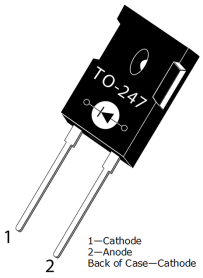
MSC010SDA170B Zero Recovery Silicon Carbide Schottky Diode

Product Overview

The silicon carbide (SiC) power Schottky barrier diode (SBD) product line from Microsemi increases the performance over silicon diode solutions while lowering the total cost of ownership for high-voltage applications. The MSC010SDA170B device is a 1700 V, 10 A SiC SBD in a TO-247 package.



Features

The following are key features of the MSC010SDA170B device:

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

Benefits

The following are benefits of the MSC010SDA170B device:

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

Applications

The MSC010SDA170B 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 device specifications for the MSC010SDA170B device.

Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC010SDA170B device. T_C = 25 °C unless otherwise specified.

Table 1 • Absolute Maximum Ratings

Symbol	Parameter		Ratings	Unit
V_R	Maximum DC reverse voltage		1700	V
V_{RRM}	Maximum peak repetitive reverse voltage		1700	
V_{RWM}	Maximum working peak reverse voltage		1700	
I_F	Maximum DC forward current	T_C = 25 °C	31	A
		T_C = 135 °C	14	
		T_C = 145 °C	12	
I_{FRM}	Repetitive peak forward surge current (T_C = 25 °C, t_p = 8.3 ms, half sine wave)		43	
I_{FSM}	Non-repetitive forward surge current (T_C = 25 °C, t_p = 8.3 ms, half sine wave)		90	
P_{tot}	Power dissipation	T_C = 25 °C	163	W
		T_C = 110 °C	71	
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 MSC010SDA170B device.

Table 2 • Thermal and Mechanical Characteristics

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		0.63	0.92	°C/W
T_J, T_{STG}	Operating junction and storage temperature range		–55 to 175		°C
T_L	Lead temperature for 10 seconds		300		°C
Wt	Package weight		0.22		oz
			6.2		g
	Mounting torque, 6-32 or M3 screw			10	lbf-in
				1.1	N-m

Electrical Performance

The following table shows the static characteristics of the MSC010SDA170B device.

Table 3 • Static Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_F	Forward voltage	I_F = 10 A, T_J = 25 °C		1.5	1.8	V
		I_F = 10 A, T_J = 175 °C		2.1		
I_{RM}	Reverse leakage current	V_R = 1700 V, T_J = 25 °C		4	200	µA
		V_R = 1700 V, T_J = 175 °C		10		
Q_C	Total capacitive charge	V_R = 900 V, T_J = 25 °C		84		nC
C_J	Junction capacitance	V_R = 1 V, T_J = 25 °C, ƒ = 1 MHz		820		pF
	Junction capacitance	V_R = 600 V, T_J = 25 °C, ƒ = 1 MHz		61		
	Junction capacitance	V_R = 900 V, T_J = 25 °C, ƒ = 1 MHz		51		

Typical Performance Curves

This section shows the typical performance curves of the MSC010SDA170B device.

