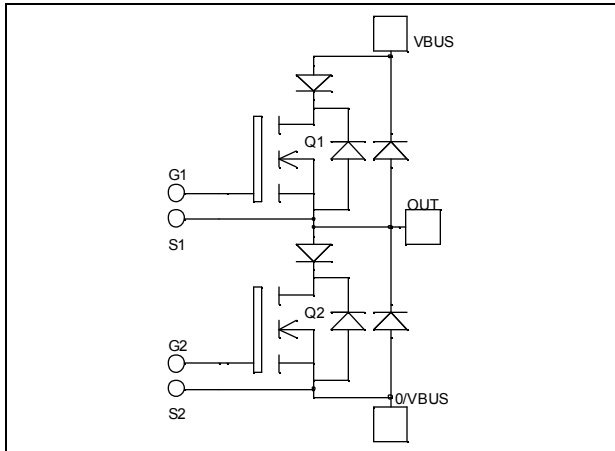


*Phase leg
Series & SiC parallel diodes
Super Junction
MOSFET Power Module*

$$V_{DSS} = 600V$$

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

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

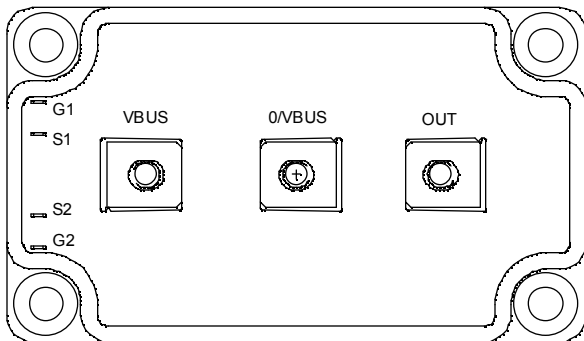


Application

- 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	± 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	$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	$T_j = 25^\circ\text{C}$			100	μA
		$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	$T_j = 125^\circ\text{C}$			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		21		ns
T_r	Rise Time	$V_{GS} = 15\text{V}$		30		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		283		
T_f	Fall Time	$I_D = 143\text{A}$ $R_G = 1.2\Omega$		84		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C		1608		μJ
E_{off}	Turn-off Switching Energy	$V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		3920		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C		2630		μJ
E_{off}	Turn-off Switching Energy	$V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		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	$V_R = 200\text{V}$	$T_j = 25^\circ\text{C}$		350	μA
			$T_j = 125^\circ\text{C}$		600	
I_F	DC Forward Current			120		A
V_F	Diode Forward Voltage	$I_F = 120\text{A}$		1.1	1.15	V
		$I_F = 240\text{A}$		1.4		
		$I_F = 120\text{A}$	$T_j = 125^\circ\text{C}$	0.9		
t_{rr}	Reverse Recovery Time	$I_F = 120\text{A}$ $V_R = 133\text{V}$ $di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	31		ns
			$T_j = 125^\circ\text{C}$	60		
Q_{rr}	Reverse Recovery Charge	$I_F = 120\text{A}$ $V_R = 133\text{V}$ $di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	120		nC
			$T_j = 125^\circ\text{C}$	500		

