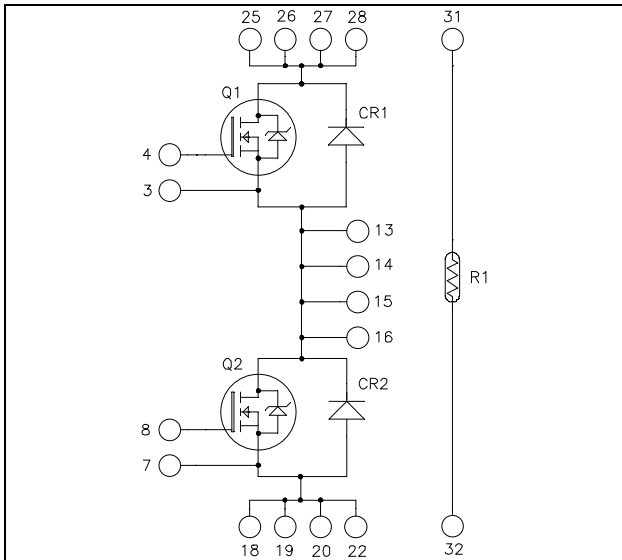


**Phase leg
SiC MOSFET Power Module**

$V_{DSS} = 1200V$
 $R_{DS(on)} = 9m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 295A^* \text{ @ } T_c = 25^\circ C$

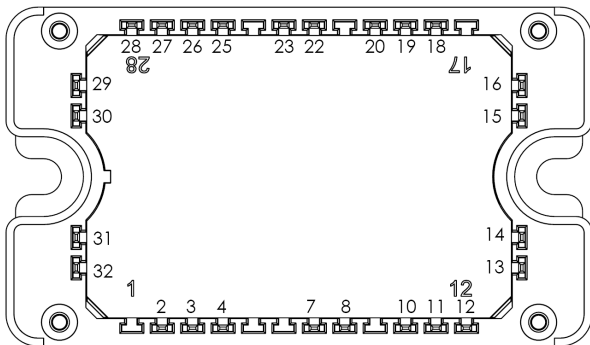


Application

- 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.
See application note APT0502 on www.microsemi.com



Absolute maximum ratings (per SiC MOSFET)

<i>Symbol</i>	<i>Parameter</i>	<i>Max ratings</i>	<i>Unit</i>
V _{DSS}	Drain - Source Voltage	1200	V
I _D	Continuous Drain Current	T _c = 25°C	295*
		T _c = 80°C	220*
I _{DM}	Pulsed Drain current	590	A
V _{GS}	Gate - Source Voltage	-10/25V	V
R _{DS(on)}	Drain - Source ON Resistance	9	mΩ
P _D	Maximum Power Dissipation	T _c = 25°C	1250
			W

* Specification of device but current must be limited due to size of pins.

Electrical Characteristics (per SiC MOSFET)

<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			400	μA
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 20V I _D = 200A	T _j = 25°C	6.25	9	mΩ
			T _j = 150°C	11	16	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} ; I _D = 40mA	2.1	2.4		V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = 20 V, V _{DS} = 0V			2.4	μA

Dynamic Characteristics (per SiC MOSFET)

<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		11		nF
C _{oss}	Output Capacitance	V _{DS} = 1000V		0.88		
C _{rss}	Reverse Transfer Capacitance	f = 1MHz		0.06		
Q _g	Total gate Charge	V _{GS} = -5/+20V		644		nC
Q _{gs}	Gate – Source Charge	V _{Bus} = 800V		184		
Q _{gd}	Gate – Drain Charge	I _D = 200A		200		
T _{d(on)}	Turn-on Delay Time	V _{GS} = -5/+20V		35		ns
T _r	Rise Time	V _{Bus} = 800V		40		
T _{d(off)}	Turn-off Delay Time	I _D = 200A ; T _j = 150°C		150		
T _f	Fall Time	R _L = 4Ω ; R _{Gext} = 5Ω		70		
E _{on}	Turn on Energy	Inductive Switching V _{GS} = -5/+20V V _{Bus} = 600V		4.4		mJ
E _{off}	Turn off Energy	I _D = 200A R _{Gext} = 5Ω		2.4		
R _{Gint}	Internal gate resistance			1.5		Ω
R _{thJC}	Junction to Case Thermal Resistance				0.1	°C/W

