



APTC80AM75SCG

*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

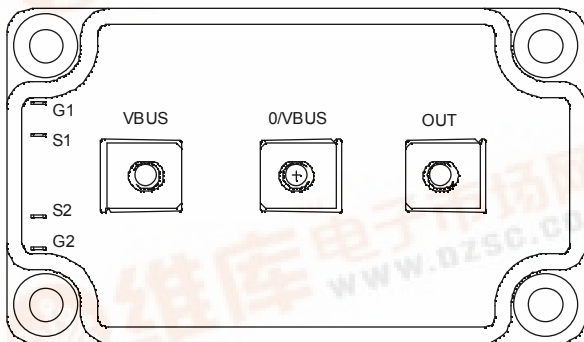
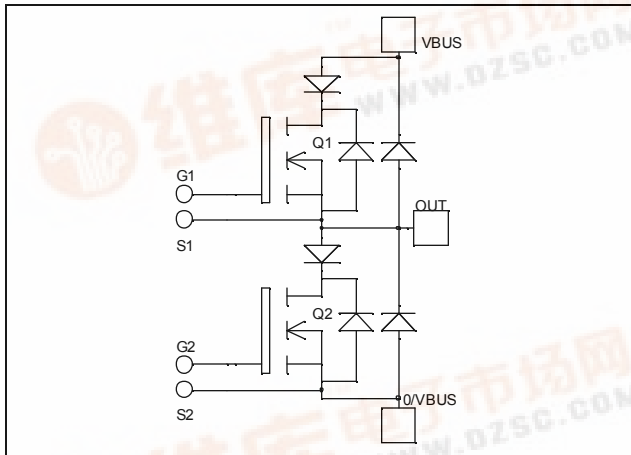
- Motor control
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- **COOLMOS**
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
 - 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



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	56	A
		T _c = 80°C	43	
I _{DM}	Pulsed Drain current		232	
V _{GS}	Gate - Source Voltage		±30	V
R _{DSon}	Drain - Source ON Resistance		75	mΩ
P _D	Maximum Power Dissipation	T _c = 25°C	568	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	$V_{GS} = 0V, V_{DS} = 800V$ $T_j = 25^\circ\text{C}$			100	μA
		$V_{GS} = 0V, V_{DS} = 800V$ $T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 28A$			75	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 4\text{mA}$	2.1	3	3.9	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 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	$f = 1\text{MHz}$		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 $V_{GS} = 15V$ $V_{Bus} = 533V$ $I_D = 56A$ $R_G = 1.2\Omega$		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 $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		583		μJ
E_{off}	Turn-off Switching Energy			556		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		1020		μJ
E_{off}	Turn-off Switching Energy			684		

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	$V_R = 200V$	$T_j = 25^\circ\text{C}$		350	μA
			$T_j = 125^\circ\text{C}$		600	
I_F	DC Forward Current	$T_c = 85^\circ\text{C}$		60		A
V_F	Diode Forward Voltage	$I_F = 60A$		1.1	1.15	V
		$I_F = 120A$		1.4		
		$I_F = 60A$ $T_j = 125^\circ\text{C}$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 60A$ $V_R = 133V$ $di/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$	24		ns
			$T_j = 125^\circ\text{C}$	48		
Q_{rr}	Reverse Recovery Charge	$T_j = 25^\circ\text{C}$		66		nC
			$T_j = 125^\circ\text{C}$	300		

