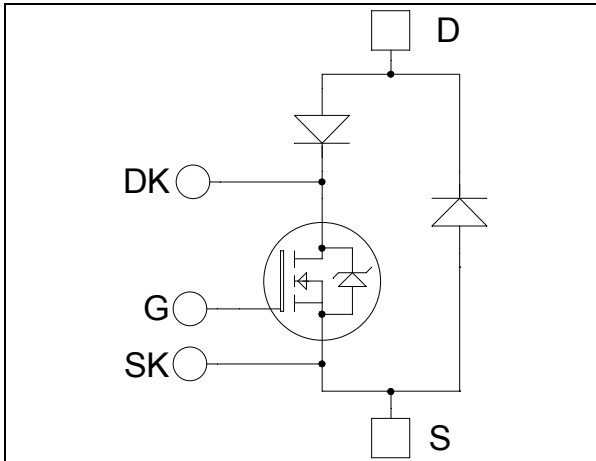
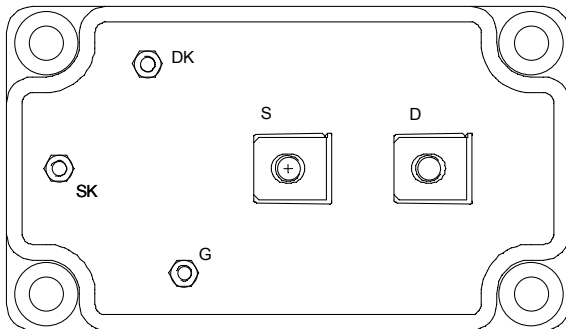


*Single switch  
Series & SiC parallel diodes  
MOSFET Power Module*

$V_{DSS} = 1000V$   
 $R_{DSon} = 65m\Omega \text{ typ @ } T_j = 25^\circ C$   
 $I_D = 145A \text{ @ } T_c = 25^\circ C$



G, SK and DK terminals are for control signals only (not for power)



### Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- **Power MOS 7<sup>®</sup> MOSFETs**
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- **SiC Parallel Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Kelvin source for easy drive
- Kelvin drain for voltage monitoring
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
  - M3 power connectors
- High level of integration
- AlN substrate for improved MOSFET thermal performance

### Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- 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**

<i>Symbol</i>	<i>Parameter</i>	<i>Max ratings</i>	<i>Unit</i>
V <sub>DSS</sub>	Drain - Source Voltage	1000	V
I <sub>D</sub>	Continuous Drain Current	T <sub>c</sub> = 25°C	145
		T <sub>c</sub> = 80°C	110
I <sub>DM</sub>	Pulsed Drain current	580	A
V <sub>GS</sub>	Gate - Source Voltage	±30	V
R <sub>DS(on)</sub>	Drain - Source ON Resistance	78	mΩ
P <sub>D</sub>	Power Dissipation	T <sub>c</sub> = 25°C	3250
I <sub>AR</sub>	Avalanche current (repetitive and non repetitive)		30
E <sub>AR</sub>	Repetitive Avalanche Energy		50
E <sub>AS</sub>	Single Pulse Avalanche Energy		3200

**Electrical Characteristics**

<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> = 1000V T <sub>j</sub> = 25°C			400	μA
		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800V T <sub>j</sub> = 125°C			2	mA
R <sub>DS(on)</sub>	Drain - Source on Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 72.5A		65	78	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 20mA	3		5	V
I <sub>GSS</sub>	Gate - Source Leakage Current	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0V			±400	nA

