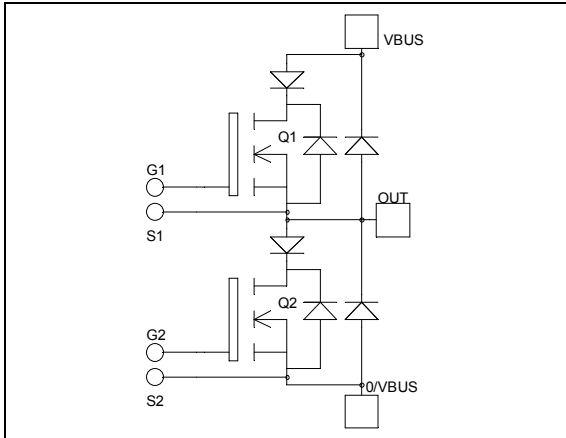


*Phase leg Series & SiC parallel diodes
Super Junction MOSFET Power Module*

$V_{DSS} = 800V$
 $R_{DSon} = 75m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 56A \text{ @ } T_c = 25^\circ C$

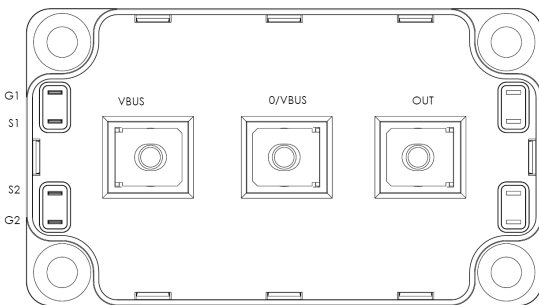


Application

- 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
 - 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	800	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	56
		$T_c = 80^\circ C$	43
I_{DM}	Pulsed Drain current	232	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	75	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	568
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

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0V, V _{DS} = 800V			100	μA
		T _j = 25°C				
		V _{GS} = 0V, V _{DS} = 800V			1000	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 28A			75	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 4mA	2.1	3	3.9	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0V			±200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V		9015		pF
C _{oss}	Output Capacitance	V _{DS} = 25V		4183		
C _{rss}	Reverse Transfer Capacitance	f = 1MHz		215		
Q _g	Total gate Charge	V _{GS} = 10V		364		nC
Q _{gs}	Gate – Source Charge	V _{Bus} = 400V		48		
Q _{gd}	Gate – Drain Charge	I _D = 56A		184		
T _{d(on)}	Turn-on Delay Time	Inductive switching @ 125°C		10		ns
T _r	Rise Time	V _{GS} = 15V		13		
T _{d(off)}	Turn-off Delay Time	V _{Bus} = 533V		83		
T _f	Fall Time	I _D = 56A R _G = 1.2Ω		35		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C		583		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 533V I _D = 56A, R _G = 1.2Ω		556		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C		1020		μJ
E _{off}	Turn-off Switching Energy	V _{GS} = 15V, V _{Bus} = 533V I _D = 56A, R _G = 1.2Ω		684		
R _{thJC}	Junction to Case Thermal Resistance				0.22	°C/W

