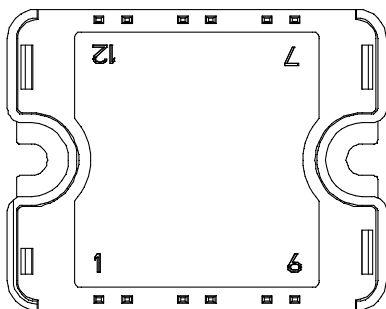
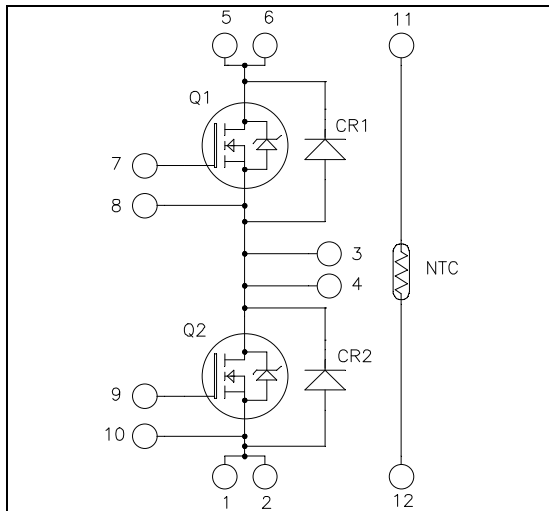


Phase leg SiC MOSFET Power Module

$$V_{DSS} = 1700V$$

$$R_{DS(on)} = 70m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 50A \text{ @ } T_c = 25^\circ C$$



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	$T_c = 25^\circ C$	A
		$T_c = 80^\circ C$	
I_{DM}	Pulsed Drain current	100	
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	70	m Ω
P_D	Power Dissipation	$T_c = 25^\circ C$	W

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

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	$V_{GS} = 20V$ $I_D = 50A$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	45 90	70	$m\Omega$
$V_{GS(th)}$	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	$V_{GS} = 0V$		3672		pF
C_{oss}	Output Capacitance	$V_{DS} = 1000V$		171		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		7		
Q_g	Total gate Charge	$V_{GS} = -5/+20V$		190		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 900V$		37		
Q_{gd}	Gate – Drain Charge	$I_D = 50A$		70		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$		105		ns
T_r	Rise Time	$V_{Bus} = 900V$		75		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 50A$		210		
T_f	Fall Time	$R_{Gext} = 20\Omega$		55		
E_{on}	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 900V$	$T_j = 150^\circ C$	2.2		mJ
E_{off}	Turn off Energy	$I_D = 50A$ $R_{Gext} = 20\Omega$	$T_j = 150^\circ C$	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	$V_{GS} = -5V$ $I_{SD} = 25A$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	4.1 3.6		V
t_{rr}	Reverse Recovery Time	$I_{SD} = 50A ; V_{GS} = -5V$		70		ns
Q_{rr}	Reverse Recovery Charge	$V_R = 900V ; di_F/dt = 1400A/\mu s$		530		nC
I_{rr}	Reverse Recovery Current			14		A

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
		T _j = 25°C				
		T _j = 175°C		100	400	
I _F	DC Forward Current	T _C = 125°C		25		A
V _F	Diode Forward Voltage	I _F = 25A		1.8	2	V
		T _j = 25°C				
		T _j = 175°C		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	T _C = 100°C		4		%