**Dynamic Characteristics**

<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 V <sub>DS</sub> = 25V f = 1MHz		28.5		nF
C <sub>oss</sub>	Output Capacitance			5.08		
C <sub>rss</sub>	Reverse Transfer Capacitance			0.9		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = 10V V <sub>Bus</sub> = 500V I <sub>D</sub> = 145A		1068		nC
Q <sub>gs</sub>	Gate - Source Charge			136		
Q <sub>gd</sub>	Gate - Drain Charge			692		
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>GS</sub> = 15V V <sub>Bus</sub> = 670V I <sub>D</sub> = 145A R <sub>G</sub> = 0.75Ω		18		ns
T <sub>r</sub>	Rise Time			14		
T <sub>d(off)</sub>	Turn-off Delay Time			140		
T <sub>f</sub>	Fall Time			55		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 670V I <sub>D</sub> = 145A, R <sub>G</sub> = 0.75Ω		2.9		mJ
E <sub>off</sub>	Turn-off Switching Energy			2.9		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 670V I <sub>D</sub> = 145A, R <sub>G</sub> = 0.75Ω		4.8		mJ
E <sub>off</sub>	Turn-off Switching Energy			3.9		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.038	°C/W

**Series diode ratings and characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage					1000	V
I <sub>RM</sub>	Reverse Leakage Current	V <sub>R</sub> =1000V				500	μA
