

Buck chopper Super Junction MOSFET SiC chopper diode

$$V_{DSS} = 600V$$

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

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

Application

- AC and DC motor control
- Switched Mode Power Supplies

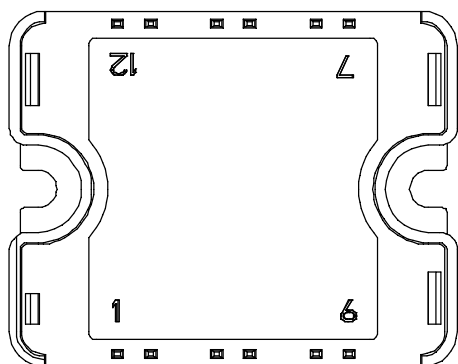
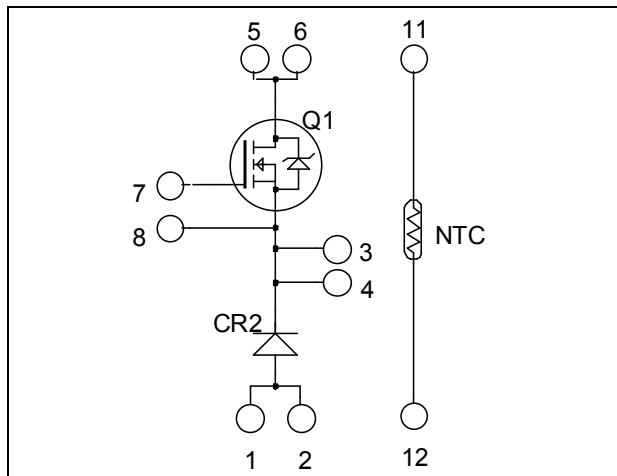
Features



- 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



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

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	600	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	95
		$T_c = 80^\circ C$	70
I_{DM}	Pulsed Drain current	260	A
V_{GS}	Gate - Source Voltage	± 20	V
R_{DSon}	Drain - Source ON Resistance	24	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	462
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

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	μA
		$V_{GS} = 0V, V_{DS} = 600V$ $T_j = 125^\circ\text{C}$			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	Inductive Switching (125°C) $V_{GS} = 10V$ $V_{Bus} = 400V$ $I_D = 95A$ $R_G = 2.5\Omega$		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	Inductive switching @ 25°C $V_{GS} = 10V ; V_{Bus} = 400V$ $I_D = 95A ; R_G = 2.5\Omega$		810		μJ
E_{off}	Turn-off Switching Energy			1040		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 10V ; V_{Bus} = 400V$ $I_D = 95A ; R_G = 2.5\Omega$		1320		μJ
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	μA
			$T_j = 175^\circ\text{C}$	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 _{thJC}	Junction to Case Thermal Resistance	Transistor			0.27	°C/W
		SiC Diode			0.8	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1mA, 50/60Hz		4000			V
T _J	Operating junction temperature range		-40		150	°C
T _{STG}	Storage Temperature Range		-40		125	
T _C	Operating Case Temperature		-40		100	
Torque	Mounting torque	To heatsink	M4	2.5	4.7	N.m
Wt	Package Weight				80	g

