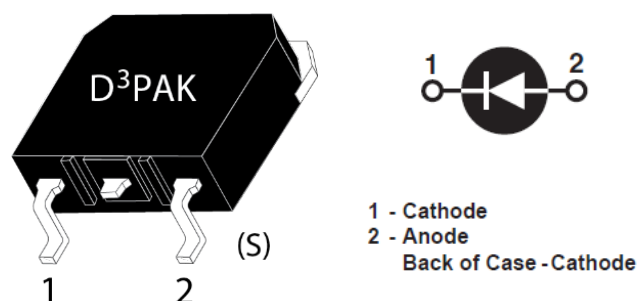


# MSC050SDA070S Zero Recovery Silicon Carbide Schottky Diode

## 1 Product Overview

The silicon carbide (SiC) power Schottky barrier diode (SBD) product line from Microsemi increases your performance over silicon diode solutions while lowering your total cost of ownership for high-voltage applications. The MSC050SDA070S is a 700 V, 50 A SiC SBD.



### 1.1 Features

The following are key features of the MSC050SDA070S device:

- No reverse recovery
- Low forward voltage
- Low leakage current
- Avalanche energy rated
- RoHS compliant

### 1.2 Benefits

The following are benefits of the MSC050SDA070S device:

- High switching frequency
- Low switching losses
- Low noise (EMI) switching
- Higher reliability systems
- Increased system power density

### 1.3 Applications

The MSC050SDA070S device is designed for the following applications:

- Power factor correction (PFC)
- Anti-parallel diode
  - Switch-mode power supply
  - Inverters/converters
  - Motor controllers
- Freewheeling diode
  - Switch-mode power supply
  - Inverters/converters
- Snubber/clamp diode

## 2 Device Specifications

This section shows the specifications of the MSC050SDA070S device.

### 2.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MSC050SDA070S device.

All ratings at  $T_c = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

**Table 1 • Absolute Maximum Ratings**

| Symbol         | Parameter                                                                                                                         | Ratings                             | Unit               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------|
| $V_R$          | Maximum DC reverse voltage                                                                                                        | 700                                 | V                  |
| $V_{RRM}$      | Maximum peak repetitive reverse voltage                                                                                           | 700                                 |                    |
| $V_{RWM}$      | Maximum working peak reverse voltage                                                                                              | 700                                 |                    |
| $I_F$          | Maximum DC forward current                                                                                                        | $T_c = 25\text{ }^{\circ}\text{C}$  | A                  |
|                |                                                                                                                                   | $T_c = 135\text{ }^{\circ}\text{C}$ |                    |
|                |                                                                                                                                   | $T_c = 145\text{ }^{\circ}\text{C}$ |                    |
| $I_{FRM}$      | Repetitive peak forward surge current ( $t_p = 8.3\text{ ms}$ , half sine wave)                                                   | 128                                 |                    |
| $I_{FSM}$      | Non-repetitive forward surge current ( $t_p = 8.3\text{ ms}$ , half sine wave)                                                    | 124                                 |                    |
| $P_{TOT}$      | Power dissipation                                                                                                                 | $T_c = 25\text{ }^{\circ}\text{C}$  | W                  |
|                |                                                                                                                                   | $T_c = 110\text{ }^{\circ}\text{C}$ |                    |
| $T_J, T_{STG}$ | Operating junction and storage temperature range                                                                                  | -55 to 175                          | $^{\circ}\text{C}$ |
| $T_L$          | Lead temperature for 10 seconds                                                                                                   | 300                                 |                    |
| $E_{AS}$       | Single-pulse avalanche energy<br>(starting $T_J = 25\text{ }^{\circ}\text{C}$ , $L = 0.08\text{ mH}$ , peak $I_L = 50\text{ A}$ ) | 100                                 | mJ                 |

The following table shows the thermal and mechanical characteristics of the MSC050SDA070S device.

**Table 2 • Thermal and Mechanical Characteristics**

| Symbol          | Characteristic                      | Min | Typ  | Max  | Unit                 |
|-----------------|-------------------------------------|-----|------|------|----------------------|
| $R_{\theta JC}$ | Junction-to-case thermal resistance |     | 0.37 | 0.53 | $^{\circ}\text{C/W}$ |
| $Wt$            | Package weight                      |     | 0.14 |      | oz                   |
|                 |                                     |     | 4.0  |      | g                    |

## 2.2 Electrical Performance

The following table shows the static characteristics of the MSC050SDA070S device.

