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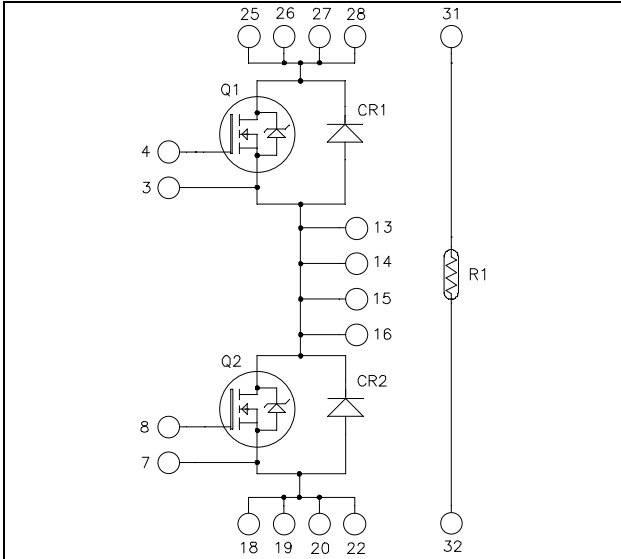
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**Phase leg
SiC MOSFET Power Module**

$V_{DSS} = 1200V$
 $R_{DS(on)} = 25m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 113A \text{ @ } T_c = 25^\circ C$

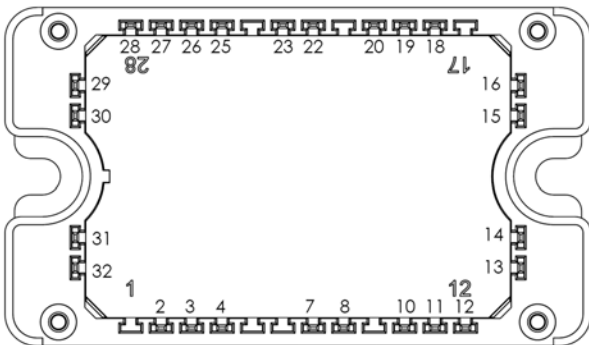


Application

- 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



Pins 25 to 28 must be shorted together
Pins 13 to 16 must be shorted together
Pins 18/19/20/22 must be shorted together

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

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

Absolute maximum ratings (per SiC MOSFET)

Symbol	Parameter	Max ratings	Unit
V _{DSS}	Drain - Source Voltage	1200	V
I _D	Continuous Drain Current	T _c = 25°C	113
		T _c = 80°C	90
I _{DM}	Pulsed Drain current	220	A
V _{GS}	Gate - Source Voltage	-10/25	V
V _{GSOP}	Gate - Source Voltage, recommended operation values	-5/18	
R _{DSon}	Drain - Source ON Resistance	25	mΩ
P _D	Maximum Power Dissipation	T _c = 25°C	600
			W

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} = 1200V			400	μA
R _{DS(on)}	Drain - Source on Resistance	V _{GS} = 20V; I _D = 80A		20	25	mΩ
		T _j = 25°C				
		V _{GS} = 18V; I _D = 80A		38.2		
		T _j = 175°C				
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 20mA	2	2.6	4	V
I _{GSS}	Gate - Source Leakage Current	V _{GS} = 20 V, V _{DS} = 0V			1	μA