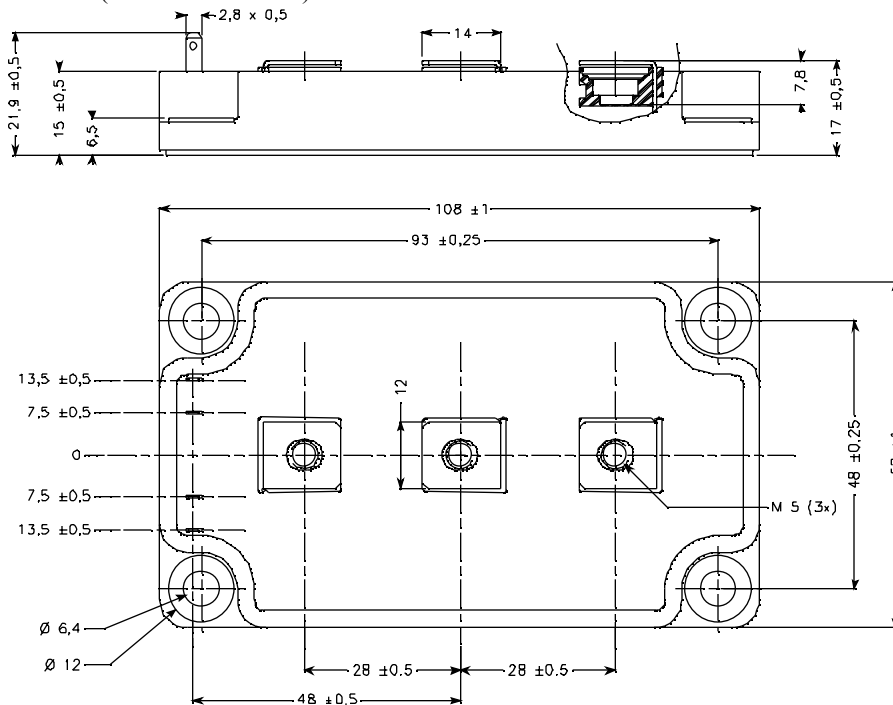
Parallel diode ratings and characteristics

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	μA
			$T_j = 175^\circ C$		800	8000	
I_F	DC Forward Current		$T_c = 125^\circ C$		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

