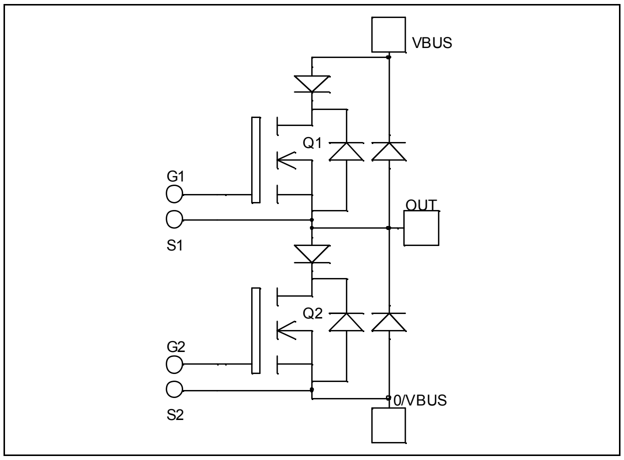
APTC60AM18SCG

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

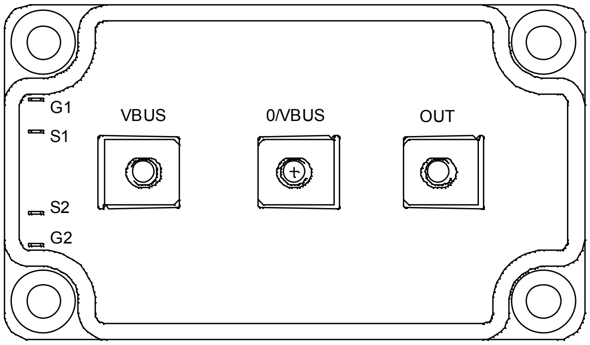


Application

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

Features

- COOLMOS 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		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 Handing Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

All ratings @ $T_j = 25°C$ unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 600V$	$T_j = 25°C$			100	µA
		$V_{GS} = 0V, V_{DS} = 600V$	$T_j = 125°C$			1000	
$R_{DS(on)}$	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	$V_{GS} = \pm 20\ V$, $V_{DS} = 0V$				±200	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** $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 143A$ $R_G = 1.2\Omega$		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** $V_{GS} = 15V$, $V_{Bus} = 400V$ $I_D = 143A$, $R_G = 1.2\Omega$		1608		µJ
Eoff	Turn-off Switching Energy			3920		
Eon	Turn-on Switching Energy	**Inductive switching @ 125°C** $V_{GS} = 15V$, $V_{Bus} = 400V$ $I_D = 143A$, $R_G = 1.2\Omega$		2630		µJ
Eoff	Turn-off Switching Energy			4824		

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	$T_j = 25°C$			350	µA
			$T_j = 125°C$			600	
I_F	DC Forward Current		$T_c = 85°C$		120		A
V_F	Diode Forward Voltage	$I_F = 120A$			1.1	1.15	V
		$I_F = 240A$			1.4		
		$I_F = 120A$	$T_j = 125°C$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 120A$ $V_R = 133V$ di/dt = 400A/µs	$T_j = 25°C$		31		ns
			$T_j = 125°C$		60		
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		120		nC
			$T_j = 125°C$		500		

