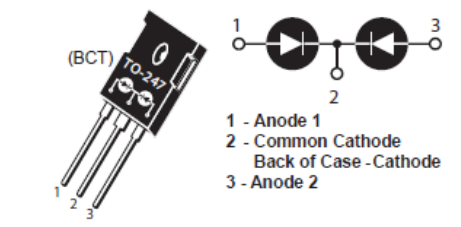


# MSC050SDA070BCT Zero Recovery Silicon Carbide Schottky Dual Diode

## Product Overview

The silicon carbide (SiC) power Schottky barrier diodes (SBD) product line from Microsemi increases your performance over silicon diode solutions while lowering your total cost of ownership for high-voltage applications. The MSC050SDA070BCT is a 700 V, 50 A SiC dual common cathode SBD in a three-lead TO-247 package shown below.



### Features

The following are key features of the MSC050SDA070BCT device:

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

### Benefits

The following are benefits of the MSC050SDA070BCT device:

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

### Applications

The MSC050SDA070BCT 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

## Electrical Specifications

This section shows the specifications for the MSC050SDA070BCT device. All ratings are per leg.

### Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC050SDA070BCT device.

All ratings:  $T_c = 25\text{ }^{\circ}\text{C}$  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 ( $T_c = 25\text{ }^{\circ}\text{C}$ )                                                              | 88         | A                  |
|                | Maximum DC forward current ( $T_c = 135\text{ }^{\circ}\text{C}$ )                                                             | 39         |                    |
|                | Maximum DC forward current ( $T_c = 145\text{ }^{\circ}\text{C}$ )                                                             | 32         |                    |
| $I_{FRM}$      | Repetitive peak forward surge current ( $T_c = 25\text{ }^{\circ}\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)           | 128        |                    |
| $I_{FSM}$      | Non-repetitive forward surge current ( $T_c = 25\text{ }^{\circ}\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)            | 124        |                    |
| $P_{tot}$      | Power dissipation ( $T_c = 25\text{ }^{\circ}\text{C}$ )                                                                       | 283        | W                  |
|                | Power dissipation ( $T_c = 110\text{ }^{\circ}\text{C}$ )                                                                      | 123        |                    |
| $T_J, T_{STG}$ | Operating and storage temperature range                                                                                        | -55 to 175 | $^{\circ}\text{C}$ |
| $T_L$          | Lead temperature for 10 seconds                                                                                                | 300        |                    |
| $E_{AS}$       | Single-pulse avalanche energy (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 MSC050SDA070BCT 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 | $^{\circ}\text{C}/\text{W}$ |
| $W_T$           | Package weight                      |     | 0.22 |      | oz                          |

| Symbol | Characteristic                       | Min | Typ | Max | Unit   |
|--------|--------------------------------------|-----|-----|-----|--------|
|        |                                      |     | 5.9 |     | g      |
|        | Mounting torque,<br>6-32 or M3 screw |     |     | 10  | lbf-in |
|        |                                      |     |     | 1.1 | N-m    |

## Electrical Performance

The following table shows the static characteristics of the MSC050SDA070BCT device.

**Table 3 • Static Characteristics**

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

## Performance Curves

This section shows the typical performance curves for the MSC050SDA070BCT device.

