

**Boost chopper
SiC FWD diode
Super Junction
MOSFET Power Module**

$$V_{DSS} = 600V$$

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

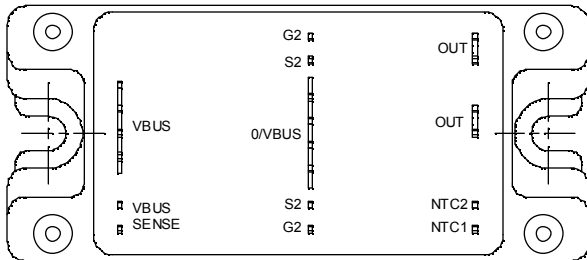
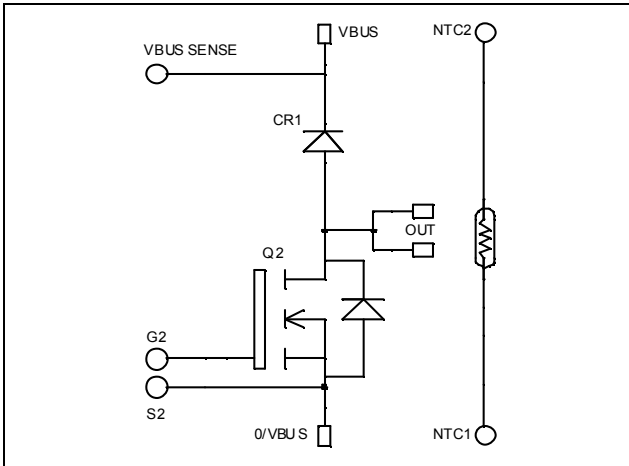
$$I_D = 143A \text{ @ } T_c = 25^\circ C$$

Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features

- **COOLMOS** Power Semiconductors
 - Ultra low R_{DSon}
 - Low Miller capacitance
 - Ultra low gate charge
 - Avalanche energy rated
- **FWD 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
 - Lead frames for power connections
- 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	$T_c = 25^\circ C$	143
		$T_c = 80^\circ C$	107
I_{DM}	Pulsed Drain current	572	
V_{GS}	Gate - Source Voltage	± 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

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	$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$			100	μA
		$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	$T_j = 25^\circ\text{C}$		1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 71.5\text{A}$			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	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$		28		nF
C_{oss}	Output Capacitance			10.2		
C_{rss}	Reverse Transfer Capacitance			0.85		
Q_g	Total gate Charge	$V_{GS} = 10\text{V}$ $V_{Bus} = 300\text{V}$ $I_D = 143\text{A}$		1036		nC
Q_{gs}	Gate – Source Charge			116		
Q_{gd}	Gate – Drain Charge			444		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_D = 143\text{A}$ $R_G = 1.2\Omega$		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	Inductive switching @ 25°C $V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		1608		μJ
E_{off}	Turn-off Switching Energy			3920		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		2630		μJ
E_{off}	Turn-off Switching Energy			4824		

Chopper 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	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$	0.5	2	mA
			$T_j = 175^\circ\text{C}$	1	10	
I_F	DC Forward Current	$T_c = 125^\circ\text{C}$		100		A
V_F	Diode Forward Voltage	$I_F = 100\text{A}$	$T_j = 25^\circ\text{C}$	1.6	1.8	V
			$T_j = 175^\circ\text{C}$	2.0	2.4	
Q_C	Total Capacitive Charge	$I_F = 100\text{A}, V_R = 300\text{V}$ $di/dt = 2400\text{A}/\mu\text{s}$		140		nC
C	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$		650		pF
		$f = 1\text{MHz}, V_R = 400\text{V}$		500		

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R _{thJC}	Junction to Case Thermal Resistance	Transistor		0.15	°C/W	
		Diode		0.28		
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	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

