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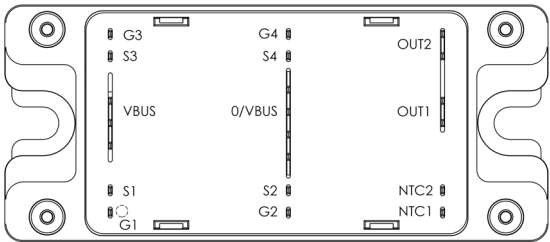
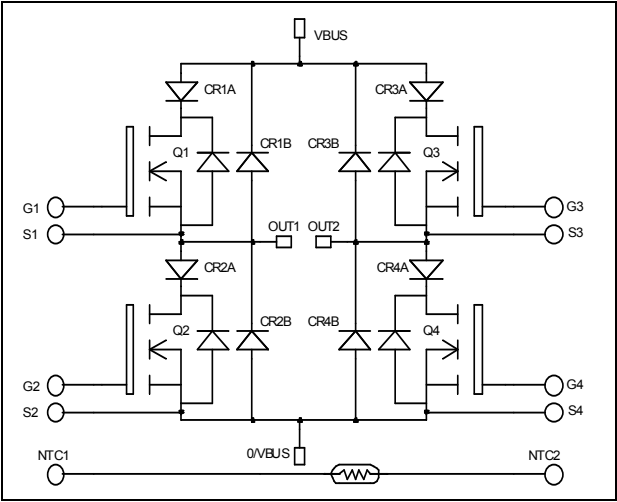
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Full bridge
Series & SiC parallel diodes
MOSFET Power Module

$V_{DSS} = 500V$
 $R_{DSon} = 75m\Omega$ typ @ $T_j = 25^\circ C$
 $I_D = 46A$ @ $T_c = 25^\circ C$



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
- 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	500	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	46
		$T_c = 80^\circ C$	34
I_{DM}	Pulsed Drain current	184	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	90	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	357
I_{AR}	Avalanche current (repetitive and non repetitive)	46	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} = 500V			100	μA
		T _j = 25°C				
		V _{GS} = 0V, V _{DS} = 400V			500	
		T _j = 125°C				
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 23A		75	90	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		5590		pF
C _{oss}	Output Capacitance	V _{DS} = 25V		1180		
C _{rss}	Reverse Transfer Capacitance	f = 1MHz		85		
Q _g	Total gate Charge	V _{GS} = 10V		123		nC
Q _{gs}	Gate – Source Charge	V _{Bus} = 250V		33		
Q _{gd}	Gate – Drain Charge	I _D = 46A		65		
T _{d(on)}	Turn-on Delay Time	Inductive switching @ 125°C		18		ns
T _r	Rise Time	V _{GS} = 15V		35		
T _{d(off)}	Turn-off Delay Time	V _{Bus} = 333V		87		
T _f	Fall Time	I _D = 46A R _G = 5Ω		77		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C		453		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 333V I _D = 46A, R _G = 5Ω		726		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C		745		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 333V I _D = 46A, R _G = 5Ω		846		
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}	Peak Repetitive Reverse Voltage				600	V
I _{RM}	Reverse Leakage Current	V _R = 600V			50	μA
I _F	DC Forward current	T _c = 80°C		50		A
V _F	Diode Forward Voltage	I _F = 50A		1.6	2	V
		V _{GE} = 0V	T _j = 25°C			
			T _j = 150°C	1.5		
t _{rr}	Reverse Recovery Time	I _F = 50A	T _j = 25°C	100		ns
			T _j = 150°C	150		
Q _{rr}	Reverse Recovery Charge	V _R = 300V di/dt = 1800A/μs	T _j = 25°C	2.6		μC
			T _j = 150°C	5.4		
E _{rr}	Reverse Recovery Energy		T _j = 25°C	0.60		mJ
			T _j = 150°C	1.2		
R _{thJC}	Junction to Case Thermal Resistance				1.42	°C/W

Parallel 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}	Peak Repetitive Reverse Voltage					600	V
I _{RM}	Reverse Leakage Current	V _R =600V	T _j = 25°C		100	400	μA
			T _j = 175°C		200	2000	
I _F	DC Forward Current		T _c = 125°C		20		A
V _F	Diode Forward Voltage	I _F = 20A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.0	2.4	
Q _C	Total Capacitive Charge	I _F = 20A, V _R = 600V di/dt = 800A/μs			56		nC
Q	Total Capacitance	f = 1MHz, V _R = 200V			130		pF
		f = 1MHz, V _R = 400V			100		
R _{thJC}	Junction to Case Thermal Resistance					1.5	°C/W

