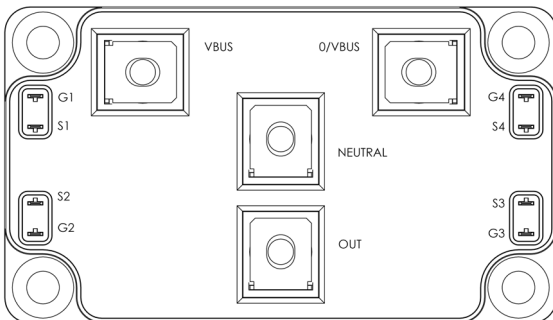
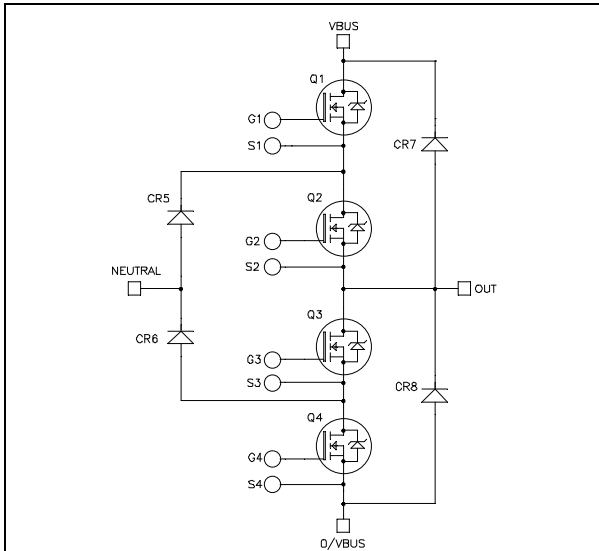


Three level inverter SiC MOSFET Power Module

SiC Power MOSFET :

$V_{DSS} = 1200V$; $R_{DS(on)} = 13m\Omega$ @ $T_j = 25^\circ C$



Application

- Uninterruptible Power Supplies

Features

- **SiC Power MOSFET**
 - Low $R_{DS(on)}$
 - High temperature performance
- **SiC Schottky Diode**
 - Zero reverse recovery
 - Zero forward recovery
 - Temperature Independent switching behavior
 - Positive temperature coefficient on VF
- Kelvin emitter for easy drive
- Very low stray inductance
- M5 power connectors
- High level of integration
- AlN substrate for improved thermal performance

Benefits

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

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

Q1 to Q4 Absolute maximum ratings (per SiC MOSFET)

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	1200	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	215
		$T_c = 80^\circ C$	160
I_{DM}	Pulsed Drain current	440	
V_{GS}	Gate - Source Voltage	-10/+25	V
$R_{DS(on)}$	Drain - Source ON Resistance	13	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$ 1000	W

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

Q1 to Q4 Electrical Characteristics (per SiC MOSFET)

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V$; $V_{DS} = 1200V$		100	800	μA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 160A$	$T_j = 25^\circ C$	19	13	m Ω
			$T_j = 150^\circ C$	75	26	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$; $I_D = 8mA$	1.7	2.2		V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = 20V$, $V_{DS} = 0V$			2	μA

Q1 to Q4 Dynamic Characteristics (per SiC MOSFET)

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
C_{iss}	Input Capacitance	$V_{GS} = 0V$		7600		pF
C_{oss}	Output Capacitance	$V_{DS} = 1000V$		640		
C_{riss}	Reverse Transfer Capacitance	$f = 1MHz$		52		
Q_g	Total gate Charge	$V_{GS} = 20V$		392		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 800V$		88		
Q_{gd}	Gate – Drain Charge	$I_D = 160A$		144		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$		12		ns
T_r	Rise Time	$V_{Bus} = 800V$		14		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 160A$		23		
T_f	Fall Time	$R_L = 5\Omega$; $R_G = 6.25\Omega$		18		
E_{on}	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$	$T_j = 150^\circ C$	3.5		mJ
E_{off}	Turn off Energy	$I_D = 160A$ $R_G = 6.25\Omega$	$T_j = 150^\circ C$	2		mJ
R_{thJC}	Junction to Case Thermal Resistance				0.13	$^\circ C/W$

