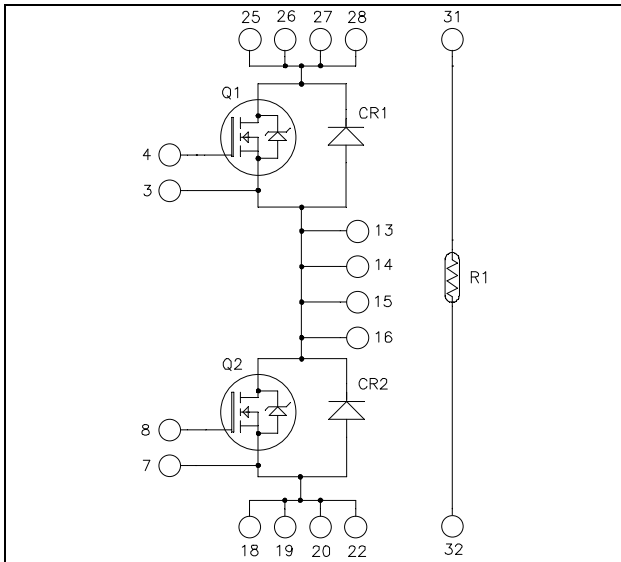


**Phase leg  
SiC MOSFET Power Module**

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

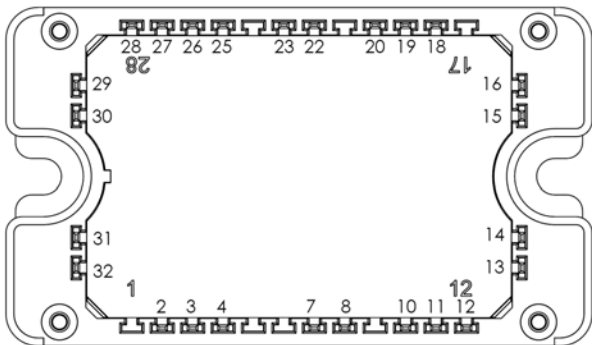


**Application**

- 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 <sub>DSS</sub>	Drain - Source Voltage	1200	V
I <sub>D</sub>	Continuous Drain Current	T <sub>c</sub> = 25°C	113
		T <sub>c</sub> = 80°C	90
I <sub>DM</sub>	Pulsed Drain current	220	A
V <sub>GS</sub>	Gate - Source Voltage	-10/25	V
V <sub>GSOP</sub>	Gate - Source Voltage, recommended operation values	-5/18	
R <sub>DSon</sub>	Drain - Source ON Resistance	25	mΩ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>c</sub> = 25°C	600
			W

**Electrical Characteristics** (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1200V			400	μA
R <sub>DS(on)</sub>	Drain - Source on Resistance	V <sub>GS</sub> = 20V; I <sub>D</sub> = 80A		20	25	mΩ
		T <sub>j</sub> = 25°C				
		V <sub>GS</sub> = 18V; I <sub>D</sub> = 80A		38.2		
		T <sub>j</sub> = 175°C				
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 20mA	2	2.6	4	V
I <sub>GSS</sub>	Gate - Source Leakage Current	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0V			1	μA