Series diode ratings and characteristics

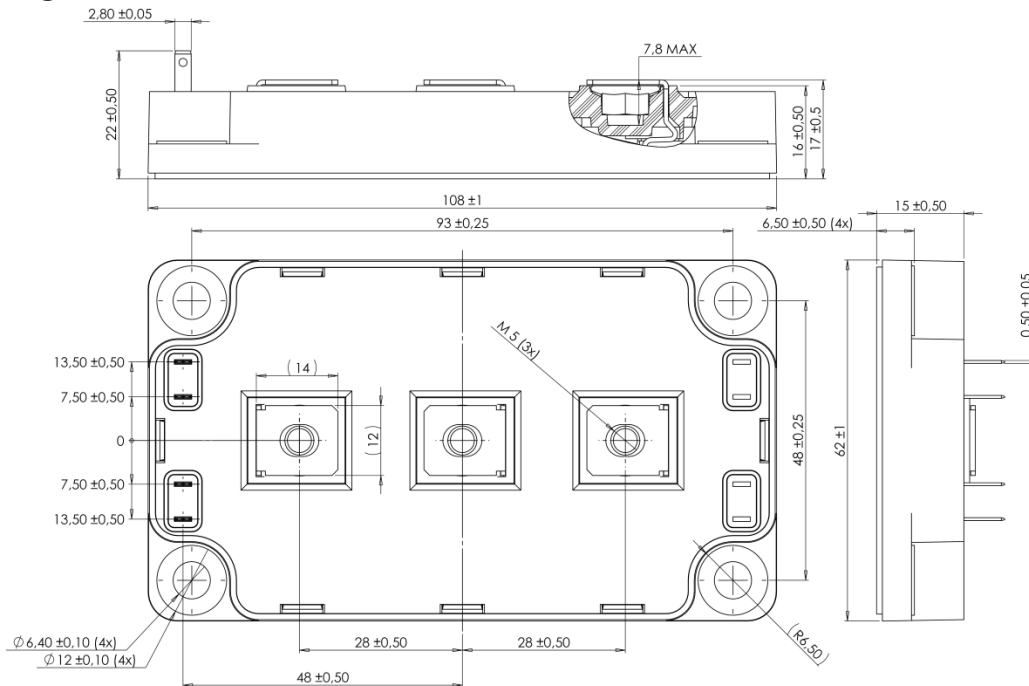
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V _{RRM}	Maximum Peak Repetitive Reverse Voltage		1000			V
I _{RM}	Maximum Reverse Leakage Current	V _R = 1000V			300	μA
I _F	DC Forward Current	T _c = 80°C		120		A
V _F	Diode Forward Voltage	I _F = 120A		1.9	2.5	V
		I _F = 240A		2.2		
		I _F = 120A	T _j = 125°C		1.7	
t _{rr}	Reverse Recovery Time	I _F = 120A V _R = 667V di/dt = 400A/μs	T _j = 25°C		280	ns
			T _j = 125°C		350	
Q _{rr}	Reverse Recovery Charge	I _F = 120A V _R = 667V di/dt = 400A/μs	T _j = 25°C		1.52	μC
			T _j = 125°C		7.2	
R _{thJC}	Junction to Case Thermal Resistance				0.46	°C/W