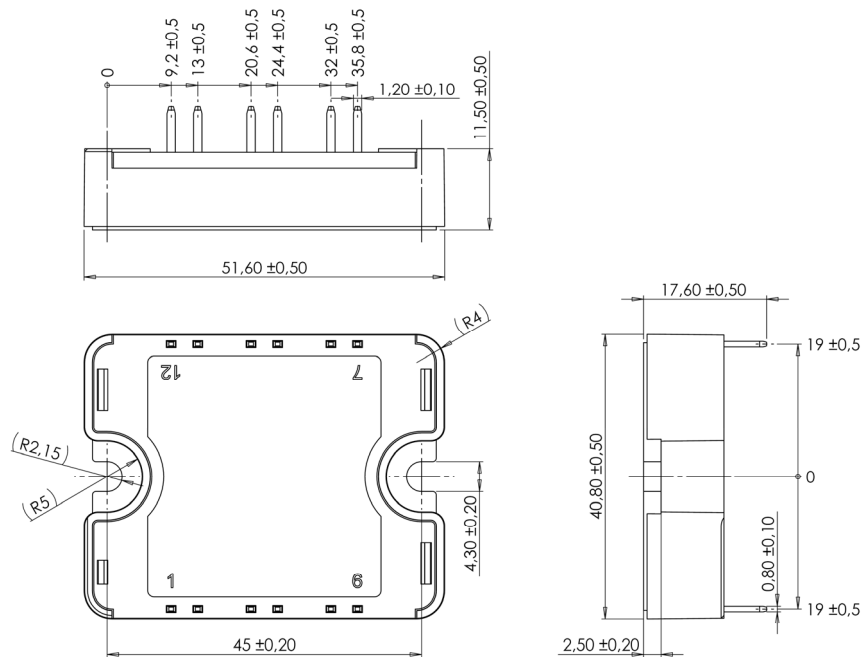
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

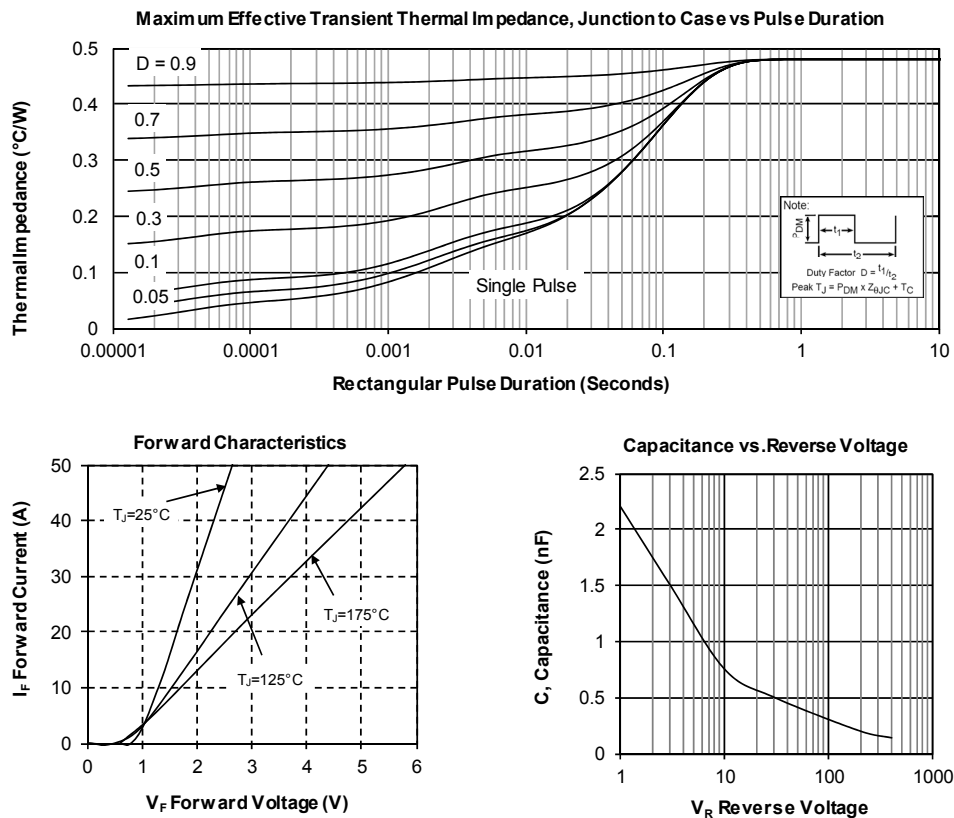
Symbol	Characteristic	Min	Max	Unit
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V
T _J	Operating junction temperature range			
	SiC MOSFET	-40	150	
	SiC diode	-40	175	
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25	°C
T _{STG}	Storage Temperature Range	-40	125	
T _C	Operating Case Temperature	-40	125	
Torque	Mounting torque	To heatsink	M4	N.m
Wt	Package Weight		80	g

