

Phase leg Series & SiC parallel diodes MOSFET Power Module

$$V_{DSS} = 500V$$

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

$$I_D = 150A \text{ @ } T_c = 25^\circ C$$

Application

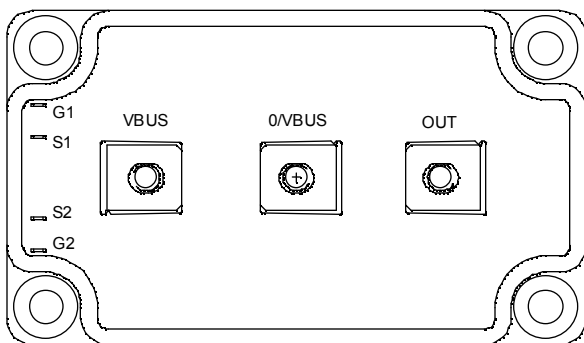
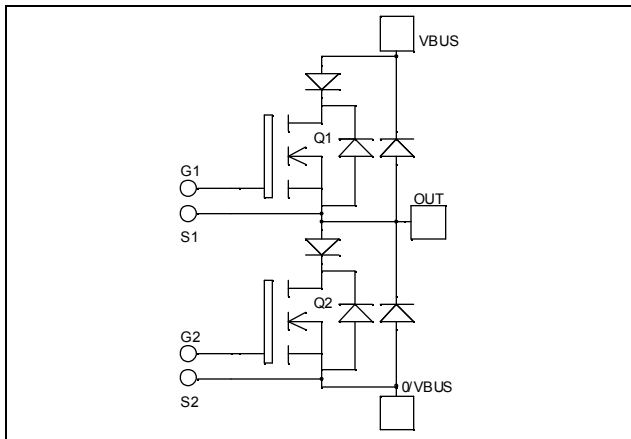
- Motor control
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

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	A
		$T_c = 80^\circ C$ 110	
I_{DM}	Pulsed Drain current	600	
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	28	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$ 1250	W
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

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 500V$	$T_j = 25^\circ\text{C}$			500	μA
		$V_{GS} = 0V, V_{DS} = 400V$	$T_j = 125^\circ\text{C}$			3	mA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 75A$			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	$V_{GS} = \pm 30V, V_{DS} = 0V$				± 500	nA

Dynamic Characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
C_{iss}	Input Capacitance	$V_{GS} = 0V$		19.6		nF
C_{oss}	Output Capacitance	$V_{DS} = 25V$		4.2		
C_{rss}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.3		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 250V$ $I_D = 150A$		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 $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 150A$ $R_G = 0.8\Omega$		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 $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 150A, R_G = 0.8\Omega$		1.15		mJ
E_{off}	Turn-off Switching Energy			1.5		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 150A, R_G = 0.8\Omega$		1.97		mJ
E_{off}	Turn-off Switching Energy			1.7		

Series diode ratings and characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V_{RRM}	Maximum Repetitive Reverse Voltage			200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25^\circ\text{C}$			350	μA
			$T_j = 125^\circ\text{C}$			600	
I_F	DC Forward Current		$T_c = 85^\circ\text{C}$		120		A
V_F	Diode Forward Voltage	$I_F = 120A$			1.1	1.15	V
		$I_F = 240A$			1.4		
		$I_F = 120A$	$T_j = 125^\circ\text{C}$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 120A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$		31		ns
			$T_j = 125^\circ\text{C}$		60		
Q_{rr}	Reverse Recovery Charge	$I_F = 120A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$		120		nC
			$T_j = 125^\circ\text{C}$		500		