Thermal and package characteristics

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>		
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

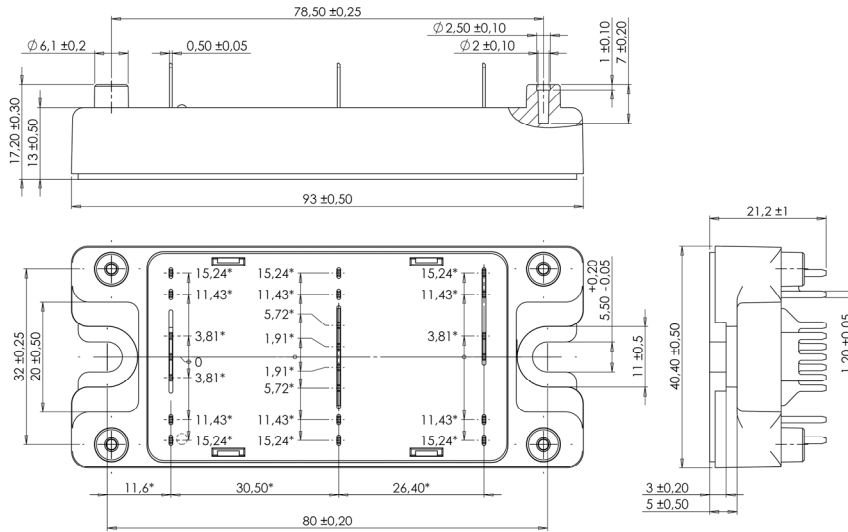
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
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		%

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

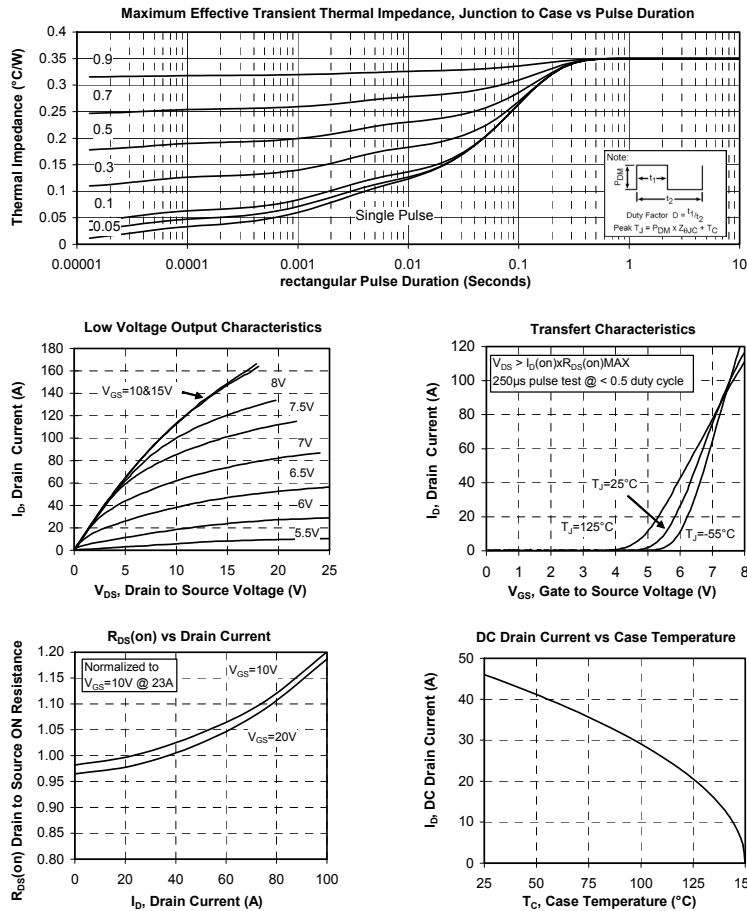
T: Thermistor temperature
 R_T: Thermistor value at T