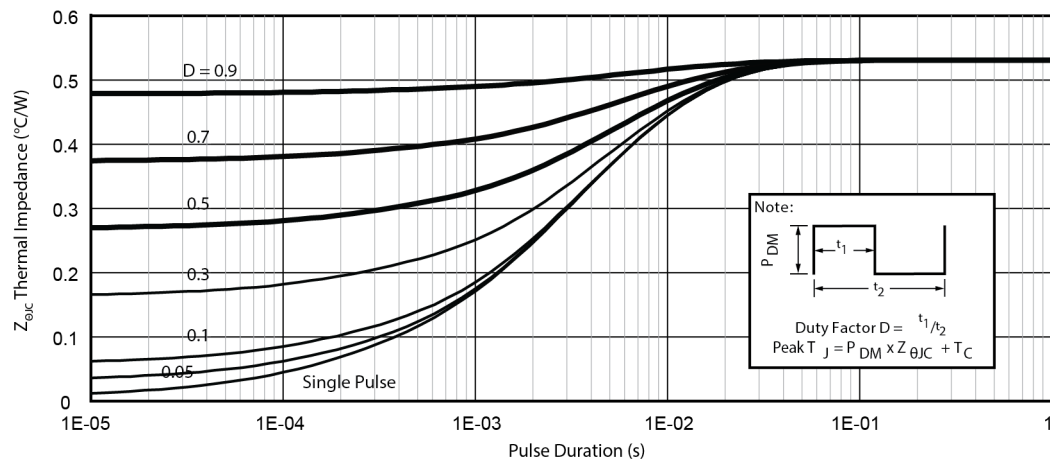


Figure 1 • Maximum Transient Thermal Impedance

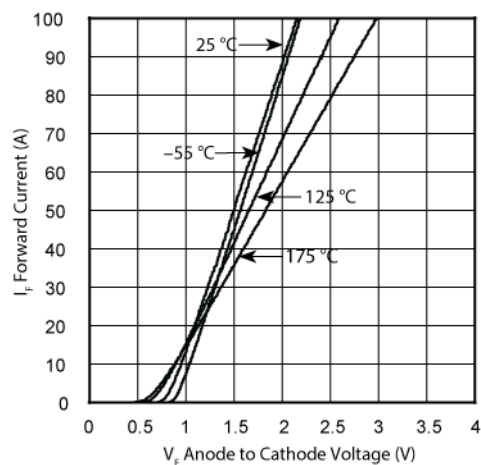


Figure 2 • Forward Current vs Forward Voltage

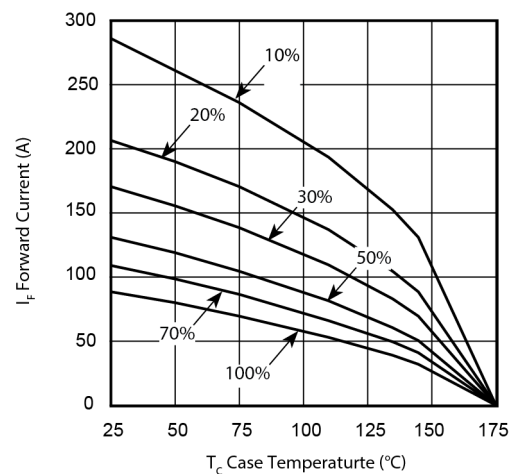


Figure 3 • Max Forward Current vs Case Temp

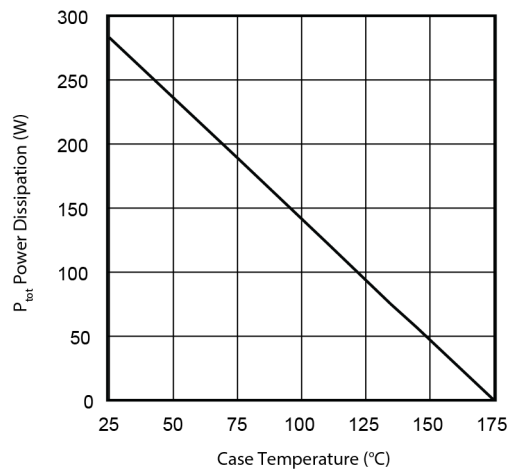


Figure 4 • Max Power Dissipation vs Case Temp

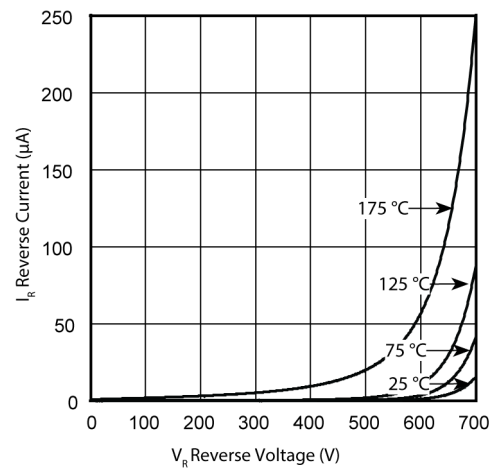
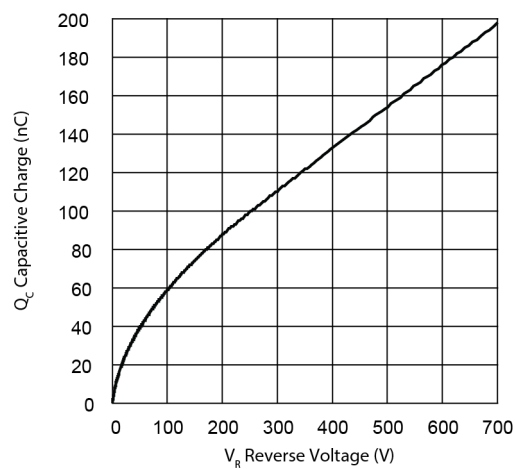
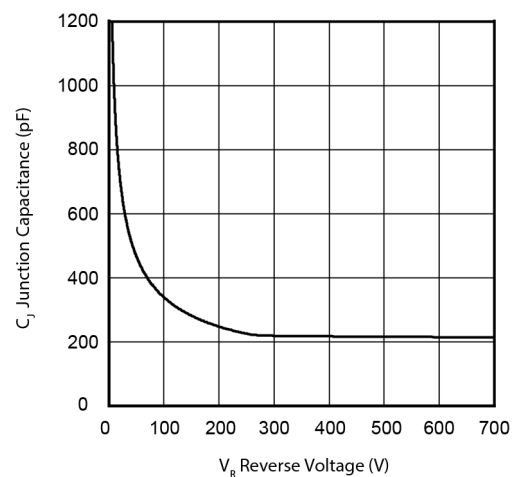


