

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

$V_{DSS} = 500V$
 $R_{DSon} = 24m\Omega$ typ @ $T_j = 25^\circ C$
 $I_D = 150A$ @ $T_c = 25^\circ C$

Application

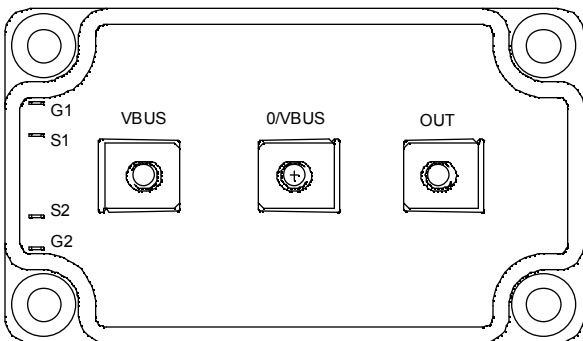
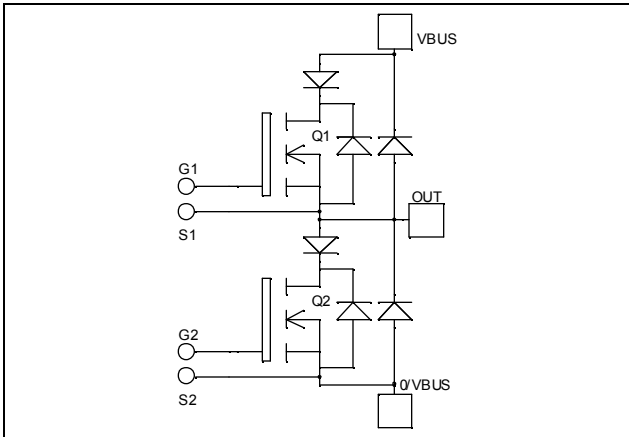
- Motor control
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- **Power MOS 7[®] MOSFETs**
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Avalanche energy rated
 - Very rugged
- **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	500	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	150
		$T_c = 80^\circ C$	110
I_{DM}	Pulsed Drain current	600	
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	28	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	1250
I_{AR}	Avalanche current (repetitive and non repetitive)	24	A
E_{AR}	Repetitive Avalanche Energy	30	mJ
E_{AS}	Single Pulse Avalanche Energy	1300	

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	$V_{GS} = 0\text{V}, V_{DS} = 500\text{V}$			500	μA
		$V_{GS} = 0\text{V}, V_{DS} = 400\text{V}$			3	mA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 75\text{A}$		24	28	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 6\text{mA}$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$			± 500	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$		19.6		nF
C_{oss}	Output Capacitance	$V_{DS} = 25\text{V}$		4.2		
C_{rss}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.3		
Q_g	Total gate Charge	$V_{GS} = 10\text{V}$ $V_{Bus} = 250\text{V}$ $I_D = 150\text{A}$		434		nC
Q_{gs}	Gate – Source Charge			120		
Q_{gd}	Gate – Drain Charge			216		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15\text{V}$ $V_{Bus} = 333\text{V}$ $I_D = 150\text{A}$ $R_G = 0.8\Omega$		10		ns
T_r	Rise Time			17		
$T_{d(off)}$	Turn-off Delay Time			50		
T_f	Fall Time			41		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 150\text{A}, R_G = 0.8\Omega$		1.15		mJ
E_{off}	Turn-off Switching Energy			1.5		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 150\text{A}, R_G = 0.8\Omega$		1.97		mJ
E_{off}	Turn-off Switching Energy			1.7		

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Maximum 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	$I_F = 120\text{A}$ $V_R = 133\text{V}$	$T_j = 25^\circ\text{C}$	31		ns
			$T_j = 125^\circ\text{C}$	60		
Q_{rr}	Reverse Recovery Charge	$di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	120		nC
			$T_j = 125^\circ\text{C}$	500		