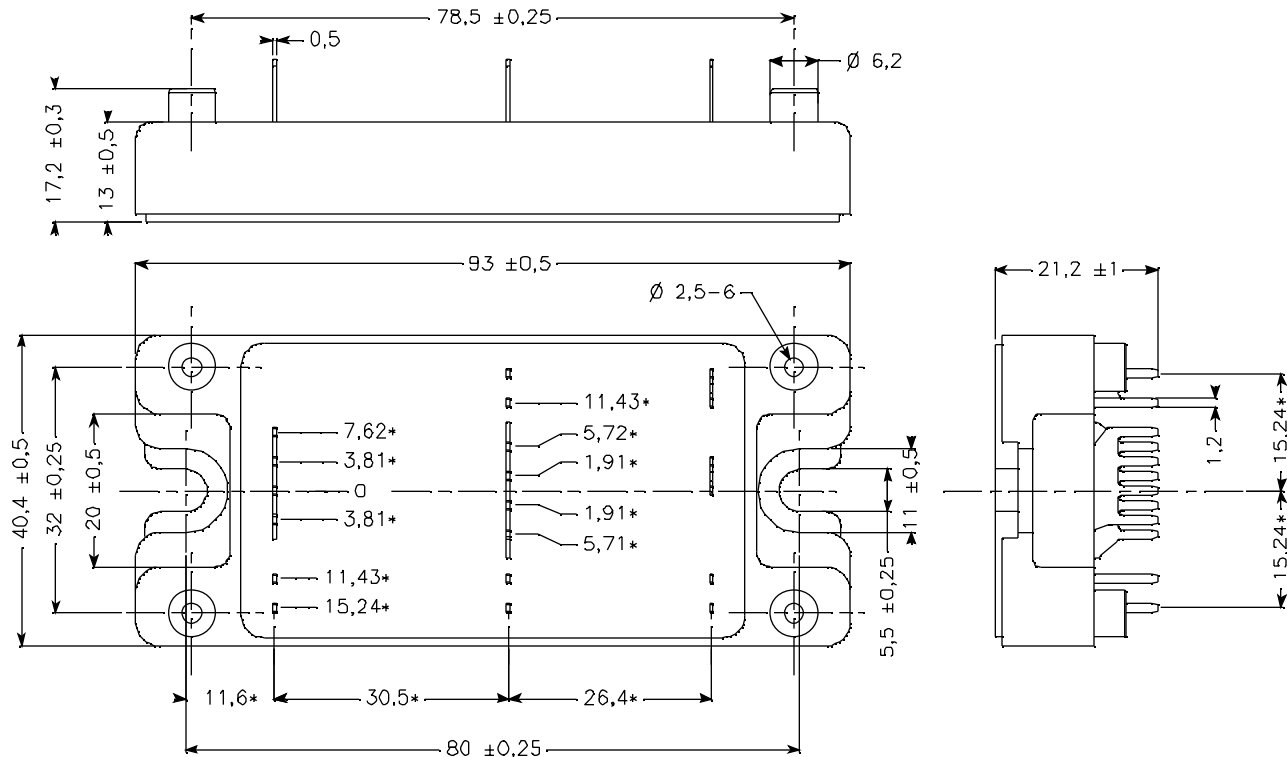
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

