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**Zero Recovery Silicon Carbide Schottky Diode**

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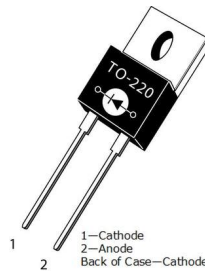
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**Product Overview**

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The silicon carbide (SiC) power Schottky barrier diode (SBD) product line from Microchip increases the performance over silicon diode solutions while lowering the total cost of ownership for high-voltage applications. The MSC010SDA070K device is a 700 V, 10 A SiC SBD in a two-lead TO-220 package.

**Features**

The following are key features of the MSC010SDA070K device:

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

**Benefits**

The following are benefits of the MSC010SDA070K device:

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

**Applications**

The MSC010SDA070K 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

## 1. Device Specifications

This section shows the specifications of the MSC010SDA070K device.

### 1.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MSC010SDA070K device.  $T_C = 25\text{ }^\circ\text{C}$  unless otherwise specified.

**Table 1-1. Absolute Maximum Ratings**

Symbol	Parameter	Ratings	Unit	
$V_R$	Maximum DC reverse voltage	700	V	
$V_{RRM}$	Maximum peak repetitive reverse voltage			
$V_{RWM}$	Maximum working peak reverse voltage			
$I_F$	Maximum DC forward current	$T_C = 25\text{ }^\circ\text{C}$	24	A
		$T_C = 135\text{ }^\circ\text{C}$	10	
		$T_C = 145\text{ }^\circ\text{C}$	8	
$I_{FRM}$	Repetitive peak forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)	34		
$I_{FSM}$	Non-repetitive forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)	58		
$P_{TOT}$	Total power dissipation	$T_C = 25\text{ }^\circ\text{C}$	83	W
		$T_C = 110\text{ }^\circ\text{C}$	36	
$E_{AS}$	Single-pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , peak $I_L = 10\text{ A}$ )	100	mJ	

The following table shows the thermal and mechanical characteristics of the MSC010SDA070K device.

**Table 1-2. Thermal and Mechanical Characteristics**

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		1.30	1.80	$^\circ\text{C/W}$
$T_J, T_{STG}$	Operating junction and storage temperature range	-55		175	$^\circ\text{C}$
$T_L$	Lead temperature for 10 seconds			300	
Wt	Package weight		0.07		oz
			1.9		g
	Mounting torque, 6-32 or M3 screw			10	lbf-in
				1.1	N-m

### 1.2 Electrical Performance

The following table shows the static characteristics of the MSC010SDA070K device.  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise specified.

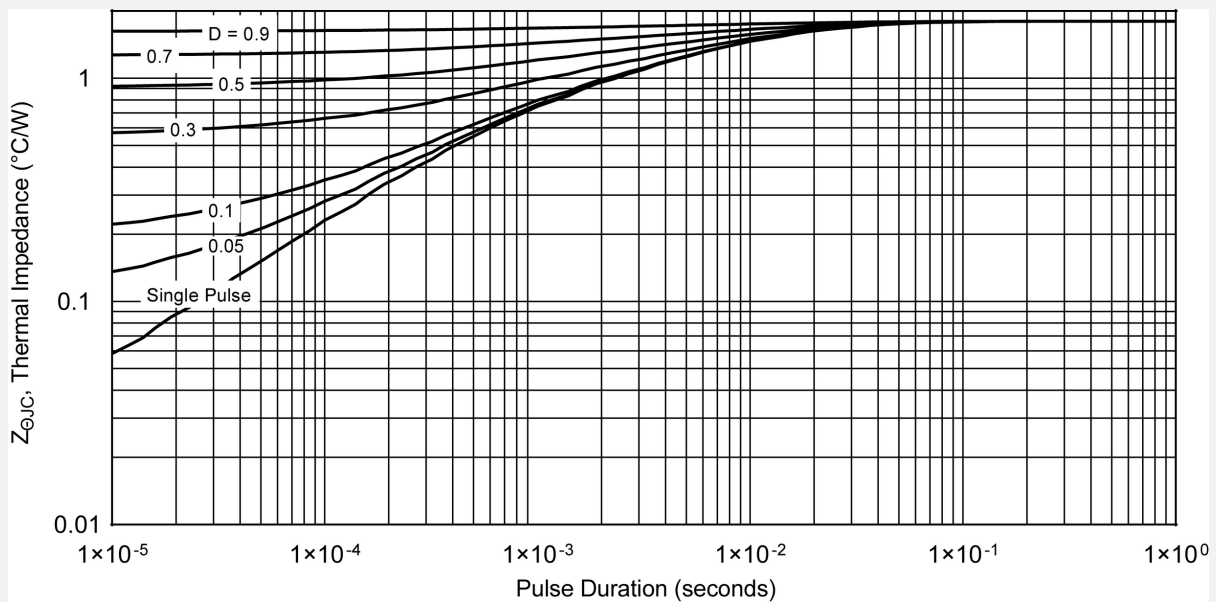
**Table 1-3. Static Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_F$	Forward voltage	$I_F = 10\text{ A}$ , $T_J = 25\text{ }^\circ\text{C}$		1.5	1.8	V
		$I_F = 10\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$		1.8		
$I_{RM}$	Reverse leakage current	$V_R = 700\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$		3	200	$\mu\text{A}$
		$V_R = 700\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$		15		
$Q_C$	Total capacitive charge	$V_R = 400\text{ V}$		27		nC
$C_J$	Junction capacitance	$V_R = 1\text{ V}$ , $f = 1\text{ MHz}$		353		pF
		$V_R = 200\text{ V}$ , $f = 1\text{ MHz}$		54		
		$V_R = 400\text{ V}$ , $f = 1\text{ MHz}$		46		

