

## Silicon Carbide Power Schottky Diode

|                                  |   |        |
|----------------------------------|---|--------|
| $V_{RRM}$                        | = | 3300 V |
| $I_F @ 25\text{ }^\circ\text{C}$ | = | 0.3 A  |
| $Q_C$                            | = | 20 nC  |

### Features

- 3300 V Schottky rectifier
- 210 °C maximum operating temperature
- Positive temperature coefficient of  $V_F$
- Fast switching speeds
- Superior figure of merit  $Q_C/I_F$



Die Size = 1.39 mm x 1.39 mm

### Advantages

- Improved circuit efficiency (Lower overall cost)
- Significantly reduced switching losses compare to Si PiN diodes
- Ease of paralleling devices without thermal runaway
- Smaller heat sink requirements
- Low reverse recovery current
- Low device capacitance

### Applications

- Down Hole Oil Drilling, Geothermal Instrumentation
- High Voltage Multipliers
- Military Power Supplies

### Maximum Ratings at $T_j = 175\text{ }^\circ\text{C}$ , unless otherwise specified

| Parameter  | Symbol         | Conditions   | Values |            |      | Unit             |
|--|----------------|--|--------|------------|------|------------------|
|  |                |  | min.   | typ.       | max. |                  |
| Repetitive peak reverse voltage                      | $V_{RRM}$      |  |        | 3300       |      | V                |
| Continuous forward current                           | $I_F$          | $T_C \leq 125\text{ }^\circ\text{C}$ , $R_{thJC} = 1.69$         |        | 0.3        |      | A                |
| RMS forward current                                  | $I_{F(RMS)}$   | $T_C \leq 125\text{ }^\circ\text{C}$ , $R_{thJC} = 1.69$         |        | 0.35       |      | A                |
| Surge non-repetitive forward current, Half Sine Wave | $I_{F,SM}$     | $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 10\text{ ms}$          |        | 2          |      | A                |
|  |                | $T_C = 125\text{ }^\circ\text{C}$ , $t_p = 10\text{ ms}$         |        | 1          |      | A                |
| Non-repetitive peak forward current                  | $I_{F,max}$    | $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ |        | 10         |      | A                |
| $I^2t$ value   | $\int i^2 dt$  | $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 10\text{ ms}$          |        | 0.1        |      | A <sup>2</sup> S |
| Power dissipation                                    | $P_{tot}$      | $T_C = 25\text{ }^\circ\text{C}$ , $R_{thJC} = 1.69$             |        | 89         |      | W                |
| Operating and storage temperature                    | $T_j, T_{stg}$ |  |        | -55 to 210 |      | °C               |

### Electrical Characteristics at $T_j = 175\text{ }^\circ\text{C}$ , unless otherwise specified

| Parameter               | Symbol | Conditions   | Values                |      |      | Unit          |
|-------------------------|--------|--|-----------------------|------|------|---------------|
|                         |        |  | min.                  | typ. | max. |               |
| Diode forward voltage   | $V_F$  | $I_F = 0.3\text{ A}$ , $T_j = 25\text{ }^\circ\text{C}$  |                       | 1.7  | 2.2  | V             |
|                         |        | $I_F = 0.3\text{ A}$ , $T_j = 175\text{ }^\circ\text{C}$   |                       | 4.0  | 5.0  |               |
| Reverse current         | $I_R$  | $V_R = 3300\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$   |                       | 1    | 10   | $\mu\text{A}$ |
|                         |        | $V_R = 3300\text{ V}$ , $T_j = 175\text{ }^\circ\text{C}$  |                       | 10   | 100  |               |
| Total capacitive charge | $Q_C$  | $I_F \leq I_{F,MAX}$<br>$di_F/dt = 35\text{ A}/\mu\text{s}$<br>$T_j = 175\text{ }^\circ\text{C}$ | $V_R = 1500\text{ V}$ | 20   |      | nC            |
| Switching time          | $t_s$  |  | $V_R = 1500\text{ V}$ | < 60 |      | ns            |
| Total capacitance       | C      | $V_R = 1\text{ V}$ , $f = 1\text{ MHz}$ , $T_j = 25\text{ }^\circ\text{C}$                       |                       | 42   |      | pF            |
|                         |        | $V_R = 400\text{ V}$ , $f = 1\text{ MHz}$ , $T_j = 25\text{ }^\circ\text{C}$                     |                       | 8    |      |               |
|                         |        | $V_R = 1000\text{ V}$ , $f = 1\text{ MHz}$ , $T_j = 25\text{ }^\circ\text{C}$                    |                       | 7    |      |               |