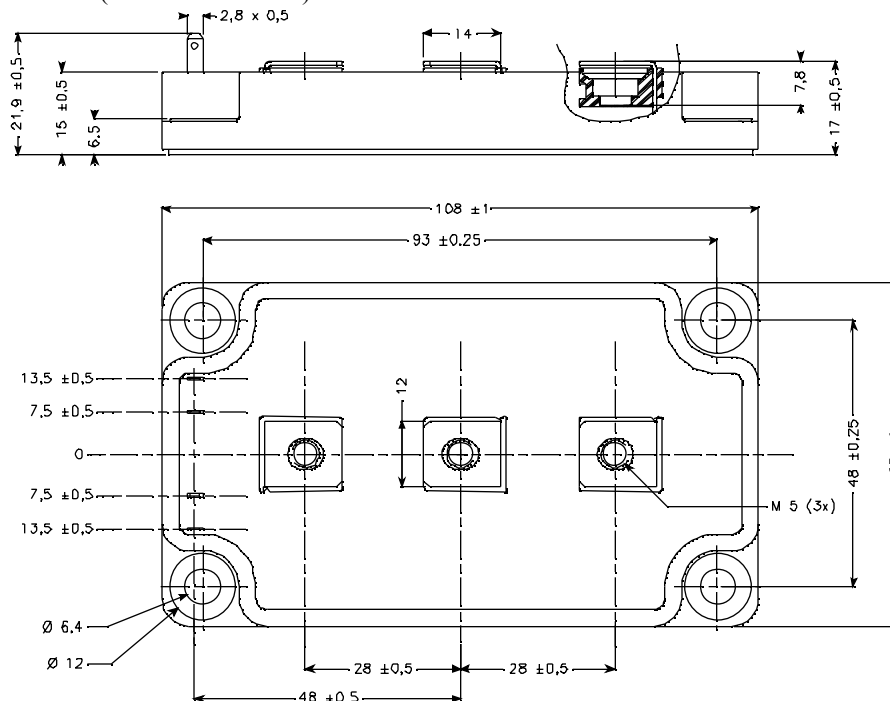
Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 1200V$	$T_j = 25^\circ C$		300	1200	μA
			$T_j = 175^\circ C$		600	6000	
I_F	DC Forward Current		$T_c = 125^\circ C$		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	$I_F = 30A, V_R = 600V$ $di/dt = 1600A/\mu s$			84		nC
Q	Total Capacitance	$f = 1MHz, V_R = 200V$			270		pF
		$f = 1MHz, V_R = 400V$			198		

