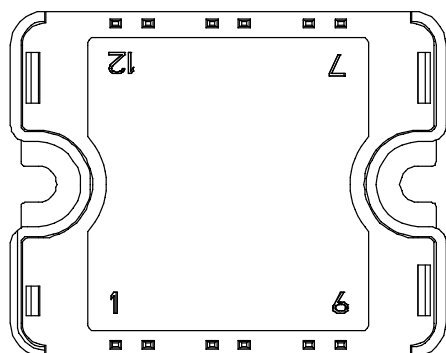
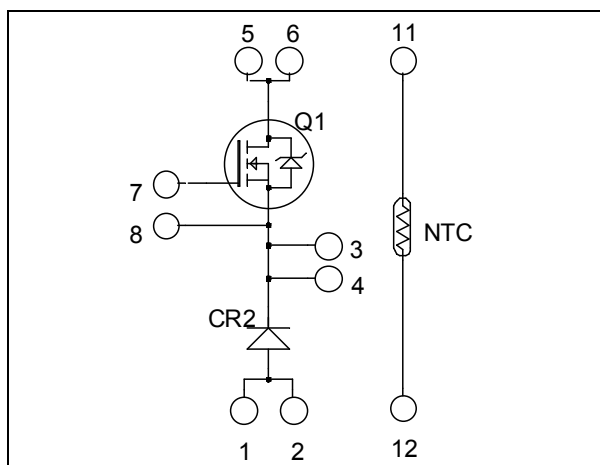


## Buck chopper Super Junction MOSFET SiC chopper diode



Pins 1/2 ; 3/4 ; 5/6 must be shorted together

$$V_{DSS} = 600V$$

$$R_{DSon} = 24m\Omega \text{ max @ } T_j = 25^{\circ}C$$

$$I_D = 95A \text{ @ } T_c = 25^{\circ}C$$

### Application

- AC and DC motor control
- Switched Mode Power Supplies

### Features

- **COOLMOS** Power Semiconductors
  - Ultra low  $R_{DSon}$
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
  - Very rugged
- **CR2 SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Very low stray inductance
- Internal thermistor for temperature monitoring
- High level of integration

### 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

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	600	V
$I_D$	Continuous Drain Current	$T_c = 25^{\circ}C$	A
		$T_c = 80^{\circ}C$	
$I_{DM}$	Pulsed Drain current	260	
$V_{GS}$	Gate - Source Voltage	$\pm 20$	V
$R_{DSon}$	Drain - Source ON Resistance	24	m $\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^{\circ}C$	W
$I_{AR}$	Avalanche current (repetitive and non repetitive)	15	A
$E_{AR}$	Repetitive Avalanche Energy	3	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1900	

**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	$V_{GS} = 0V, V_{DS} = 600V$ $T_j = 25^\circ\text{C}$			350	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 600V$ $T_j = 125^\circ\text{C}$			600	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 47.5A$			24	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5\text{mA}$	2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			200	nA

### Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V; V_{DS} = 25V$ $f = 1\text{MHz}$		14.4		nF
$C_{oss}$	Output Capacitance			17		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 95A$		300		nC
$Q_{gs}$	Gate – Source Charge			68		
$Q_{gd}$	Gate – Drain Charge			102		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive Switching (<math>125^\circ\text{C}</math>)</b> $V_{GS} = 10V$ $V_{Bus} = 400V$ $I_D = 95A$ $R_G = 2.5\Omega$		21		ns
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			100		
$T_f$	Fall Time			45		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 10V; V_{Bus} = 400V$ $I_D = 95A; R_G = 2.5\Omega$		810		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			1040		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 10V; V_{Bus} = 400V$ $I_D = 95A; R_G = 2.5\Omega$		1320		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			1270		

