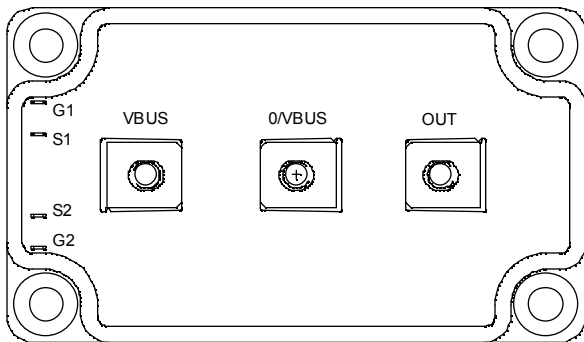
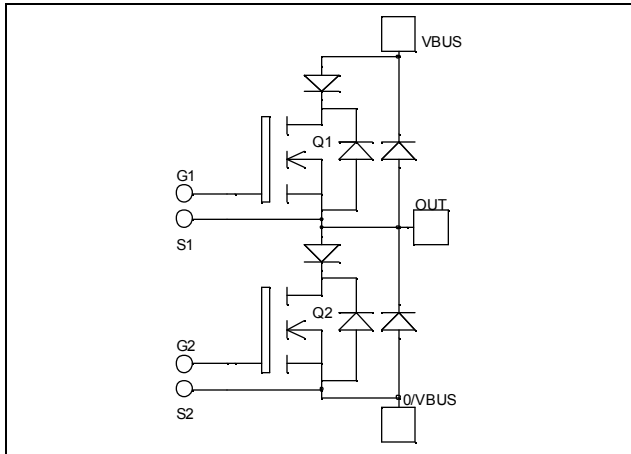


*Phase leg  
Series & SiC parallel diodes  
Super Junction  
MOSFET Power Module*

**$V_{DSS} = 800V$**   
 **$R_{DSon} = 75m\Omega \text{ max @ } T_j = 25^\circ C$**   
 **$I_D = 56A \text{ @ } T_c = 25^\circ C$**



### Application

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

### Features

- **COOLMOS** Power Semiconductors
  - Ultra low  $R_{DSon}$
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
- **Parallel SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

### Benefits

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

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	800	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	56
		$T_c = 80^\circ C$	43
$I_{DM}$	Pulsed Drain current	232	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	75	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	568
$I_{AR}$	Avalanche current (repetitive and non repetitive)	17	A
$E_{AR}$	Repetitive Avalanche Energy	0.5	mJ
$E_{AS}$	Single Pulse Avalanche Energy	670	

**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)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 800V$			100	$\mu\text{A}$
		$T_j = 25^\circ\text{C}$				
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 0V, V_{DS} = 800V$			1000	$\text{m}\Omega$
		$T_j = 125^\circ\text{C}$				
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 4\text{mA}$	2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 200$	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		9015		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		4183		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		215		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		364		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 400V$		48		
$Q_{gd}$	Gate – Drain Charge	$I_D = 56A$		184		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>		10		ns
$T_r$	Rise Time	$V_{GS} = 15V$		13		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 533V$		83		
$T_f$	Fall Time	$I_D = 56A$ $R_G = 1.2\Omega$		35		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b>		583		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		556		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>		1020		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		684		

**Series diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25^\circ\text{C}$		350	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		600	
$I_F$	DC Forward Current	$T_c = 85^\circ\text{C}$		60		A
$V_F$	Diode Forward Voltage	$I_F = 60A$		1.1	1.15	V
		$I_F = 120A$		1.4		
		$I_F = 60A$	$T_j = 125^\circ\text{C}$	0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 60A$ $V_R = 133V$	$T_j = 25^\circ\text{C}$	24		ns
			$T_j = 125^\circ\text{C}$	48		
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	66		nC
			$T_j = 125^\circ\text{C}$	300		