Body diode ratings and characteristics (per SiC MOSFET)

<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} = -5V, I _{SD} = 100A		3.3		V
		V _{GS} = -2V, I _{SD} = 100A		3.1		
t _{rr}	Reverse Recovery Time	I _{SD} = 200A ; V _{GS} = -5V V _R = 800V ; di _F /dt = 4000A/μs		45		ns
Q _{rr}	Reverse Recovery Charge			1.62		μC
I _{rr}	Reverse Recovery Current			54		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		140	800	μA
				260	1600	
I _F	DC Forward Current			80		A
V _F	Diode Forward Voltage	I _F = 80A		1.5	1.8	V
				2.2	3	
Q _C	Total Capacitive Charge	I _F = 80A, V _R = 1200V di/dt = 2000A/μs		520		nC
C	Total Capacitance	f = 1MHz, V _R = 400V		372		pF
		f = 1MHz, V _R = 800V		268		
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		%
					T _C =100°C

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

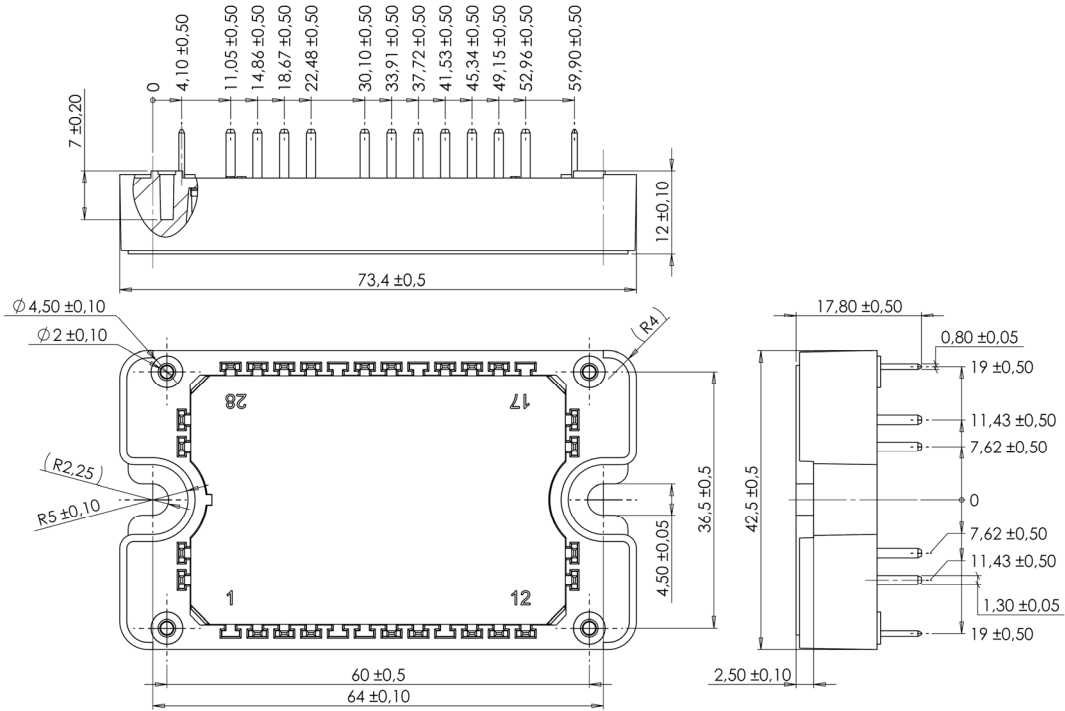
T: Thermistor temperature
R_T: Thermistor value at T

