

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

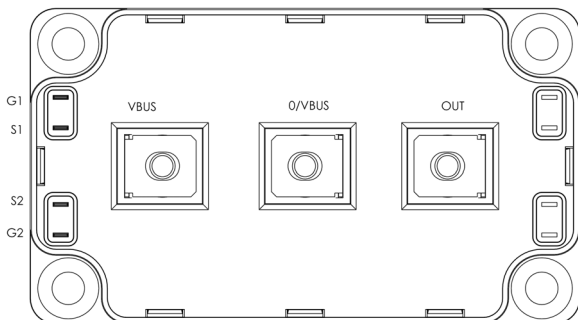
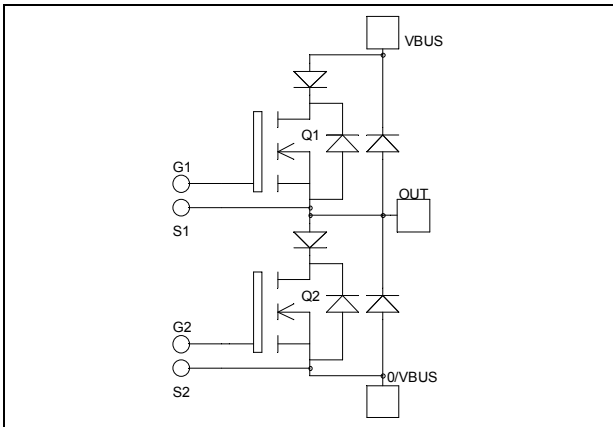
$V_{DSS} = 500V$
 $R_{DSon} = 24m\Omega$ typ @ $T_j = 25^\circ C$
 $I_D = 150A$ @ $T_c = 25^\circ C$

Application

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

Features

- **Power MOS⁷® 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

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

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	A
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

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0V, V _{DS} = 500V			500	μA
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 75A		24	28	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 6mA	3		5	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±30 V, V _{DS} = 0V			±600	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
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 = 1MHz		0.3		
Q _g	Total gate Charge	V _{GS} = 10V		434		nC
Q _{gs}	Gate – Source Charge	V _{Bus} = 250V		120		
Q _{gd}	Gate – Drain Charge	I _D = 150A		216		
T _{d(on)}	Turn-on Delay Time	Inductive switching @ 125°C V _{GS} = 15V V _{Bus} = 333V I _D = 150A R _G = 0.8Ω		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 = 0.8Ω		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 = 0.8Ω		1.97		mJ
E _{off}	Turn-off Switching Energy			1.7		
R _{thJC}	Junction to Case Thermal Resistance				0.1	°C/W

Series 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			150	μA
I _F	DC Forward Current			200		A
V _F	Diode Forward Voltage	I _F = 200A V _{GE} = 0V	T _j = 25°C	1.6	2	V
			T _j = 150°C	1.5		
t _{rr}	Reverse Recovery Time	I _F = 200A V _R = 300V di/dt = 2800A/μs	T _j = 25°C	125		ns
			T _j = 150°C	220		
Q _{rr}	Reverse Recovery Charge	I _F = 200A V _R = 300V di/dt = 2800A/μs	T _j = 25°C	9.4		μC
			T _j = 150°C	19.8		
E _r	Reverse Recovery Energy	I _F = 200A V _R = 300V di/dt = 2800A/μs	T _j = 25°C	2.2		mJ
			T _j = 150°C	4.8		
R _{thJC}	Junction to Case Thermal Resistance				0.39	°C/W