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

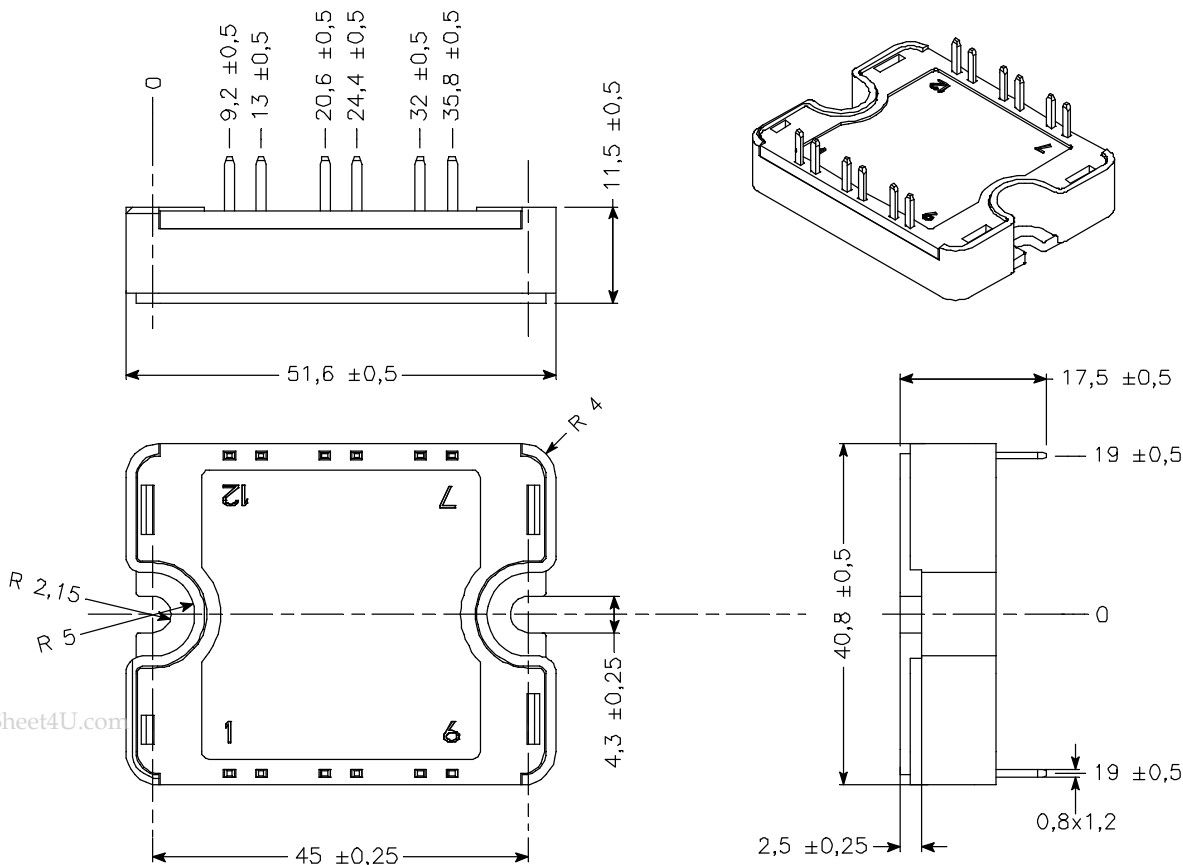
Symbol Characteristic

		Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B	T _C = 100°C		4		%

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

