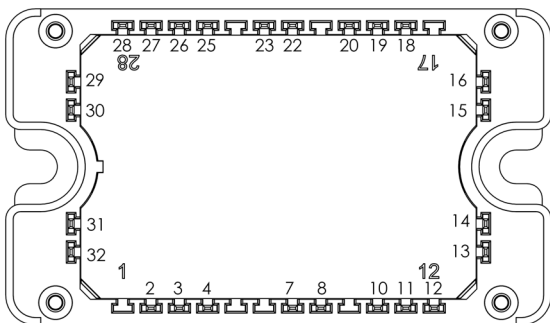
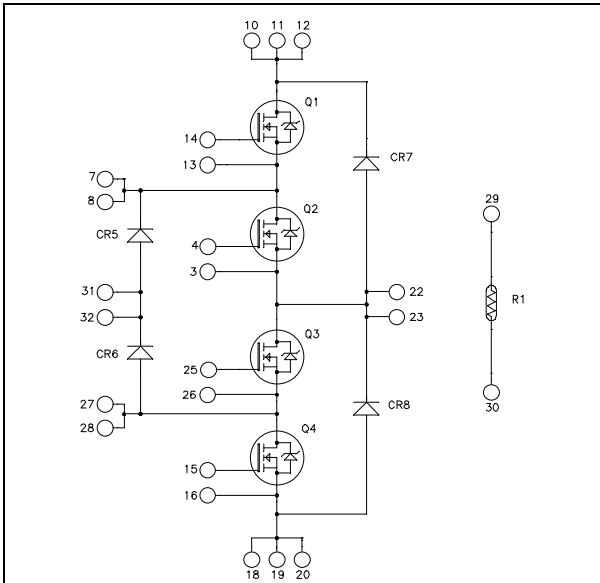


Three level inverter SiC MOSFET Power Module

SiC Power MOSFET :
 $V_{DSS} = 1200V$; $R_{DSon} = 49m\Omega$ @ $T_j = 25^\circ C$



All multiple inputs and outputs must be shorted together
 10/11/12 ; 7/8 ; 27/28 ; ...

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	$T_c = 25^\circ C$	55
		$T_c = 80^\circ C$	42
I_{DM}	Pulsed Drain current	110	A
V_{GS}	Gate - Source Voltage	-10/+25	V
R_{DSon}	Drain - Source ON Resistance	49	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$ 250	W

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

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
- High level of integration
- Internal thermistor for temperature monitoring
- 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

Q1 to Q4 Electrical Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V$; $V_{DS} = 1200V$		25	200	μA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 40A$	$T_j = 25^\circ C$ $T_j = 150^\circ C$	40 75	49 104	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$; $I_D = 2mA$	1.7	2.2		V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = 20V$, $V_{DS} = 0V$			500	nA

Q1 to Q4 Dynamic Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		1900		pF
C_{oss}	Output Capacitance	$V_{DS} = 1000V$		160		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		13		
Q_g	Total gate Charge	$V_{GS} = 20V$		98		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 800V$		22		
Q_{gd}	Gate – Drain Charge	$I_D = 40A$		36		
$T_{d(on)}$	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	$I_D = 40A$		23		
T_f	Fall Time	$R_L = 20\Omega$; $R_G = 25\Omega$		18		
E_{on}	Turn on Energy	Inductive Switching $V_{GS} = -5/+20V$ $V_{Bus} = 600V$	$T_j = 150^\circ C$	0.9		mJ
E_{off}	Turn off Energy	$I_D = 40A$ $R_G = 25\Omega$	$T_j = 150^\circ C$	0.5		mJ
R_{thJC}	Junction to Case Thermal Resistance				0.5	$^\circ C/W$

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

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		600			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 600V$	$T_j = 25^\circ C$ $T_j = 175^\circ C$	30 60	180 900	μA
I_F	DC Forward Current			30		A
V_F	Diode Forward Voltage	$I_F = 30A$	$T_j = 25^\circ C$ $T_j = 175^\circ C$	1.6 2	1.8 2.4	V
Q_C	Total Capacitive Charge	$I_F = 30A$, $V_R = 600V$ $di/dt = 1000A/\mu s$		84		nC
C	Total Capacitance	$f = 1MHz$, $V_R = 200V$ $f = 1MHz$, $V_R = 400V$		195 150		pF
R_{thJC}	Junction to Case Thermal Resistance				0.8	$^\circ C/W$

