 1200V$
 $R_{DS(on)} = 50m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 74A \text{ @ } T_c = 25^\circ C$



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
- 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	$T_c = 25^\circ C$	74
		$T_c = 80^\circ C$	59
I_{DM}	Pulsed Drain current	140	A
V_{GS}	Gate - Source Voltage	-10/+25	V
$R_{DS(on)}$	Drain - Source ON Resistance	50	m Ω
P_D	Power Dissipation	$T_c = 25^\circ C$	470
			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

<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	$V_{GS} = 0V$; $V_{DS} = 1200V$		25	200	μA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 40A$	$T_j = 25^\circ C$	40	50	m Ω
			$T_j = 150^\circ C$	68	85	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$; $I_D = 2mA$	1.7	3		V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = 20V$, $V_{DS} = 0V$			200	nA

Dynamic Characteristics

<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	$V_{GS} = 0V$		5120		pF
C_{oss}	Output Capacitance	$V_{DS} = 1000V$		244		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		42		
Q_g	Total gate Charge	$V_{GS} = 20V$		260		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 800V$		118		
Q_{gd}	Gate – Drain Charge	$I_D = 40A$		54		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$		10		ns
T_r	Rise Time	$V_{Bus} = 800V$		15		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 40A$		20		
T_f	Fall Time	$R_{Gext} = 2.5\Omega$		20		
E_{on}	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$	$T_j = 150^\circ C$	1		mJ
E_{off}	Turn off Energy	$I_D = 40A$ $R_{Gext} = 2.5\Omega$	$T_j = 150^\circ C$	0.5		mJ
R_{Gint}	Internal gate resistance			3.1		Ω
R_{thJC}	Junction to Case Thermal Resistance				0.32	$^\circ C/W$

Source - Drain diode ratings and characteristics

<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	$V_{GS} = 0V$, $I_{SD} = 40A$		3.85		V
t_{rr}	Reverse Recovery Time	$I_{SD} = 40A$; $V_{GS} = 0V$ $V_R = 800V$; $di_F/dt = 200A/\mu s$		140		ns
Q_{rr}	Reverse Recovery Charge			230		nC
I_{rr}	Reverse Recovery Current			4		A

2. Thermal and package characteristics

Package characteristics

Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	175	°C		
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

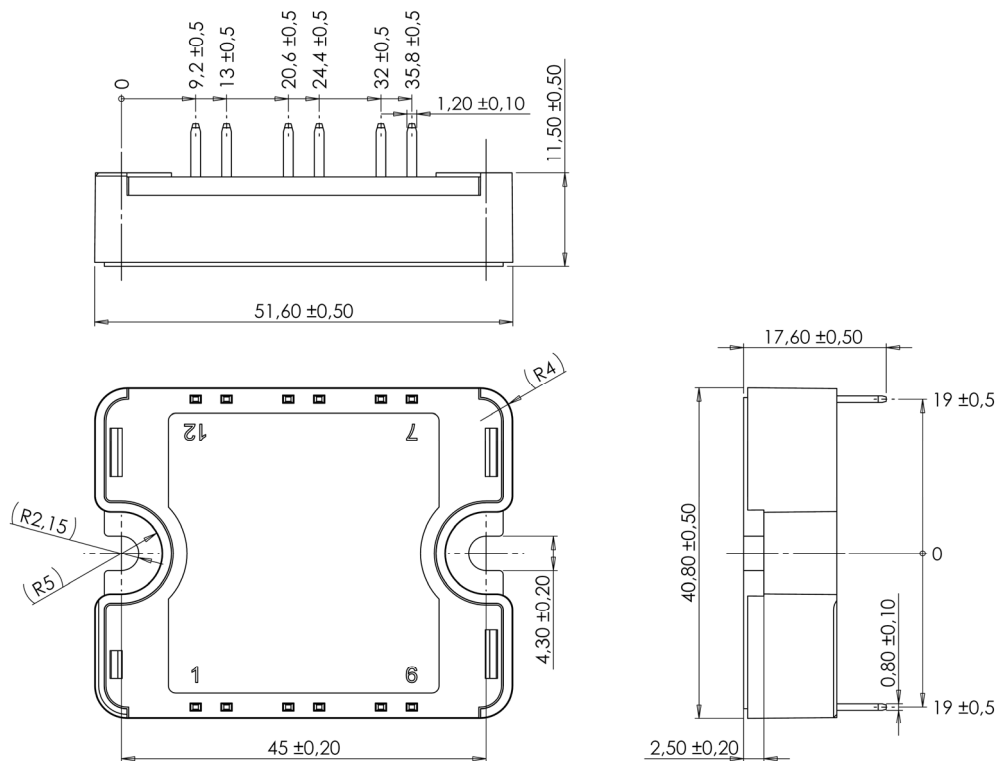
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