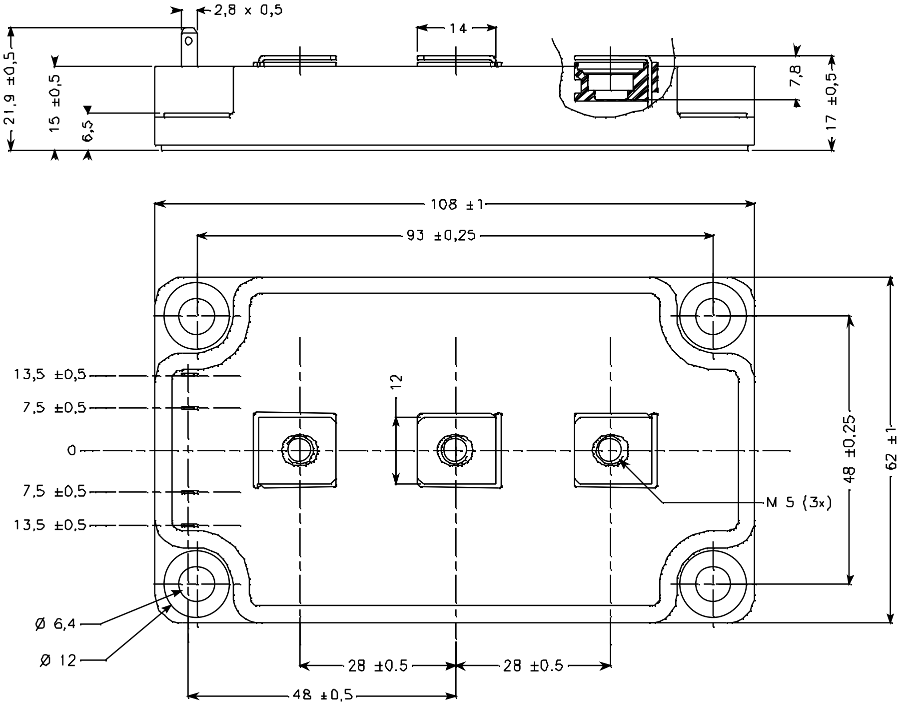
Parallel diode ratings and characteristics

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 = 300V di/dt =2000A/µs			112		nC
Q	Total Capacitance	f = 1MHz, V_R = 200V			520		pF
		f = 1MHz, V_R = 400V			400		

Thermal and package characteristics

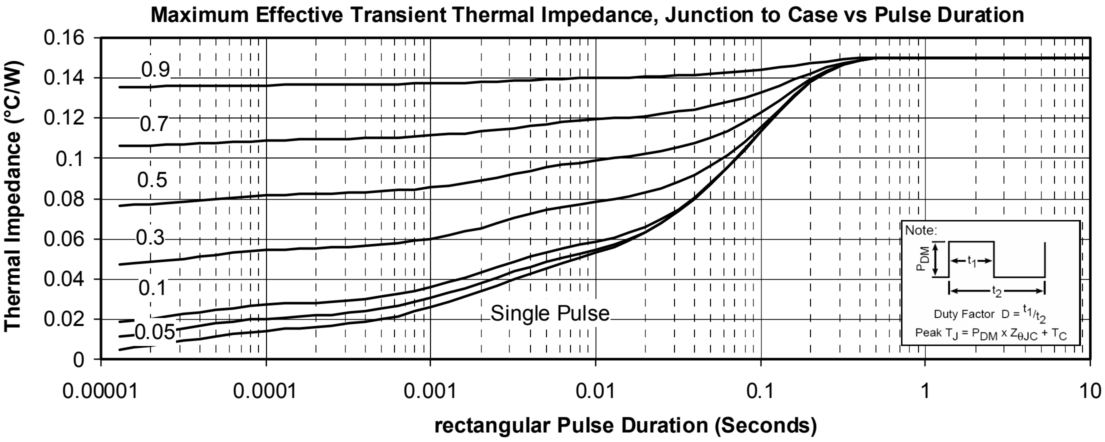
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance	Transistor				0.15	°C/W
		Series diode				0.46	
		Parallel diode				0.35	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°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

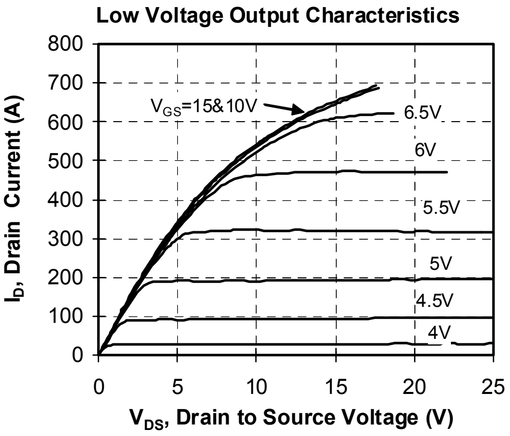
SP6 Package outline (dimensions in mm)

