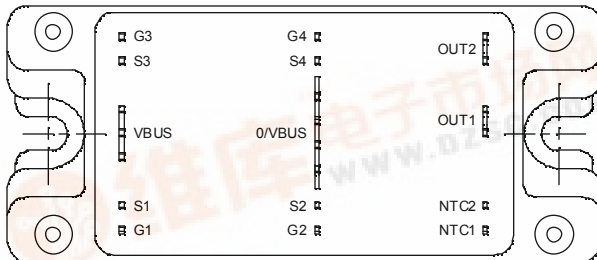
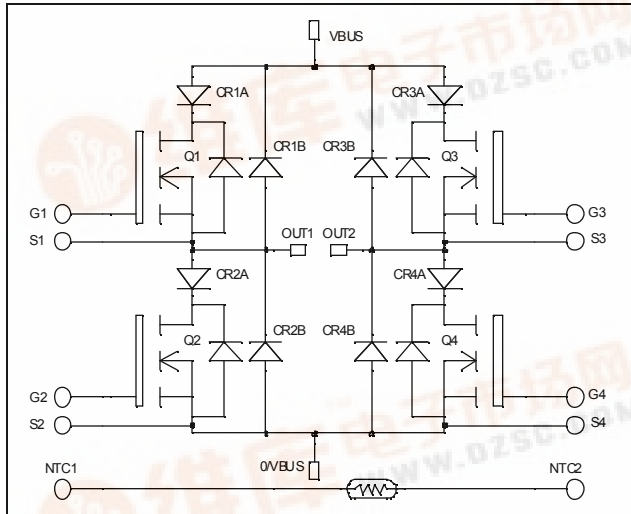




APTC80H29SCTG

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



$$V_{DSS} = 800V$$

$$R_{DSon} = 290m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 15A \text{ @ } T_c = 25^\circ C$$

Application

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

Features

- **COOLMOS** Power Semiconductors
 - 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
 - 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

Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
V _{DSS}	Drain - Source Breakdown Voltage		800	V
I _D	Continuous Drain Current	T _c = 25°C	15	A
		T _c = 80°C	11	
I _{DM}	Pulsed Drain current		60	
V _{GS}	Gate - Source Voltage		±30	V
R _{DSon}	Drain - Source ON Resistance		290	mΩ
P _D	Maximum Power Dissipation	T _c = 25°C	156	W
I _{AR}	Avalanche current (repetitive and non repetitive)		17	A
E _{AR}	Repetitive Avalanche Energy		0.5	mJ
E _{AS}	Single Pulse Avalanche Energy		670	

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

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 800V, T_j = 25^\circ\text{C}$			25	μA
		$V_{GS} = 0V, V_{DS} = 800V, T_j = 125^\circ\text{C}$			250	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 7.5A$			290	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 1\text{mA}$	2.1	3	3.9	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		2254		pF
C_{oss}	Output Capacitance	$V_{DS} = 25V$		1046		
C_{rss}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		54		
Q_g	Total gate Charge	$V_{GS} = 10V$		91		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 400V$		12		
Q_{gd}	Gate – Drain Charge	$I_D = 15A$		46		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @125°C $V_{GS} = 15V$ $V_{Bus} = 533V$ $I_D = 15A$ $R_G = 5\Omega$		10		ns
T_r	Rise Time			13		
$T_{d(off)}$	Turn-off Delay Time			83		
T_f	Fall Time			35		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 15A, R_G = 5\Omega$		146		μJ
E_{off}	Turn-off Switching Energy			139		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 15A, R_G = 5\Omega$		255		μJ
E_{off}	Turn-off Switching Energy			171		

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25^\circ\text{C}$		250	μA
			$T_j = 125^\circ\text{C}$		500	
I_F	DC Forward Current	$T_c = 85^\circ\text{C}$		30		A
V_F	Diode Forward Voltage	$I_F = 30A$		1.1	1.15	V
		$I_F = 60A$		1.4		
		$I_F = 30A, T_j = 125^\circ\text{C}$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 30A$ $V_R = 133V$ $di/dt = 200A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	24		ns
			$T_j = 125^\circ\text{C}$	48		
Q_{rr}	Reverse Recovery Charge	$T_j = 25^\circ\text{C}$		33		nC
			$T_j = 125^\circ\text{C}$	150		

Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V _{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I _{RM}	Maximum Reverse Leakage Current	V _R =1200V	T _j = 25°C		50	200	μA
			T _j = 175°C		100	1000	
I _F	DC Forward Current				5		A
V _F	Diode Forward Voltage	I _F = 5 A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.6	3.0	
Q _C	Total Capacitive Charge	I _F = 5 A, V _R = 600 V di/dt = 500 A/μs			14		nC
Q	Total Capacitance	f = 1 MHz, V _R = 200 V			45		pF
		f = 1 MHz, V _R = 400 V			33		

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case Thermal Resistance	Transistor				0.8	°C/W
		Series diode				1.2	
		Parallel diode				2.5	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I _{isol} < 1 mA, 50/60 Hz			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	M5	2.5		4.7	N.m
Wt	Package Weight					160	g

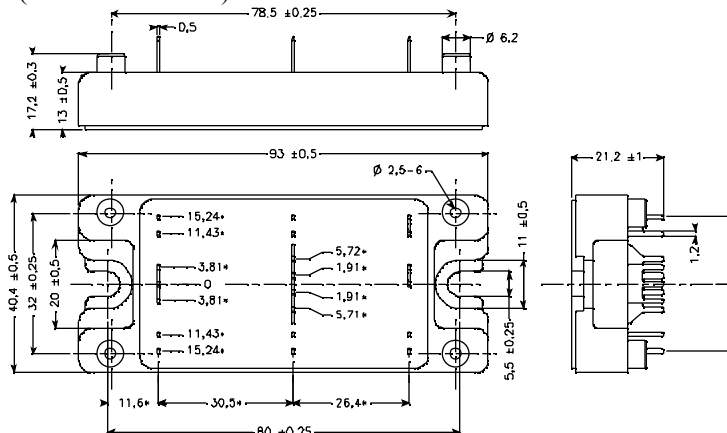
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