### CR2 SiC 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	$V_R = 600V$	$T_j = 25^\circ\text{C}$	200	800	$\mu\text{A}$
			$T_j = 175^\circ\text{C}$	400	4000	
$I_F$	DC Forward Current	$T_c = 100^\circ\text{C}$		40		A
$V_F$	Diode Forward Voltage	$I_F = 40A$	$T_j = 25^\circ\text{C}$	1.6	1.8	V
			$T_j = 175^\circ\text{C}$	2.0	2.4	
$Q_C$	Total Capacitive Charge	$I_F = 40A, V_R = 300V$ $di/dt = 1200A/\mu\text{s}$		56		nC
C	Total Capacitance	$f = 1\text{MHz}, V_R = 200V$		260		pF
		$f = 1\text{MHz}, V_R = 400V$		200		

## Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case Thermal Resistance		Transistor			0.27	°C/W
			SiC Diode			0.8	
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>STG</sub>	Storage Temperature Range			-40		125	
T <sub>C</sub>	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					80	g

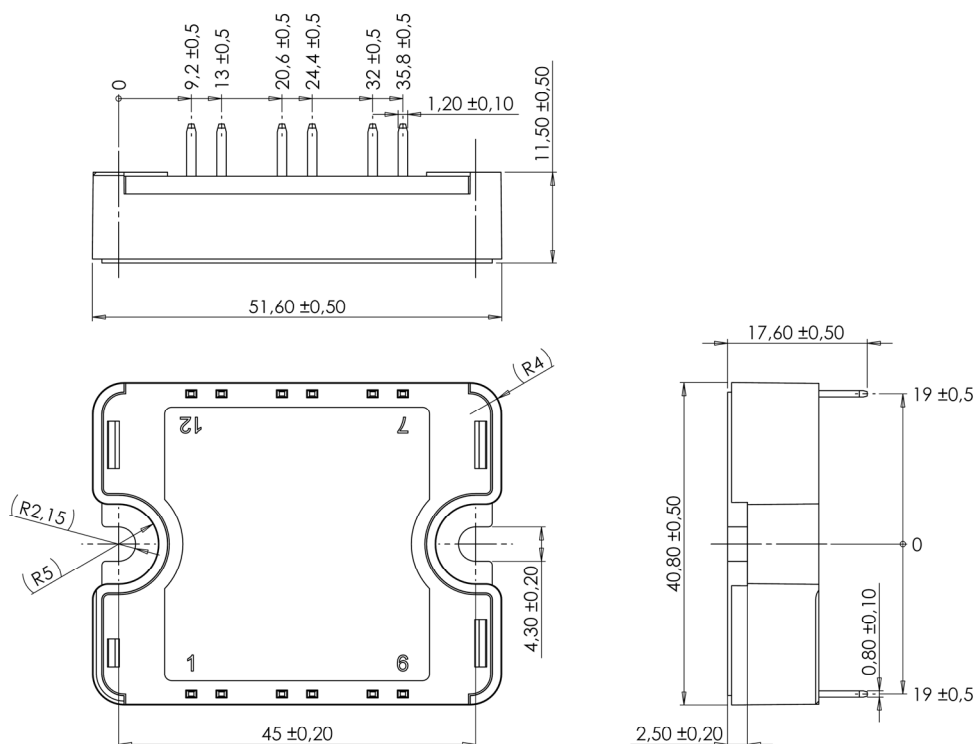
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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		%