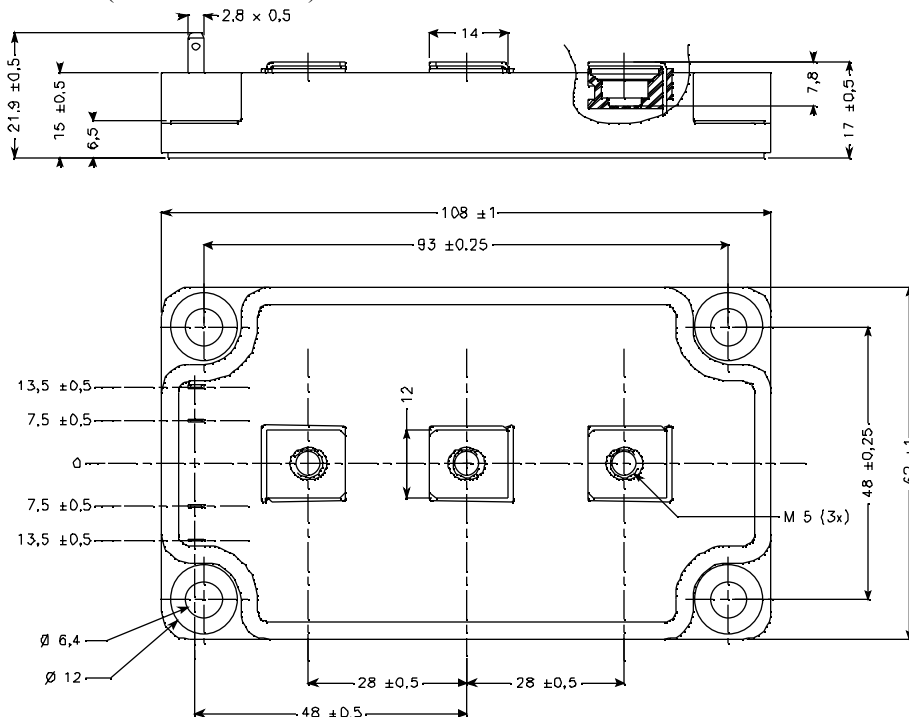
SiC Parallel diode ratings and characteristics

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			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

