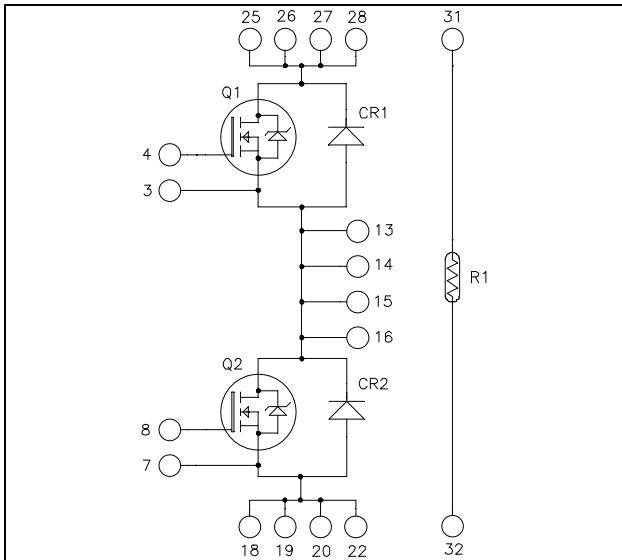


**Phase leg  
SiC MOSFET Power Module**

$V_{DSS} = 1200V$   
 $R_{DS(on)} = 12m\Omega \text{ max @ } T_j = 25^\circ C$   
 $I_D = 220A^* \text{ @ } T_c = 25^\circ C$

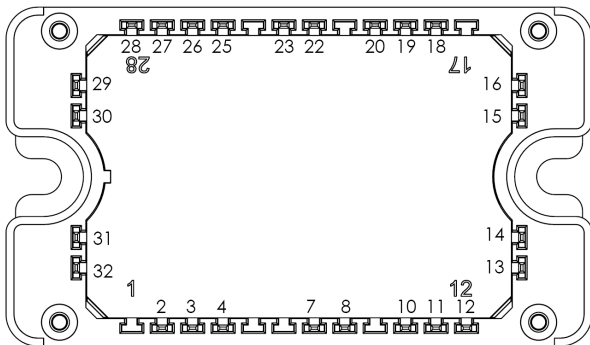


**Application**

- 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](http://www.microsemi.com)

**Absolute maximum ratings** (per SiC MOSFET)

<i>Symbol</i>	<i>Parameter</i>	<i>Max ratings</i>	<i>Unit</i>
V <sub>DSS</sub>	Drain - Source Voltage	1200	V
I <sub>D</sub>	Continuous Drain Current	T <sub>c</sub> = 25°C	220*
		T <sub>c</sub> = 80°C	165*
I <sub>DM</sub>	Pulsed Drain current	440	A
V <sub>GS</sub>	Gate - Source Voltage	-10/25V	V
R <sub>DS(on)</sub>	Drain - Source ON Resistance	12	mΩ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>c</sub> = 25°C	925
			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 <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1200V			300	μA
R <sub>DS(on)</sub>	Drain - Source on Resistance	V <sub>GS</sub> = 20V I <sub>D</sub> = 150A	T <sub>j</sub> = 25°C	8	12	mΩ
			T <sub>j</sub> = 150°C	14	21	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> ; I <sub>D</sub> = 30mA	2.1	2.4		V
I <sub>GSS</sub>	Gate - Source Leakage Current	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0V			1.8	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 <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V		8.4		nF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> = 1000V		0.66		
C <sub>rss</sub>	Reverse Transfer Capacitance	f = 1MHz		0.045		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = -5/+20V V <sub>Bus</sub> = 800V I <sub>D</sub> = 150A		483		nC
Q <sub>gs</sub>	Gate - Source Charge			138		
Q <sub>gd</sub>	Gate - Drain Charge			150		
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GS</sub> = -5/+20V V <sub>Bus</sub> = 800V I <sub>D</sub> = 150A, T <sub>j</sub> = 150°C R <sub>L</sub> = 5.3Ω ; R <sub>Gext</sub> = 6.7Ω		35		ns
T <sub>r</sub>	Rise Time			40		
T <sub>d(off)</sub>	Turn-off Delay Time			150		
T <sub>f</sub>	Fall Time			70		
E <sub>on</sub>	Turn on Energy	Inductive Switching V <sub>GS</sub> = -5/+20V V <sub>Bus</sub> = 600V I <sub>D</sub> = 150A R <sub>Gext</sub> = 6.7Ω	T <sub>j</sub> = 150°C	3.3		mJ
E <sub>off</sub>	Turn off Energy			T <sub>j</sub> = 150°C	1.8	
R <sub>Gint</sub>	Internal gate resistance			2		Ω
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.135	°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 <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> = -5V, I <sub>SD</sub> = 75A		3.3		V
		V <sub>GS</sub> = -2V, I <sub>SD</sub> = 75A		3.1		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 150A ; V <sub>GS</sub> = -5V V <sub>R</sub> = 800V ; di <sub>f</sub> /dt = 3000A/μs		45		ns
Q <sub>rr</sub>	Reverse Recovery Charge			1.2		μC
I <sub>rr</sub>	Reverse Recovery Current			40		A