**Dynamic Characteristics** (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 1000V f = 1MHz		3.8		nF
C <sub>oss</sub>	Output Capacitance			0.32		
C <sub>rss</sub>	Reverse Transfer Capacitance			0.030		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = -5/+20V		248		nC
Q <sub>gs</sub>	Gate - Source Charge	V <sub>Bus</sub> = 800V		60		
Q <sub>gd</sub>	Gate - Drain Charge	I <sub>D</sub> = 80A		92		
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GS</sub> = -5/+20V V <sub>Bus</sub> = 800V I <sub>D</sub> = 80A ; T <sub>j</sub> = 150°C R <sub>L</sub> = 10Ω ; R <sub>Gext</sub> = 12.5Ω		20		ns
T <sub>r</sub>	Rise Time			20		
T <sub>d(off)</sub>	Turn-off Delay Time			75		
T <sub>f</sub>	Fall Time			35		
E <sub>on</sub>	Turn on Energy	Inductive Switching V <sub>GS</sub> = -5/+20V V <sub>Bus</sub> = 600V I <sub>D</sub> = 80A R <sub>Gext</sub> = 12.5Ω	T <sub>j</sub> = 150°C	1.75		mJ
E <sub>off</sub>	Turn off Energy			T <sub>j</sub> = 150°C	1	
R <sub>Gint</sub>	Internal gate resistance			2.4		Ω
R <sub>thJC</sub>	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 <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> = -5V I <sub>SD</sub> = 40A	T <sub>j</sub> = 25°C		4	V
			T <sub>j</sub> = 175°C		3.5	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 80A ; V <sub>GS</sub> = -5V V <sub>R</sub> = 800V ; di <sub>F</sub> /dt = 9600A/μs		32		ns
Q <sub>rr</sub>	Reverse Recovery Charge			768		nC
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	T <sub>j</sub> = 25°C	128	800	μA
			T <sub>j</sub> = 175°C	224	4000	
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 125°C	40		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 40A	T <sub>j</sub> = 25°C	1.6	1.8	V
			T <sub>j</sub> = 175°C	2.3	3	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 40A, V <sub>R</sub> = 1200V di/dt = 1600A/μs		320		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V		384		pF
		f = 1MHz, V <sub>R</sub> = 800V		276		
R <sub>thJC</sub>	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 <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		T <sub>C</sub> =100°C	4		%

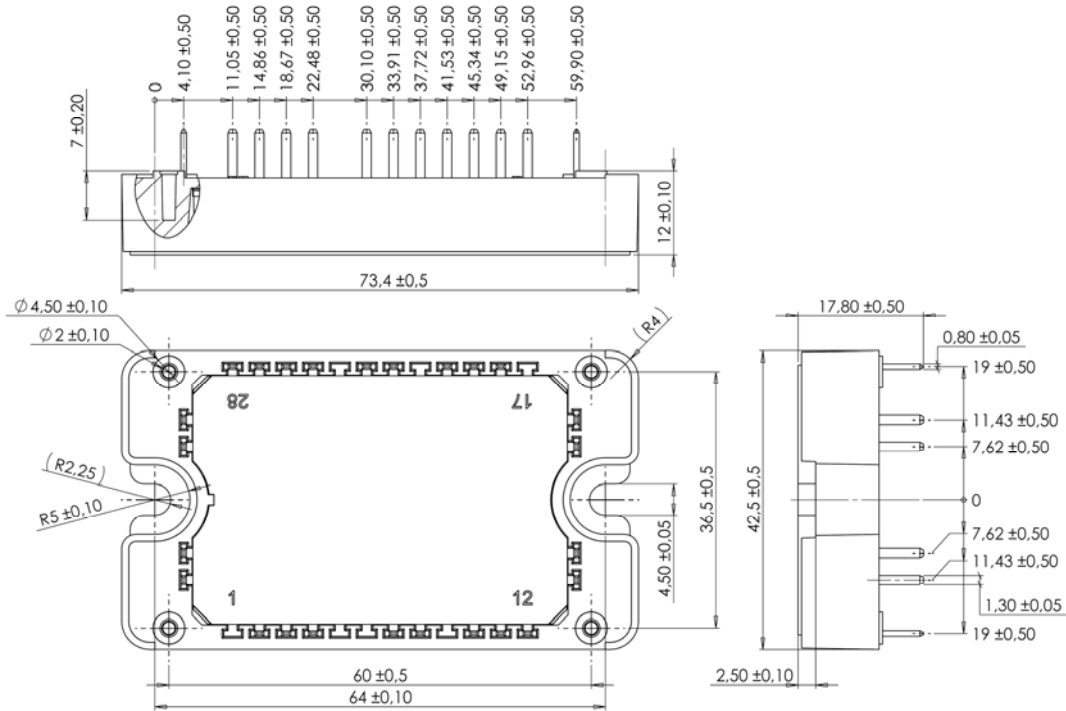
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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