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

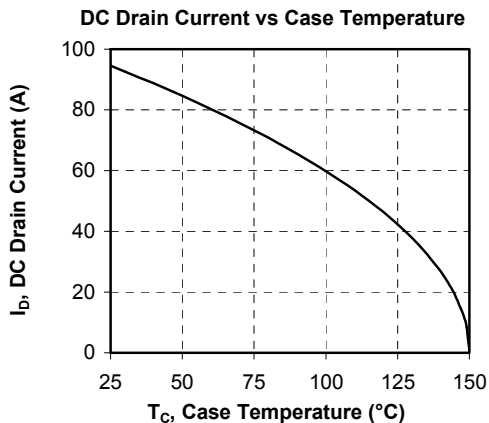
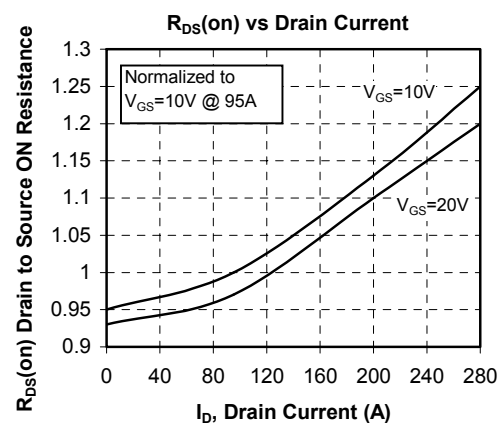
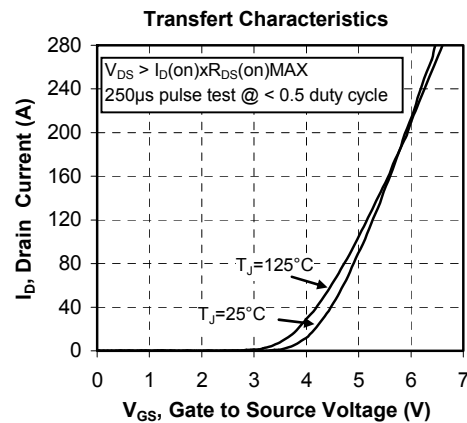
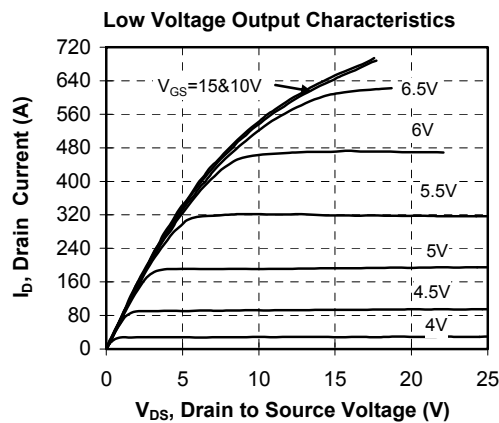
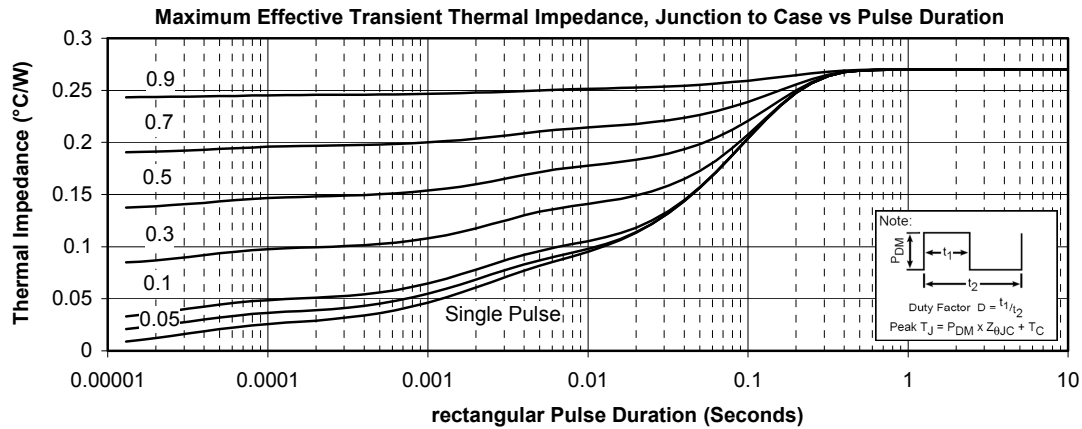
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