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 25°C		240		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 240A			1.9	2.5	V
		I <sub>F</sub> = 480A			2.2		
		I <sub>F</sub> = 240A	T <sub>j</sub> = 125°C		1.7		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 240A V <sub>R</sub> = 667V di/dt = 800A/μs	T <sub>j</sub> = 25°C		280		ns
			T <sub>j</sub> = 125°C		350		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 240A V <sub>R</sub> = 667V di/dt = 800A/μs	T <sub>j</sub> = 25°C		3		μC
			T <sub>j</sub> = 125°C		14.4		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.23	°C/W

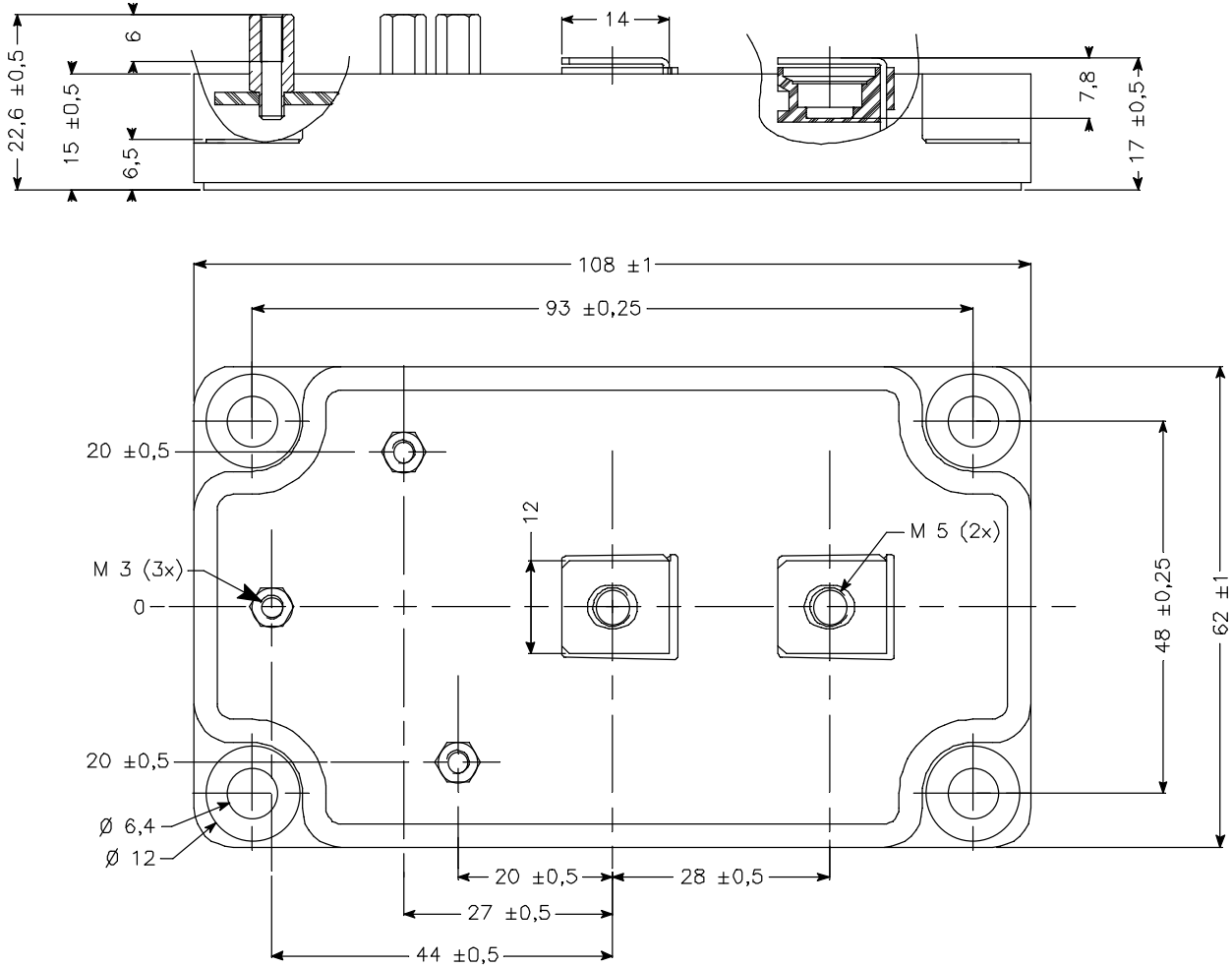
**SiC Parallel diode ratings and characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage					1200	V
I <sub>RM</sub>	Reverse Leakage Current	V <sub>R</sub> =1200V	T <sub>j</sub> = 25°C		384	2400	μA
			T <sub>j</sub> = 175°C		672	12000	
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 100°C		120		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 120A	T <sub>j</sub> = 25°C		1.6	1.8	V
			T <sub>j</sub> = 175°C		2.3	3.0	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 120A, V <sub>R</sub> = 1200V di/dt = 5000A/μs			960		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V			1152		pF
		f = 1MHz, V <sub>R</sub> = 400V			828		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					0.18	°C/W

