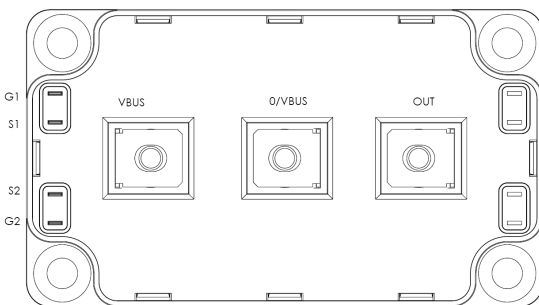
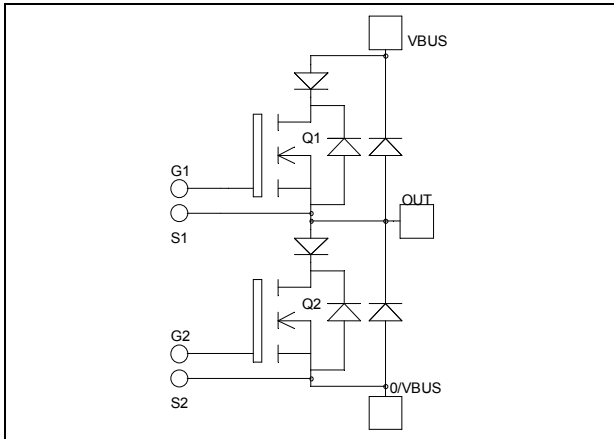


*Phase leg Series & SiC parallel diodes  
Super Junction MOSFET Power Module*

$V_{DSS} = 600V$   
 $R_{DSon} = 18m\Omega \text{ max @ } T_j = 25^\circ C$   
 $I_D = 143A \text{ @ } T_c = 25^\circ C$



### Application

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

### Features

- **CoolMOS™**
  - 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

**All ratings @  $T_j = 25^\circ C$  unless otherwise specified**

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	600	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	143
		$T_c = 80^\circ C$	107
$I_{DM}$	Pulsed Drain current	572	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	18	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	833
$I_{AR}$	Avalanche current (repetitive and non repetitive)	20	A
$E_{AR}$	Repetitive Avalanche Energy	1	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1800	

 **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)

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 600V$			100	$\mu A$
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 71.5A$			18	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 4mA$	2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 400$	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		28		nF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		10.2		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		0.85		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		1036		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 300V$		116		
$Q_{gd}$	Gate – Drain Charge	$I_D = 143A$		444		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 143A$ $R_G = 1.2\Omega$		21		ns
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
$T_f$	Fall Time			84		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		1608		$\mu J$
$E_{off}$	Turn-off Switching Energy			3920		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		2630		$\mu J$
$E_{off}$	Turn-off Switching Energy			4824		
$R_{thJC}$	Junction to Case Thermal Resistance				0.15	$^{\circ}C/W$

**Series diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600V$			150	$\mu A$
$I_F$	DC Forward Current	$T_c = 80^{\circ}C$		200		A
$V_F$	Diode Forward Voltage	$I_F = 200A$ $V_{GE} = 0V$	$T_j = 25^{\circ}C$	1.6	2	V
			$T_j = 150^{\circ}C$	1.5		
$t_{rr}$	Reverse Recovery Time	$I_F = 200A$ $V_R = 300V$ $di/dt = 2800A/\mu s$	$T_j = 25^{\circ}C$	125		ns
			$T_j = 150^{\circ}C$	220		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 200A$ $V_R = 300V$ $di/dt = 2800A/\mu s$	$T_j = 25^{\circ}C$	9.4		$\mu C$
			$T_j = 150^{\circ}C$	19.8		
$E_r$	Reverse Recovery Energy	$I_F = 200A$ $V_R = 300V$ $di/dt = 2800A/\mu s$	$T_j = 25^{\circ}C$	2.2		mJ
			$T_j = 150^{\circ}C$	4.8		
$R_{thJC}$	Junction to Case Thermal Resistance				0.39	$^{\circ}C/W$

