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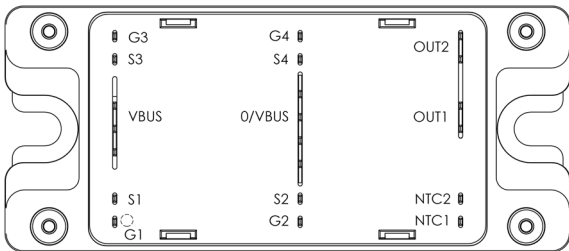
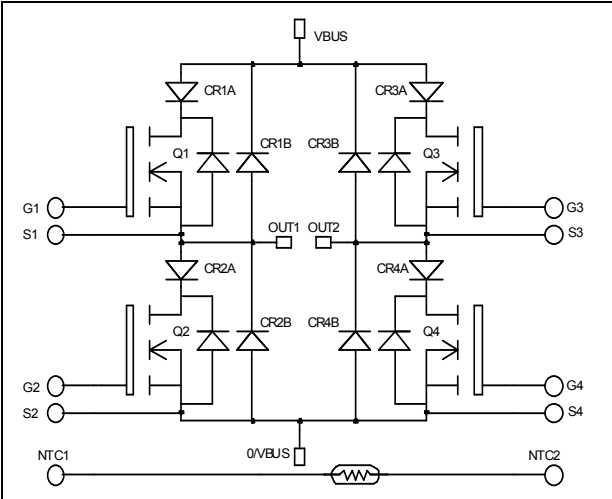
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**Full – Bridge Series & SiC parallel diodes
Super Junction
MOSFET Power Module**

$V_{DSS} = 600V$
 $R_{DSon} = 70m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 39A \text{ @ } T_c = 25^\circ C$



Application

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

Features

- **CoolMOS™**
 - Ultra low R_{DSon}
 - Low Miller capacitance
 - Ultra 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 Voltage	600	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	39
		$T_c = 80^\circ C$	29
I_{DM}	Pulsed Drain current	160	
V_{GS}	Gate - Source Voltage	± 20	V
R_{DSon}	Drain - Source ON Resistance	70	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	250
I_{AR}	Avalanche current (repetitive and non repetitive)	20	A
E_{AR}	Repetitive Avalanche Energy	1	mJ
E_{AS}	Single Pulse Avalanche Energy	1800	

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} = 600V			25	μA
		T _j = 25°C				
		V _{GS} = 0V, V _{DS} = 600V			250	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 39A			70	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 2.7mA	2.1	3	3.9	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0V			±100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V		7		nF
C _{oss}	Output Capacitance	V _{DS} = 25V		2.56		
C _{rss}	Reverse Transfer Capacitance	f = 1MHz		0.21		
Q _g	Total gate Charge	V _{GS} = 10V		259		nC
Q _{gs}	Gate – Source Charge	V _{Bus} = 300V		29		
Q _{gd}	Gate – Drain Charge	I _D = 39A		111		
T _{d(on)}	Turn-on Delay Time	Inductive Switching @ 125°C		21		ns
T _r	Rise Time	V _{GS} = 15V		30		
T _{d(off)}	Turn-off Delay Time	V _{Bus} = 400V		283		
T _f	Fall Time	I _D = 39A R _G = 5Ω		84		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C		402		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 400V I _D = 39A, R _G = 5Ω		980		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C		658		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 400V I _D = 39A, R _G = 5Ω		1206		
R _{thJC}	Junction to Case Thermal Resistance				0.5	°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	T _j = 25°C	1.6	2	V
		V _{GE} = 0V	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}	Maximum Peak Repetitive Reverse Voltage			600			V
I _{RM}	Maximum 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
C	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

