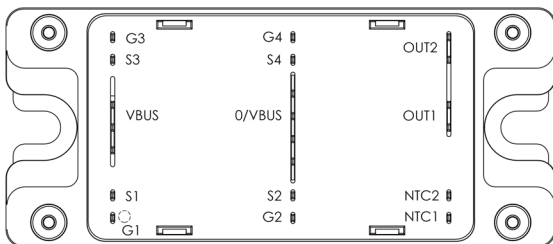
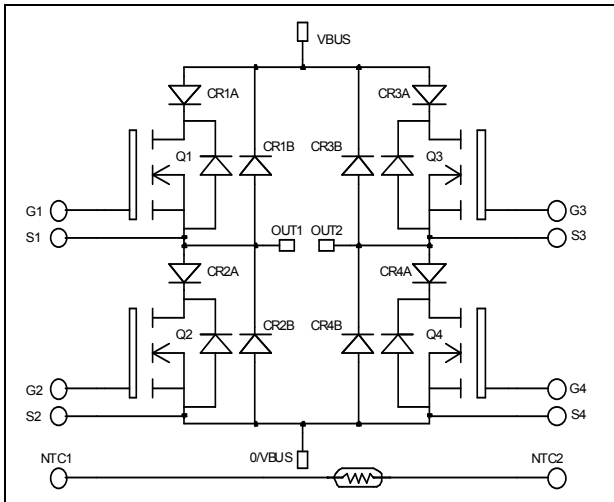


**Full – Bridge Series & SiC parallel diodes  
Super Junction MOSFET Power Module**

**$V_{DSS} = 800V$   
 $R_{DSon} = 290m\Omega$  max @  $T_j = 25^\circ C$   
 $I_D = 15A$  @  $T_c = 25^\circ C$**



### Application

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

### Features

- CoolMOST™
  - 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

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

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	800	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	15
		$T_c = 80^\circ C$	11
$I_{DM}$	Pulsed Drain current	60	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	290	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	156
$I_{AR}$	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](http://www.microsemi.com)

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800V			25	μA
		T <sub>j</sub> = 25°C				
		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800V			250	
		T <sub>j</sub> = 125°C				
R <sub>DS(on)</sub>	Drain – Source on Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7.5A			290	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 1mA	2.1	3	3.9	V
I <sub>GSS</sub>	Gate – Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0V			±100	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1MHz		2254		pF
C <sub>oss</sub>	Output Capacitance			1046		
C <sub>rss</sub>	Reverse Transfer Capacitance			54		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = 10V V <sub>Bus</sub> = 400V I <sub>D</sub> = 15A		91		nC
Q <sub>gs</sub>	Gate – Source Charge			12		
Q <sub>gd</sub>	Gate – Drain Charge			46		
T <sub>d(on)</sub>	Turn-on Delay Time	<b>Inductive switching @125°C</b> V <sub>GS</sub> = 15V V <sub>Bus</sub> = 533V I <sub>D</sub> = 15A R <sub>G</sub> = 5Ω		10		ns
T <sub>r</sub>	Rise Time			13		
T <sub>d(off)</sub>	Turn-off Delay Time			83		
T <sub>f</sub>	Fall Time			35		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 533V I <sub>D</sub> = 15A, R <sub>G</sub> = 5Ω		146		μJ
E <sub>off</sub>	Turn-off Switching Energy			139		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 533V I <sub>D</sub> = 15A, R <sub>G</sub> = 5Ω		255		μJ
E <sub>off</sub>	Turn-off Switching Energy			171		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.8	°C/W