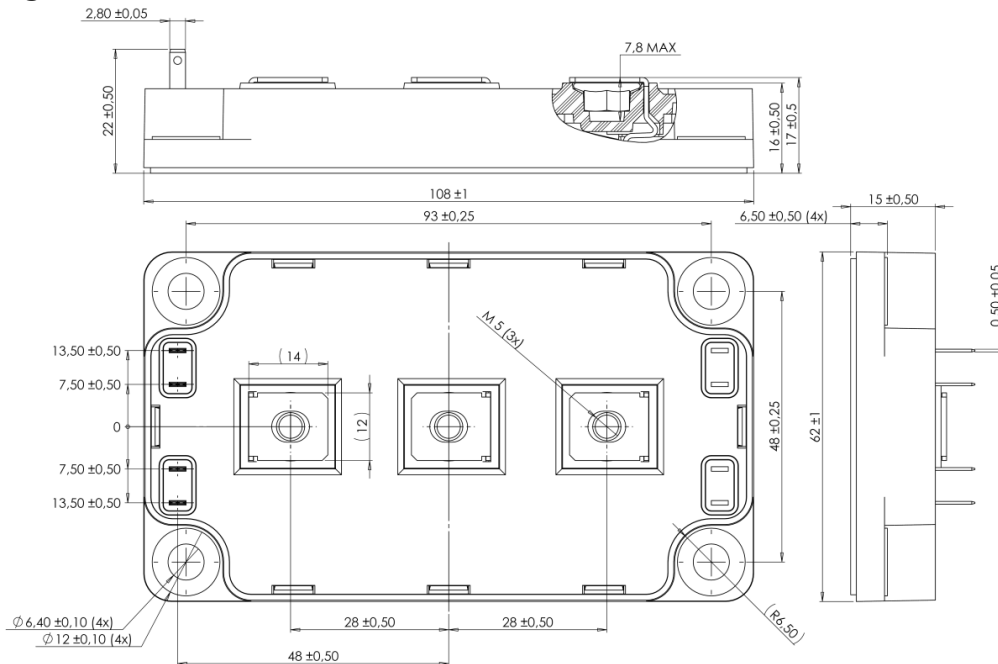
## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage		600			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =600V		400	1600	μA
				800	8000	
I <sub>F</sub>	DC Forward Current			80		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 80A		1.6	1.8	V
				2.0	2.4	
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 80A, V <sub>R</sub> = 600V di/dt = 2000A/μs		224		nC
Q	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V		520		pF
		f = 1MHz, V <sub>R</sub> = 400V		400		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.35	°C/W