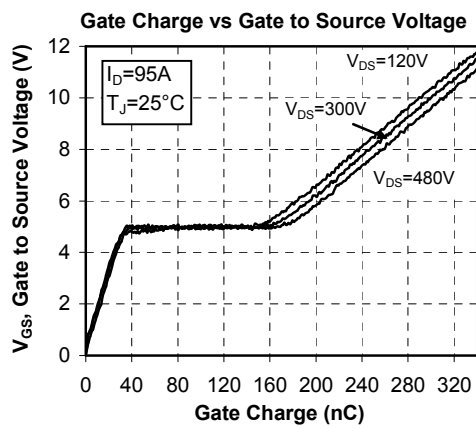
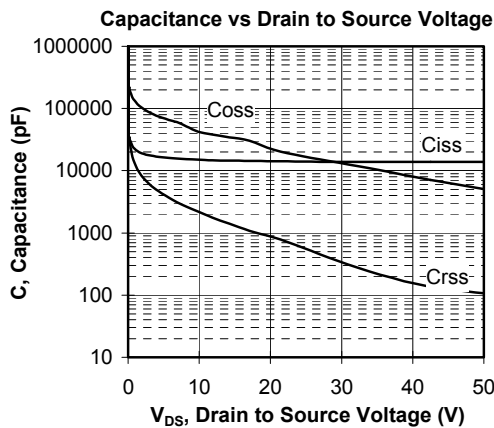
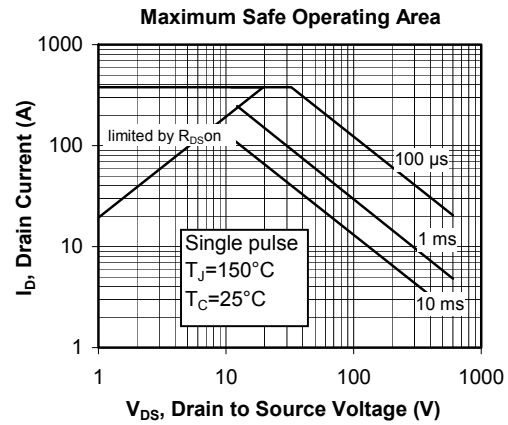
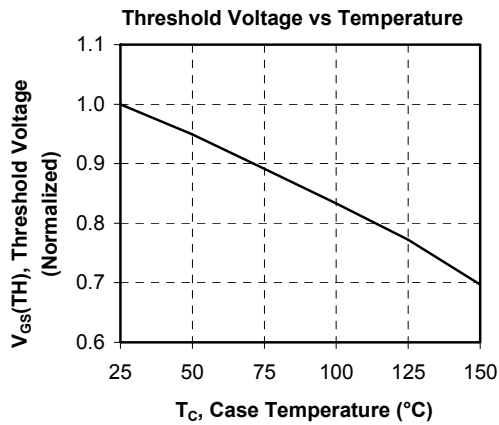
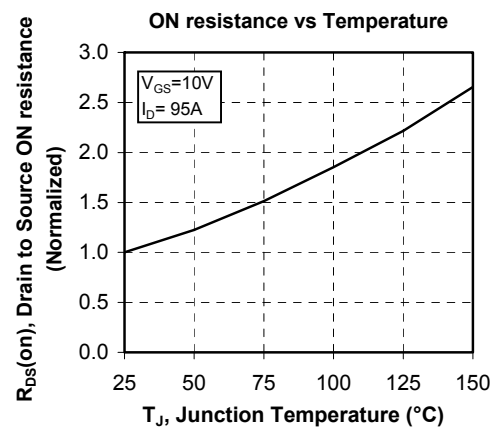
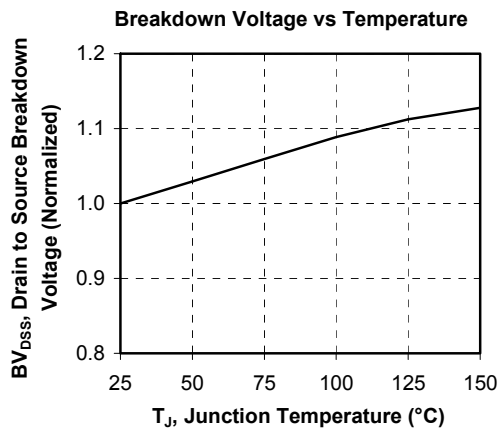
## SP1 Package outline (dimensions in mm)