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

T: Thermistor temperature
R_T: Thermistor value at T

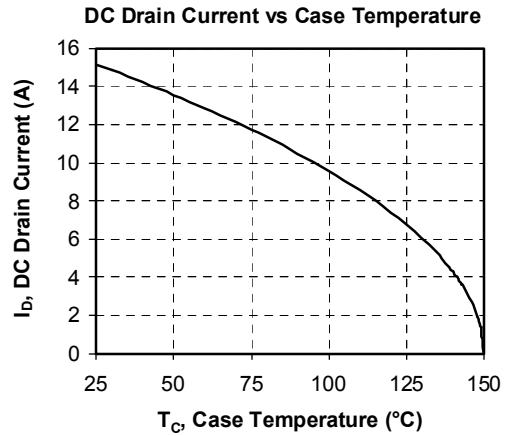
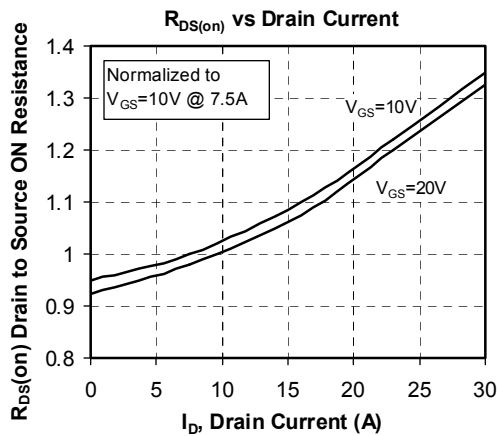
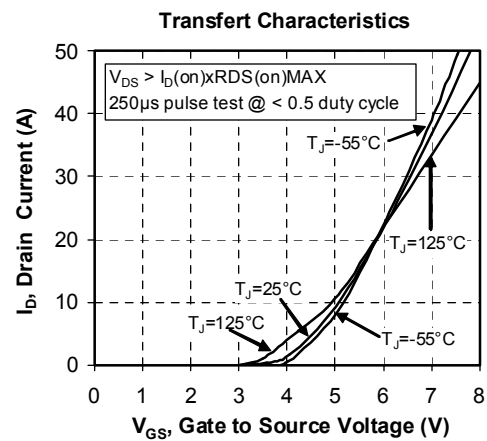
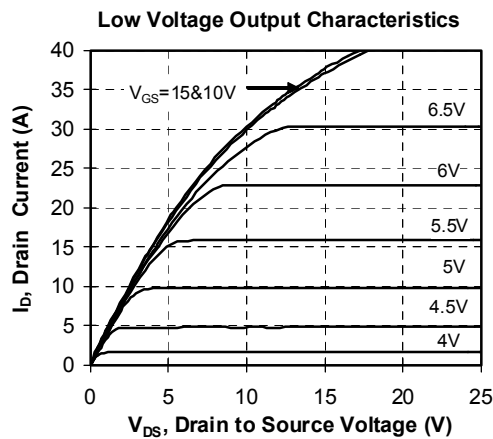
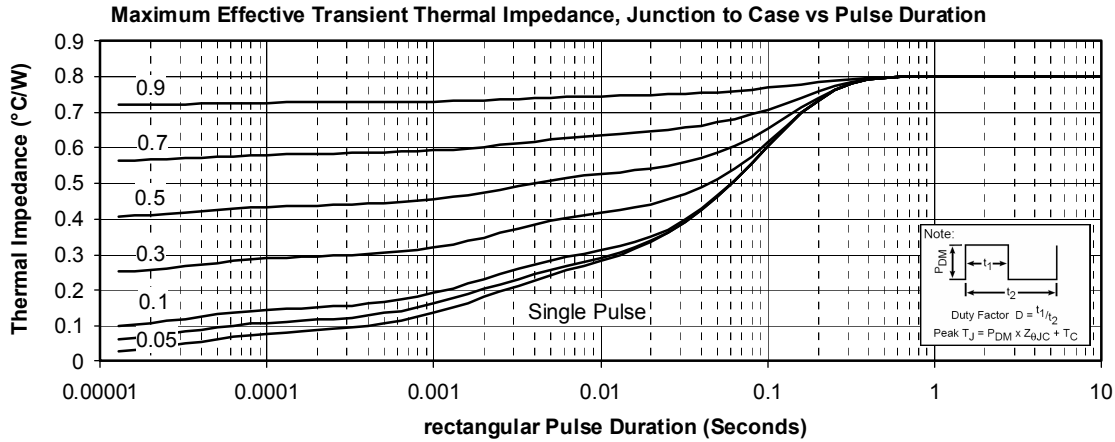
SP4 Package outline (dimensions in mm)

