# MSC020SDA120B

# Datasheet

# Zero Recovery Silicon Carbide Schottky Diode

Final

October 2017

Microsemi

Power Matters.™

# Contents

# 1 Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1 Revision B

Revision B was published in October 2017. In Revision B of this document, the following changes were made:

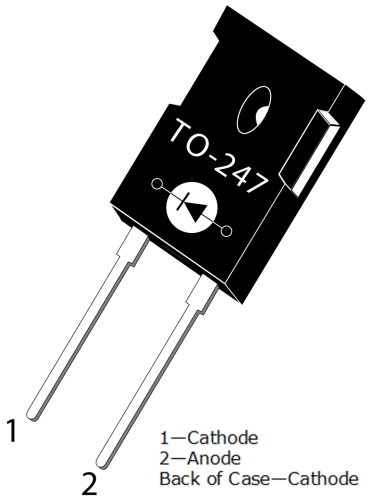
- The Absolute Maximum Ratings (see page 3) table was updated to reflect the single pulse avalanche energy ($E_{AS}$).
- The diode image in Product Overview was changed.
- The features section was updated.

## 1.2 Revision A

Revision A was published in August 2017. It is the first publication of this document.

# 2 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 MSC20SDA120B is a 1200 V, 20 A SiC SBD in a two-lead TO-247 package shown below.




## 2.1 Features

The following are key features of the MSC020SDA120B device:

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

## 2.2 Benefits

The following are benefits of the MSC020SDA120B device:

- Higher-reliability systems
- Minimizes heat sink requirements
- Higher efficiency

## 2.3 Applications

The MSC020SDA120B device is designed for the following applications:

- H/EV powertrain and EV charger
- Power supply and distribution
- PV inverter, converter, and industrial motor drives
- Smart grid transmission and distribution
- Aviation

# 3 Electrical Specifications

This section details the electrical specifications for the MSC020SDA120B device.

## 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC020SDA120B device.

All Ratings: $T_C$ = 25 °C unless otherwise specified.

**Table 1 • Absolute Maximum Ratings**

| Symbol | 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 °C | 43 | A |
| | | $T_C$ = 130 °C | 20 | |
| | | $T_C$ = 145 °C | 15 | |
| $I_{FRM}$ | Repetitive peak forward surge current ($T_C$ = 25 °C, $t_p$ = 8.3 ms, half sine wave) | | 61 | |
| $I_{FSM}$ | Non-repetitive forward surge current ($T_C$ = 25°C, $t_p$ = 8.3 ms, half sine wave) | | 150 | |
| $P_{tot}$ | Power dissipation | $T_C$ = 25 °C | 166 | W |
| | | $T_C$ = 110 °C | 72 | |
| $T_J$ , $T_{STG}$ | Operating junction and storage temperature range | | –55 to 175 | °C |
| $T_L$ | Lead temperature for 10 seconds | | 300 | |
| $E_{AS}$ | Single pulse avalanche energy (starting $T_J$ = 25 °C, L = 2.0 mH, peak $I_L$ = 10 A) | | 100 | mJ |

The following table shows the thermal and mechanical characteristics of the MSC020SDA120B device.

**Table 2 • Thermal and Mechanical Characteristics**

| Symbol | Characteristic | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case thermal resistance | | 0.62 | 0.90 | °C/W |
| $W_T$ | Package weight | | 0.22 | | oz |
| | | | 5.9 | | g |
| Torque | Maximum mounting torque | | | 10 | lb-in |
| | | | | 1.1 | N-m |

## 3.2 Electrical Performance

The following table shows the static characteristics of the MSC020SDA120B device.