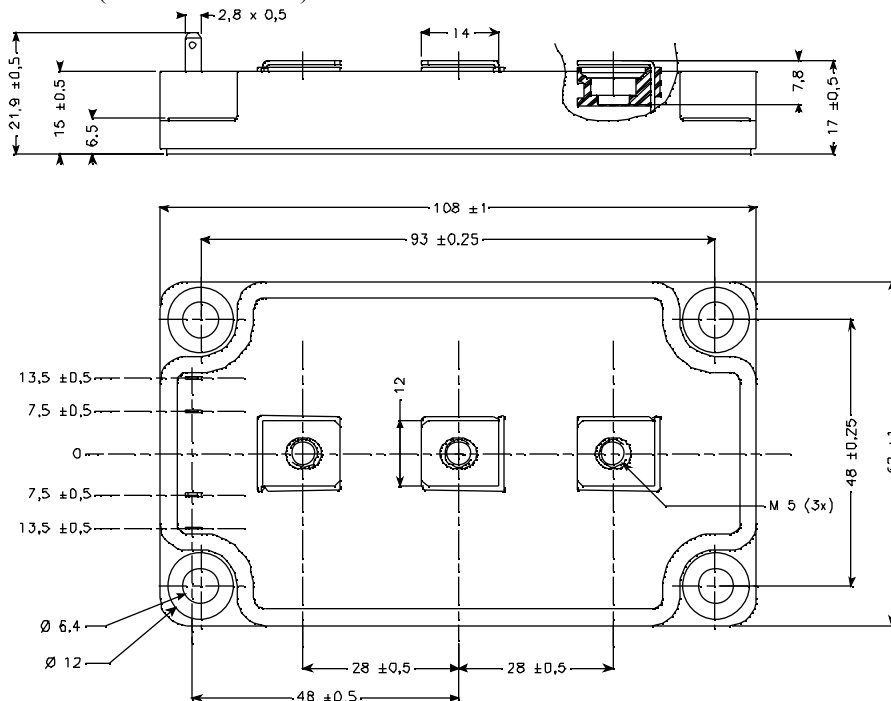
## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R=1200V$	$T_j = 25^\circ C$	300	1200	$\mu A$
			$T_j = 175^\circ C$	600	6000	
$I_F$	DC Forward Current			30		A
$V_F$	Diode Forward Voltage	$I_F = 30A$	$T_j = 25^\circ C$	1.6	1.8	V
			$T_j = 175^\circ C$	2.6	3.0	
$Q_C$	Total Capacitive Charge	$I_F = 30A, V_R = 600V$ $di/dt = 1600A/\mu s$		84		nC
Q	Total Capacitance	$f = 1MHz, V_R = 200V$		270		pF
		$f = 1MHz, V_R = 400V$		198		

