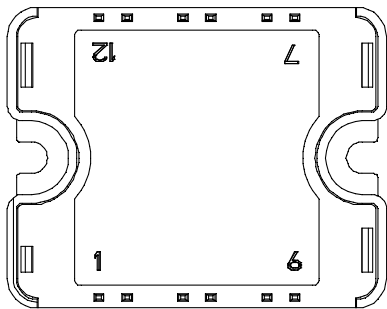
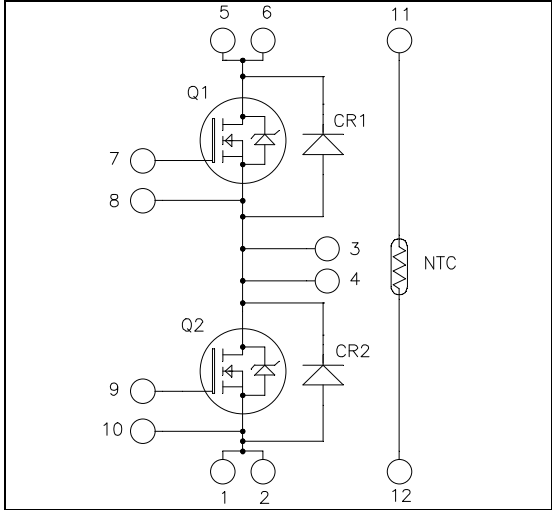


Phase leg
SiC MOSFET Power Module

$V_{DSS} = 1700V$
 $R_{DS(on)} = 70m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 50A \text{ @ } T_c = 25^\circ C$



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	$T_c = 25^\circ C$	50
		$T_c = 80^\circ C$	37
I_{DM}	Pulsed Drain current	100	A
V_{GS}	Gate - Source Voltage	-10/25	V
V_{GSOP}	Gate - Source Voltage ; recommended operation values	-5/20	V
$R_{DS(on)}$	Drain - Source ON Resistance	70	m Ω
P_D	Power Dissipation	$T_c = 25^\circ C$	350
			W

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



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Electrical Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1700V$			100	μA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 50A$	$T_j = 25^\circ C$	45	70	m Ω
			$T_j = 150^\circ C$		90	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}; I_D = 18mA$	2	2.4	4	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = 20V, V_{DS} = 0V$			600	nA

Dynamic Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 1MHz$		3672		pF
C_{oss}	Output Capacitance			171		
C_{rss}	Reverse Transfer Capacitance			7		
Q_g	Total gate Charge	$V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 50A$		190		nC
Q_{gs}	Gate – Source Charge			37		
Q_{gd}	Gate – Drain Charge			70		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 50A$ $R_{Gext} = 20\Omega$		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 $V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 50A$ $R_{Gext} = 20\Omega$	$T_j = 150^\circ C$	2.2		mJ
E_{off}	Turn off Energy			$T_j = 150^\circ C$	1.5	
R_{Gint}	Internal gate resistance			1.3		Ω
R_{thJC}	Junction to Case Thermal Resistance				0.36	$^\circ C/W$

Body diode ratings and characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	$V_{GS} = -5V$ $I_{SD} = 25A$	$T_j = 25^\circ C$	4.1		V
			$T_j = 150^\circ C$	3.6		
t_{rr}	Reverse Recovery Time	$I_{SD} = 50A ; V_{GS} = -5V$ $V_R = 900V ; di_F/dt = 1400A/\mu s$		70		ns
Q_{rr}	Reverse Recovery Charge			530		nC
I_{rr}	Reverse Recovery Current			14		A



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SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V _{RRM}	Peak Repetitive Reverse Voltage				1700	V
I _{RRM}	Reverse Leakage Current	V _R =1700V		20	100	μA
				100	400	
I _F	DC Forward Current			25		A
V _F	Diode Forward Voltage	I _F = 25A		1.8	2	V
				3.2	4	
Q _C	Total Capacitive Charge	I _F = 25A, V _R = 1700V di/dt = 400A/μs		170		nC
C	Total Capacitance	f = 1MHz, V _R = 200V		200		pF
		f = 1MHz, V _R = 400V		140		
R _{thJC}	Junction to Case Thermal Resistance				0.48	°C/W