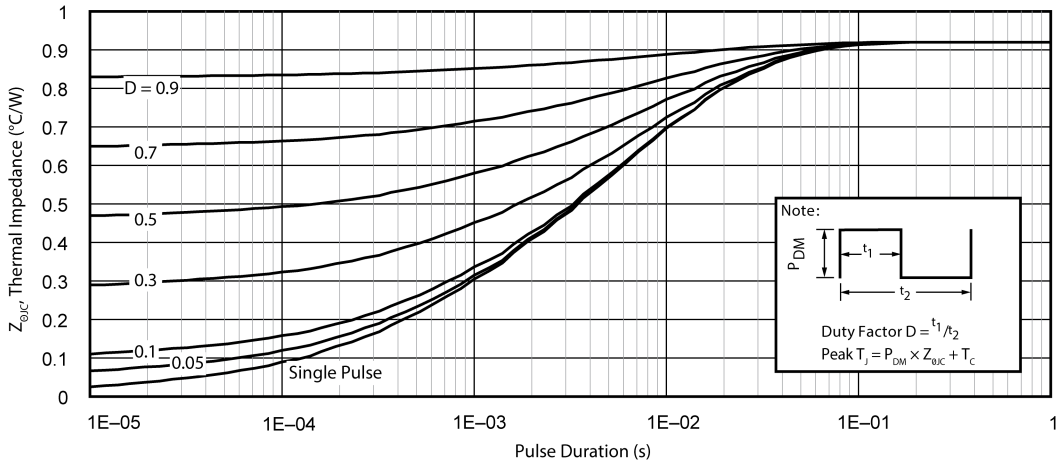


Figure 1 • Maximum Transient Thermal Impedance

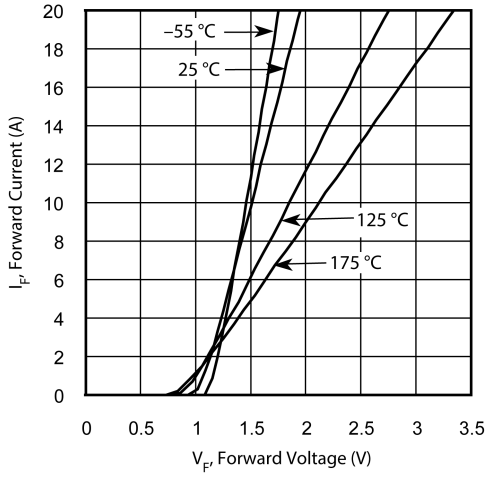


Figure 2 • Forward Current vs. Forward Voltage

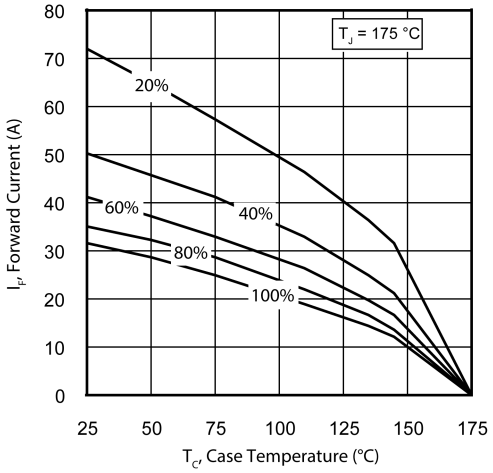


Figure 3 • Max. Forward Current vs. Case Temp.

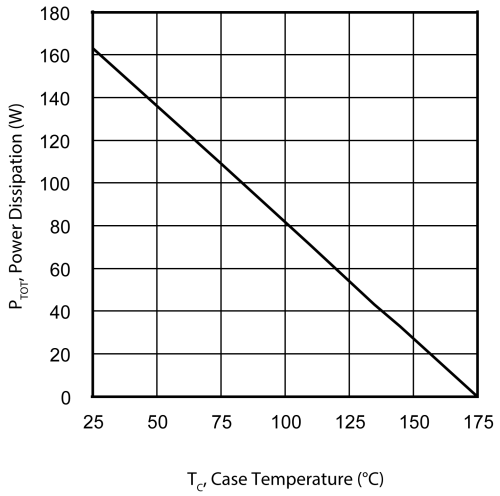


Figure 4 • Max. Power Dissipation vs. Case Temp.