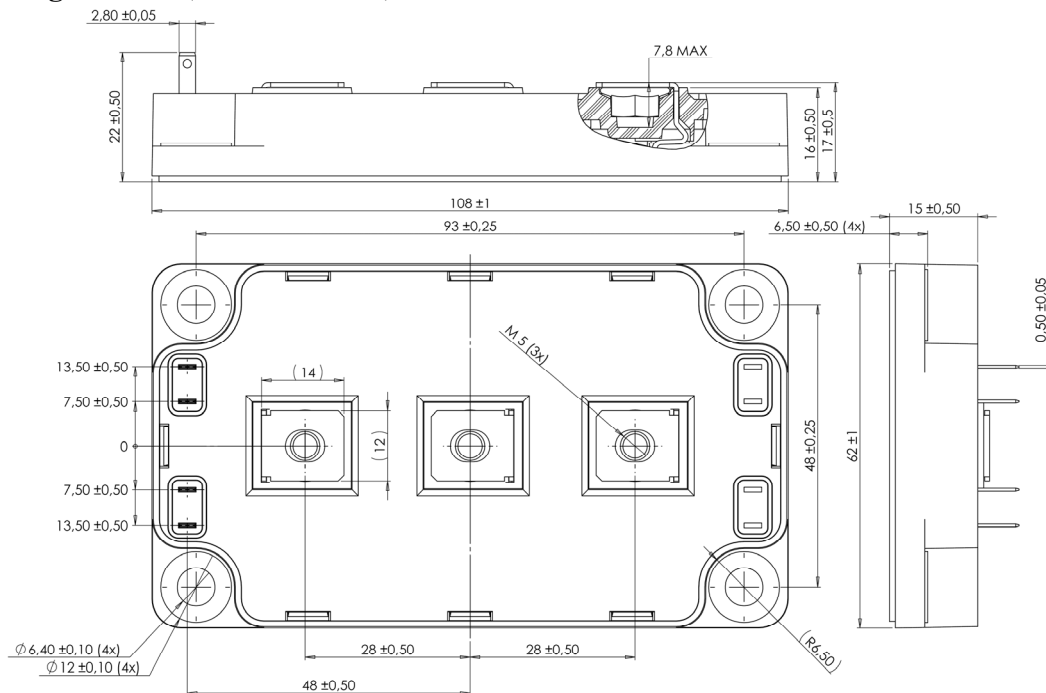
SiC Parallel diode ratings and characteristics

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		400	1600	μA	
		T _j = 25°C					
		T _j = 175°C		800	8000		
I _F	DC Forward Current			80		A	
V _F	Diode Forward Voltage	I _F = 80A	T _c = 100°C		1.6	1.8	V
			T _j = 25°C		2.0	2.4	
Q _C	Total Capacitive Charge	I _F = 80A, V _R = 600V di/dt = 2000A/μs		224		nC	
Q	Total Capacitance	f = 1MHz, V _R = 200V		520		pF	
		f = 1MHz, V _R = 400V		400			
R _{thJC}	Junction to Case Thermal Resistance				0.35	°C/W	