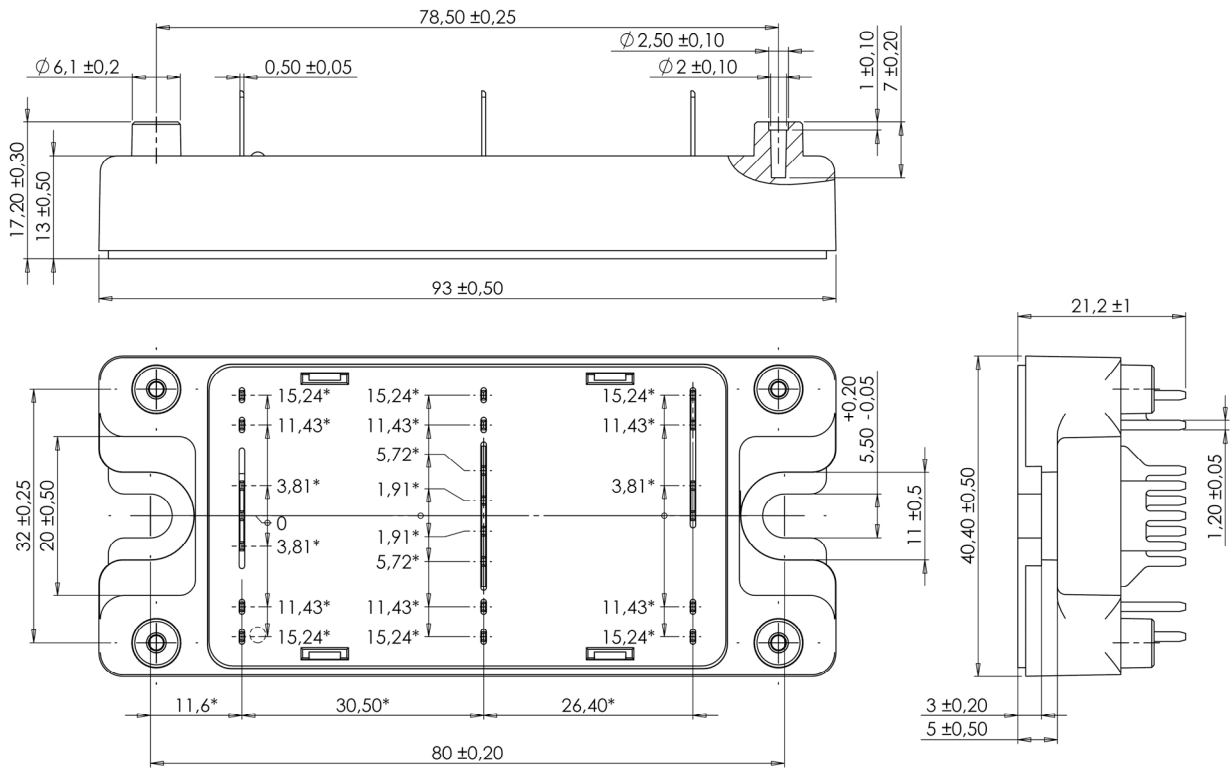
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

<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			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