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	150	°C		
	SiC MOSFET	-40	175			
	SiC diode	-40	175			
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{J,max} -25			
T _{STG}	Storage Temperature Range	-40	125			
T _C	Operating Case Temperature	-40	100			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

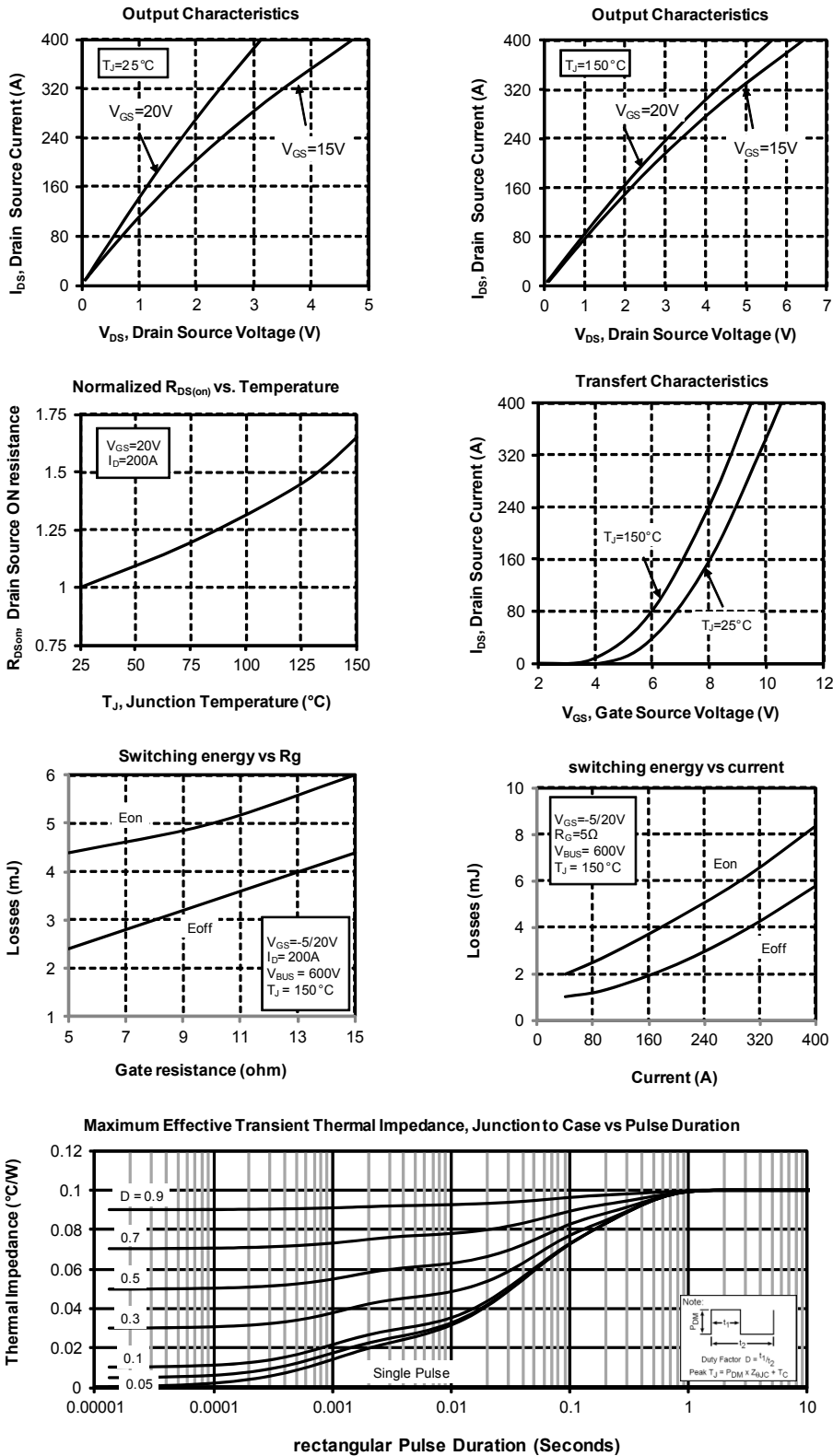