Thermal and package characteristics

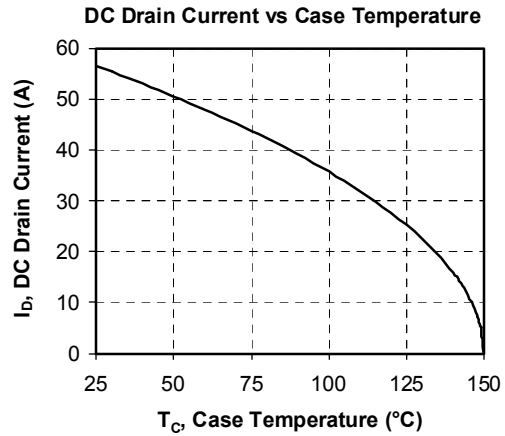
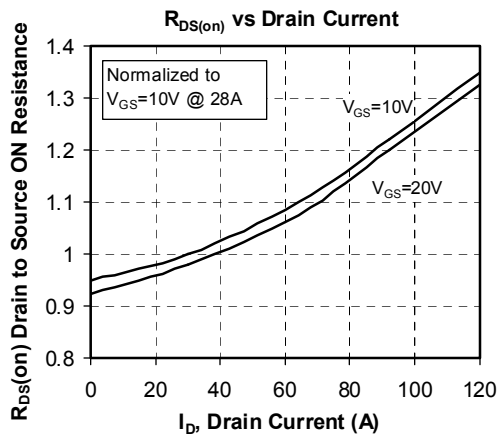
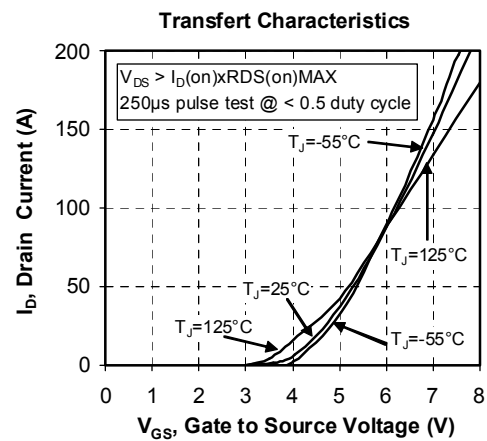
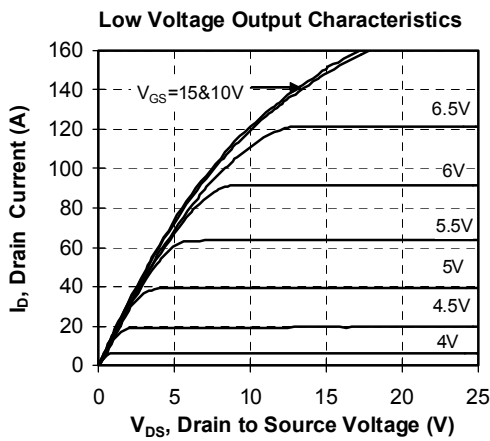
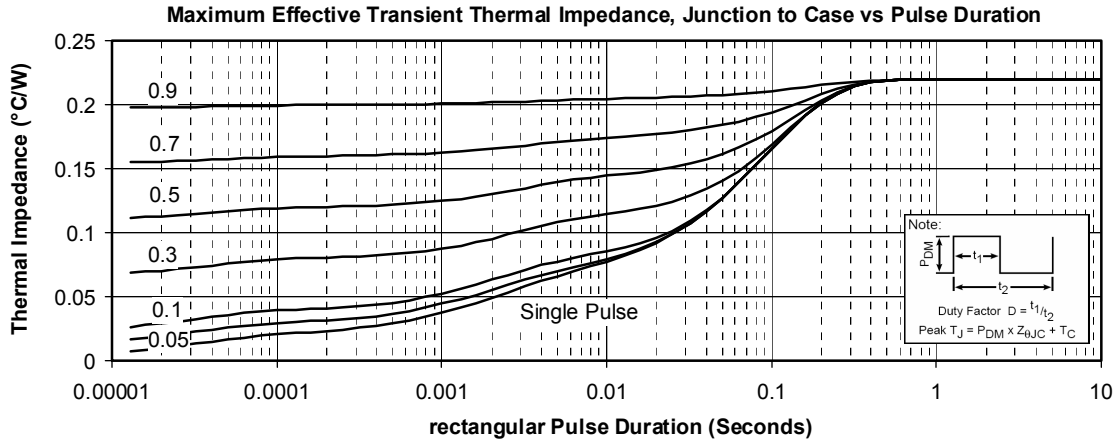
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance	Transistor				0.22	$^\circ C/W$
		Series diode				0.65	
		Parallel diode				0.45	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t = 1$ min, $I_{isol} < 1mA$, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	$^\circ C$
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					280	g

