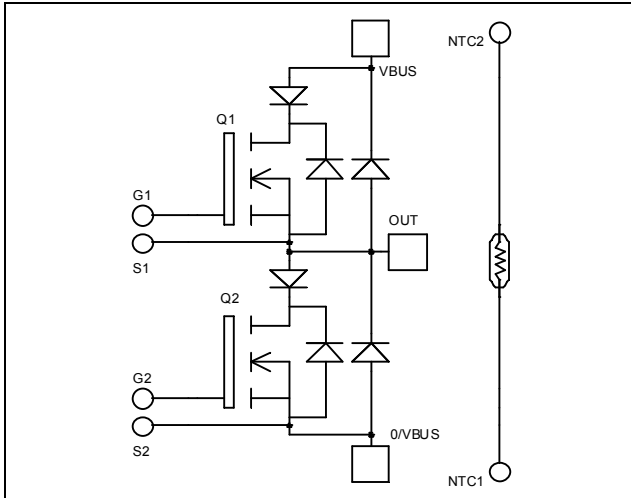


*Phase leg
Series & SiC parallel diodes
Super Junction
MOSFET Power Module*

**$V_{DSS} = 600V$
 $R_{DSon} = 35m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 72A \text{ @ } T_c = 25^\circ C$**

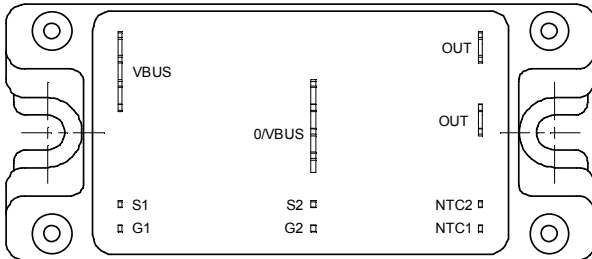


Application

- 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
 - 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

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	600	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	72
		$T_c = 80^\circ C$	54
I_{DM}	Pulsed Drain current	288	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	35	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	416
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.

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain - Source Breakdown Voltage	$V_{GS} = 0V, I_D = 500\mu A$	600			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 600V, T_j = 25^\circ\text{C}$			50	μA
		$V_{GS} = 0V, V_{DS} = 600V, T_j = 125^\circ\text{C}$			500	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 36A$			35	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2mA$	2.1	3	3.9	V
I_{GSS}	Gate - Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		14		nF
C_{oss}	Output Capacitance			5.13		
C_{rss}	Reverse Transfer Capacitance			0.42		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 72A$		518		nC
Q_{gs}	Gate - Source Charge			58		
Q_{gd}	Gate - Drain Charge			222		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 72A$ $R_G = 2.5\Omega$		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 $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 72A, R_G = 2.5\Omega$		804		μJ
E_{off}	Turn-off Switching Energy ❶			1960		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 72A, R_G = 2.5\Omega$		1315		μJ
E_{off}	Turn-off Switching Energy ❶			2412		

❶ In accordance with JEDEC standard JESD24-1.

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle, $T_c = 85^\circ\text{C}$		60		A
V_F	Diode Forward Voltage	$I_F = 60A$		1.1	1.15	V
		$I_F = 120A$		1.4		
		$I_F = 60A, T_j = 125^\circ\text{C}$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		24		ns
		$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 125^\circ\text{C}$		48		
Q_{rr}	Reverse Recovery Charge	$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		66		nC
		$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 125^\circ\text{C}$		300		

Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	$T_c = 125^\circ\text{C}$		40		A
V_F	Diode Forward Voltage	$I_F = 40\text{A}$	$T_j = 25^\circ\text{C}$		1.6	1.8	V
			$T_j = 175^\circ\text{C}$		2.0	2.4	
Q_C	Total Capacitive Charge	$I_F = 40\text{A}, V_R = 300\text{V}$ $di/dt = 1200\text{A}/\mu\text{s}$			56		nC
Q	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$			260		pF
		$f = 1\text{MHz}, V_R = 400\text{V}$			200		