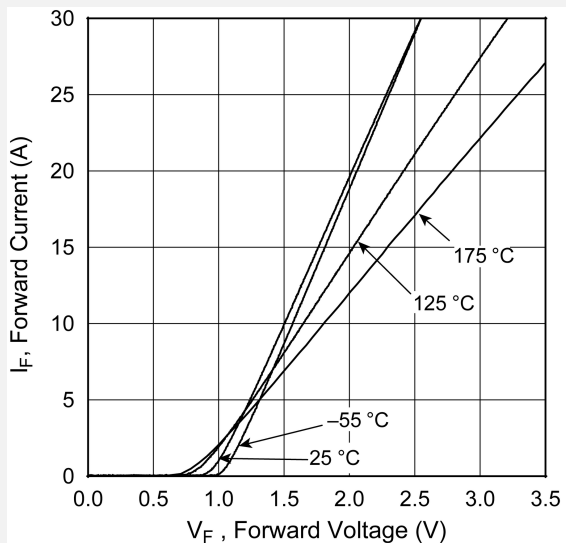
### 1.3 Typical Performance Curves

This section shows the typical performance curves of the MSC010SDA070K device.

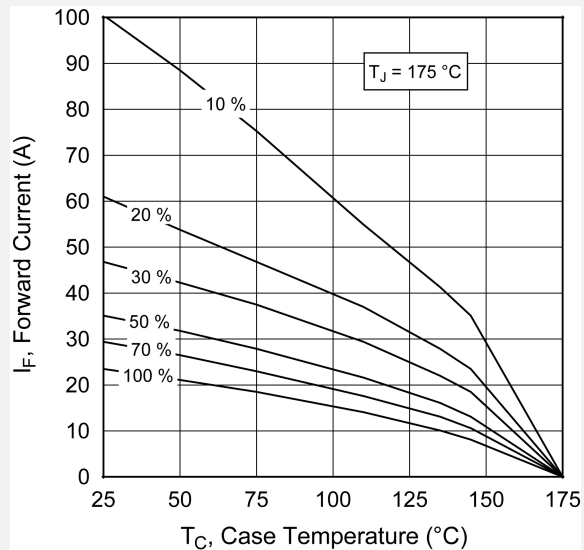
**Figure 1-1. Maximum Transient Thermal Impedance**



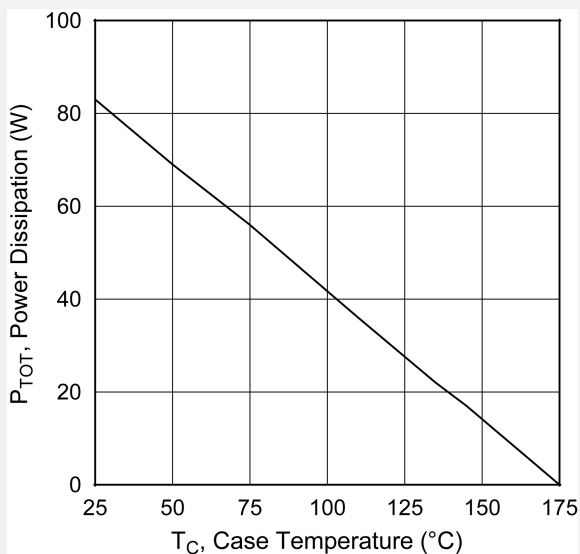
**Figure 1-2. Forward Current vs. Forward Voltage**