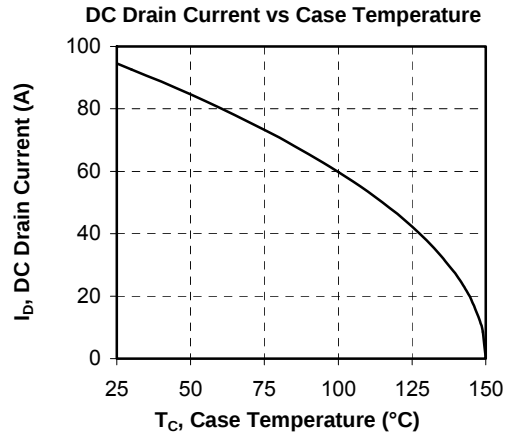
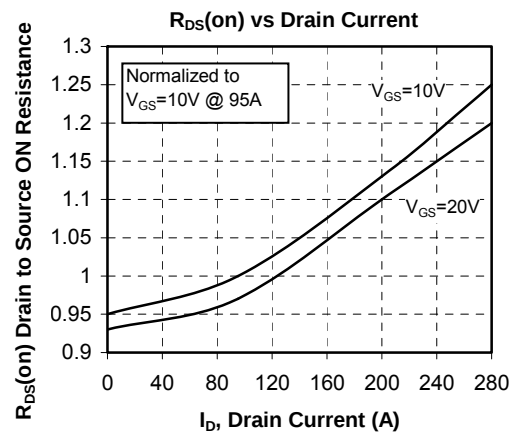
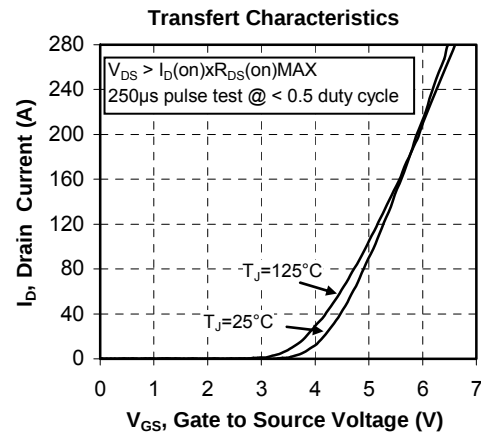
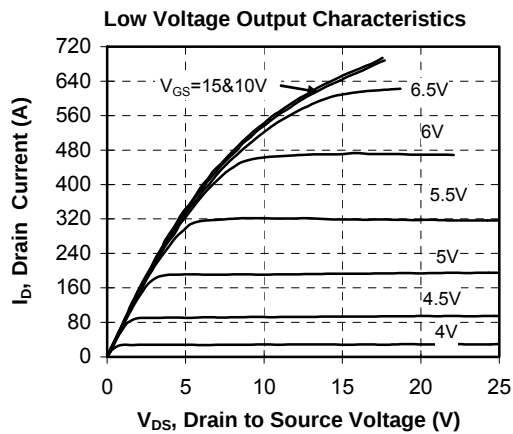
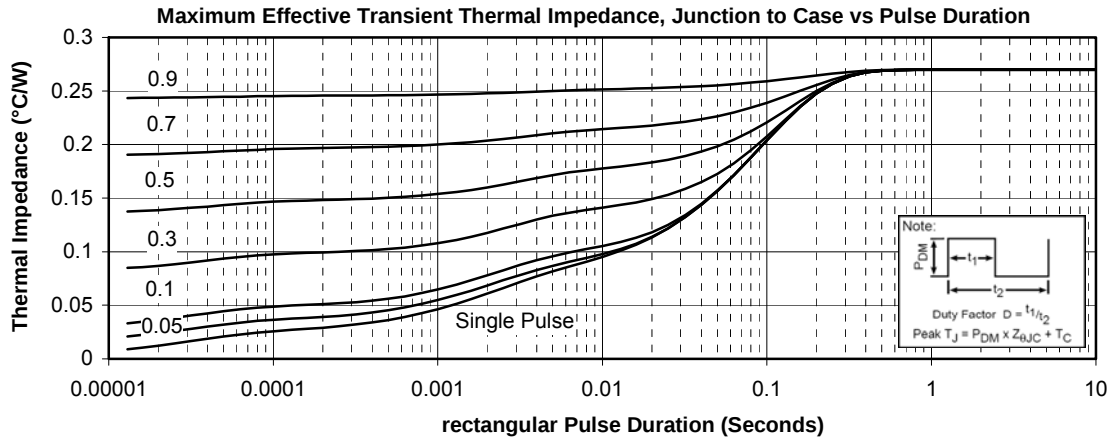
T: Thermistor temperature
 R_T: Thermistor value at T