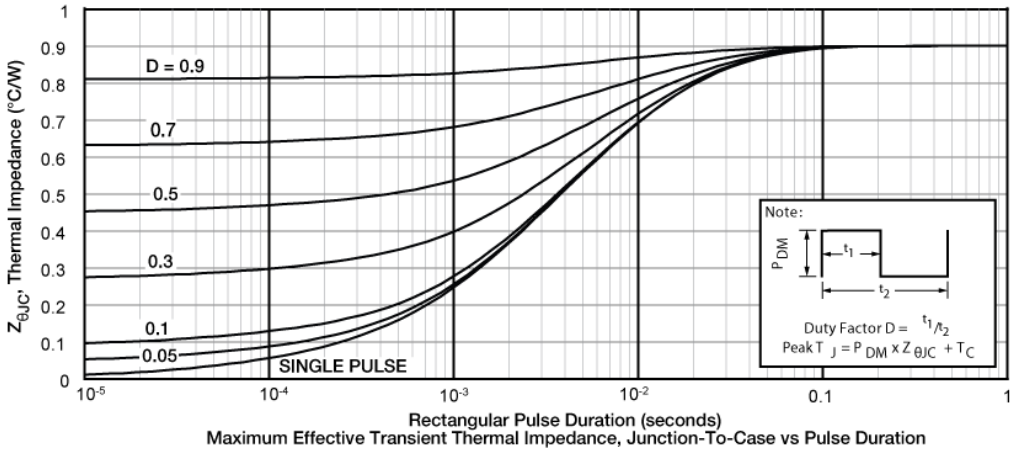
**Table 3 • Static Characteristics**

| Symbol | Characteristic/Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$ = 20 A, $T_J$ = 25 °C | | 1.5 | 1.8 | Volts |
| | | $I_F$ = 20 A, $T_J$ = 175 °C | | 2.1 | | |
| $I_{RM}$ | Reverse leakage current | $V_R$ = 1200 V, $T_J$ = 25 °C | | 6 | 200 | µA |
| | | $V_R$ = 1200 V, $T_J$ = 175 °C | | 100 | | |
| $Q_C$ | Total capacitive charge $V_R$ = 600 V, $T_J$ = 25 °C | | | 95 | | nC |
| $C_J$ | Junction capacitance $V_R$ = 400 V, $T_J$ = 25 °C, ƒ= 1 MHz | | | 104 | | pF |
| | Junction capacitance $V_R$ = 800 V, $T_J$ = 25 °C, ƒ = 1 MHz | | | 79 | | |

## 3.3 Performance Curves

This section shows the typical performance curves for the MSC020SDA120B device.