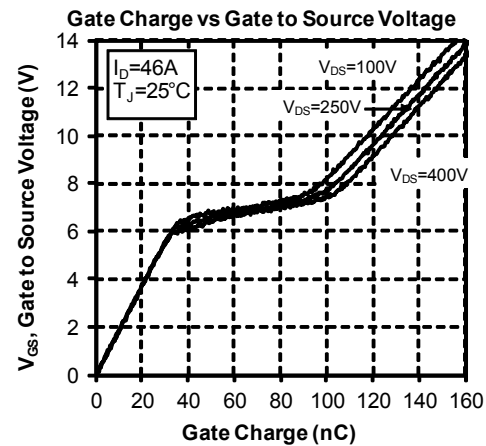
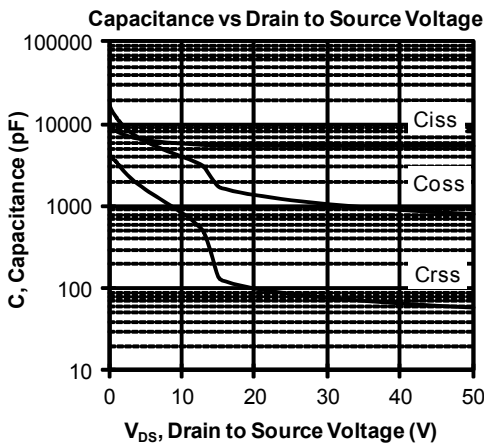
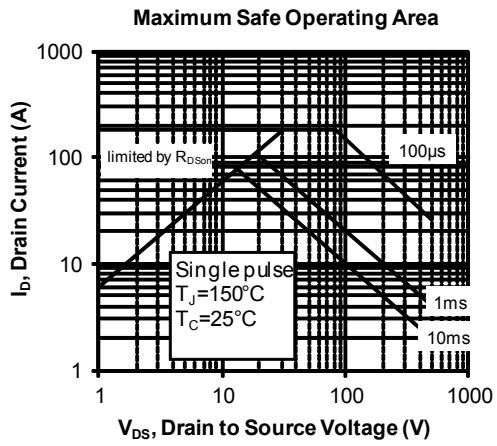
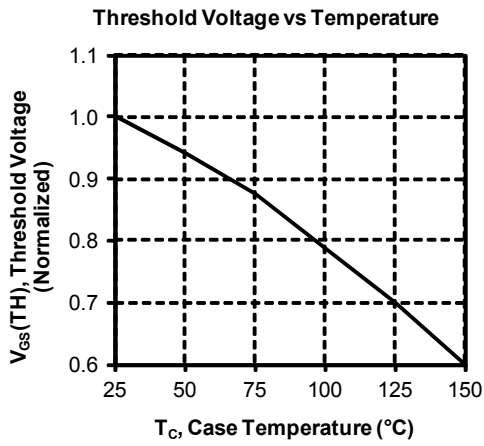
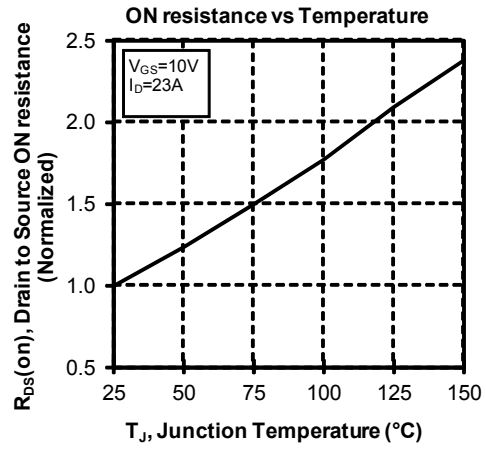
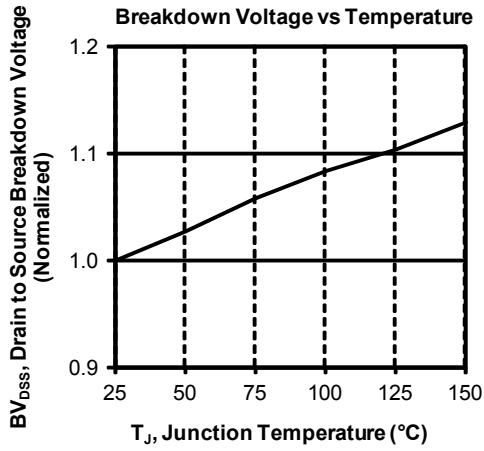
SP4 Package outline (dimensions in mm)