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

T: Thermistor temperature
 R_T: Thermistor value at T

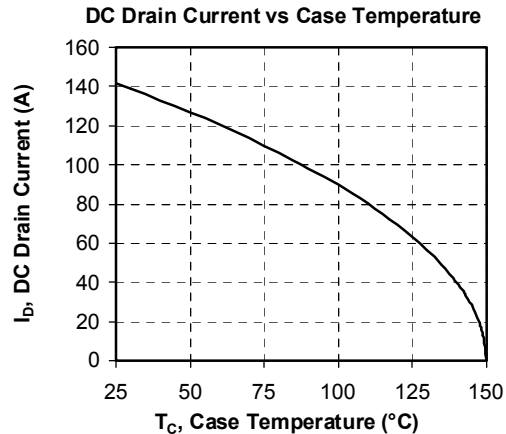
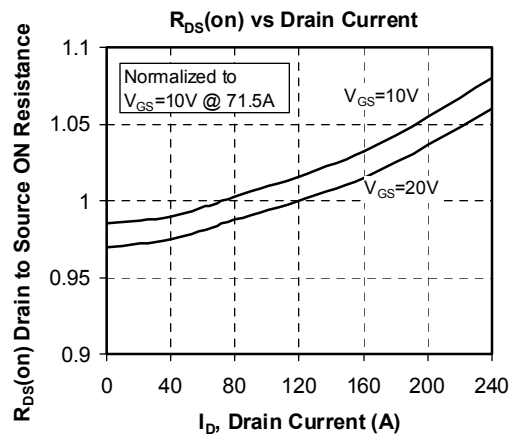
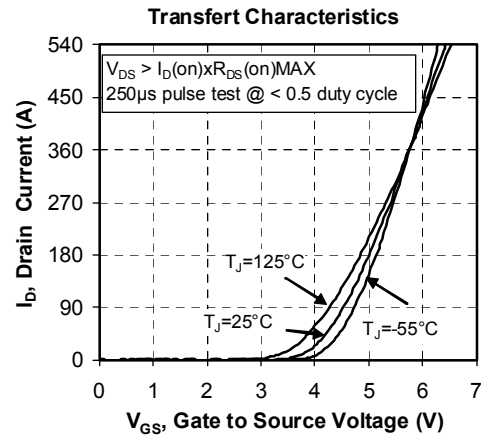
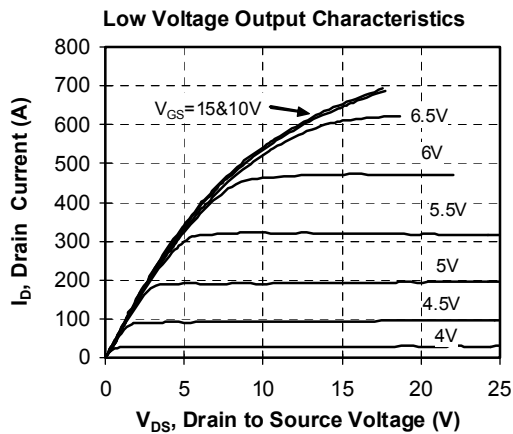
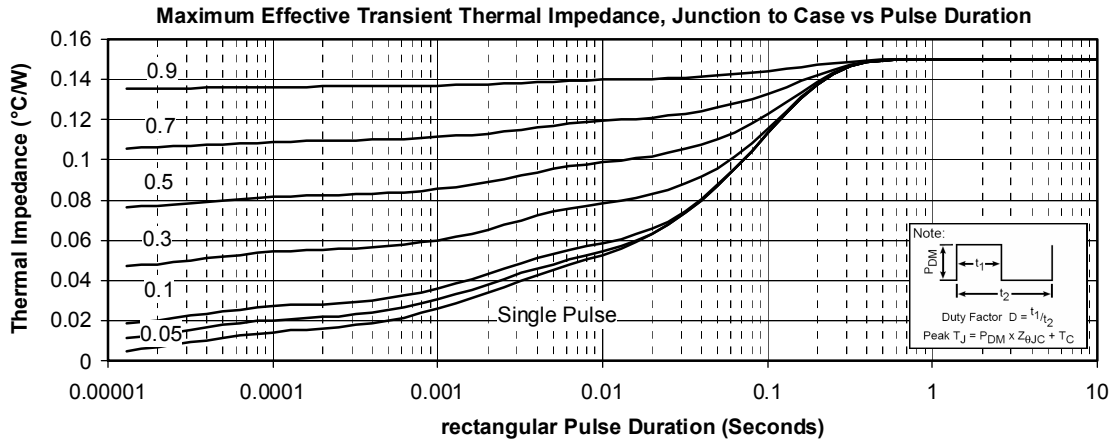
SP4 Package outline (dimensions in mm)