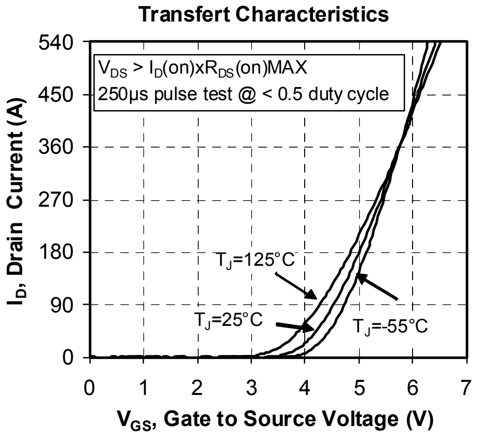


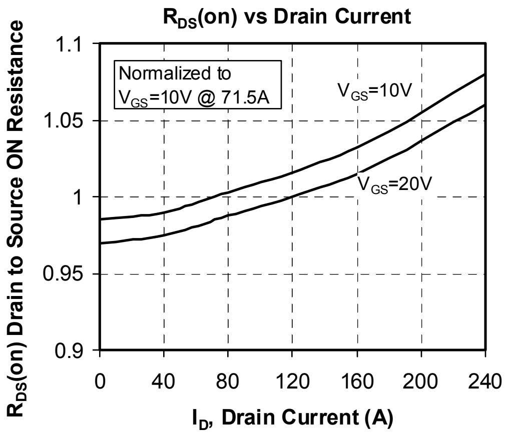
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

