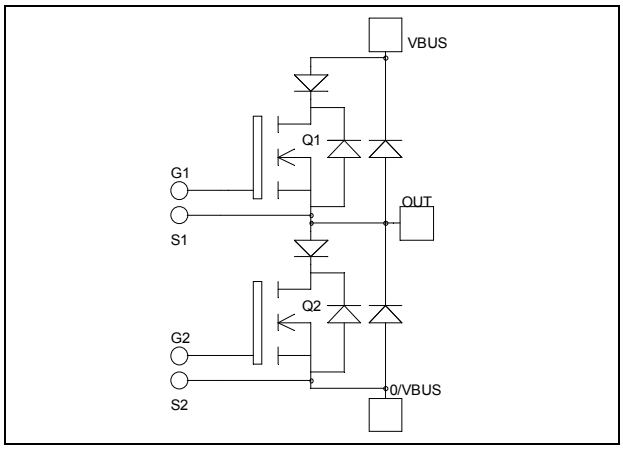
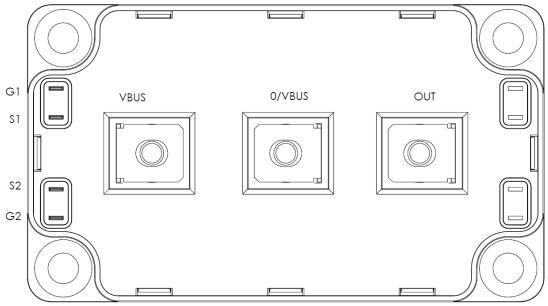
APTC60AM18SCG

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

V_{DSS} = 600V
R_{DSon} = 18mΩ max @ Tj = 25°C
I_D = 143A @ Tc = 25°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°C unless otherwise specified

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		600	V
I_D	Continuous Drain Current	T_c = 25°C	143	A
		T_c = 80°C	107	
I_{DM}	Pulsed Drain current		572	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		18	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	833	W
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			100	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 71.5A			18	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			±400	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		28		nF
C_{oss}	Output Capacitance			10.2		
C_{rss}	Reverse Transfer Capacitance			0.85		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 300V I_D = 143A		1036		nC
Q_{gs}	Gate – Source Charge			116		
Q_{gd}	Gate – Drain Charge			444		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 400V I_D = 143A R_G = 1.2Ω		21		ns
T_r	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
T_f	Fall Time			84		
Eon	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 400V I_D = 143A, R_G = 1.2Ω		1608		µJ
Eoff	Turn-off Switching Energy			3920		
Eon	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 400V I_D = 143A, R_G = 1.2Ω		2630		µJ
Eoff	Turn-off Switching Energy			4824		
R_{thJC}	Junction to Case Thermal Resistance				0.15	°C/W

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R = 600V				150	µA
I_F	DC Forward Current		Tc = 80°C		200		A
V_F	Diode Forward Voltage	I_F = 200A V_{GE} = 0V	T_j = 25°C		1.6	2	V
			T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 200A V_R = 300V di/dt =2800A/µs	T_j = 25°C		125		ns
			T_j = 150°C		220		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		9.4		µC
			T_j = 150°C		19.8		
E_r	Reverse Recovery Energy		T_j = 25°C		2.2		mJ
			T_j = 150°C		4.8		
R_{thJC}	Junction to Case Thermal Resistance					0.39	°C/W

