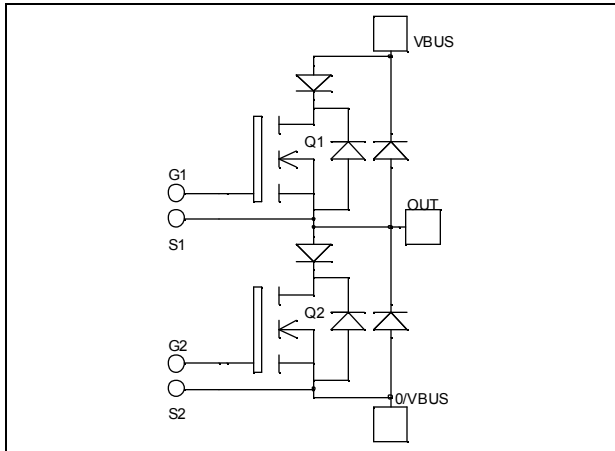


*Phase leg  
Series & SiC parallel diodes  
Super Junction  
MOSFET Power Module*

$$V_{DSS} = 600V$$

$$R_{DSon} = 18m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 143A \text{ @ } T_c = 25^\circ C$$

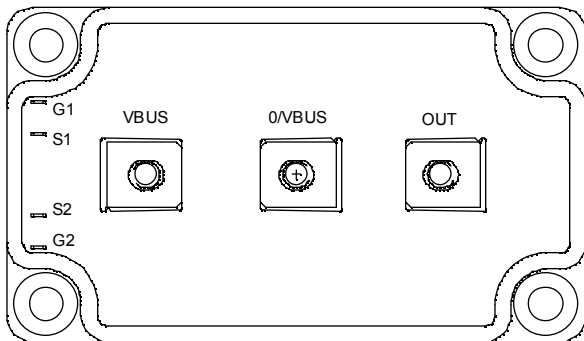


### Application

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

### Features

- **COOLMOS** 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	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)

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	$V_{GS} = 0V, V_{DS} = 600V$	$T_j = 25^\circ\text{C}$			100	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 600V$	$T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 71.5A$				18	$\text{m}\Omega$
$V_{GS(th)}$	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	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{MHz}$		28		nF
$C_{oss}$	Output Capacitance			10.2		
$C_{rss}$	Reverse Transfer Capacitance			0.85		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 143A$		1036		nC
$Q_{gs}$	Gate – Source Charge			116		
$Q_{gd}$	Gate – Drain Charge			444		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>		21		ns
$T_r$	Rise Time	$V_{GS} = 15V$		30		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400V$		283		
$T_f$	Fall Time	$I_D = 143A$ $R_G = 1.2\Omega$		84		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b>		1608		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		3920		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b>		2630		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy	$V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		4824		

**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			120		A
$V_F$	Diode Forward Voltage	$I_F = 120A$		1.1	1.15	V
		$I_F = 240A$		1.4		
		$I_F = 120A$	$T_j = 125^\circ\text{C}$	0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 120A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	31		ns
			$T_j = 125^\circ\text{C}$	60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 120A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	120		nC
			$T_j = 125^\circ\text{C}$	500		