## Thermal and package characteristics

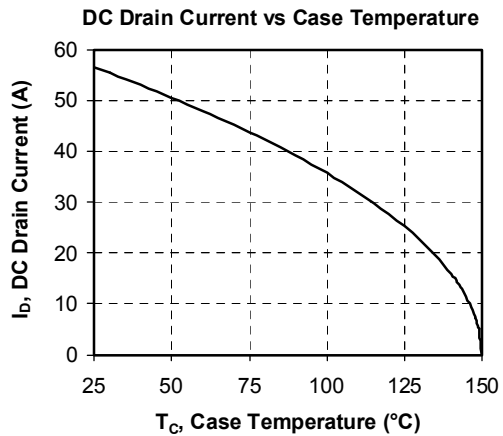
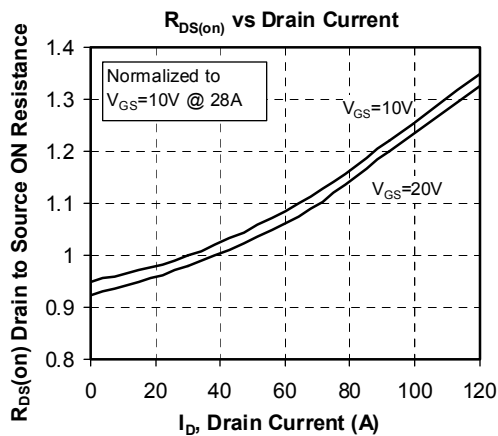
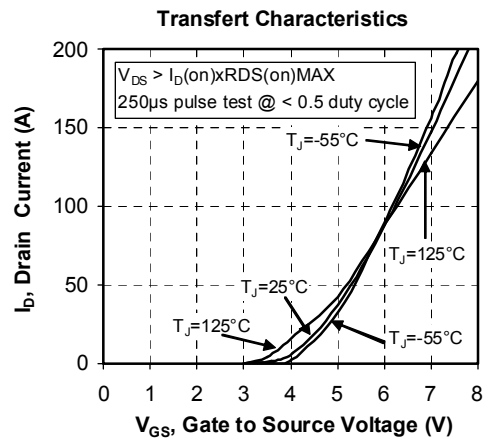
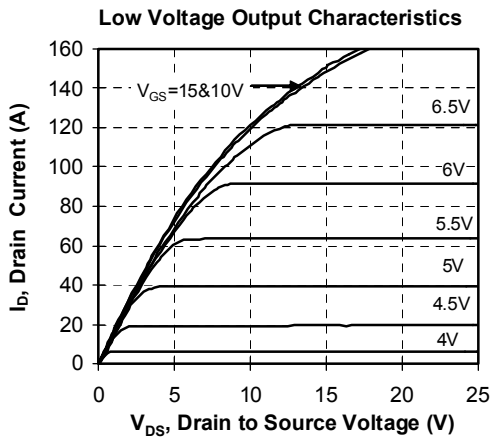
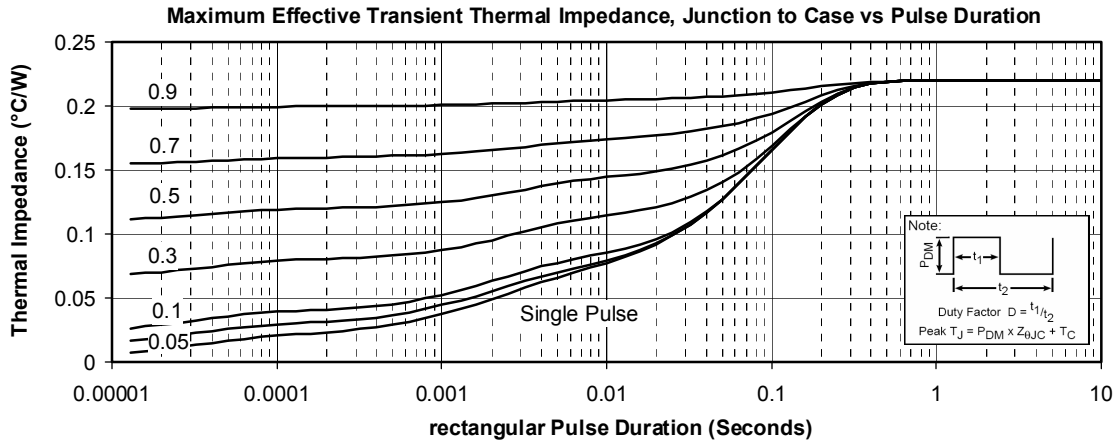
Symbol	Characteristic		Min	Typ	Max	Unit
$R_{thJC}$	Junction to Case Thermal Resistance	Transistor			0.22	$^\circ C/W$
		Series diode			0.65	
		Parallel diode			0.45	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol} < 1mA, 50/60Hz$		2500			V
$T_J$	Operating junction temperature range		-40		150	$^\circ C$
$T_{STG}$	Storage Temperature Range		-40		125	
$T_C$	Operating Case Temperature		-40		100	
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight				280	g

