

# GC50MPS33-CAL

## 3300V 50A SiC Schottky MPS™ Diode



### Silicon Carbide Schottky Diode

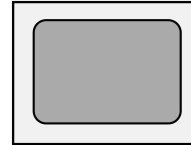
For physical chip dimensions please contact [engineering@diedevices.com](mailto:engineering@diedevices.com)

|                                 |   |        |
|---------------------------------|---|--------|
| $V_{RRM}$                       | = | 3300 V |
| $I_F (T_C = 120^\circ\text{C})$ | = | 50 A   |
| $Q_C$                           | = | 474 nC |

#### Features

- Enhanced Surge and Avalanche Robustness
- Low  $V_F$  for High Temperature Operation
- Superior Figure of Merit  $Q_C/I_F$
- Low Thermal Resistance
- Low Reverse Leakage Current
- Temperature Independent Fast Switching
- Positive Temperature Coefficient of  $V_F$
- High  $dV/dt$  Ruggedness

#### Bare Chip



#### Advantages

- High System Reliability
- Optimal Price Performance
- Improved System Efficiency
- Reduced Cooling Requirements
- Increased System Power Density
- Zero Reverse Recovery Current
- Easy to Parallel without Thermal Runaway
- Enables Extremely Fast Switching

#### Applications

- Medical Imaging
- High Voltage Sensing
- Oil Drilling
- Geothermal Instrumentation
- High Voltage Multipliers
- High Frequency Rectifiers
- High Voltage Switching
- Pulsed Power

#### Absolute Maximum Ratings (At $T_C = 25^\circ\text{C}$ Unless Otherwise Stated)

| Parameter   | Symbol         | Conditions                                     | Values     | Unit                 | Note |
|---|----------------|--|------------|----------------------|------|
| Repetitive Peak Reverse Voltage                           | $V_{RRM}$      |  | 3300       | V                    |      |
| Continuous Forward Current                                | $I_F$          | $T_C = 100^\circ\text{C}, D = 1$               | 59         | A                    |      |
|   |                | $T_C = 135^\circ\text{C}, D = 1$               | 42         |                      |      |
|   |                | $T_C = 120^\circ\text{C}, D = 1$               | 50         |                      |      |
| Non-Repetitive Peak Forward Surge Current, Half Sine Wave | $I_{F,SM}$     | $T_C = 25^\circ\text{C}, t_P = 10 \text{ ms}$  | 500        | A                    |      |
|   |                | $T_C = 150^\circ\text{C}, t_P = 10 \text{ ms}$ | 400        |                      |      |
| Repetitive Peak Forward Surge Current, Half Sine Wave     | $I_{F,RM}$     | $T_C = 25^\circ\text{C}, t_P = 10 \text{ ms}$  | 300        | A                    |      |
|   |                | $T_C = 150^\circ\text{C}, t_P = 10 \text{ ms}$ | 210        |                      |      |
| Non-Repetitive Peak Forward Surge Current                 | $I_{F,MAX}$    | $T_C = 25^\circ\text{C}, t_P = 10 \mu\text{s}$ | 2500       | A                    |      |
| $i^2t$ Value  | $\int i^2 dt$  | $T_C = 25^\circ\text{C}, t_P = 10 \text{ ms}$  | 1250       | $\text{A}^2\text{s}$ |      |
| Diode Ruggedness  | $dV/dt$        | $V_R = 0 \sim 2640 \text{ V}$                  | 200        | $\text{V/ns}$        |      |
| Power Dissipation   | $P_{TOT}$      | $T_C = 25^\circ\text{C}$                       | 606        | W                    |      |
| Operating and Storage Temperature                         | $T_j, T_{stg}$ |  | -55 to 175 | $^\circ\text{C}$     |      |

Note 1: Assumes Thermal Resistance, Junction - Case ( $R_{thJC}$ ) of  $0.25^\circ\text{C/W}$