Source - Drain diode ratings and characteristics (per SiC MOSFET)

<i>Symbol</i>	<i>Characteristic</i>	<i>Test Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
V_{SD}	Diode Forward Voltage	$V_{GS} = -5V$; $I_F = 80A$		3.3		V
		$V_{GS} = -2V$; $I_F = 80A$		3.1		
t_{rr}	Reverse Recovery Time	$I_F = 160A$; $V_R = 800V$		40		ns
Q_{rr}	Reverse Recovery Charge	$di_s/dt = 2800A/\mu s$; $V_{GS} = -5V$		1.3		μC

CR5 & CR6 SiC diode ratings and characteristics (Per SiC diode)

<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			600			V
I _{RM}	Maximum Reverse Leakage Current	V _R =600V	T _j = 25°C		220	1320	μA
			T _j = 175°C		440	6600	
I _F	DC Forward Current		T _c = 125°C		220		A
V _F	Diode Forward Voltage	I _F = 220A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2	2.4	
Q _C	Total Capacitive Charge	I _F = 220A, V _R = 600V di/dt = 5000A/μs			616		nC
C	Total Capacitance	f = 1MHz, V _R = 200V			1430		pF
		f = 1MHz, V _R = 400V			1100		
R _{thJC}	Junction to Case Thermal Resistance					0.1	°C/W

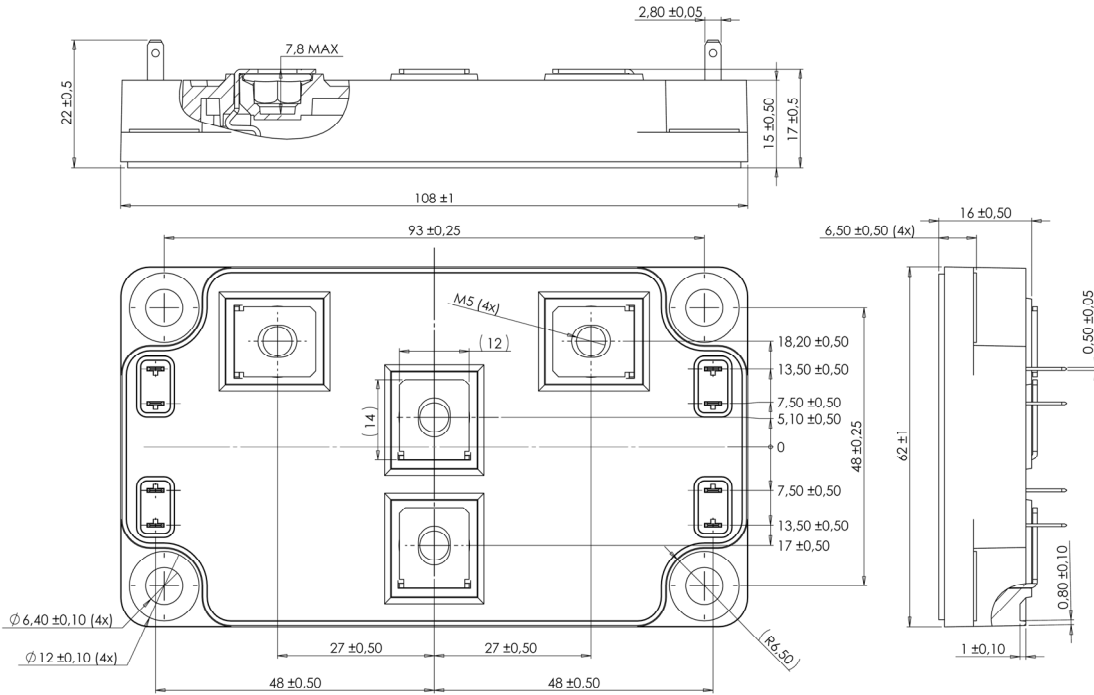
CR7 & CR8 diode ratings and characteristics (Per SiC diode)