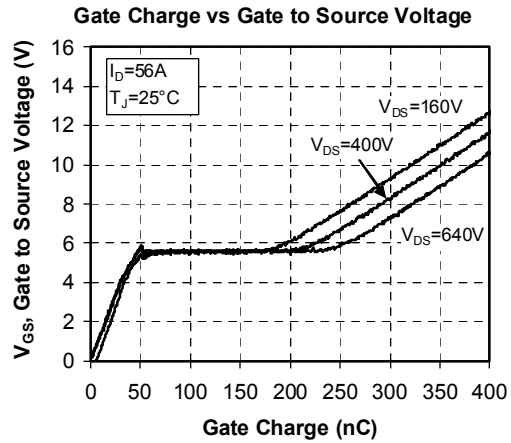
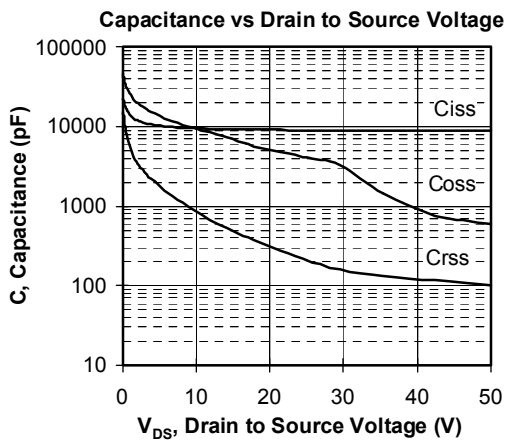
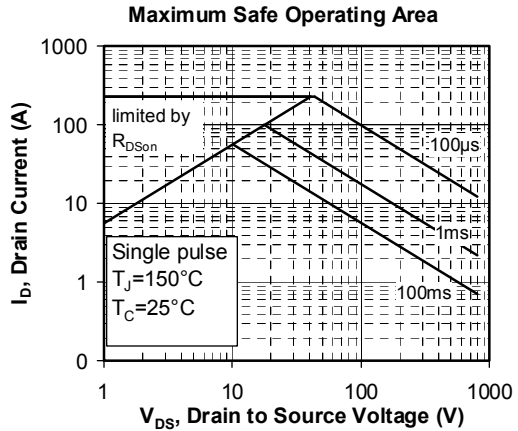
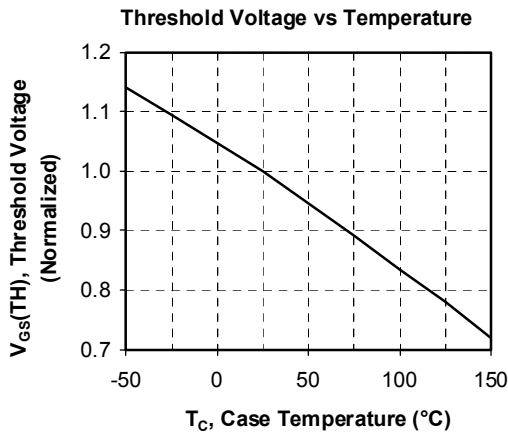
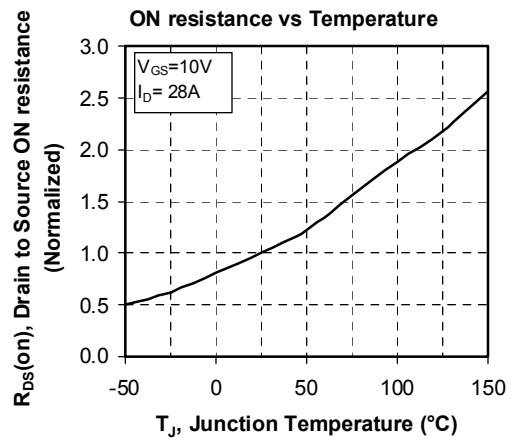
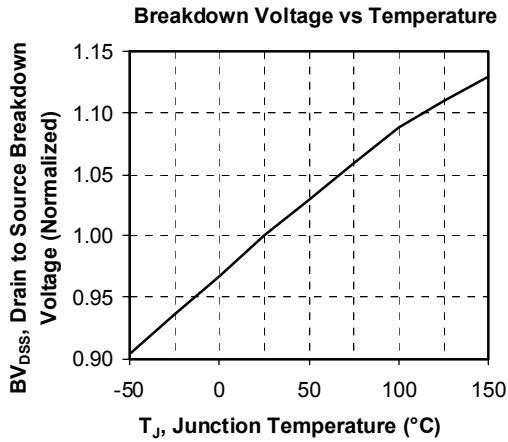
## SP6 Package outline (dimensions in mm)