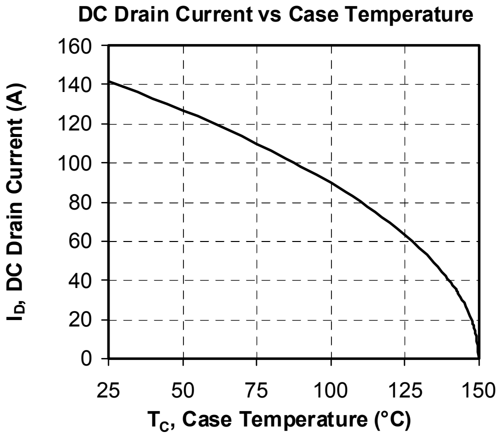
Typical CoolMOS Performance Curve

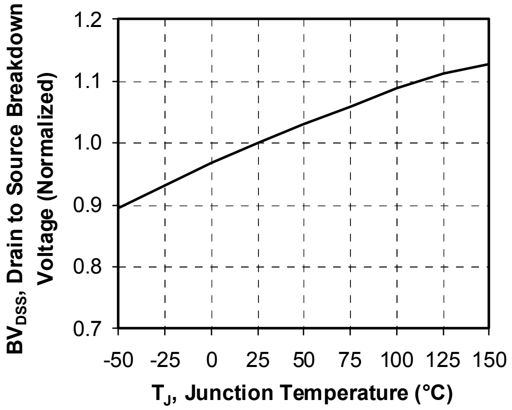

Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

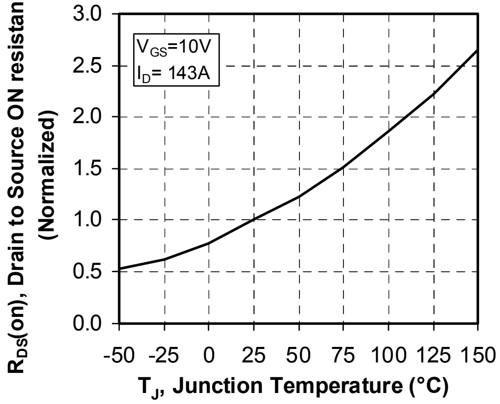

Low Voltage Output Characteristics

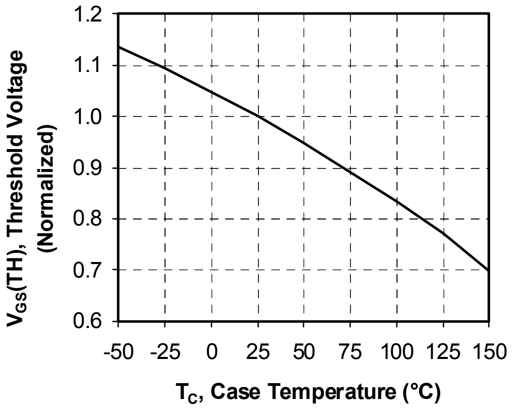

Transfert Characteristics

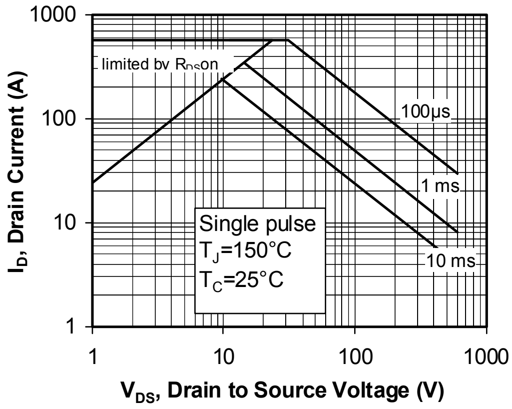

R_{DS}(on) vs Drain Current

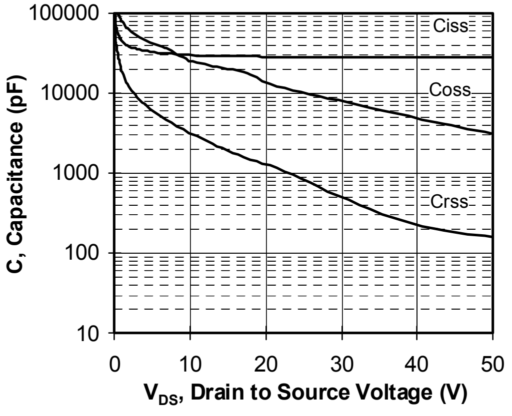

DC Drain Current vs Case Temperature

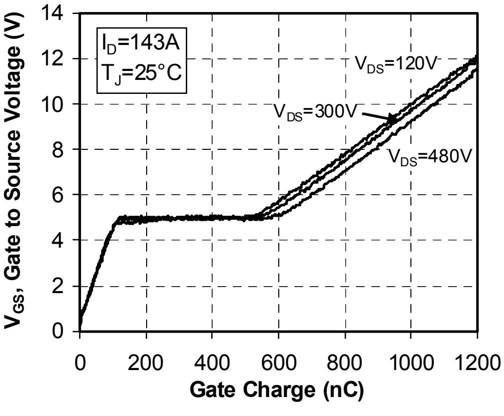