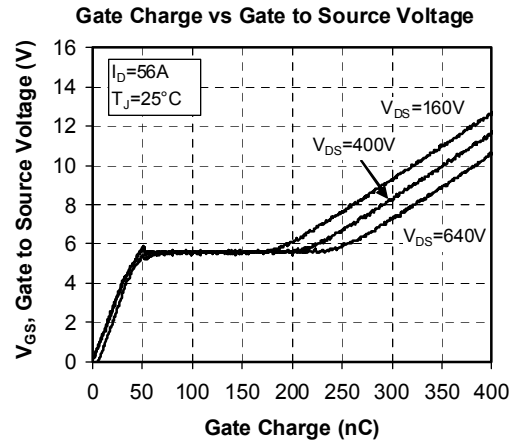
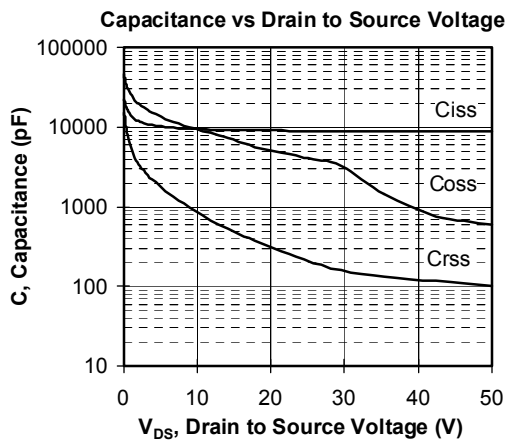
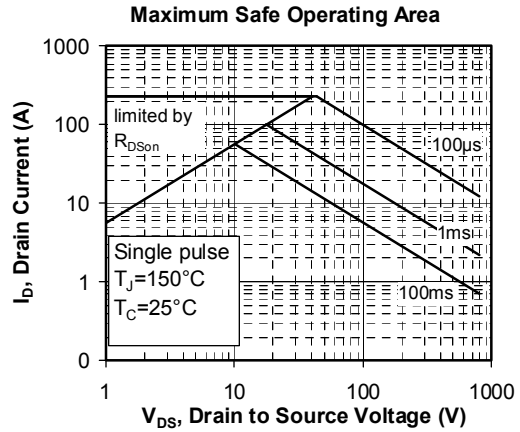
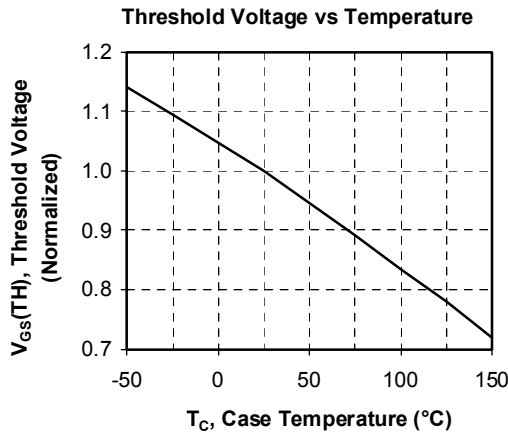
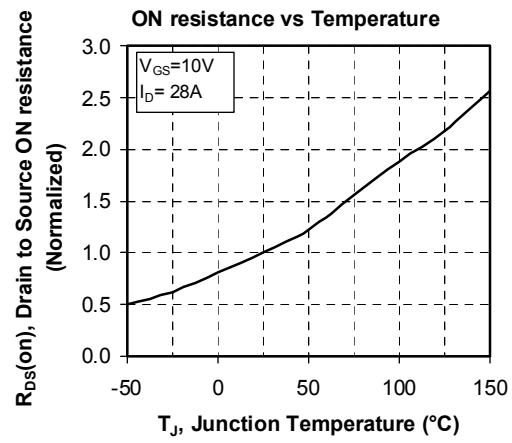
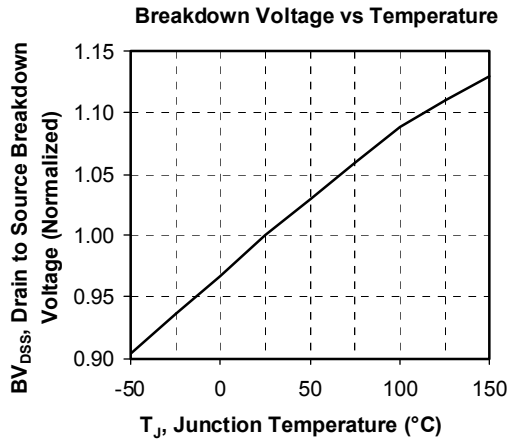
SP6 Package outline (dimensions in mm)



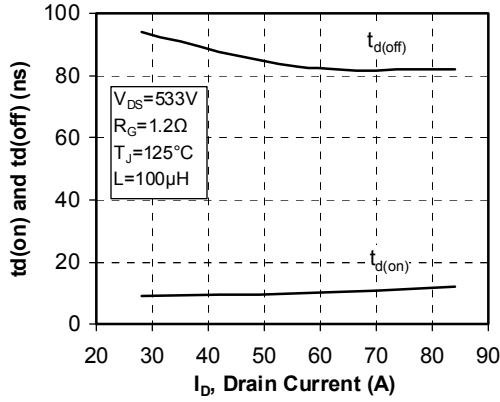
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical CoolMOS Performance Curve