## Thermal and package characteristics

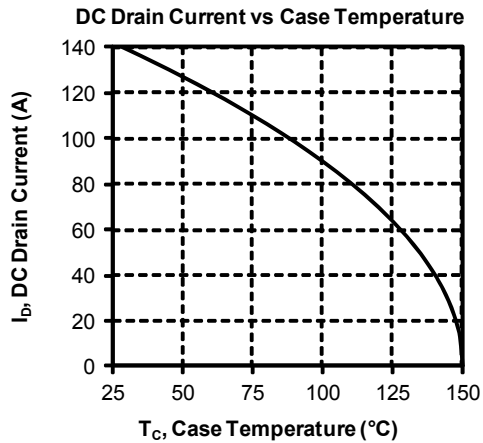
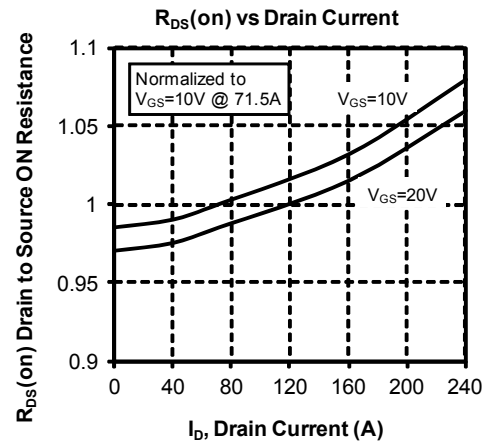
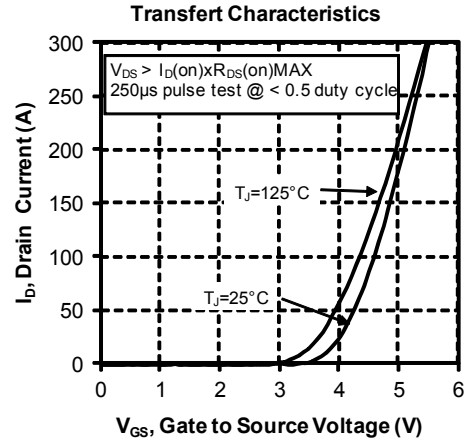
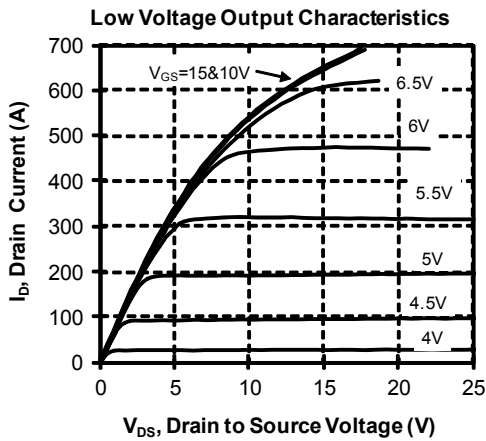
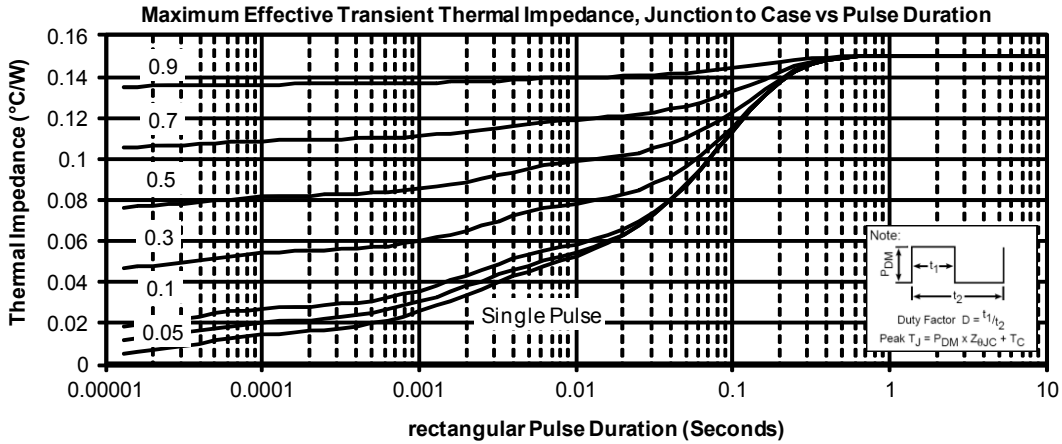
Symbol	Characteristic	Min	Max	Unit
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V
T <sub>J</sub>	Operating junction temperature range			°C
	Parallel diode	-40	175	
	Series diode & CoolMOST™	-40	150	
T <sub>JOP</sub>	Recommended junction temperature under switching 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			N.m
	To heatsink	M6	3	
	For terminals	M5	2	3.5
Wt	Package Weight		300	g