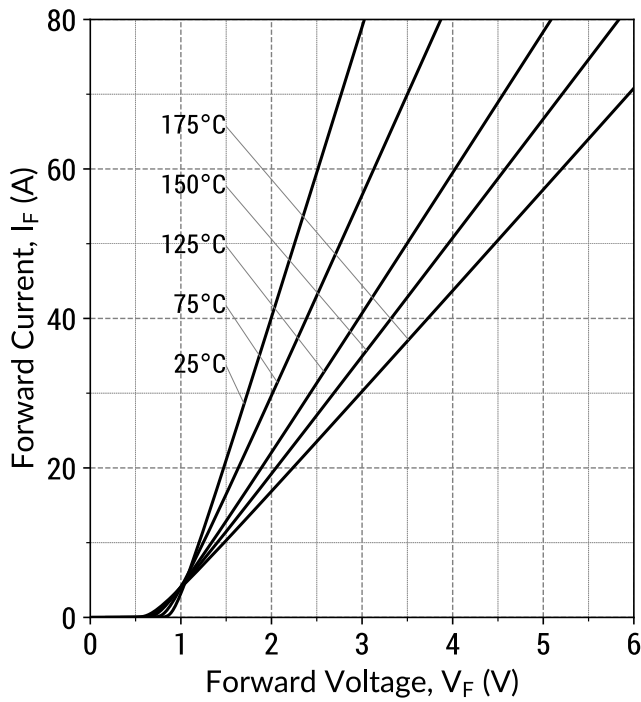
### Electrical Characteristics

| Parameter               | Symbol | Conditions   | Values                |      |      | Unit          | Note   |
|-------------------------|--------|--|-----------------------|------|------|---------------|--------|
|                         |        |  | Min.                  | Typ. | Max. |               |        |
| Diode Forward Voltage   | $V_F$  | $I_F = 40\text{ A}, T_j = 25^\circ\text{C}$                  |                       | 1.95 |      | V             | Fig. 1 |
|                         |        | $I_F = 40\text{ A}, T_j = 175^\circ\text{C}$                 |                       | 3.7  |      |               |        |
| Reverse Current         | $I_R$  | $V_R = 3300\text{ V}, T_j = 25^\circ\text{C}$                |                       | 10   | 100  | $\mu\text{A}$ |        |
|                         |        | $V_R = 3300\text{ V}, T_j = 175^\circ\text{C}$               |                       | 200  |      |               |        |
| Total Capacitive Charge | $Q_C$  | $I_F \leq I_{F,MAX}$<br>$di_F/dt = 200\text{ A}/\mu\text{s}$ | $V_R = 1500\text{ V}$ | 399  |      | nC            | Fig. 3 |
|                         |        |  | $V_R = 2000\text{ V}$ | 474  |      |               |        |
| Switching Time          | $t_s$  |  | $V_R = 1500\text{ V}$ | < 10 |      | ns            |        |
| Total Capacitance       | C      | $V_R = 1\text{ V}, f = 1\text{ MHz}$                         |                       | 3480 |      | pF            | Fig. 2 |
|                         |        | $V_R = 2000\text{ V}, f = 1\text{ MHz}$                      |                       | 149  |      |               |        |

### Mechanical Parameters

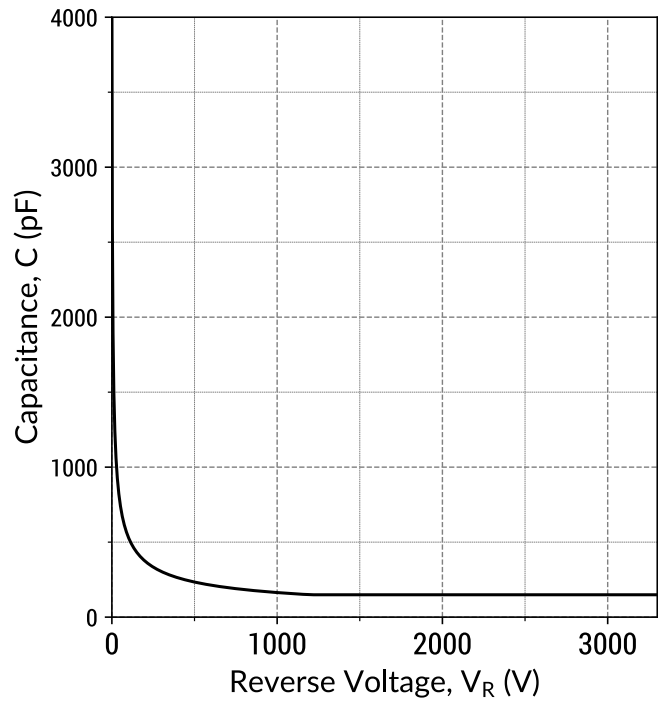
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Figure 1: Typical Forward Characteristics