**SiC schottky diode ratings and characteristics** (per SiC diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage				1200	V
I <sub>RRM</sub>	Reverse Leakage Current	V <sub>R</sub> =1200V		105	600	μA
		T <sub>j</sub> = 25°C				
		T <sub>j</sub> = 175°C		195	1200	
I <sub>F</sub>	DC Forward Current			60		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 60A		1.5	1.8	V
		T <sub>j</sub> = 25°C				
		T <sub>j</sub> = 175°C		2.2	3	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 60A, V <sub>R</sub> = 1200V di/dt = 1500A/μs		390		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 400V		279		pF
		f = 1MHz, V <sub>R</sub> = 800V		201		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.37	°C/W

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

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B			4		%
					T <sub>C</sub> =100°C

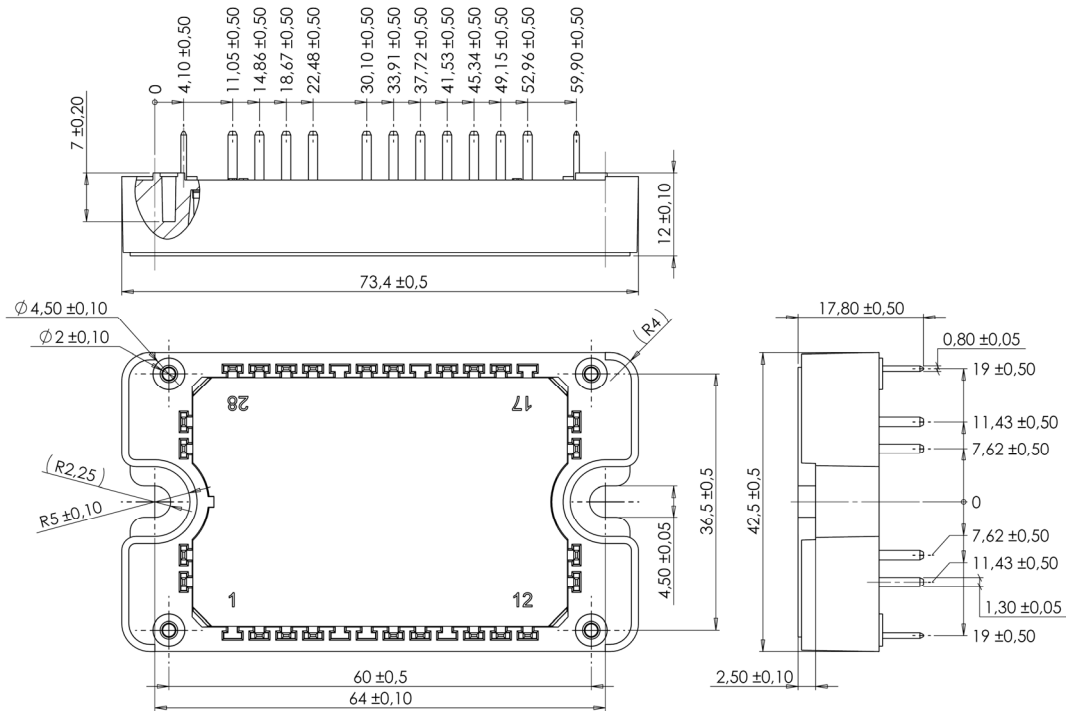
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