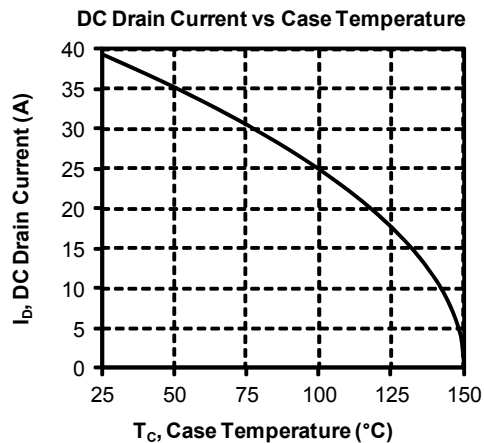
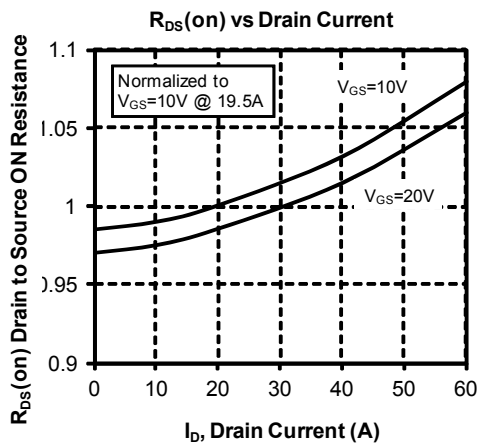
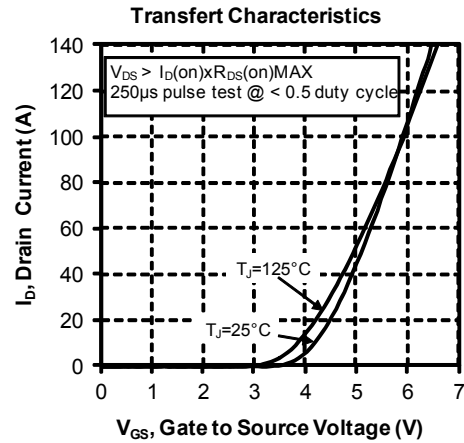
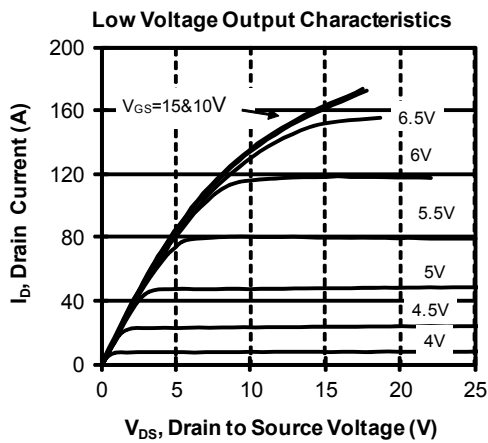
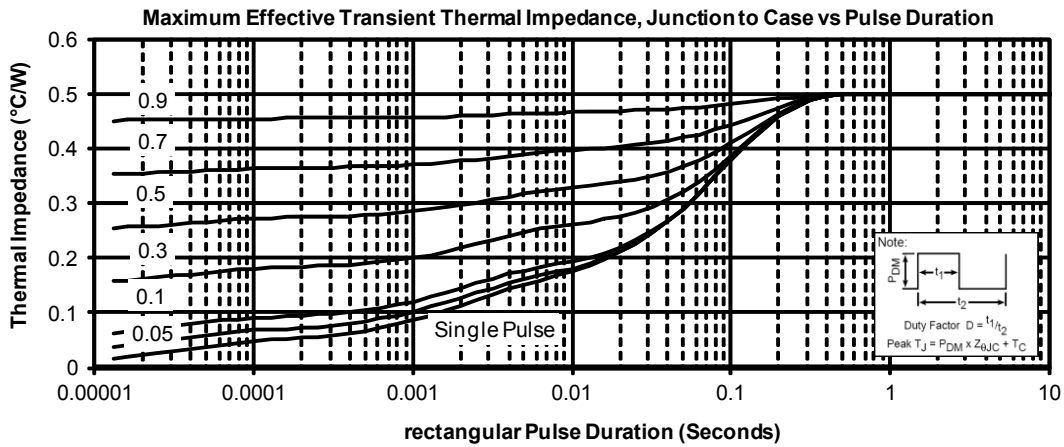
SP4 Package outline (dimensions in mm)

