

High Temperature Silicon Carbide Power Schottky Diode

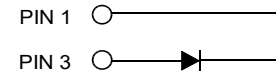
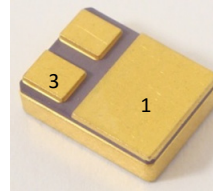
V_{RRM}	=	650 V
I_F ($T_C=25^\circ\text{C}$)	=	14 A
Q_C	=	20 nC

Features

- 650 V Schottky rectifier
- 210 °C maximum operating temperature
- Zero reverse recovery charge
- Superior surge current capability
- Positive temperature coefficient of V_F
- Temperature independent switching behavior
- Lowest figure of merit Q_C/I_F
- Available screened to Mil-PRF-19500

Package

- RoHS Compliant



SMD0.5 / TO – 276 (Hermetic Package)

Advantages

- High temperature operation
- Improved circuit efficiency (Lower overall cost)
- Low switching losses
- Ease of paralleling devices without thermal runaway
- Smaller heat sink requirements
- Industry's lowest reverse recovery charge
- Industry's lowest device capacitance
- Ideal for output switching of power supplies
- Best in class reverse leakage current at operating temperature

Applications

- Down Hole Oil Drilling
- Geothermal Instrumentation
- Solenoid Actuators
- General Purpose High-Temperature Switching
- Amplifiers
- Solar Inverters
- Switched-Mode Power Supply (SMPS)
- Power Factor Correction (PFC)

Maximum Ratings at $T_j = 210^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Values	Unit
Repetitive peak reverse voltage	V_{RRM}		650	V
Continuous forward current	I_F	$T_C = 25^\circ\text{C}$	8	A
Continuous forward current	I_F	$T_C \leq 190^\circ\text{C}$	4.3	A
RMS forward current	$I_{F(RMS)}$	$T_C \leq 190^\circ\text{C}$	8	A
Surge non-repetitive forward current, Half Sine Wave	$I_{F,SM}$	$T_C = 25^\circ\text{C}$, $t_p = 10\text{ ms}$	32	A
Non-repetitive peak forward current	$I_{F,max}$	$T_C = 25^\circ\text{C}$, $t_p = 10\ \mu\text{s}$	120	A
I^2t value	$\int I^2 dt$	$T_C = 25^\circ\text{C}$, $t_p = 10\text{ ms}$	5	A^2S
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	163	W
Operating and storage temperature	T_j, T_{stg}		-55 to 210	$^\circ\text{C}$

Electrical Characteristics at $T_j = 210^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Diode forward voltage	V_F	$I_F = 5\text{ A}$, $T_j = 25^\circ\text{C}$		1.7		V
		$I_F = 5\text{ A}$, $T_j = 210^\circ\text{C}$		2.9		
Reverse current	I_R	$V_R = 650\text{ V}$, $T_j = 25^\circ\text{C}$		1	5	μA
		$V_R = 650\text{ V}$, $T_j = 210^\circ\text{C}$		10	100	
Total capacitive charge	Q_C	$I_F \leq I_{F,MAX}$ $dI_F/dt = 200\text{ A}/\mu\text{s}$ $T_j = 210^\circ\text{C}$		20		nC
Switching time	t_s	$V_R = 400\text{ V}$		< 25		ns
Total capacitance	C	$V_R = 1\text{ V}$, $f = 1\text{ MHz}$, $T_j = 25^\circ\text{C}$		274		pF
		$V_R = 400\text{ V}$, $f = 1\text{ MHz}$, $T_j = 25^\circ\text{C}$		31		
		$V_R = 650\text{ V}$, $f = 1\text{ MHz}$, $T_j = 25^\circ\text{C}$		29		

Thermal Characteristics

Thermal resistance, junction - case	R_{thJC}	1.38	$^\circ\text{C}/\text{W}$
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Mechanical Properties