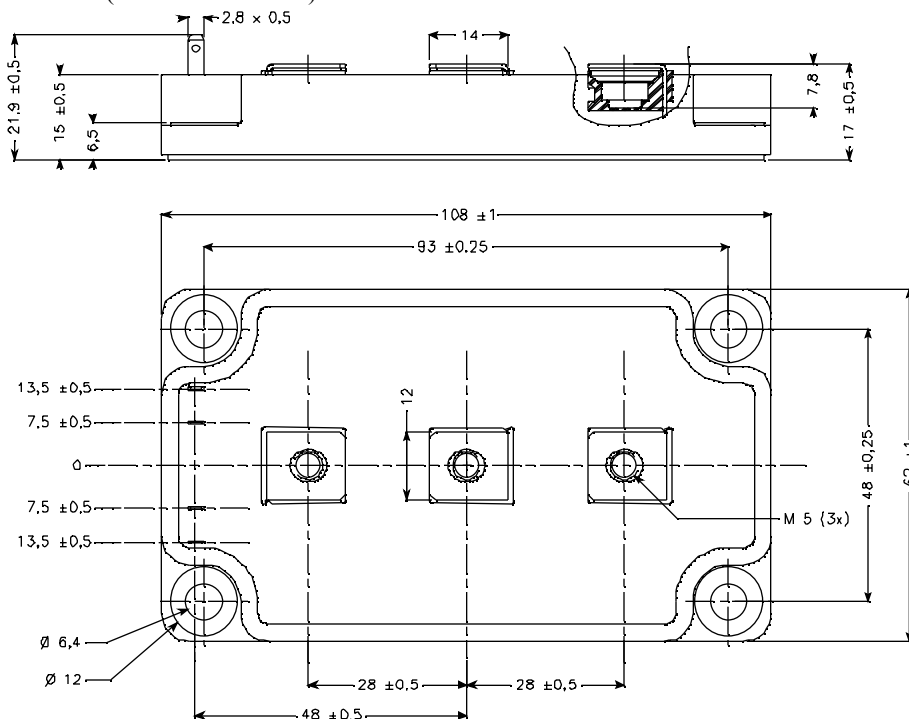
SiC Parallel diode ratings and characteristics

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°C		400	1600	μA
			T _j = 175°C		800	8000	
I _F	DC Forward Current		T _c = 125°C		80		A
V _F	Diode Forward Voltage	I _F = 80A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.0	2.4	
Q _C	Total Capacitive Charge	I _F = 80A, V _R = 300V di/dt =2000A/μs			112		nC
Q	Total Capacitance	f= 1MHz, V _R = 200V			520		pF
		f= 1MHz, V _R = 400V			400		

