

# GC20MPS12-220

1200V 20A SiC Schottky MPS™ Diode



## Silicon Carbide Schottky Diode

|                                 |   |        |
|---------------------------------|---|--------|
| $V_{RRM}$                       | = | 1200 V |
| $I_F (T_C = 135^\circ\text{C})$ | = | 27 A   |
| $Q_C$                           | = | 47 nC  |

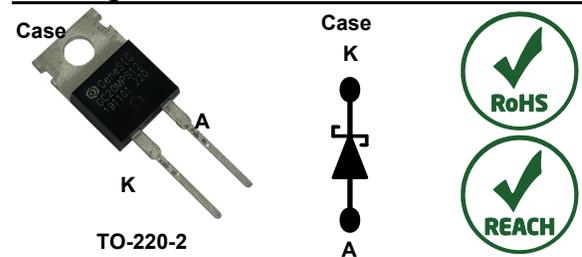
### Features

- High Avalanche (UIS) Capability
- Enhanced Surge Current Capability
- Superior Figure of Merit  $Q_C/I_F$
- Low Thermal Resistance
- 175 °C Maximum Operating Temperature
- Temperature Independent Switching Behavior
- Positive Temperature Coefficient of  $V_F$
- Extremely Fast Switching Speeds

### Advantages

- Low Standby Power Losses
- Improved Circuit Efficiency (Lower Overall Cost)
- Low Switching Losses
- Ease of Paralleling without Thermal Runaway
- Smaller Heat Sink Requirements
- Low Reverse Recovery Current
- Low Device Capacitance
- Low Reverse Leakage Current

### Package



### Applications

- Boost Diode in Power Factor Correction (PFC)
- Switched Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Motor Drives
- Freewheeling / Anti-parallel Diode in Inverters
- Solar Inverters & Wind Energy Converters
- Electric Vehicles (EV) & DC Fast Charging
- Induction Heating & Welding

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

| Parameter   | Symbol         | Conditions  | Values     | Unit                 |
|---|----------------|---|------------|----------------------|
| Repetitive Peak Reverse Voltage                           | $V_{RRM}$      |   | 1200       | V                    |
| Continuous Forward Current                                | $I_F$          | $T_C = 25^\circ\text{C}, D = 1$                       | 58         | A                    |
|   |                | $T_C = 135^\circ\text{C}, D = 1$                      | 27         |                      |
| Non-Repetitive Peak Forward Surge Current, Half Sine Wave | $I_{F,SM}$     | $T_C = 25^\circ\text{C}, t_P = 10\text{ ms}$          | 160        | A                    |
|   |                | $T_C = 150^\circ\text{C}, t_P = 10\text{ ms}$         | 128        |                      |
| Repetitive Peak Forward Surge Current, Half Sine Wave     | $I_{F,RM}$     | $T_C = 25^\circ\text{C}, t_P = 10\text{ ms}$          | 96         | A                    |
|   |                | $T_C = 150^\circ\text{C}, t_P = 10\text{ ms}$         | 68         |                      |
| Non-Repetitive Peak Forward Surge Current                 | $I_{F,max}$    | $T_C = 25^\circ\text{C}, t_P = 10\text{ }\mu\text{s}$ | 800        | A                    |
| $i^2t$ Value  | $\int i^2 dt$  | $T_C = 25^\circ\text{C}, t_P = 10\text{ ms}$          | 128        | $\text{A}^2\text{s}$ |
| Non-Repetitive Avalanche Energy                           | $E_{AS}$       | $L = 1.3\text{ mH}, I_{AS} = 20\text{ A}$             | 245        | mJ                   |
| Diode Ruggedness  | $dV/dt$        | $V_R = 0 \sim 960\text{ V}$                           | 200        | V/ns                 |
| Power Dissipation   | $P_{tot}$      | $T_C = 25^\circ\text{C}$                              | 242        | W                    |
| Operating and Storage Temperature                         | $T_j, T_{stg}$ |   | -55 to 175 | $^\circ\text{C}$     |