**Thermal and package characteristics**

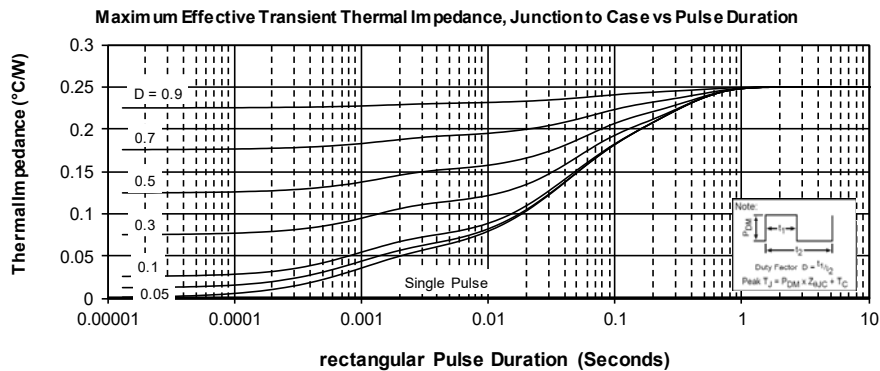
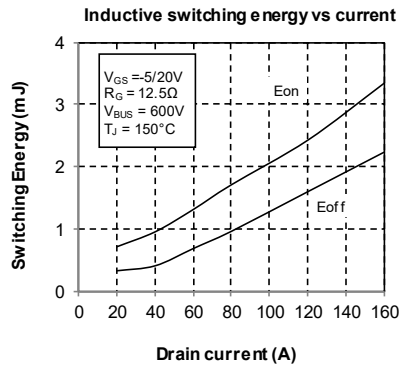
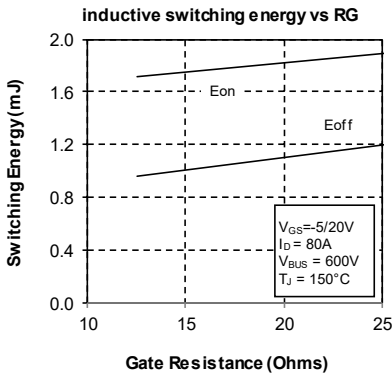
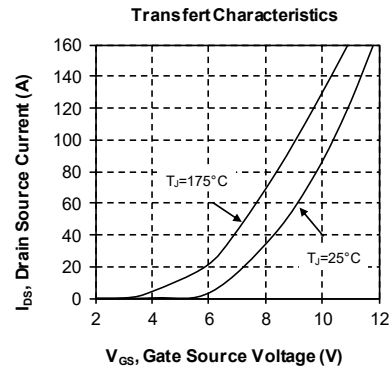
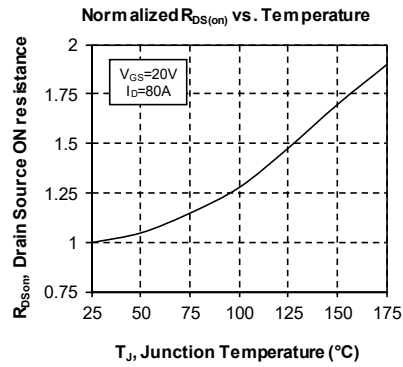
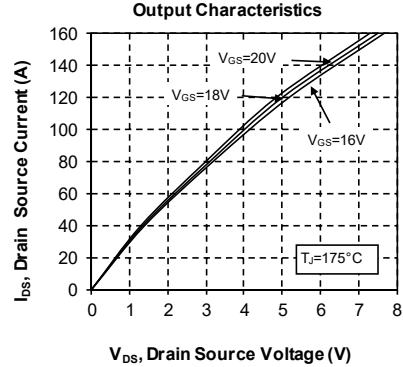
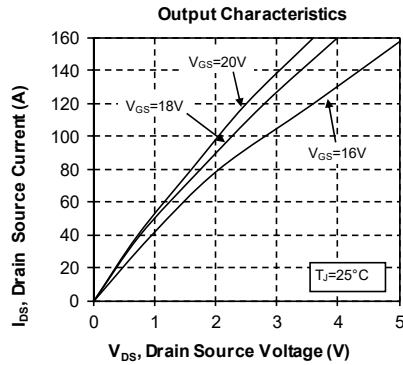
Symbol	Characteristic	Min	Max	Unit		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	-40	175	°C		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T <sub>STG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