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		%

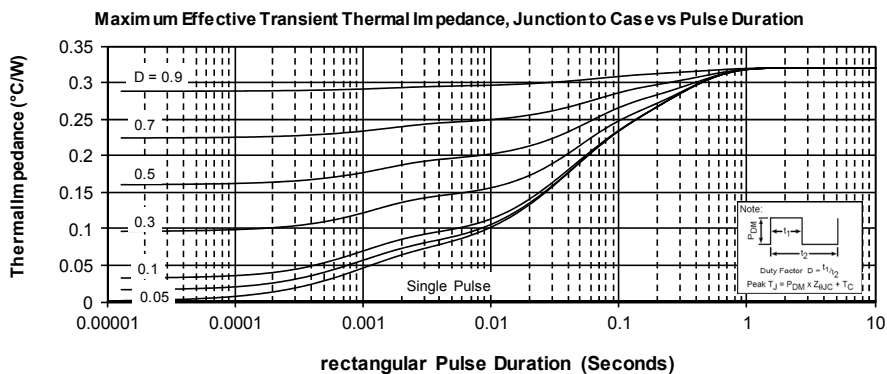
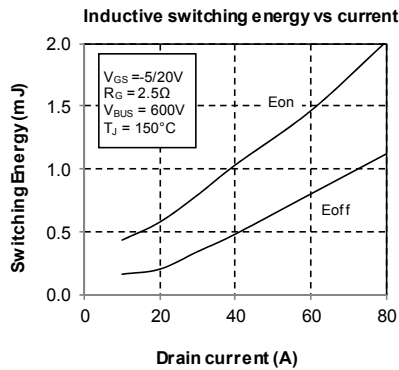
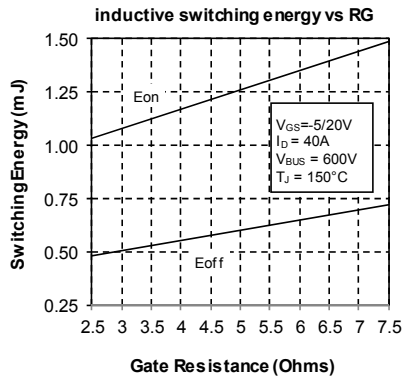
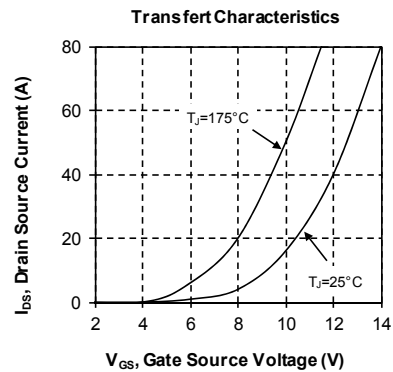
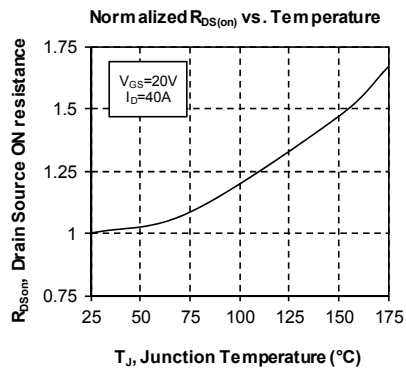
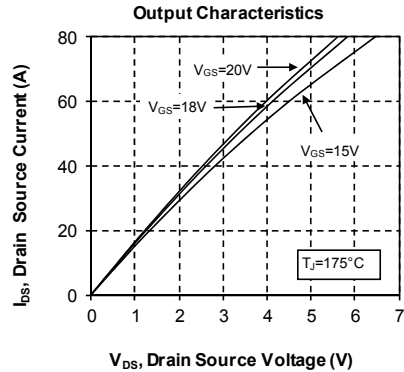
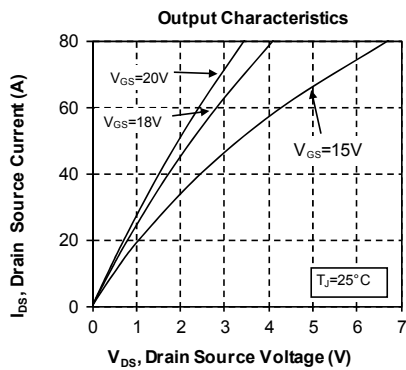
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
 R_T: Thermistor value at T