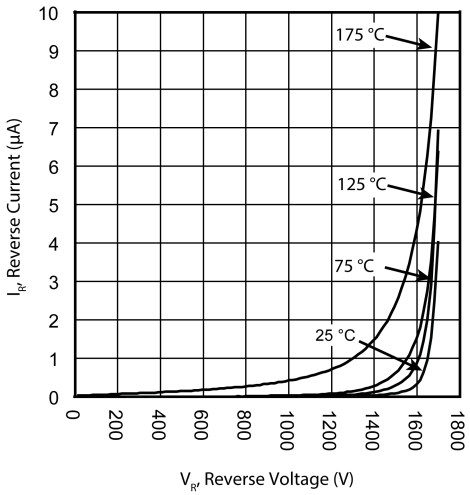


Figure 5 • Reverse Current vs. Reverse Voltage

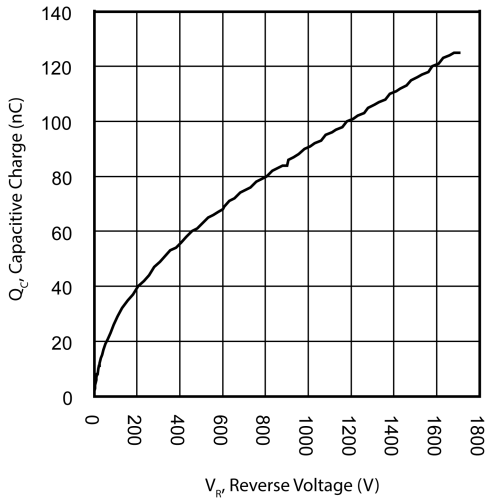


Figure 6 • Total Capacitive Charge vs. V_R

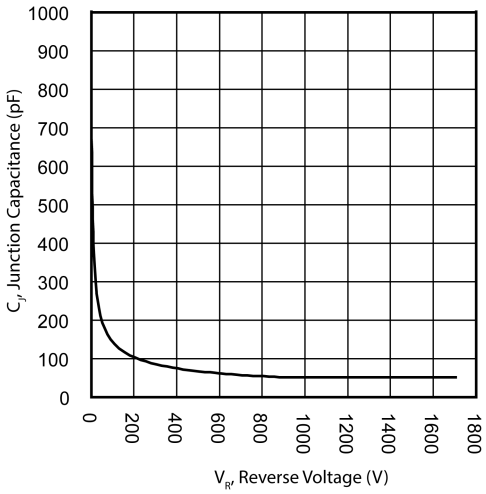


Figure 7 • Junction Capacitance vs. V_R

Package Specification

This section outlines the package specification for the MSC010SDA170B device.

Package Outline Drawing

This section shows the TO-247 package outline of the MSC010SDA170B device. The dimensions in the figure below are in millimeters and (inches).

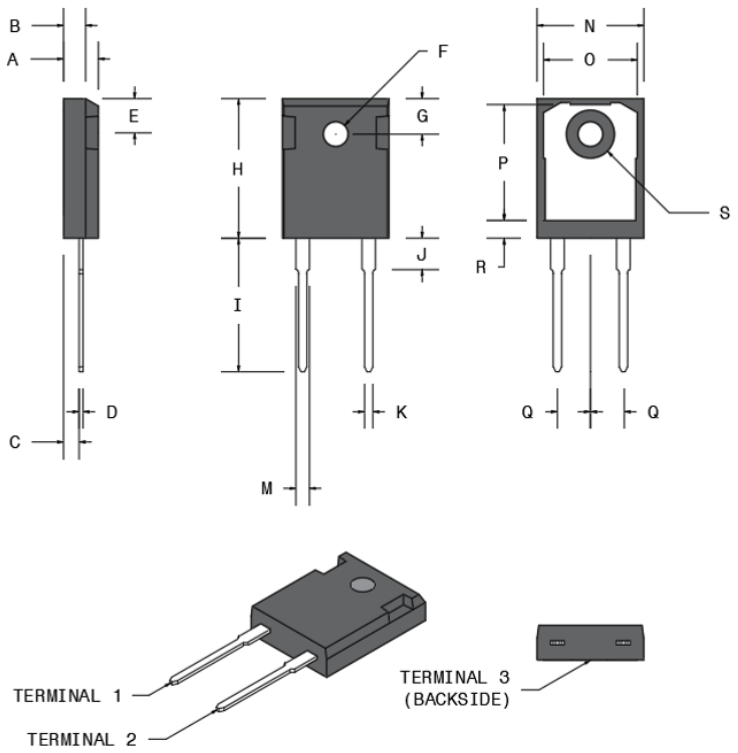


Figure 8 • Package Outline Drawing

The following table shows the MSC010SDA170B dimensions and should be used in conjunction with the package outline drawing.

Table 4 • TO-247 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

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
F	3.50	3.81	0.138	0.150
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	Cathode			
Terminal 2	Anode			
Terminal 3	Cathode			

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