Figure 5 • Reverse Current vs. Reverse Voltage

Figure 6 • Total Capacitive Charge vs.  $V_R$ Figure 7 • Junction Capacitance vs  $V_R$

## Package Specification

This section outlines the package specification for the MSC050SDA070BCT device.

### Package Outline Drawing

This section shows the TO-247 package drawing of the MSC050SDA070BCT device. Dimensions are in millimeters and (inches).

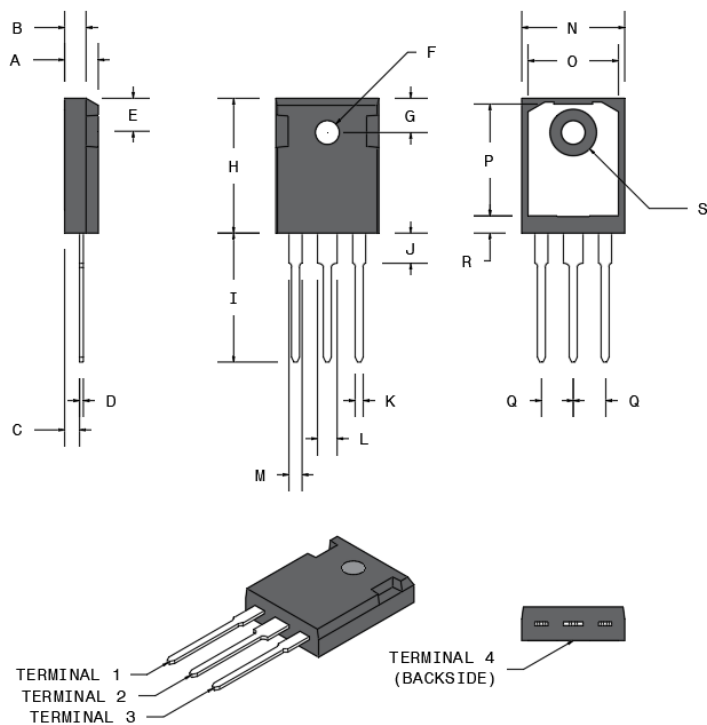


**Figure 8 • Package Outline Drawing**

The following table shows the TO-247 dimensions and should be used in conjunction with the package outline drawing.

**Table 4 • Dimensions**

| Symbol | Min. (mm) | Max. (mm) | Min. (in.) | Max (in.) |
|--------|-----------|-----------|------------|-----------|
| A      | 4.69      | 5.31      | 0.185      | 0.209     |
| B      | 1.49      | 2.49      | 0.059      | 0.098     |
| C      | 2.21      | 2.59      | 0.087      | 0.102     |
| D      | 0.40      | 0.79      | 0.016      | 0.031     |
| E      | 5.38      | 6.20      | 0.212      | 0.244     |
| F      | 3.50      | 3.81      | 0.138      | 0.150     |

| Symbol     | Min. (mm)      | Max. (mm) | Min. (in.) | Max (in.) |
|------------|----------------|-----------|------------|-----------|
| G          | 6.15 BSC       |           | 0.242 BSC  |           |
| H          | 20.80          | 21.46     | 0.819      | 0.845     |
| I          | 19.81          | 20.32     | 0.780      | 0.800     |
| J          | 4.00           | 4.50      | 0.157      | 0.177     |
| K          | 1.01           | 1.40      | 0.040      | 0.055     |
| L          | 2.87           | 3.12      | 0.113      | 0.123     |
| M          | 1.65           | 2.13      | 0.065      | 0.084     |
| N          | 15.49          | 16.26     | 0.610      | 0.640     |
| O          | 13.50          | 14.50     | 0.531      | 0.571     |
| P          | 16.50          | 17.50     | 0.650      | 0.689     |
| Q          | 5.45 BSC       |           | 0.215 BSC  |           |
| R          | 2.00           | 2.75      | 0.079      | 0.108     |
| S          | 7.10           | 7.50      | 0.280      | 0.295     |
| Terminal 1 | Anode 1        |           |            |           |
| Terminal 2 | Common cathode |           |            |           |
| Terminal 3 | Anode 2        |           |            |           |
| Terminal 4 | Common cathode |           |            |           |

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