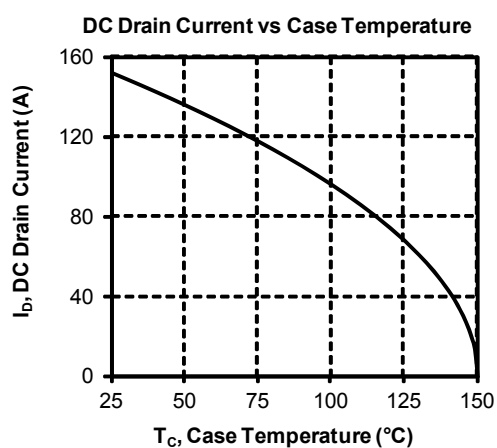
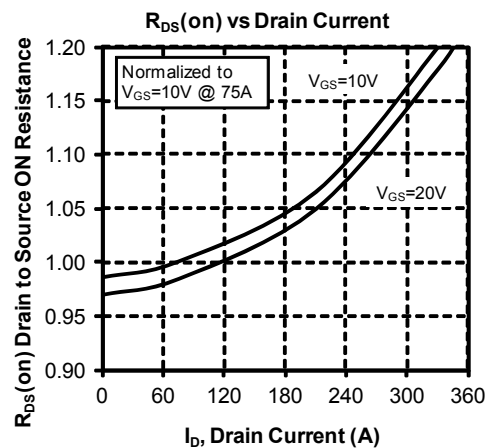
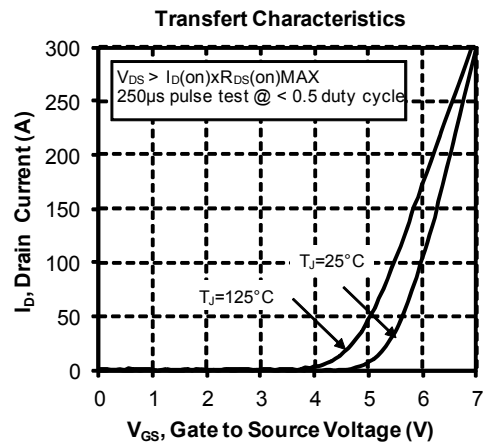
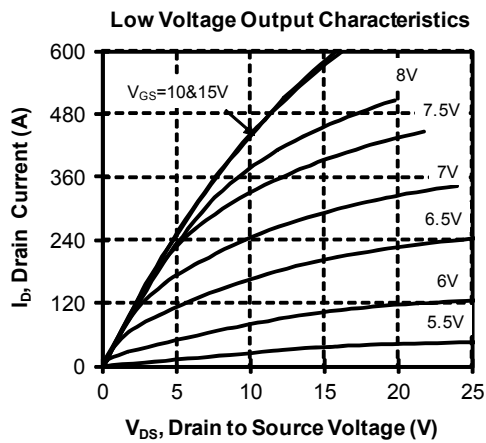
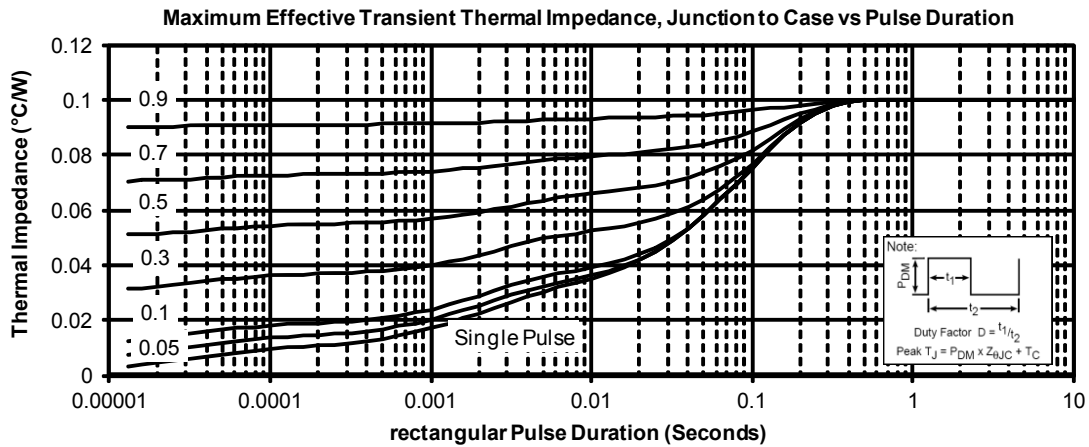
Thermal and package characteristics