**Figure 1-3. Max. Forward Current vs. Case Temp.**



**Figure 1-4. Max. Power Dissipation vs. Case Temp.**



**Figure 1-5. Reverse Current vs. Reverse Voltage**

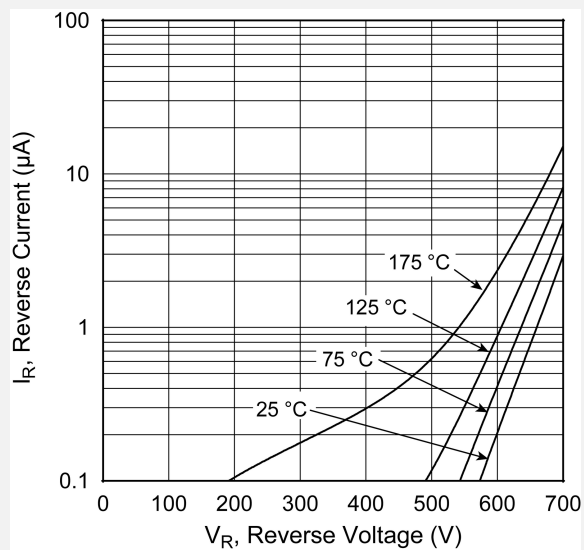


Figure 1-6. Total Charge vs. Reverse Voltage

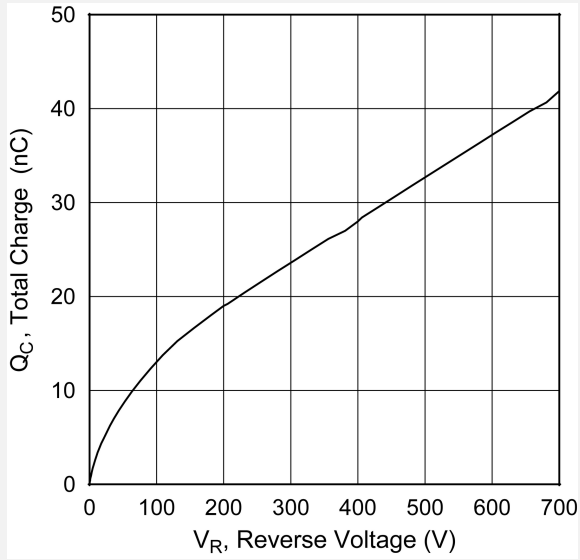
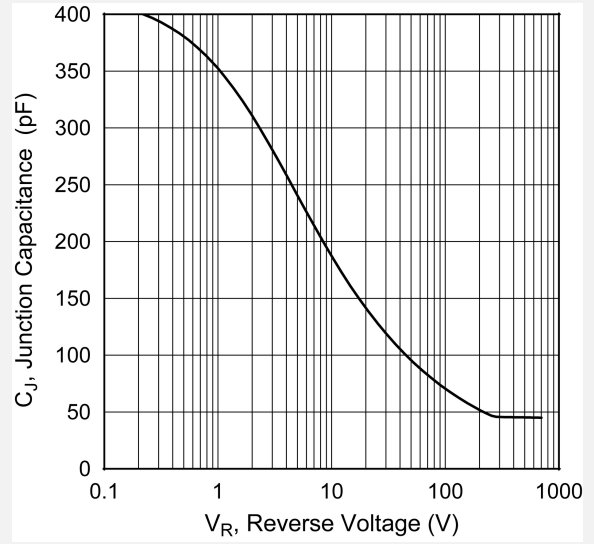