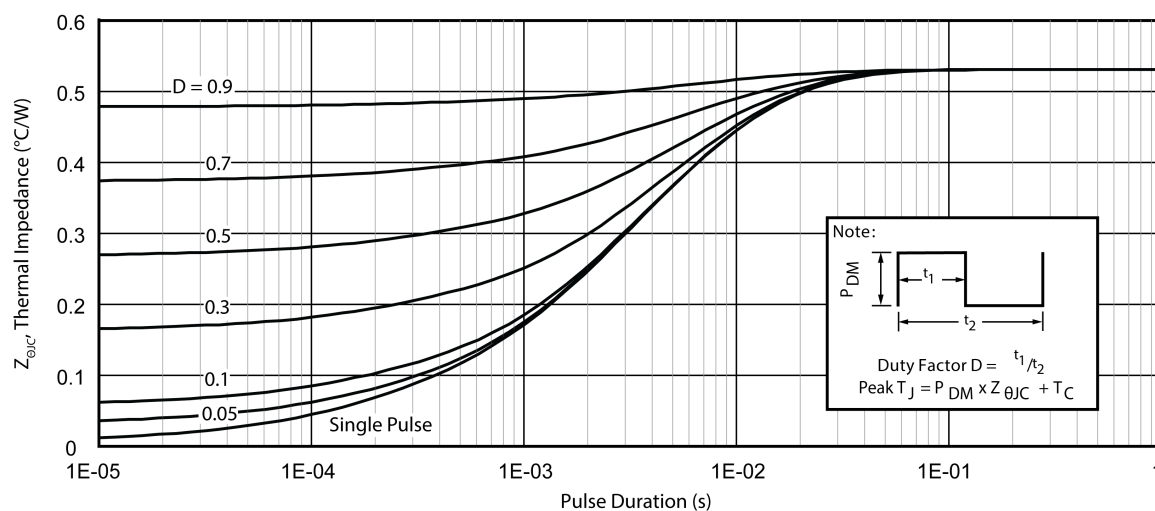
**Table 3 • Static Characteristics**

| Symbol   | Characteristic          | Test Conditions                                                        | Min | Typ  | Max | Unit          |
|----------|-------------------------|------------------------------------------------------------------------|-----|------|-----|---------------|
| $V_F$    | Forward voltage         | $I_F = 50 \text{ A}$ , $T_J = 25^\circ\text{C}$                        |     | 1.5  | 1.8 | V             |
|          |                         | $I_F = 50 \text{ A}$ , $T_J = 175^\circ\text{C}$                       |     | 1.9  |     |               |
| $I_{RM}$ | Reverse leakage current | $V_R = 700 \text{ V}$ , $T_J = 25^\circ\text{C}$                       | 15  |      | 200 | $\mu\text{A}$ |
|          |                         | $V_R = 700 \text{ V}$ , $T_J = 175^\circ\text{C}$                      |     | 250  |     |               |
| $Q_C$    | Total capacitive charge | $V_R = 400 \text{ V}$ , $T_J = 25^\circ\text{C}$                       |     | 133  |     | nC            |
| $C_J$    | Junction capacitance    | $V_R = 1 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$   |     | 2034 |     | pF            |
|          | Junction capacitance    | $V_R = 200 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$ |     | 248  |     |               |
|          | Junction capacitance    | $V_R = 400 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$ |     | 216  |     |               |

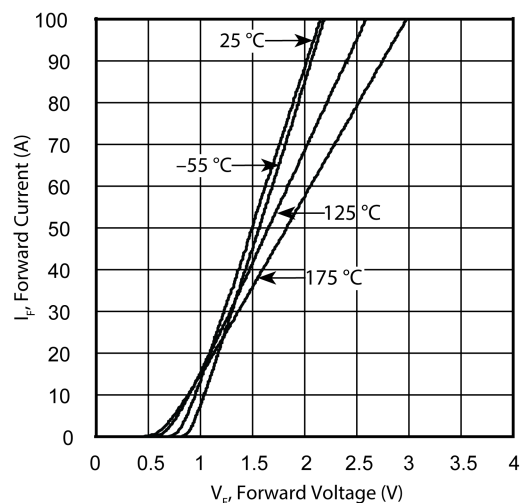
## 2.3 Performance Curves

This section shows the typical performance curves of the MSC050SDA070S device.