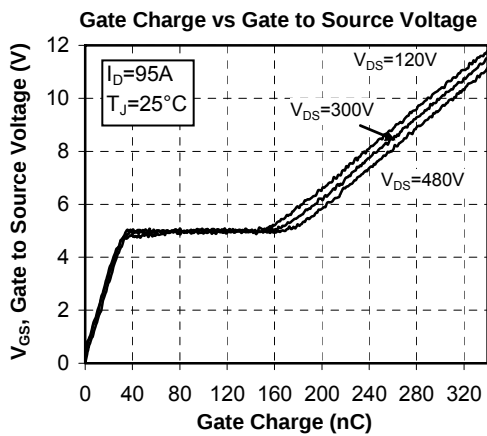
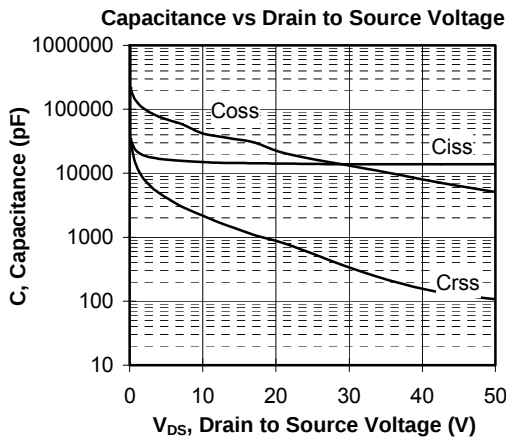
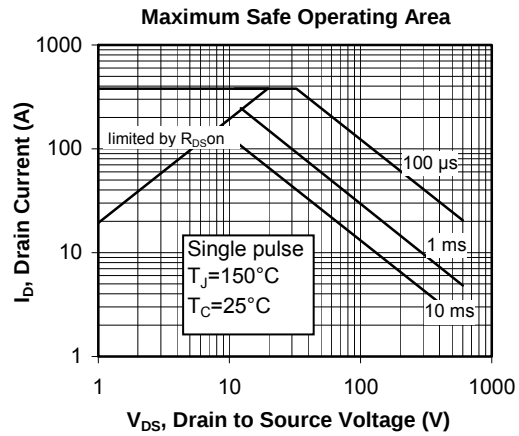
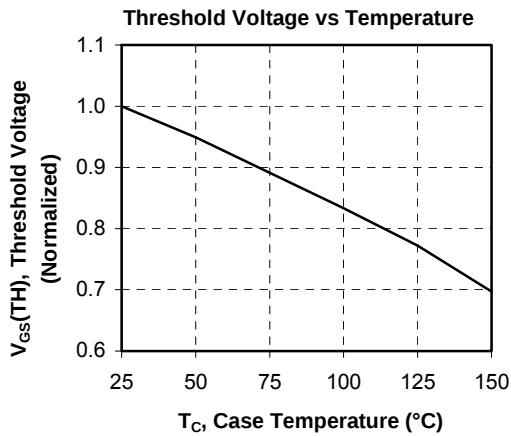
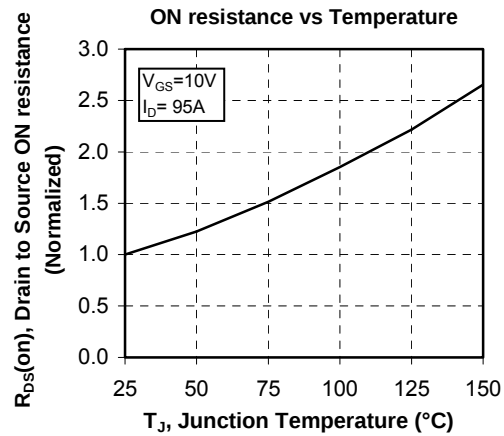
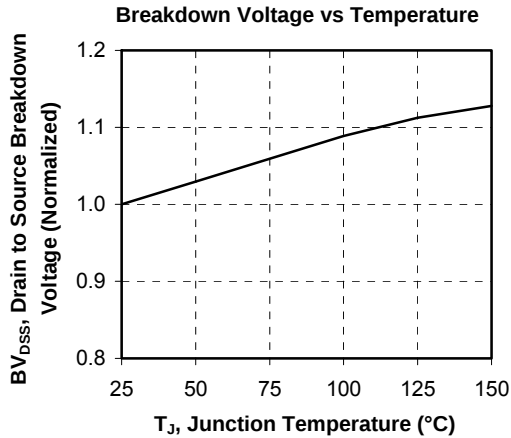
SP1 Package outline (dimensions in mm)