<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°C		280	1600	μA
			T _j = 175°C		520	3200	
I _F	DC Forward Current		T _c = 125°C		160		A
V _F	Diode Forward Voltage	I _F = 160A	T _j = 25°C		1.5	1.8	V
			T _j = 175°C		2.2	3	
Q _C	Total Capacitive Charge	I _F = 160A, V _R = 1200V di/dt = 1600A/μs			1040		nC
C	Total Capacitance	f = 1MHz, V _R = 400V			744		pF
		f = 1MHz, V _R = 800V			536		
R _{thJC}	Junction to Case Thermal Resistance					0.18	°C/W

Thermal and package characteristics

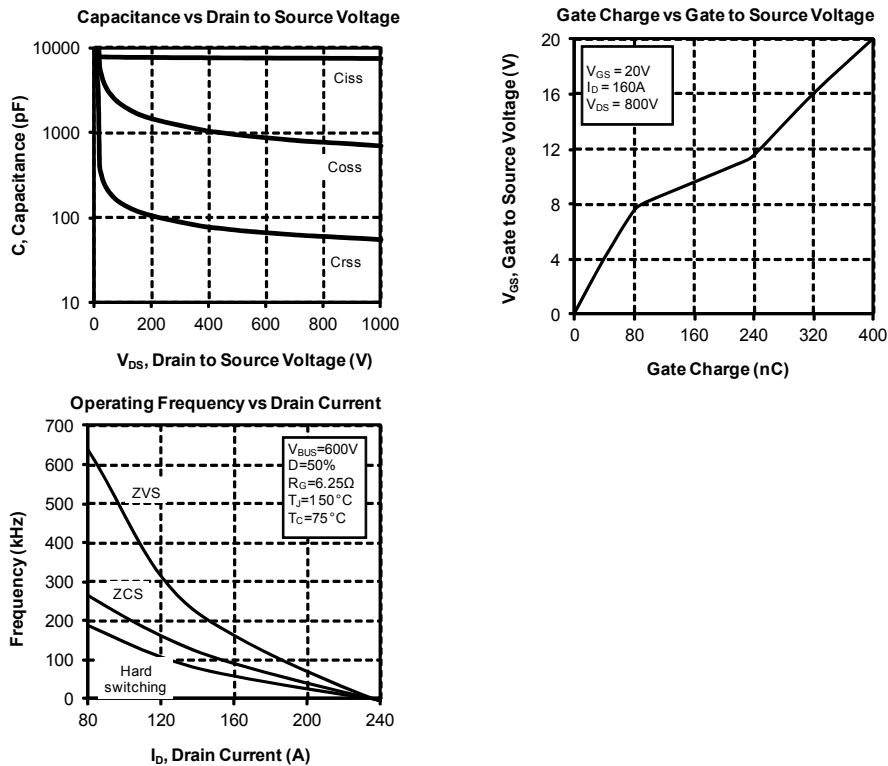
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V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz			4000			V
T _J	Operating junction temperature range	SiC MOSFET		-40		150	°C
		SiC diode		-40		175	
T _{JOP}	Recommended junction temperature under switching conditions			-40		T _{jmax} -25	
T _{STG}	Storage Temperature Range			-40		125	
T _C	Operating Case Temperature			-40		125	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					300	g