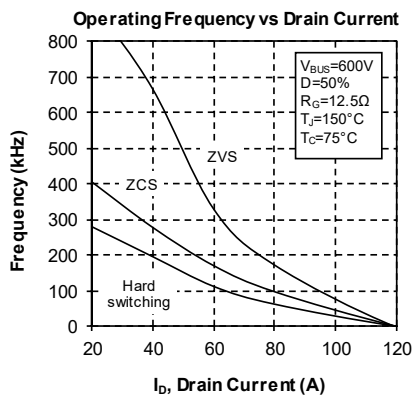
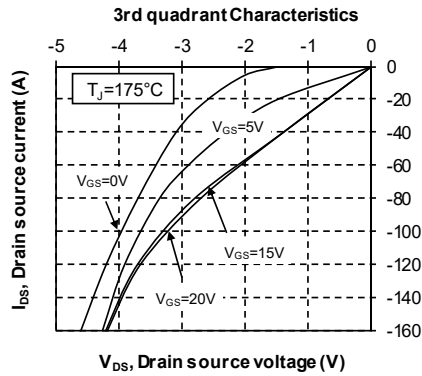
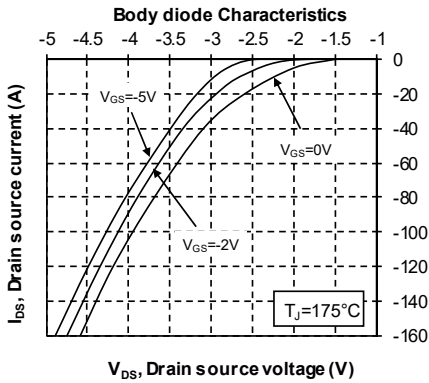
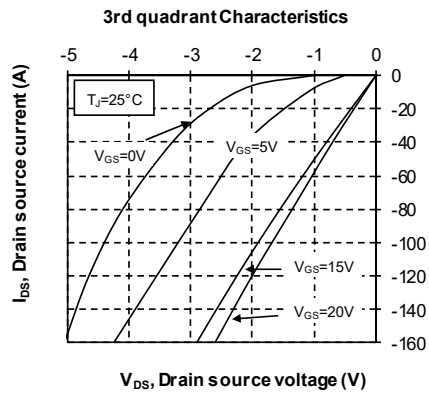
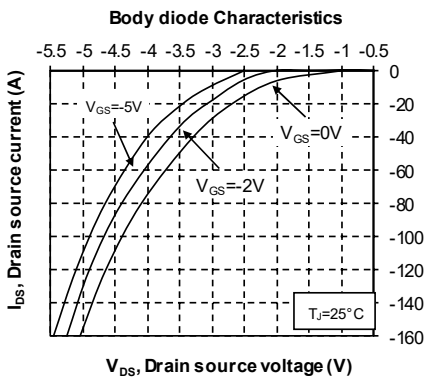
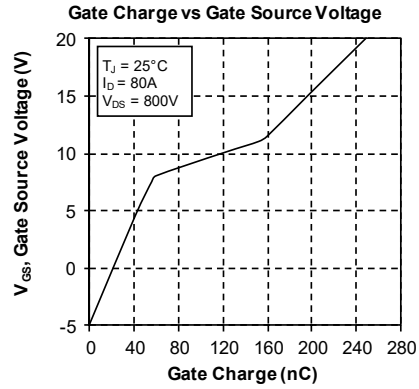
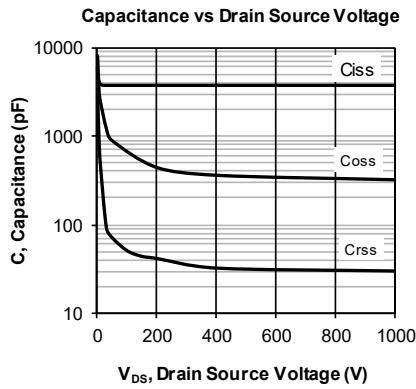
**Package outline (dimensions in mm)**