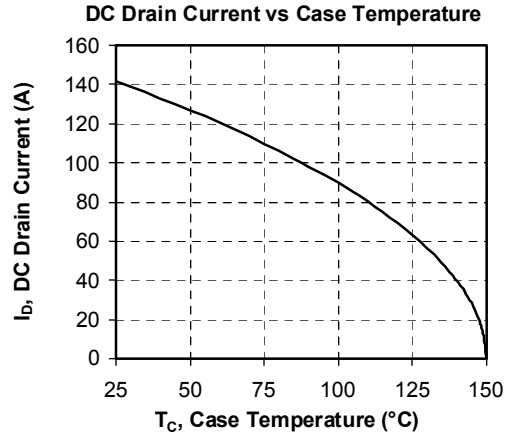
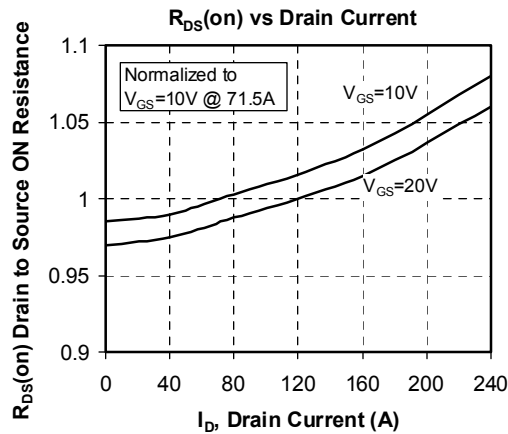
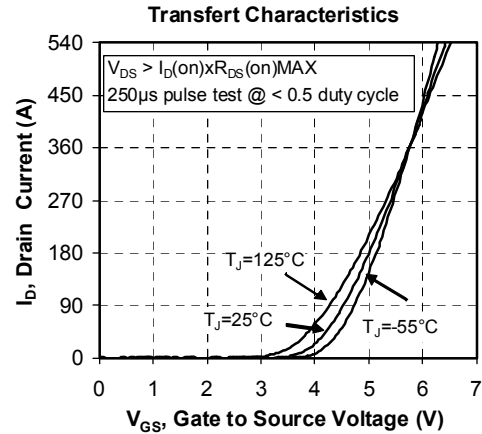
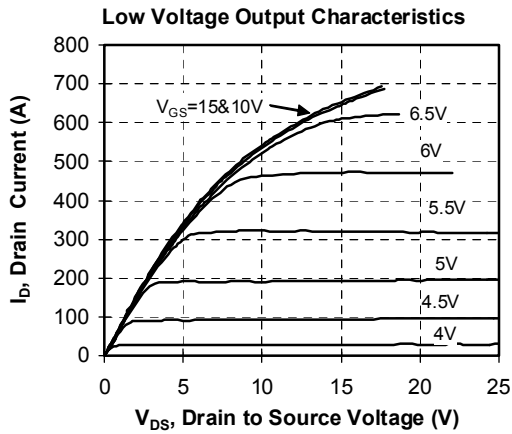
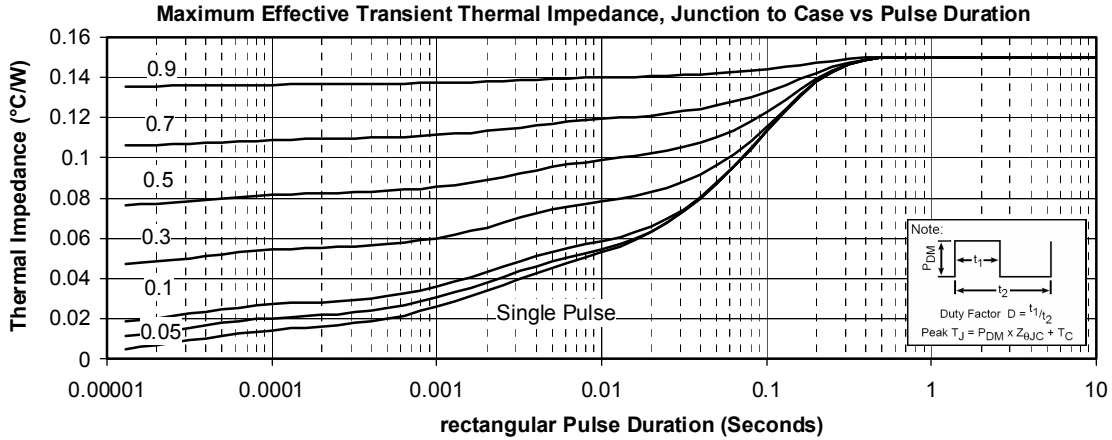
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance	Transistor				0.15	$^\circ C/W$
		Series diode				0.46	
		Parallel diode				0.35	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol} < 1mA$, 50/60Hz			2500			V
T_J	Operating junction temperature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