Thermal and package characteristics

Symbol	Characteristic		Min	Typ	Max	Unit
R_{thJC}	Junction to Case	Transistor			0.3	$^\circ\text{C}/\text{W}$
		Series diode			0.65	
		Parallel diode			0.8	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t = 1\text{ min}$, $I_{isol} < 1\text{mA}$, 50/60Hz		2500			V
T_J	Operating junction temperature range		-40		150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range		-40		125	
T_C	Operating Case Temperature		-40		100	
Torque	Mounting torque	To Heatsink	M5		4.7	N.m
Wt	Package Weight				160	g

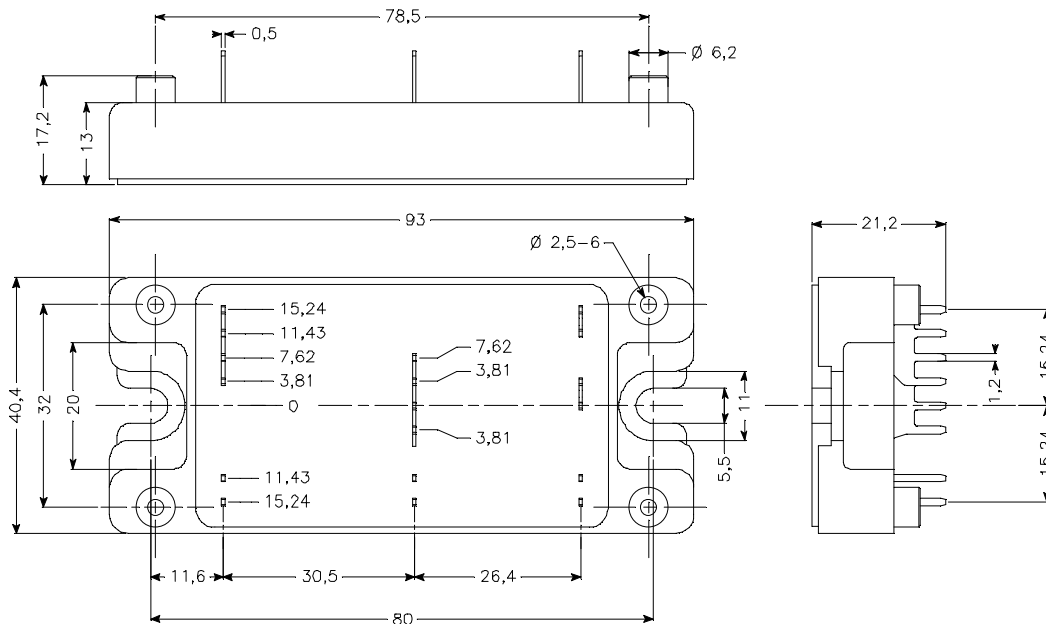
Temperature sensor NTC

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		68		$\text{k}\Omega$
$B_{25/85}$	$T_{25} = 298.16\text{ K}$		4080		K