Mounting torque	M	0.6	Nm
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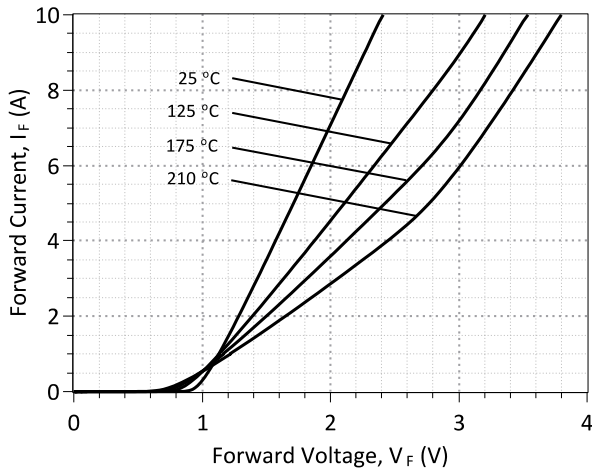


Figure 1: Typical Forward Characteristics

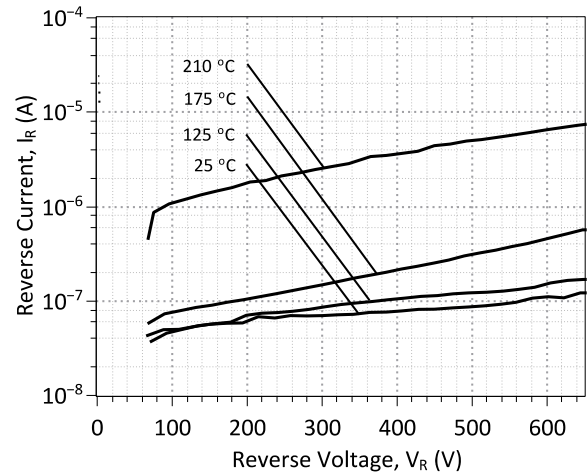


Figure 2: Typical Reverse Characteristics

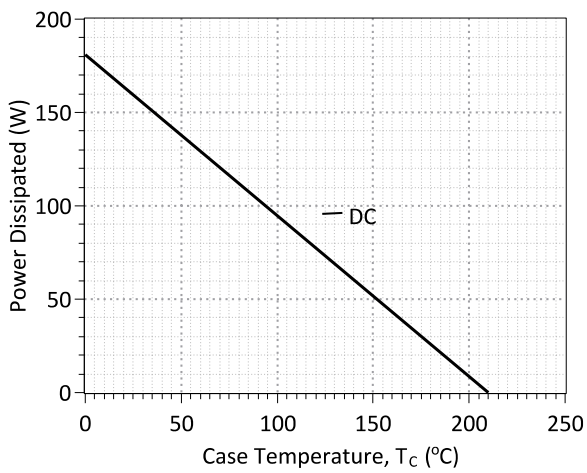
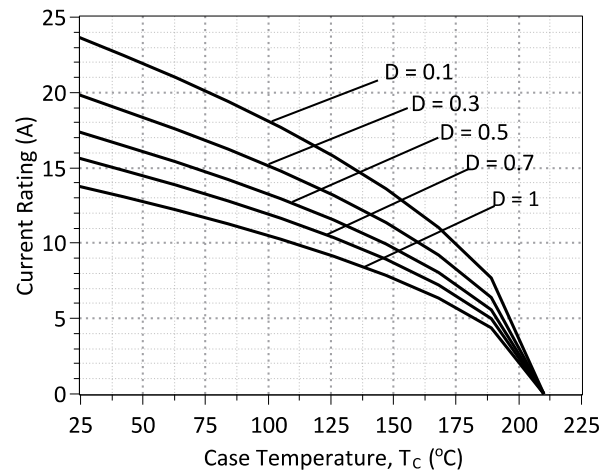