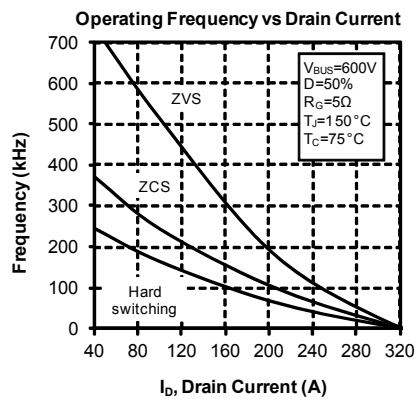
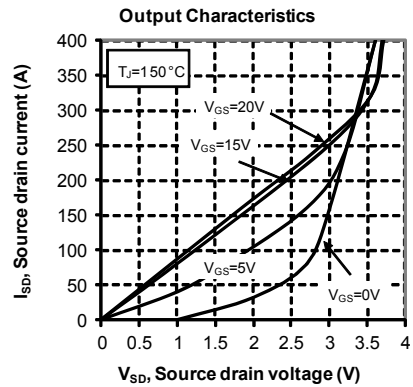
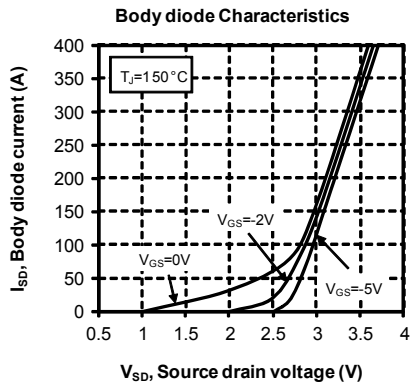
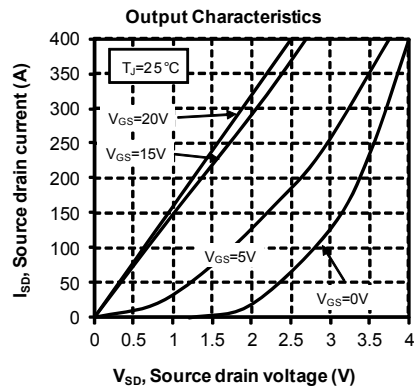
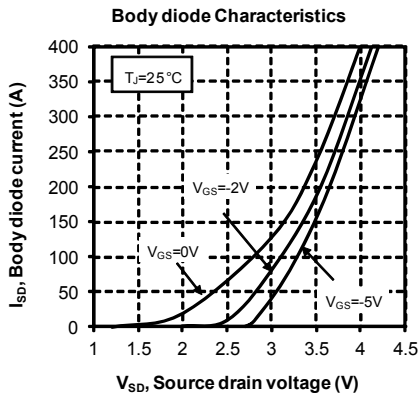
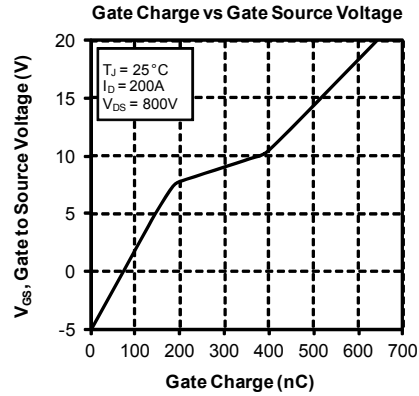
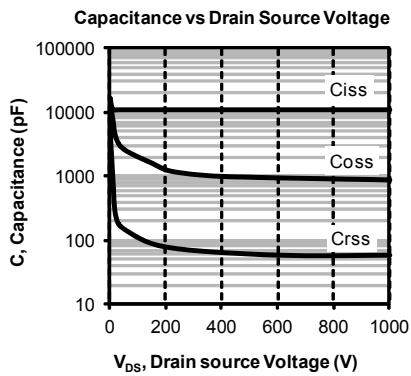
Package outline (dimensions in mm)