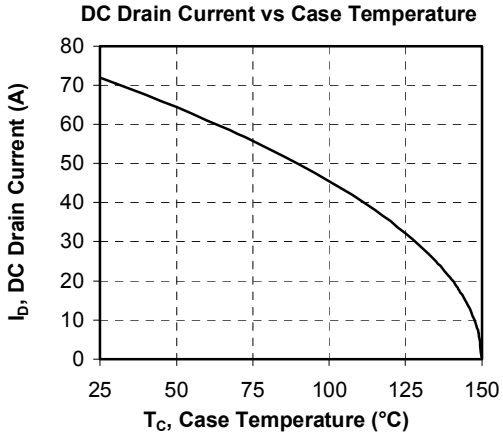
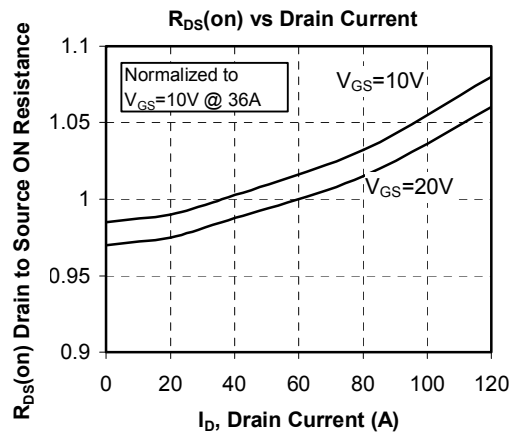
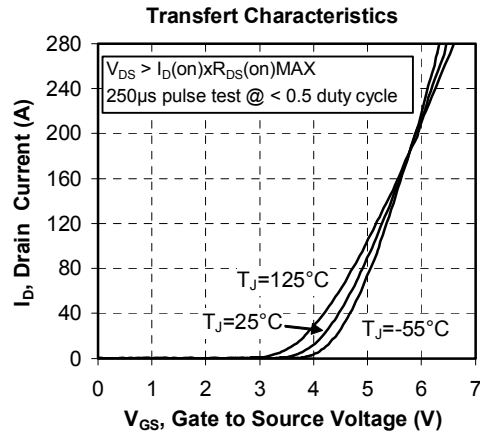
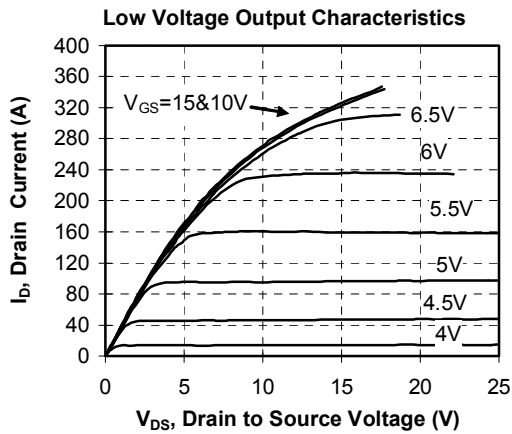
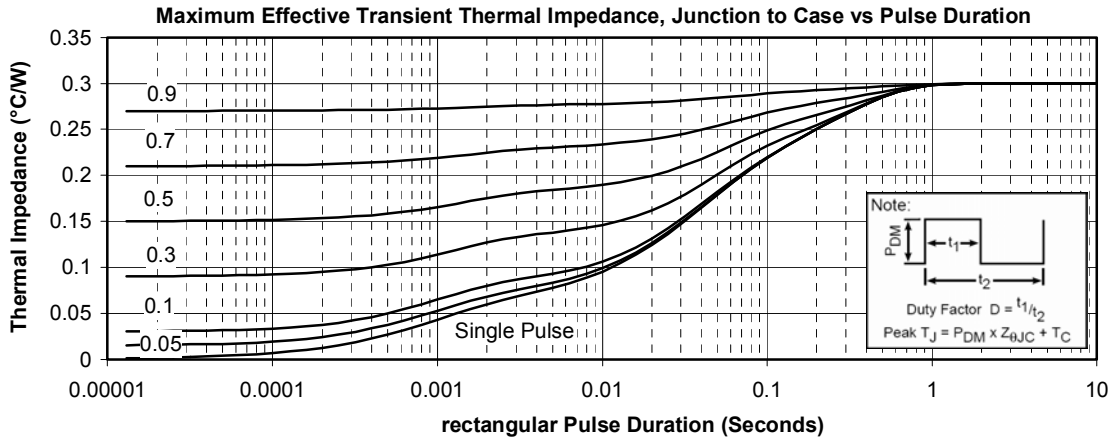
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