**Thermal and package characteristics**

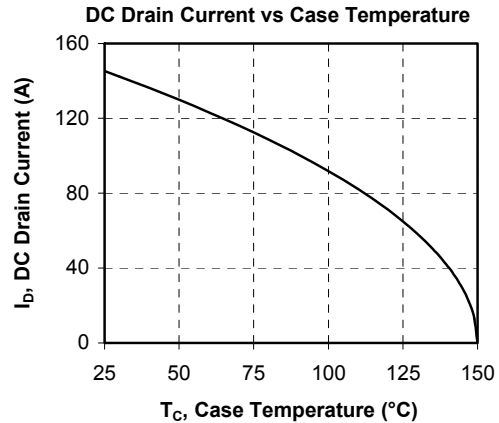
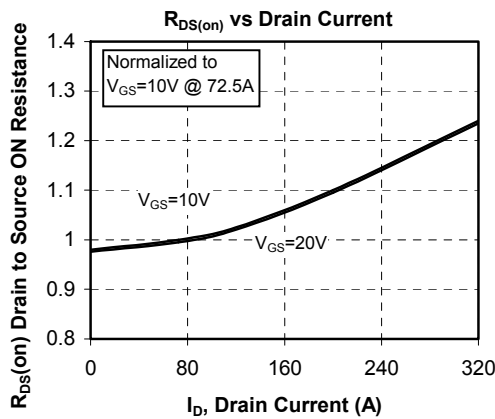
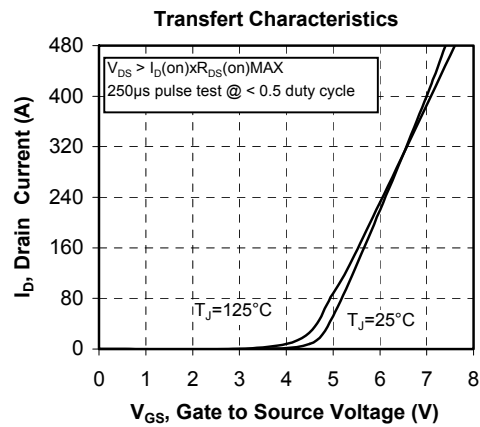
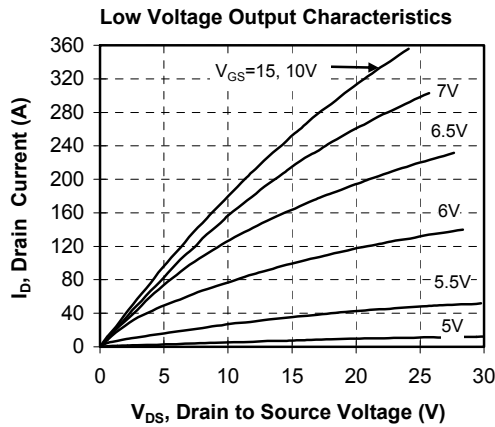
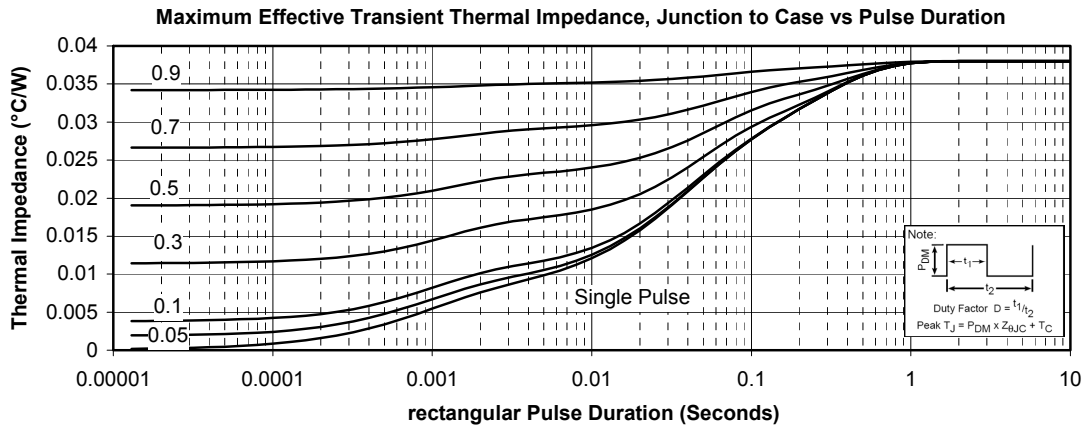
<i>Symbol</i>	<i>Characteristic</i>			<i>Min</i>	<i>Max</i>	<i>Unit</i>
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz			4000		V
T <sub>J</sub>	Operating junction temperature range			-40	150	°C
T <sub>JOP</sub>	Recommended junction temperature under switching conditions			-40	T <sub>Jmax</sub> -25	
T <sub>STG</sub>	Storage Temperature Range			-40	125	
T <sub>C</sub>	Operating Case Temperature			-40	100	
Torque	Mounting torque	To heatsink	M6	3	5	
		For terminals	M5	2	3.5	
			M3	1	1.5	
Wt	Package Weight				300	g