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## Electrical Characteristics

| Parameter               | Symbol | Conditions   | Values |      |      | Unit          |
|-------------------------|--------|--|--------|------|------|---------------|
|                         |        |  | Min.   | Typ. | Max. |               |
| Diode Forward Voltage   | $V_F$  | $I_F = 20 \text{ A}, T_j = 25 \text{ }^\circ\text{C}$  |        | 1.5  | 1.8  | V             |
|                         |        | $I_F = 20 \text{ A}, T_j = 175 \text{ }^\circ\text{C}$   |        | 2    | 2.4  |               |
| Reverse Current         | $I_R$  | $V_R = 1200 \text{ V}, T_j = 25 \text{ }^\circ\text{C}$  |        | 3    | 15   | $\mu\text{A}$ |
|                         |        | $V_R = 1200 \text{ V}, T_j = 175 \text{ }^\circ\text{C}$   |        | 30   | 150  |               |
| Total Capacitive Charge | $Q_C$  | $V_R = 400 \text{ V}$  |        | 34   |      | nC            |
|                         |        | $I_F \leq I_{F,MAX}$<br>$dI_F/dt = 200 \text{ A}/\mu\text{s}$<br>$T_j = 175 \text{ }^\circ\text{C}$<br>$V_R = 800 \text{ V}$ |        | 47   |      |               |
| Switching Time          | $t_s$  | $V_R = 400 \text{ V}$  |        | < 10 |      | ns            |
|                         |        | $V_R = 800 \text{ V}$  |        |      |      |               |
| Total Capacitance       | C      | $V_R = 1 \text{ V}, f = 1 \text{ MHz}$   |        | 1080 |      | pF            |
|                         |        | $V_R = 800 \text{ V}, f = 1 \text{ MHz}$   |        | 70   |      |               |

## Thermal / Mechanical Characteristics

|                                     |            |          |      |                           |
|-------------------------------------|------------|----------|------|---------------------------|
| Thermal Resistance, Junction - Case | $R_{thJC}$ |          | 0.62 | $^\circ\text{C}/\text{W}$ |
| Weight                              | $W_T$      |          | 2    | g                         |
| Mounting Torque                     | $T_M$      | M3 Screw | 0.8  | Nm                        |

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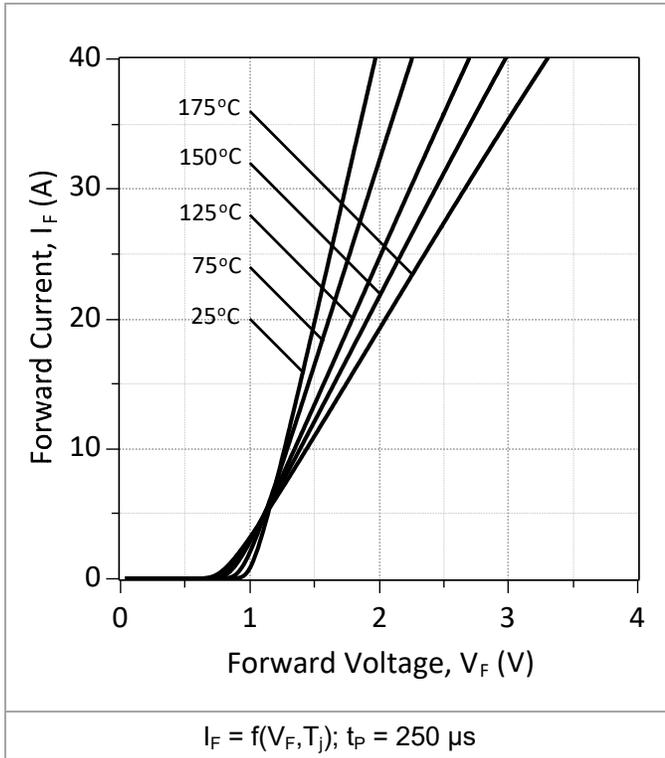