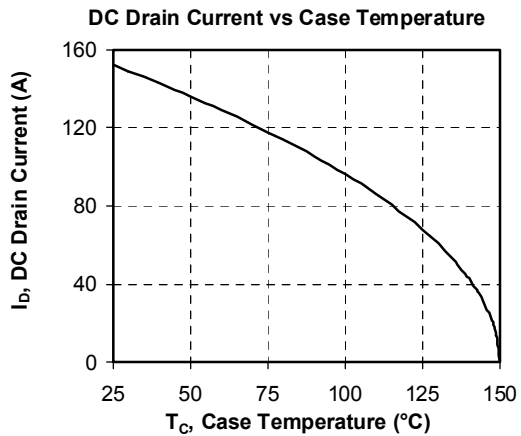
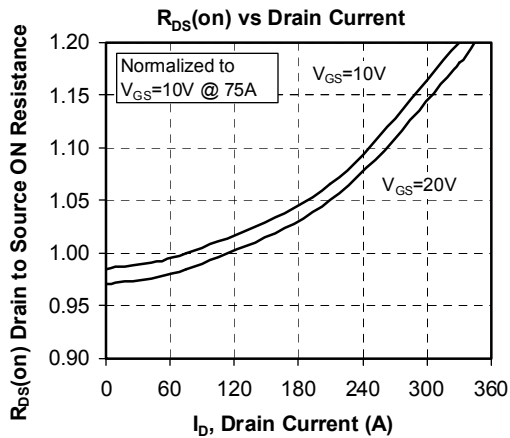
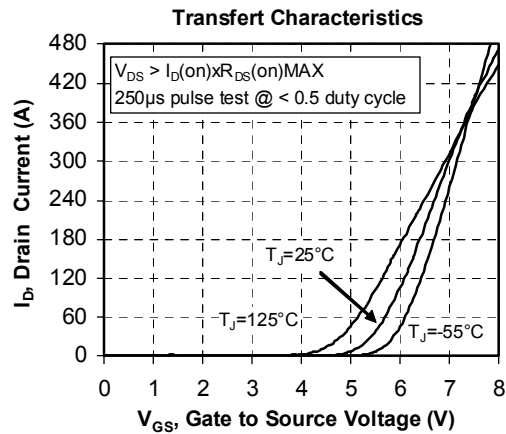
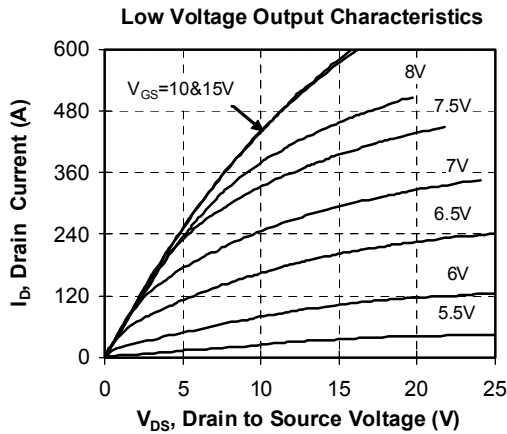
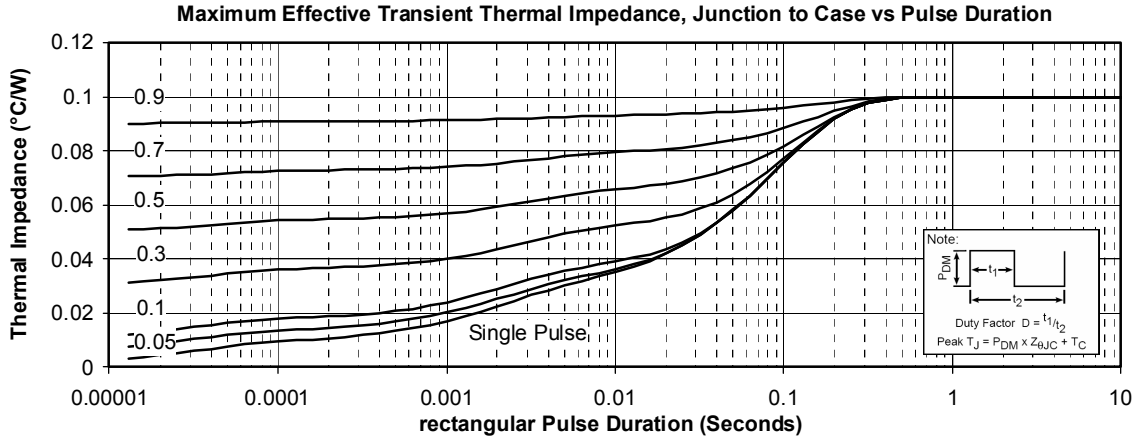
Symbol	Characteristic		Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance	Transistor			0.10	$^\circ C/W$
		Series diode			0.46	
		Parallel diode			0.35	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol} < 1mA$, 50/60Hz		2500			V
T_J	Operating junction temperature range		-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