Thermal and package characteristics

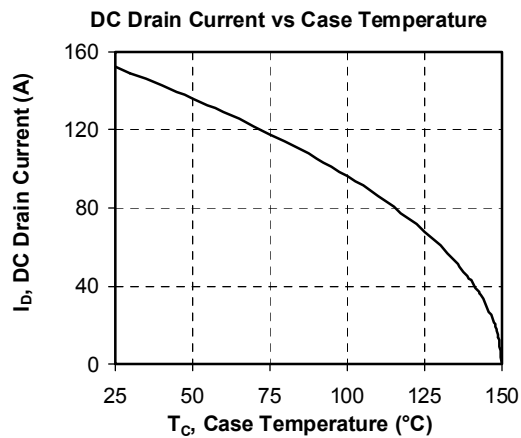
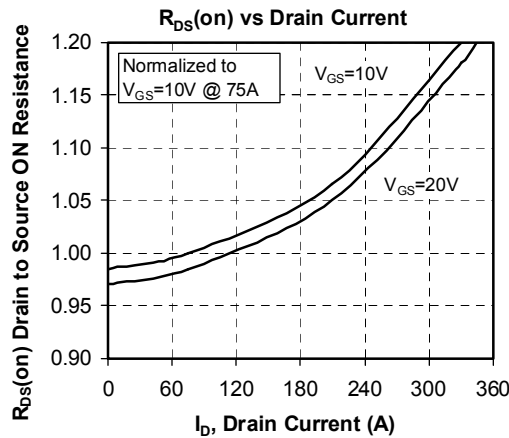
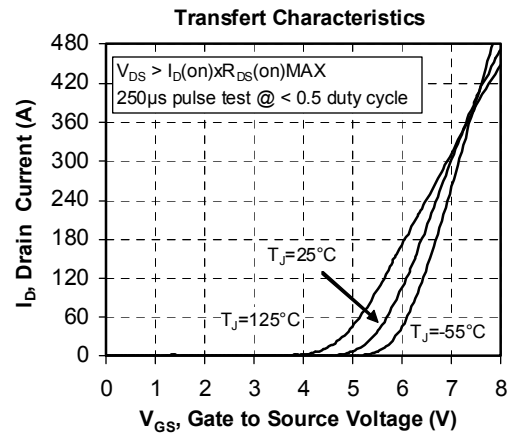
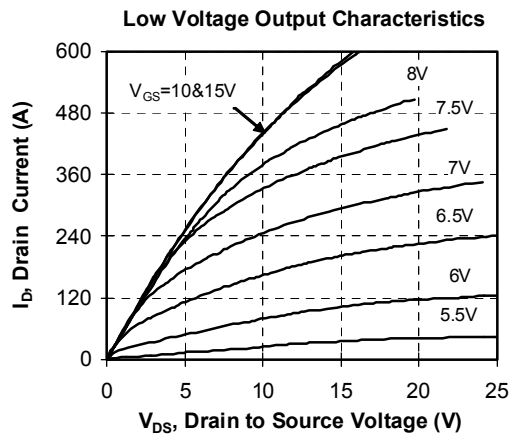
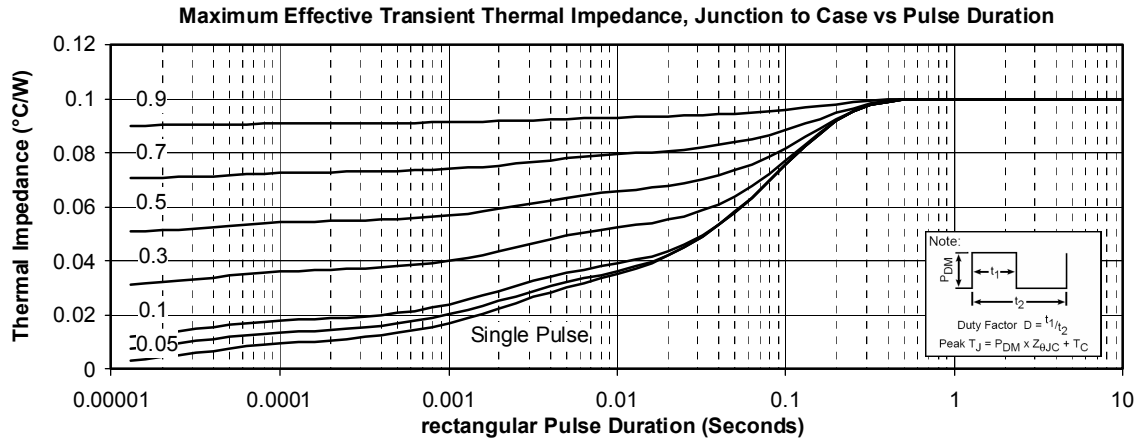
Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance		Transistor			0.10	°C/W
			Series diode			0.46	
			Parallel diode			0.35	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I isol<1mA, 50/60Hz			2500			V
T _J	Operating junction temperature range			-40		150	°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