**Thermal and package characteristics**

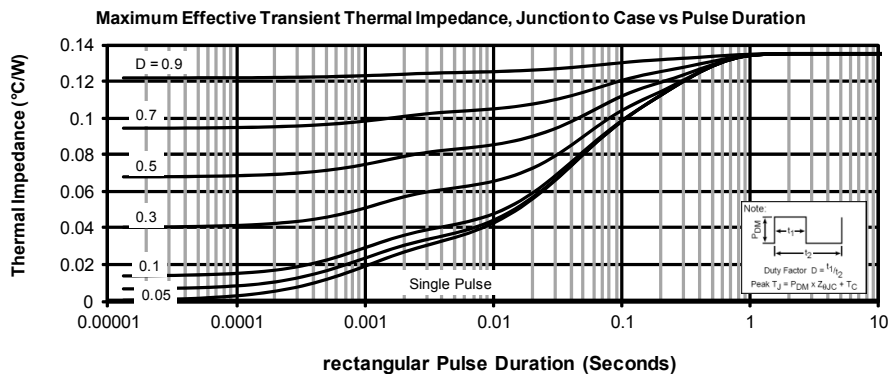
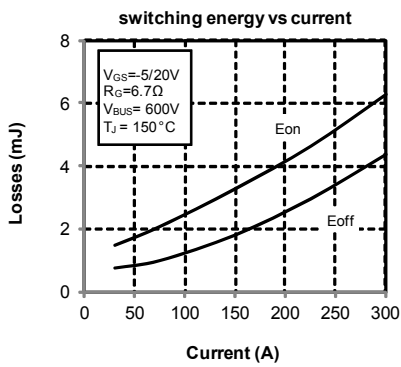
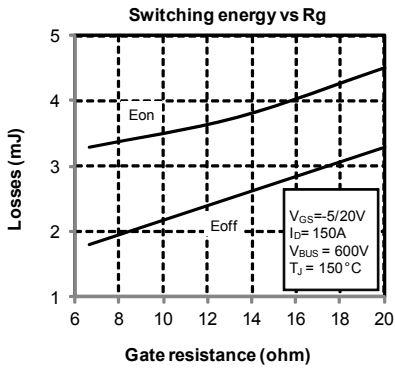
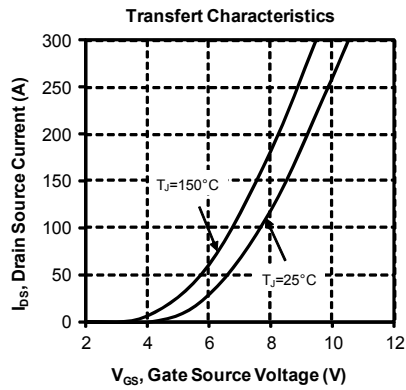
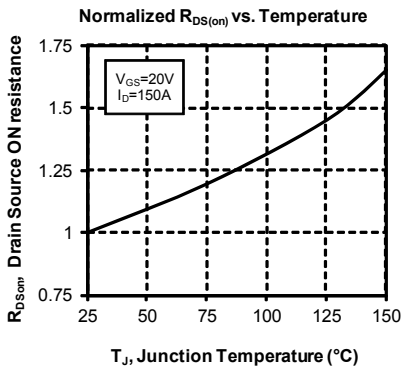
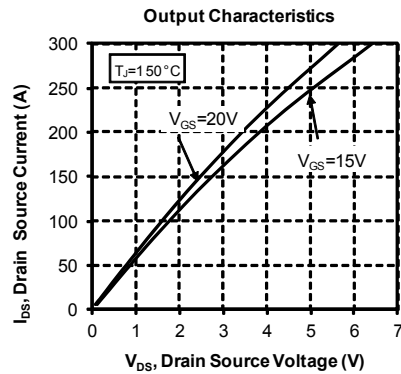
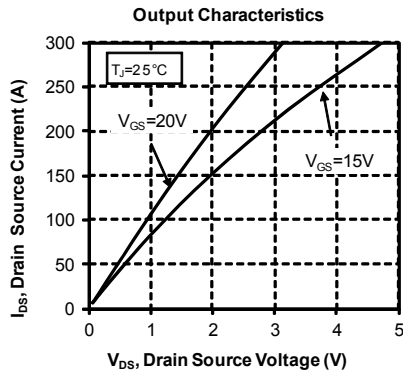
Symbol	Characteristic	Min	Max	Unit		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	SiC MOSFET	-40	150	°C	
		SiC diode	-40	175		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>J,max</sub> -25			
T <sub>STG</sub>	Storage Temperature Range	-40	125			
T <sub>C</sub>	Operating Case Temperature	-40	100			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