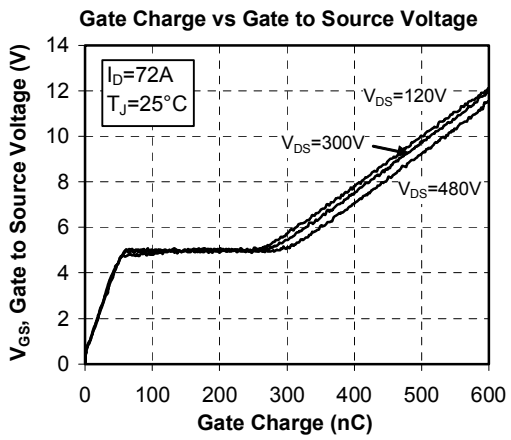
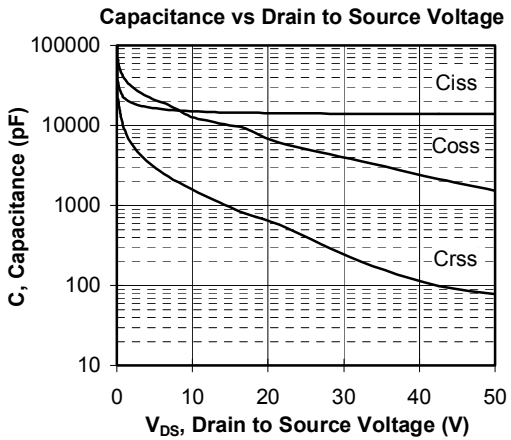
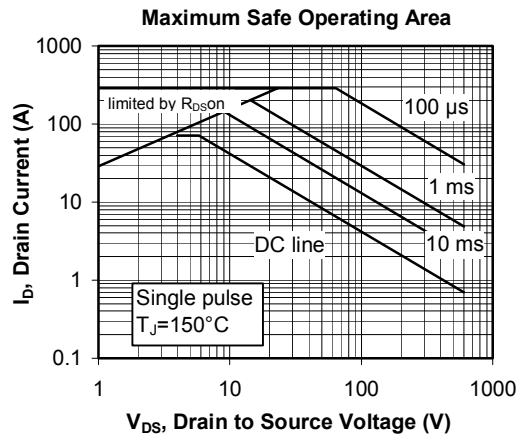
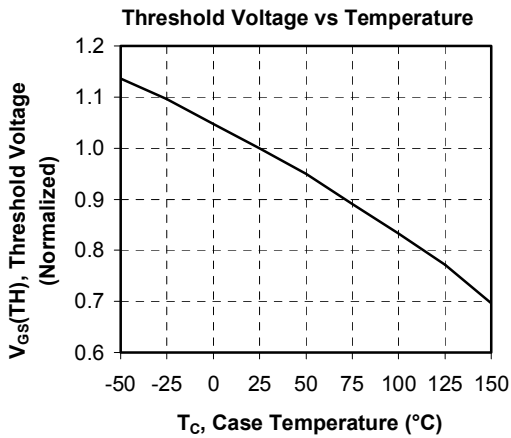
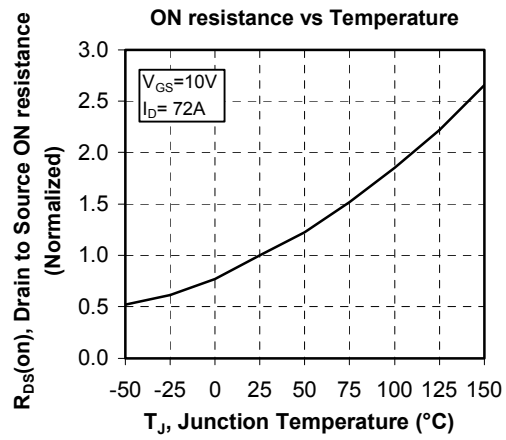
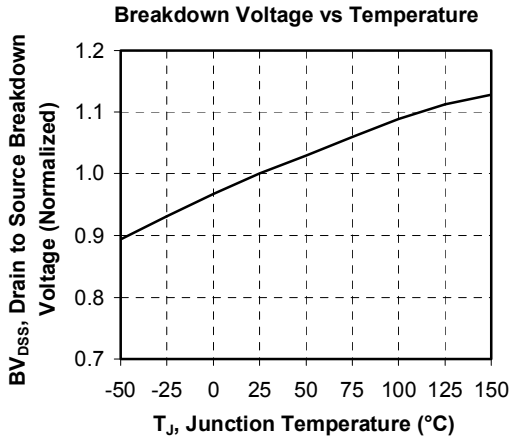
T: Thermistor temperature
R_T: Thermistor value at T