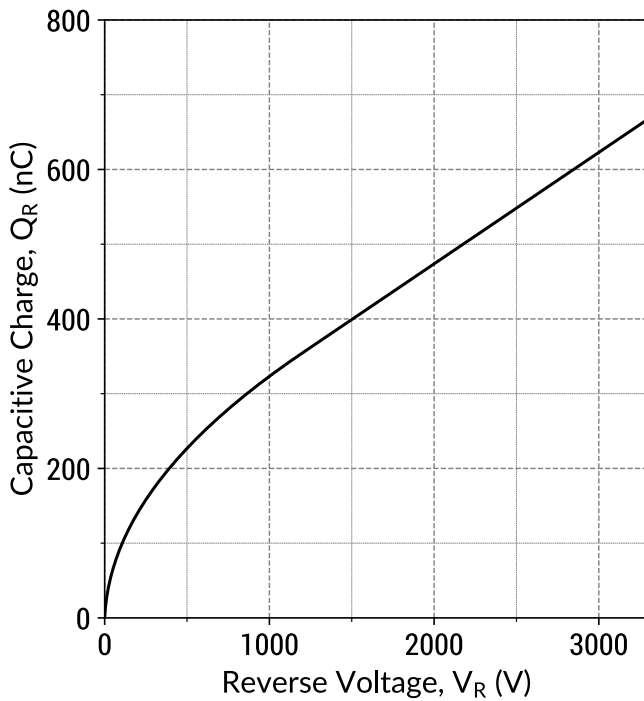
$I_F = f(V_F, T_j); t_P = 250 \mu s$

Figure 2: Typical Junction Capacitance vs Reverse Voltage Characteristics



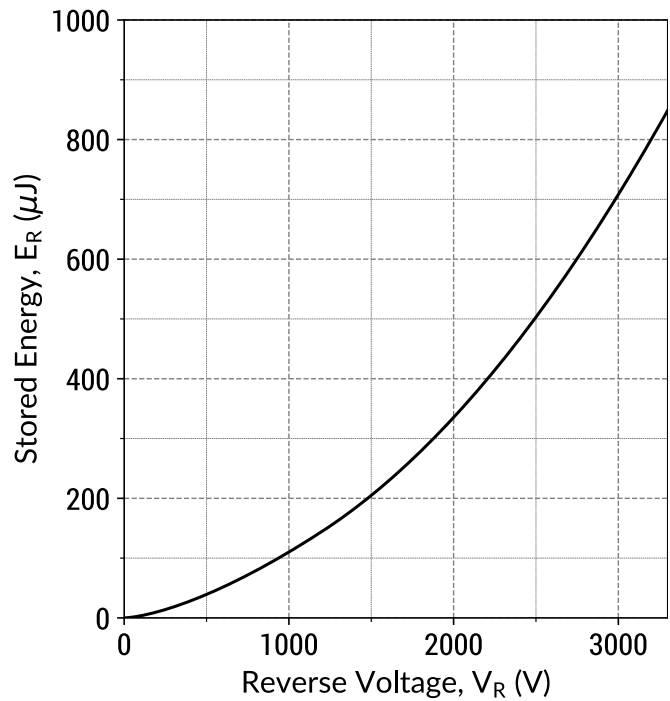
$C = f(V_R); f = 1 \text{ MHz}$

Figure 3: Typical Capacitive Charge vs Reverse Voltage Characteristics



$Q_C = f(V_R); f = 1 \text{ MHz}$

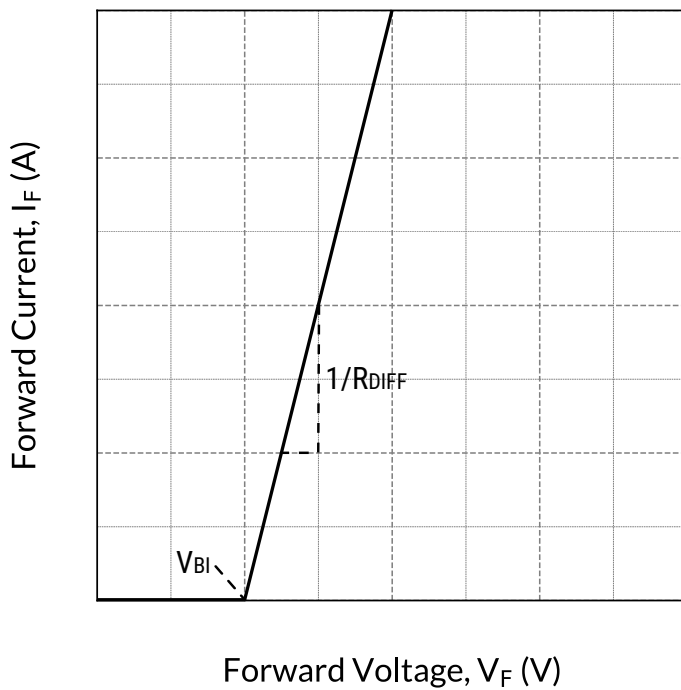
Figure 4: Typical Capacitive Energy vs Reverse Voltage Characteristics



$E_C = f(V_R); f = 1 \text{ MHz}$



Figure 5: Forward Curve Model



$$I_F = f(V_F, T_j)$$

**Forward Curve Model Equation:**

$$I_F = (V_F - V_{BI})/R_{DIFF} \text{ (A)}$$

**Built-In Voltage ( $V_{BI}$ ):**

$$V_{BI}(T_j) = m \times T_j + n \text{ (V)}$$

$$m = -0.00128 \text{ (V/}^\circ\text{C)}$$

$$n = 1.0 \text{ (V)}$$

**Differential Resistance ( $R_{DIFF}$ ):**

$$R_{DIFF}(T_j) = a \times T_j^2 + b \times T_j + c \text{ (}\Omega\text{)}$$

$$a = 9.35e-07 \text{ (}\Omega\text{/}^\circ\text{C}^2\text{)}$$

$$b = 0.000133 \text{ (}\Omega\text{/}^\circ\text{C)}$$

$$c = 0.0218 \text{ (}\Omega\text{)}$$

**Forward Power Loss Equation:**

$$P_{LOSS} = V_{BI}(T_j) \times I_{AVG} + R_{DIFF}(T_j) \times I_{RMS}^2$$

### Chip Dimensions

This information is **confidential**, please contact [sales@genesicsemi.com](mailto:sales@genesicsemi.com) to learn more.

#### NOTE

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

## Compliance

### RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS 2), as adopted by EU member states on January 2, 2013 and amended on March 31, 2015 by EU Directive 2015/863. RoHS Declarations for this product can be obtained from your GeneSiC representative.

### REACH Compliance

REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a GeneSiC representative to insure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

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## Related Links

- SPICE Models: [https://www.genesicsemi.com/sic-schottky-mps/GC50MPS33-CAL/GC50MPS33-CAL\\_SPICE.zip](https://www.genesicsemi.com/sic-schottky-mps/GC50MPS33-CAL/GC50MPS33-CAL_SPICE.zip)
- PLECS Models: [https://www.genesicsemi.com/sic-schottky-mps/GC50MPS33-CAL/GC50MPS33-CAL\\_PLECS.zip](https://www.genesicsemi.com/sic-schottky-mps/GC50MPS33-CAL/GC50MPS33-CAL_PLECS.zip)
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- Quality Manual: <https://www.genesicsemi.com/quality>

## Revision History

| Date     | Revision | Comments | Supersedes |
|----------|----------|----------|------------|
| 2020/Sep | Rev 2    |          | Rev 1      |
| 2020/Jul | Rev 1    |          |            |



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