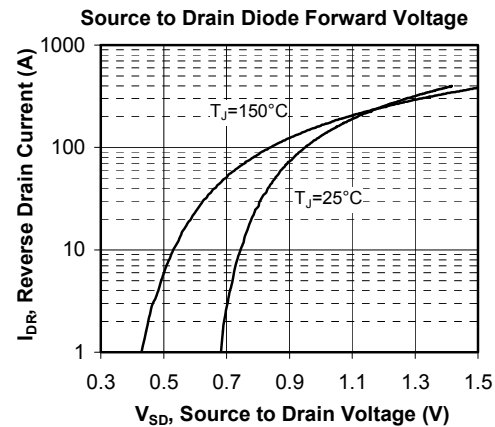
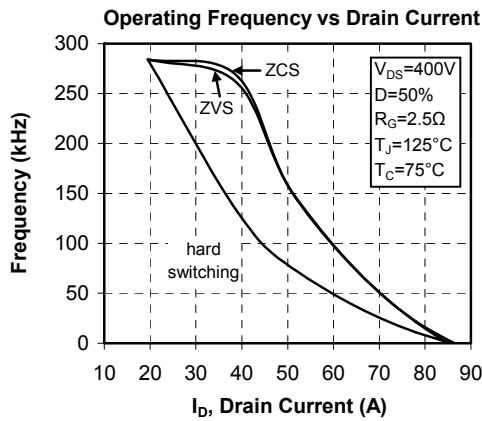
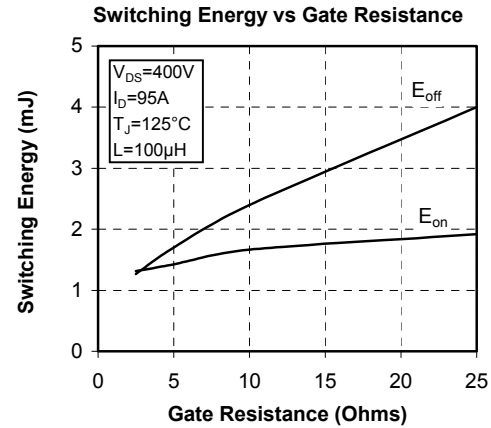
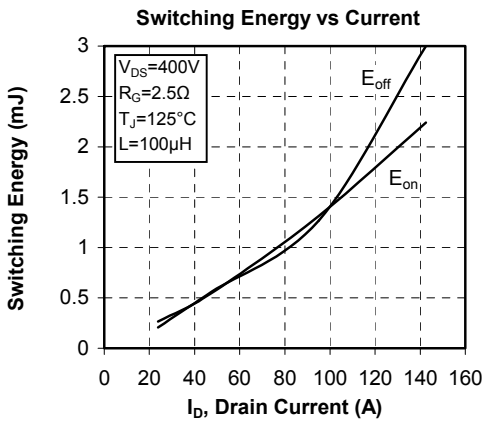
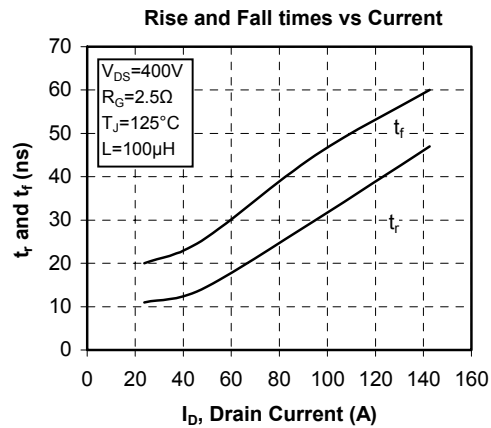
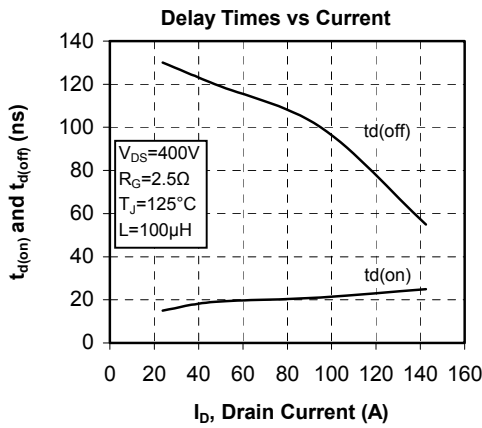