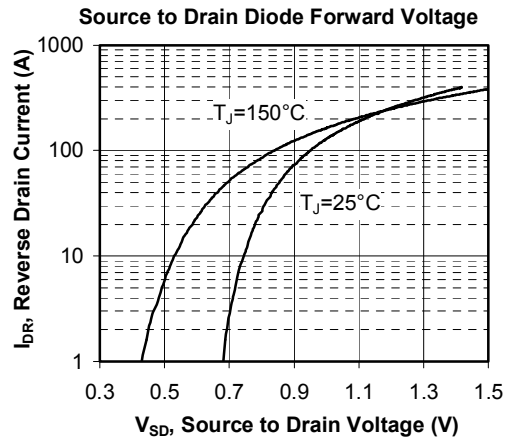
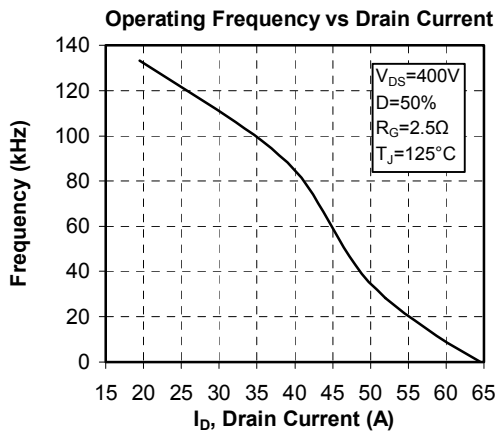
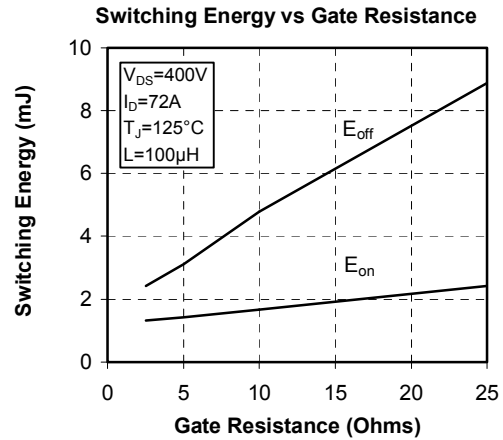
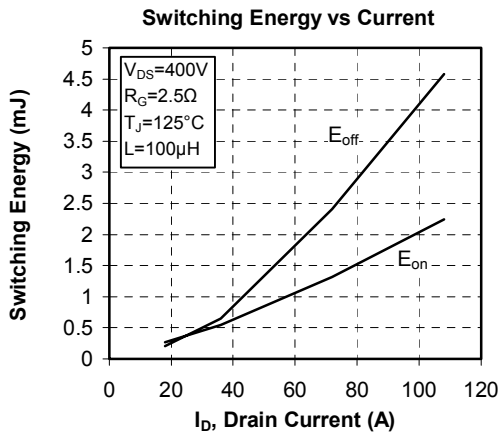
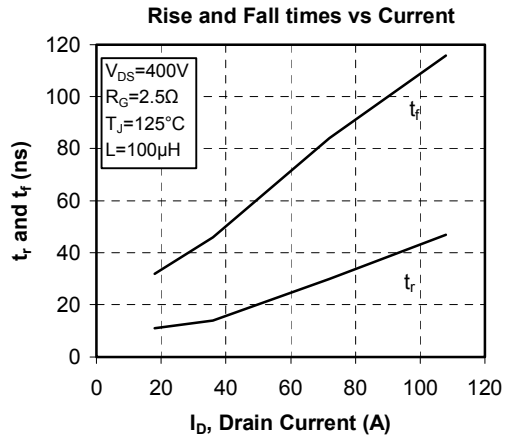
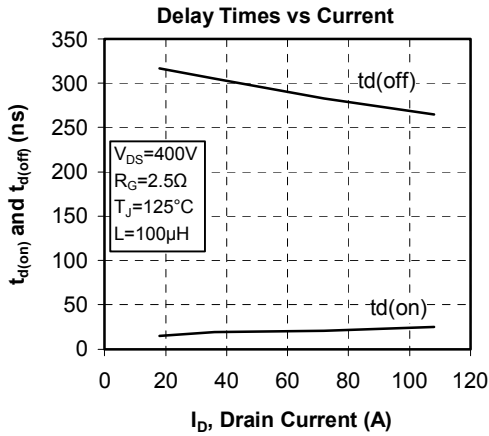
Package outline