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		96	600	μA
			T _j = 175°C		168	3000	
I _F	DC Forward Current		T _c = 125°C		30		A
V _F	Diode Forward Voltage	I _F = 30A	T _j = 25°C		1.6	1.8	V
			T _j = 175°C		2.3	3	
Q _C	Total Capacitive Charge	I _F = 30A, V _R = 1200V di/dt = 1500A/μs			240		nC
C	Total Capacitance	f = 1MHz, V _R = 200V			288		pF
		f = 1MHz, V _R = 400V			207		
R _{thJC}	Junction to Case Thermal Resistance					0.50	°C/W

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B		T _C =100°C	4		%

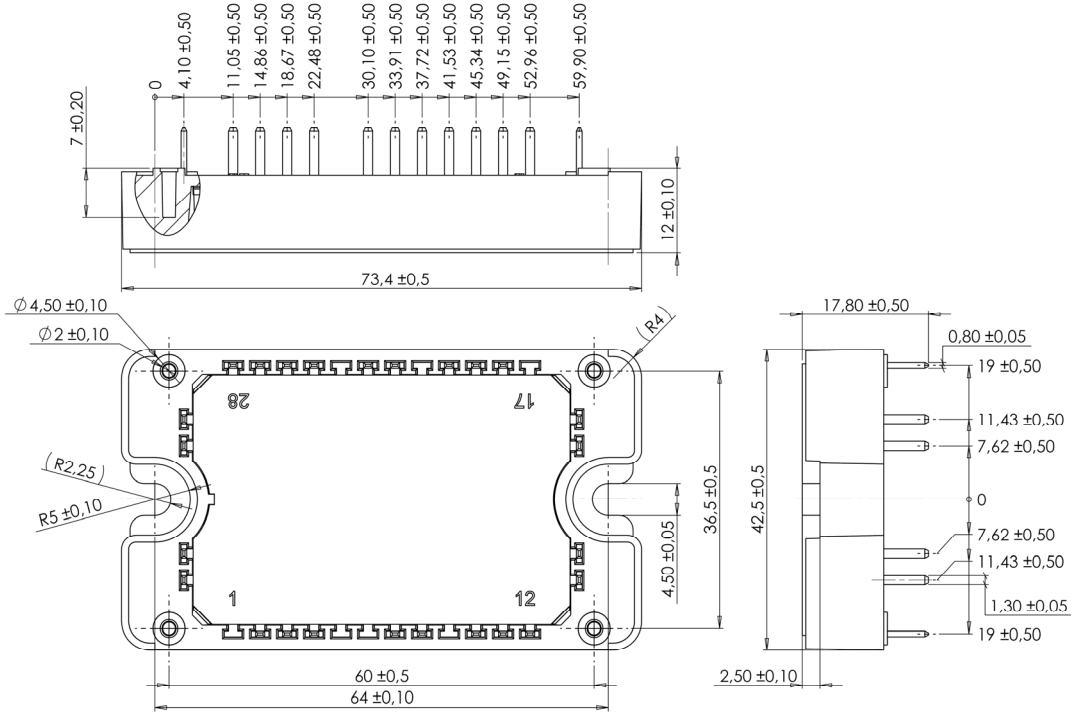
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