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		3.8		nF
C _{oss}	Output Capacitance			0.32		
C _{rss}	Reverse Transfer Capacitance			0.030		
Q _g	Total gate Charge	V _{GS} = -5/+20V		248		nC
Q _{gs}	Gate - Source Charge	V _{Bus} = 800V		60		
Q _{gd}	Gate - Drain Charge	I _D = 80A		92		
T _{d(on)}	Turn-on Delay Time	V _{GS} = -5/+20V V _{Bus} = 800V I _D = 80A ; T _j = 150°C R _L = 10Ω ; R _{Gext} = 12.5Ω		20		ns
T _r	Rise Time			20		
T _{d(off)}	Turn-off Delay Time			75		
T _f	Fall Time			35		
E _{on}	Turn on Energy	Inductive Switching V _{GS} = -5/+20V V _{Bus} = 600V I _D = 80A R _{Gext} = 12.5Ω	T _j = 150°C	1.75		mJ
E _{off}	Turn off Energy			T _j = 150°C	1	
R _{Gint}	Internal gate resistance			2.4		Ω
R _{thJC}	Junction to Case Thermal Resistance				0.25	°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} = 40A	T _j = 25°C		4	V
			T _j = 175°C		3.5	
t _{rr}	Reverse Recovery Time	I _{SD} = 80A ; V _{GS} = -5V V _R = 800V ; di _F /dt = 9600A/μs		32		ns
Q _{rr}	Reverse Recovery Charge			768		nC
I _{rr}	Reverse Recovery Current			40		A

SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V _{RRM}	Peak Repetitive Reverse Voltage				1200	V
I _{RRM}	Reverse Leakage Current	V _R =1200V		128	800	μA
				224	4000	
I _F	DC Forward Current			40		A
V _F	Diode Forward Voltage	I _F = 40A		1.6	1.8	V
				2.3	3	
Q _C	Total Capacitive Charge	I _F = 40A, V _R = 1200V di/dt = 1600A/μs		320		nC
C	Total Capacitance	f = 1MHz, V _R = 200V		384		pF
		f = 1MHz, V _R = 800V		276		
R _{thJC}	Junction to Case Thermal Resistance				0.28	°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		%

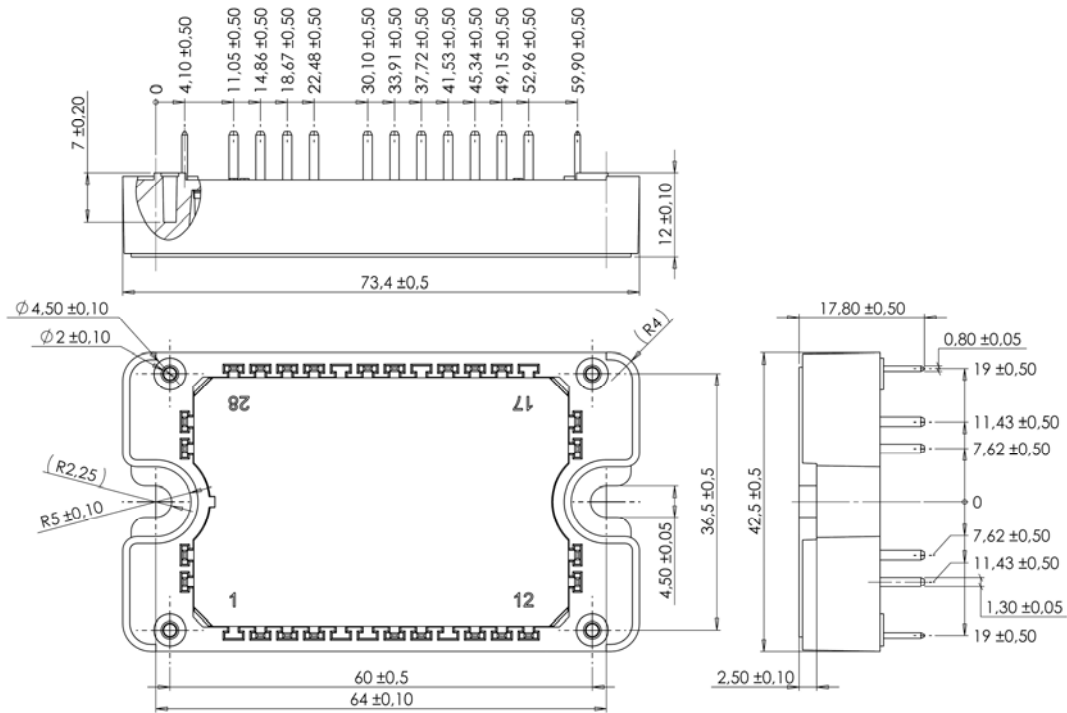
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