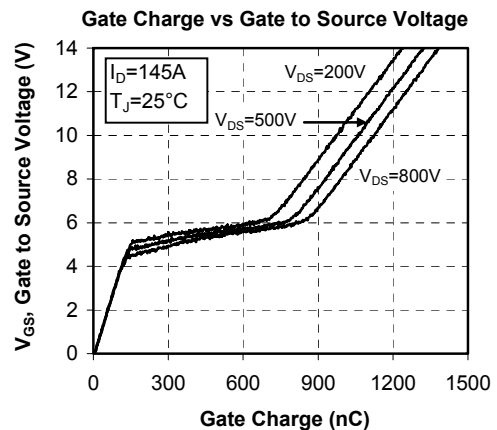
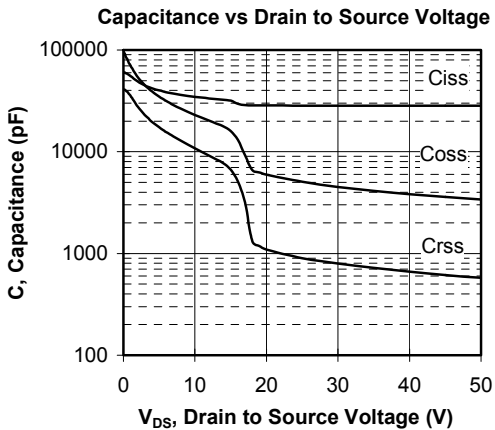
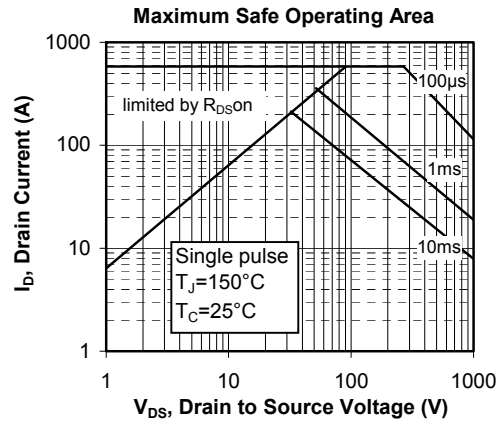
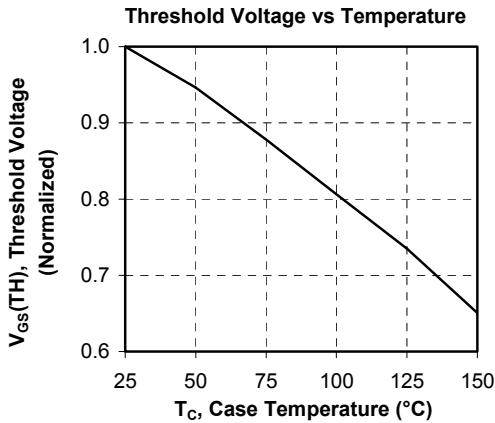
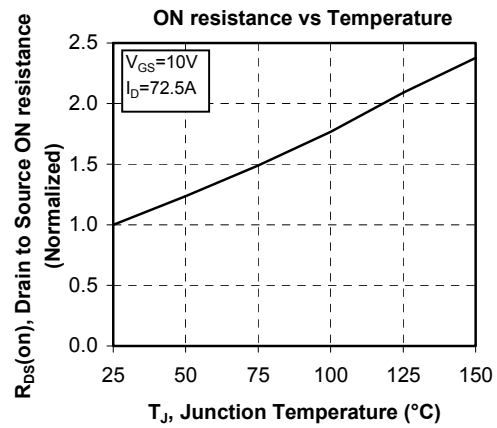
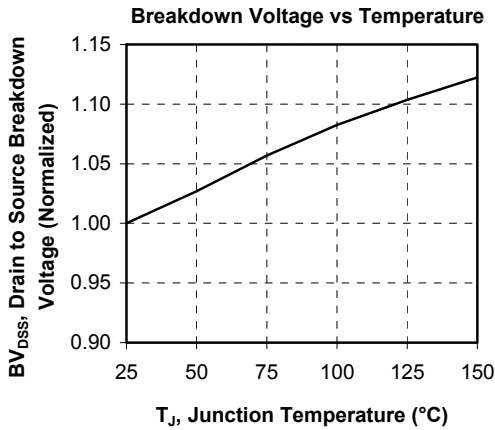
**SP6 Package outline** (dimensions in mm)