**Series diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage		1000			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> = 1000V			250	μA
I <sub>F</sub>	DC Forward Current	T <sub>c</sub> = 85°C		30		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 30A		1.9	2.3	V
		I <sub>F</sub> = 60A		2.2		
		I <sub>F</sub> = 30A	T <sub>j</sub> = 125°C		1.7	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 30A V <sub>R</sub> = 667V di/dt = 200A/μs	T <sub>j</sub> = 25°C		290	ns
			T <sub>j</sub> = 125°C		390	
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 30A V <sub>R</sub> = 667V di/dt = 200A/μs	T <sub>j</sub> = 25°C		670	nC
			T <sub>j</sub> = 125°C		2350	
R <sub>thJC</sub>	Junction to Case Thermal Resistance				1.2	°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 <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			1200			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> =1200V	T <sub>j</sub> = 25°C			200	μA
			T <sub>j</sub> = 150°C			1000	
I <sub>F</sub>	DC Forward Current		T <sub>C</sub> = 125°C		10		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 10A	T <sub>j</sub> = 25°C		1.5	1.8	V
			T <sub>j</sub> = 150°C		2.1		
Q <sub>C</sub>	Total Capacitive Charge	I <sub>F</sub> = 10A, V <sub>R</sub> = 800V di/dt = 100A/μs			30		nC
Q	Total Capacitance	f = 1MHz, V <sub>R</sub> = 200V			71		pF
		f = 1MHz, V <sub>R</sub> = 400V			52		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					2.7	°C/W

**Thermal and package characteristics**

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Max</i>	<i>Unit</i>		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	-40	150	°C		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T <sub>STG</sub>	Storage Temperature Range	-40	125			
T <sub>C</sub>	Operating Case Temperature	-40	100			
Torque	Mounting torque	To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

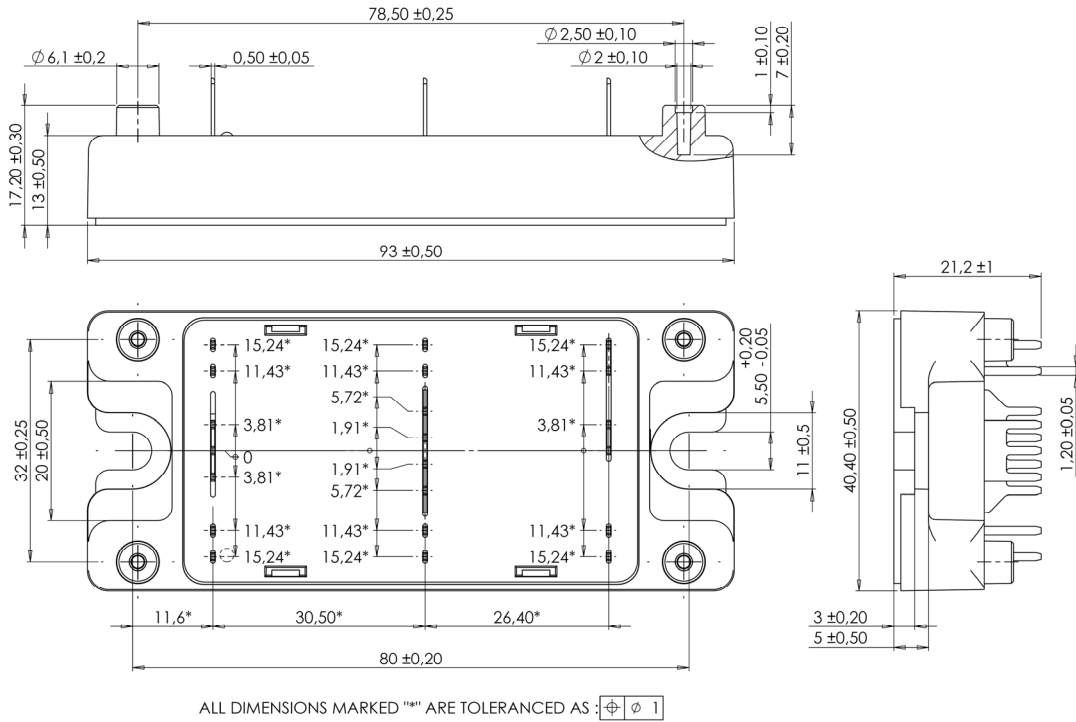
**Temperature sensor NTC** (see application note APT0406 on www.microsemi.com for more information).