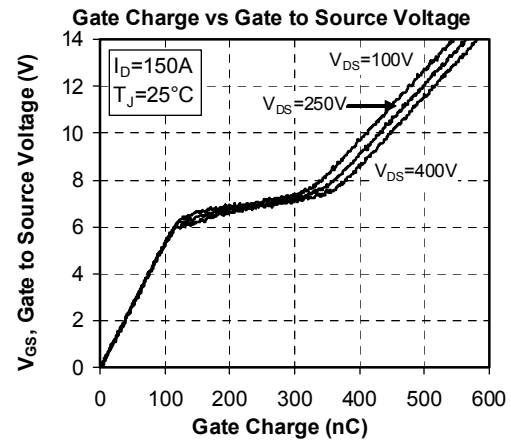
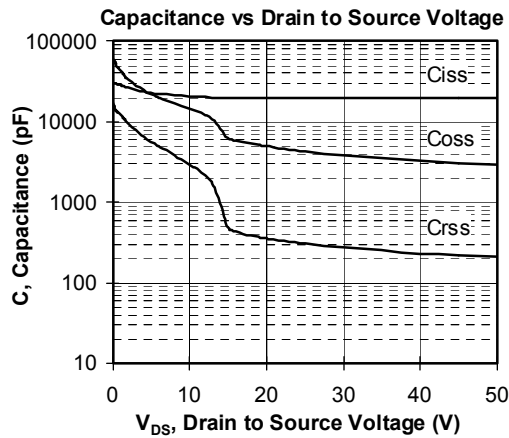
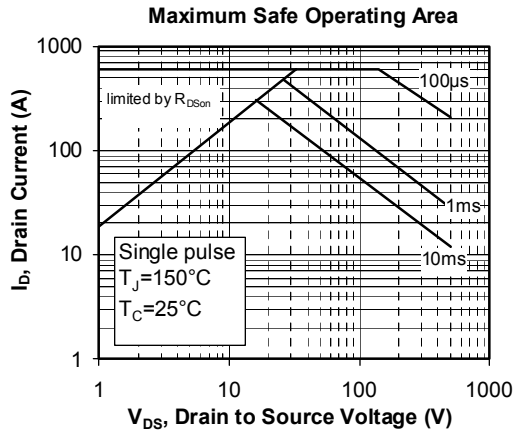
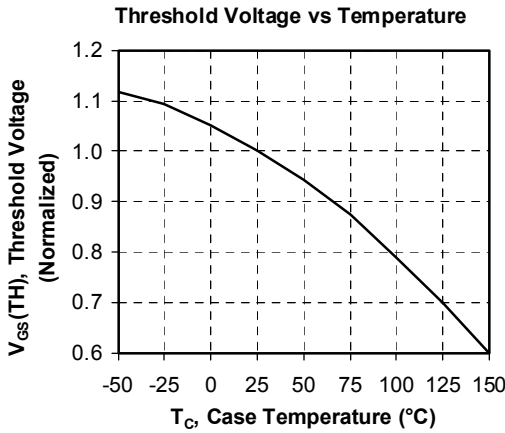
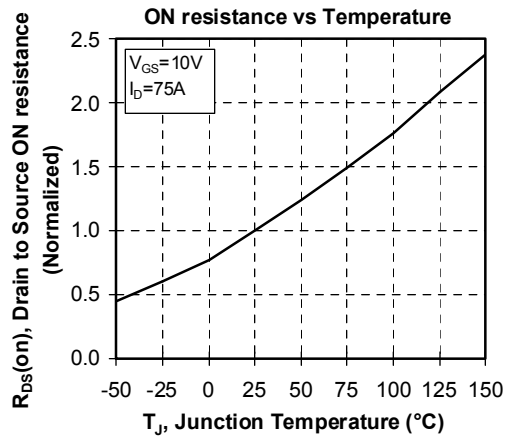
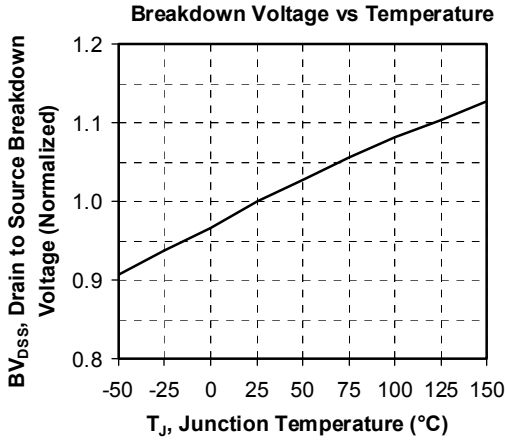
SP6 Package outline (dimensions in mm)