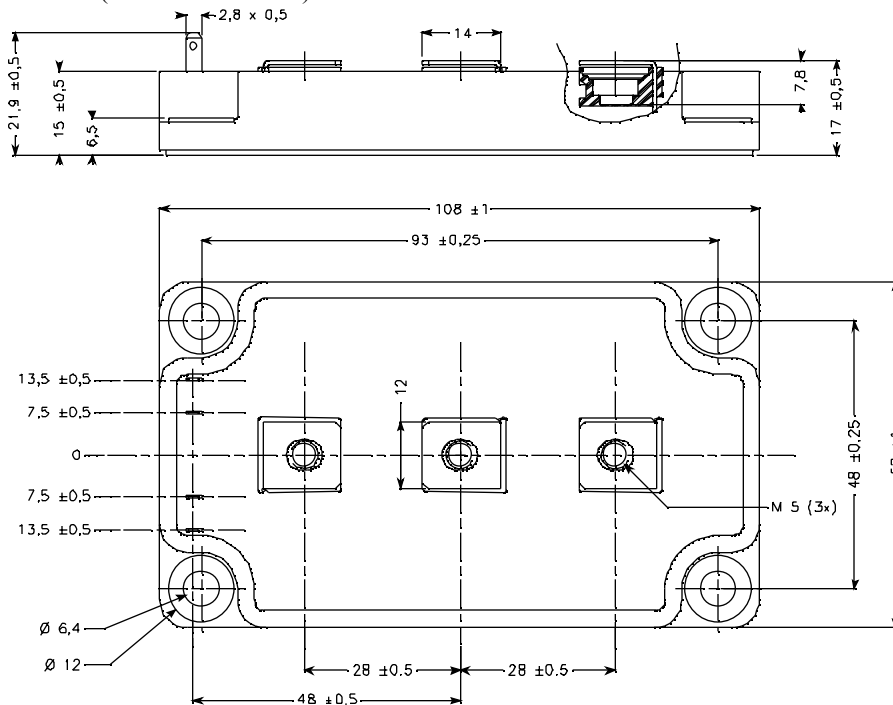
## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V	
$I_{RM}$	Maximum Reverse Leakage Current	$V_R=600V$	$T_j = 25^\circ C$		400	1600	$\mu A$
			$T_j = 175^\circ C$		800	8000	
$I_F$	DC Forward Current			80		A	
$V_F$	Diode Forward Voltage	$I_F = 80A$	$T_j = 25^\circ C$		1.6	1.8	V
			$T_j = 175^\circ C$		2.0	2.4	
$Q_C$	Total Capacitive Charge	$I_F = 80A, V_R = 300V$ $di/dt = 2000A/\mu s$		112		nC	
Q	Total Capacitance	$f = 1MHz, V_R = 200V$		520		pF	
		$f = 1MHz, V_R = 400V$		400			