Figure 3: Power Derating Curve



**Figure 4: Current Derating Curves ($D = t_p/T$, $t_p = 400 \mu s$)
(Considering worst case Z_{th} conditions)**

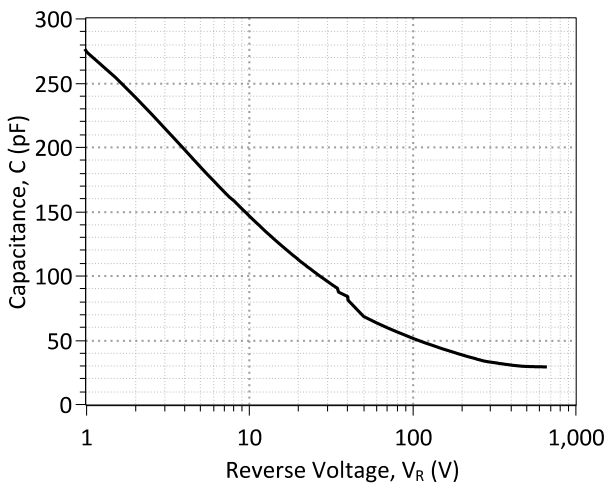


Figure 5: Typical Junction Capacitance vs Reverse Voltage Characteristics

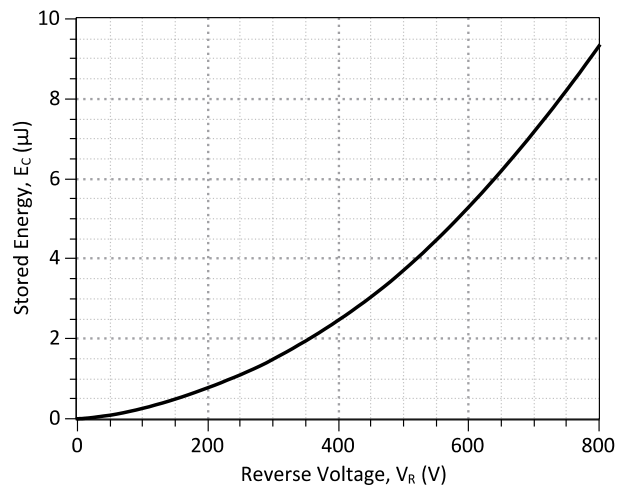


Figure 6: Typical Capacitive Energy vs Reverse Voltage Characteristics

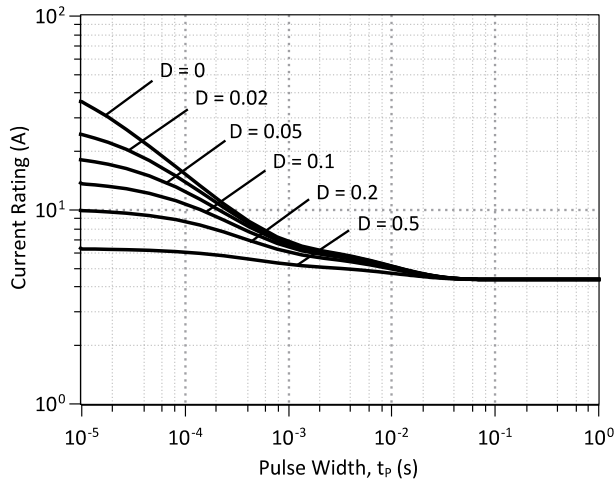


Figure 7: Current vs Pulse Duration Curves at $T_c = 190\text{ }^\circ\text{C}$

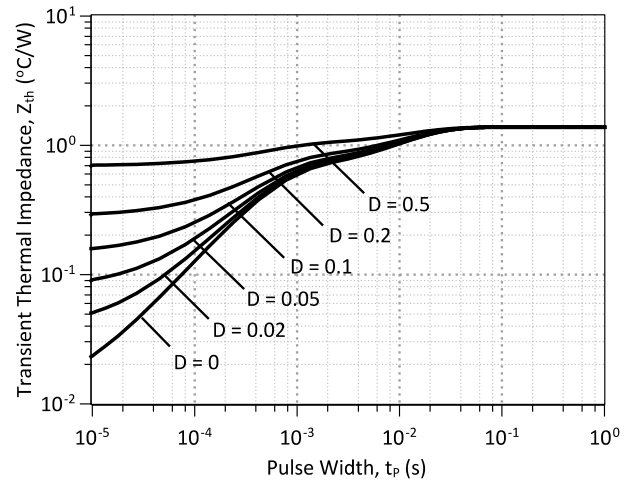
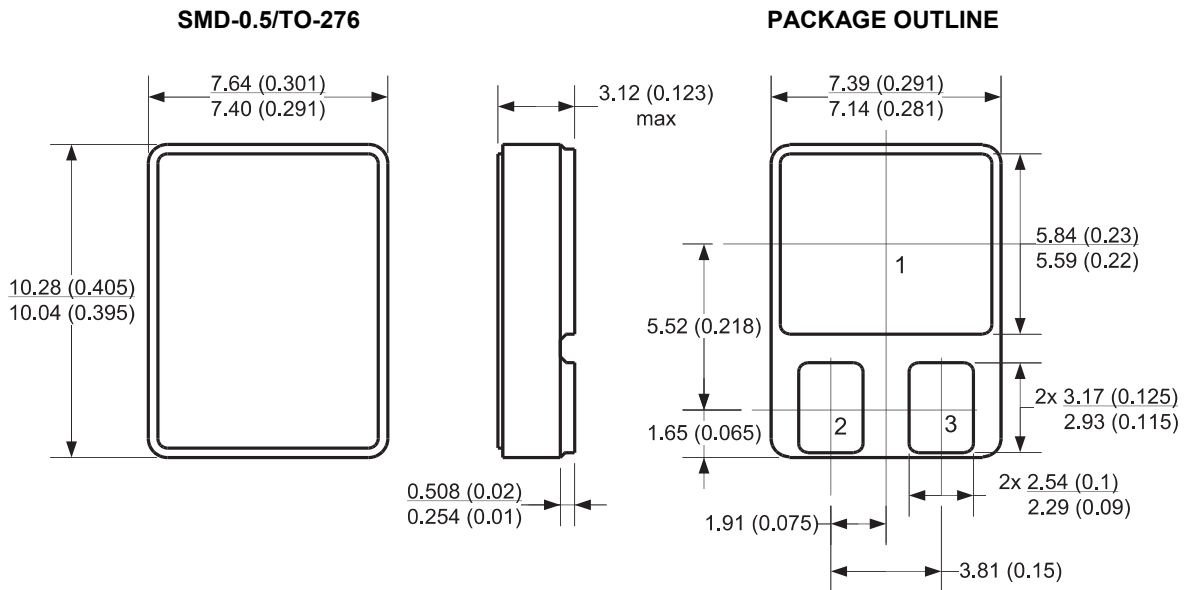


Figure 8: Transient Thermal Impedance

Package Dimensions:



NOTE

1. CONTROLLED DIMENSION IS INCH. DIMENSION IN BRACKET IS MILLIMETER.
2. DIMENSIONS DO NOT INCLUDE END FLASH, MOLD FLASH, MATERIAL PROTRUSIONS

Revision History

Date	Revision	Comments	Supersedes
2014/08/26	1	Updated Electrical Characteristics	
2012/04/24	0	Initial release	

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SPICE Model Parameters

Copy the following code into a SPICE software program for simulation of the 1N8033-GA device.

```
*      MODEL OF GeneSiC Semiconductor Inc.
*
*      $Revision:   1.0           $
*      $Date:      05-SEP-2013   $
*
*      GeneSiC Semiconductor Inc.
*      43670 Trade Center Place Ste. 155
*      Dulles, VA 20166