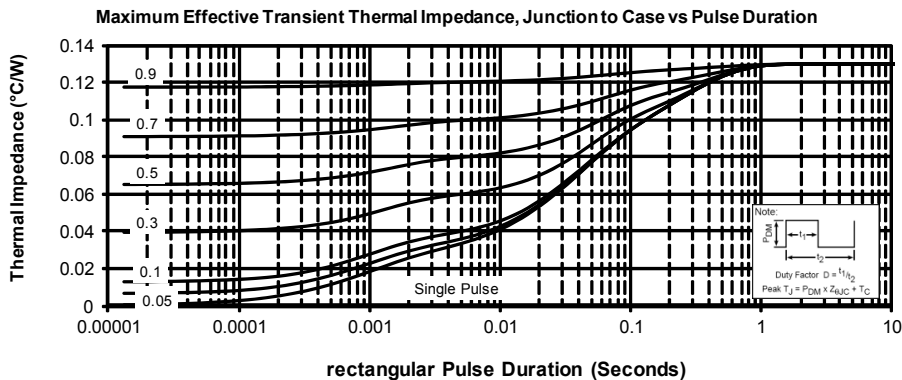
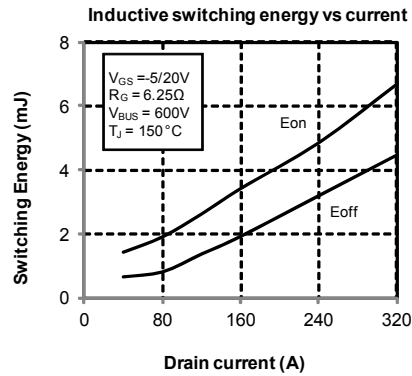
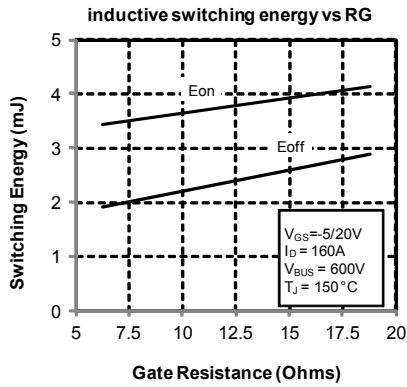
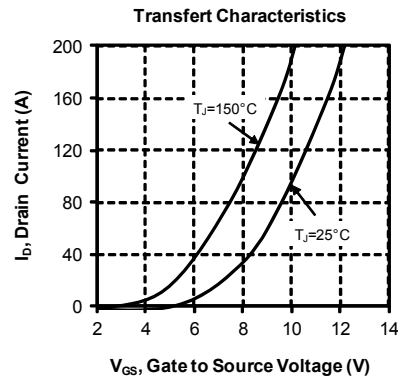
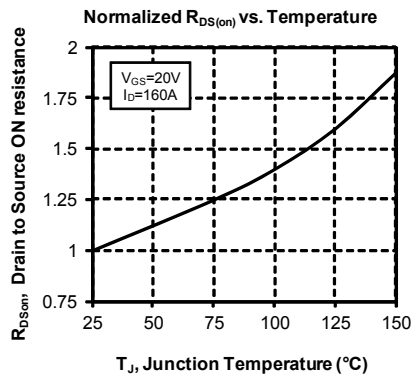
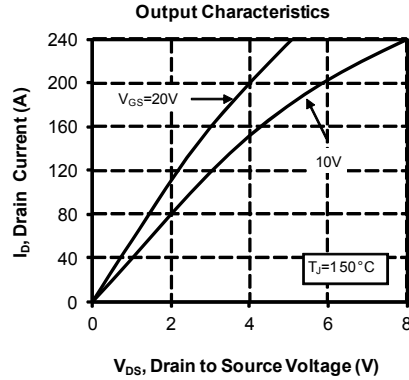
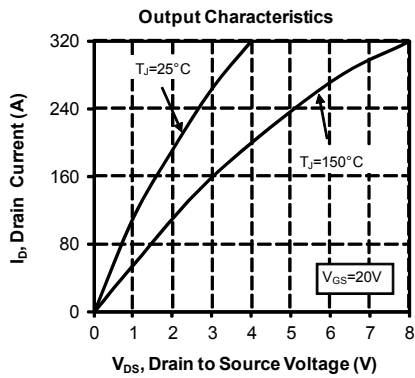
SP6 Package outline (dimensions in mm)