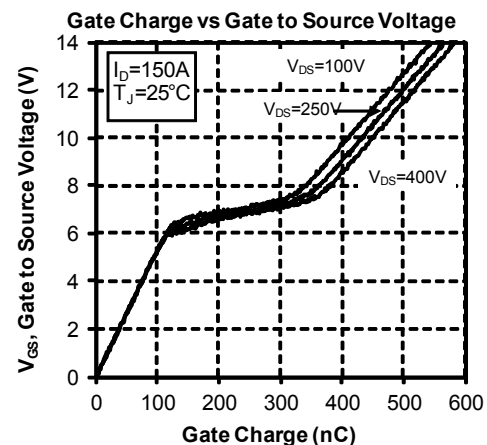
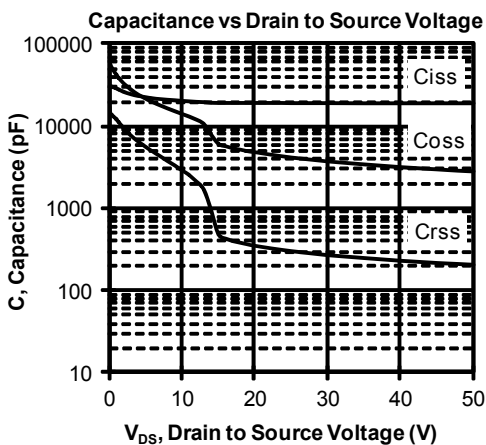
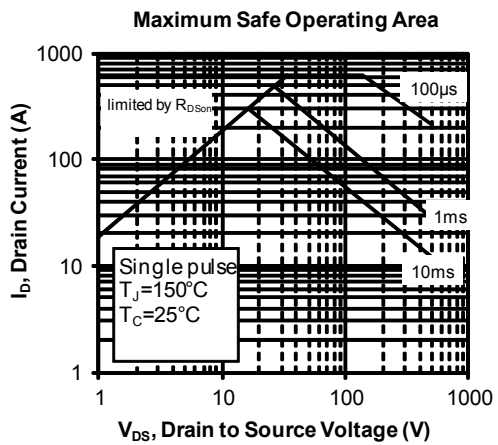
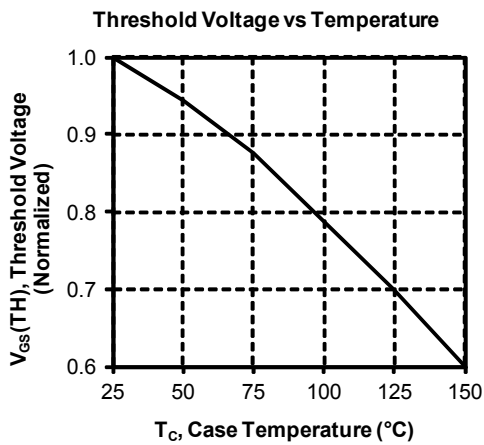
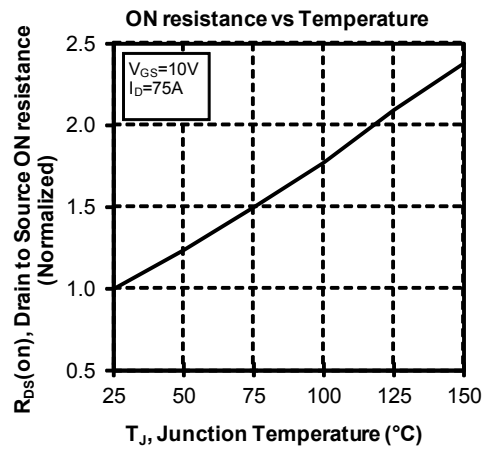
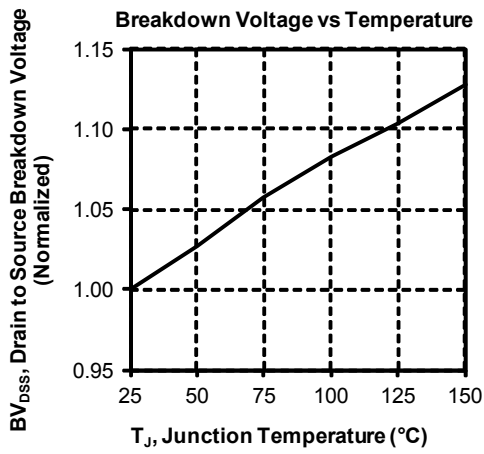
Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	150	°C		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25			
T _{STG}	Storage Temperature Range	-40	125			
T _C	Operating Case Temperature	-40	100			
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight			300	g	