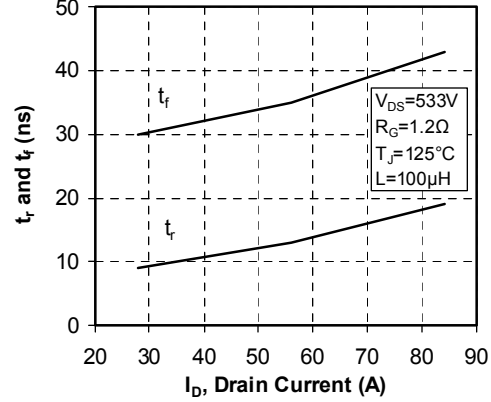




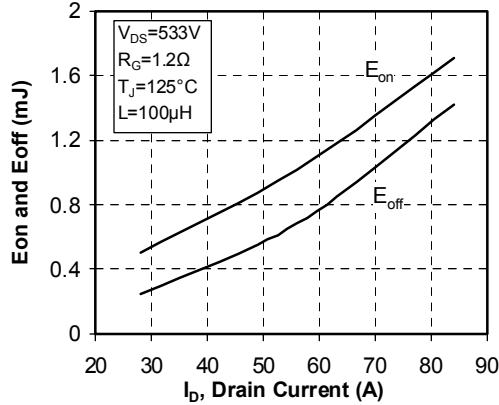
Delay Times vs Current



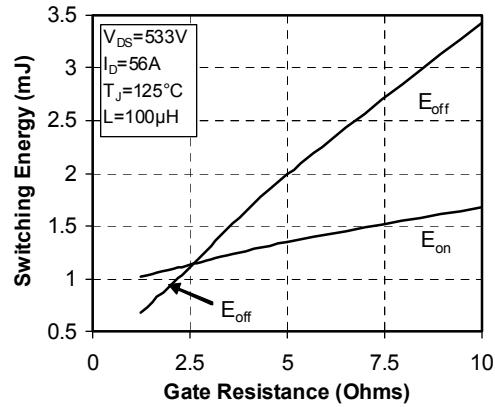
Rise and Fall times vs Current



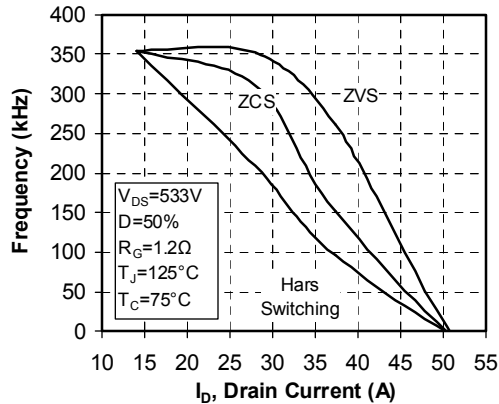
Switching Energy vs Current



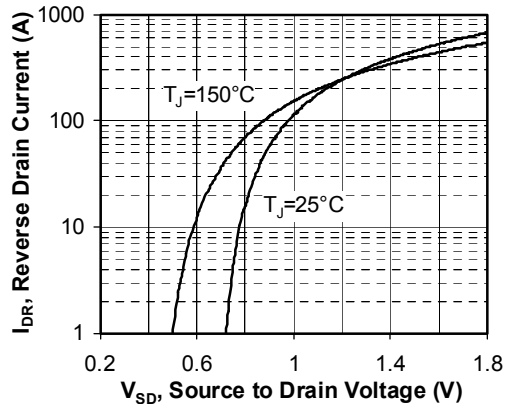
Switching Energy vs Gate Resistance