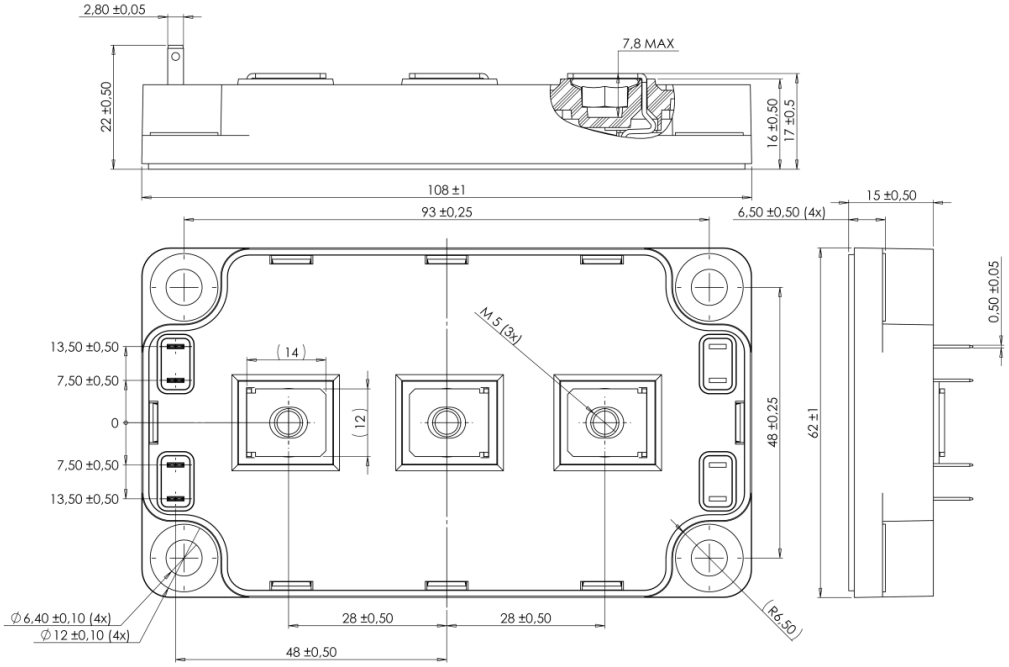
Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R=600V	T_j = 25°C		400	1600	µA
			T_j = 175°C		800	8000	
I_F	DC Forward Current		Tc = 125°C		80		A
V_F	Diode Forward Voltage	I_F = 80A	T_j = 25°C		1.6	1.8	V
			T_j = 175°C		2.0	2.4	
Q_C	Total Capacitive Charge	I_F = 80A, V_R = 600V di/dt =2000A/µs			224		nC
Q	Total Capacitance	f = 1MHz, V_R = 200V			520		pF
		f = 1MHz, V_R = 400V			400		
R_{thJC}	Junction to Case Thermal Resistance					0.35	°C/W

Thermal and package characteristics

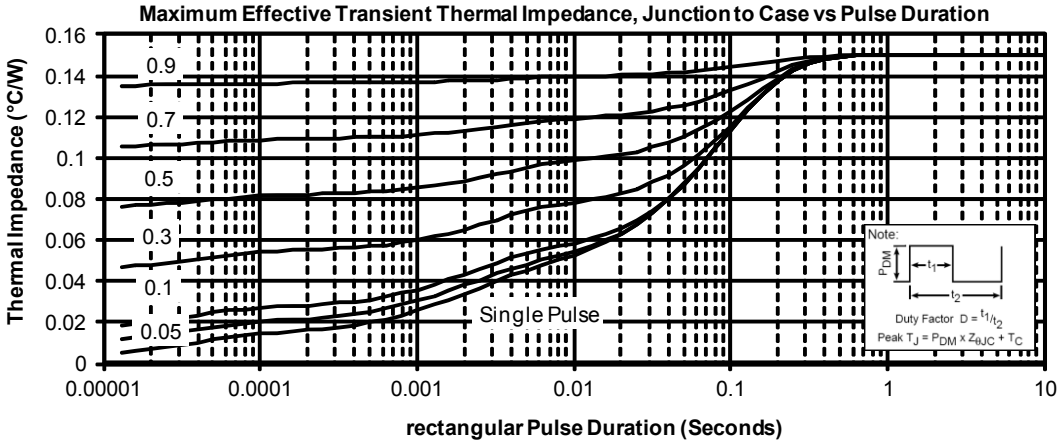
Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range	Parallel diode		-40	175	°C
		Series diode & CoolMOS™		-40	150	
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -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

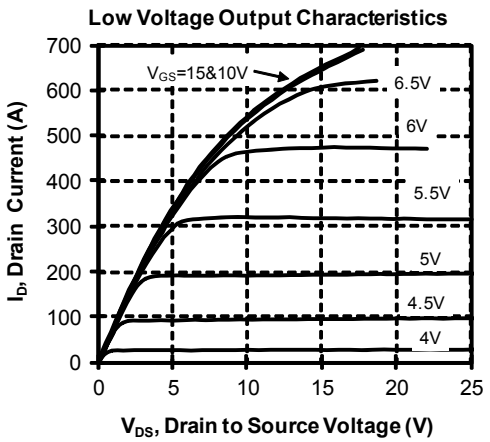
SP6 Package outline (dimensions in mm)