Figure 1-7. Capacitance vs. Reverse Voltage



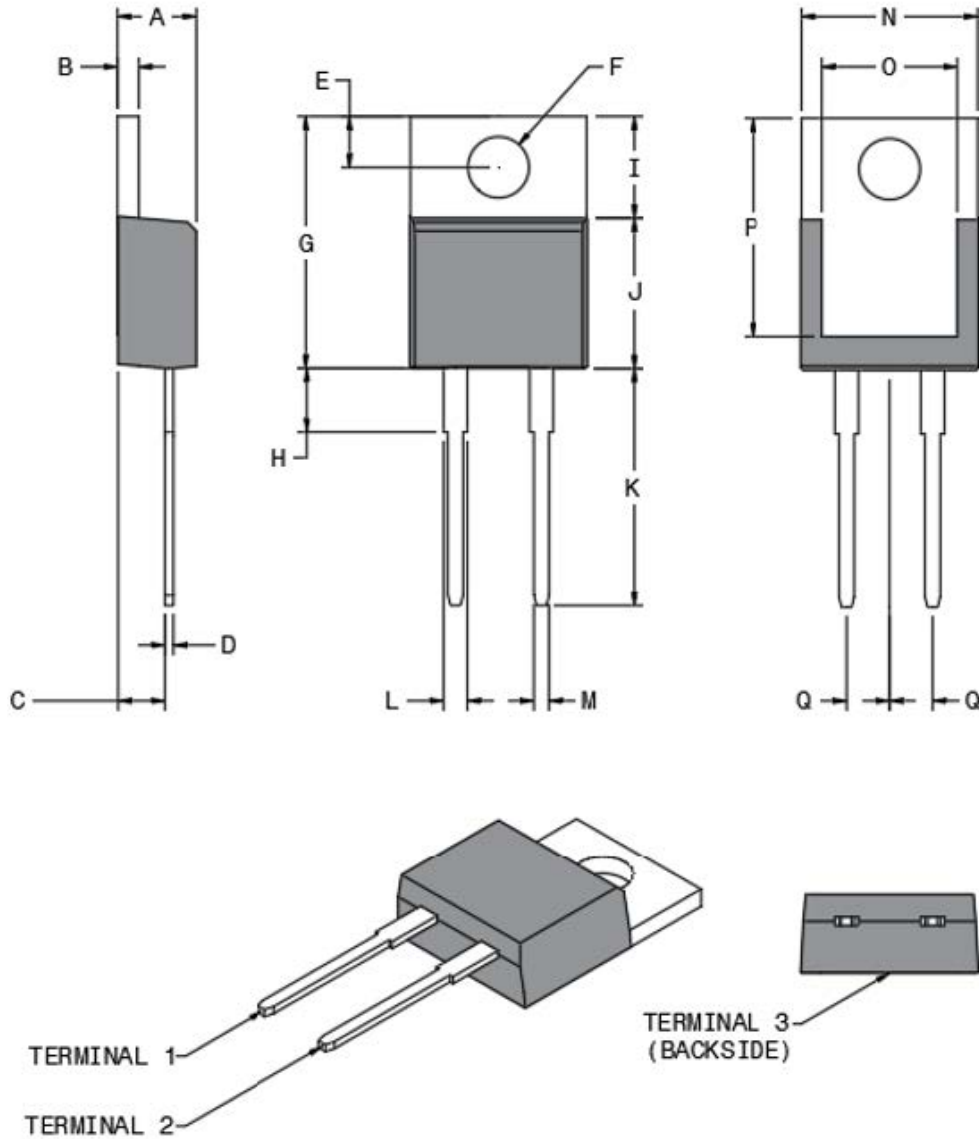
## 2. Package Specification

This section shows the package specification of the MSC010SDA070K device.

### 2.1 Package Outline Drawing

The following figure illustrates the TO-220 package outline of the MSC010SDA070K device.

**Figure 2-1. Package Outline Drawing**



The following table shows the TO-220 dimensions and should be used in conjunction with the package outline drawing.

# MSC010SDA070K

## Package Specification

**Table 2-1. TO-220 Dimensions**

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
A	4.32	4.57	0.170	0.180
B	1.14	1.40	0.045	0.055
C	2.50	2.74	0.098	0.108
D	0.36	0.53	0.014	0.021
E	2.65	3.05	0.104	0.120
F	3.60	3.96	0.142	0.156
G	14.50	15.60	0.571	0.614
H	2.39	3.65	0.094	0.144
I	6.00	6.80	0.236	0.268
J	8.40	9.00	0.331	0.354
K	13.00	14.00	0.512	0.051
L	1.23	1.39	0.048	0.055
M	0.69	0.88	0.027	0.035
N	10.00	10.36	0.394	0.408
O	7.57	7.90	0.298	0.311
P	12.20	13.10	0.480	0.516
Q	2.54 BSC (nom.)		0.100 BSC (nom.)	
Terminal 1	Cathode			
Terminal 2	Anode			
Terminal 3	Cathode			

### 3. Revision History

Table 3-1. Revision History

Revision	Date	Description
A	03/2021	Document migrated from Microsemi template to Microchip template; Assigned Microchip literature number DS-00003907A, which replaces the previous Microsemi literature number 053-4083.
Initial release (Microsemi Revision A)	12/2017	Document created.



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