

**MSC050SDA120B**  
**Datasheet**  
**Zero Recovery Silicon Carbide Schottky Diode**

Final  
January 2018



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# 1 Revision History

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

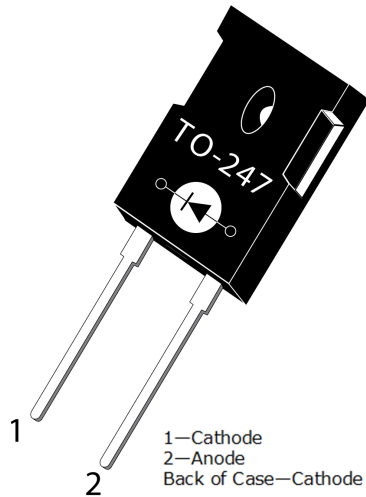
## 1.1 Revision A

Revision A was published in January 2018. It is the first publication of this document.

## 2 Product Overview

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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 MSC050SDA120B is a 1200 V, 50 A SiC SBD in a two-lead TO-247 package (shown below).



### 2.1 Features

The following are key features of the MSC050SDA120B 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 MSC050SDA120B device:

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

### 2.3 Applications

The MSC050SDA120B 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 MSC050SDA120B device.

#### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC050SDA120B 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	1200	V	
$V_{RRM}$	Maximum peak repetitive reverse voltage			
$V_{RWM}$	Maximum working peak reverse voltage			
$I_F$	Maximum DC forward current	$T_c = 25\text{ }^\circ\text{C}$	109	A
		$T_c = 135\text{ }^\circ\text{C}$	49	
		$T_c = 145\text{ }^\circ\text{C}$	41	
$I_{FRM}$	Repetitive peak forward surge current ( $T_c = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)	154		
$I_{FSM}$	Non-repetitive forward surge current ( $T_c = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)	290		
$P_{tot}$	Power dissipation	$T_c = 25\text{ }^\circ\text{C}$	429	W
		$T_c = 110\text{ }^\circ\text{C}$	186	
$T_J, T_{STG}$	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 $T_J = 25\text{ }^\circ\text{C}$ , $L = 0.08\text{ mH}$ , peak $I_L = 50\text{ A}$ )	100	mJ	

The following table shows the thermal and mechanical characteristics of the MSC050SDA120B device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		0.24	0.35	$^\circ\text{C}/\text{W}$
$W_T$	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 MSC050SDA120B device.

