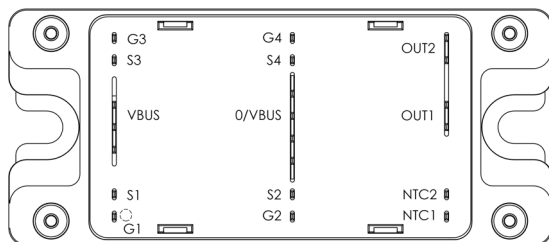
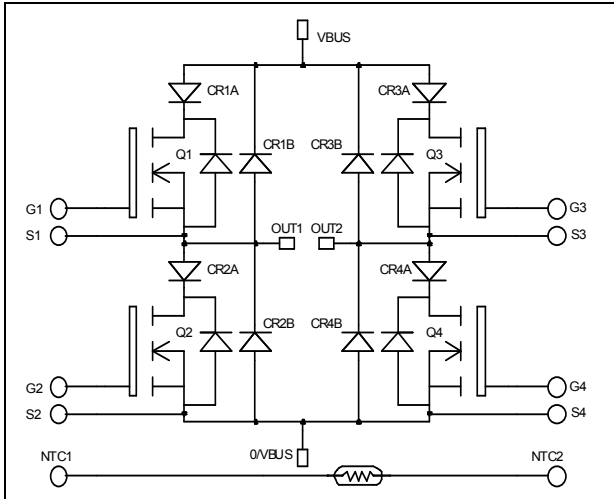


**Full bridge Series & SiC parallel diodes
MOSFET Power Module**

$V_{DSS} = 1000V$
 $R_{DSon} = 450m\Omega$ typ @ $T_j = 25^\circ C$
 $I_D = 18A$ @ $T_c = 25^\circ C$



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
- **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
- RoHS Compliant

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

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	1000	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	18
		$T_c = 80^\circ C$	14
I_{DM}	Pulsed Drain current	72	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	540	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	357
I_{AR}	Avalanche current (repetitive and non repetitive)	18	A
E_{AR}	Repetitive Avalanche Energy	50	mJ
E_{AS}	Single Pulse Avalanche Energy	2500	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0V, V _{DS} = 1000V			100	μA
		V _{GS} = 0V, V _{DS} = 800V			500	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 9A		450	540	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 2.5mA	3		5	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±30 V, V _{DS} = 0V			±100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1MHz		4350		pF
C _{oss}	Output Capacitance			715		
C _{rss}	Reverse Transfer Capacitance			120		
Q _g	Total gate Charge	V _{GS} = 10V V _{Bus} = 500V I _D = 18A		154		nC
Q _{gs}	Gate – Source Charge			26		
Q _{gd}	Gate – Drain Charge			97		
T _{d(on)}	Turn-on Delay Time	Inductive switching @ 125°C V _{GS} = 15V V _{Bus} = 667V I _D = 18A R _G = 5Ω		10		ns
T _r	Rise Time			12		
T _{d(off)}	Turn-off Delay Time			121		
T _f	Fall Time			35		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C V _{GS} = 15V, V _{Bus} = 667V I _D = 18A, R _G = 5Ω		383		μJ
E _{off}	Turn-off Switching Energy			380		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C V _{GS} = 15V, V _{Bus} = 667V I _D = 18A, R _G = 5Ω		627		μJ
E _{off}	Turn-off Switching Energy			451		
R _{thJC}	Junction to Case Thermal Resistance				0.35	°C/W

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V _{RRM}	Maximum Peak Repetitive Reverse Voltage		1000			V
I _{RM}	Maximum Reverse Leakage Current	V _R = 1000V			250	μA
I _F	DC Forward Current	T _c = 85°C		30		A
V _F	Diode Forward Voltage	I _F = 30A		1.9	2.3	V
		I _F = 60A		2.2		
		I _F = 30A	T _j = 125°C		1.7	
t _{rr}	Reverse Recovery Time	I _F = 30A V _R = 667V di/dt = 200A/μs	T _j = 25°C		290	ns
			T _j = 125°C		390	
Q _{rr}	Reverse Recovery Charge	I _F = 30A V _R = 667V di/dt = 200A/μs	T _j = 25°C		670	nC
			T _j = 125°C		2350	
R _{thJC}	Junction to Case Thermal Resistance				1.2	°C/W