## Thermal and package characteristics

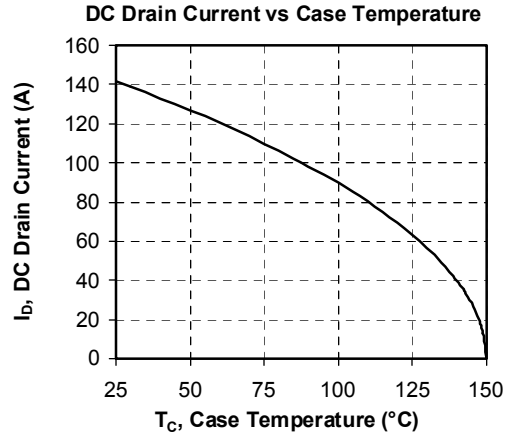
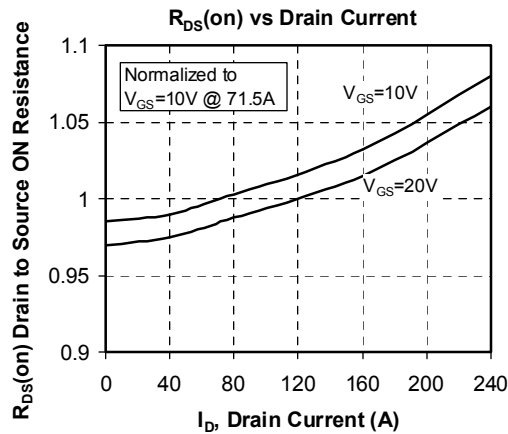
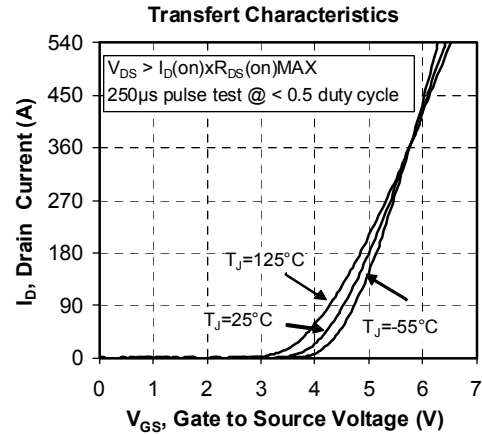
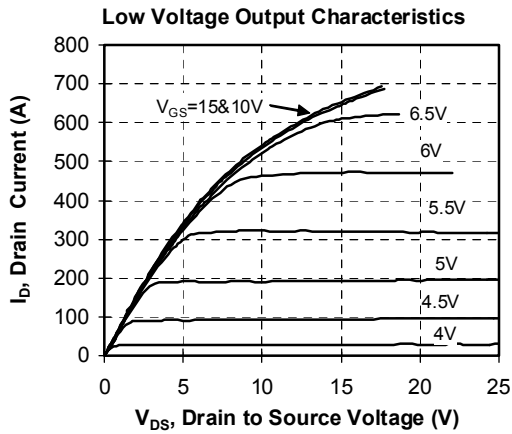
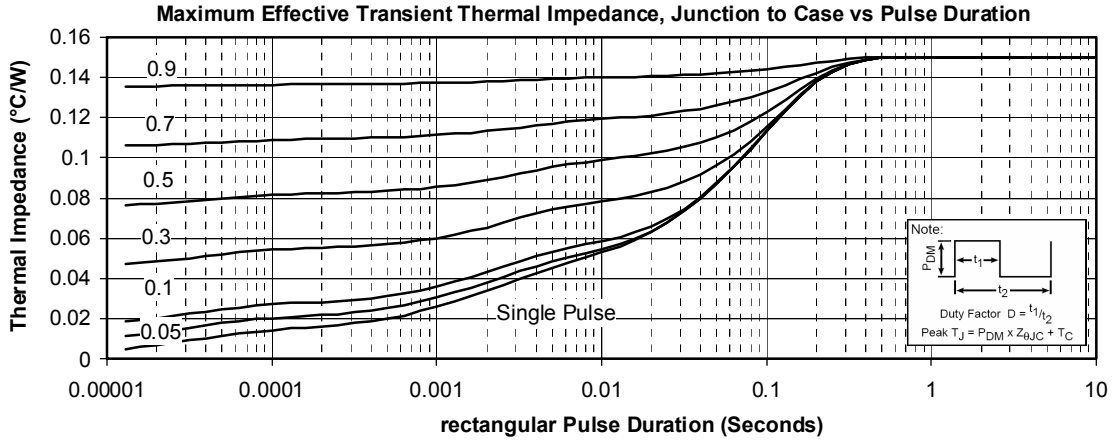
Symbol	Characteristic	Min	Typ	Max	Unit	
$R_{thJC}$	Junction to Case Thermal Resistance	Transistor			0.15	$^\circ C/W$
		Series diode			0.46	
		Parallel diode			0.35	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol} < 1mA, 50/60Hz$	2500			V	
$T_J$	Operating junction temperature 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	

