

High Temperature Silicon Carbide Power Schottky Diode

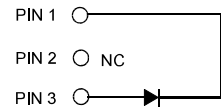
V_{RRM}	=	650 V
$I_F (T_C=25^\circ\text{C})$	=	30 A
Q_C	=	66 nC

Features

- 650 V Schottky rectifier
- 210 °C maximum operating temperature
- Electrically isolated base-plate
- 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



TO – 257 (Isolated Base-plate 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
			min.	typ.	
Repetitive peak reverse voltage	V_{RRM}			650	V
Continuous forward current	I_F	$T_C = 25^\circ\text{C}$		30	A
Continuous forward current	I_F	$T_C \leq 190^\circ\text{C}$		9.4	A
RMS forward current	$I_{F(RMS)}$	$T_C \leq 190^\circ\text{C}$		16	A
Surge non-repetitive forward current, Half Sine Wave	$I_{F,SM}$	$T_C = 25^\circ\text{C}, t_p = 10\text{ ms}$		140	A
Non-repetitive peak forward current	$I_{F,max}$	$T_C = 25^\circ\text{C}, t_p = 10\ \mu\text{s}$		650	A
I^2t value	$\int I^2 dt$	$T_C = 25^\circ\text{C}, t_p = 10\text{ ms}$		98	A ² S
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$		208	W
Operating and storage temperature	T_j, T_{stg}			-55 to 210	°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	$I_F = 10\text{ A}, T_j = 25^\circ\text{C}$		1.3		V
		$I_F = 10\text{ A}, T_j = 210^\circ\text{C}$		1.8		
Reverse current	I_R	$V_R = 650\text{ V}, T_j = 25^\circ\text{C}$		1	5	μA
		$V_R = 650\text{ V}, T_j = 210^\circ\text{C}$		50	200	
Total capacitive charge	Q_C	$I_F \leq I_{F,MAX}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $T_j = 210^\circ\text{C}$	$V_R = 400\text{ V}$	66		nC
Switching time	t_s		$V_R = 400\text{ V}$	< 49		ns
Total capacitance	C	$V_R = 1\text{ V}, f = 1\text{ MHz}, T_j = 25^\circ\text{C}$		1107		pF
		$V_R = 400\text{ V}, f = 1\text{ MHz}, T_j = 25^\circ\text{C}$		103		
		$V_R = 650\text{ V}, f = 1\text{ MHz}, T_j = 25^\circ\text{C}$		99		

Thermal Characteristics

Thermal resistance, junction - case	R_{thJC}	1.08	°C/W
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Mechanical Properties

Mounting torque	M	0.6	Nm
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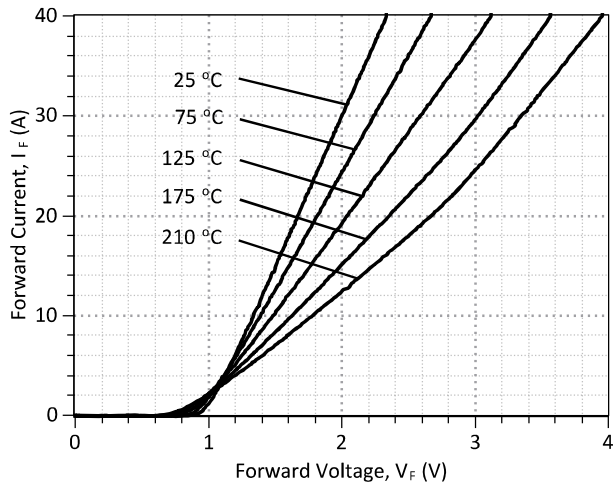