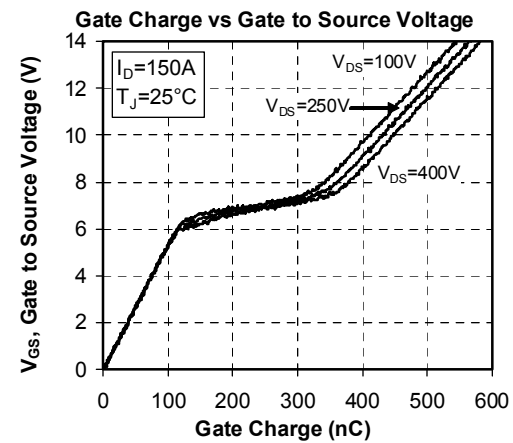
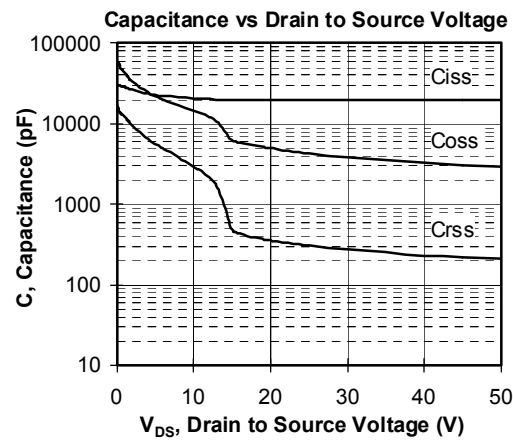
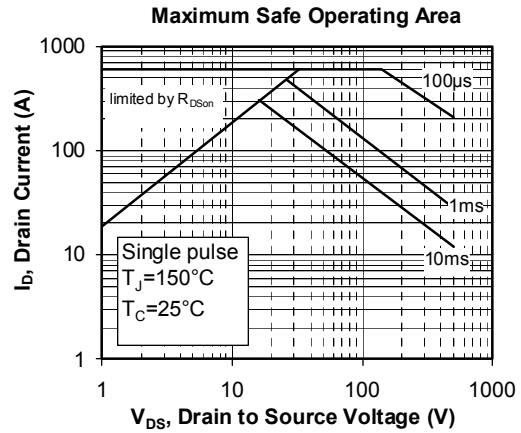
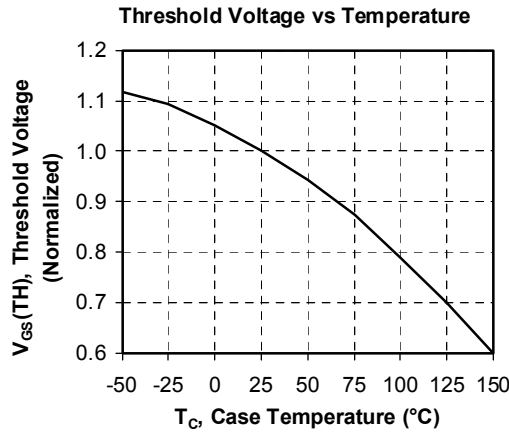
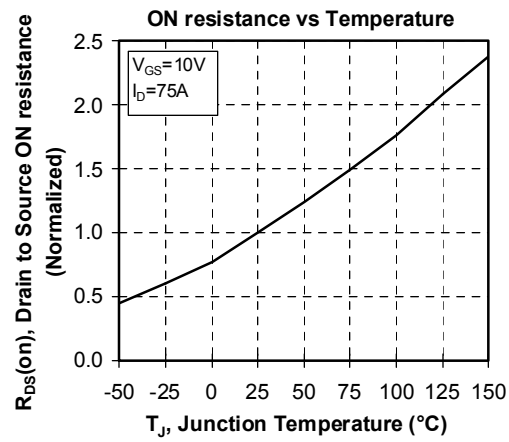
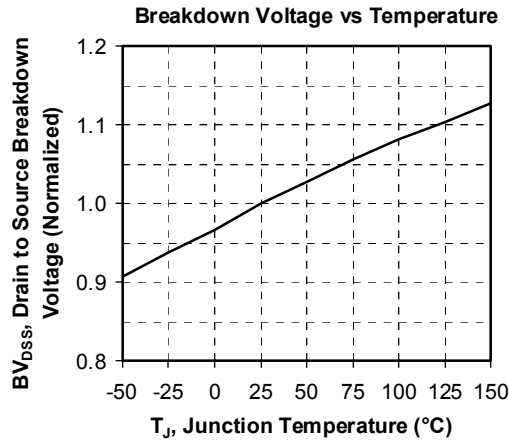
SP6 Package outline (dimensions in mm)