Parallel SiC diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V _{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I _{RRM}	Maximum Reverse Leakage Current	V _R =1200V	T _j = 25°C		100	400	μA
			T _j = 175°C		200	2000	
I _F	DC Forward Current	T _c = 100°C			10		A
V _F	Diode Forward Voltage	I _F = 10A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.6	3.0	
Q _C	Total Capacitive Charge	I _F = 10A, V _R = 1200V di/dt = 800A/μs			56		nC
Q	Total Capacitance	f = 1MHz, V _R = 200V			90		pF
		f = 1MHz, V _R = 400V			66		
R _{thJC}	Junction to Case Thermal Resistance					1.5	°C/W

Thermal and package characteristics

Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	150	°C		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25			
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

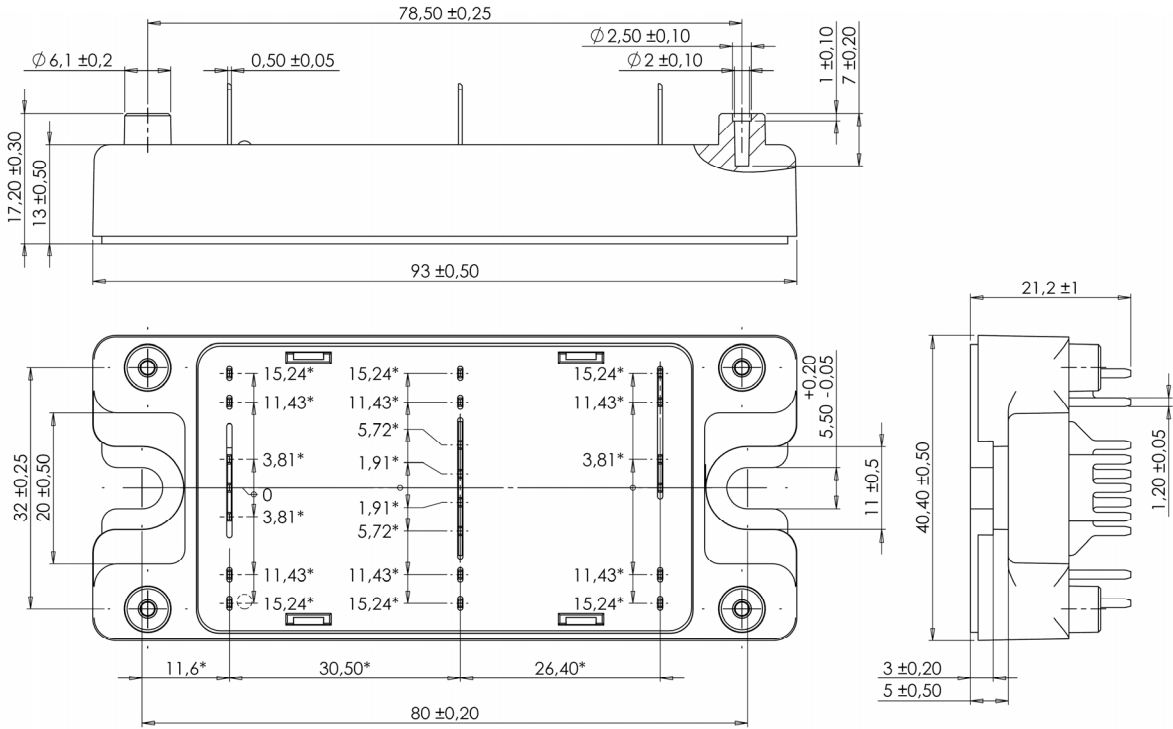
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B		T _C = 100°C	4		%