*      http://www.genesicsemi.com/index.php/hit-sic/schottky
*
*      COPYRIGHT (C) 2013 GeneSiC Semiconductor Inc.
*      ALL RIGHTS RESERVED
*
*      These models are provided "AS IS, WHERE IS, AND WITH NO WARRANTY
*      OF ANY KIND EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED
*      TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
*      PARTICULAR PURPOSE."
*      Models accurate up to 2 times rated drain current.
*
*      Start of 1N8033-GA SPICE Model
*
.SUBCKT 1N8033 ANODE KATHODE
D1 ANODE KATHODE 1N8033_25C; Call the Schottky Diode Model
D2 ANODE KATHODE 1N8033_PIN; Call the PiN Diode Model
.MODEL 1N8033_25C D
+ IS      1.99E-17      RS      0.12463
+ N       1            IKF     569.082
+ EG      1.2          XTI     3
+ TRS1    0.0035       TRS2    3.87E-05
+ CJO     3.38E-10     VJ      0.41772
+ M       1.5479       FC      0.5
+ TT      1.00E-10     BV      650
+ IBV     1.00E-03     VPK     650
+ IAVE    5            TYPE    SiC_Schottky
+ MFG     GeneSiC_Semiconductor
.MODEL 1N8033_PIN D
+ IS      1.33E-10     RS      0.31147
+ N       5            IKF     0
+ EG      3.23         XTI     -10
+ FC      0.5          TT      0
+ BV      650          IBV     1.00E-03
+ VPK     650          IAVE    5
+ TYPE    SiC_PiN
.ENDS
*
*      End of 1N8033-GA SPICE Model
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