Parallel diode ratings and characteristics

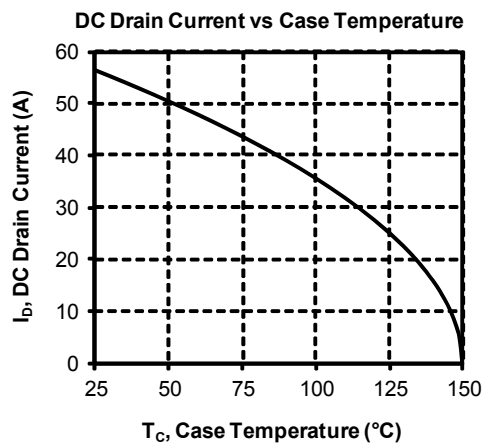
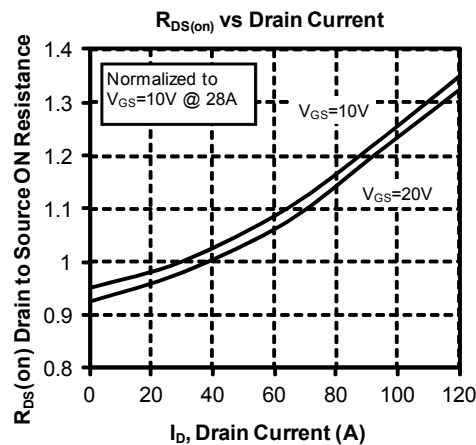
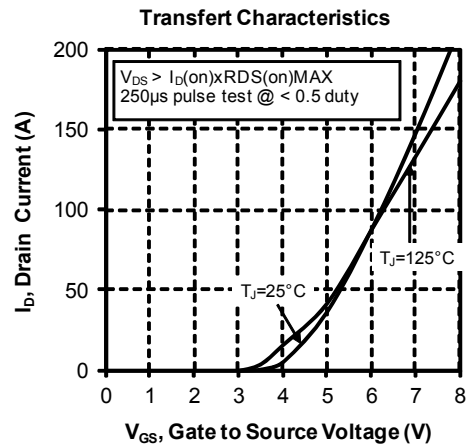
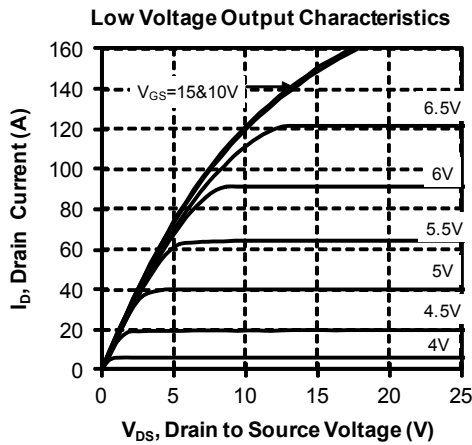
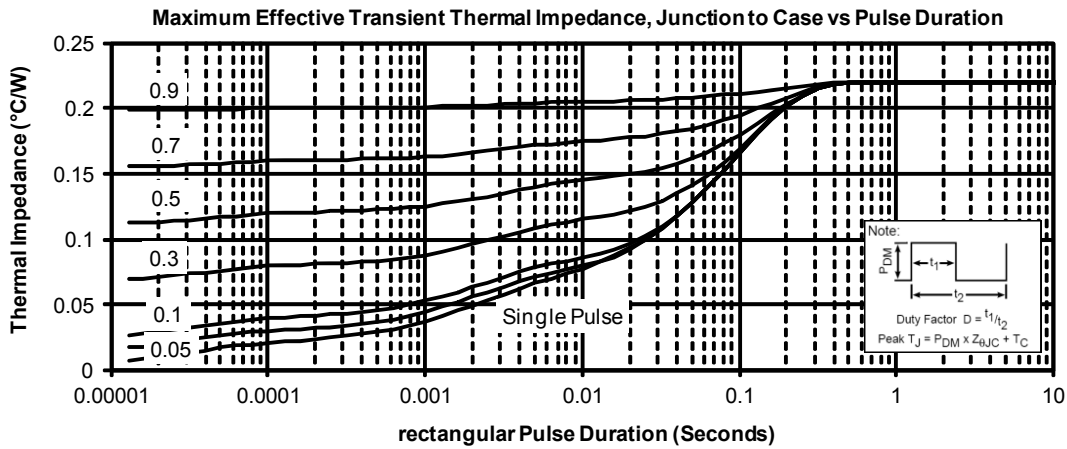
<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R=1200V$	$T_j = 25^\circ C$		300	1200	μA
			$T_j = 175^\circ C$		600	6000	
I_F	DC Forward Current		$T_c = 100^\circ C$		30		A
V_F	Diode Forward Voltage	$I_F = 30A$	$T_j = 25^\circ C$		1.6	1.8	V
			$T_j = 175^\circ C$		2.6	3.0	
Q_C	Total Capacitive Charge	$I_F = 30A, V_R = 1200V$ $di/dt = 1600A/\mu s$			168		nC
Q	Total Capacitance	$f = 1MHz, V_R = 200V$			270		pF
		$f = 1MHz, V_R = 400V$			198		
R_{thJC}	Junction to Case Thermal Resistance					0.45	$^\circ C/W$