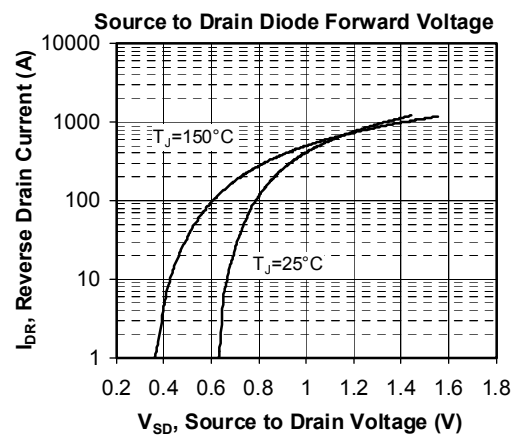
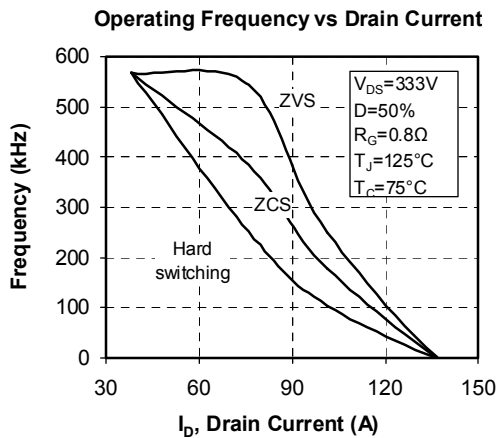
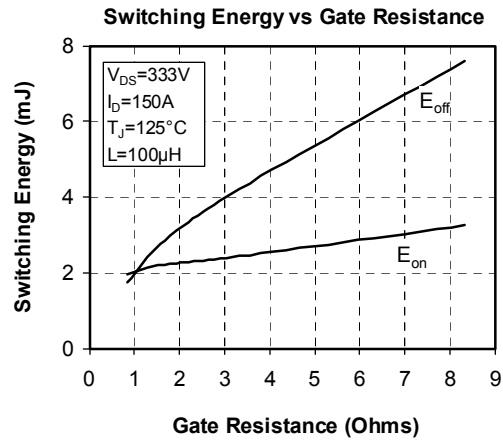
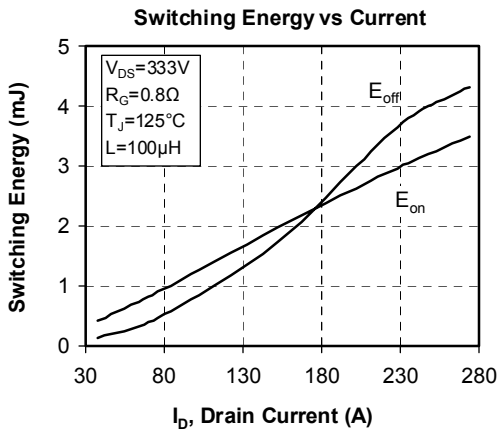
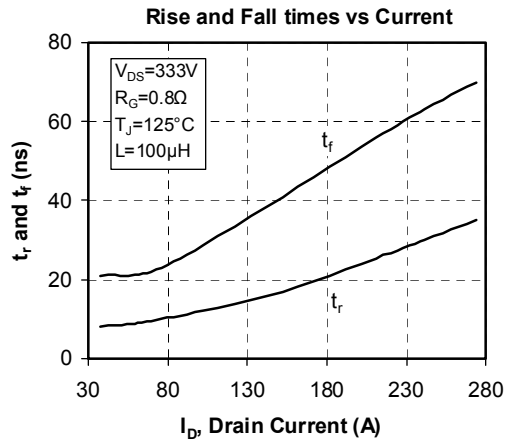
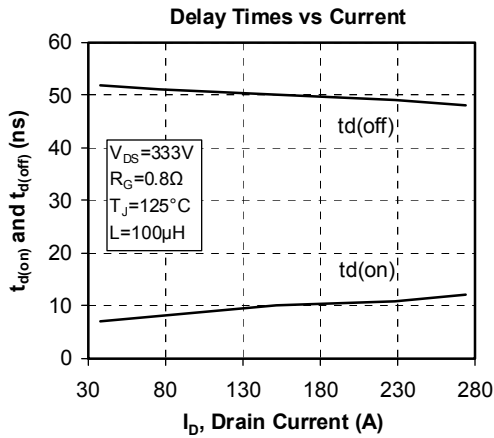