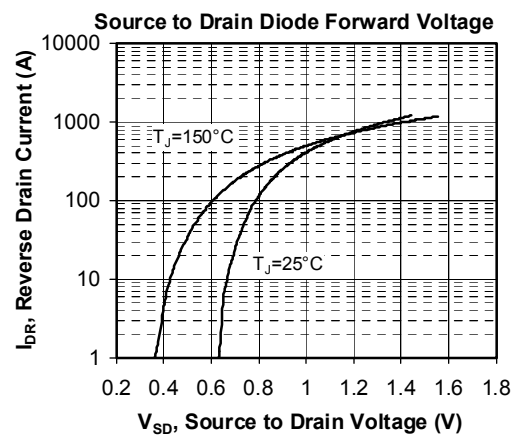
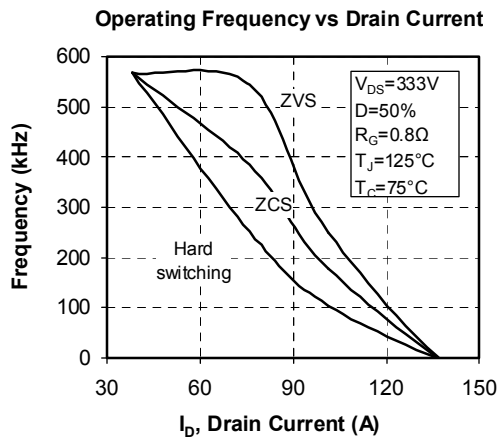
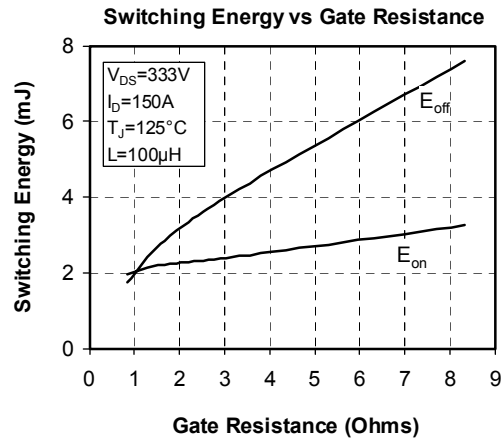
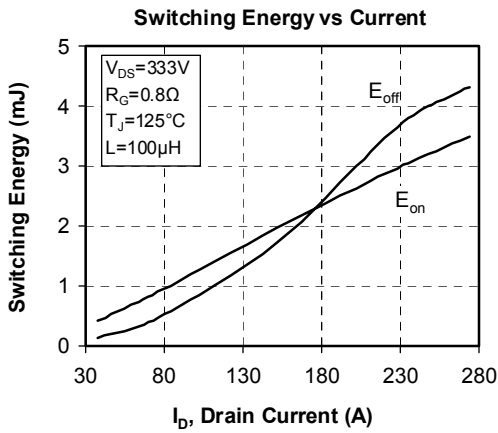
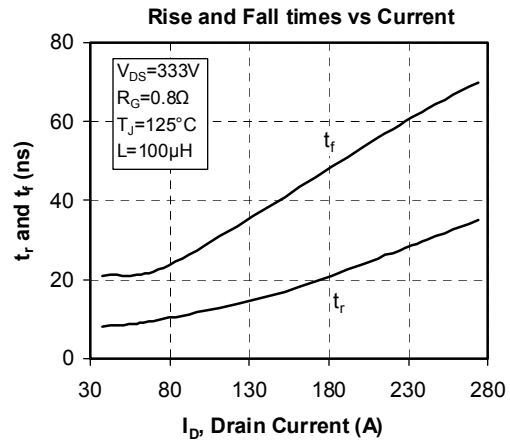
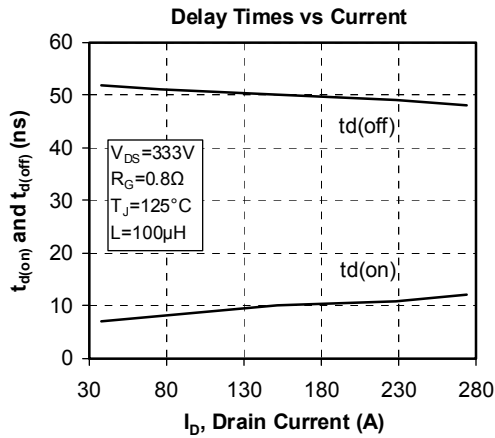