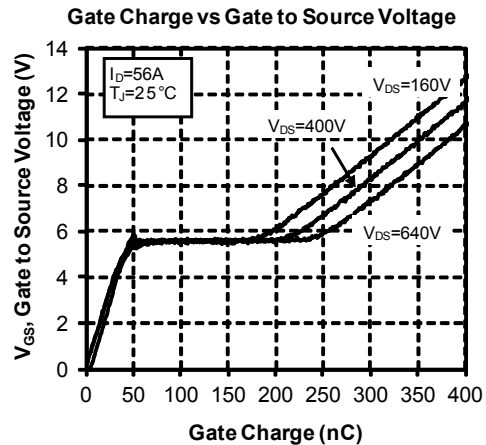
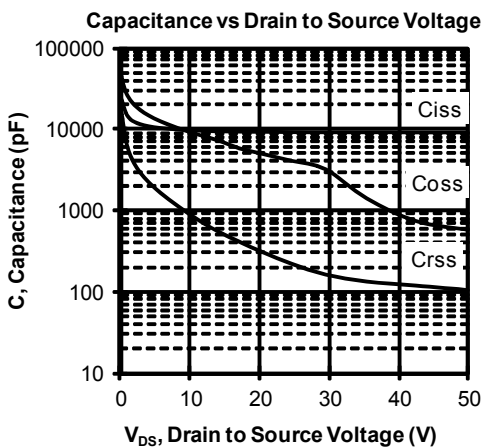
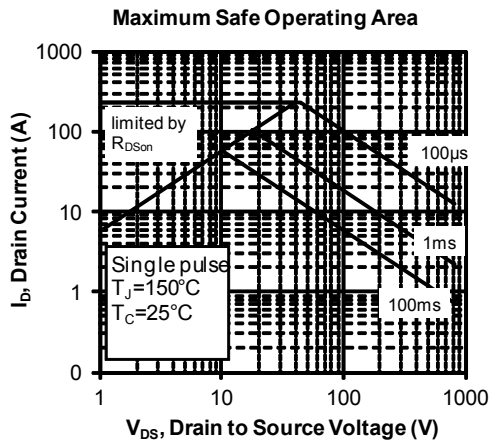
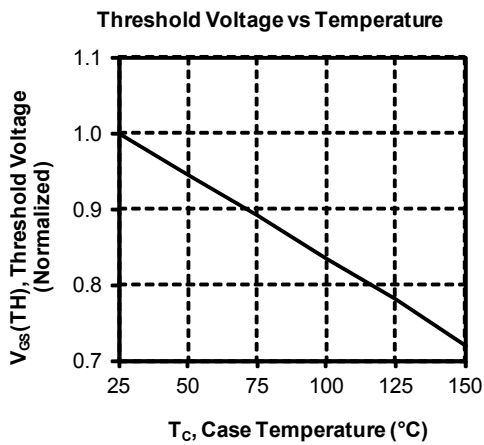
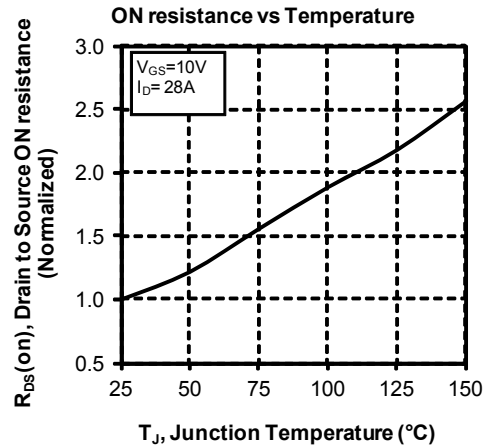
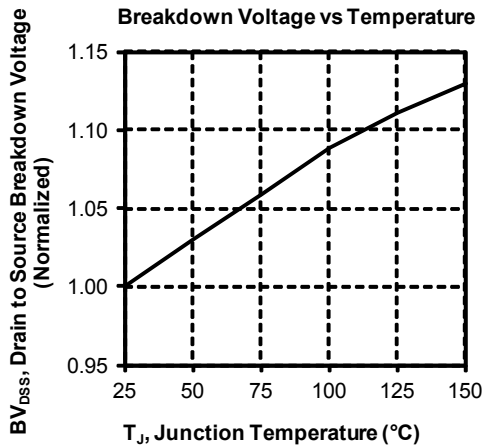
Thermal and package characteristics

<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	$^\circ C$
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_{j,max} -25$	
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