Figure 1: Typical Forward Characteristics

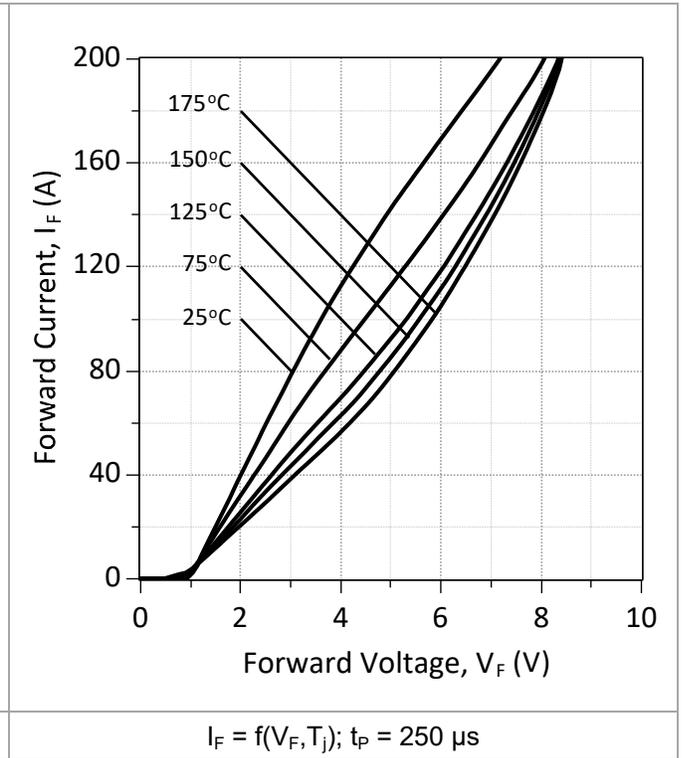


Figure 2: Typical High Current Forward Characteristics

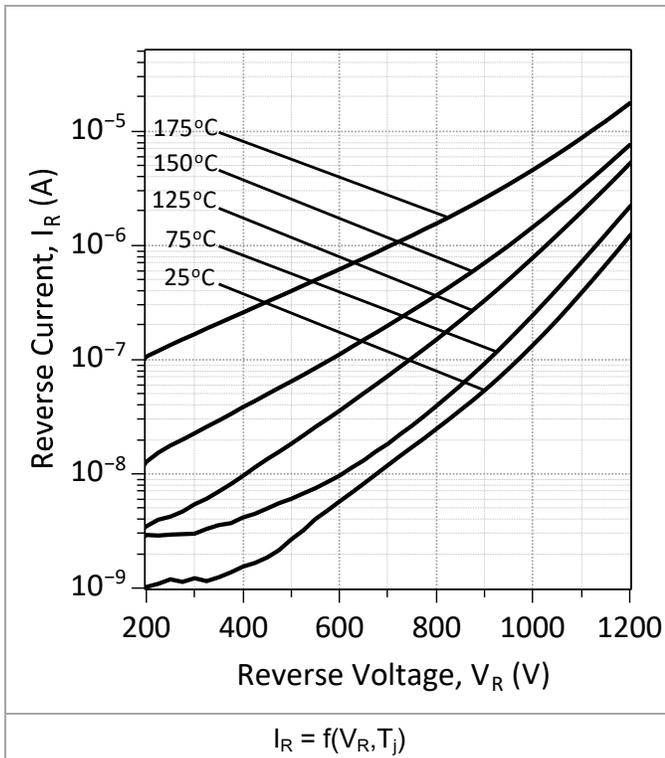