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B	T <sub>C</sub> = 100°C		4		%

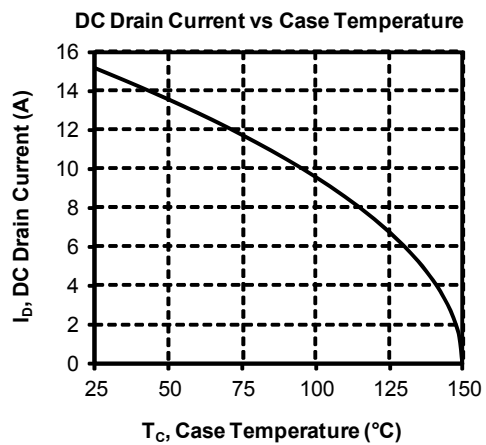
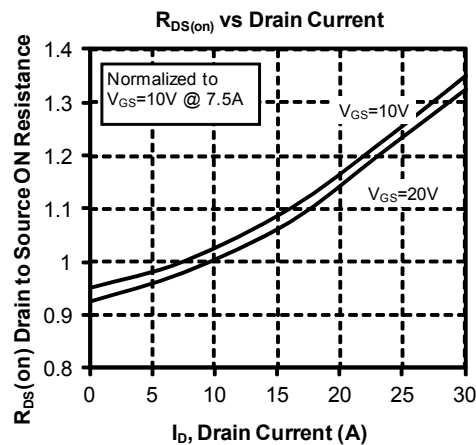
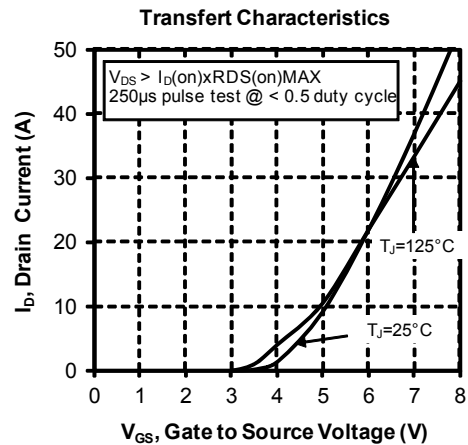
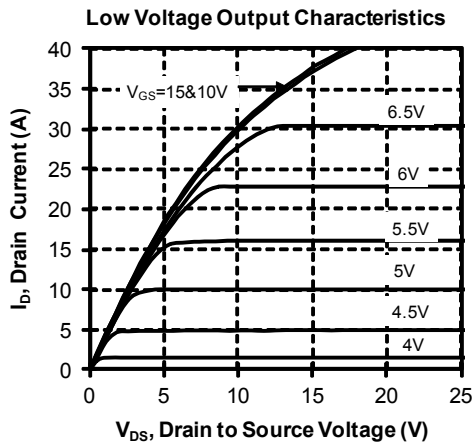
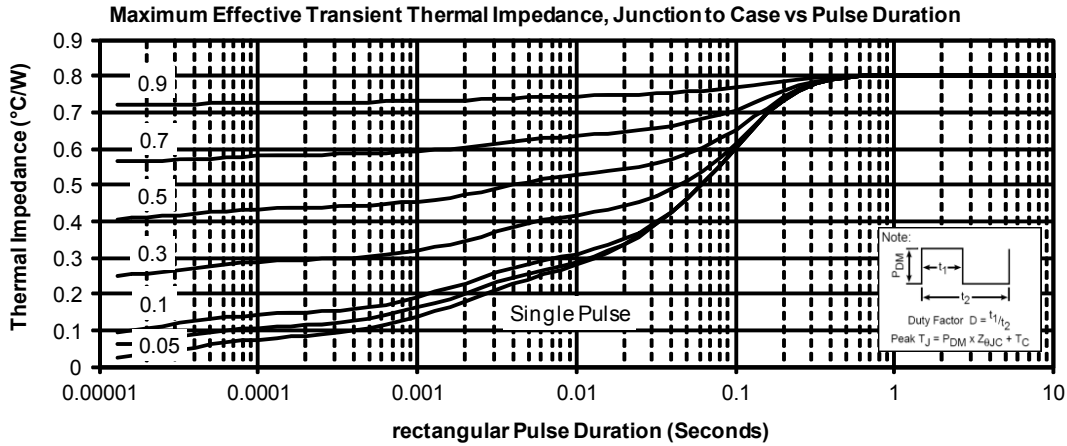
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