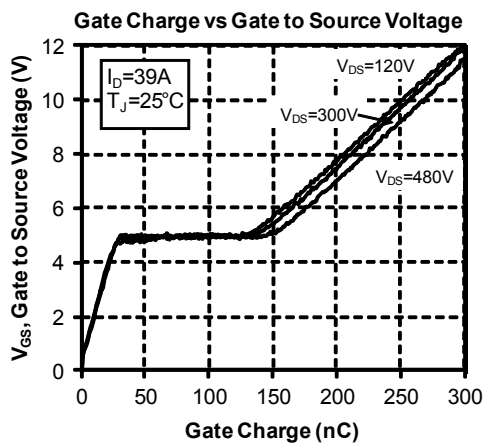
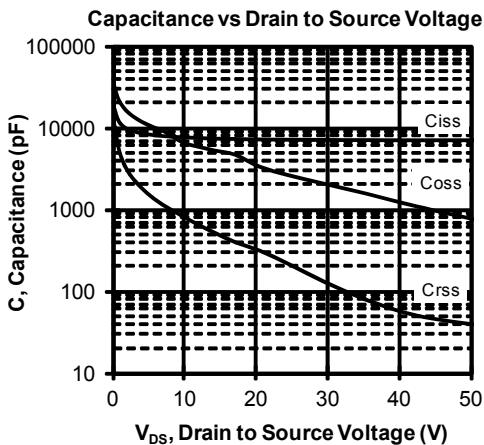
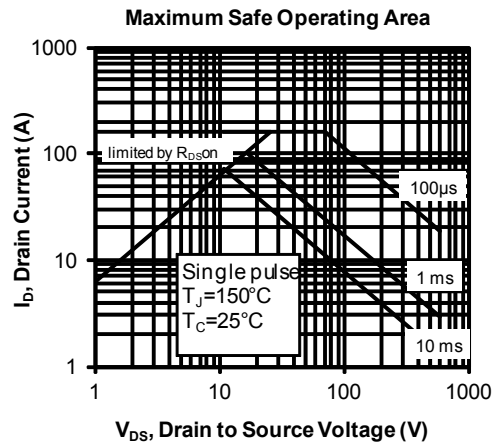
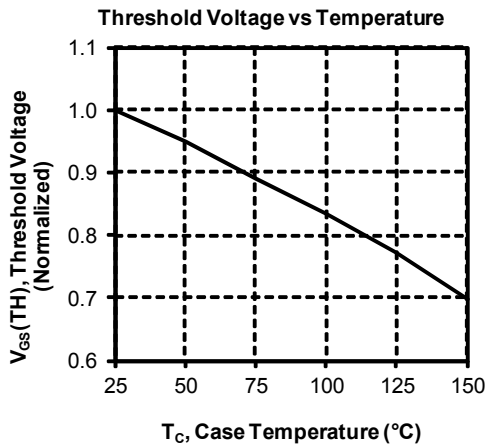
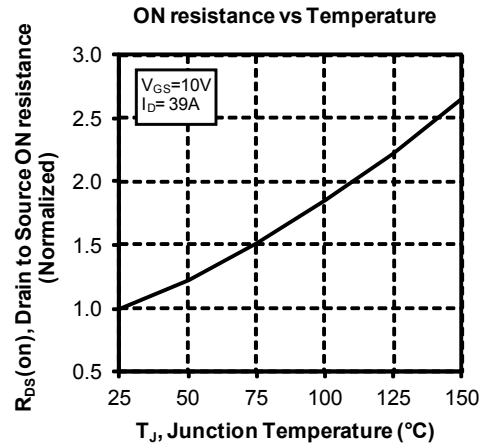
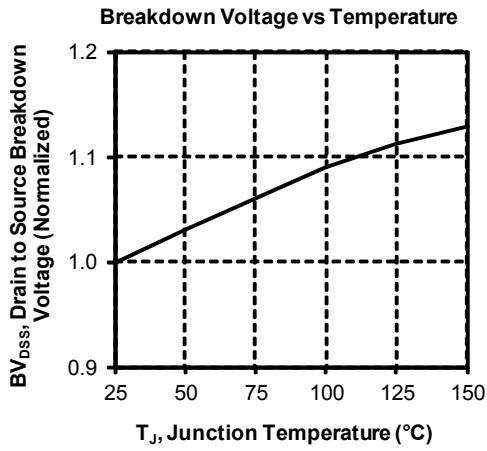