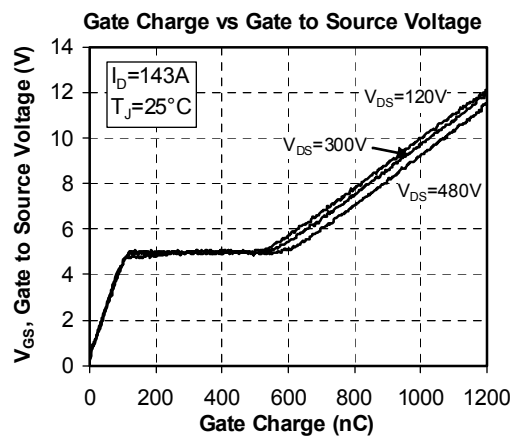
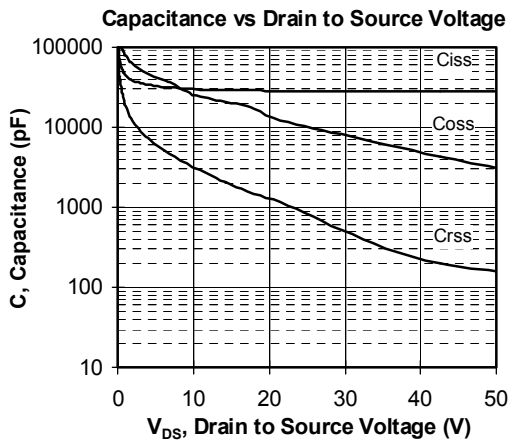
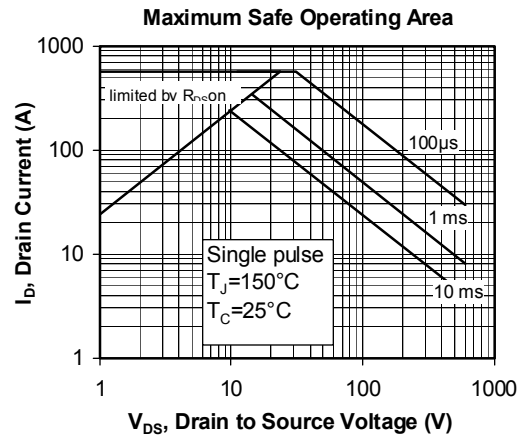
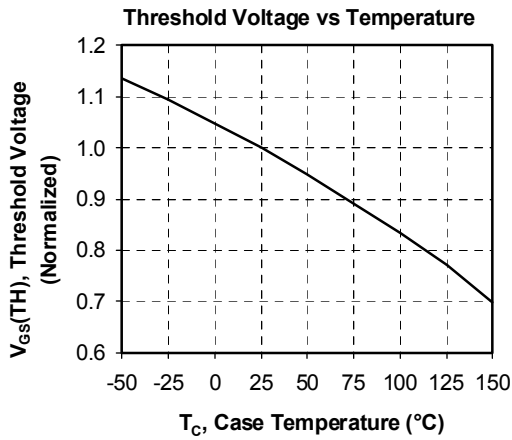
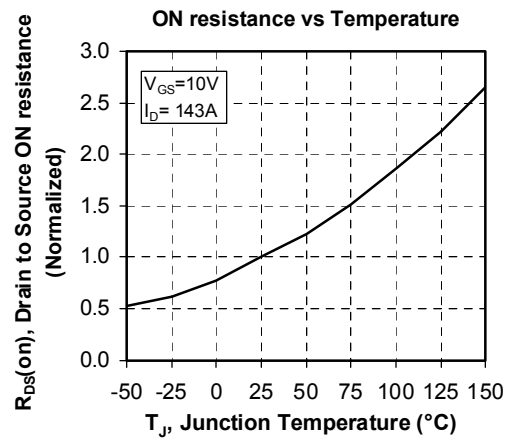
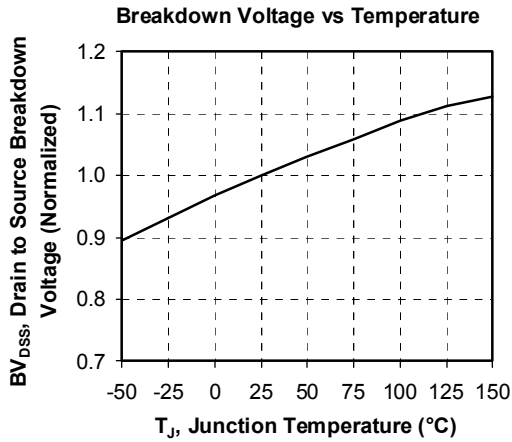
SP6 Package outline (dimensions in mm)