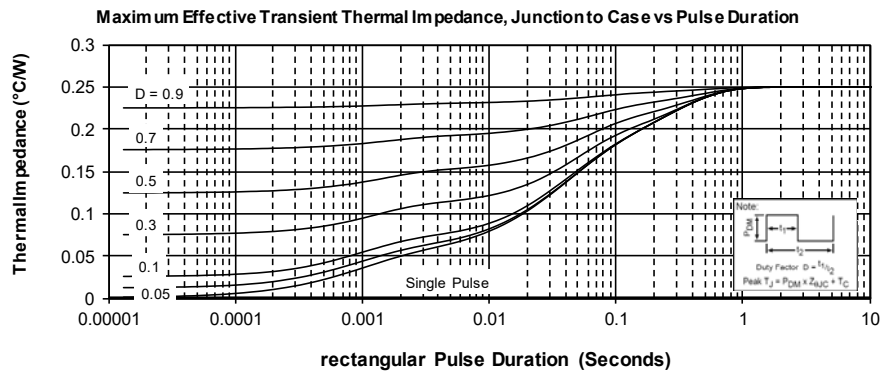
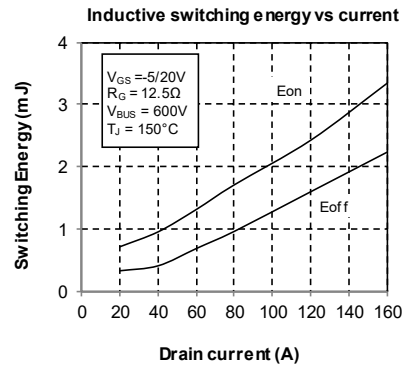
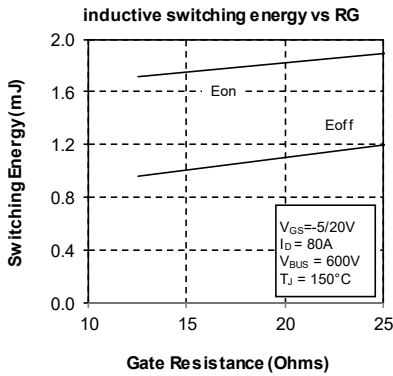
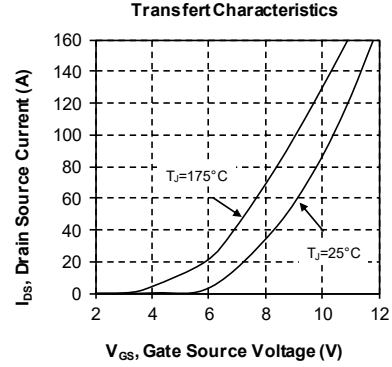
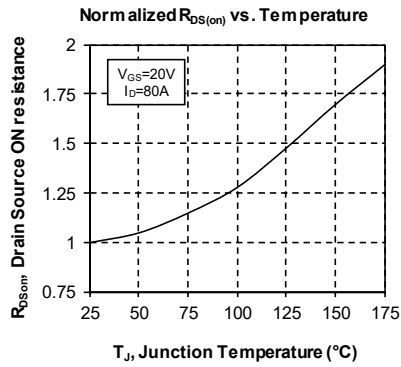
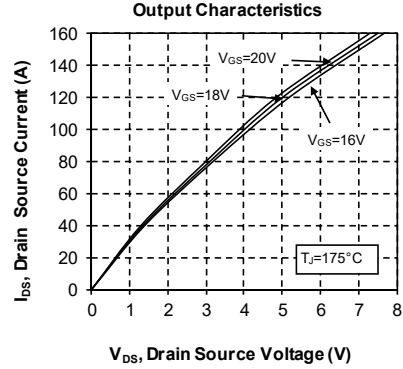
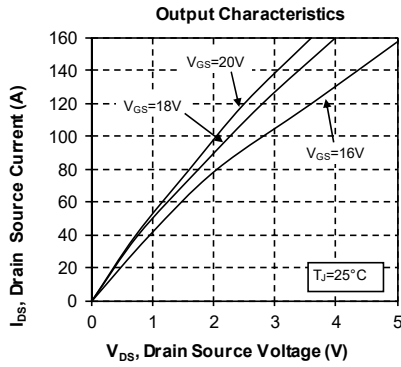
Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	175	°C		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25			
T _{STG}	Storage Temperature Range	-40	125			
T _C	Operating Case Temperature	-40	125			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