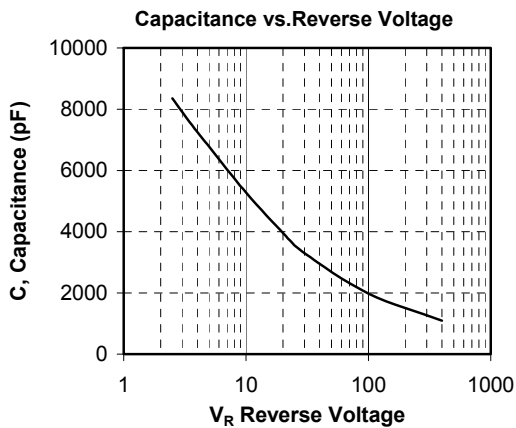
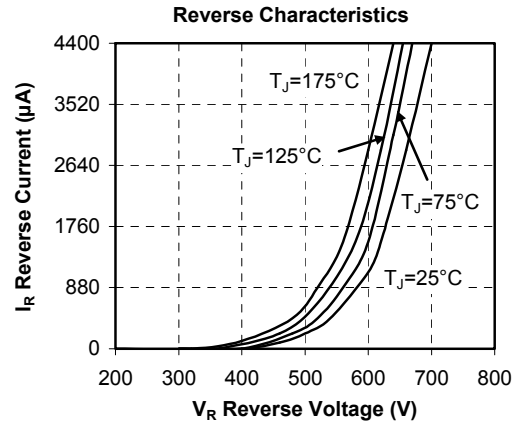
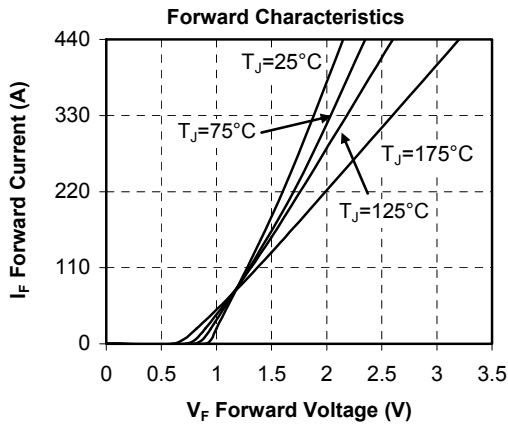
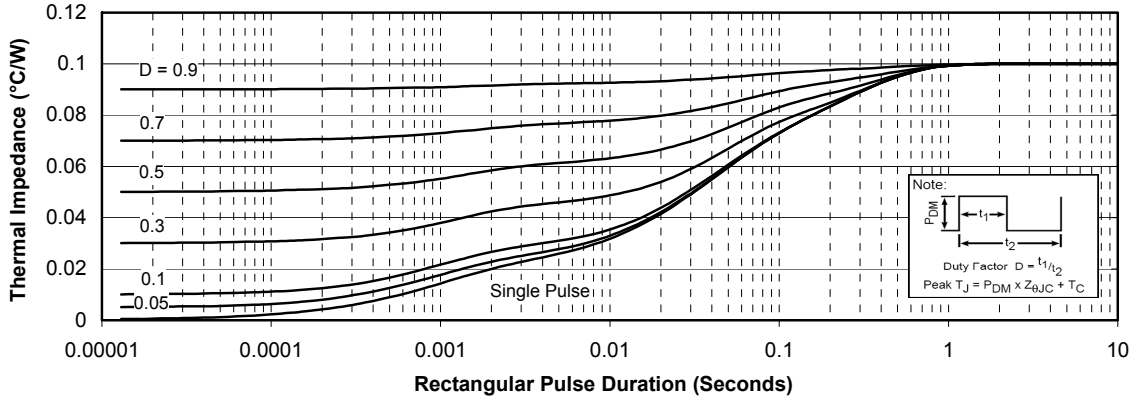