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

T: Thermistor temperature
R_T: Thermistor value at T

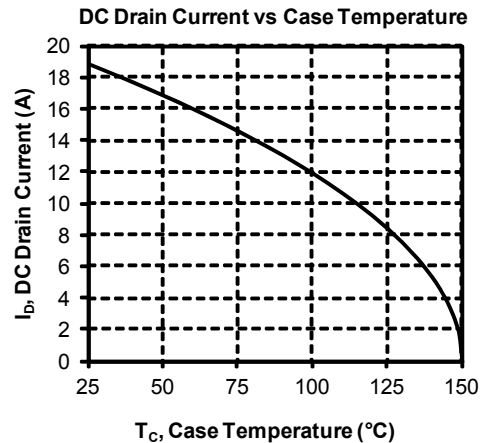
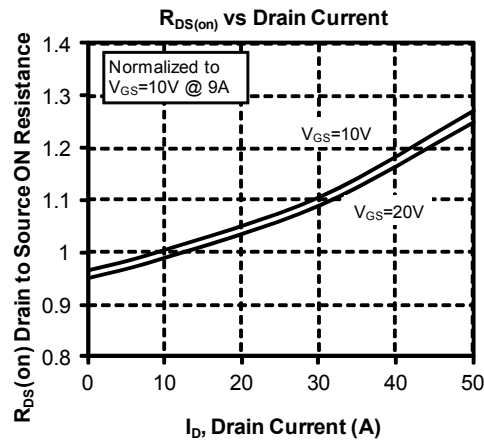
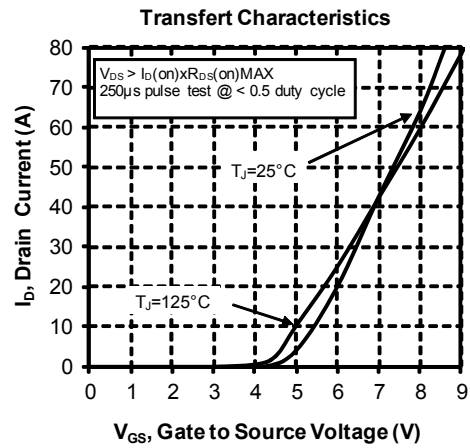
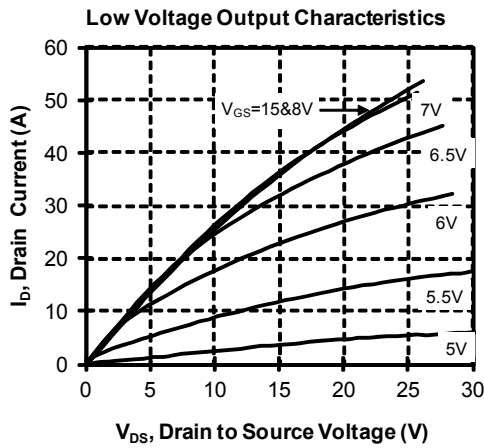
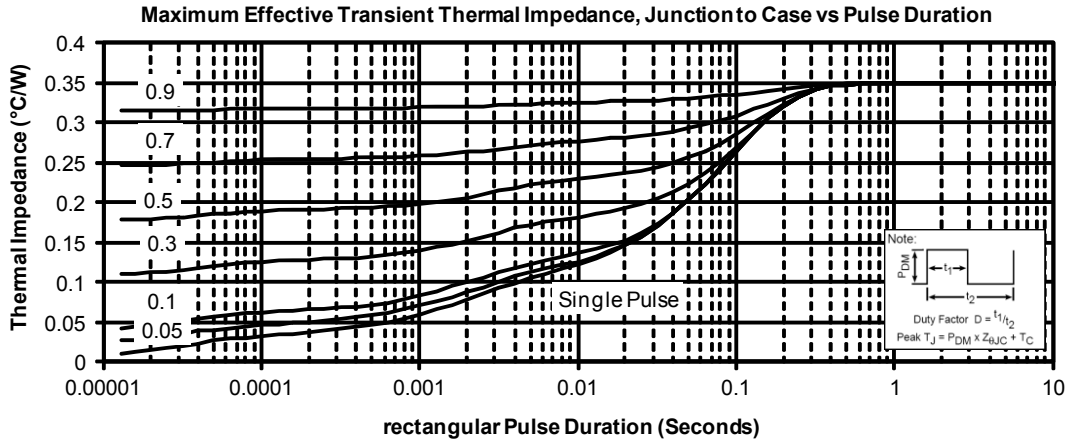
SP4 Package outline (dimensions in mm)