Figure 1: Typical Forward Characteristics

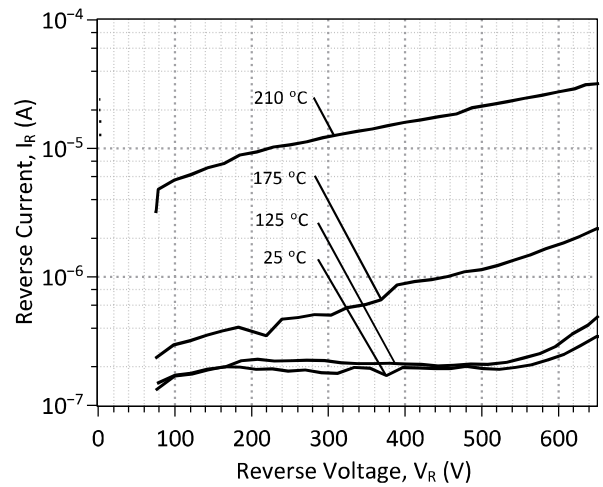


Figure 2: Typical Reverse Characteristics

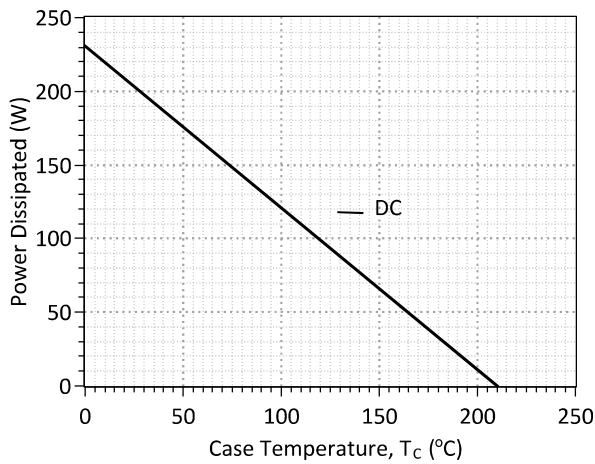
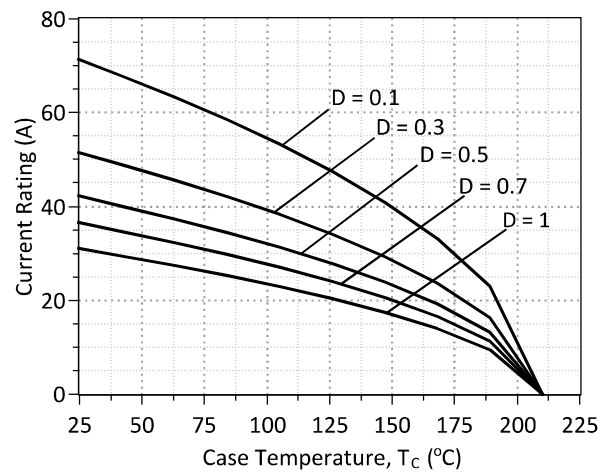