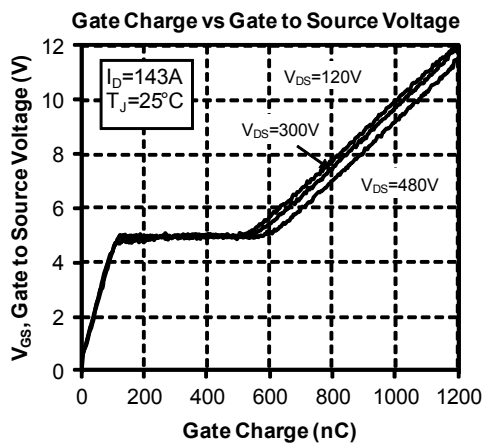
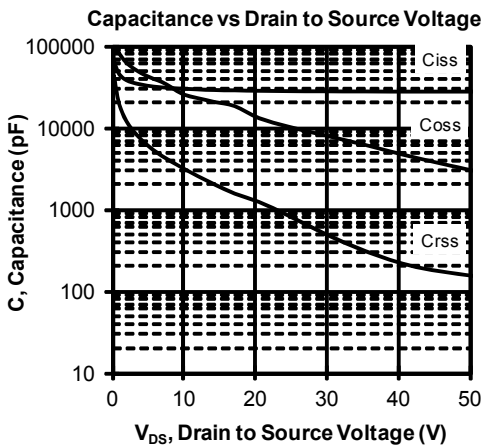
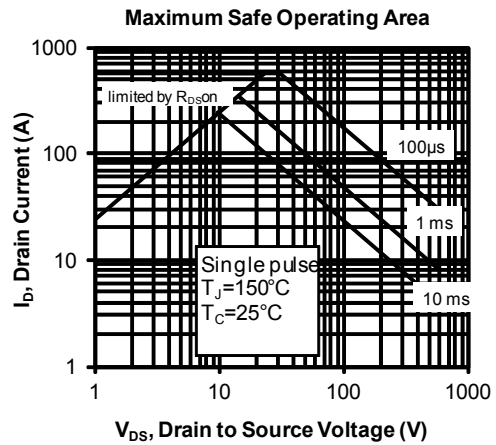
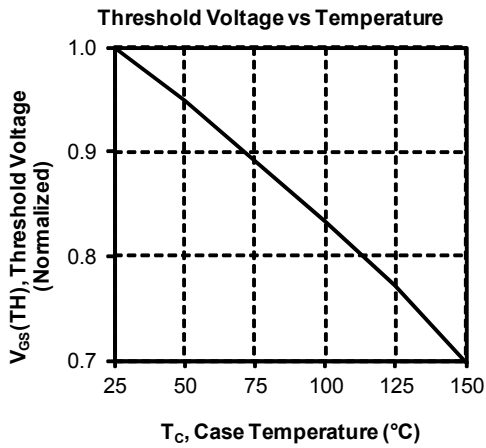
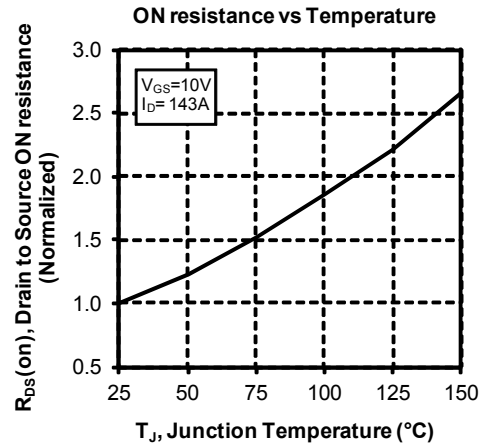
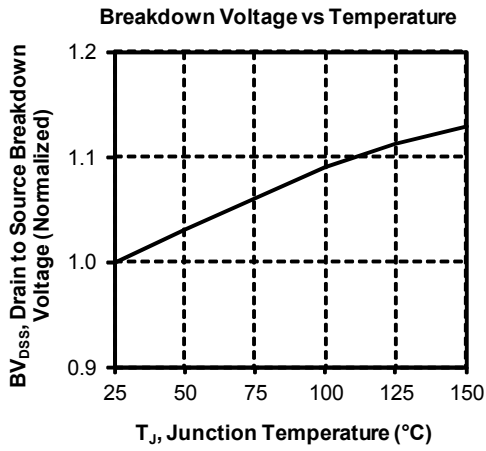
## SP6 Package outline (dimensions in mm)