Figures:

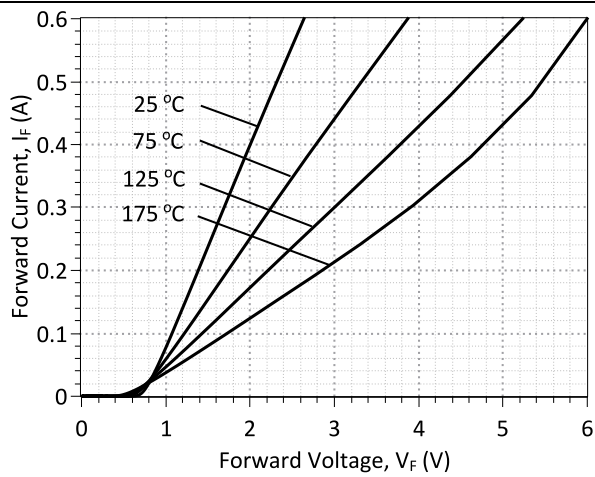


Figure 1: Typical Forward Characteristics

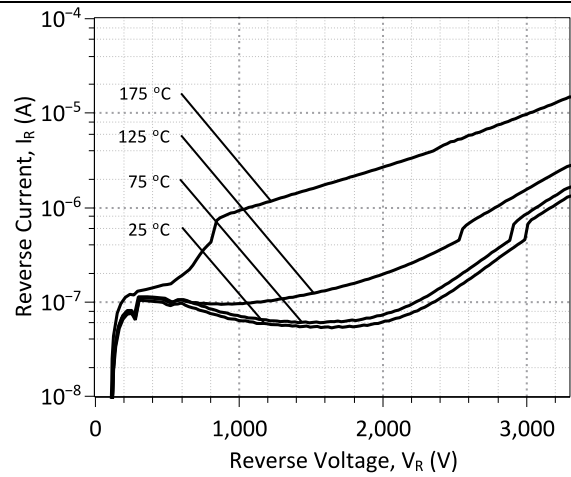


Figure 2: Typical Reverse Characteristics

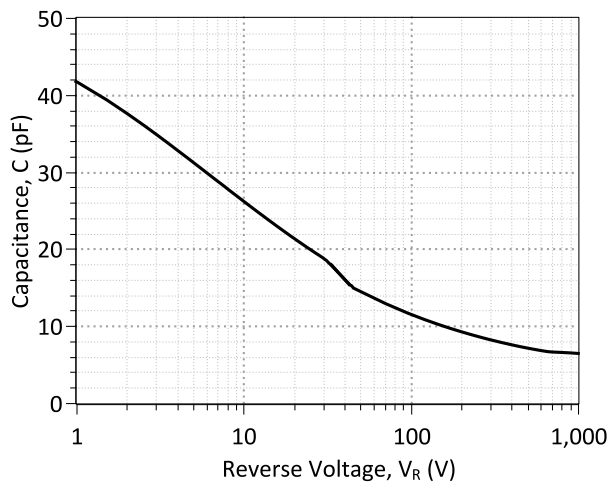


Figure 3: Typical Junction Capacitance vs Reverse Voltage Characteristics

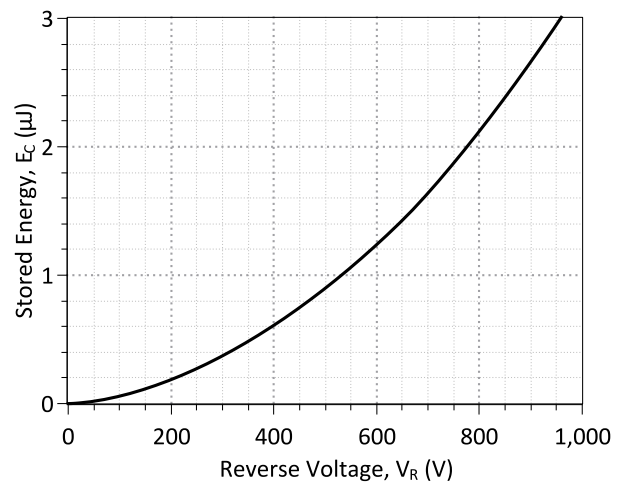
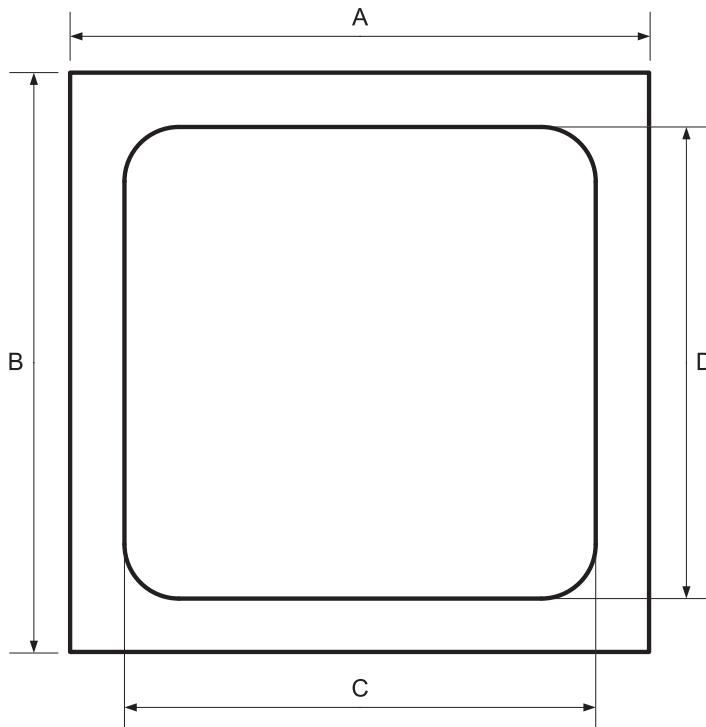


Figure 4: Typical Capacitive Energy vs Reverse Voltage Characteristics

**Mechanical Parameters**

|                                 |  |                 |
|---------------------------------|--|-----------------|
| Die Dimensions                  | 1.39 x 1.39  | mm <sup>2</sup> |
| Anode pad size                  | 0.75 x 0.75  |                 |
| Die Area total / active         | 1.93/0.56  |                 |
| Die Thickness                   | 360  | μm              |
| Wafer Size                      | 100  | mm              |
| Flat Position                   | 0  | deg             |
| Die Frontside Passivation       | Polyimide  |                 |
| Anode Pad Metallization         | 4000 nm Al   |                 |
| Backside Cathode Metallization  | 400 nm Ni + 200 nm Au  |                 |
| Die Attach                      | Electrically conductive glue or solder   |                 |
| Wire Bond                       | Al ≤ 130 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:**



|              |        |      |
|--------------|--------|------|
| <b>DIE</b>   | A [mm] | 1.39 |
|              | B [mm] | 1.39 |
| <b>METAL</b> | C [mm] | 0.75 |
|              | D [mm] | 0.75 |

**Revision History**

| Date       | Revision | Comments                           | Supersedes |