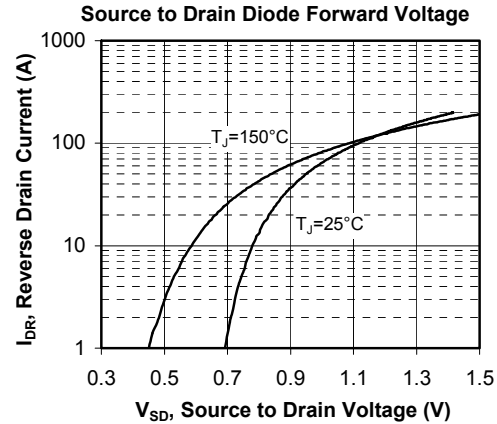
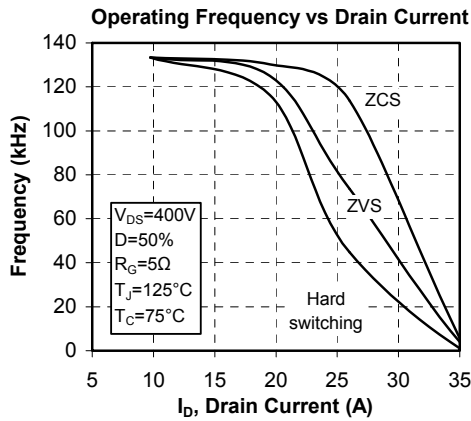
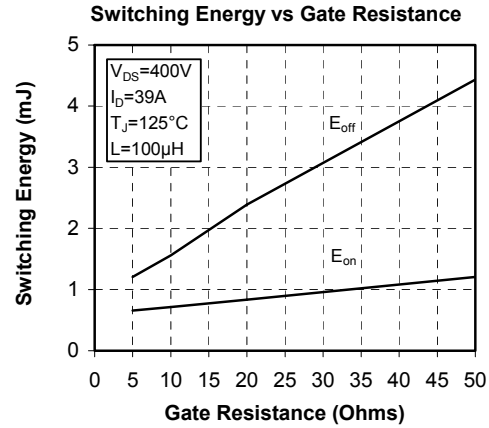
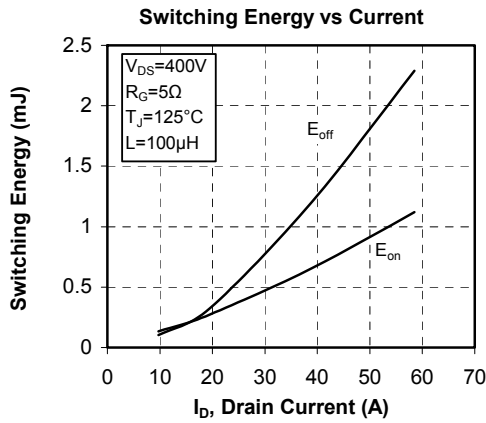
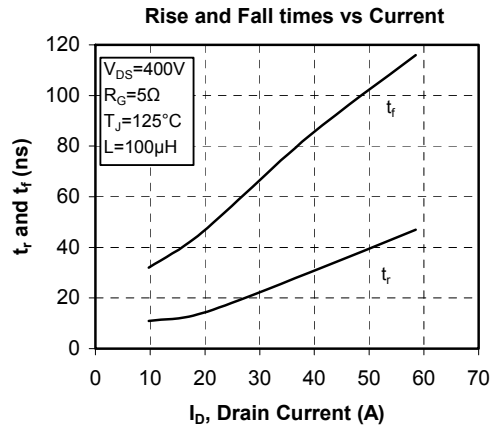
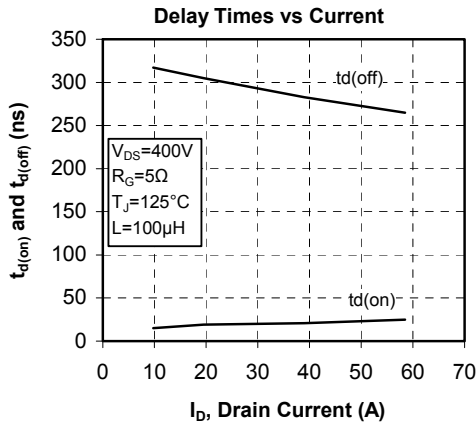
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS: $\pm \phi 1$

