

## High Temperature Silicon Carbide Power Schottky Diode

|                          |   |       |
|--------------------------|---|-------|
| $V_{RRM}$                | = | 650 V |
| $I_F @ 25^\circ\text{C}$ | = | 8 A   |
| $Q_C$                    | = | 20 nC |

### Features

- 650 V Schottky rectifier
- 250 °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



Die Size = 1.6 mm x 1.6 mm

### 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)

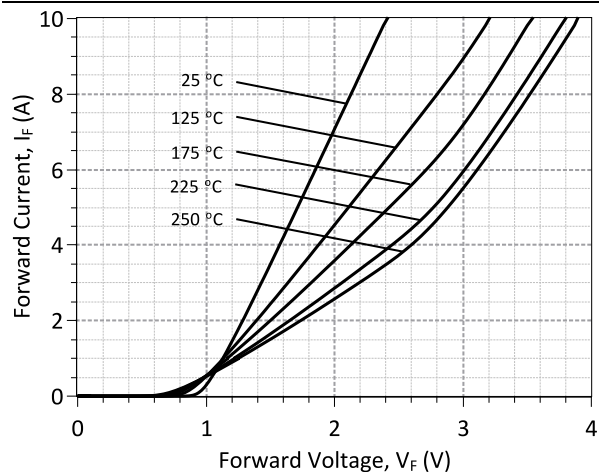
### Maximum Ratings at $T_J = 250^\circ\text{C}$ , unless otherwise specified

| Parameter                                            | Symbol         | Conditions                                               | Values     | Unit                 |
|------------------------------------------------------|----------------|----------------------------------------------------------|------------|----------------------|
| Repetitive peak reverse voltage                      | $V_{RRM}$      |                                                          | 650        | V                    |
| Continuous forward current                           | $I_F$          | $T_C = 25^\circ\text{C}$ , $R_{thJC} = 3.4$              | 8          | A                    |
| Continuous forward current                           | $I_F$          | $T_C \leq 225^\circ\text{C}$ , $R_{thJC} = 3.4$          | 2.5        | A                    |
| RMS forward current                                  | $I_{F(RMS)}$   | $T_C \leq 225^\circ\text{C}$ , $R_{thJC} = 3.4$          | 4.3        | 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                  | $I_{F,max}$    | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ | 120        | A                    |
| $I^2t$ value                                         | $\int i^2 dt$  | $T_C = 25^\circ\text{C}$ , $t_p = 10\text{ ms}$          | 5          | $\text{A}^2\text{S}$ |
| Power dissipation                                    | $P_{tot}$      | $T_C = 25^\circ\text{C}$ , $R_{thJC} = 3.4$              | 66         | W                    |
| Operating and storage temperature                    | $T_J, T_{stg}$ |                                                          | -55 to 250 | $^\circ\text{C}$     |

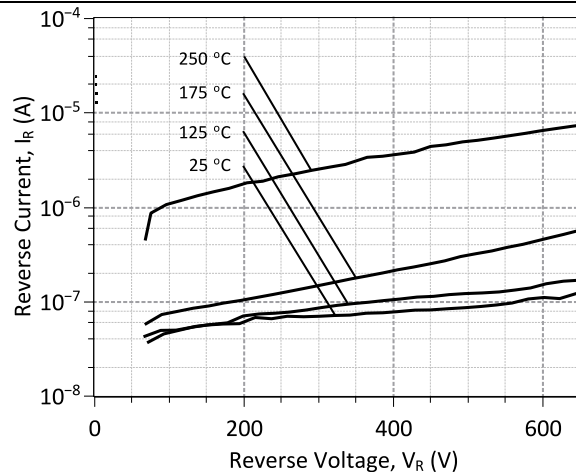
### Electrical Characteristics at $T_J = 250^\circ\text{C}$ , unless otherwise specified