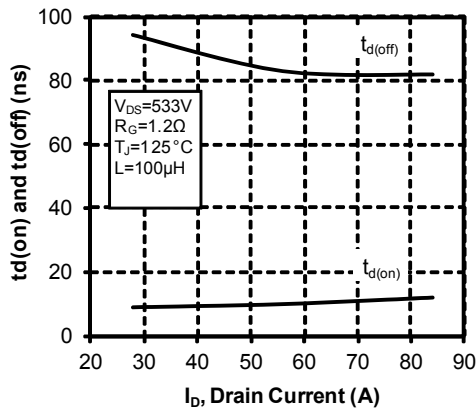
SP6 Package outline (dimensions in mm)

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

Typical CoolMOS Performance Curve

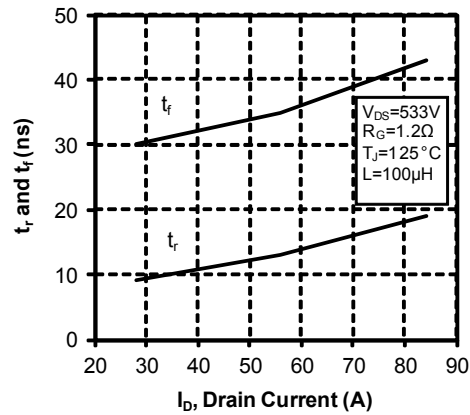




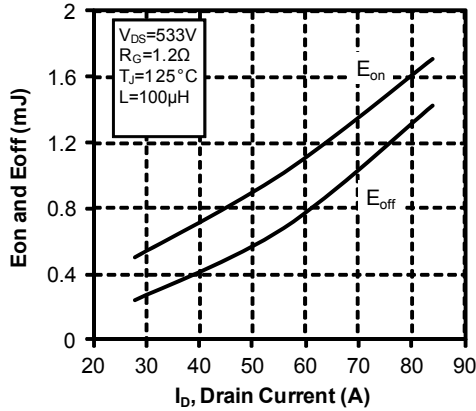
Delay Times vs Current



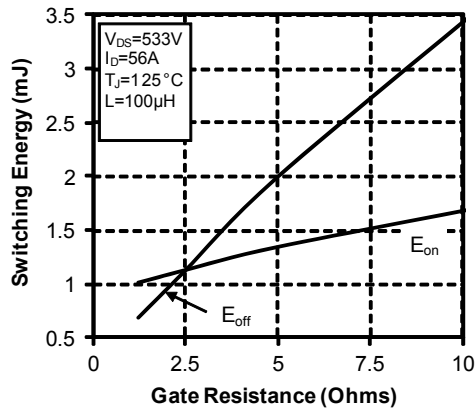
Rise and Fall times vs Current



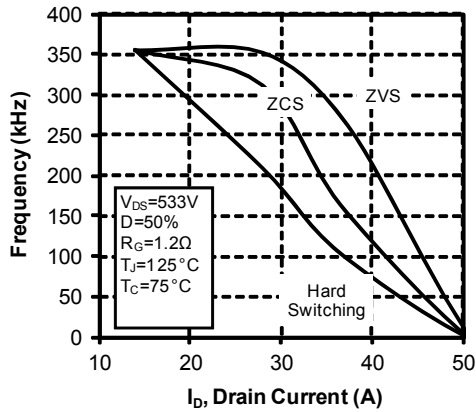