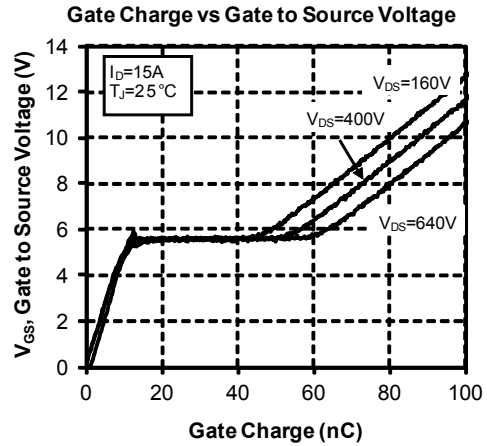
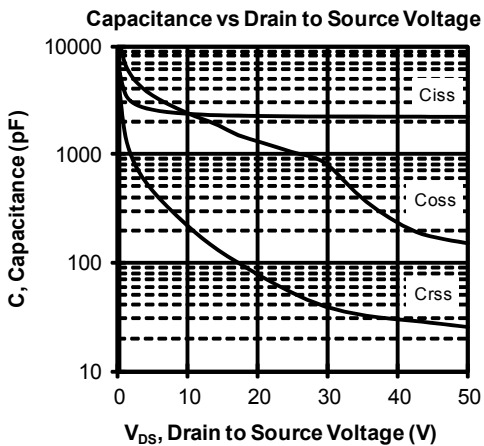
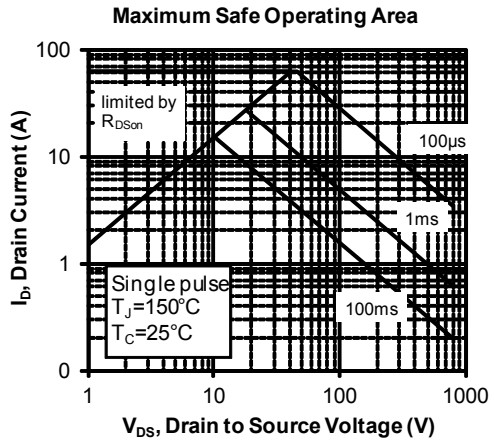
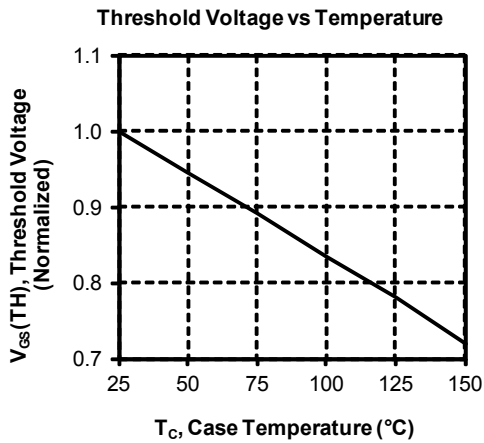
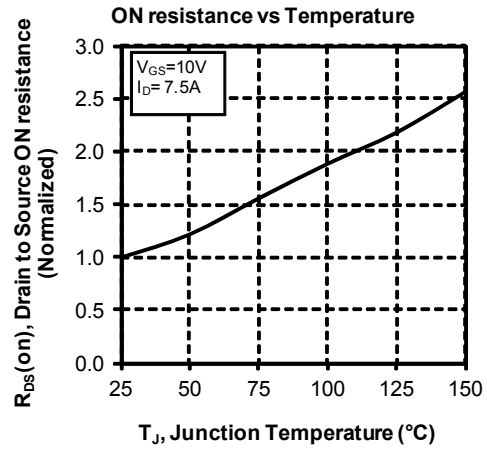
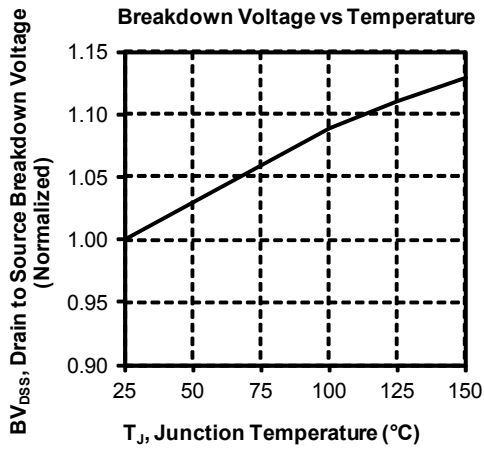
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

