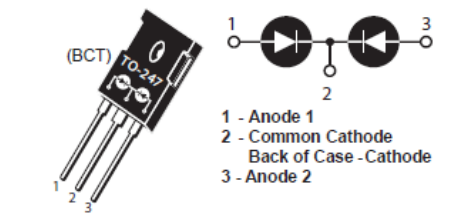


# MSC030SDA120BCT Zero Recovery Silicon Carbide Schottky Dual Diode

## 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 MSC030SDA120BCT is a 1200 V, 30 A SiC dual common cathode SBD in a three-lead TO-247 package shown below.



### Features

The following are key features of the MSC030SDA120BCT device:

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

### Benefits

The following are benefits of the MSC030SDA120BCT device:

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

### Applications

The MSC030SDA120BCT 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 details the specifications for the MSC030SDA120BCT device. All ratings are per leg.

### Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC030SDA120BCT device.

All Ratings:  $T_C = 25\text{ }^\circ\text{C}$  unless otherwise specified.

**Table 1 • Absolute Maximum Ratings**

| Sym-<br>bol    | Parameter                                                                                                                    |                                   | Ratings    | Unit             |
|----------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------|------------------|
| $V_R$          | Maximum DC reverse voltage                                                                                                   |                                   | 1200       | V                |
| $V_{RRM}$      | Maximum peak repetitive reverse voltage                                                                                      |                                   |            |                  |
| $V_{RWM}$      | Maximum working peak reverse voltage                                                                                         |                                   |            |                  |
| $I_F$          | Maximum DC forward current                                                                                                   | $T_C = 25\text{ }^\circ\text{C}$  | 65         | A                |
|                |                                                                                                                              | $T_C = 135\text{ }^\circ\text{C}$ | 29         |                  |
|                |                                                                                                                              | $T_C = 145\text{ }^\circ\text{C}$ | 24         |                  |
| $I_{FRM}$      | Repetitive peak forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)           |                                   | 92         |                  |
| $I_{FSM}$      | Non-repetitive forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)            |                                   | 165        |                  |
| $P_{TOT}$      | Power dissipation                                                                                                            | $T_C = 25\text{ }^\circ\text{C}$  | 259        | W                |
|                |                                                                                                                              | $T_C = 110\text{ }^\circ\text{C}$ | 112        |                  |
| $T_J, T_{STG}$ | 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 (starting $T_J = 25\text{ }^\circ\text{C}$ , $L = 0.22\text{ mH}$ , peak $I_L = 30\text{ A}$ ) |                                   | 100        | mJ               |

The following table shows the thermal and mechanical characteristics of the MSC030SDA120BCT device.

**Table 2 • Thermal and Mechanical Characteristics**

| Symbol          | Characteristic                      | Min | Typ  | Max  | Unit               |
|-----------------|-------------------------------------|-----|------|------|--------------------|
| $R_{\theta JC}$ | Junction-to-case thermal resistance |     | 0.4  | 0.58 | $^\circ\text{C/W}$ |
| $W_T$           | Package weight                      |     | 0.22 |      | oz                 |

| Symbol | Characteristic          | Min | Typ | Max | Unit   |
|--------|-------------------------|-----|-----|-----|--------|
|        |                         |     | 5.9 |     | g      |
|        | Maximum mounting torque |     |     | 10  | lbf-in |
|        |                         |     |     | 1.1 | N-m    |