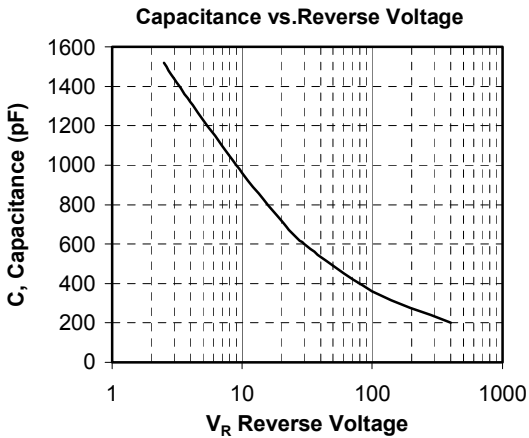
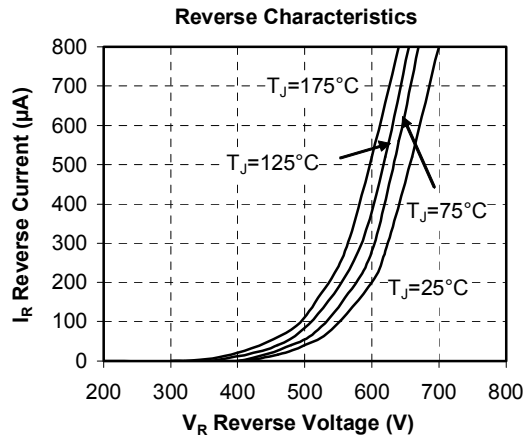
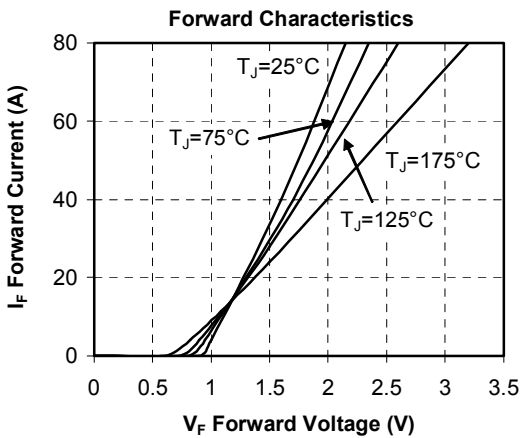
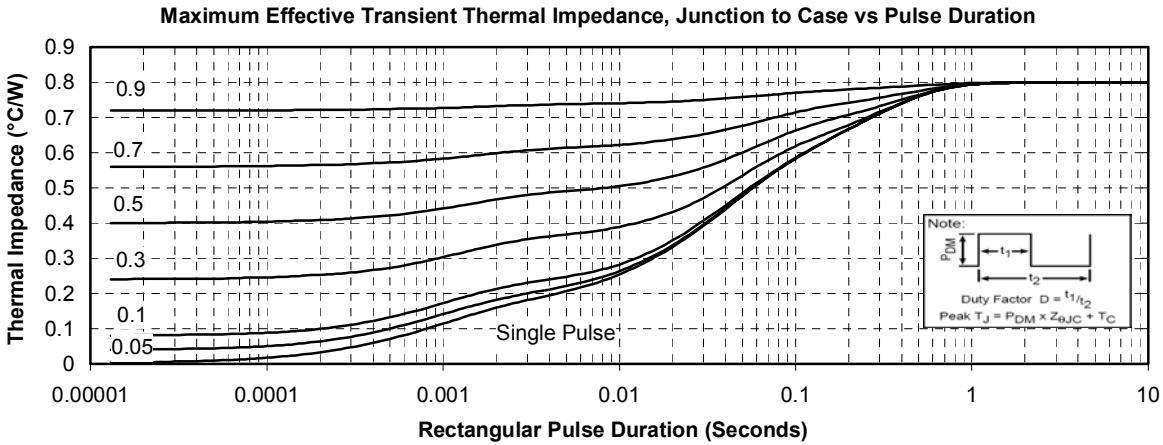
Typical CoolMOS Performance Curve







Typical SiC Diode Performance Curve



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