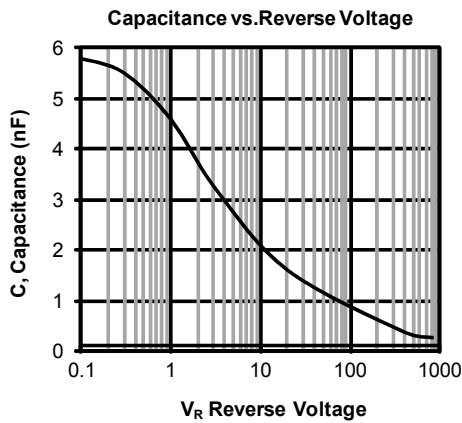
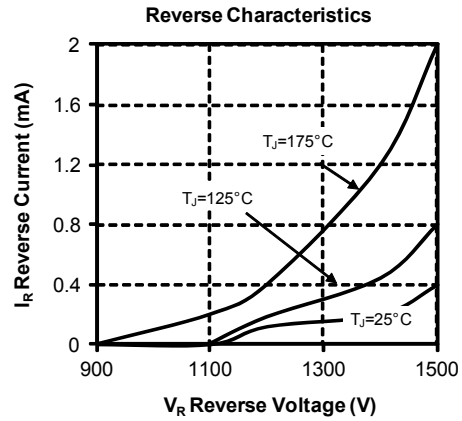
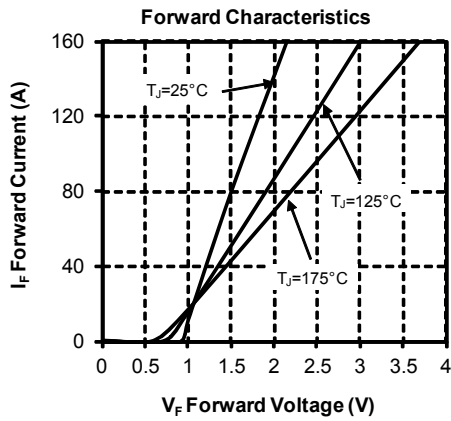
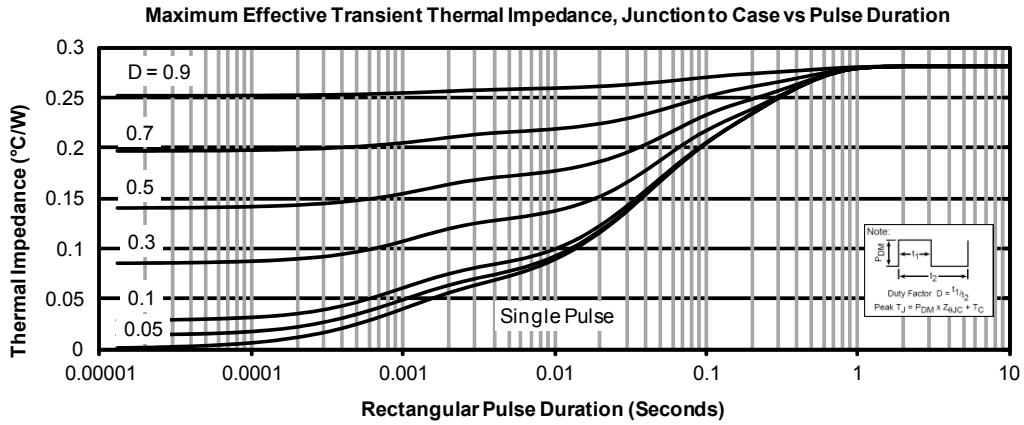


See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

Typical SiC MOSFET Performance Curve





Typical SiC diode Performance Curve


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