## Electrical Performance

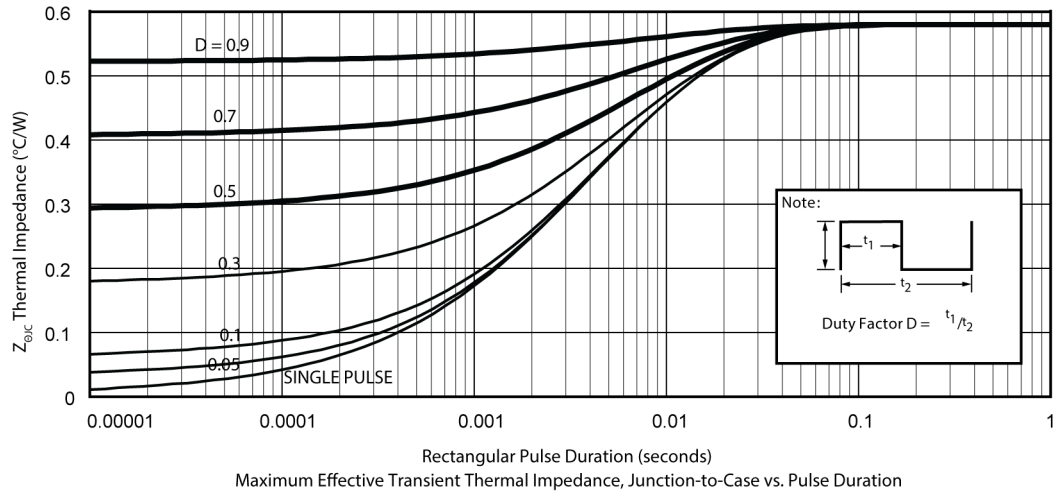
The following table shows the static characteristics of the MSC030SDA120BCT device.

**Table 3 • Static Characteristics**

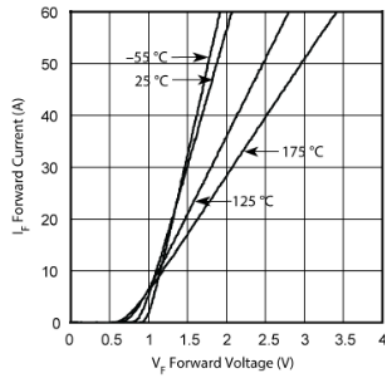
| Symbol   | Characteristic          | Test Conditions                                                        | Min | Typ | Max | Unit          |
|----------|-------------------------|------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_F$    | Forward Voltage         | $I_F = 30\text{ A}, T_J = 25\text{ }^\circ\text{C}$                    |     | 1.5 | 1.8 | V             |
|          |                         | $I_F = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$                   |     | 2.1 |     |               |
| $I_{RM}$ | Reverse leakage current | $V_R = 1200\text{ V}, T_J = 25\text{ }^\circ\text{C}$                  |     | 9   | 200 | $\mu\text{A}$ |
|          |                         | $V_R = 1200\text{ V}, T_J = 175\text{ }^\circ\text{C}$                 |     | 150 |     |               |
| $Q_C$    | Total capacitive charge | $V_R = 600\text{ V}, T_J = 25\text{ }^\circ\text{C}$                   |     | 130 |     | nC            |
| $C_J$    | Junction capacitance    | $V_R = 400\text{ V}, T_J = 25\text{ }^\circ\text{C}, f = 1\text{ MHz}$ |     | 141 |     | pF            |
|          | Junction capacitance    | $V_R = 800\text{ V}, T_J = 25\text{ }^\circ\text{C}, f = 1\text{ MHz}$ |     | 105 |     |               |

## Performance Curves

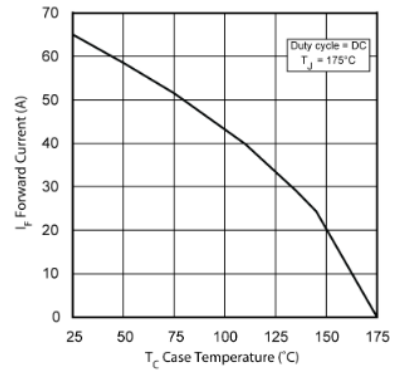
This section shows the typical performance curves for the MSC030SDA120BCT device.