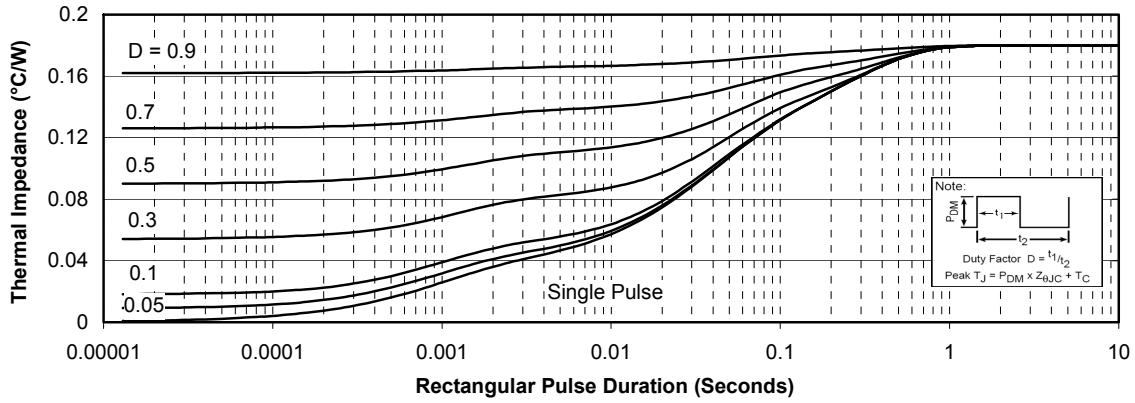
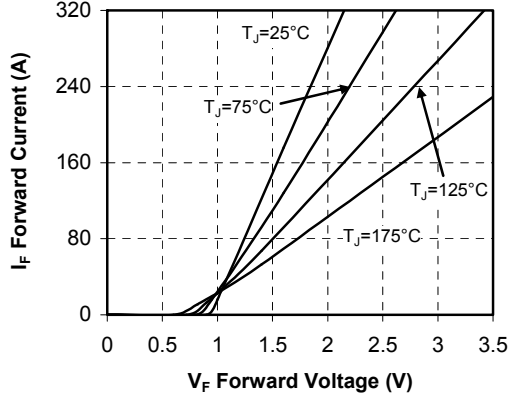
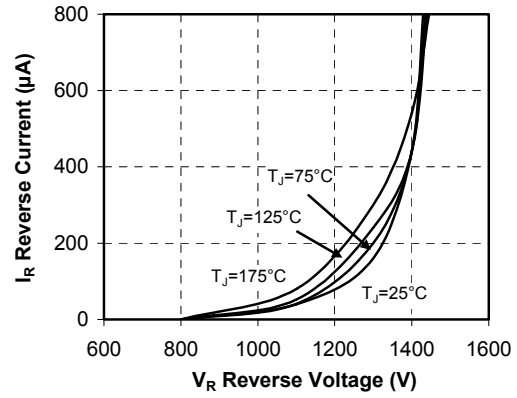
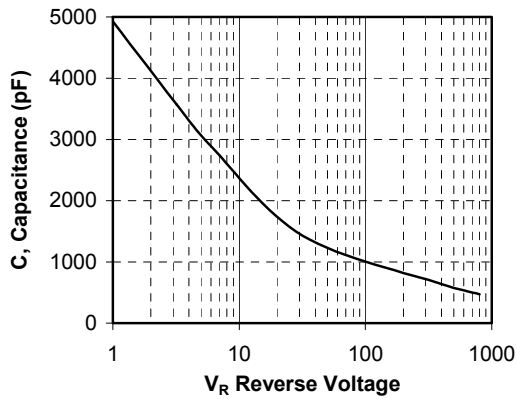
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Q1 to Q4 Typical performance curve





CR5 & CR6 Typical performance curve
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration


CR7 & CR8 Typical 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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