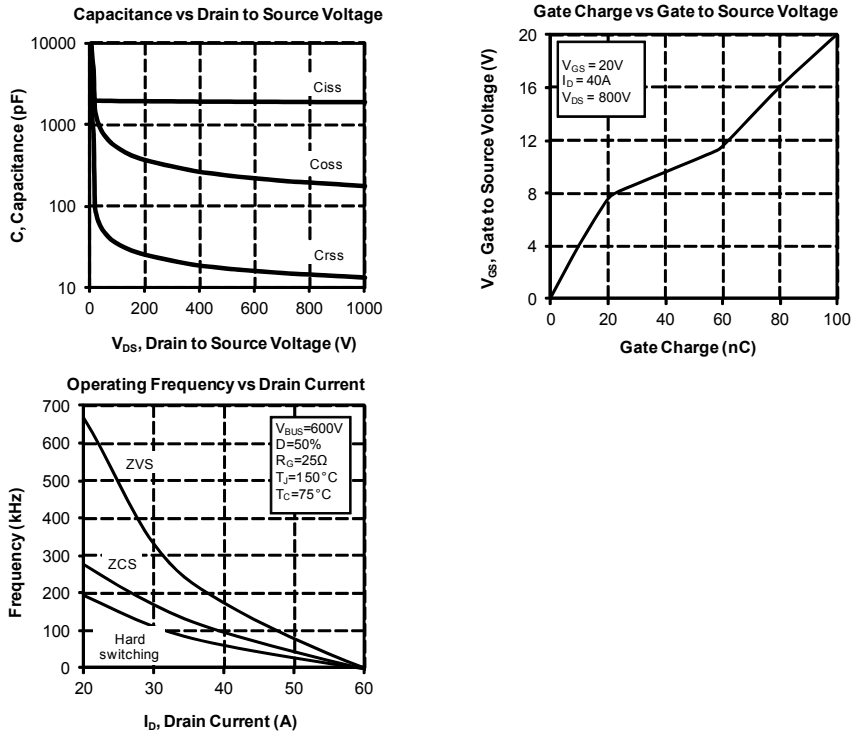
<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000			V	
T _J	Operating junction temperature range	SiC MOSFET	-40	150	°C	
		SiC diode	-40	175		
T _{JOP}	Recommended junction temperature under switching conditions	-40		T _{Jmax} -25		
T _{STG}	Storage Temperature Range	-40		125		
T _C	Operating Case Temperature	-40		125		
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

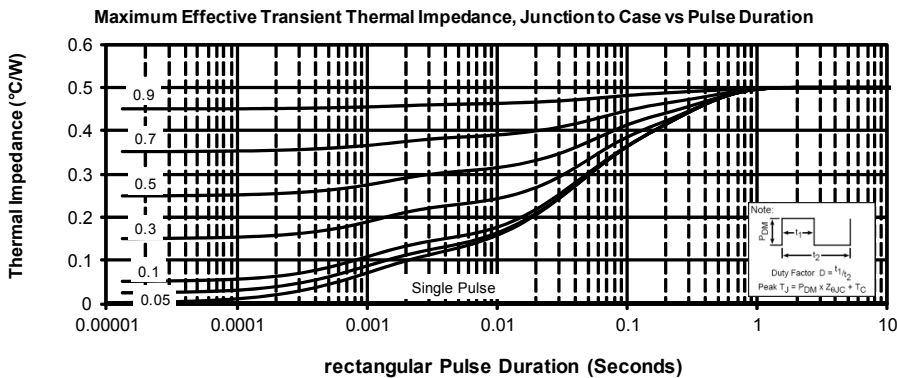
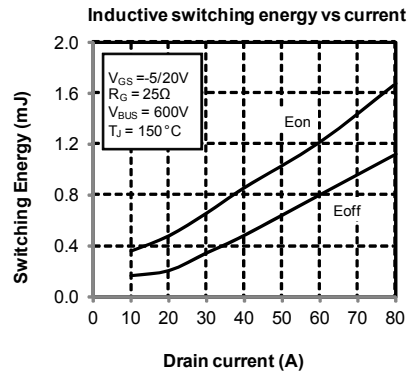
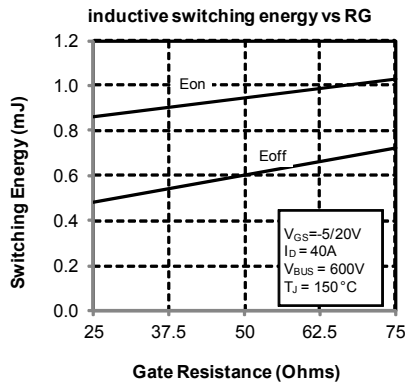
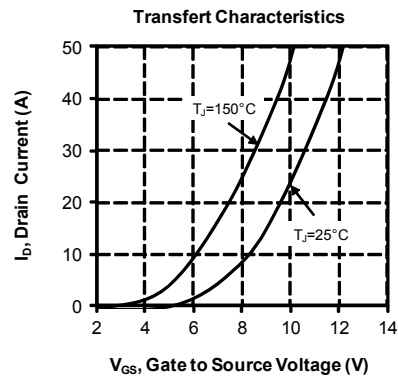
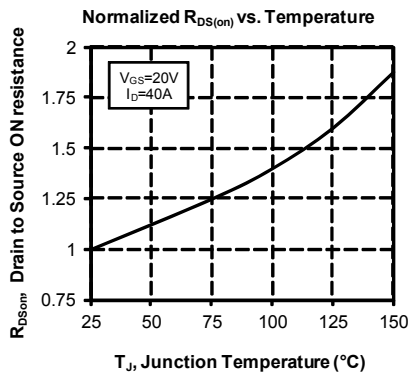
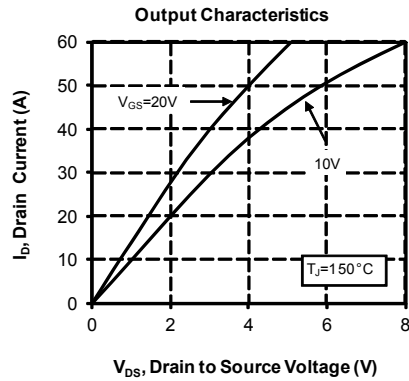
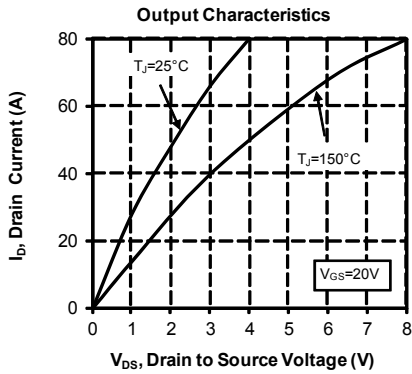
SP3 Package outline (dimensions in mm)

