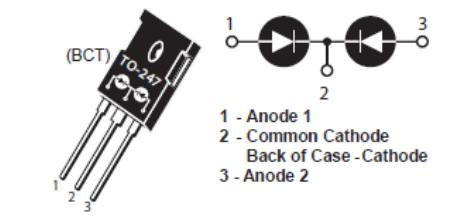


# MSC050SDA120BCT Zero Recovery Silicon Carbide Schottky Dual Diode

## 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 MSC050SDA120BCT is a 1200 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 MSC050SDA120BCT device:

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

### Benefits

The following are benefits of the MSC050SDA120BCT device:

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

### Applications

The MSC050SDA120BCT 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

## Device Specifications

This section details the specifications for the MSC050SDA120BCT device. All ratings are per leg.

### Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC050SDA120BCT 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 MSC050SDA120BCT 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	$^\circ\text{C/W}$
$W_T$	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 MSC050SDA120BCT device.

**Table 3 • Static Characteristics**

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit	
$V_F$	Forward voltage	$I_F = 50\text{ A}, T_J = 25\text{ }^\circ\text{C}$		1.5	1.8	V
		$I_F = 50\text{ A}, T_J = 175\text{ }^\circ\text{C}$		2.1		
$I_{RM}$	Reverse leakage current	$V_R = 1200\text{ V}, T_J = 25\text{ }^\circ\text{C}$		15	200	$\mu\text{A}$
		$V_R = 1200\text{ V}, T_J = 175\text{ }^\circ\text{C}$		250		
$Q_C$	Total capacitive charge $V_R = 600\text{ V}, T_J = 25\text{ }^\circ\text{C}$		224		nC	
$C_J$	Junction capacitance $V_R = 400\text{ V}, T_J = 25\text{ }^\circ\text{C}, f = 1\text{ MHz}$		246		pF	
	Junction capacitance $V_R = 800\text{ V}, T_J = 25\text{ }^\circ\text{C}, f = 1\text{ MHz}$		182			

## Performance Curves

This section shows the typical performance curves for the MSC050SDA120BCT device.