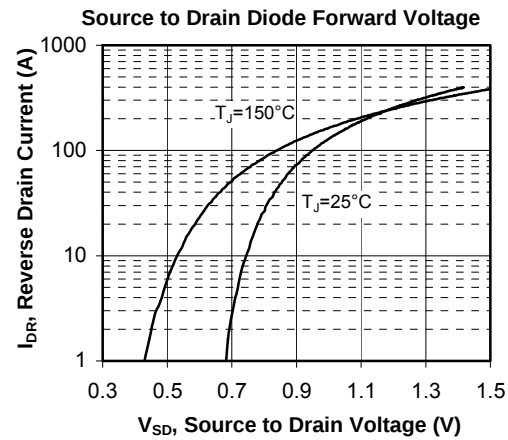
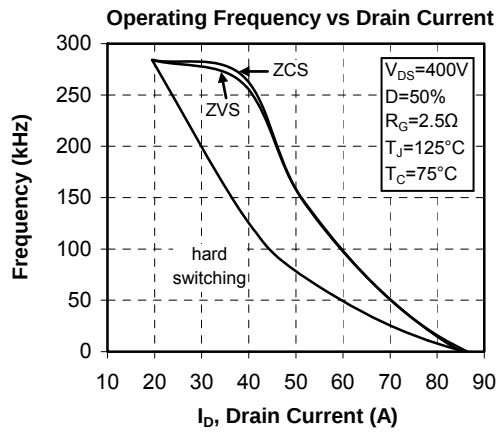
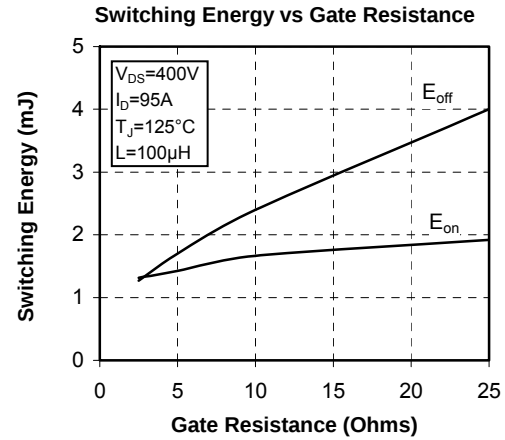
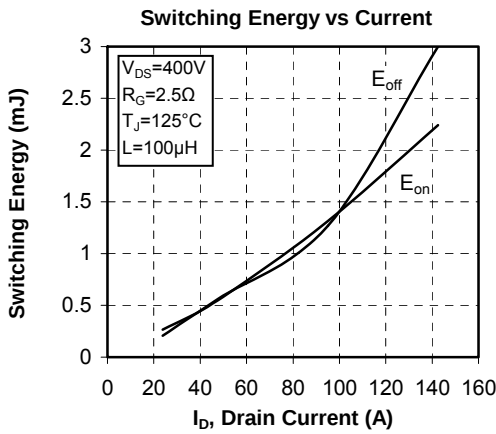
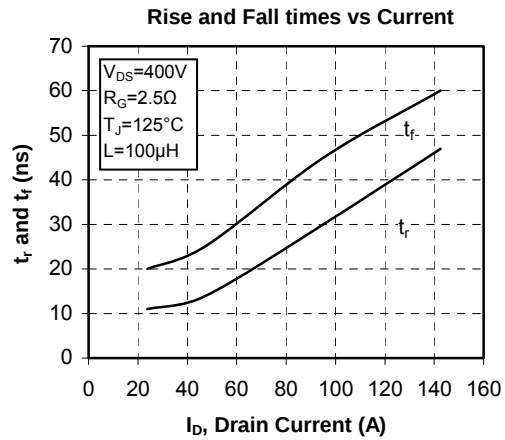
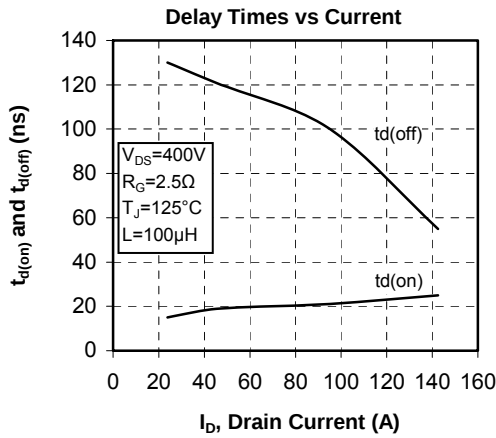