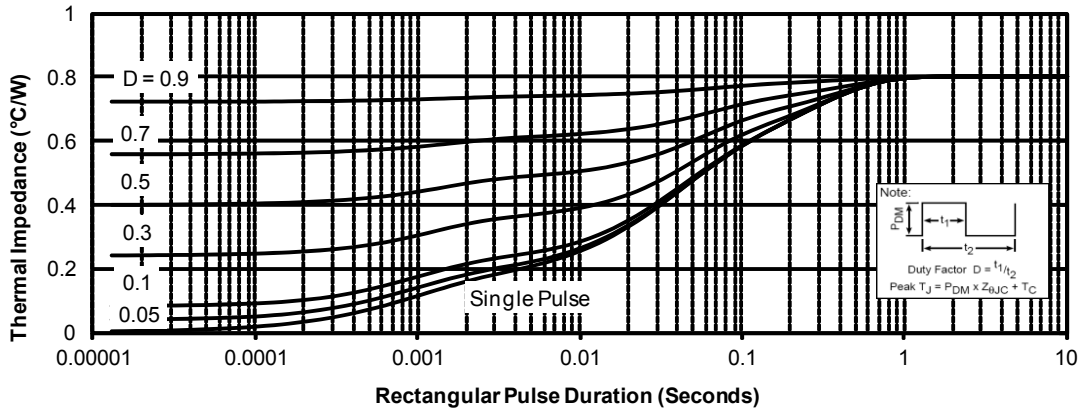
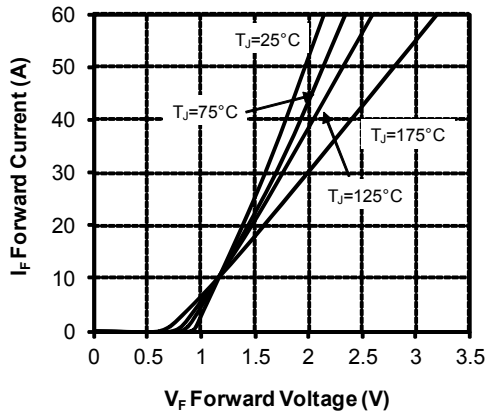
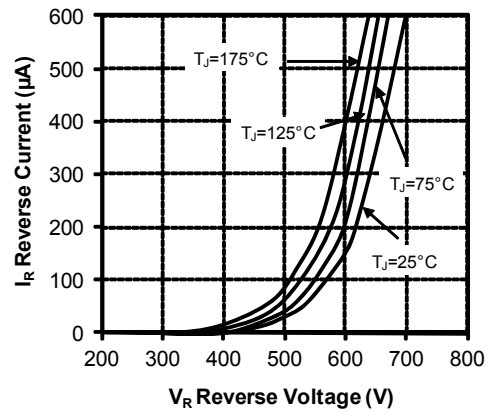
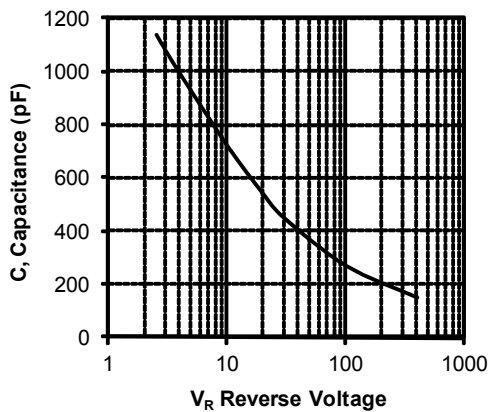