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

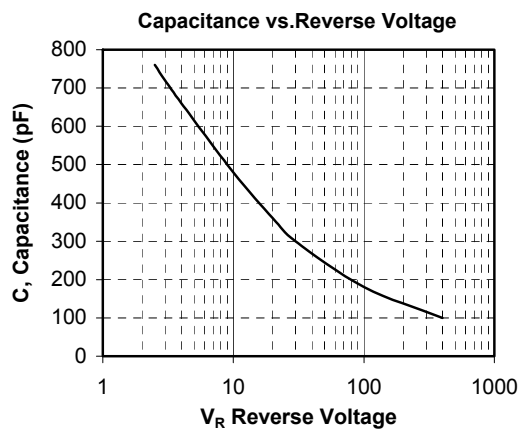
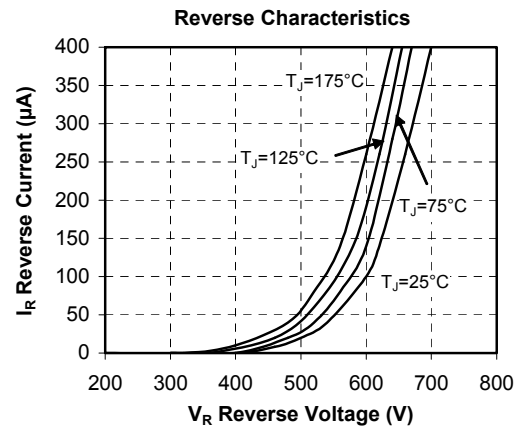
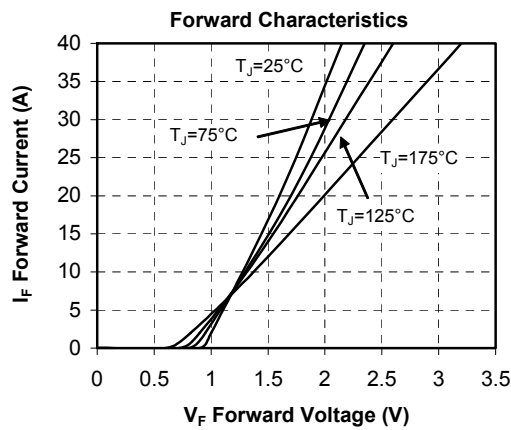
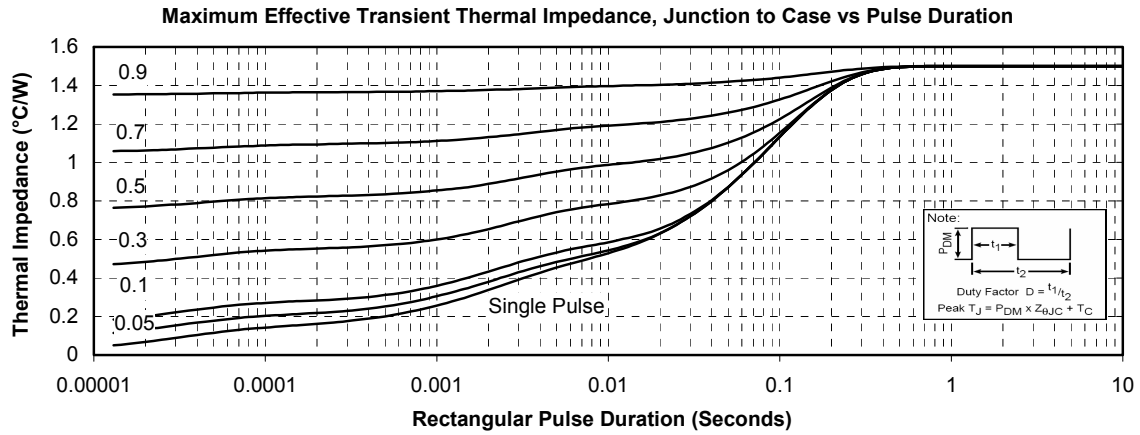
Typical CoolMOS Performance Curve







Typical SiC Diode Performance Curve



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