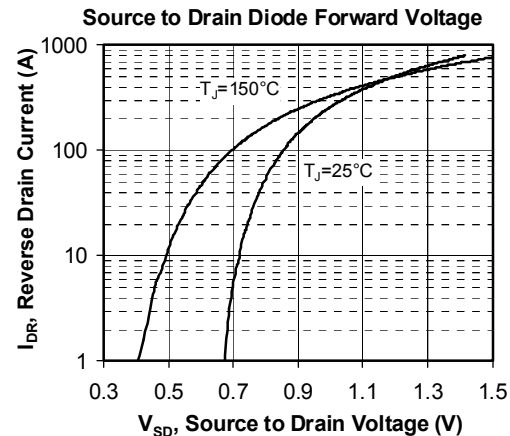
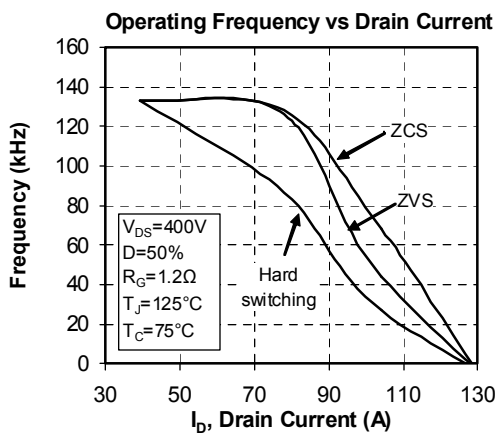
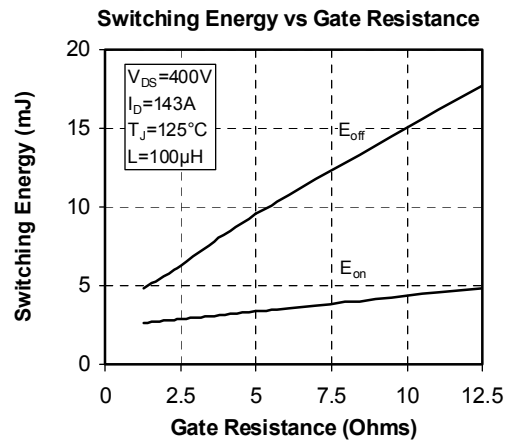
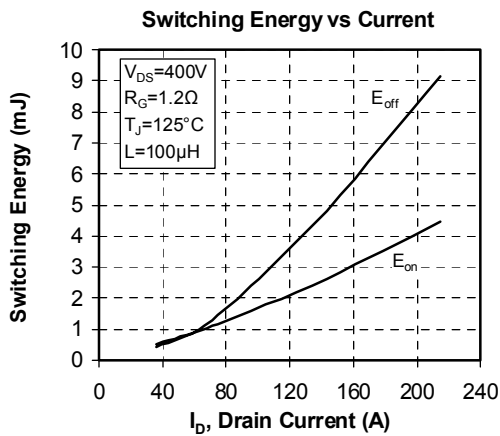
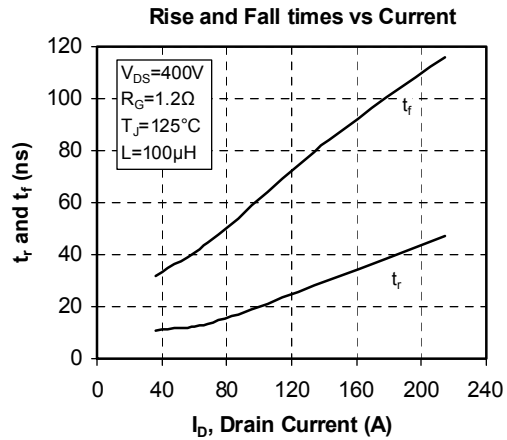
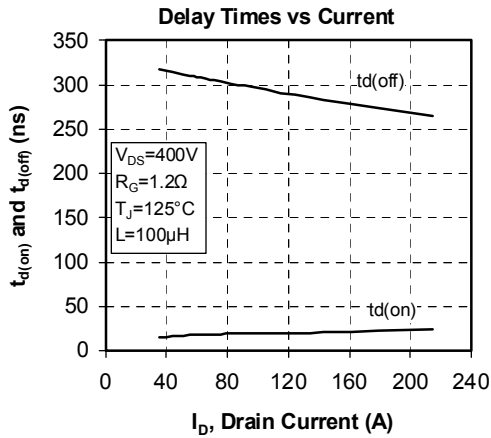