See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

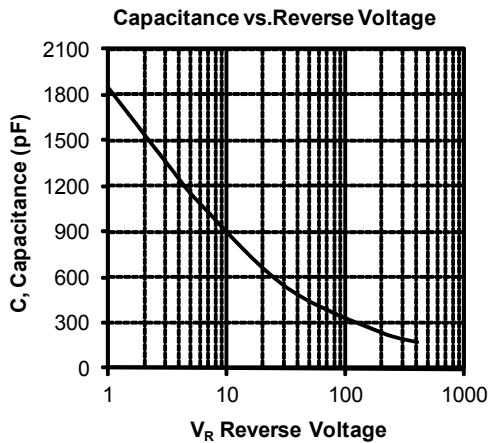
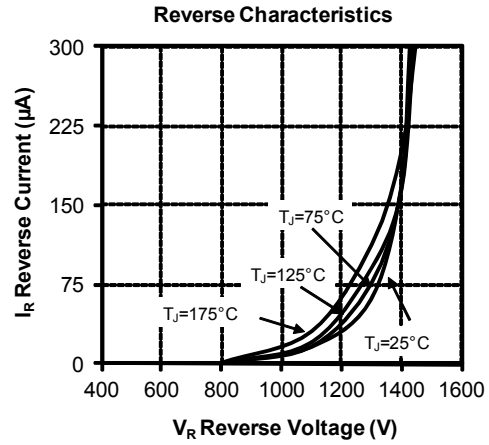
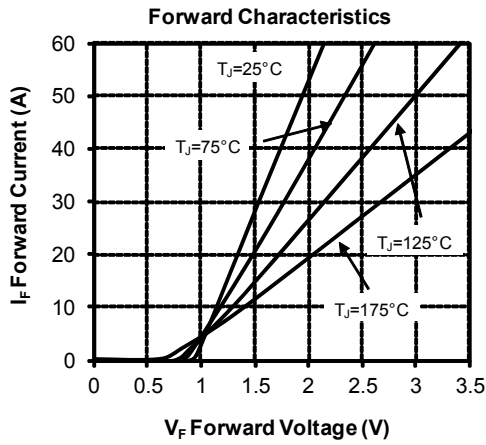
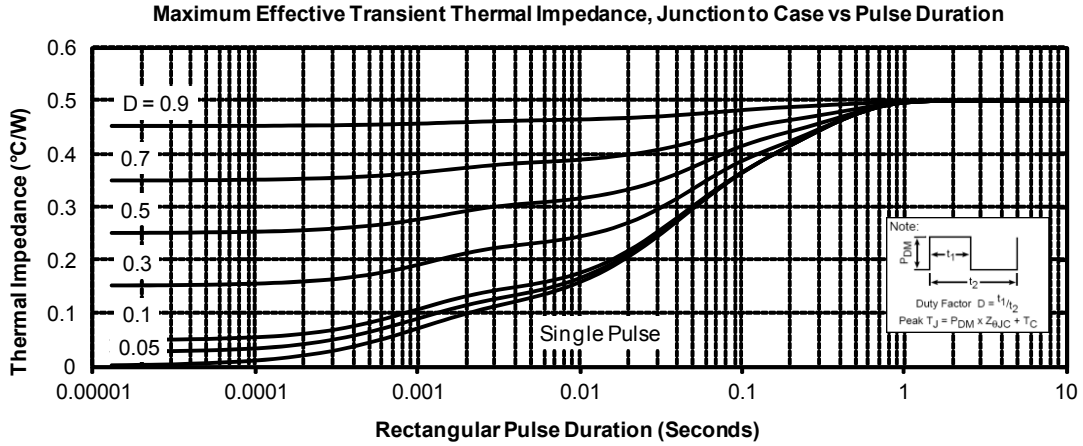
Q1 to Q4 Typical performance curve





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

Forward Characteristics

Reverse Characteristics

Capacitance vs. Reverse Voltage


CR7 & CR8 Typical performance curve



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