Figure 3: Power Derating Curve



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

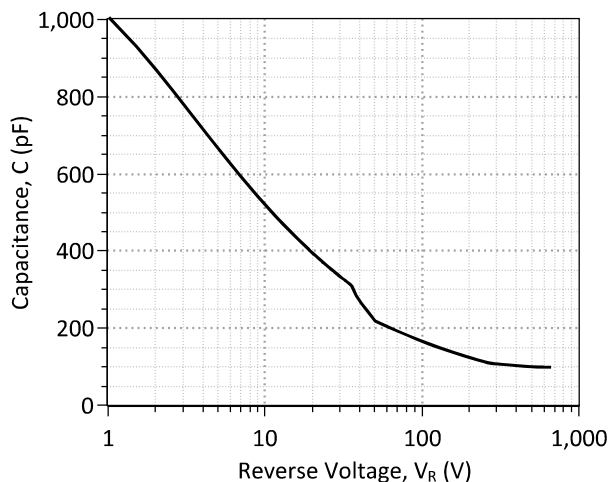


Figure 5: Typical Junction Capacitance vs Reverse Voltage Characteristics

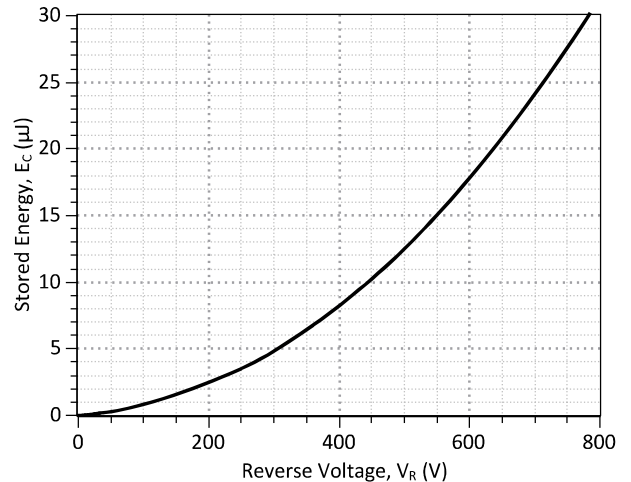


Figure 6: Typical Capacitive Energy vs Reverse Voltage Characteristics

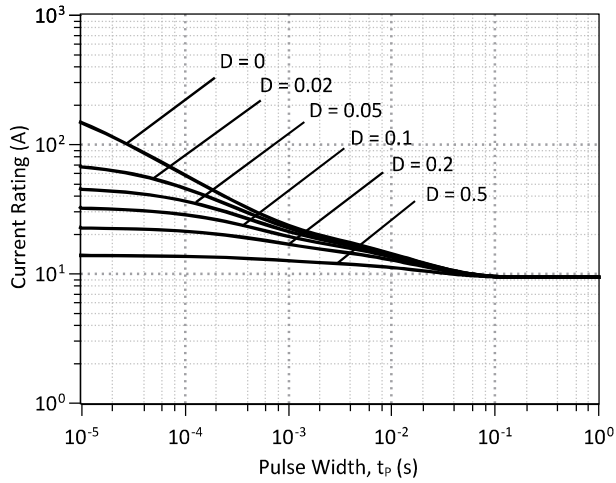


Figure 7: Current vs Pulse Duration Curves at $T_c = 190\text{ }^\circ\text{C}$

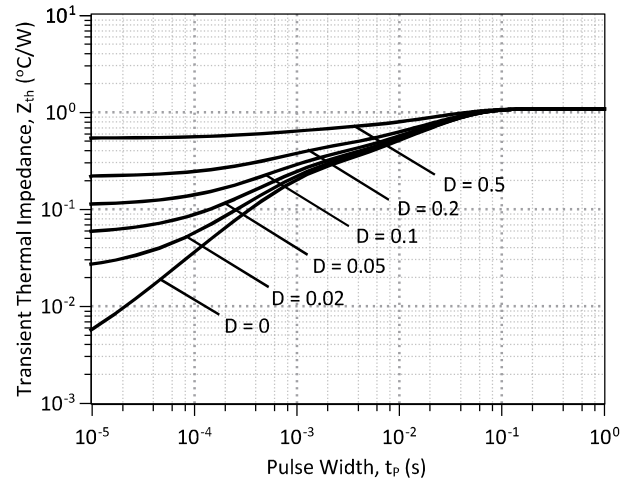
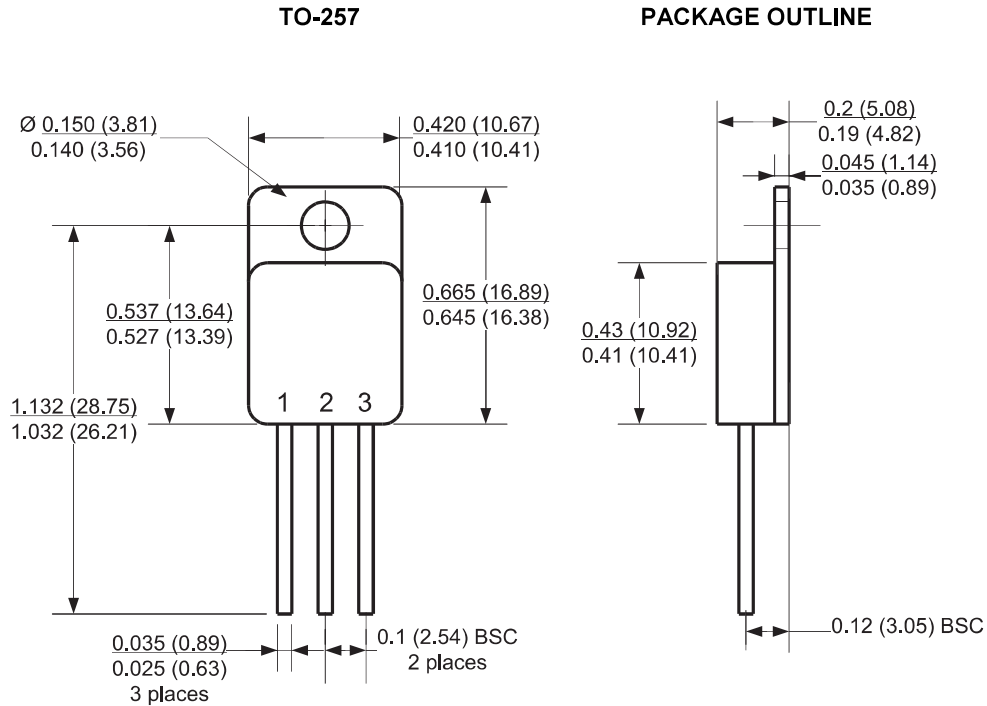


Figure 8: Transient Thermal Impedance

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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43670 Trade Center Place Suite 155
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SPICE Model Parameters

Copy the following code into a SPICE software program for simulation of the 1N8034-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.
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*
* 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 1N8034-GA SPICE Model
*
.SUBCKT 1N8034 ANODE KATHODE
D1 ANODE KATHODE 1N8034_25C; Call the Schottky Diode Model
D2 ANODE KATHODE 1N8034_PIN; Call the PiN Diode Model
.MODEL 1N8034_25C D
+ IS      8.46E-17      RS      0.0319
+ N       1            IKF     1000
+ EG      1.2          XTI     3
+ TRS1    0.0038       TRS2    3.00E-05
+ CJO     1.26E-09     VJ      0.438
+ M       1.5278       FC      0.5
+ TT      1.00E-10     BV      650
+ IBV     1.00E-03     VPK     650
+ IAVE    20          TYPE    SiC_Schottky
+ MFG     GeneSiC_Semiconductor
.MODEL 1N8034_PIN D
+ IS      2.77E-10     RS      0.086693
+ N       3.3505       IKF     3.67E-06
+ EG      3.23         XTI     -10
+ FC      0.5          TT      0
+ BV      650          IBV     1.00E-03
+ VPK     650          IAVE    20
+ TYPE    SiC_PiN
.ENDS
*
* End of 1N8034-GA SPICE Model
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