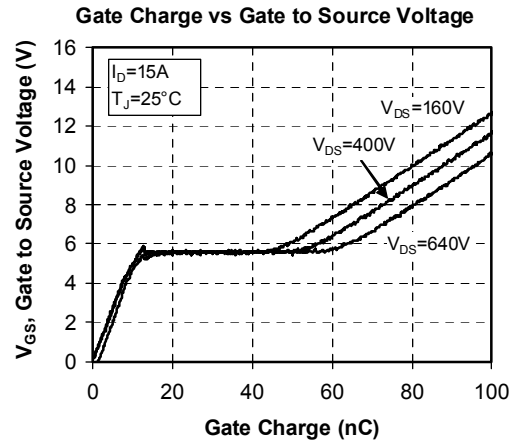
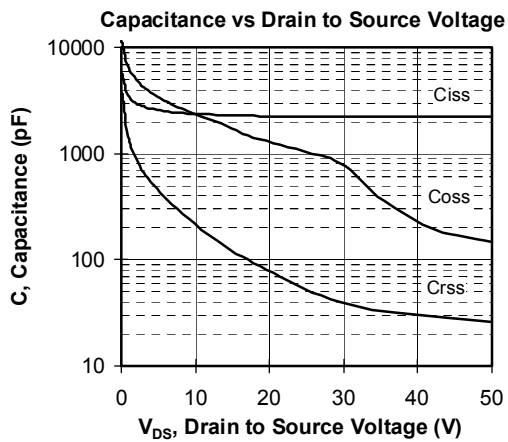
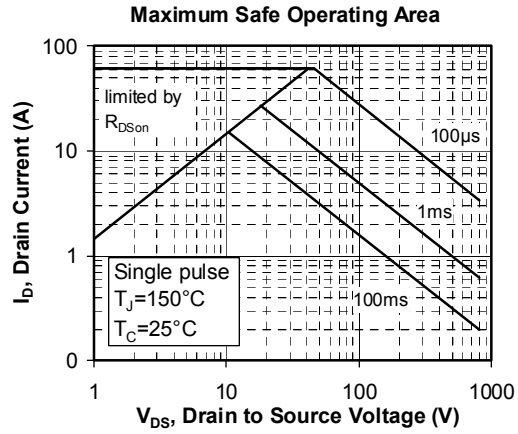
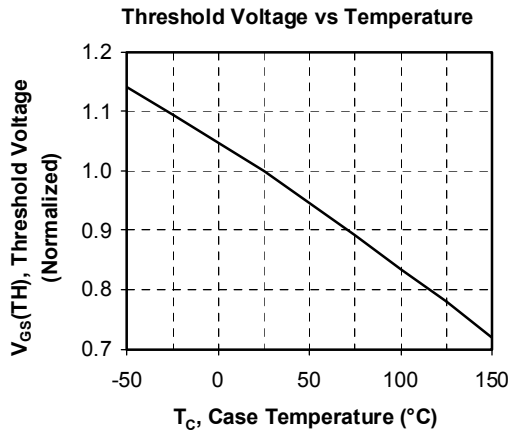
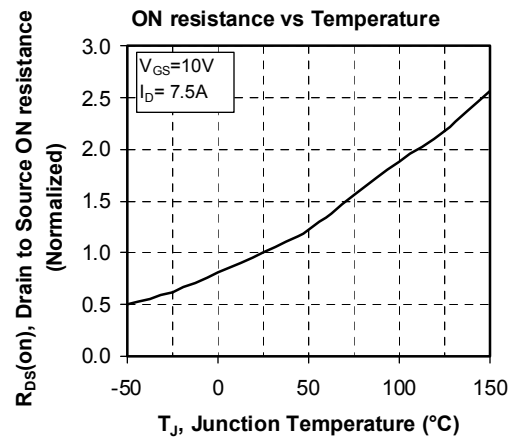
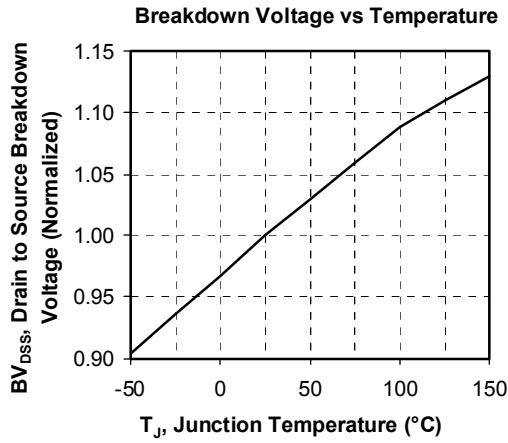


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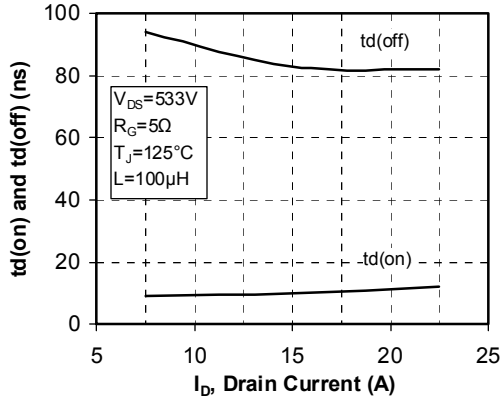
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