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

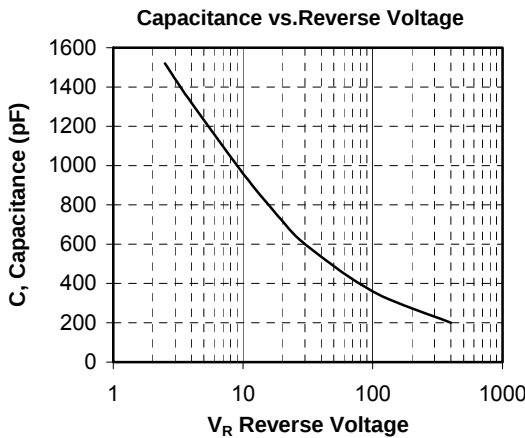
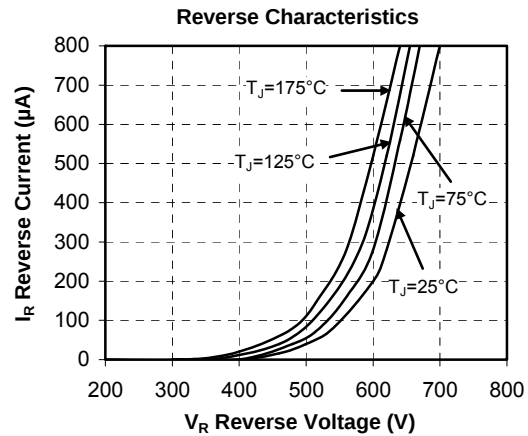
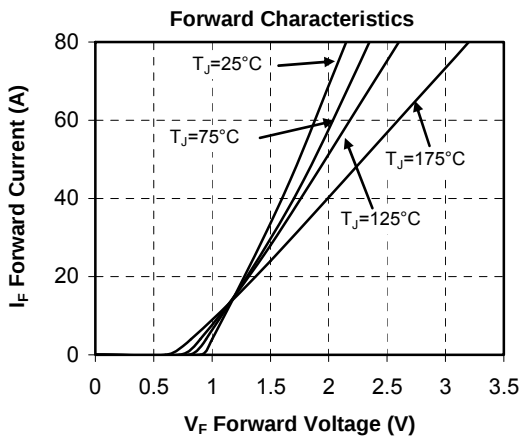
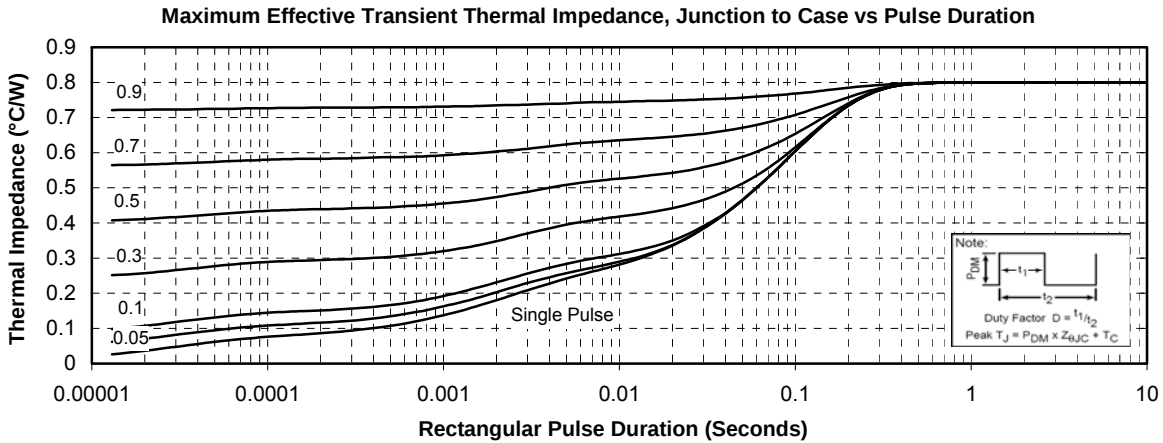
Typical CoolMOS Performance Curve







Typical CR2 SiC Diode Performance Curve



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