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

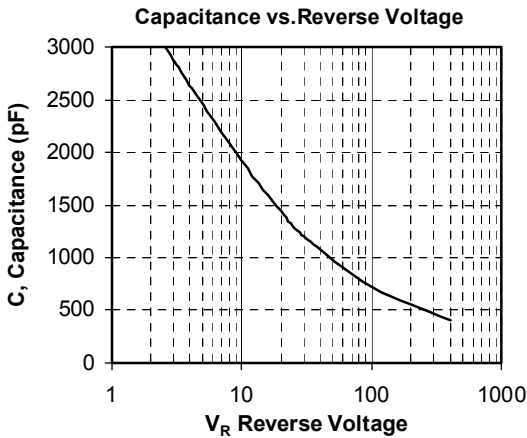
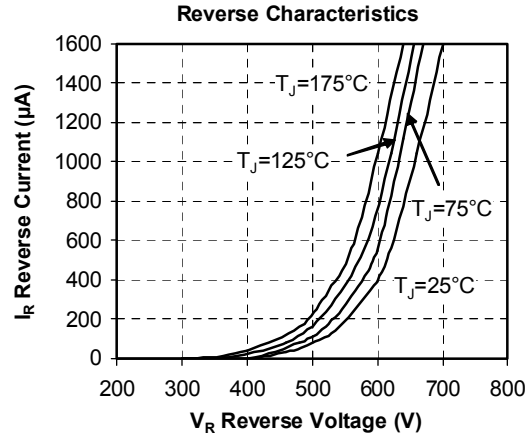
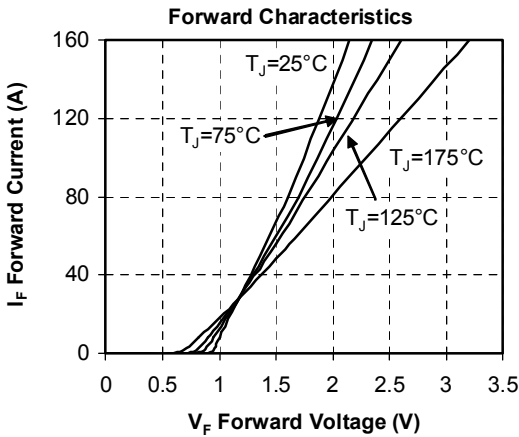
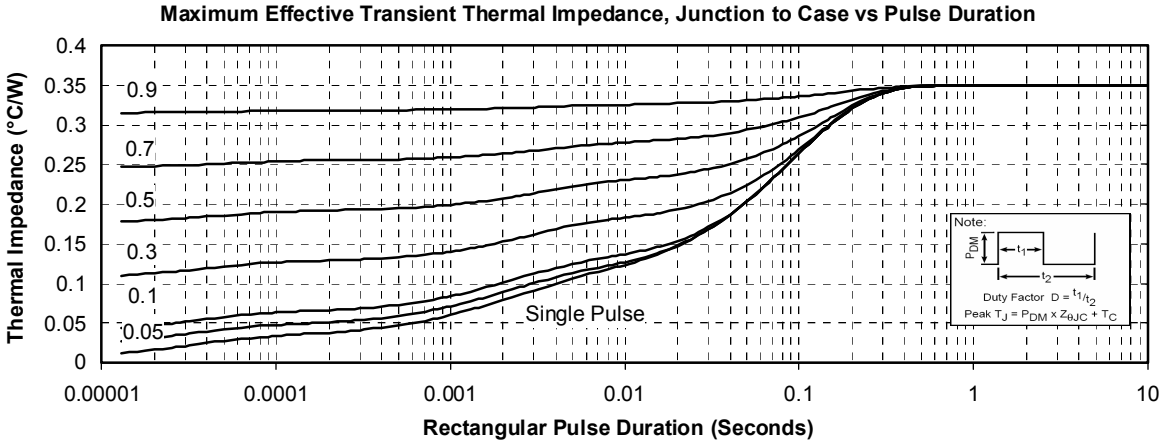
Typical CoolMOS Performance Curve







Typical SiC Diode Performance Curve



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