Figure 3: Typical Reverse Characteristics

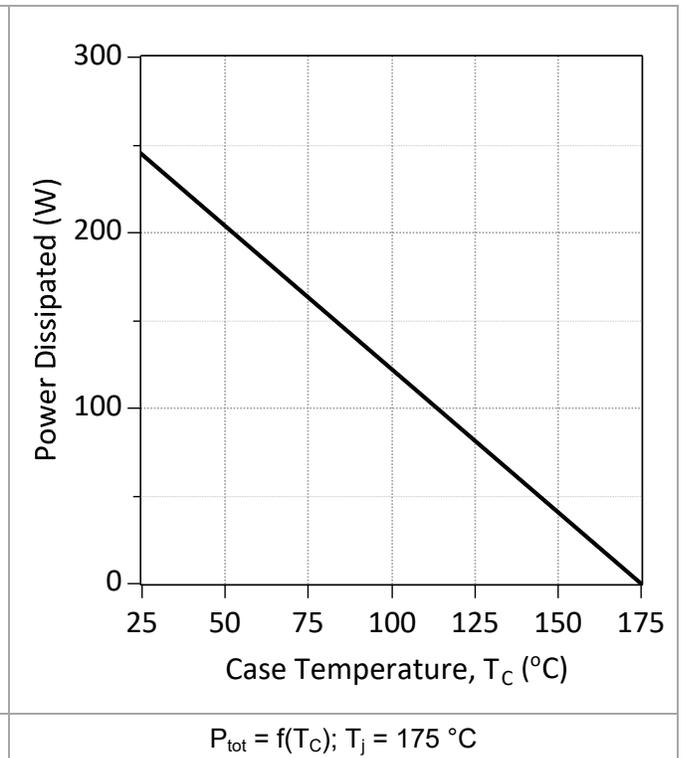


Figure 4: Power Derating Curve

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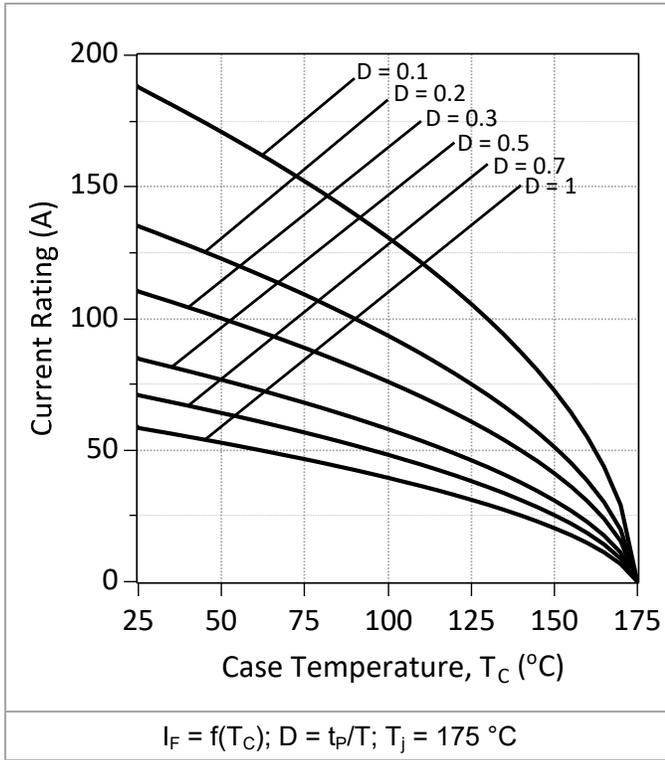