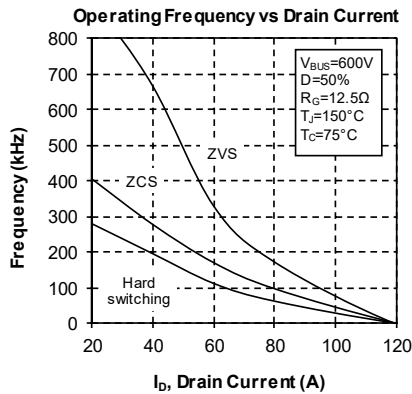
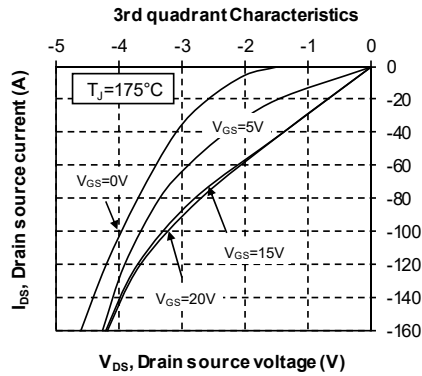
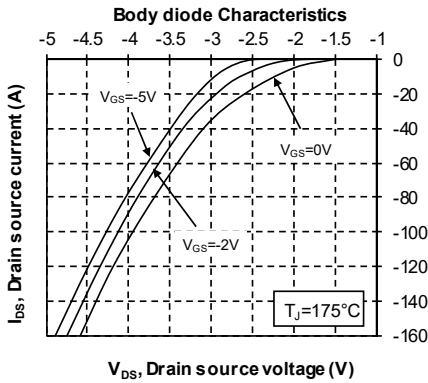
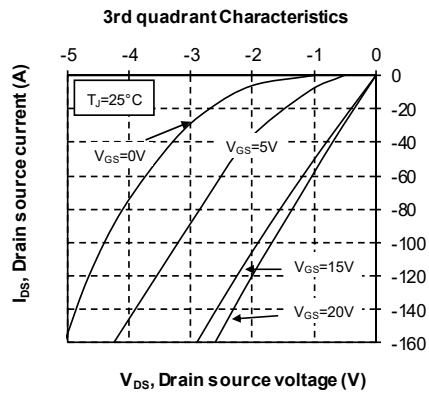
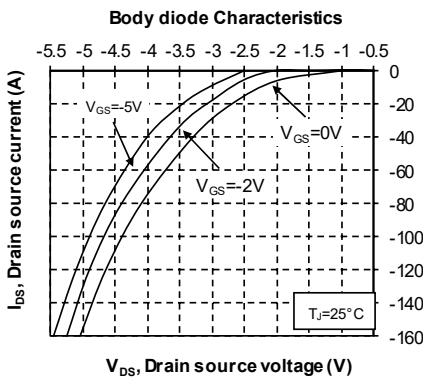
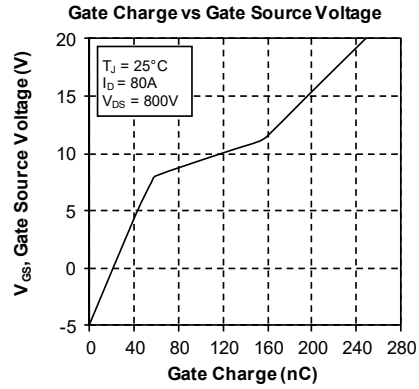
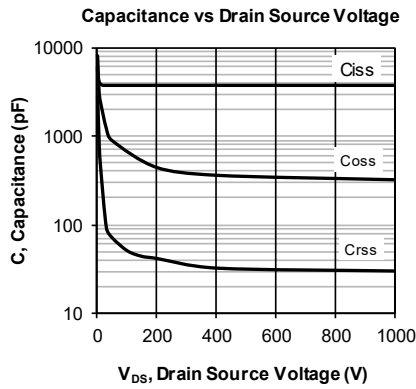
Package outline (dimensions in mm)