Breakdown Voltage vs Temperature

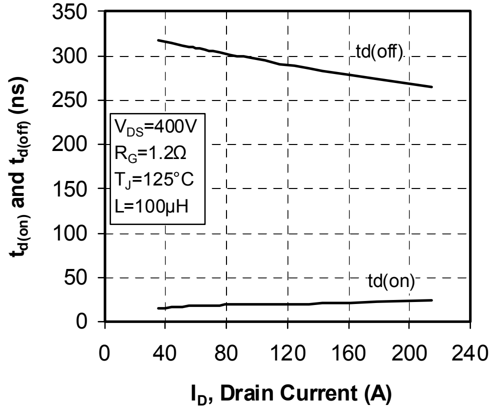

ON resistance vs Temperature

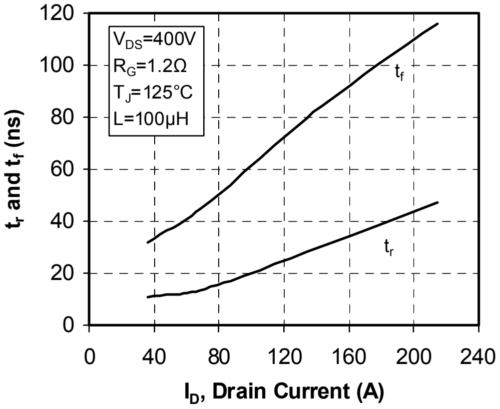

Threshold Voltage vs Temperature

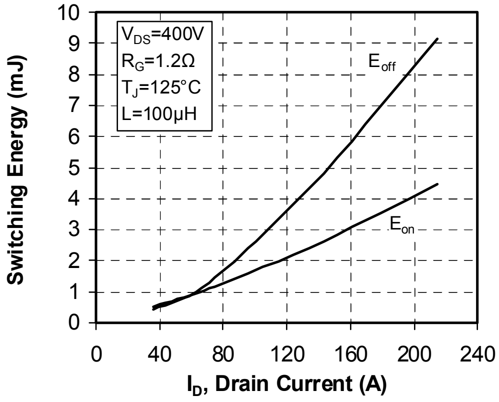

Maximum Safe Operating Area

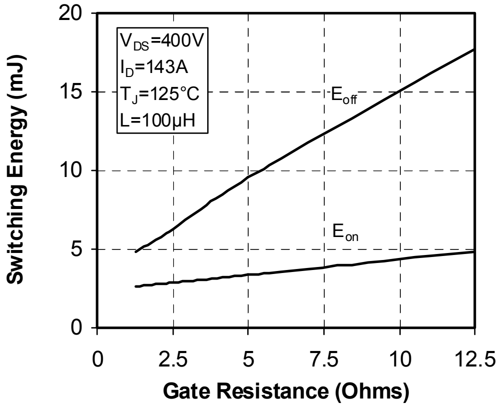

Capacitance vs Drain to Source Voltage

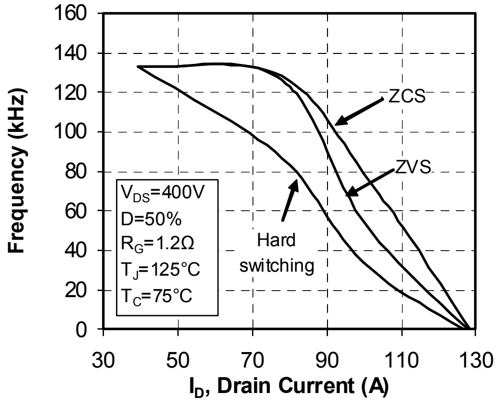

Gate Charge vs Gate to Source Voltage

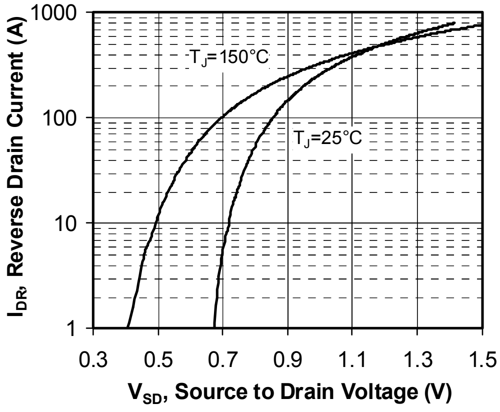

Delay Times vs Current


Rise and Fall times vs Current


Switching Energy vs Current