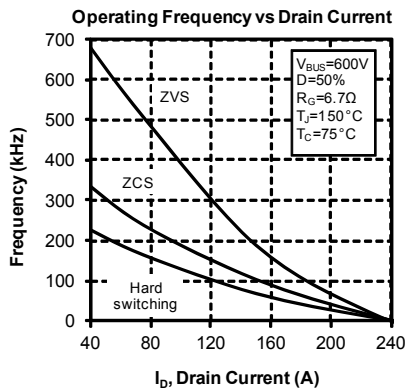
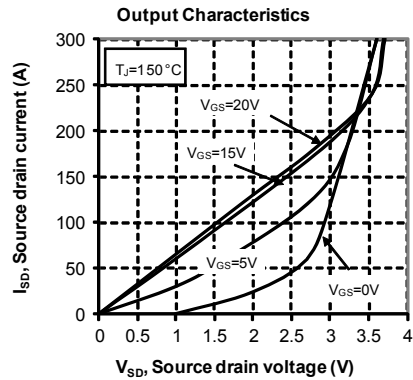
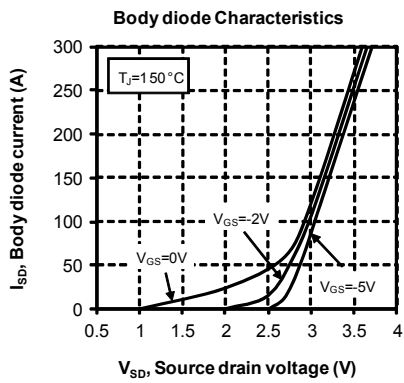
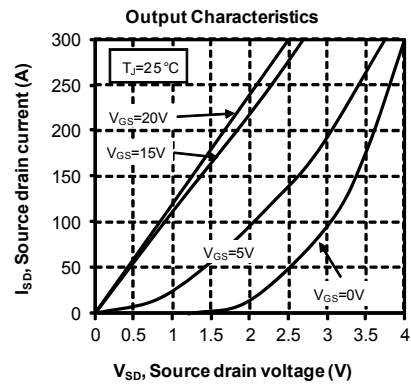
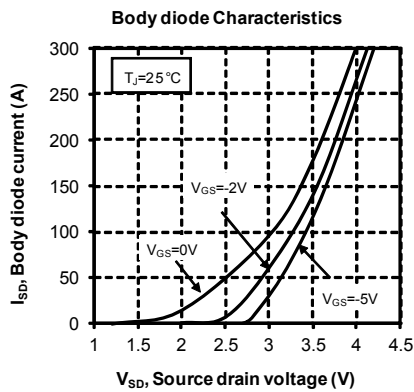
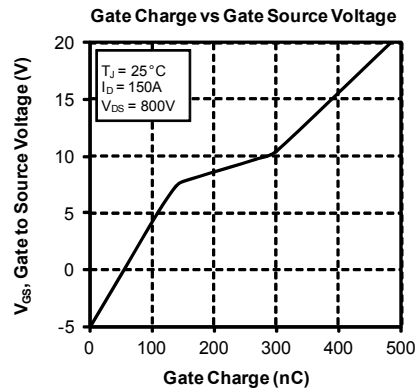
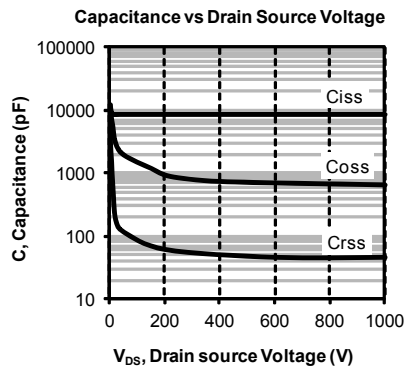
**Package outline (dimensions in mm)**