Typical CoolMOS Performance Curve

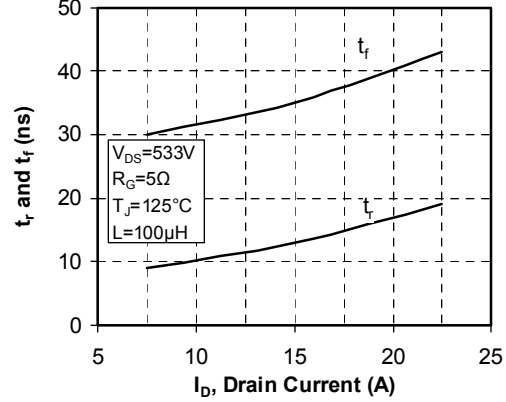




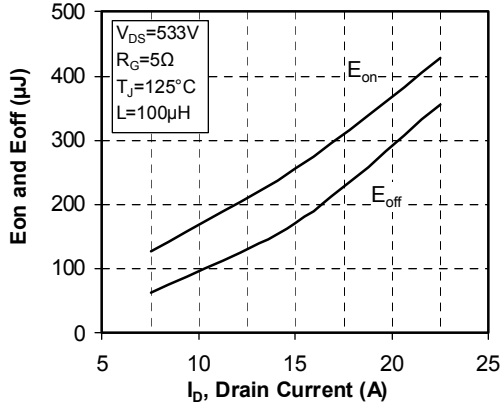
Delay Times vs Current



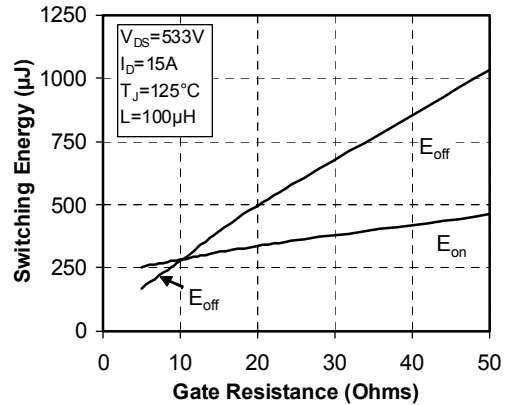
Rise and Fall times vs Current



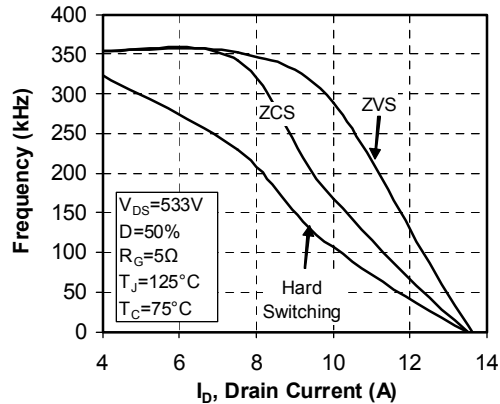
Switching Energy vs Current



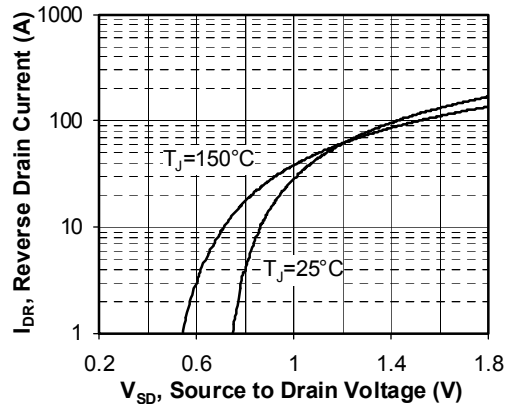
Switching Energy vs Gate Resistance