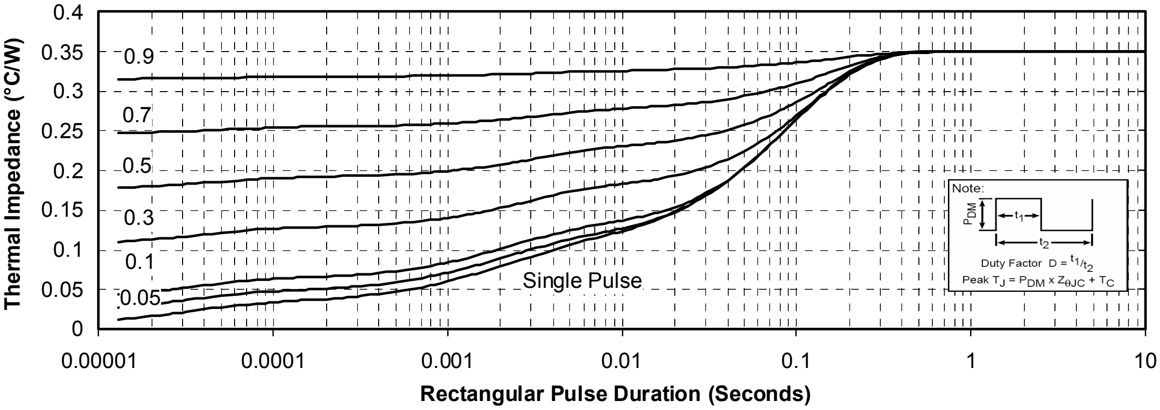

Switching Energy vs Gate Resistance


Operating Frequency vs Drain Current

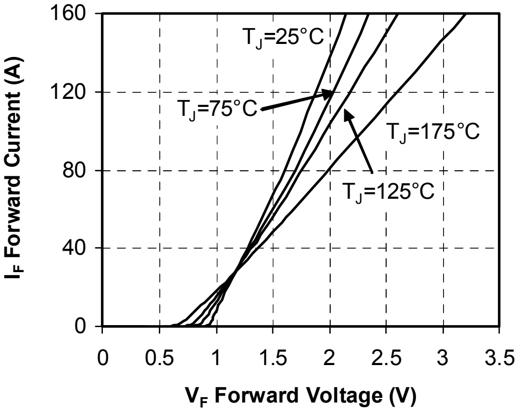

Source to Drain Diode Forward Voltage

Typical SiC Diode Performance Curve

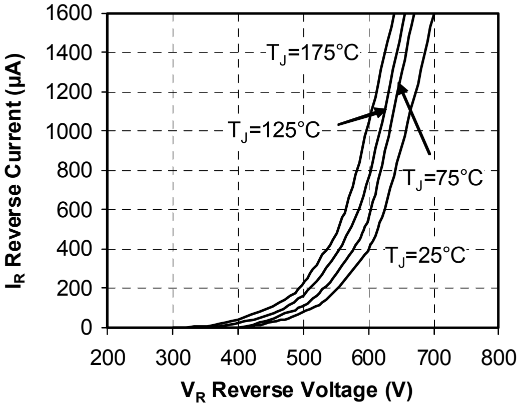
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



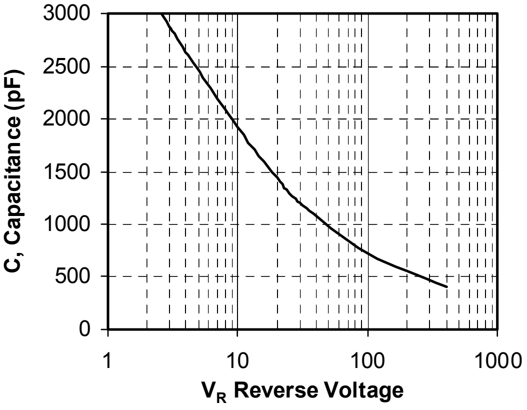
Forward Characteristics



Reverse Characteristics



Capacitance vs.Reverse Voltage



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