**SP4 Package outline** (dimensions in mm)

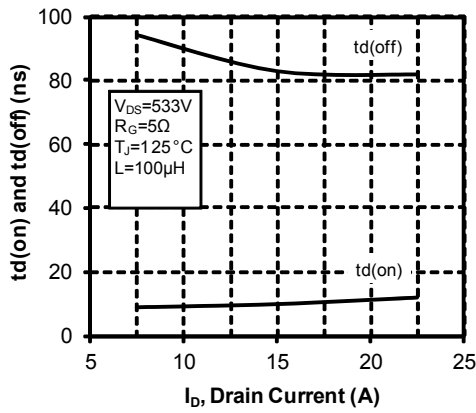


See application note APT0501 - Mounting Instructions for SP4 Power Modules on [www.microsemi.com](http://www.microsemi.com)

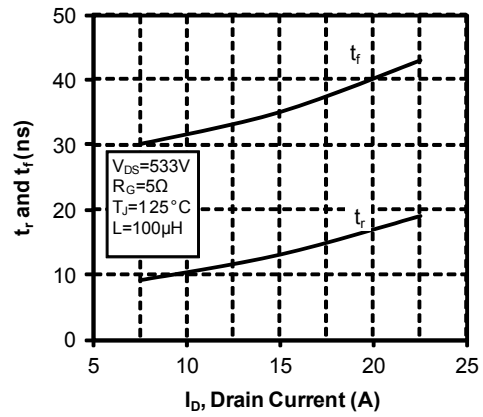
**Typical CoolMOS Performance Curve**




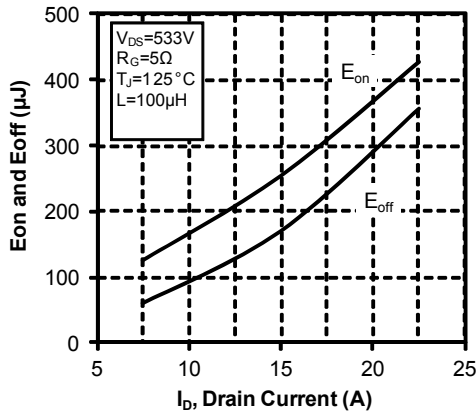
**Delay Times vs Current**



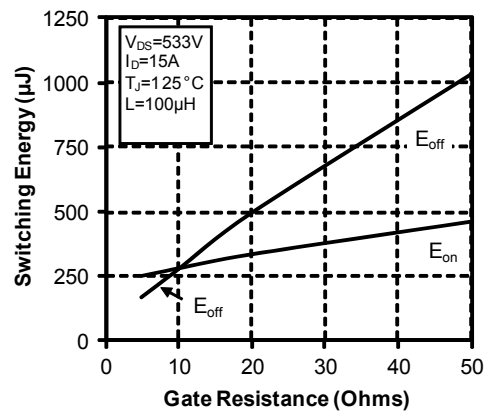