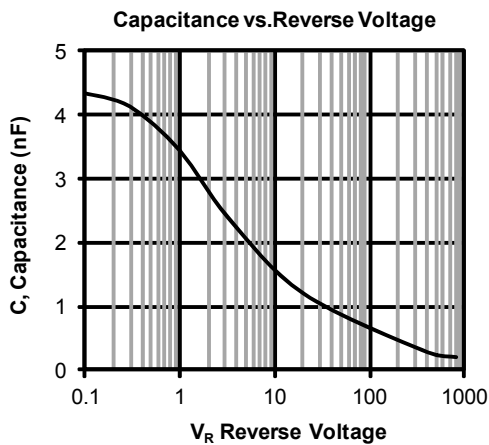
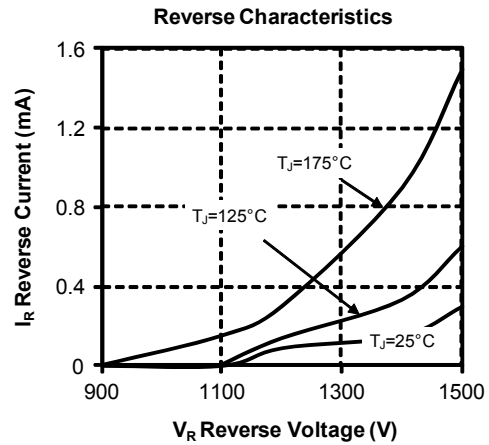
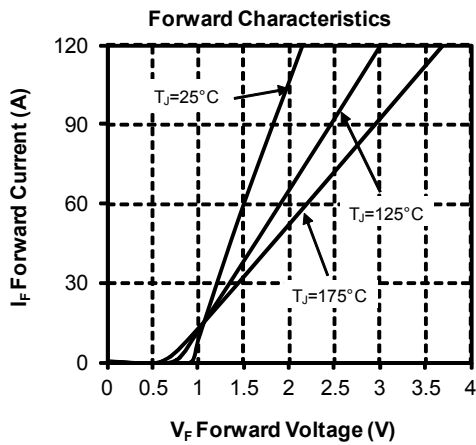
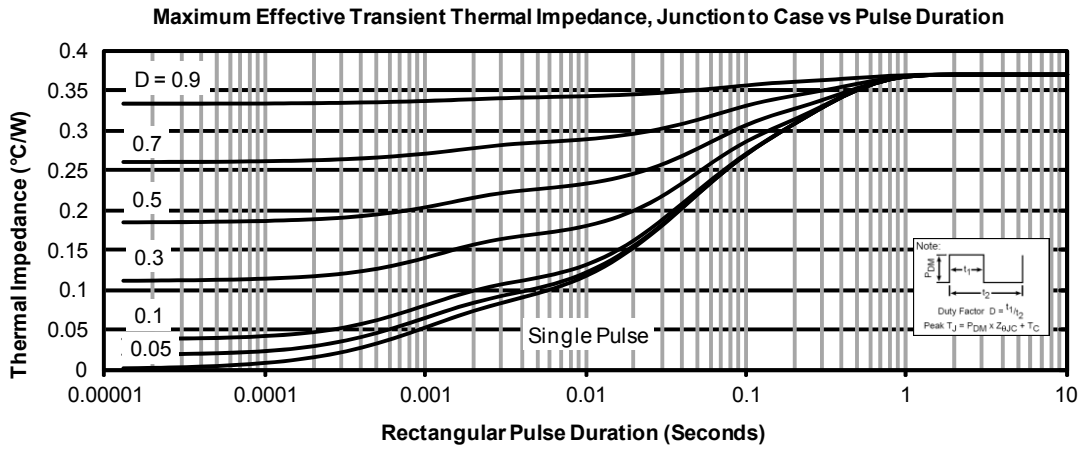


See application note 1906 - Mounting Instructions for SP3F Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical SiC MOSFET Performance Curve





**Typical SiC diode Performance Curve**


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