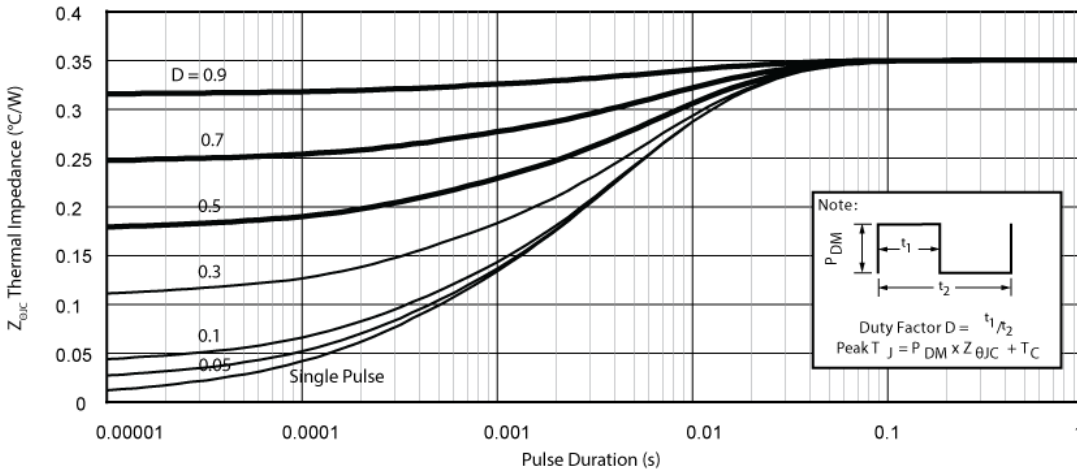
**Table 3 • Static Characteristics**

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
V <sub>F</sub>	Forward voltage	I <sub>F</sub> = 50 A, T <sub>J</sub> = 25 °C		1.5	V
		I <sub>F</sub> = 50 A, T <sub>J</sub> = 175 °C		2.1	
I <sub>RM</sub>	Reverse leakage current	V <sub>R</sub> = 1200 V, T <sub>J</sub> = 25 °C		15	μA
		V <sub>R</sub> = 1200 V, T <sub>J</sub> = 175 °C		250	
Q <sub>C</sub>	Total capacitive charge V <sub>R</sub> = 600 V, T <sub>J</sub> = 25 °C			224	nC
C <sub>J</sub>	Junction capacitance V <sub>R</sub> = 400 V, T <sub>J</sub> = 25 °C, f = 1 MHz			246	pF
	Junction capacitance V <sub>R</sub> = 800 V, T <sub>J</sub> = 25 °C, f = 1 MHz			182	

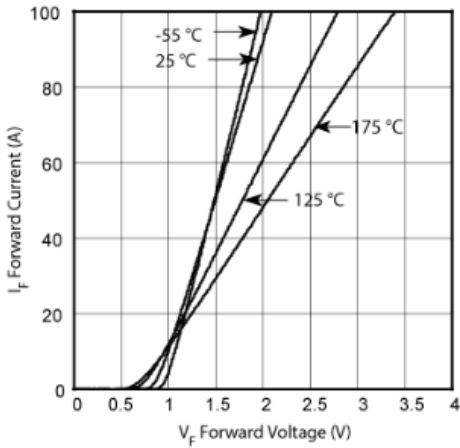
### 3.3 Performance Curves

This section shows the typical performance curves for the MSC050SDA120B device.

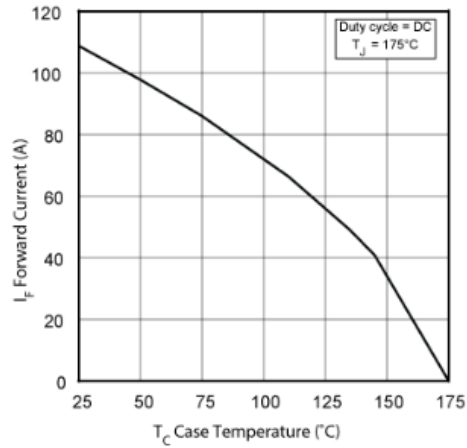
**Figure 1 • Maximum Transient Thermal Impedance**



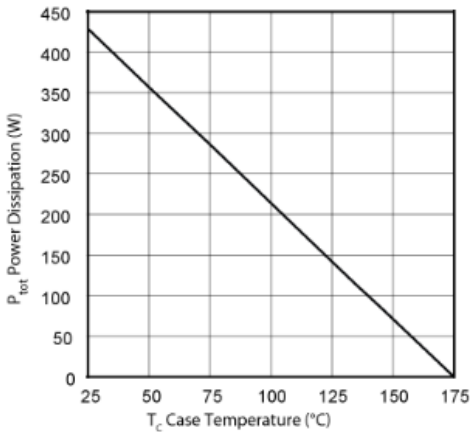
**Figure 2 • Forward Current vs Forward Voltage**



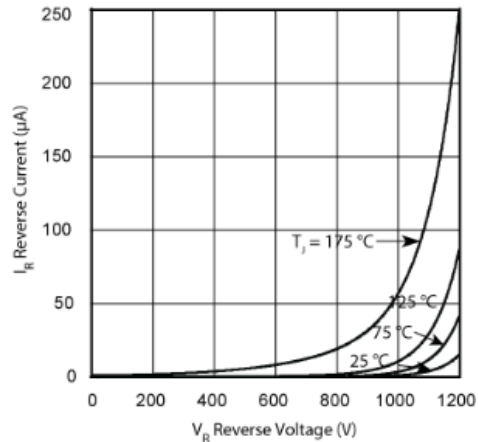
**Figure 3 • Max Forward Current vs Case Temp**