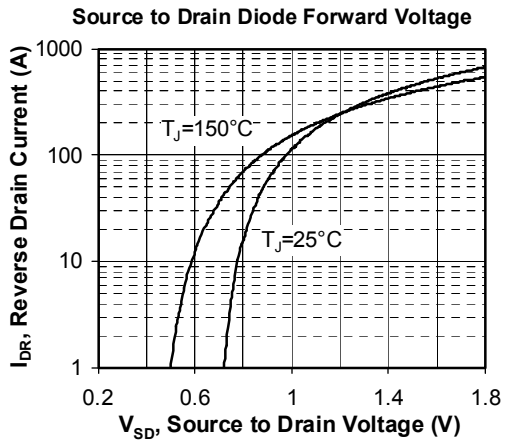
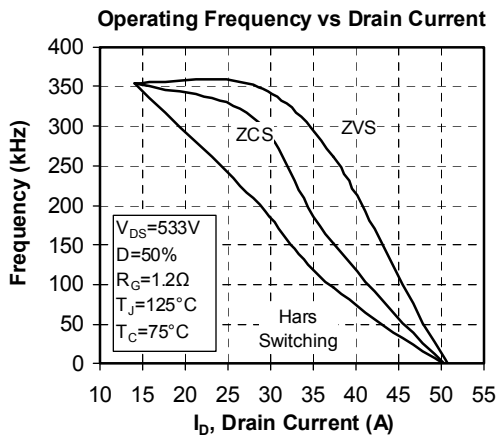
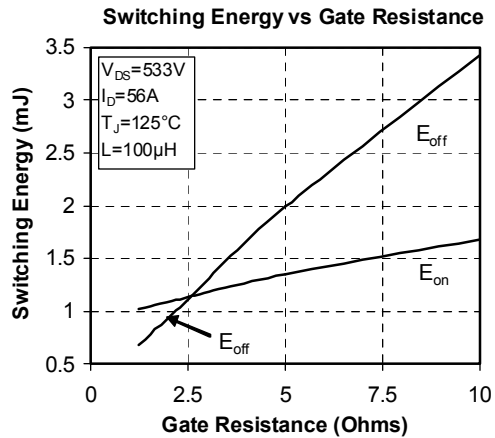
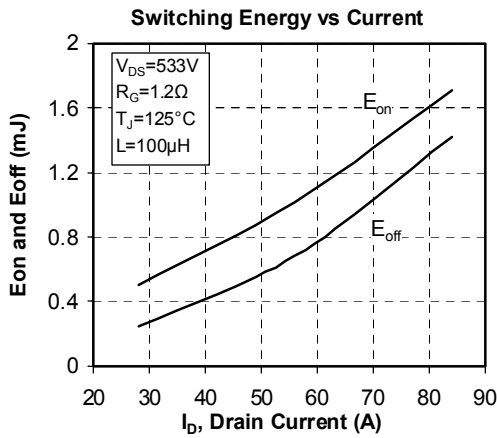
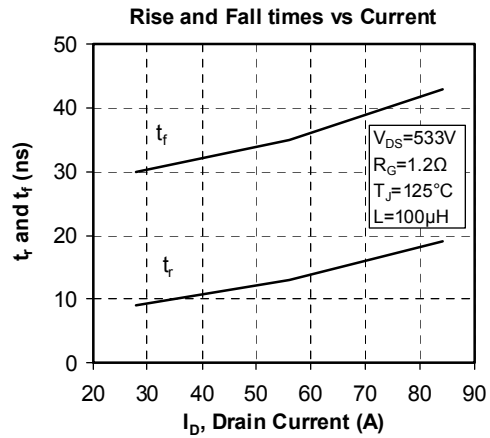
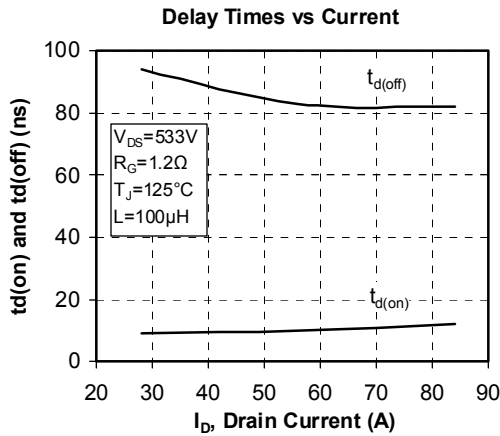