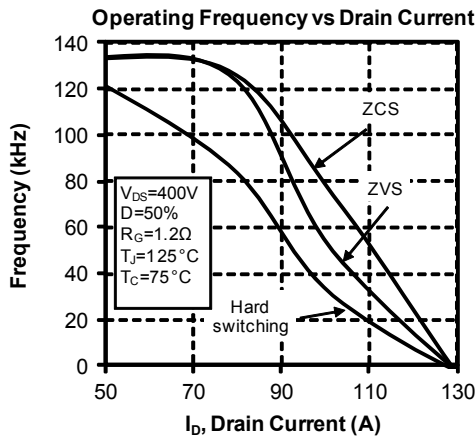
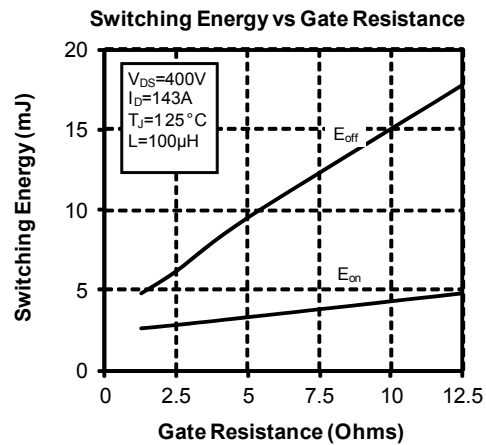
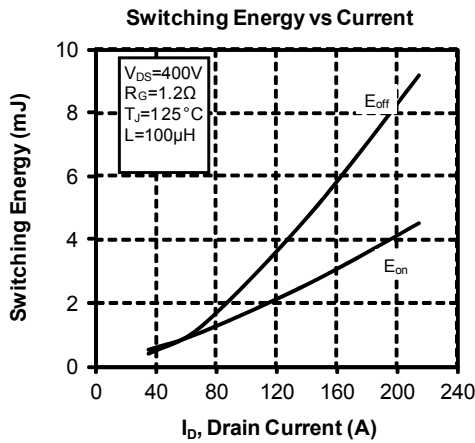
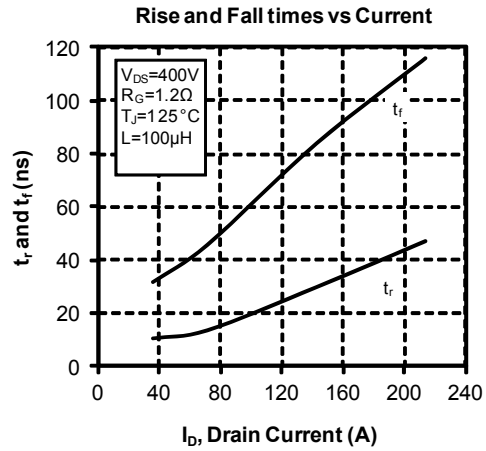
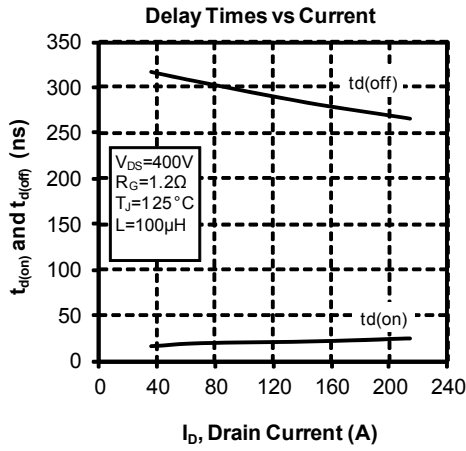