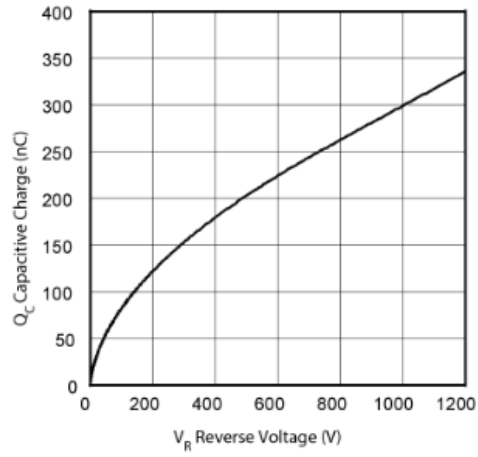
**Figure 4 • Max Power Dissipation vs Case Temp**



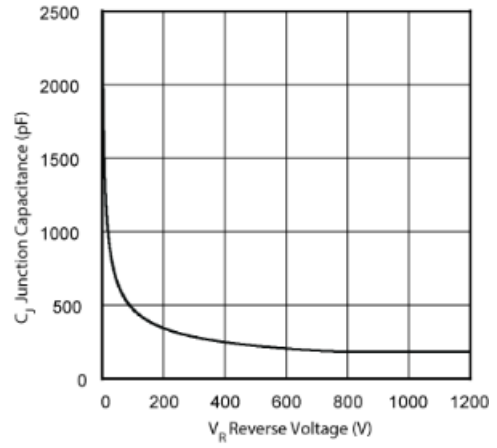
**Figure 5 • Reverse Current vs. Reverse Voltage**



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



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





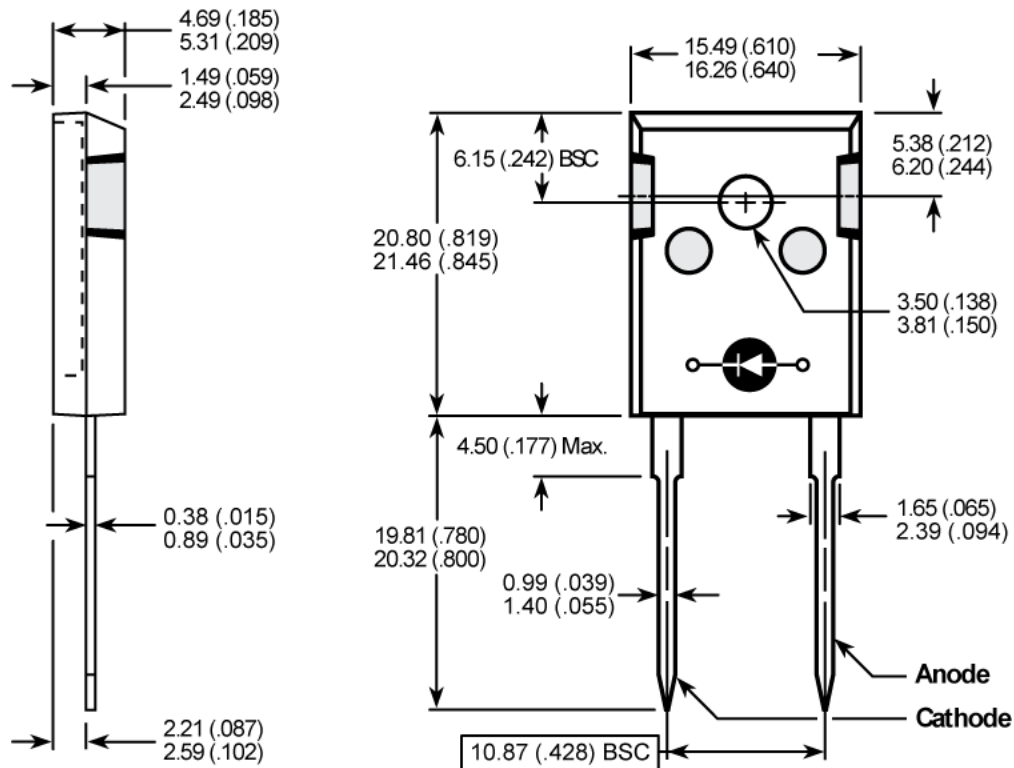
## 4 Package Specification

This section outlines the package specification for the MSC050SDA120B device.

### 4.1 Package Outline Drawing

This section details the TO-247 package drawing of the MSC050SDA120B device. Dimensions are in millimeters and (inches).

Figure 8 • Package Outline Drawing



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