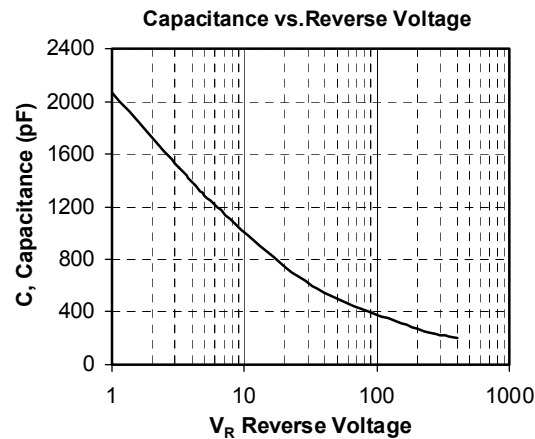
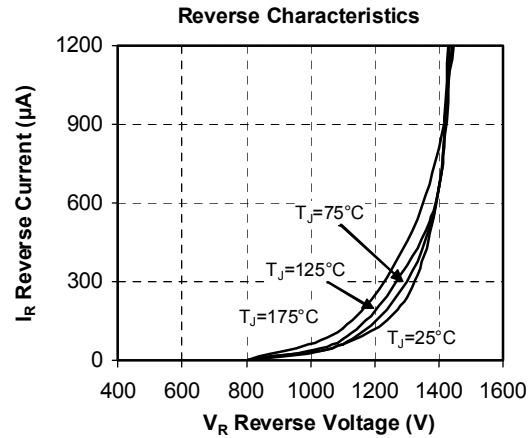
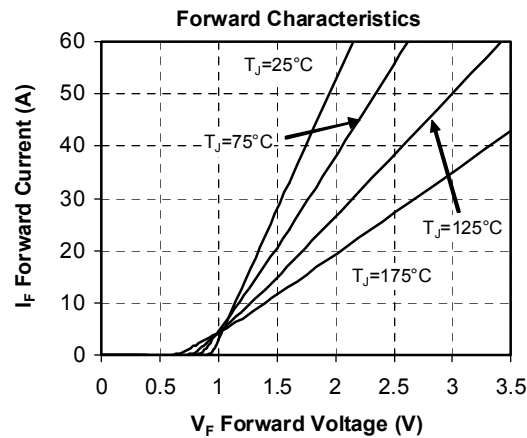
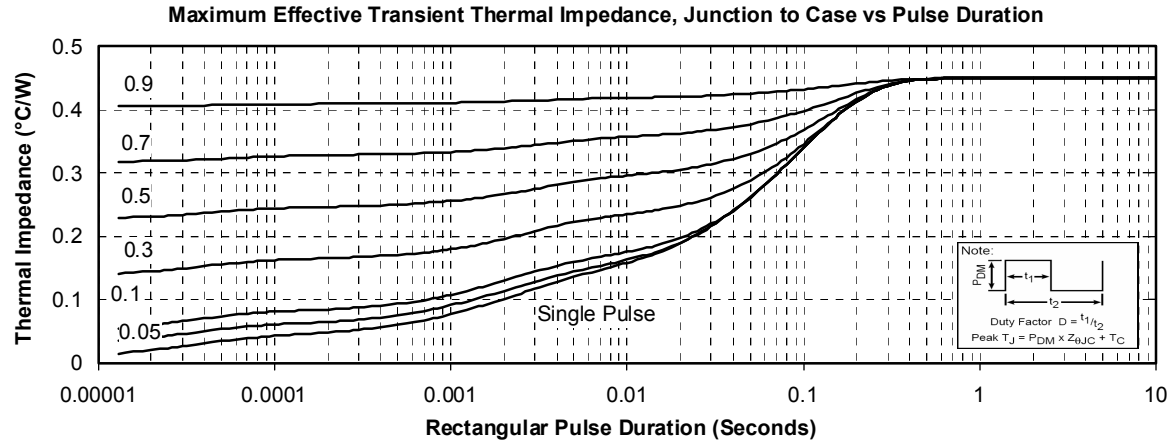
Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



Typical SiC Diode Performance Curve



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