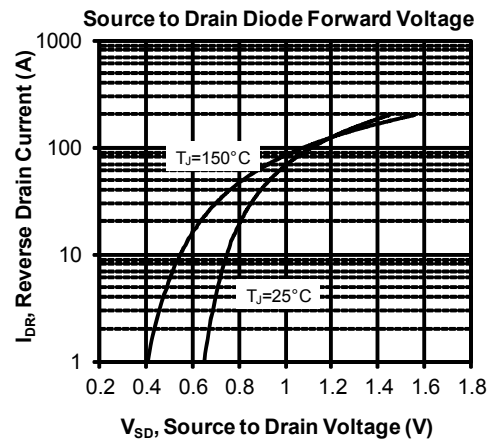
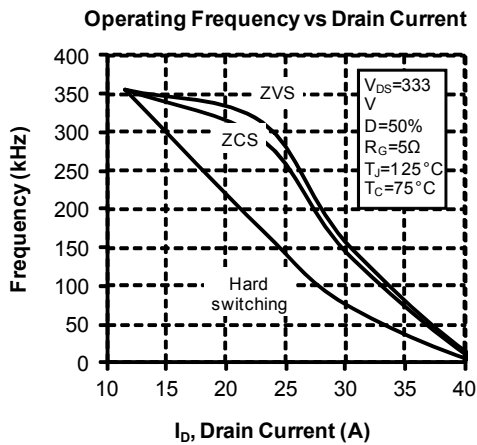
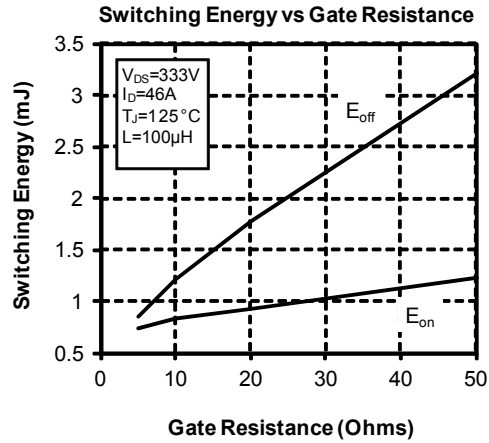
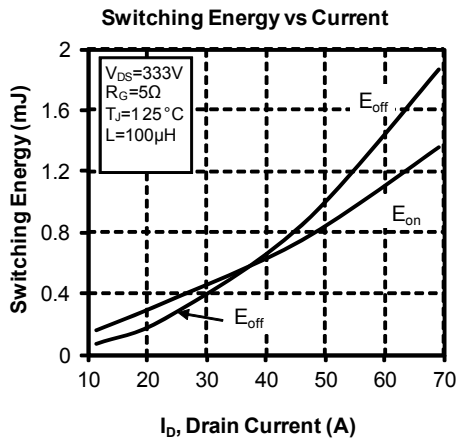
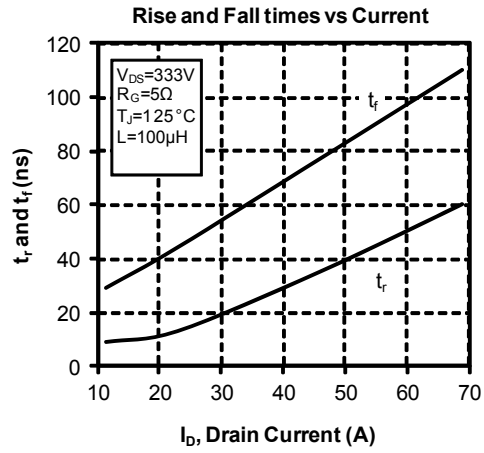
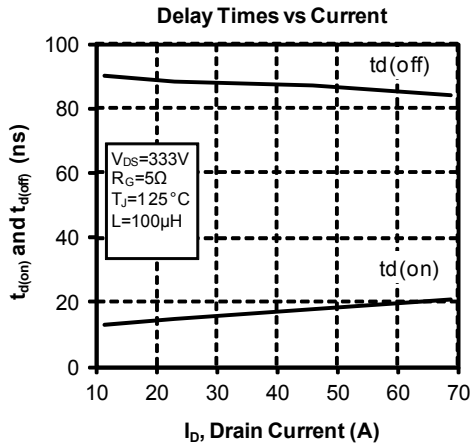