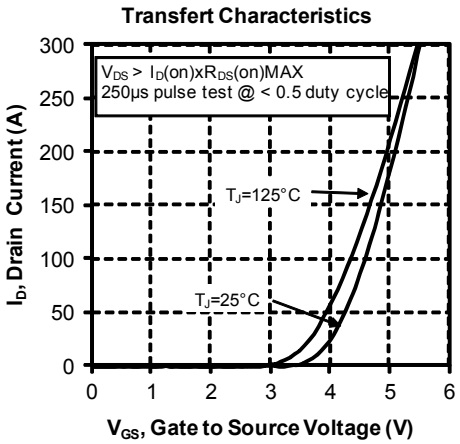


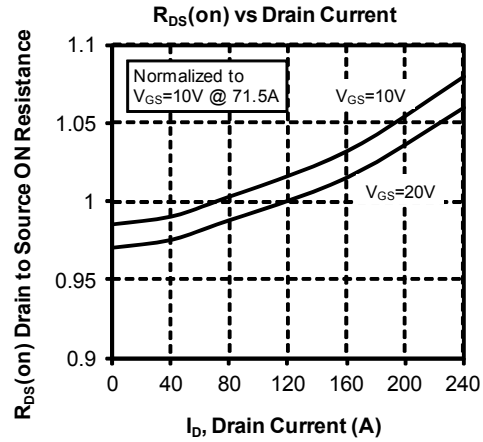
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