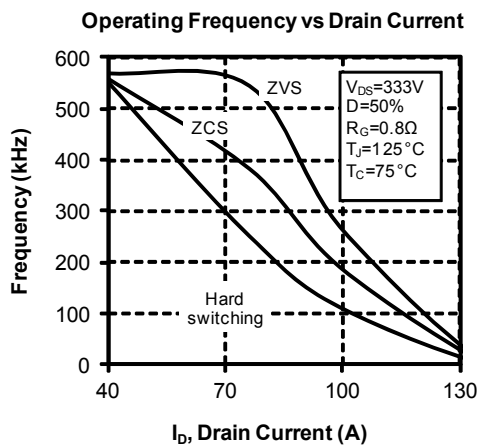
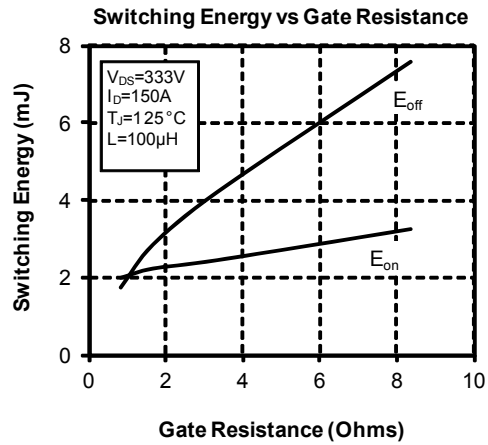
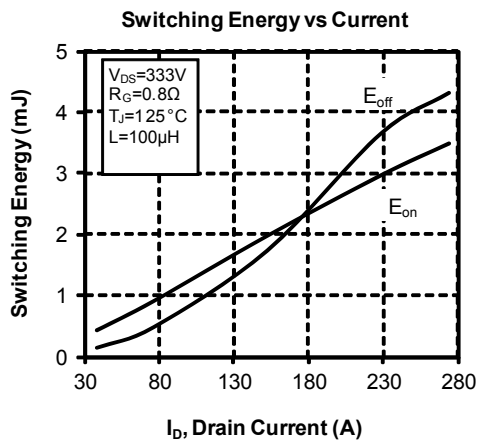
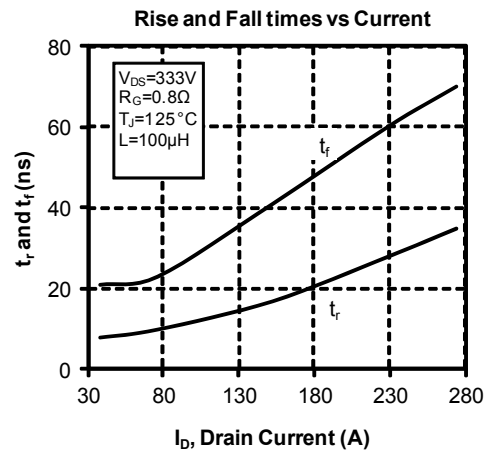
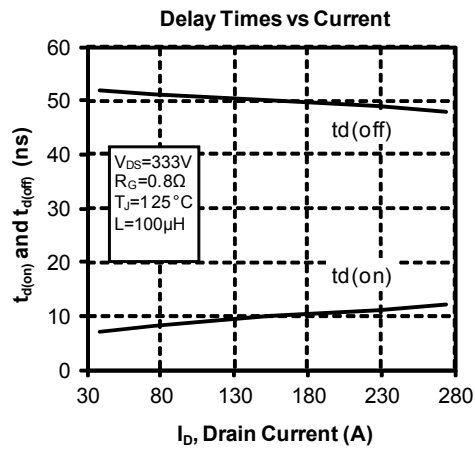
SP6 Package outline (dimensions in mm)