Figure 5: Current Derating Curves

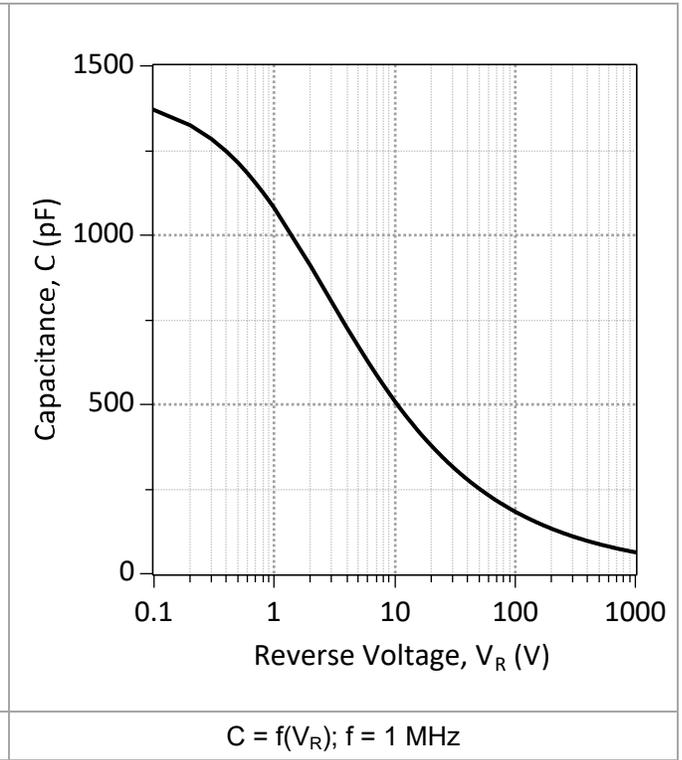


Figure 6: Typical Junction Capacitance vs Reverse Voltage Characteristics

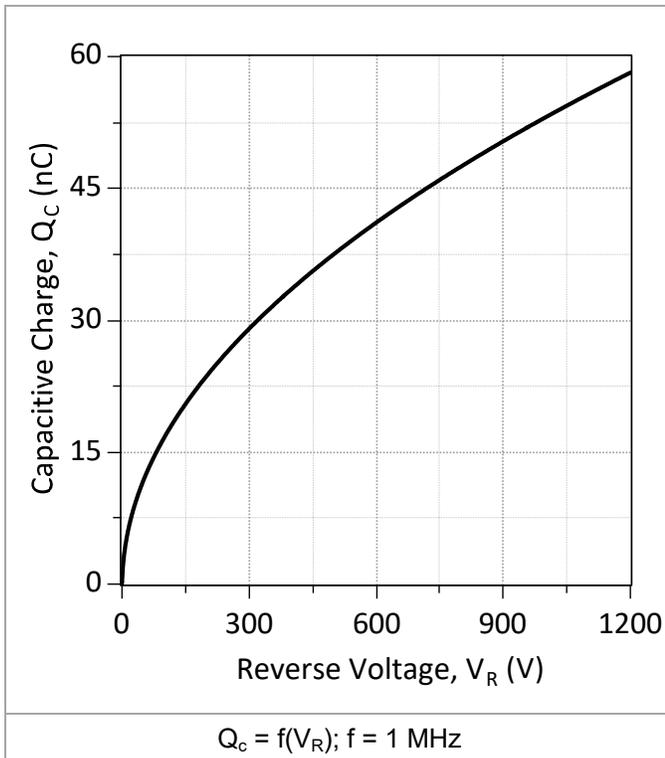


Figure 7: Typical Capacitive Charge vs Reverse Voltage Characteristics