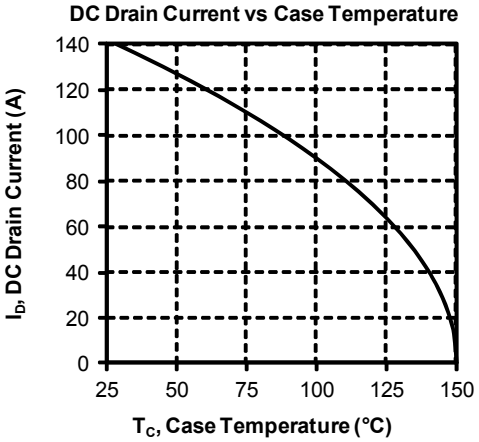
Typical CoolMOS Performance Curve



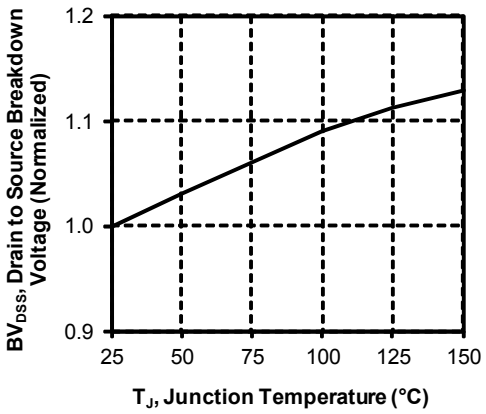




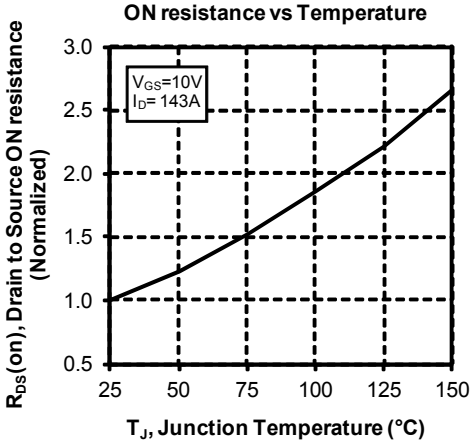




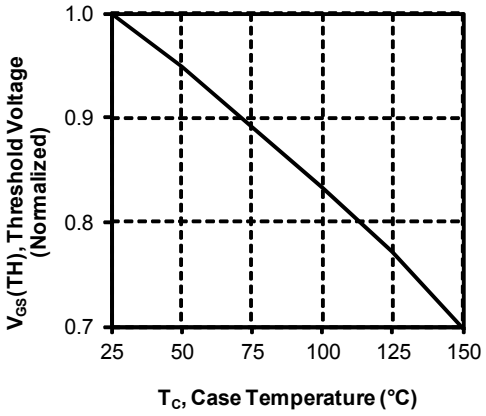
Breakdown Voltage vs Temperature



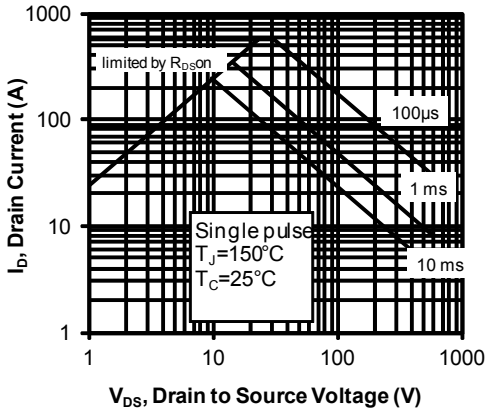
ON resistance vs Temperature



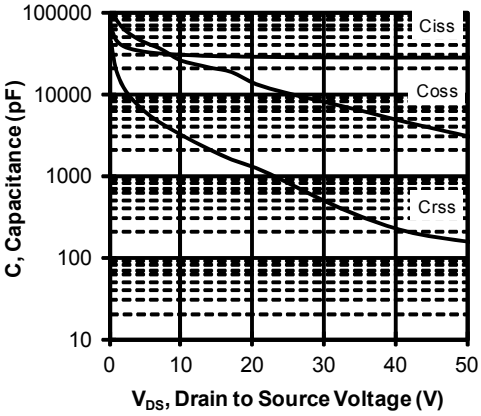
Threshold Voltage vs Temperature



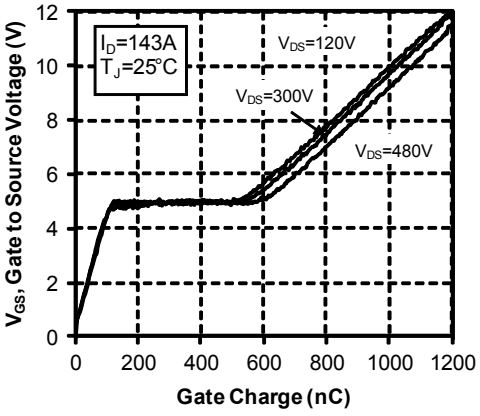
Maximum Safe Operating Area



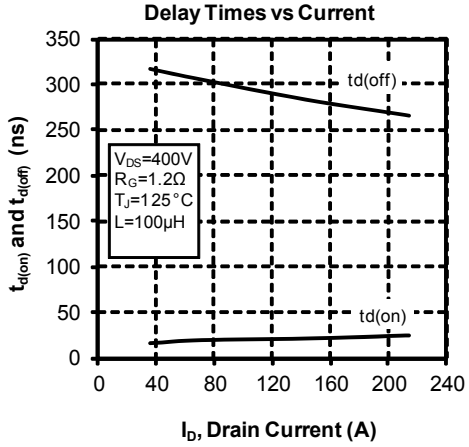
Capacitance vs Drain to Source Voltage



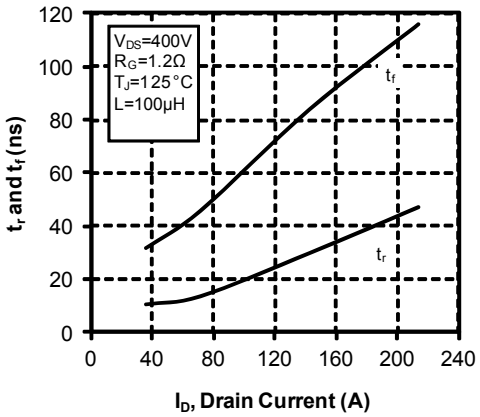