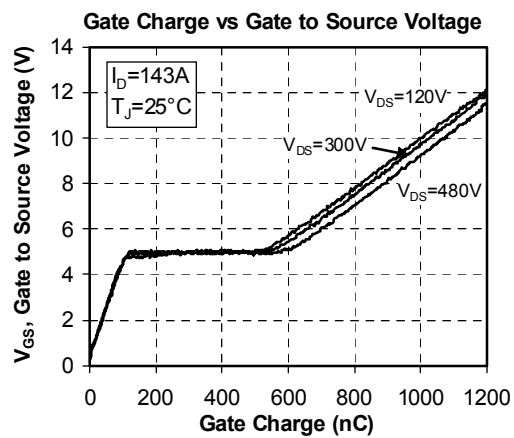
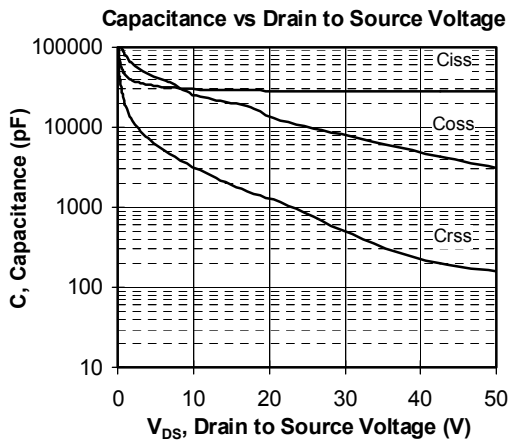
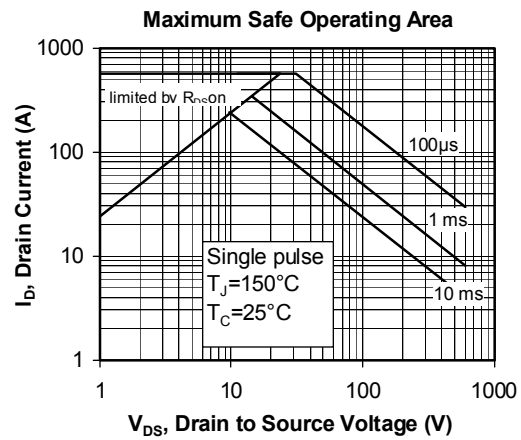
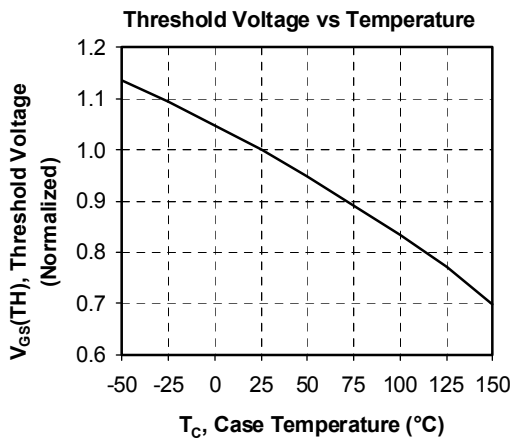
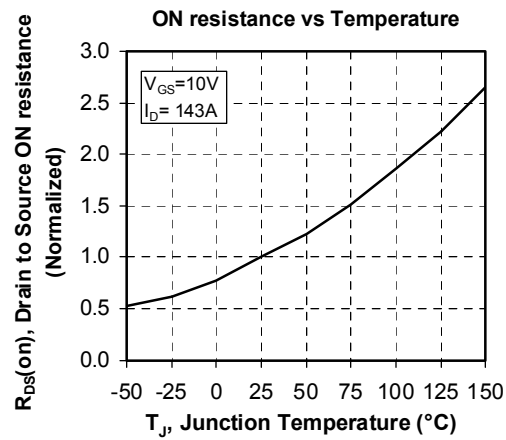
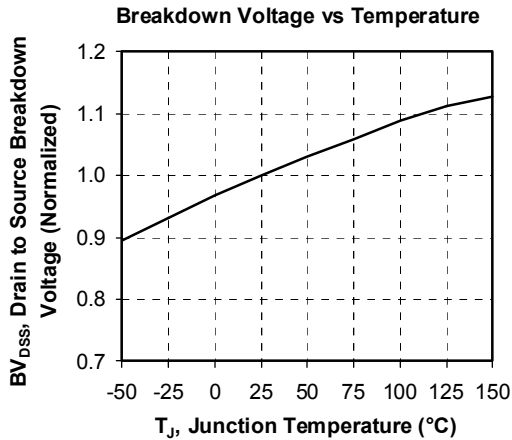
## SP6 Package outline (dimensions in mm)