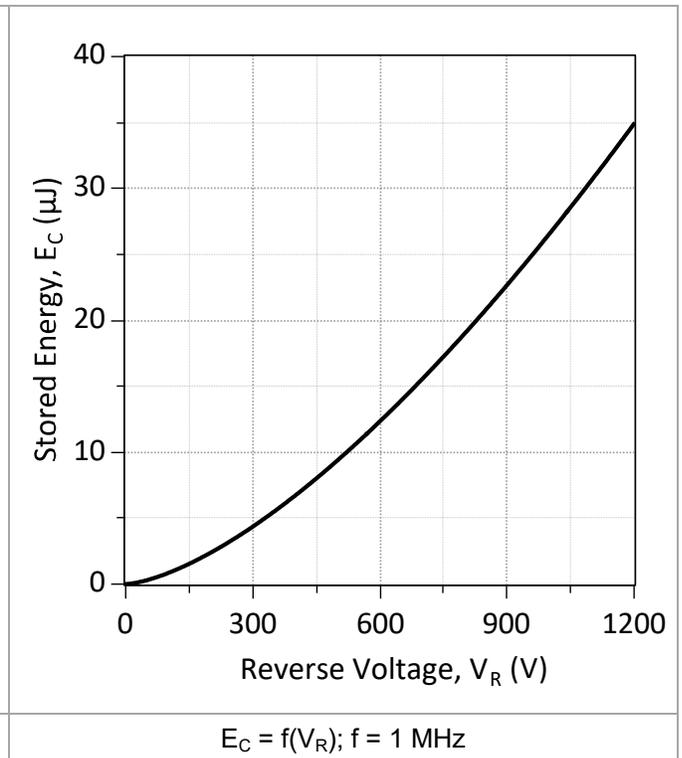


Figure 8: Typical Capacitive Energy vs Reverse Voltage Characteristics

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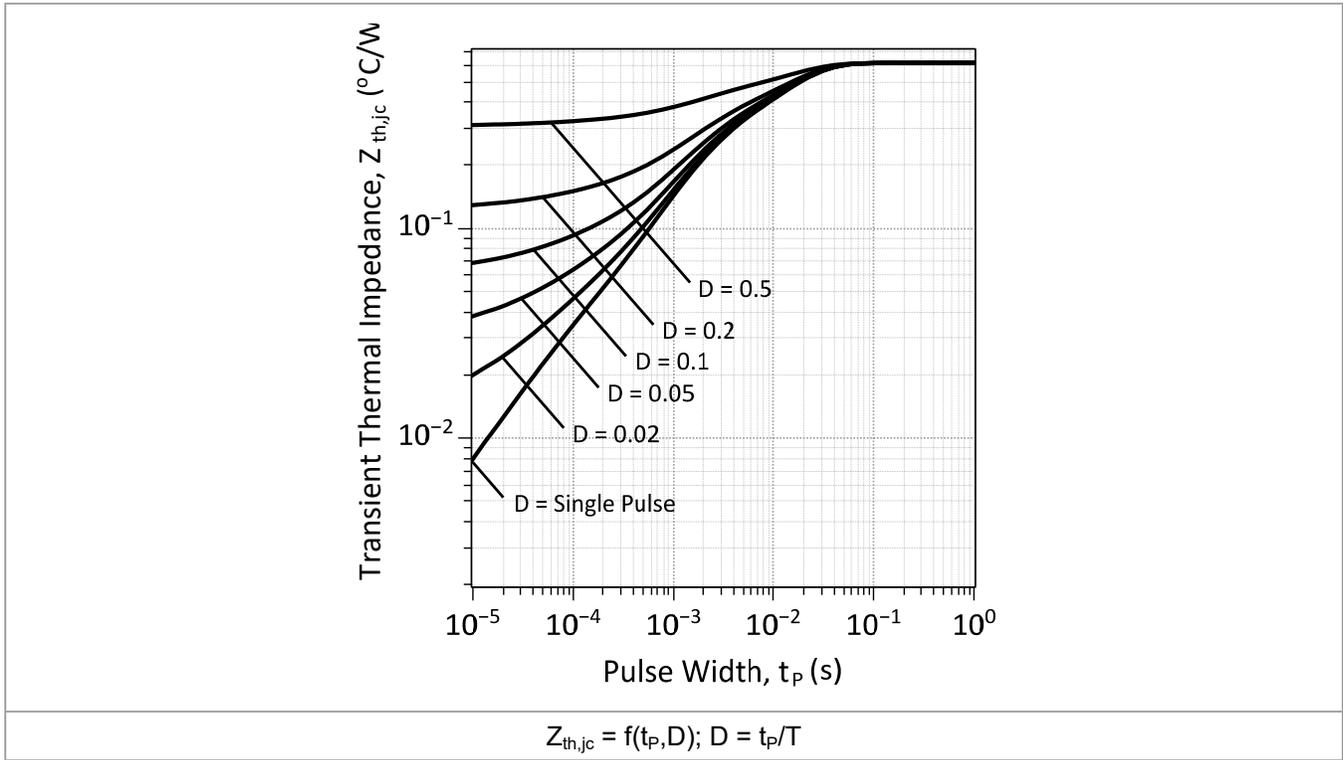