See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

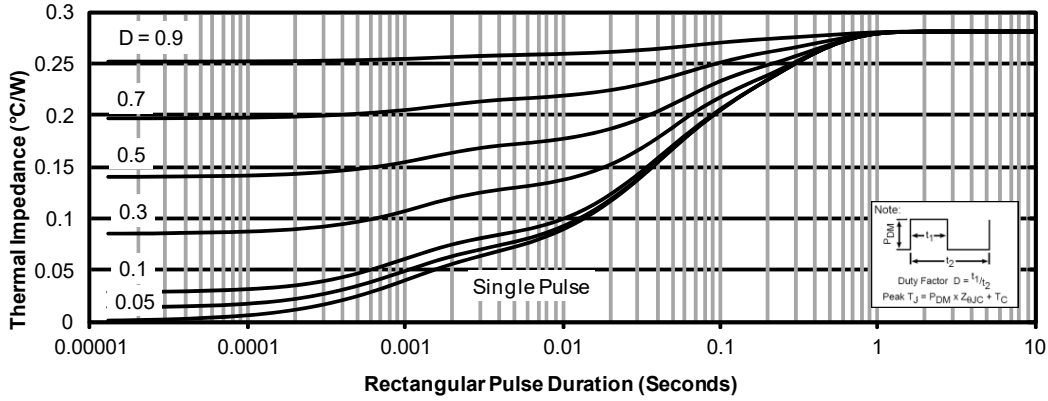
Typical SiC MOSFET Performance Curve



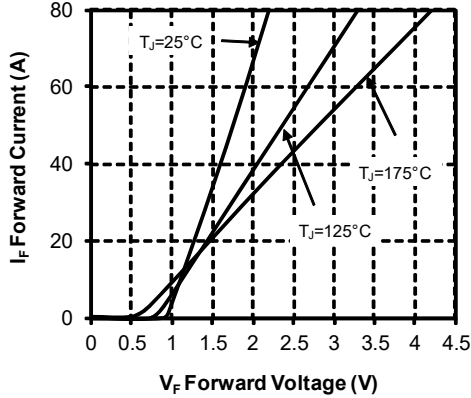


Typical SiC diode Performance Curve

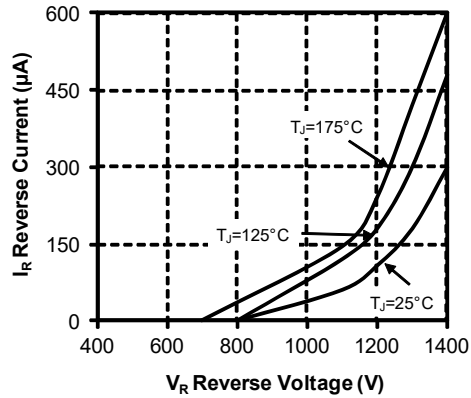
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



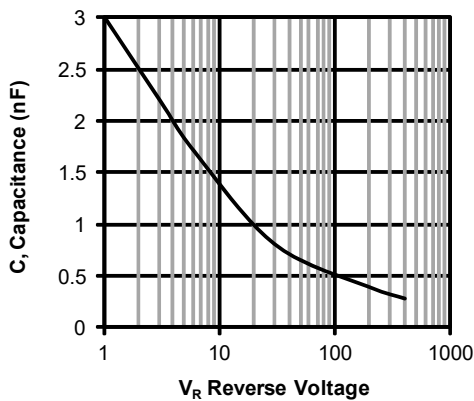
Forward Characteristics



Reverse Characteristics



Capacitance vs. Reverse Voltage



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