See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

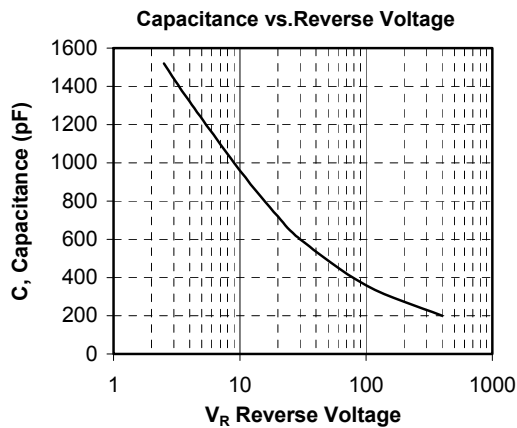
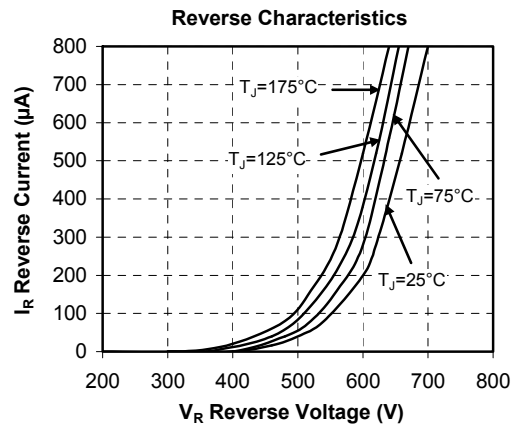
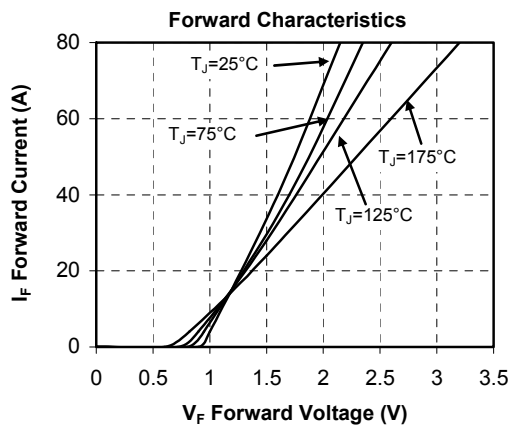
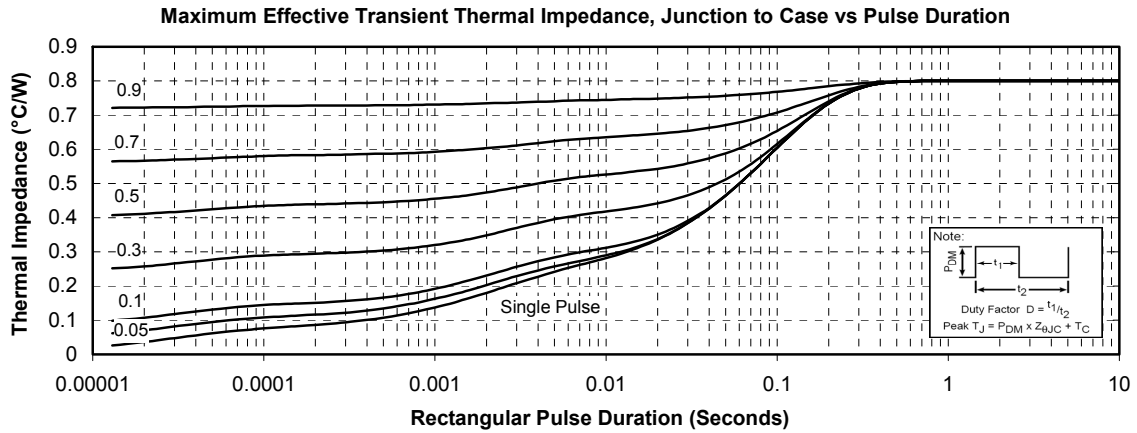
## Typical CoolMOS Performance Curve







## Typical CR2 SiC Diode Performance Curve



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