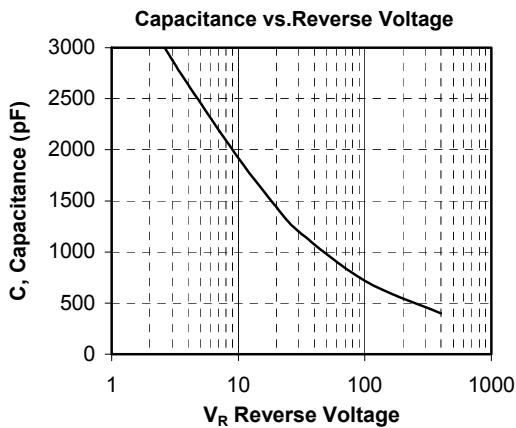
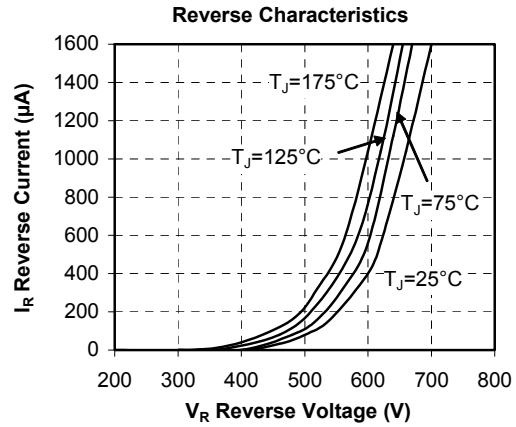
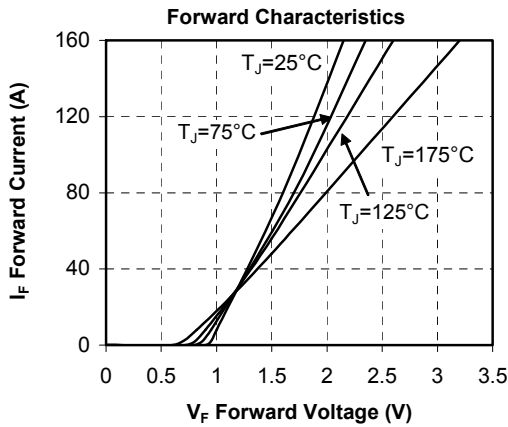
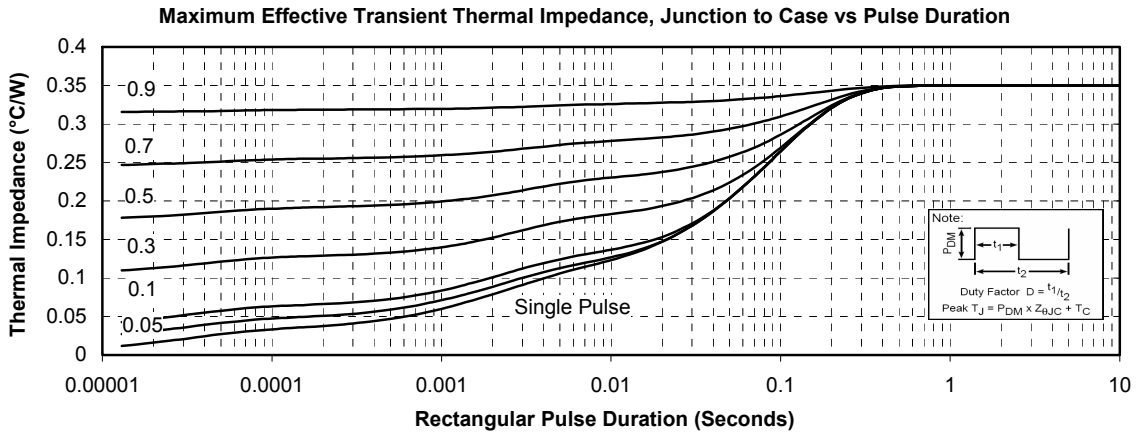


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical MOSFET Performance Curve






Typical SiC Diode Performance Curve


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