Gate Charge vs Gate to Source Voltage



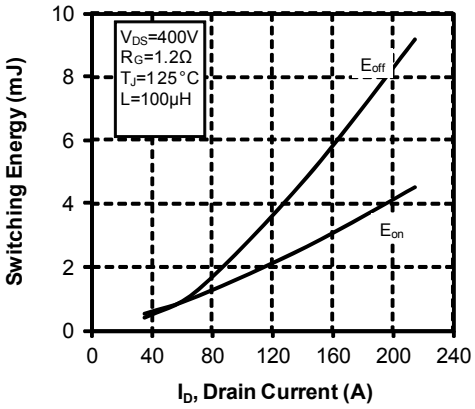
Delay Times vs Current



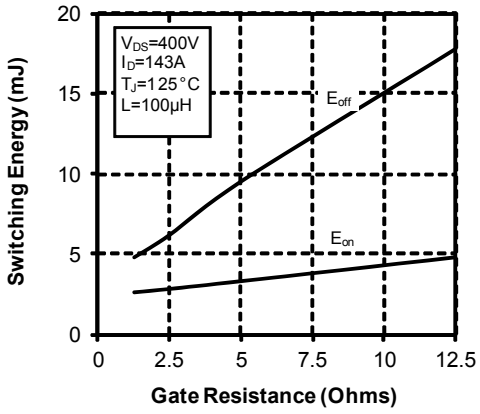
Rise and Fall times vs Current



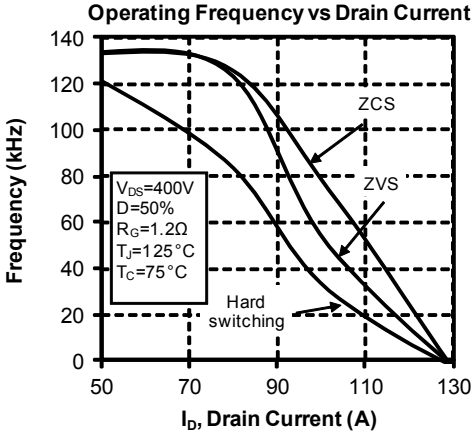
Switching Energy vs Current



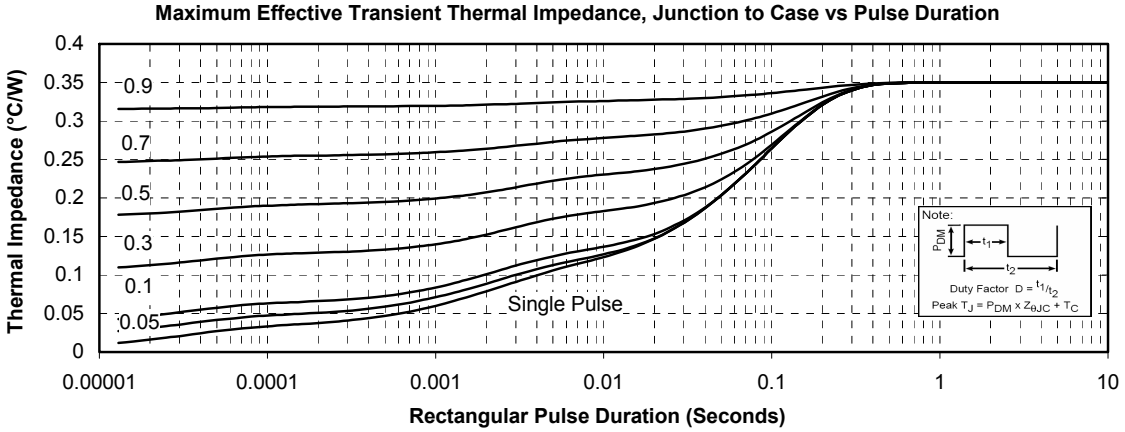
Switching Energy vs Gate Resistance

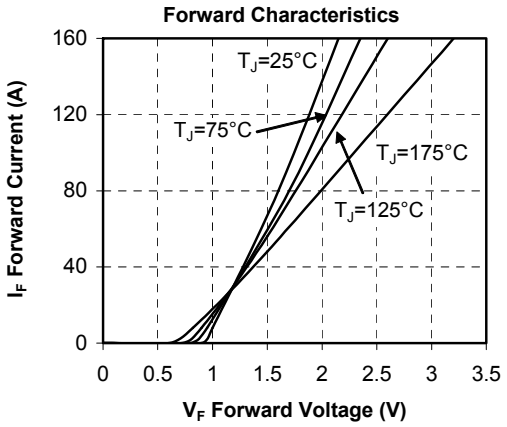


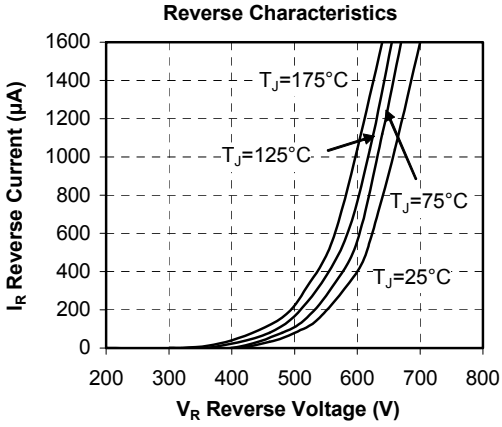
Operating Frequency vs Drain Current

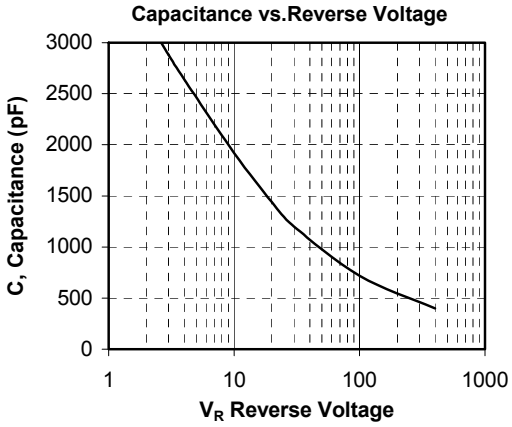


Typical SiC Diode Performance Curve









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