Switching Energy vs Current



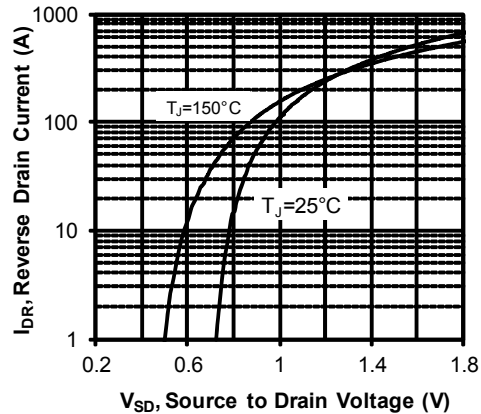
Switching Energy vs Gate Resistance

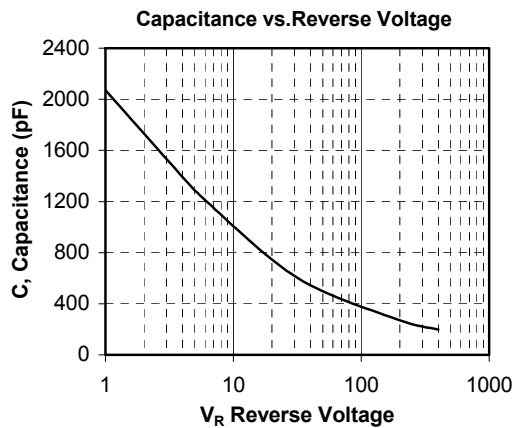
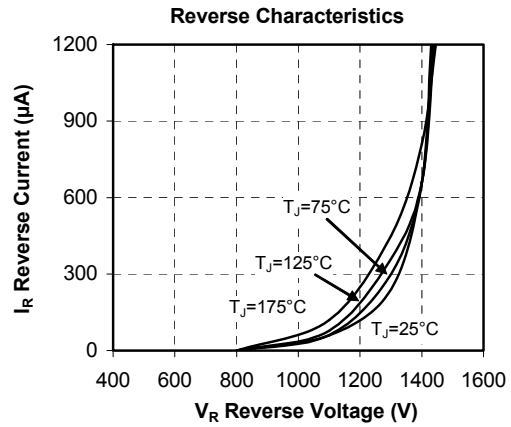
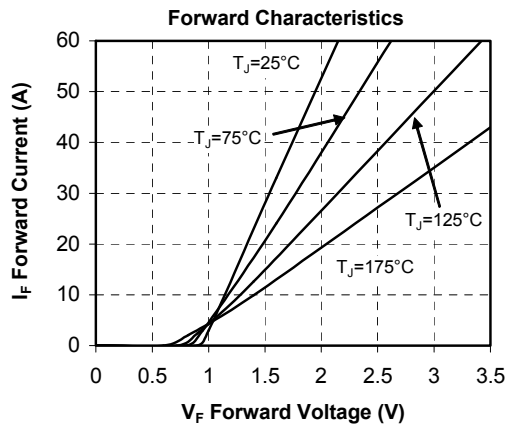
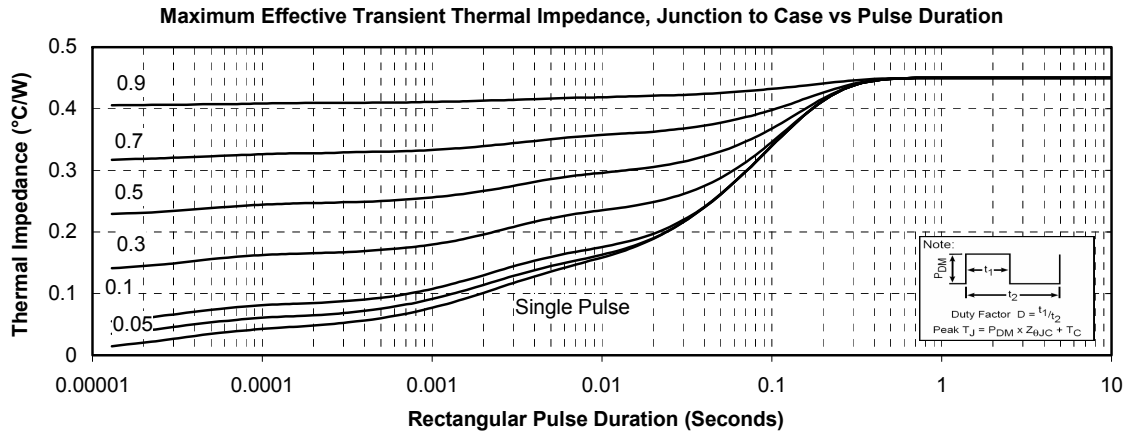


Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



Typical SiC Diode Performance Curve


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