| Parameter               | Symbol | Conditions                                                                                          | Values |            |          | Unit          |
|-------------------------|--------|-----------------------------------------------------------------------------------------------------|--------|------------|----------|---------------|
|                         |        |                                                                                                     | min.   | typ.       | max.     |               |
| Diode forward voltage   | $V_F$  | $I_F = 2.5\text{ A}$ , $T_J = 25^\circ\text{C}$<br>$I_F = 2.5\text{ A}$ , $T_J = 250^\circ\text{C}$ |        | 1.3<br>2.0 |          | V             |
| Reverse current         | $I_R$  | $V_R = 650\text{ V}$ , $T_J = 25^\circ\text{C}$<br>$V_R = 650\text{ V}$ , $T_J = 250^\circ\text{C}$ |        | 1<br>10    | 5<br>100 | $\mu\text{A}$ |
| Total capacitive charge | $Q_C$  | $I_F \leq I_{F,MAX}$<br>$dI_F/dt = 200\text{ A}/\mu\text{s}$<br>$T_J = 210^\circ\text{C}$           |        | 20         |          | nC            |
| Switching time          | $t_s$  | $V_R = 400\text{ V}$<br>$V_R = 400\text{ V}$                                                        |        | < 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         |          |               |

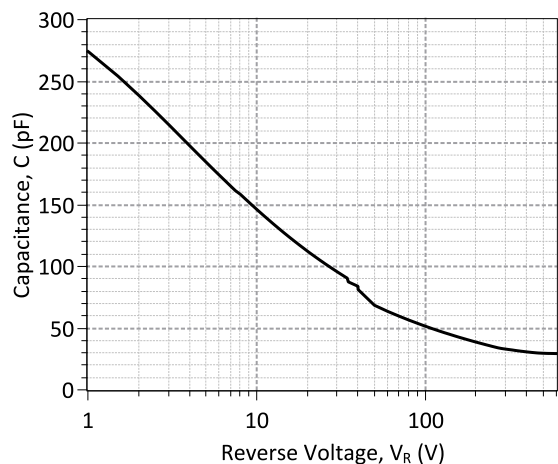
**Figures:**



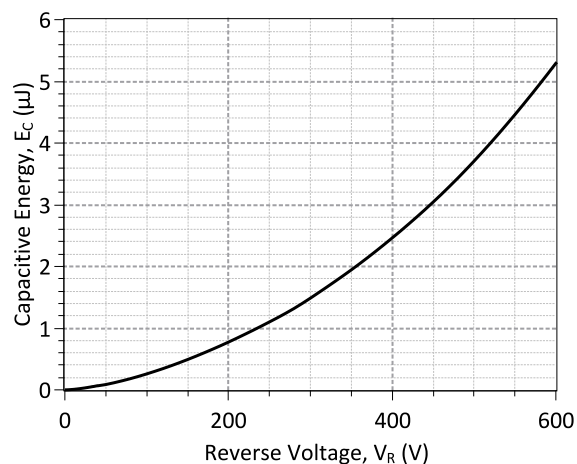
**Figure 1: Typical Forward Characteristics**