Package outline (dimensions in mm)

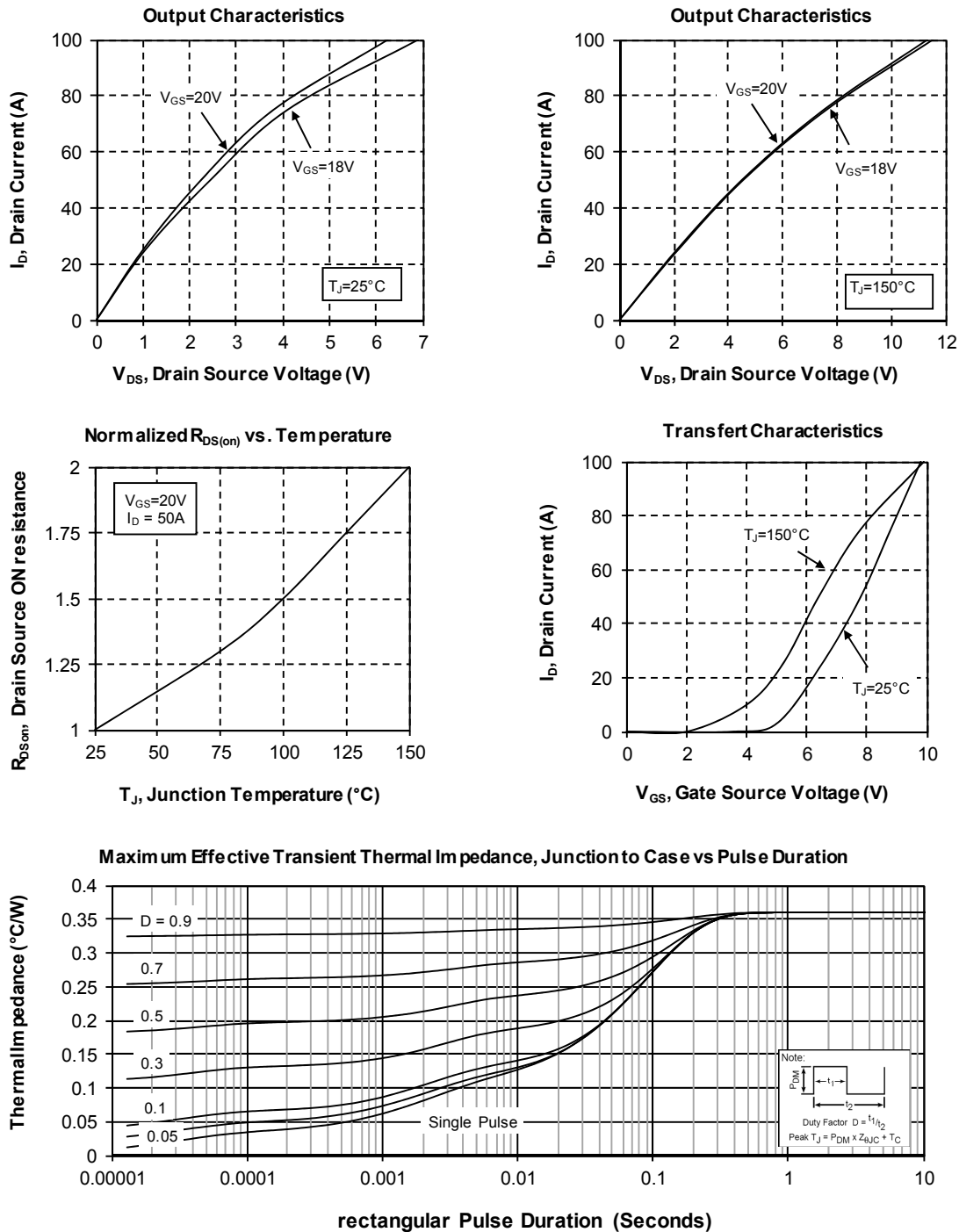


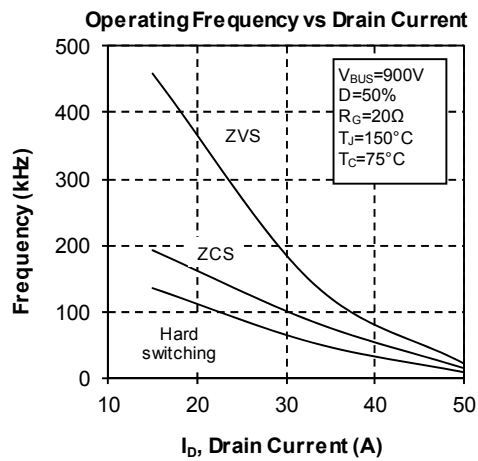
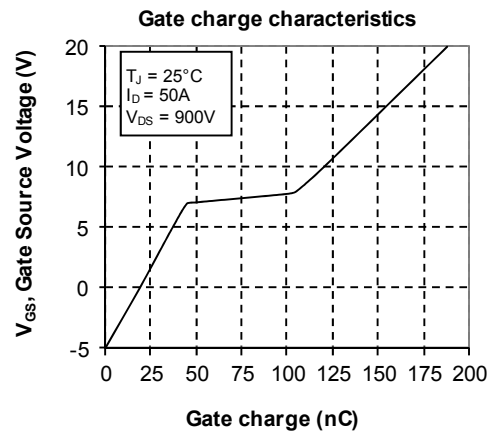
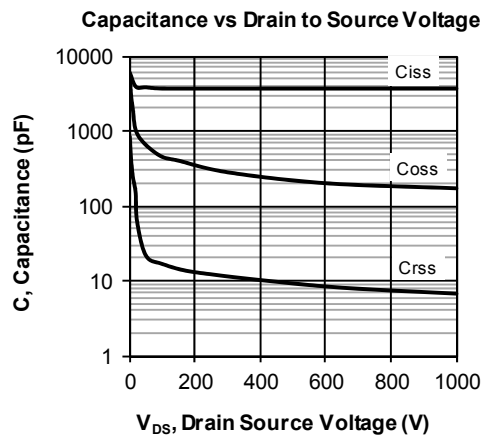
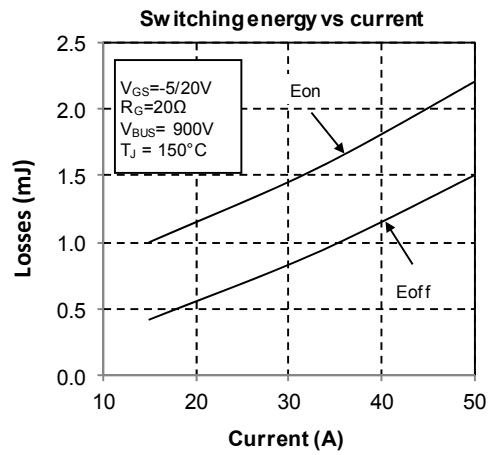
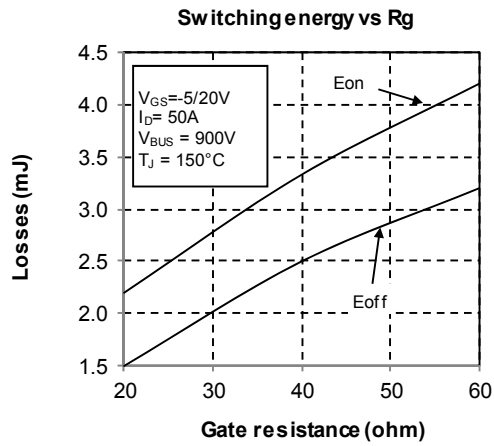
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical SiC diode Performance Curve



Typical SiC MOSFET Performance Curve





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