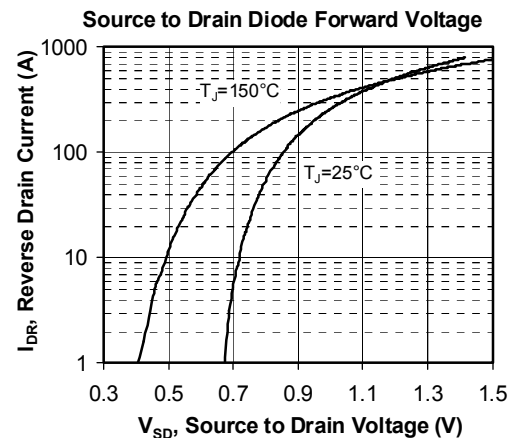
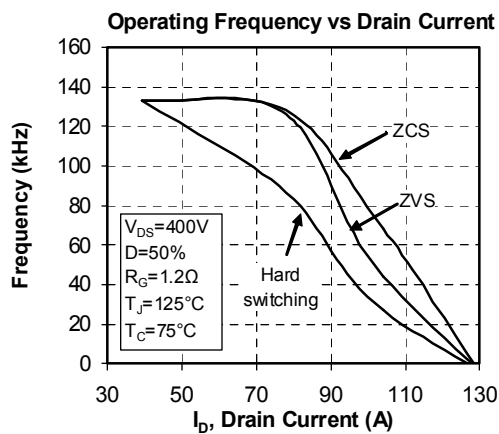
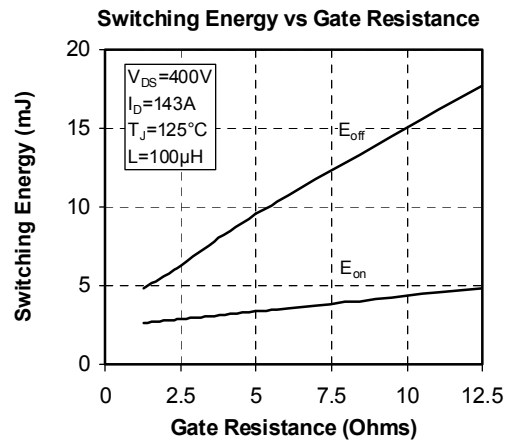
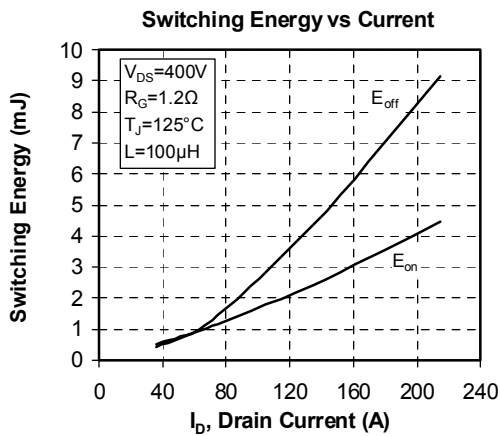
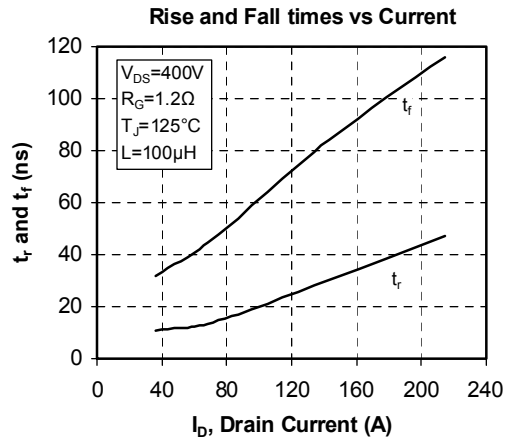
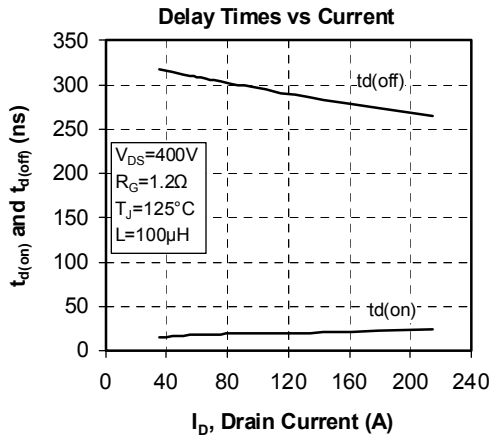