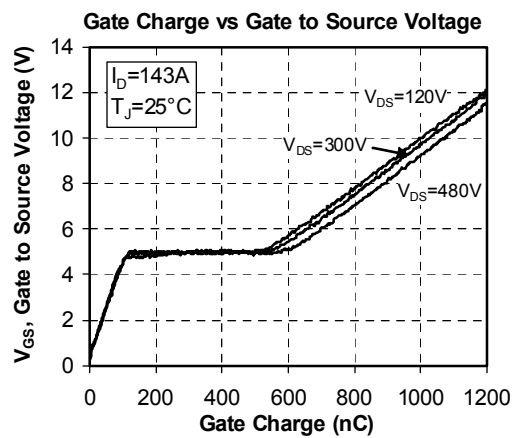
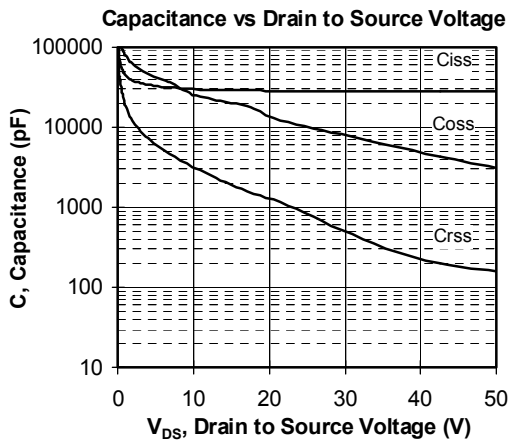
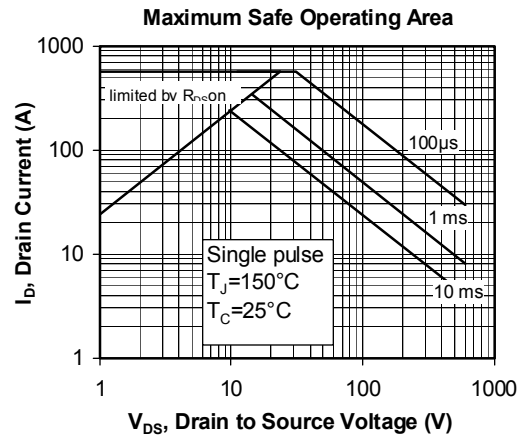
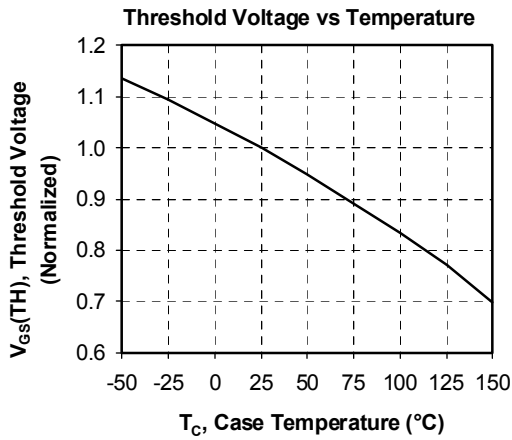
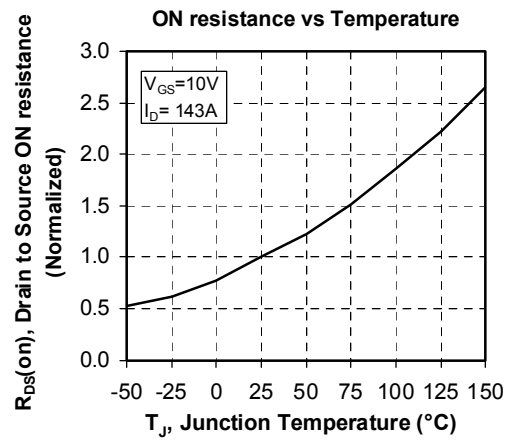
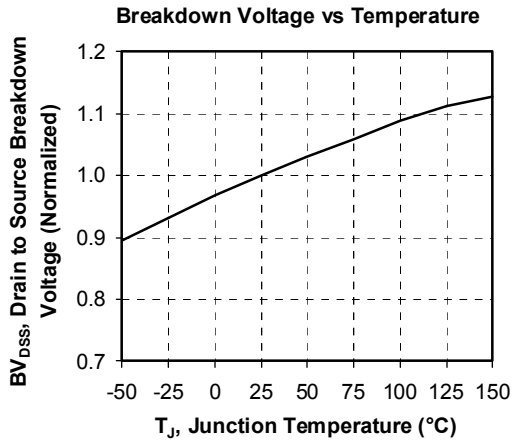