**Figure 1 • Maximum Transient Thermal Impedance**




Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

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

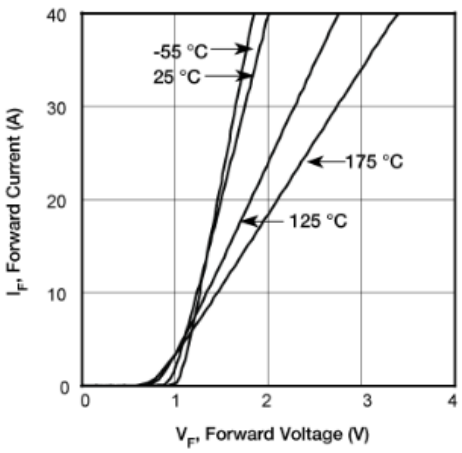



**Figure 3 • Max Forward Current vs. Case Temp**

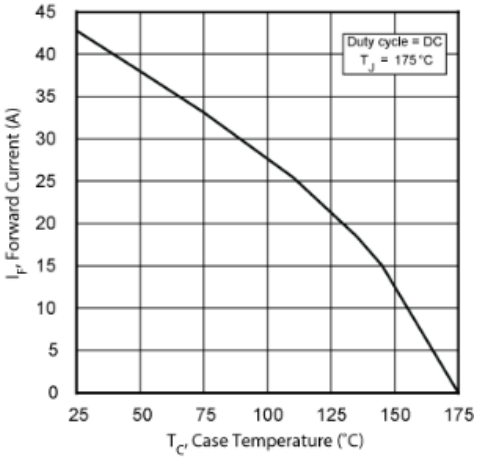



**Figure 4 • Max Power Dissipation vs. Case Temp**

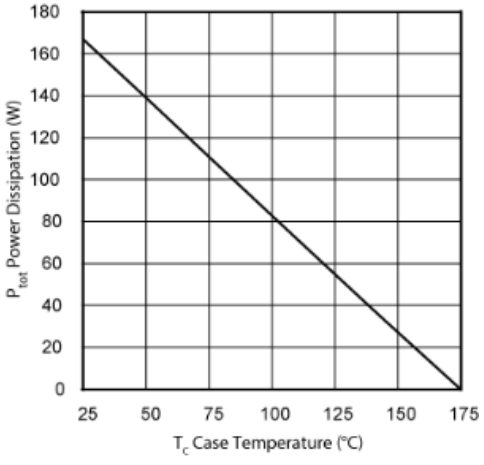



**Figure 5 • Reverse Current vs. Reverse Voltage**

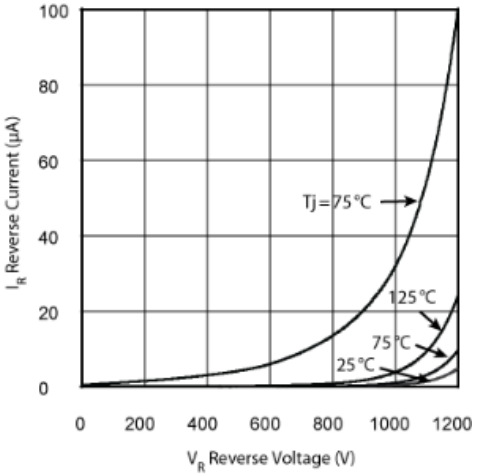


**Figure 6 • Total Capacitive Charge vs. Reverse Voltage**

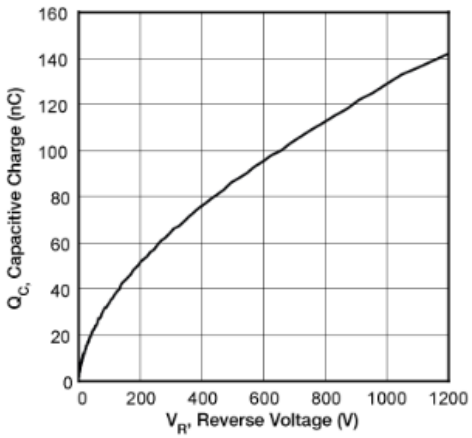
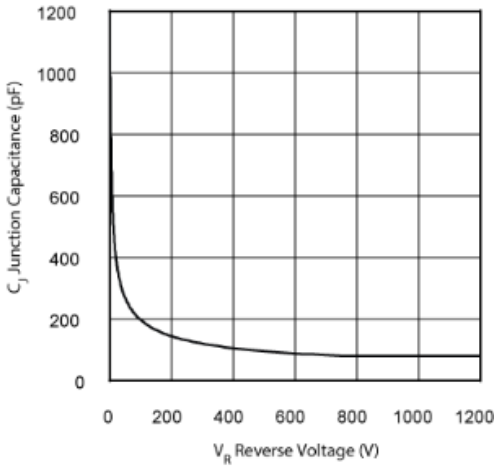



**Figure 7 • Junction Capacitance vs. Reverse Voltage**



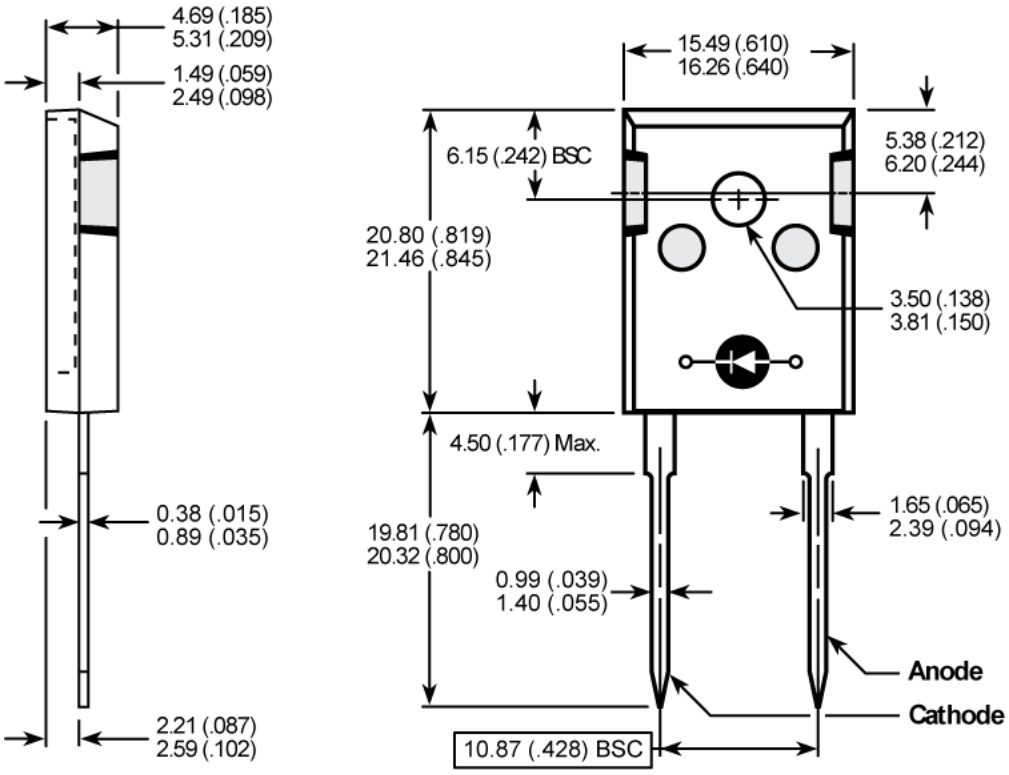
# 4 Package Specification

This section outlines the package specification for the MSC020SDA120B device.

## 4.1 Package Outline Drawing

This section details the TO-247 package drawing of the MSC020SDA120B device. Dimensions are in millimeters and (inches).

**Figure 8 • Package Outline Drawing**



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