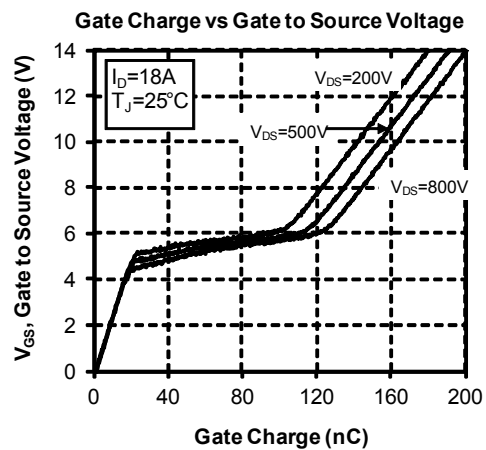
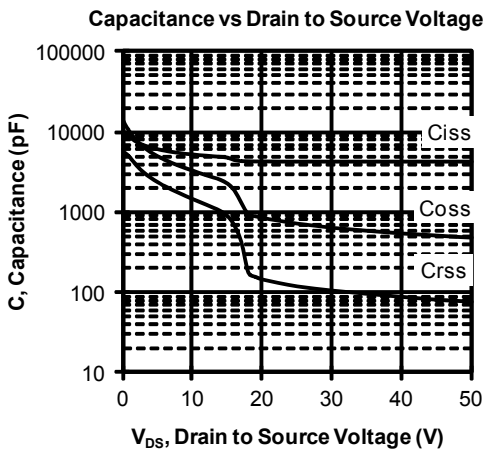
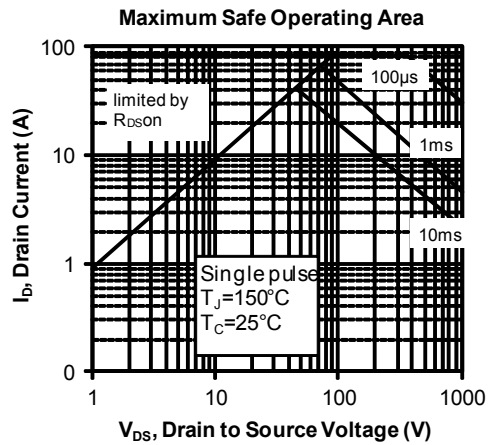
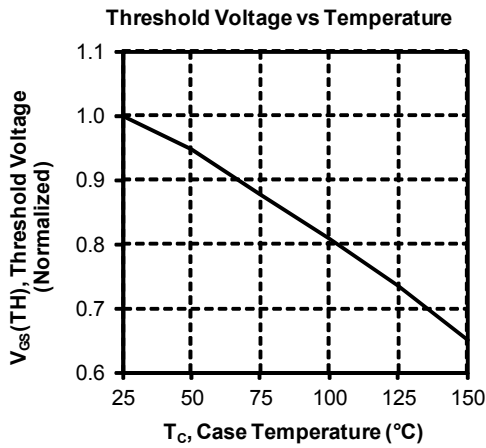
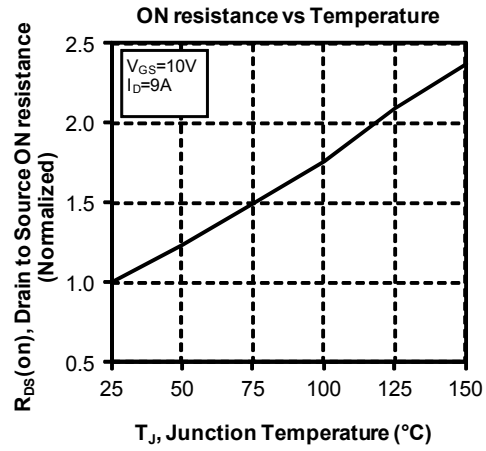
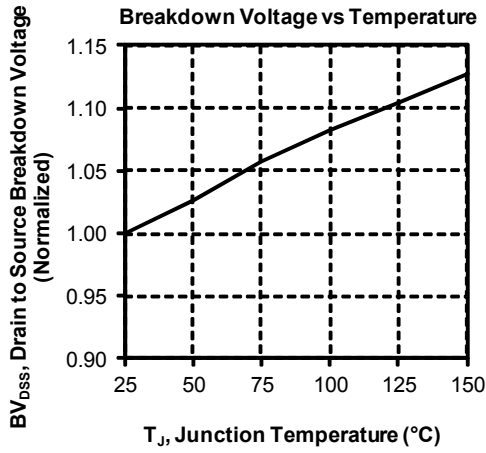