**Rise and Fall times vs Current**



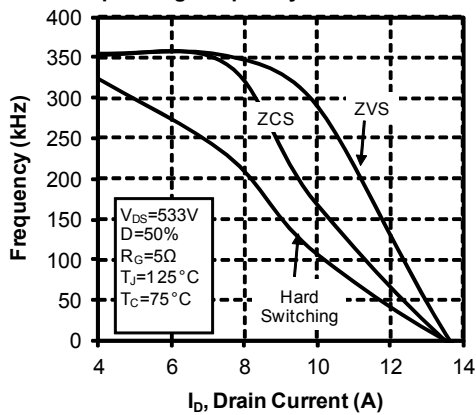
**Switching Energy vs Current**

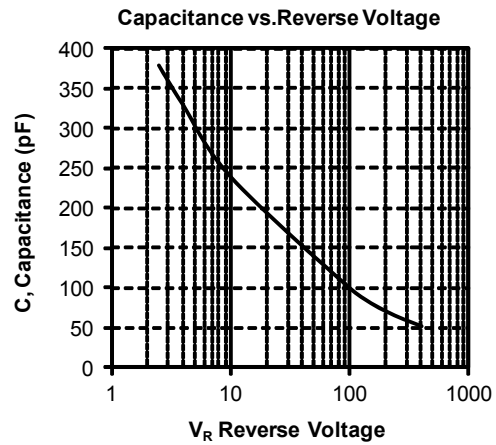
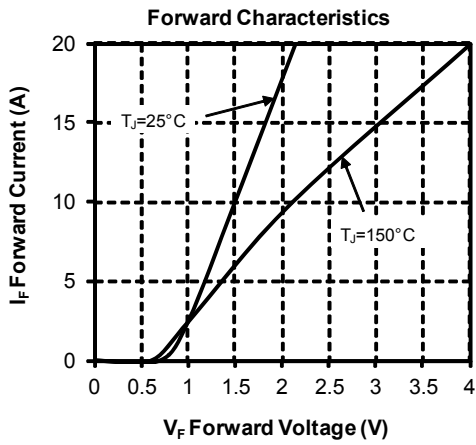
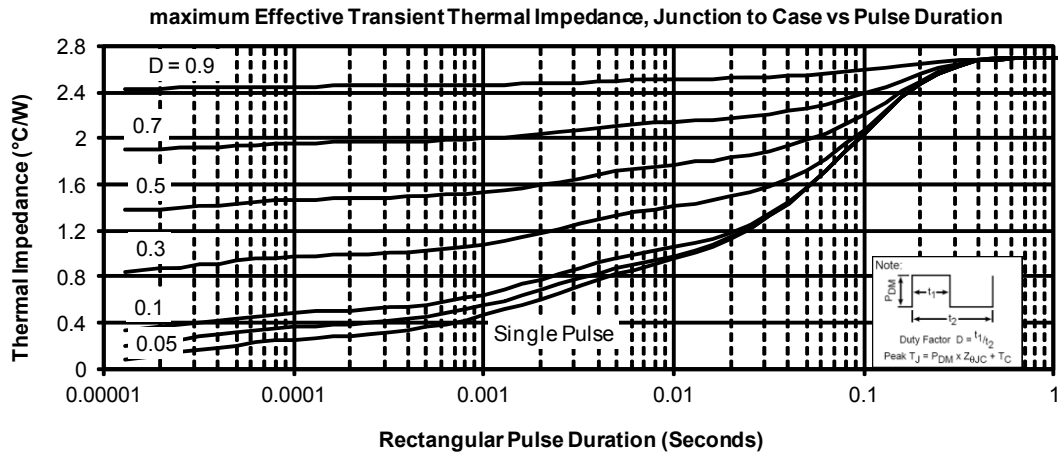


**Switching Energy vs Gate Resistance**



**Operating Frequency vs Drain Current**



**Typical SiC Diode Performance Curve**


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