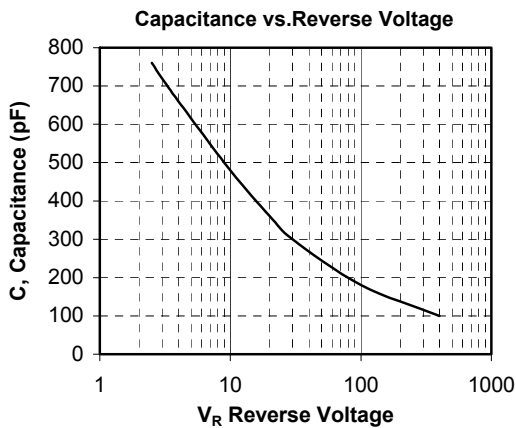
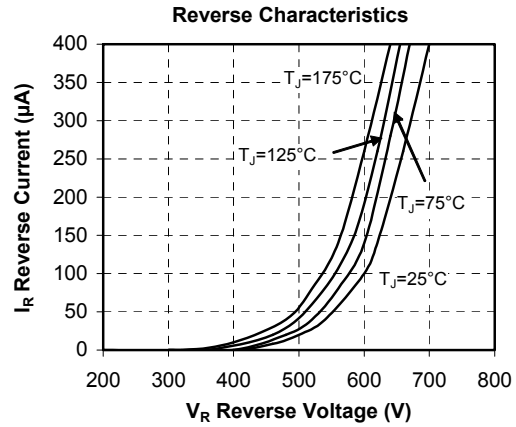
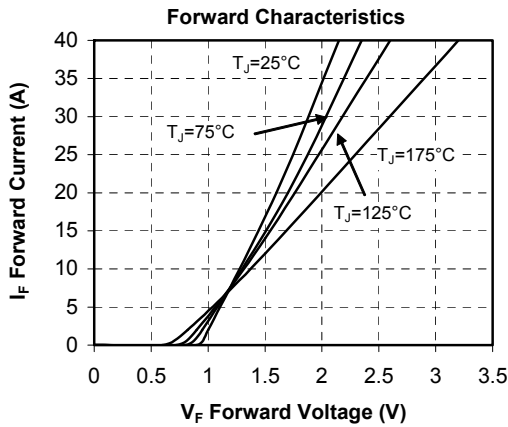
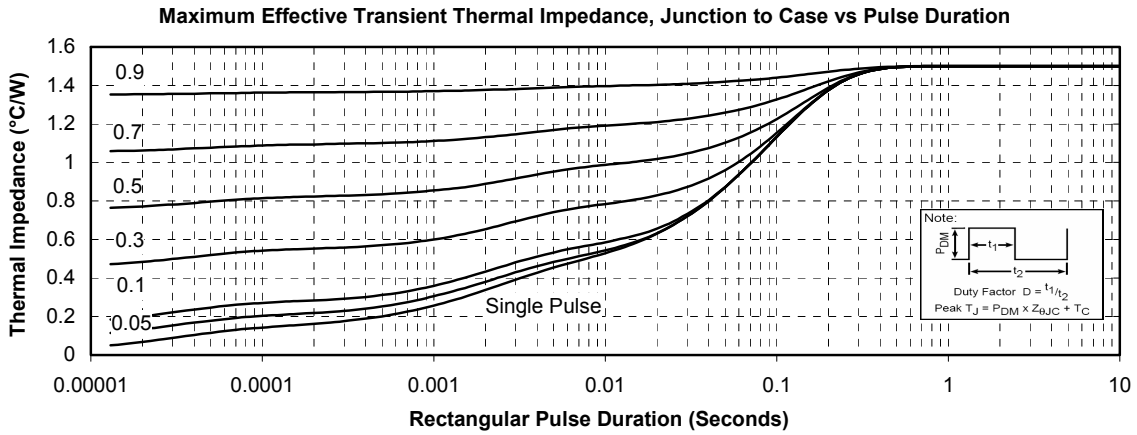
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical MOSFET Performance Curve







Typical SiC Diode Performance Curve


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