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			4		%

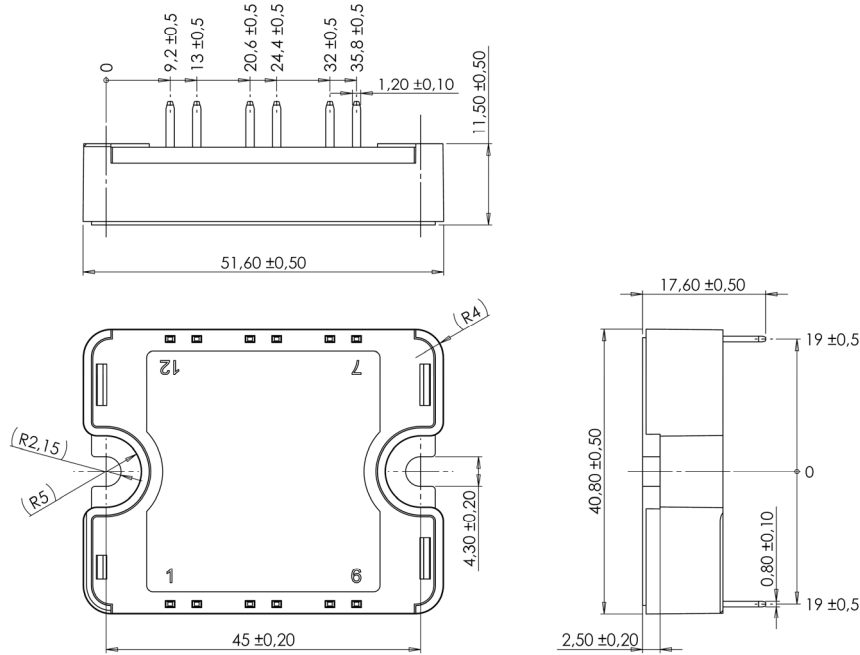
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

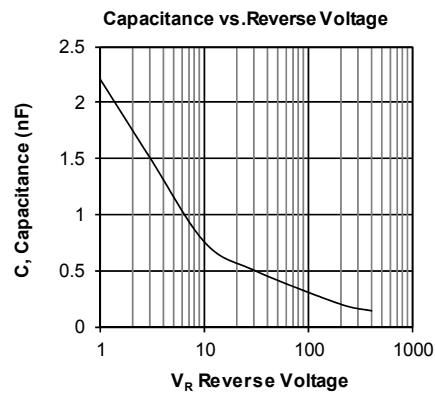
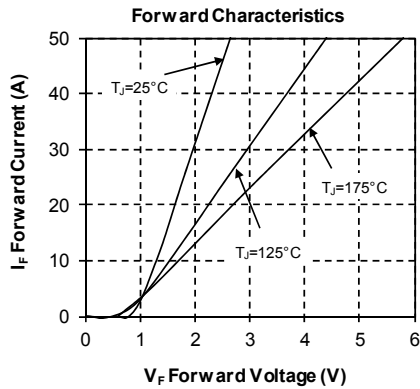
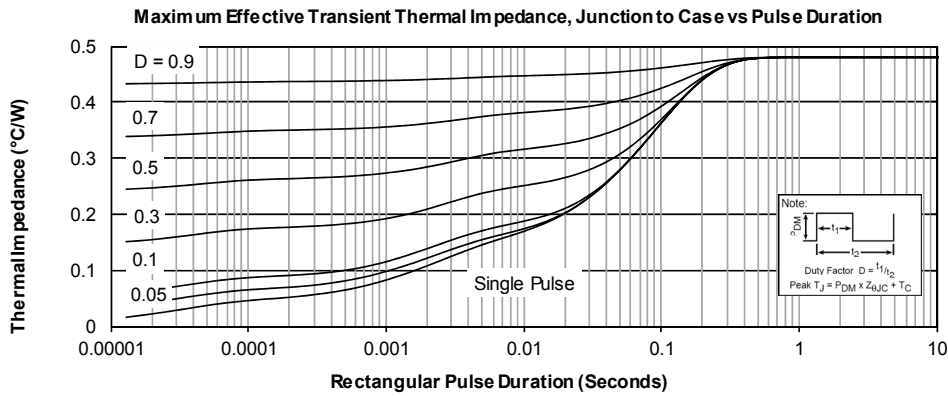
Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	SiC MOSFET	-40	150	°C	
		SiC diode	-40	175		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25	°C		
T _{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