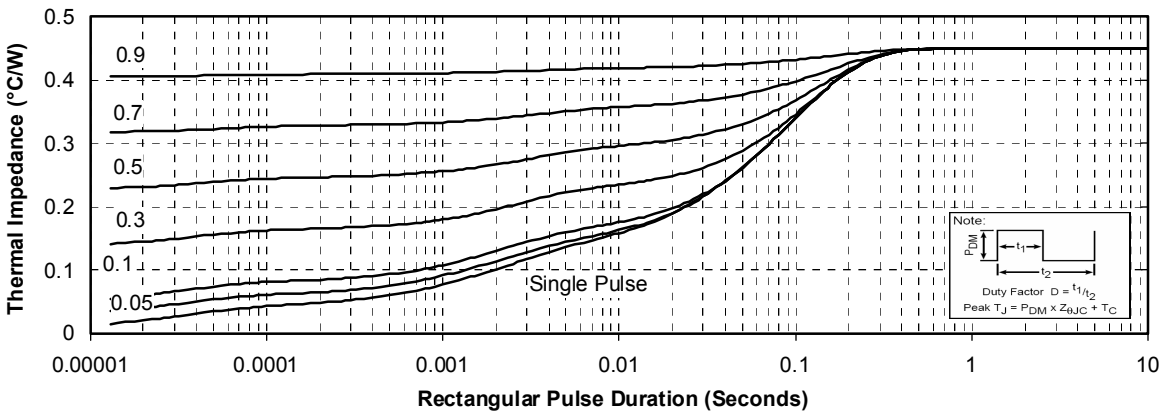
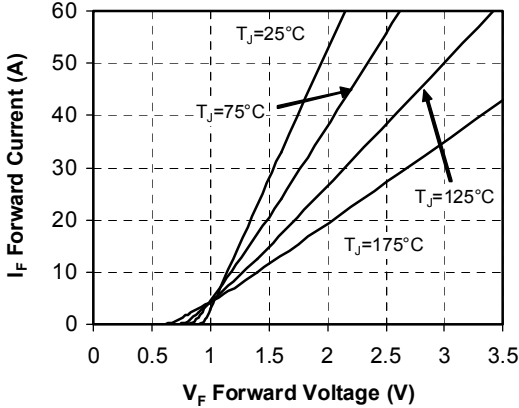
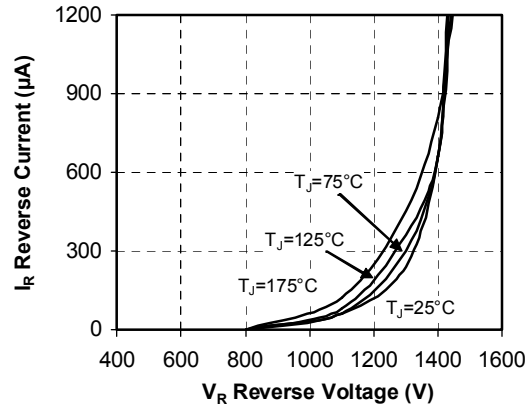
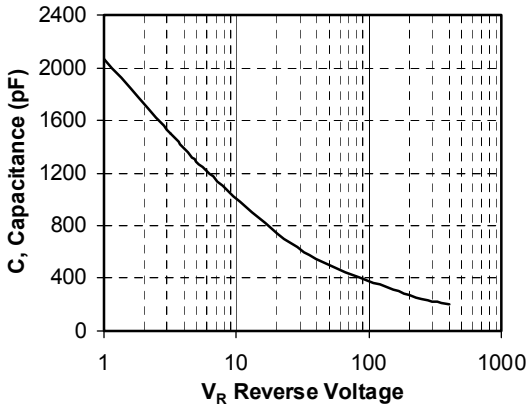
See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical CoolMOS 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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