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

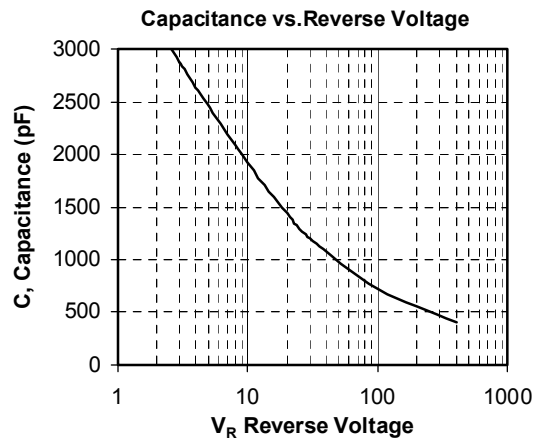
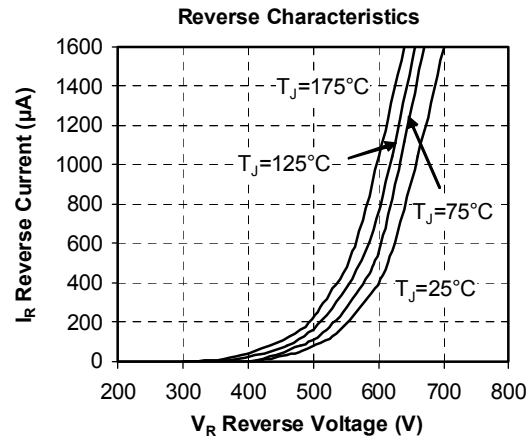
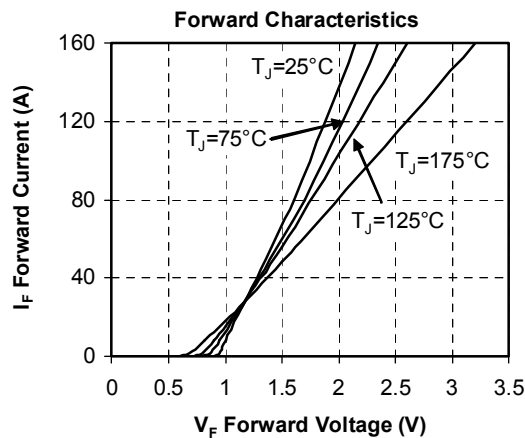
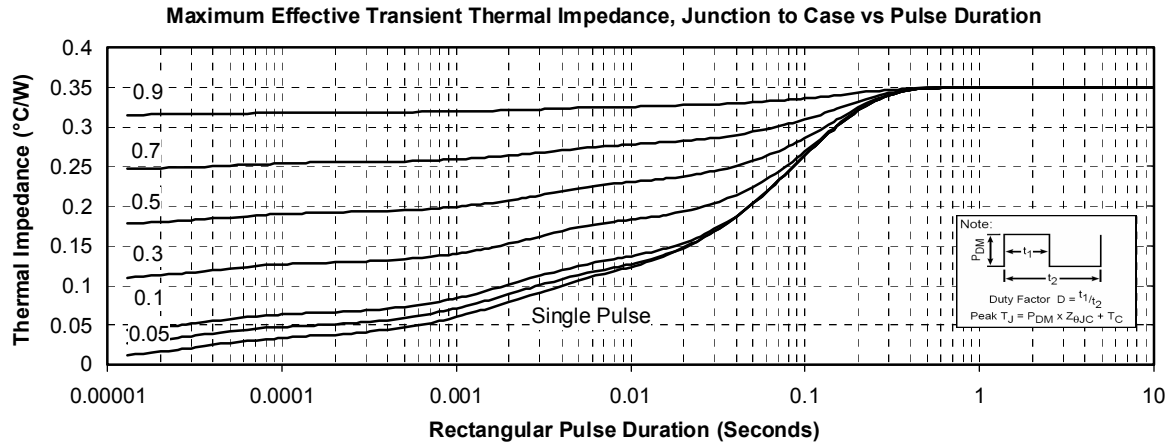
Typical MOSFET Performance Curve







Typical SiC Diode Performance Curve



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