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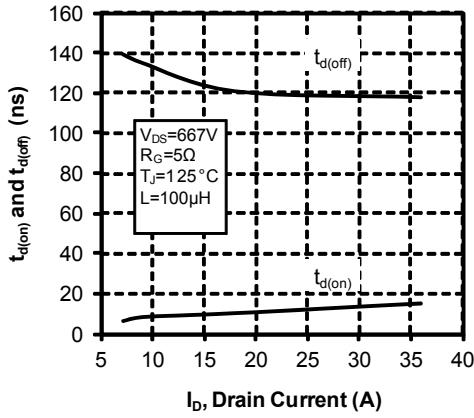
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical MOSFET Performance Curve

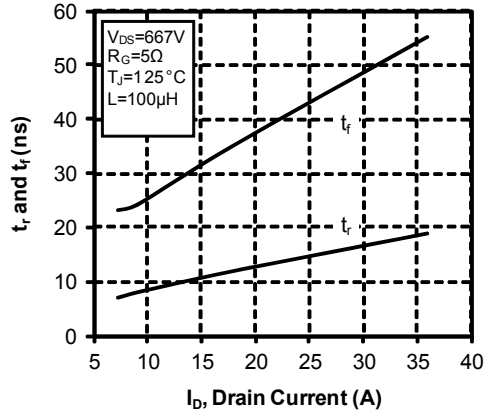




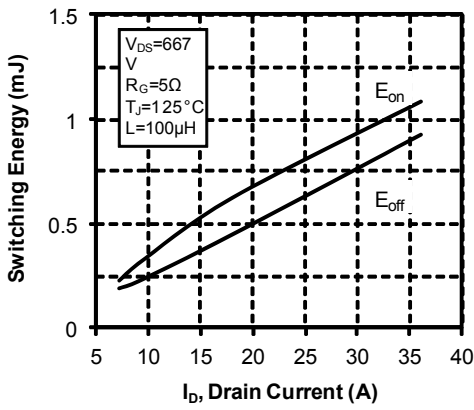
Delay Times vs Current



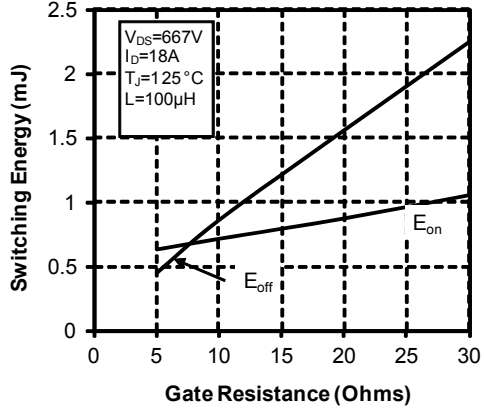
Rise and Fall times vs Current