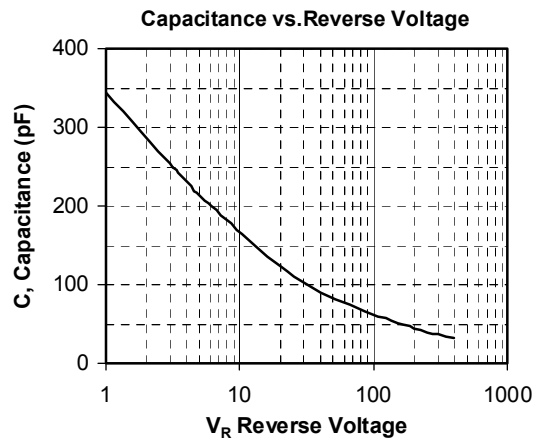
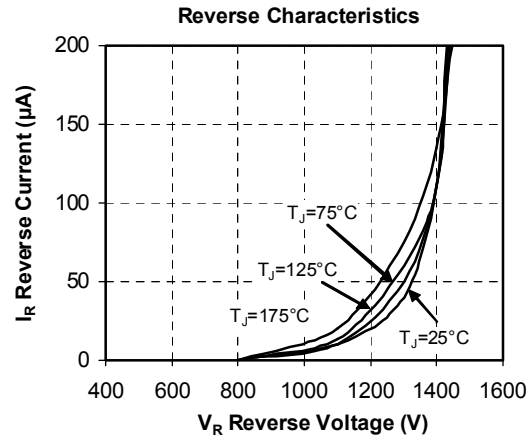
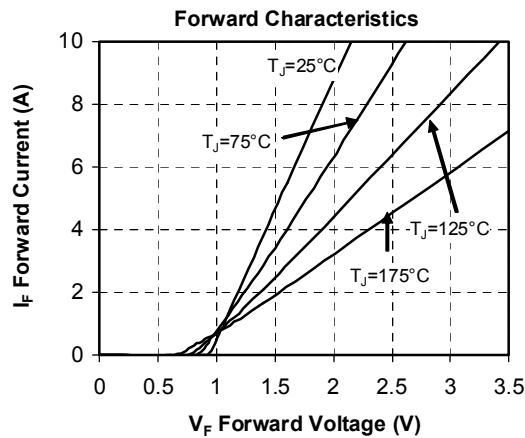
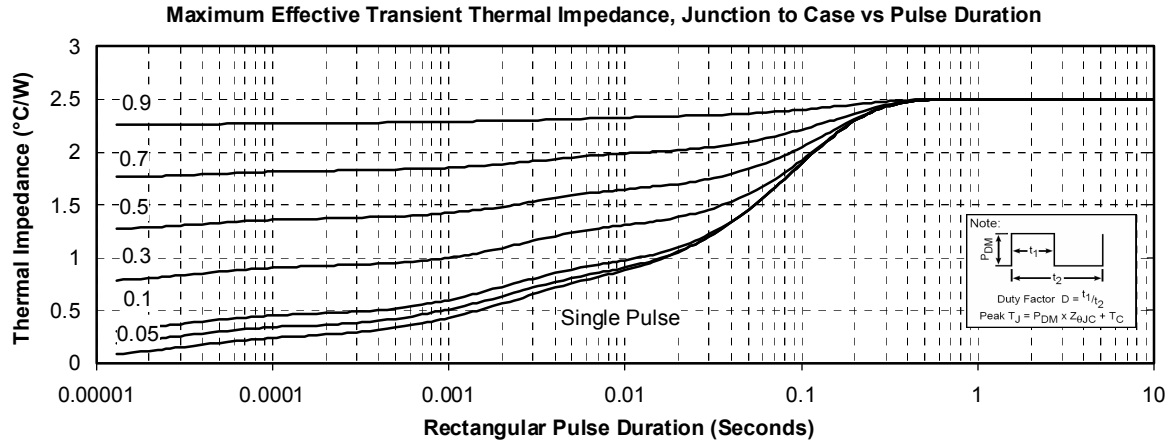
Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



Typical SiC Diode Performance Curve



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Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.