|------------|----------|------------------------------------|------------|
| 2015/0212  | 2        | Inserted Mechanical Parameters     |            |
| 2014/12/19 | 1        | Updated Electrical Characteristics |            |
| 2013/09/09 | 0        | Initial Release                    |            |

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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/GAP3SHT33-CAL\\_SPICE.pdf](http://www.genesicsemi.com/images/hit_sic/baredie/schottky/GAP3SHT33-CAL_SPICE.pdf)) into LTSPICE (version 4) software for simulation of the GAP3SHT33-CAL.

```
*      MODEL OF GeneSiC Semiconductor Inc.
*
*      $Revision: 1.0          $
*      $Date: 04-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
* 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 GAP3SHT33-CAL SPICE Model
*
.SUBCKT GAP3SHT33 ANODE KATHODE
R1 ANODE INT R=((TEMP-24)*0.0535); Temperature Dependant Resistor
D1 INT KATHODE GAP3SHT33_25C; Call the 25C Diode Model
D2 ANODE KATHODE GAP3SHT33_PIN; Call the PiN Diode Model
.MODEL GAP3SHT33_25C D
+ IS      1.39E-14      RS      2.88
+ N      1.0120127     IKF     36.05007504
+ EG     1.2           XTI     -3
+ CJO    6.01E-11     VJ     0.924257443
+ M      0.3084545     FC     0.5
+ TT     1.00E-10     BV     3300
+ IBV    1.00E-03     VPK    3300
+ IAVE   3.00E-01     TYPE   SiC_Schottky
+ MFG    GeneSiC_Semiconductor
.MODEL GAP3SHT33_PIN D
+ IS      178.99E-18   RS      15
+ N      5             EG     3.23
+ XTI    50           FC     0.5
+ TT     0            BV     3300
+ IBV    1.00E-03     VPK    3300
+ IAVE   3.00E-01     TYPE   SiC_PiN
.ENDS
* End of GAP3SHT33-CAL SPICE Model
```