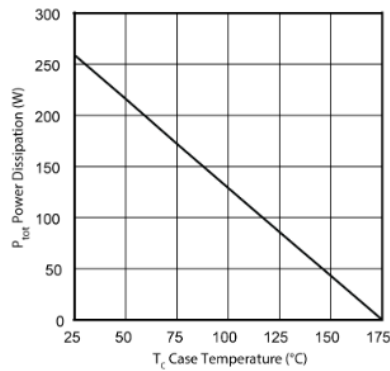
**Figure 1 • Maximum Transient Thermal Impedance**



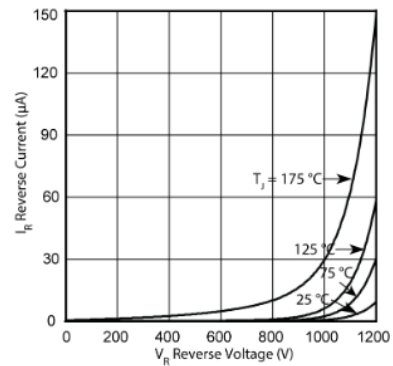
**Figure 2 • Forward Current vs. Forward Voltage**



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



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



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

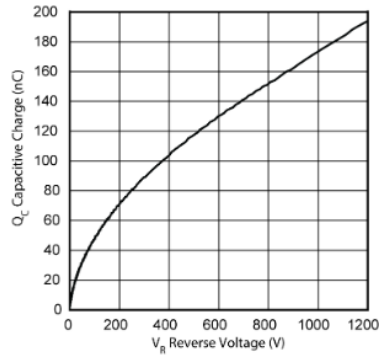


Figure 6 • Total Capacitive Charge vs.  $V_R$

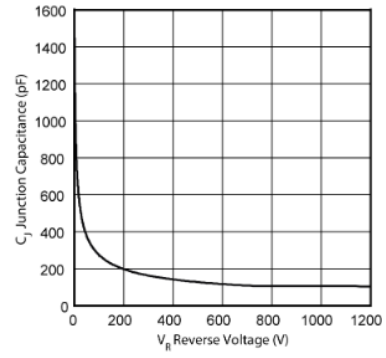


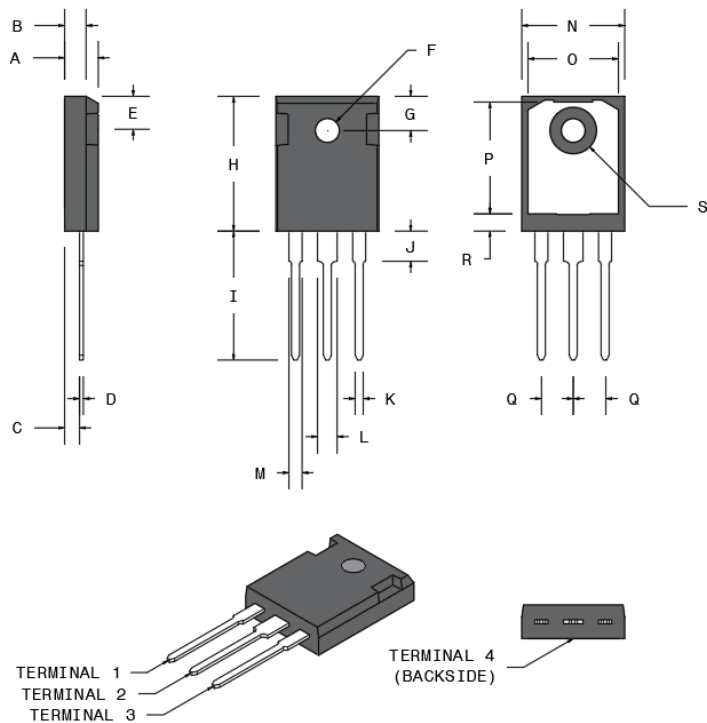
Figure 7 • Junction Capacitance vs.  $V_R$

## Package Specification

This section outlines the package specification for the MSC030SDA120BCT device.

### Package Outline Drawing

This section details the TO-247 package drawing of the MSC030SDA120BCT 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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