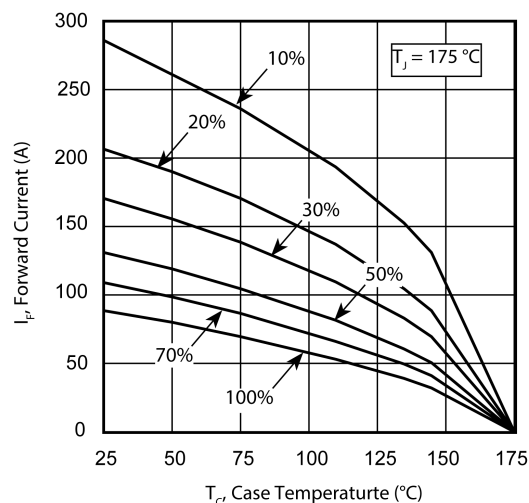
**Figure 1 • Maximum Transient Thermal Impedance**



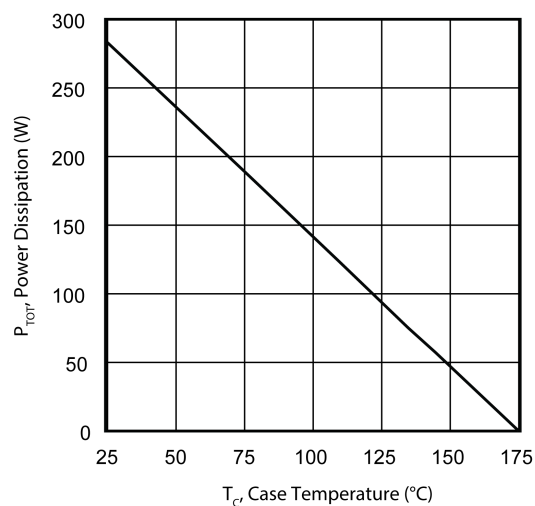
**Figure 2 • Forward Current vs. Forward Voltage**



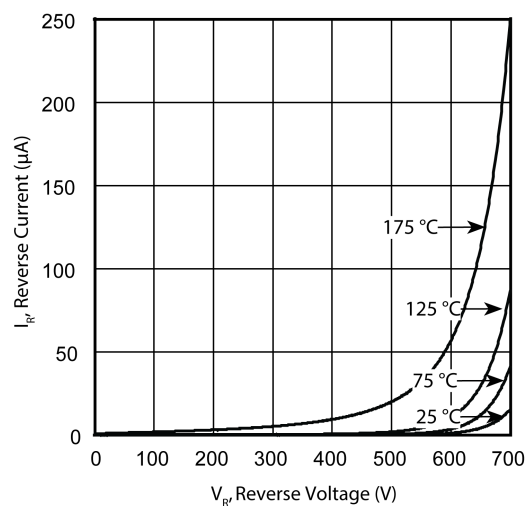
**Figure 3 • Max. Forward Current vs. Case Temp.**



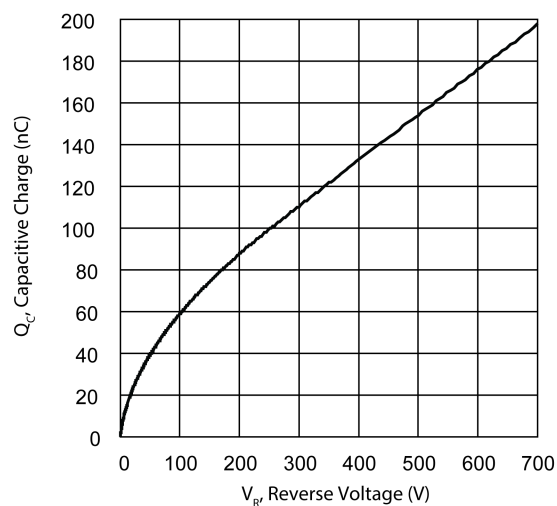
**Figure 4 • Max. Power Dissipation vs. Case Temp.**



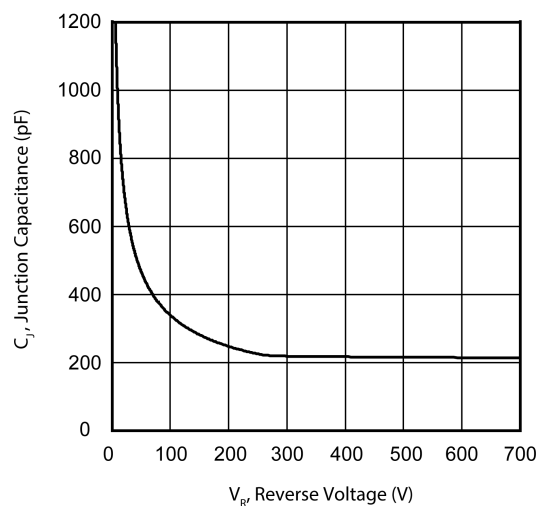
**Figure 5 • Reverse Current vs. Reverse Voltage**