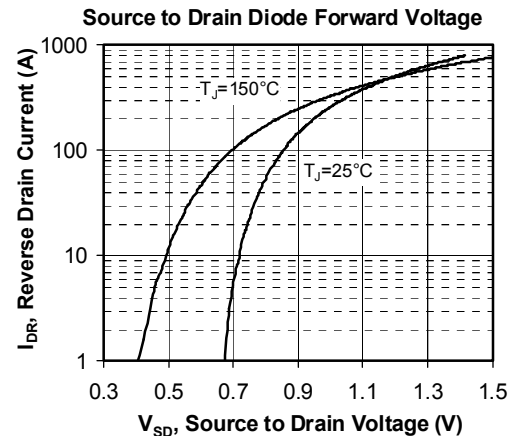
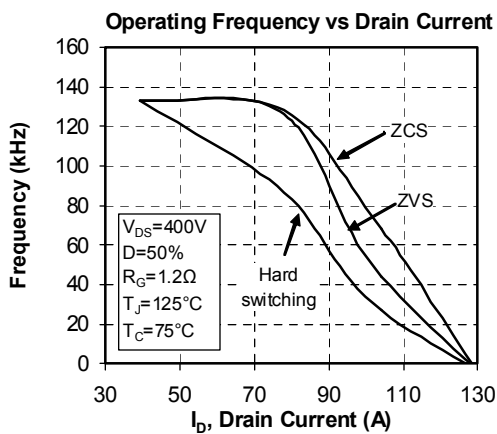
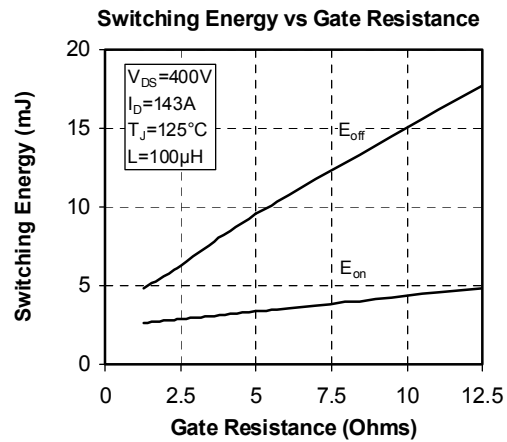
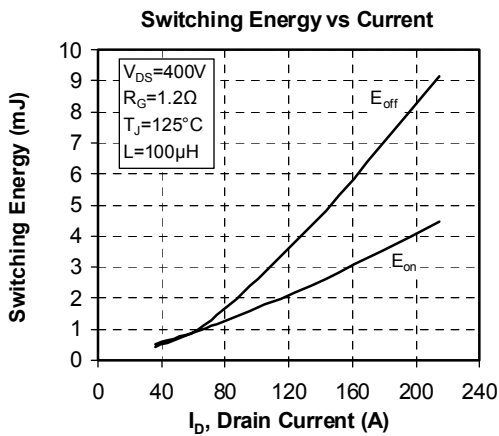
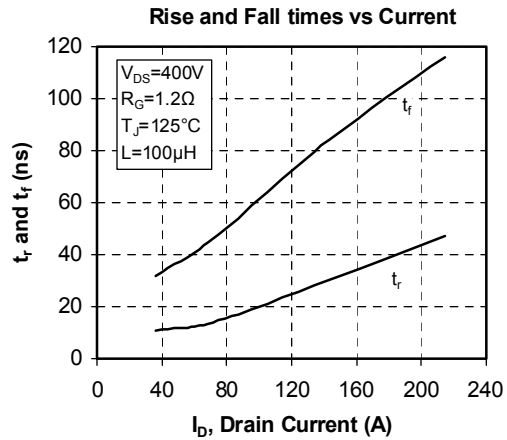
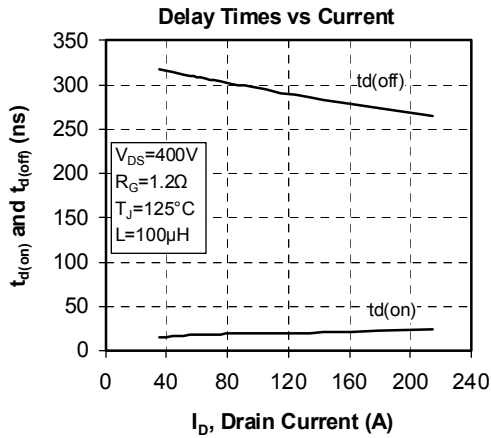
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: ± 0.1