Figure 9: Transient Thermal Impedance

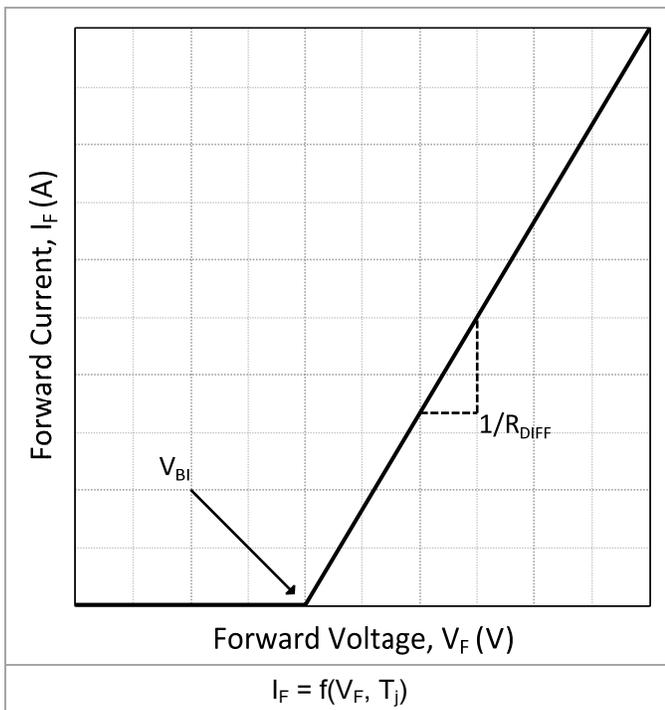


Figure 10: Forward Curve Model

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

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

$$V_{Bi}(T_j) = m \cdot T_j + n \text{ (V)},$$

$$m = -1.48e-03, n = 1.08$$

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

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

$$a = 7.45e-07, b = 8.84e-05, c = 0.0192$$

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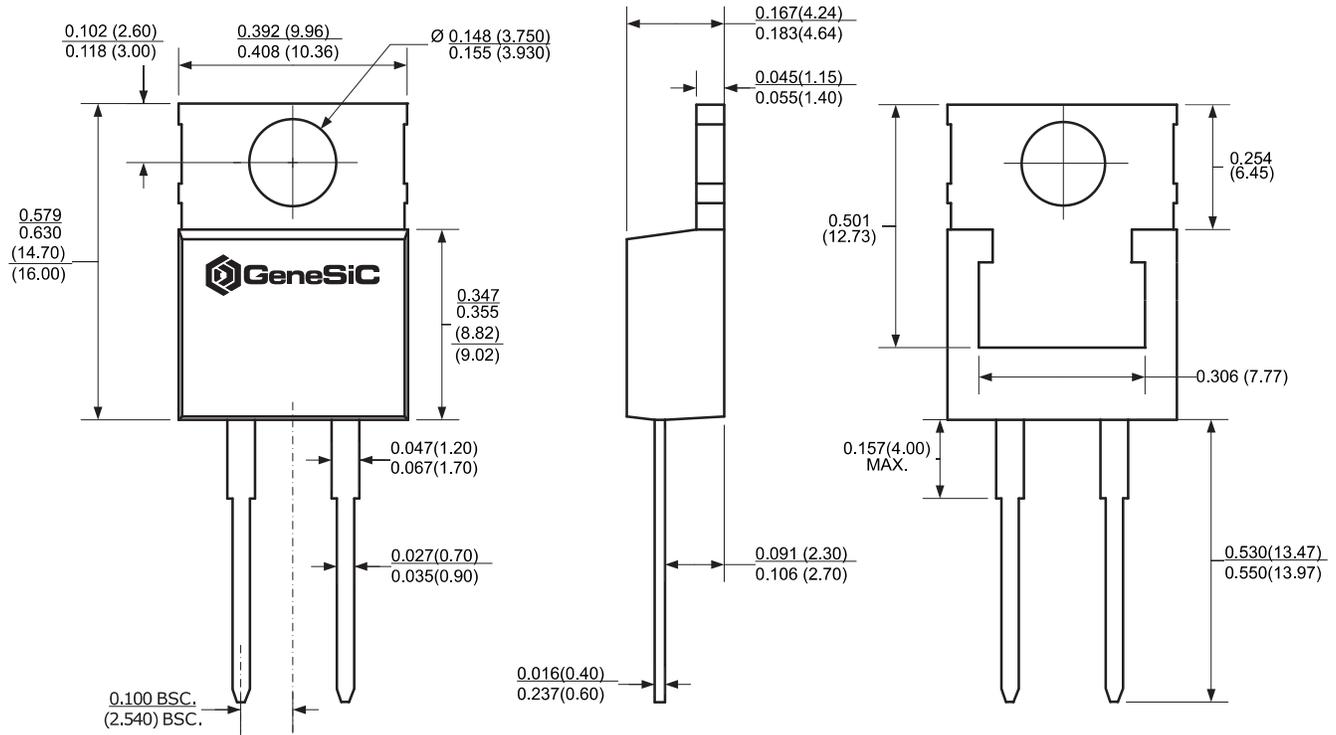
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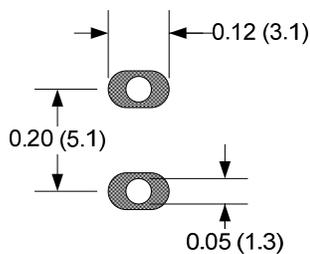
## Package Dimensions

### TO-220-2

### Package Outline



### Recommended Solder Pad Layout



### NOTE

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

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### 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.

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### Related Links

- SPICE Models: <https://www.genesicsemi.com/schottky-mps>
- Evaluation Boards: <https://www.genesicsemi.com/technical-support>
- Quality Manual: <https://www.genesicsemi.com/technical-support/quality-manual>
- Compliance: <https://www.genesicsemi.com/technical-support/compliance>
- Reliability Report: <https://www.genesicsemi.com/technical-support/reliability>

[www.genesicsemi.com/schottky-mps](https://www.genesicsemi.com/schottky-mps)



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