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

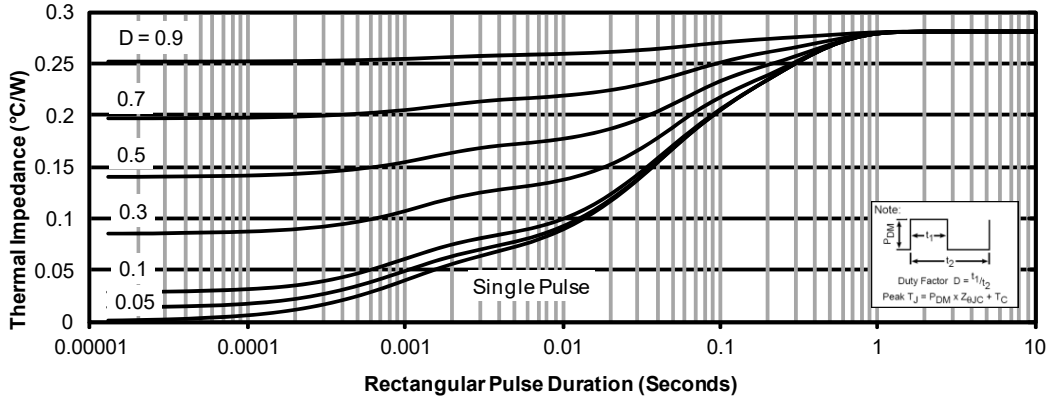
## Typical SiC MOSFET Performance Curve



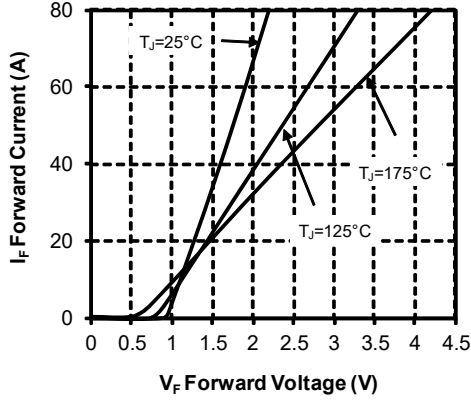


## Typical SiC diode Performance Curve

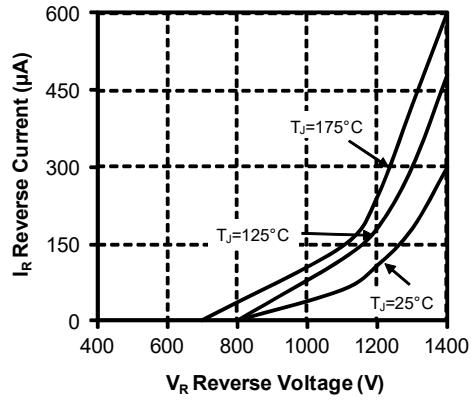
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



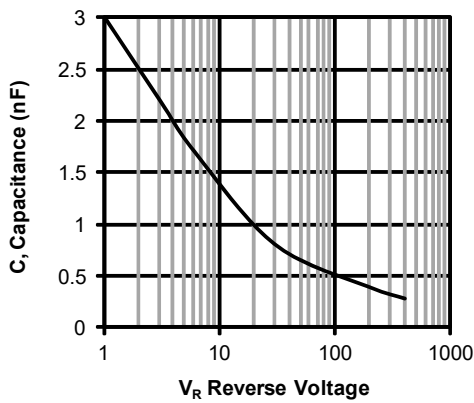
Forward Characteristics



Reverse Characteristics



Capacitance vs. Reverse Voltage



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