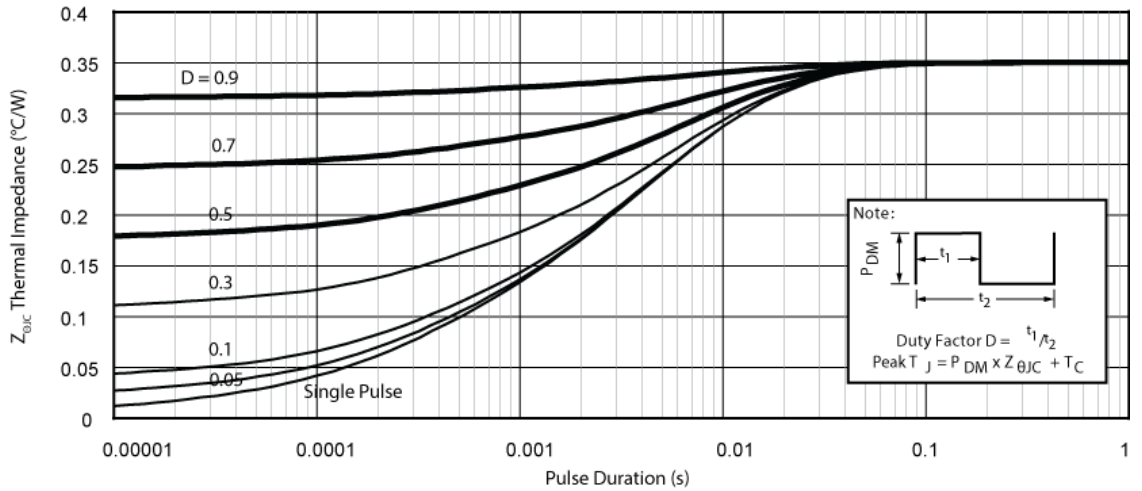


Figure 1 • Maximum Transient Thermal Impedance

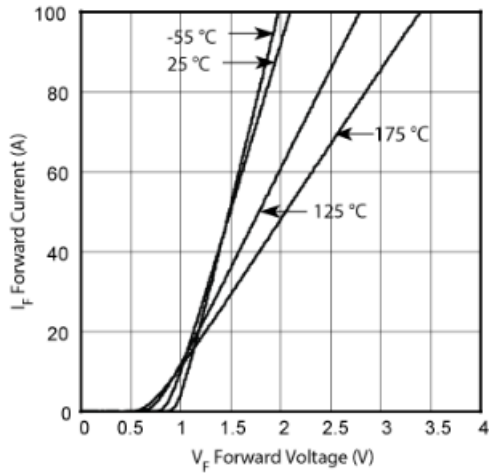


Figure 2 • Forward Current vs. Forward Voltage

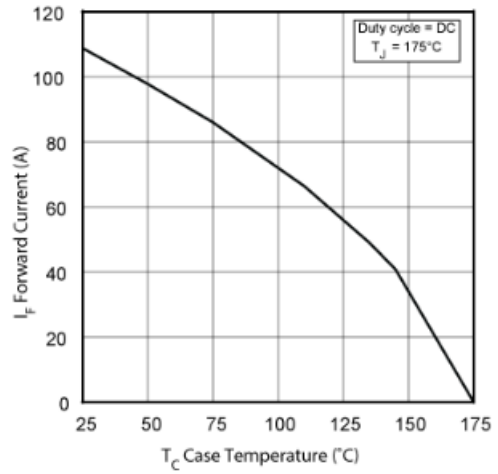


Figure 3 • Max Forward Current vs. Case Temp

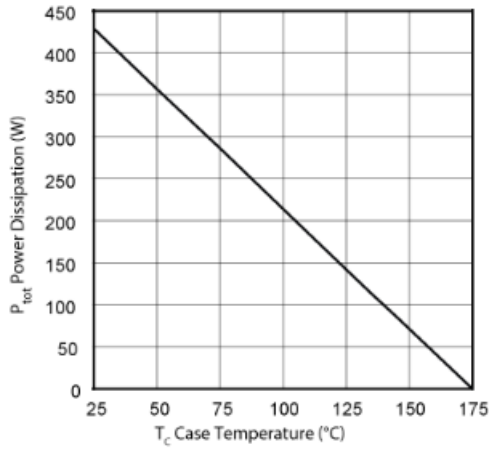


Figure 4 • Max Power Dissipation vs. Case Temp

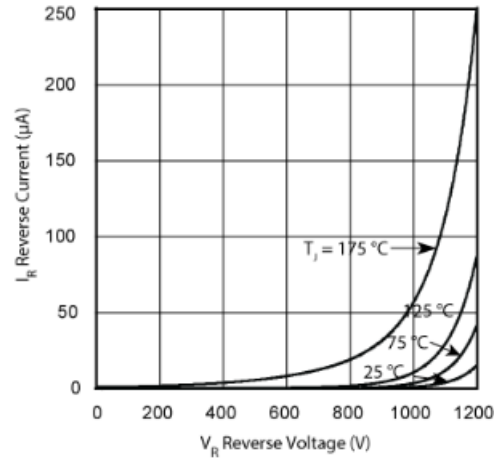


Figure 5 • Reverse Current vs. Reverse Voltage

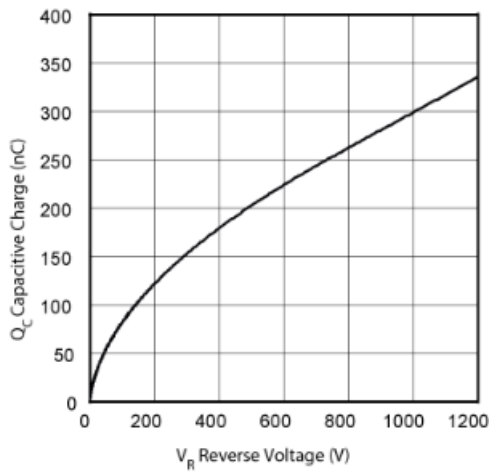


Figure 6 • Total Capacitive Charge vs. V<sub>R</sub>

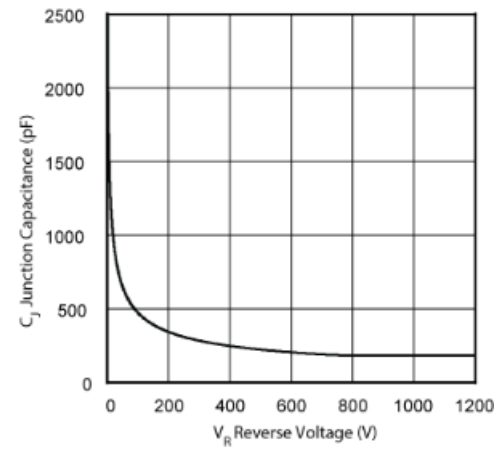


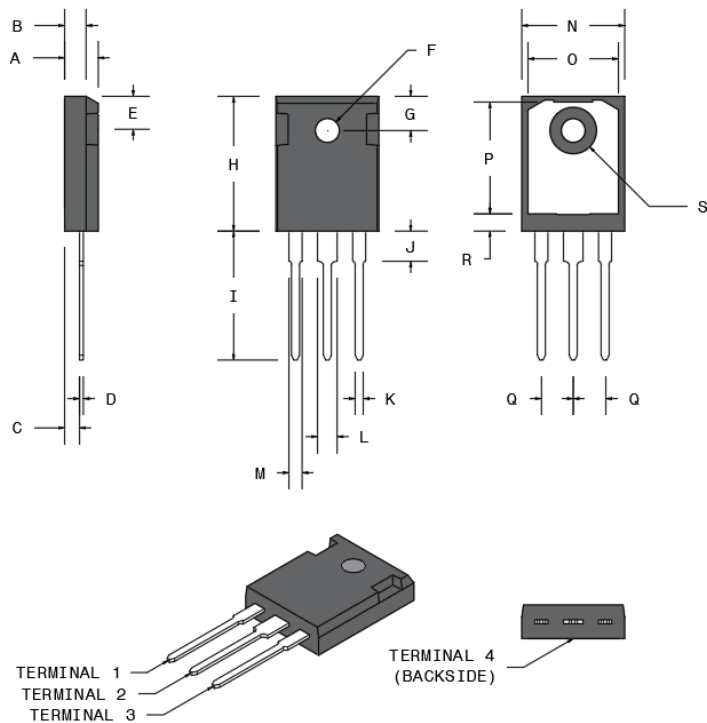
Figure 7 • Junction Capacitance vs. V<sub>R</sub>

## Package Specification

This section outlines the package specification for the MSC050SDA120BCT device.

### Package Outline Drawing

This section details the TO-247 package drawing of the MSC050SDA120BCT 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			

**Microsemi**

2355 W. Chandler Blvd.  
Chandler, AZ 85224 USA

Within the USA: +1 (480) 792-7200  
Fax: +1 (480) 792-7277

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