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

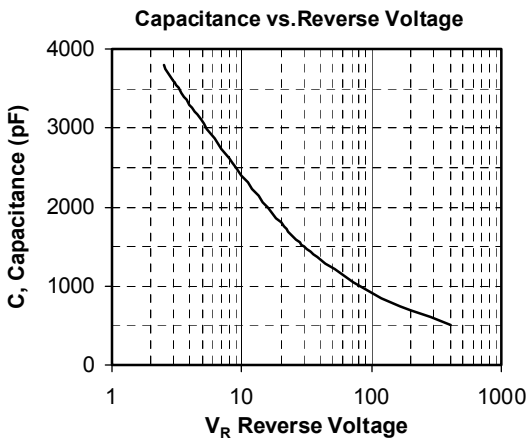
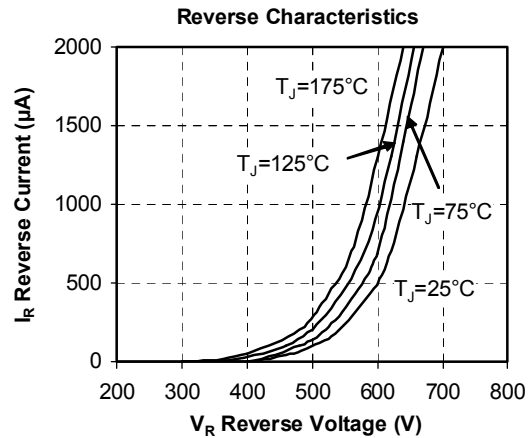
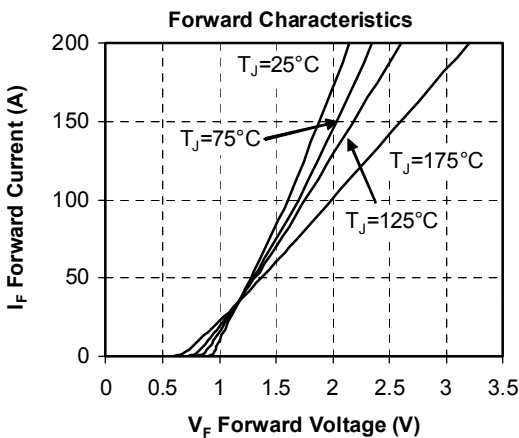
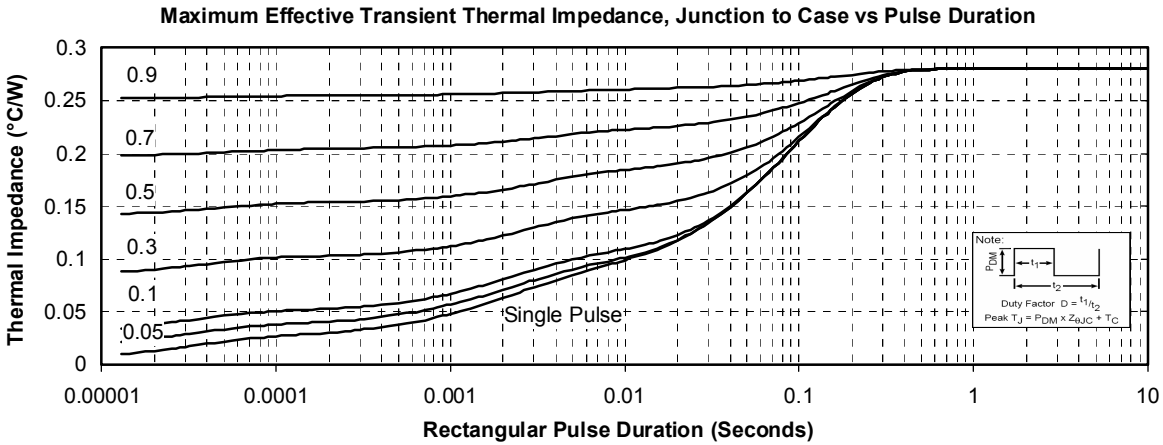
Typical CoolMOS Performance Curve







Typical SiC Diode Performance Curve



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