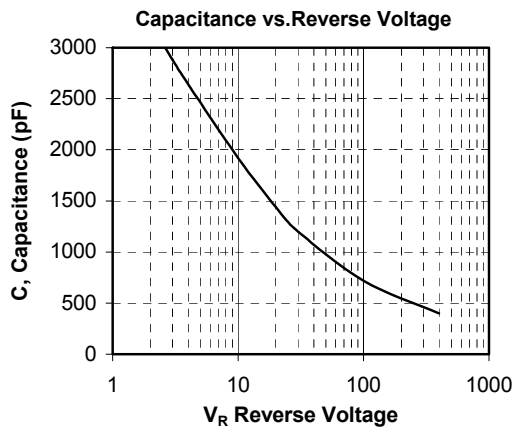
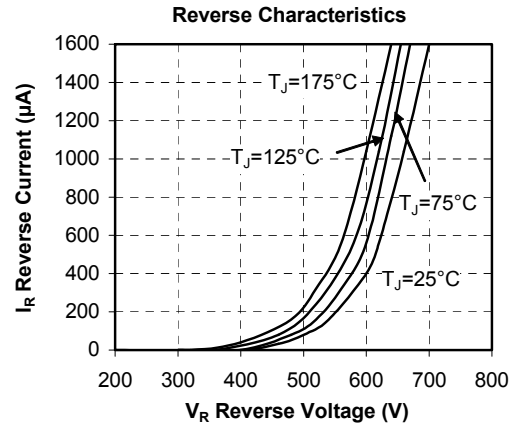
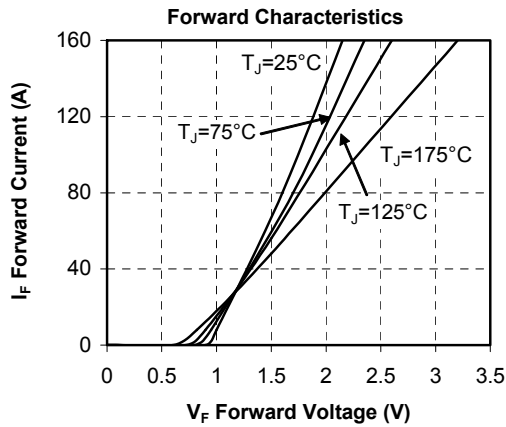
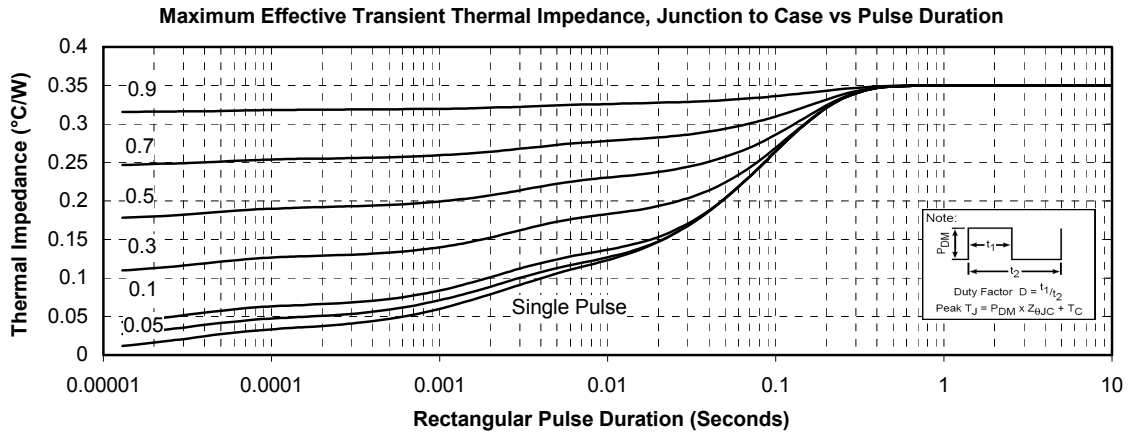
See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical CoolMOS Performance Curve







**Typical SiC Diode Performance Curve**


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