**Figure 2: Typical Reverse Characteristics**



**Figure 3: Typical Junction Capacitance vs Reverse Voltage Characteristics**

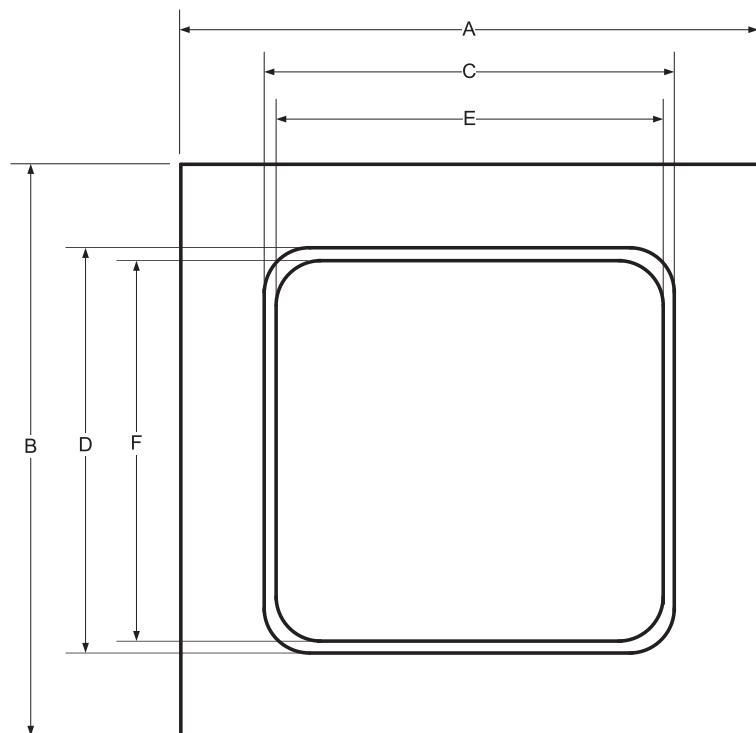


**Figure 4: Typical Capacitive Energy vs Reverse Voltage Characteristics**

## Mechanical Parameters

|                                 |                                                                                                |                 |
|---------------------------------|------------------------------------------------------------------------------------------------|-----------------|
| Die Dimensions                  | 1.6 x 1.6                                                                                      | mm <sup>2</sup> |
| Anode pad size                  | 1.34 x 1.34                                                                                    |                 |
| Die Area total / active         | 2.56/1.69                                                                                      |                 |
| Die Thickness                   | 360                                                                                            | μm              |
| Wafer Size                      | 100                                                                                            | mm              |
| Flat Position                   | 0                                                                                              | deg             |
| Die Frontside Passivation       | Polyimide                                                                                      |                 |
| Anode Pad Metallization         | 400 nm Ni + 200 nm Au                                                                          |                 |
| Backside Cathode Metallization  | 400 nm Ni + 200 nm Au                                                                          |                 |
| Die Attach                      | Electrically conductive glue or solder                                                         |                 |
| Wire Bond                       | Au ≤ 76 μm                                                                                     |                 |
| Reject ink dot size             | Φ ≥ 0.3 mm                                                                                     |                 |
| Recommended storage environment | Store in original container, in dry nitrogen,<br>< 6 months at an ambient temperature of 23 °C |                 |

## Chip Dimensions:



|               |        |      |
|---------------|--------|------|
| DIE           | A [mm] | 1.6  |
|               | B [mm] | 1.6  |
| METAL         | C [mm] | 1.34 |
|               | D [mm] | 1.34 |
| WIRE BONDABLE | E [mm] | 1.3  |
|               | F [mm] | 1.3  |

**Revision History**

| Date       | Revision | Comments                       | Supersedes |
|------------|----------|--------------------------------|------------|
| 2015/02/09 | 1        | Inserted Mechanical Parameters |            |
| 2012/04/03 | 0        | Initial release                |            |

## Published by

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## SPICE Model Parameters

This is a secure document. Please copy this code from the SPICE model PDF file on our website ([http://www.genesicsemi.com/images/hit\\_sic/baredie/schottky/GB05SHT06-CAU\\_SPICE.pdf](http://www.genesicsemi.com/images/hit_sic/baredie/schottky/GB05SHT06-CAU_SPICE.pdf)) into LTSPICE (version 4) software for simulation of the GB05SHT06-CAU.

```
*      MODEL OF GeneSiC Semiconductor Inc.
*
*      $Revision:   1.0           $
*      $Date:      05-SEP-2013    $
*
*      GeneSiC Semiconductor Inc.
*      43670 Trade Center Place Ste. 155
*      Dulles, VA 20166
*
*      COPYRIGHT (C) 2013 GeneSiC Semiconductor Inc.
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*      These models are provided "AS IS, WHERE IS, AND WITH NO WARRANTY
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*      Models accurate up to 2 times rated drain current.
*
*      Start of GB05SHT06-CAU SPICE Model
*
.SUBCKT GB05SHT06 ANODE KATHODE
D1 ANODE KATHODE GB05SHT06_25C; Call the Schottky Diode Model
D2 ANODE KATHODE GB05SHT06_PIN; Call the PiN Diode Model
.MODEL GB05SHT06_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 GB05SHT06_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 GB05SHT06-CAU SPICE Model
```

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