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

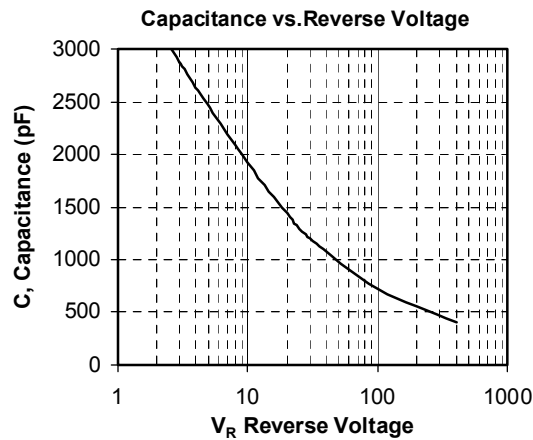
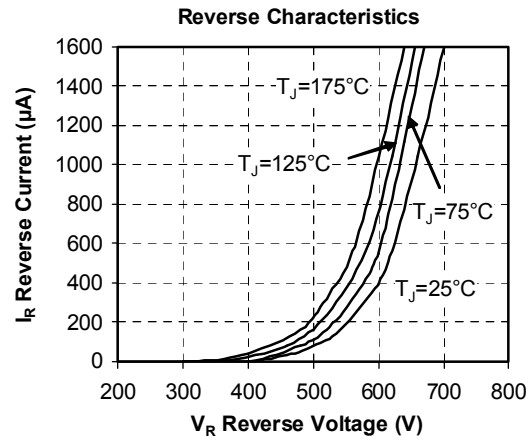
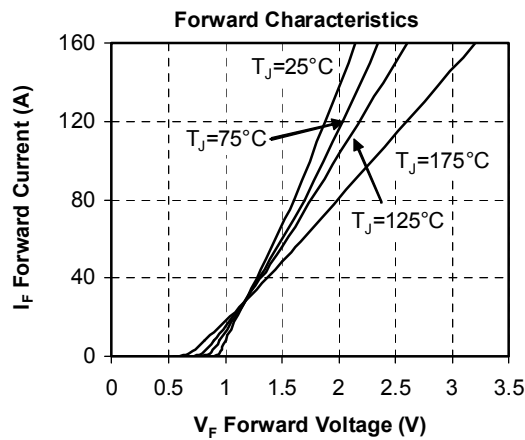
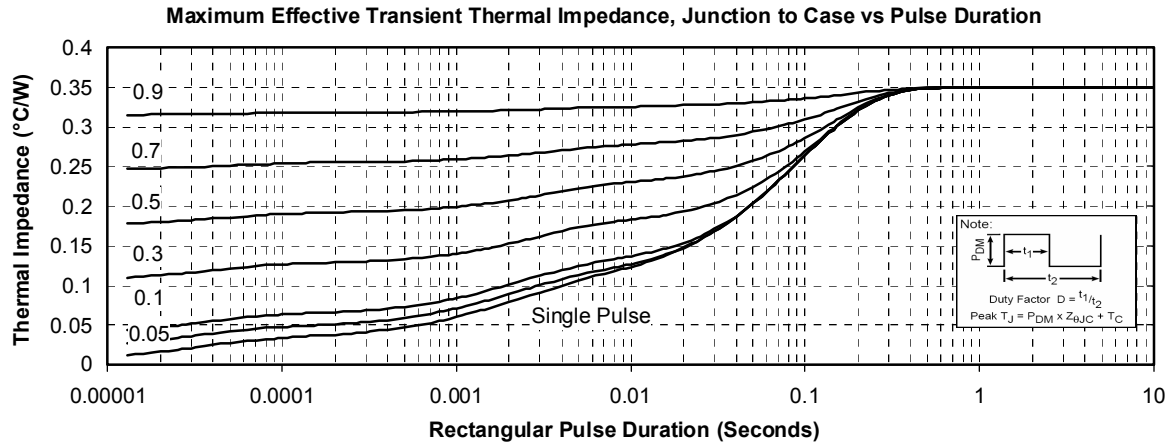
## Typical CoolMOS Performance Curve







## Typical SiC Diode Performance Curve



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