**Figure 6 • Total Capacitive Charge vs. Reverse Voltage**



**Figure 7 • Junction Capacitance vs. Reverse Voltage**



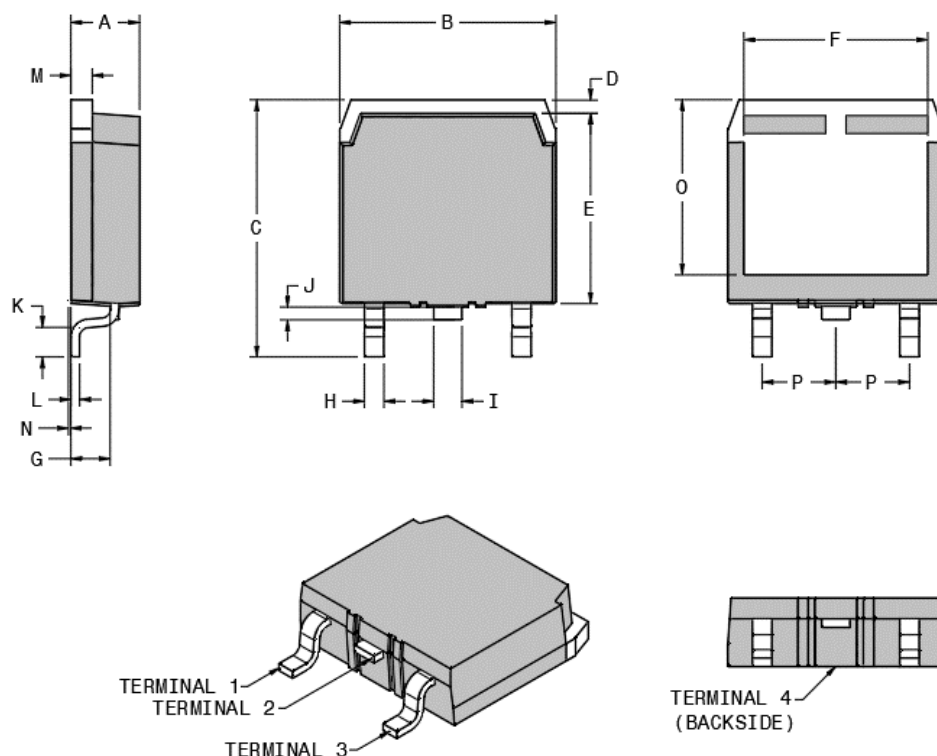
## 3 Package Specification

This section shows the package specification of the MSC050SDA070S device.

### 3.1 Package Outline Drawing

This following figure illustrates the TO-268 package outline of the MSC050SDA070S device.

**Figure 8 • Package Outline Drawing**



The following table lists the TO-268 dimensions and should be used in conjunction with the Package Outline Drawing.

**Table 4 • TO-268 Dimensions**

| Symbol | Min (mm) | Max (mm) | Min (in.) | Max (in.) |
|--------|----------|----------|-----------|-----------|
| A      | 4.90     | 5.10     | 0.193     | 0.201     |
| B      | 15.85    | 16.20    | 0.624     | 0.638     |
| C      | 18.70    | 19.10    | 0.736     | 0.752     |
| D      | 1.00     | 1.25     | 0.039     | 0.049     |
| E      | 13.80    | 14.00    | 0.543     | 0.551     |
| F      | 13.30    | 13.60    | 0.524     | 0.535     |
| G      | 2.70     | 2.90     | 0.106     | 0.114     |
| H      | 1.15     | 1.45     | 0.045     | 0.057     |
| I      | 1.95     | 2.21     | 0.077     | 0.087     |
| J      | 0.94     | 1.40     | 0.037     | 0.055     |

| Symbol     | Min (mm)        | Max (mm) | Min (in.)        | Max (in.) |
|------------|-----------------|----------|------------------|-----------|
| K          | 2.40            | 2.70     | 0.094            | 0.106     |
| L          | 0.40            | 0.60     | 0.016            | 0.024     |
| M          | 1.45            | 1.60     | 0.057            | 0.063     |
| N          | 0.00            | 0.18     | 0.000            | 0.007     |
| O          | 12.40           | 12.70    | 0.488            | 0.500     |
| P          | 5.45 BSC (nom.) |          | 0.215 BSC (nom.) |           |
| Terminal 1 | Cathode         |          |                  |           |
| Terminal 2 | Cathode         |          |                  |           |
| Terminal 3 | Anode           |          |                  |           |
| Terminal 4 | Cathode         |          |                  |           |

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