Package outline (dimensions in mm)

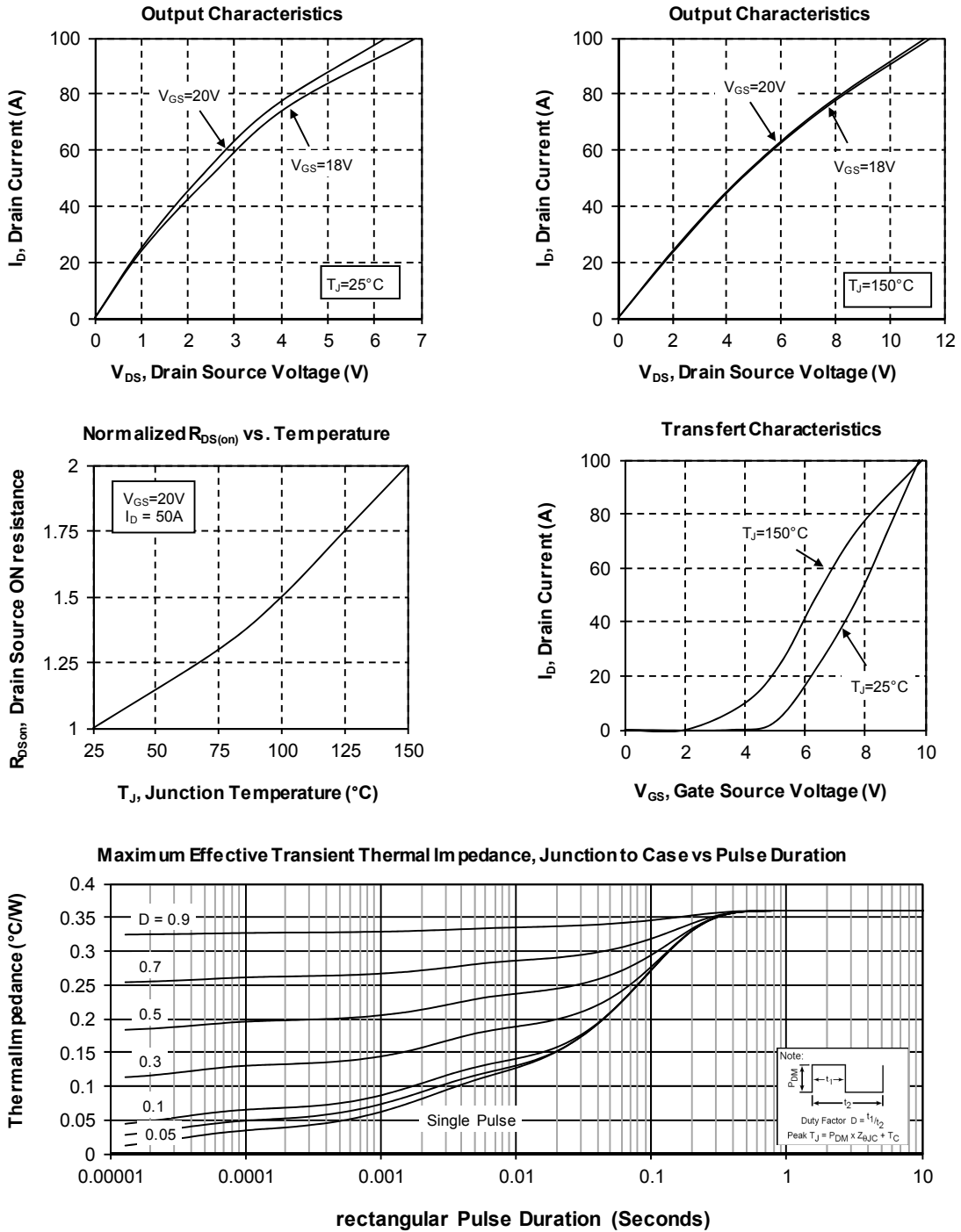


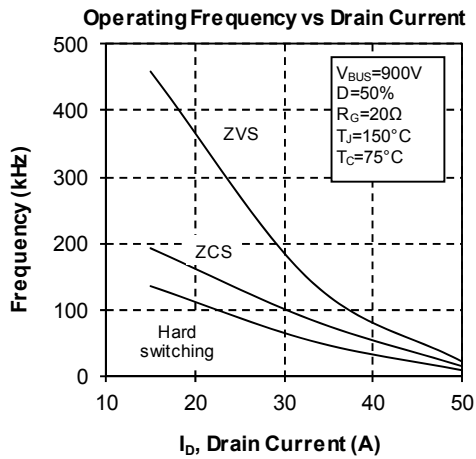
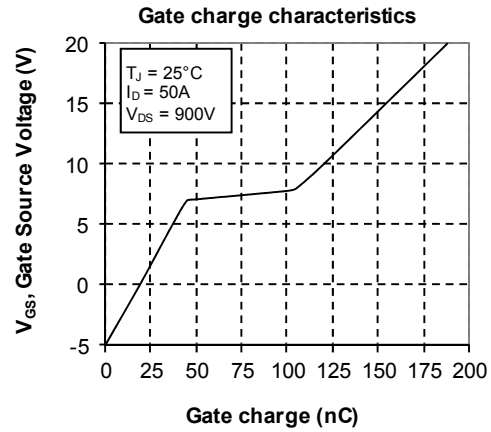
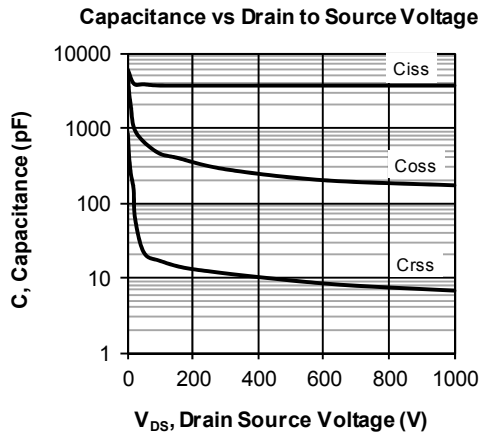
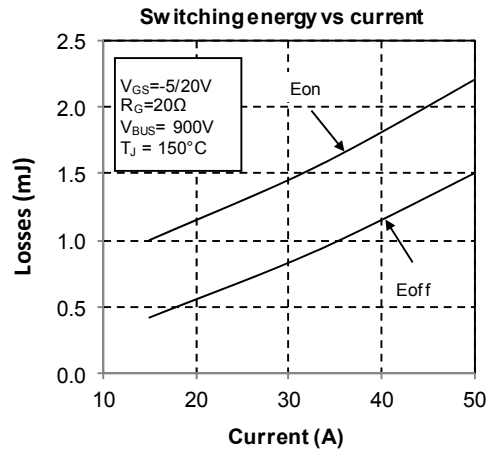
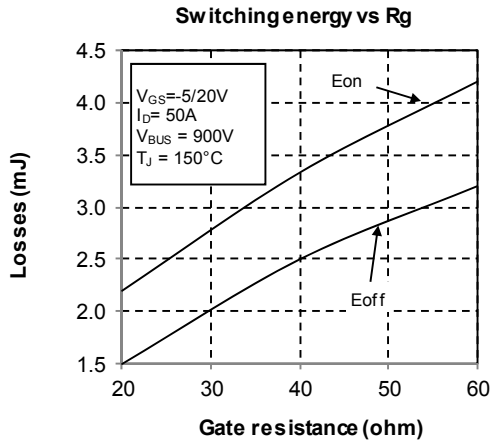
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical SiC diode Performance Curve



Typical SiC MOSFET Performance Curve





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