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

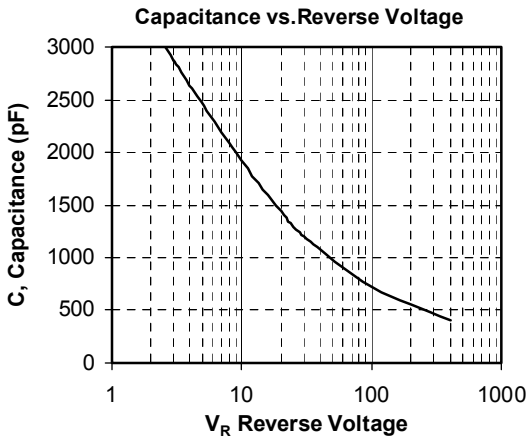
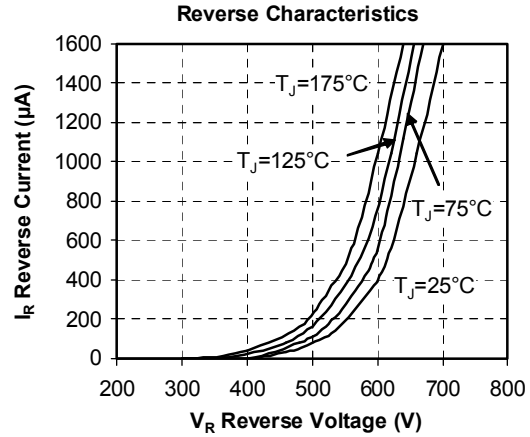
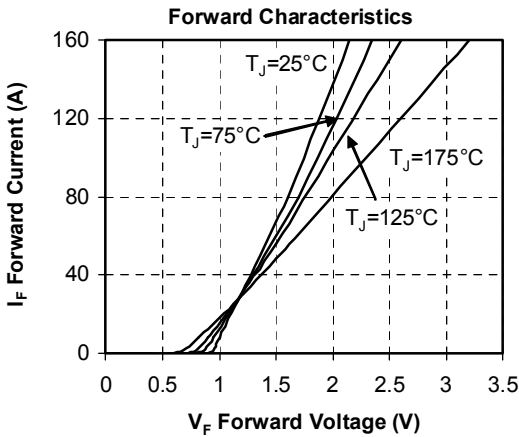
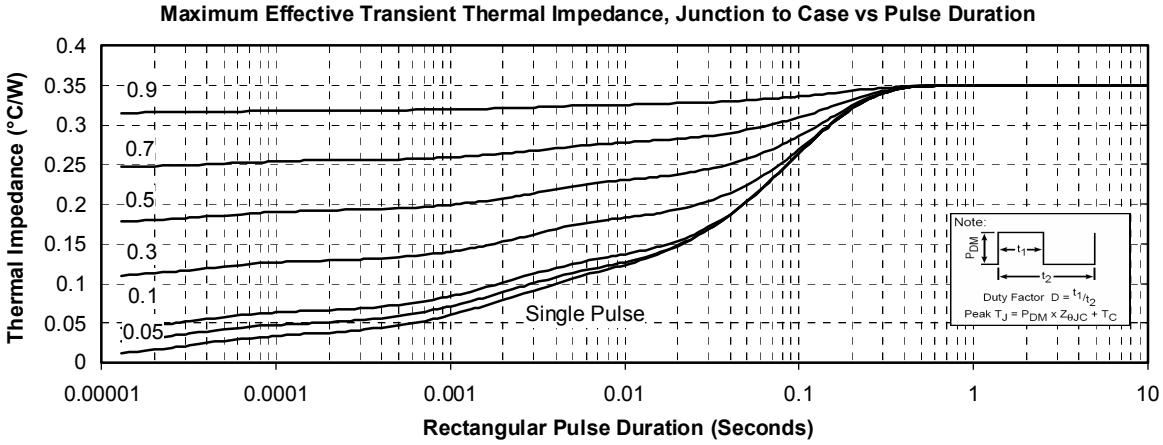
Typical MOSFET Performance Curve







Typical SiC Diode Performance Curve



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