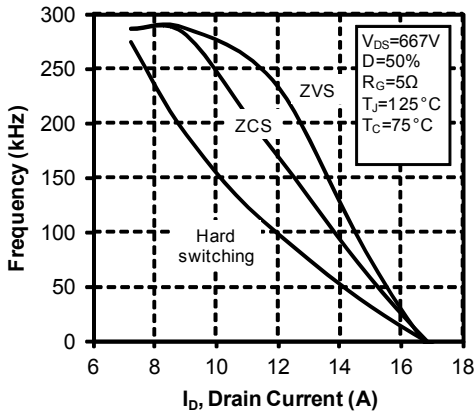
Switching Energy vs Current



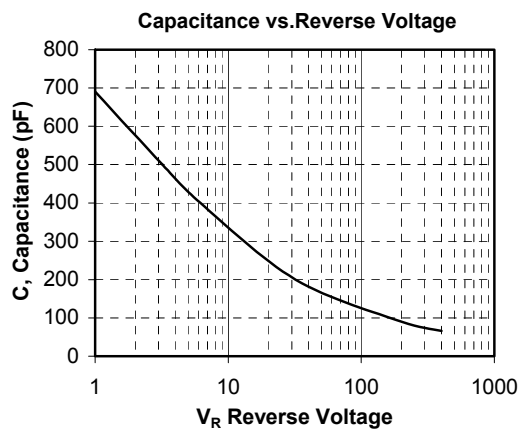
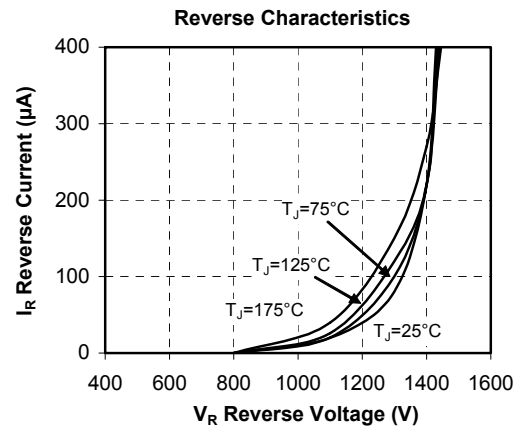
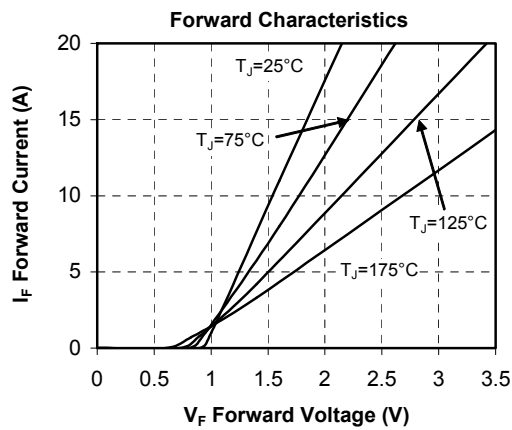
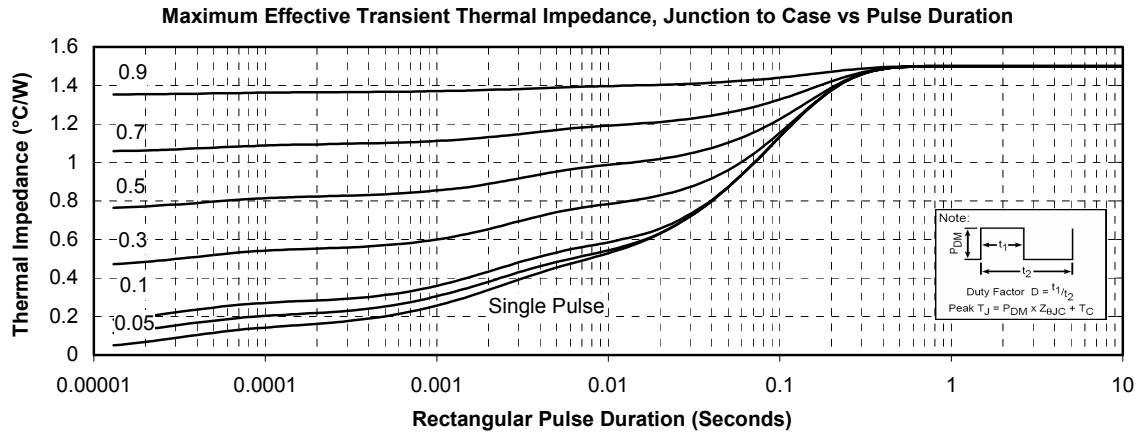
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Typical SiC Diode Performance Curve



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