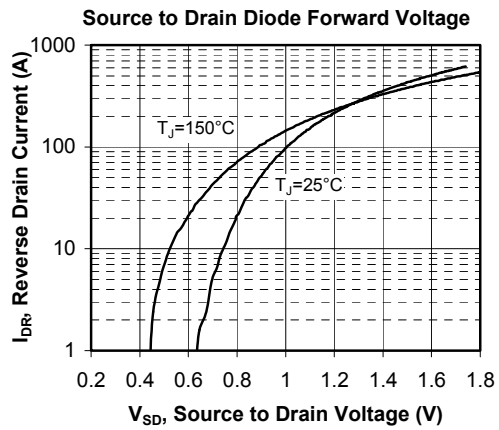
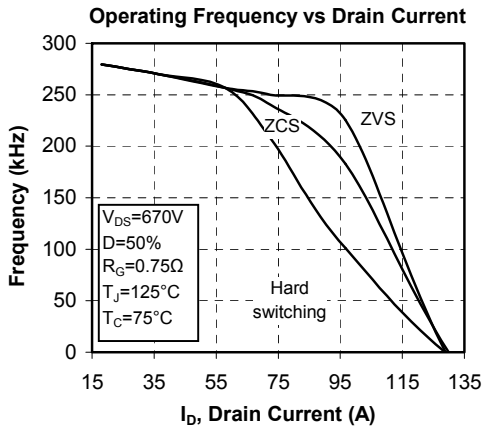
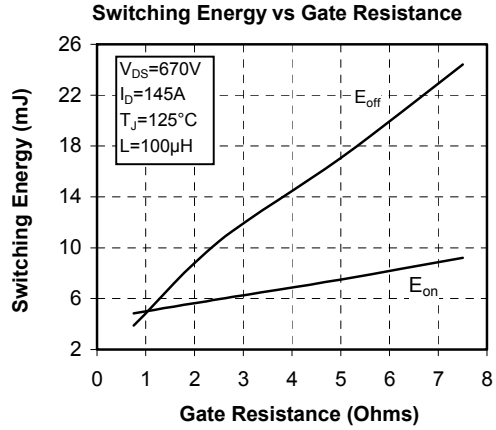
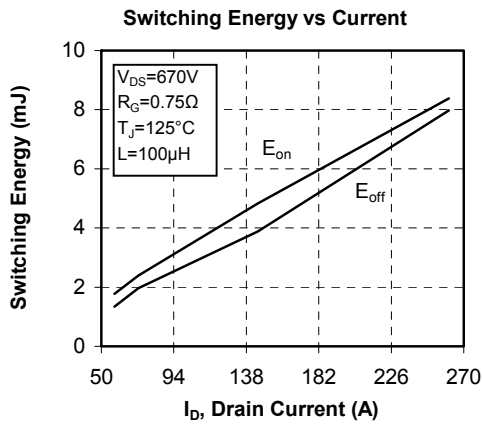
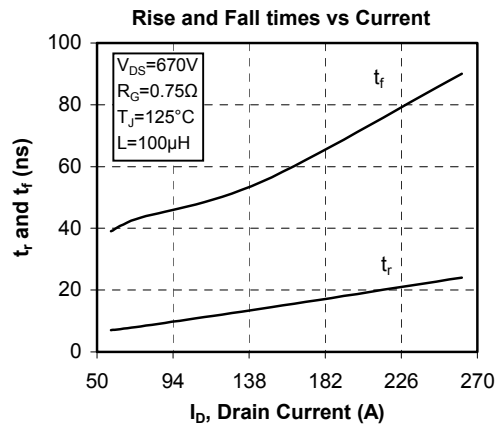
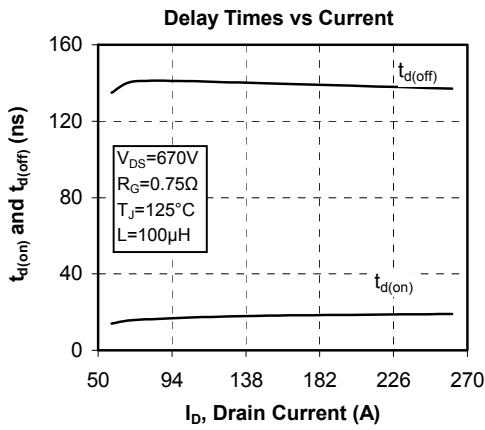