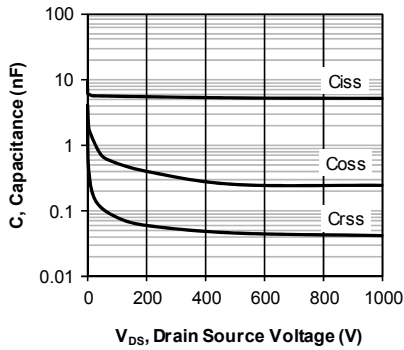
SP1 Package outline (dimensions in mm)



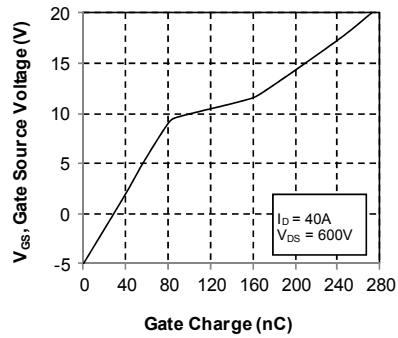
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical Performance Curve


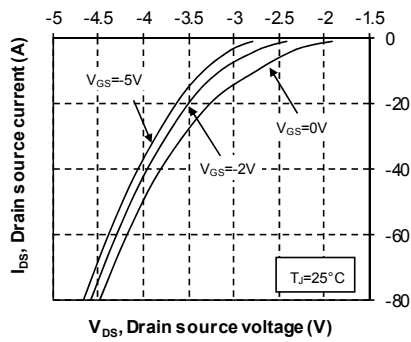
Capacitance vs Drain Source Voltage



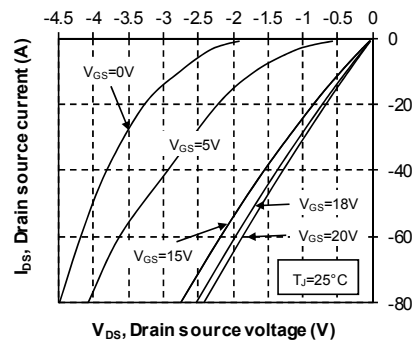
Gate Charge vs Gate Source Voltage



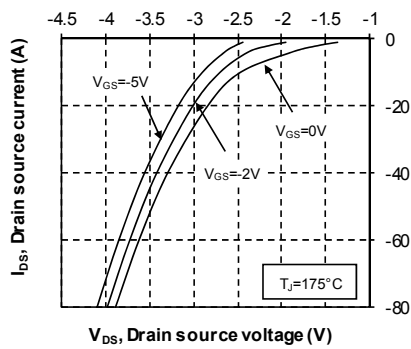
Body diode Characteristics



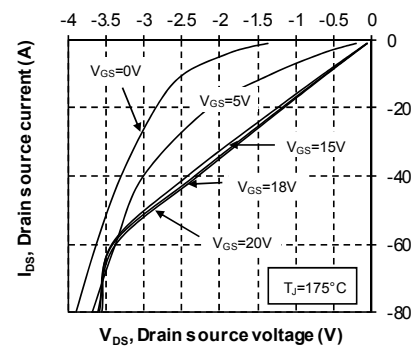
3rd quadrant Characteristics



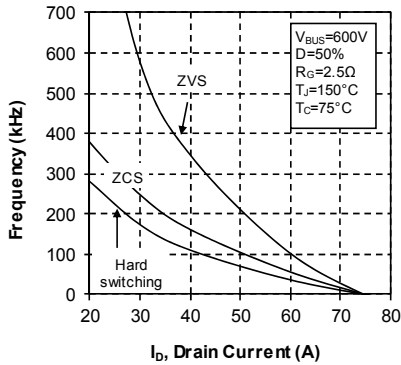
Body diode Characteristics



3rd quadrant Characteristics



Operating Frequency vs Drain Current



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