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical MOSFET Performance Curve

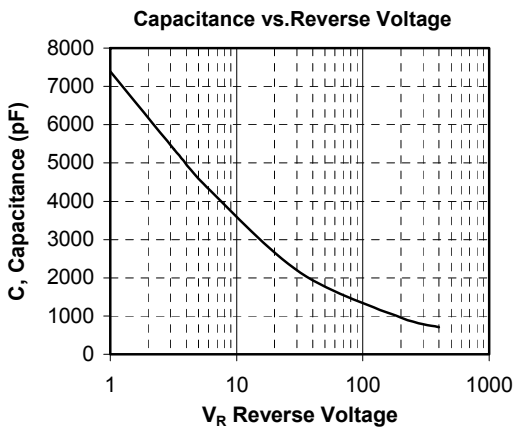
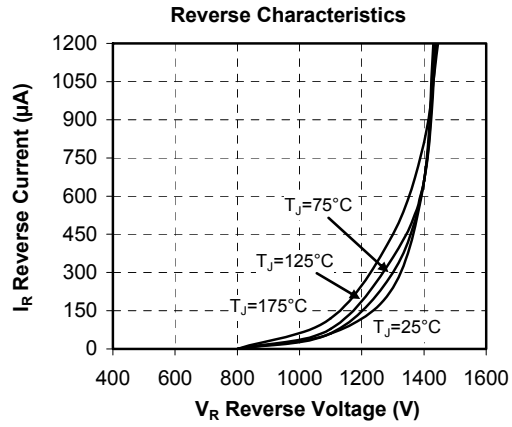
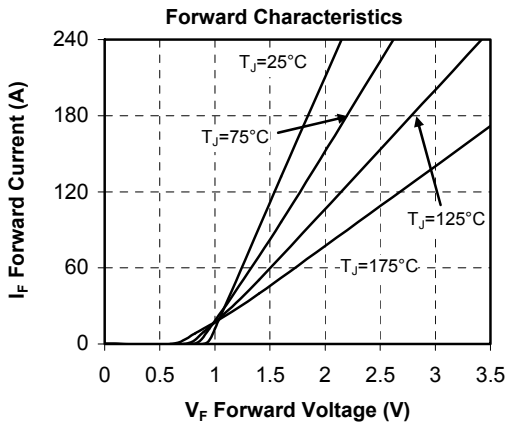
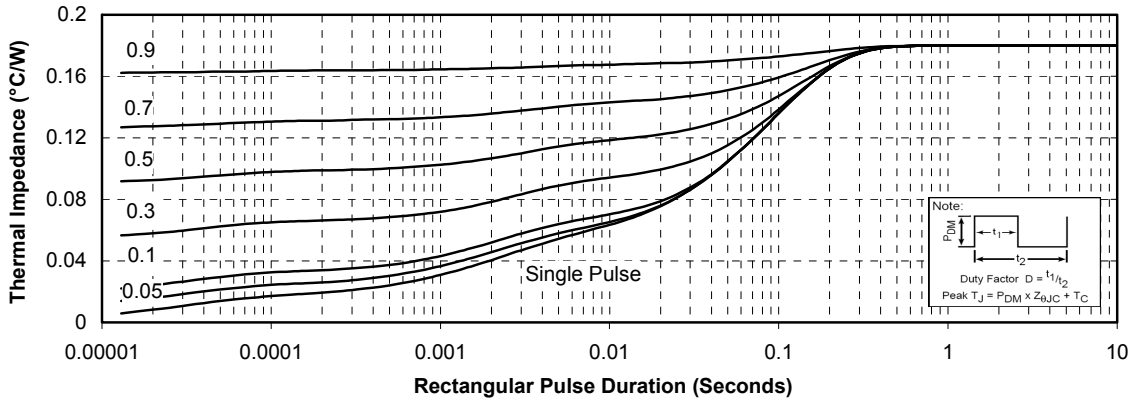






## Typical SiC Diode Performance Curve

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





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