

# MSC020SDA120K 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. MSC020SDA120K is a 1200 V, 20 A SiC SBD in a two-lead TO-220 package.



### Features

The following are key features of the MSC020SDA120K device:

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

### Benefits

The following are benefits of the MSC020SDA120K device:

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

### Applications

The MSC020SDA120K 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 shows the specifications of the MSC020SDA120K device.

### Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC020SDA120K device.  $T_C = 25\text{ }^\circ\text{C}$  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		1200	
$V_{RWM}$	Maximum working peak reverse voltage		1200	
$I_F$	Maximum DC forward current	$T_C = 25\text{ }^\circ\text{C}$	49	A
		$T_C = 135\text{ }^\circ\text{C}$	22	
		$T_C = 145\text{ }^\circ\text{C}$	18	
$I_{FRM}$	Repetitive peak forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)		64	
$I_{FSM}$	Non-repetitive forward surge current ( $T_C = 25\text{ }^\circ\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)		115	
$P_{TOT}$	Power dissipation	$T_C = 25\text{ }^\circ\text{C}$	186	W
		$T_C = 110\text{ }^\circ\text{C}$	80	
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , peak $I_L = 20\text{ A}$ )		100	mJ

The following table shows the thermal and mechanical characteristics of the MSC020SDA120K device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		0.65	0.95	°C/W
$T_J, T_{STG}$	Operating junction and storage temperature range	-55		175	°C
$T_L$	Lead temperature for 10 seconds		300		°C
Wt	Package weight		0.07		oz
			1.9		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 MSC020SDA120K device.  $T_J = 25\text{ °C}$  unless otherwise specified.

**Table 3 • Static Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_F$	Forward voltage	$I_F = 20\text{ A}$		1.5	1.8	V
		$I_F = 20\text{ A}, T_J = 175\text{ °C}$		2.1		
$I_{RM}$	Reverse leakage current	$V_R = 1200\text{ V}$		6	200	$\mu\text{A}$
		$V_R = 1200\text{ V}, T_J = 175\text{ °C}$		100		
$Q_C$	Total capacitive charge	$V_R = 600\text{ V}$		91		nC
$C_J$	Junction capacitance	$V_R = 1\text{ V}, f = 1\text{ MHz}$		1130		pF
	Junction capacitance	$V_R = 400\text{ V}, f = 1\text{ MHz}$		91		
	Junction capacitance	$V_R = 800\text{ V}, f = 1\text{ MHz}$		74		

## Typical Performance Curves

This section shows the typical performance curves of the MSC020SDA120K device.

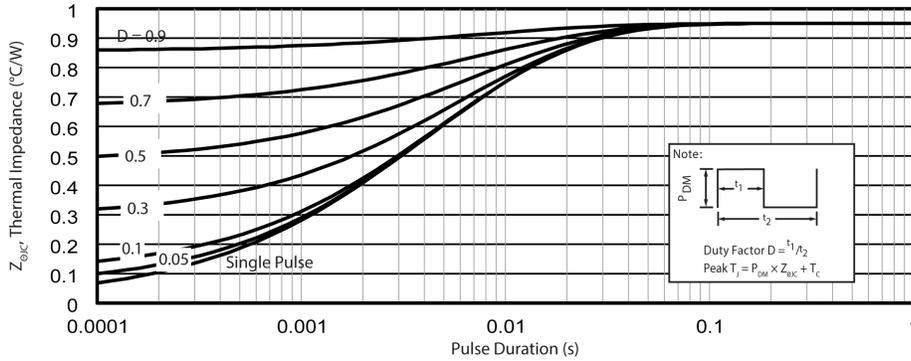


Figure 1 • Maximum Transient Thermal Impedance

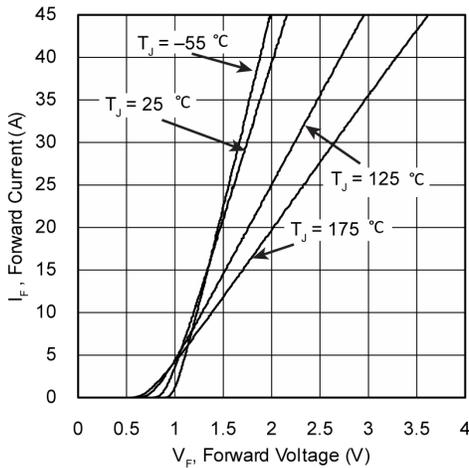


Figure 2 • Forward Current vs. Forward Voltage

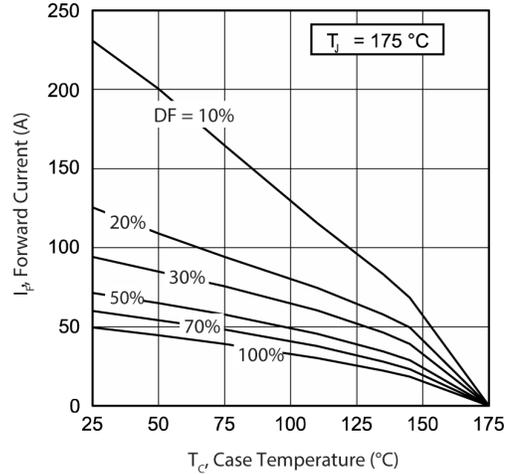


Figure 3 • Max. Forward Current vs. Case Temp.

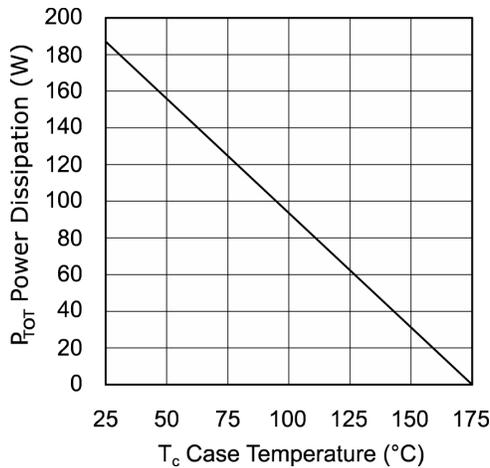


Figure 4 • Max. Power Dissipation vs. Case Temp.

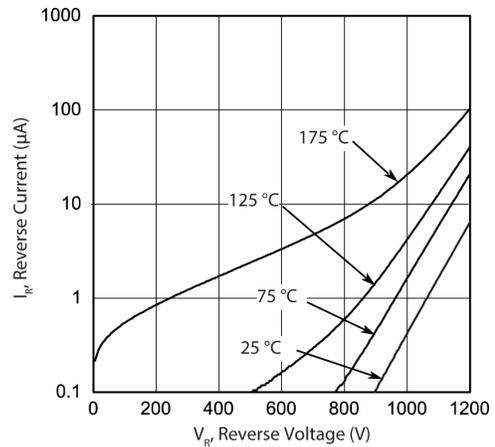


Figure 5 • Reverse Current vs. Reverse Voltage

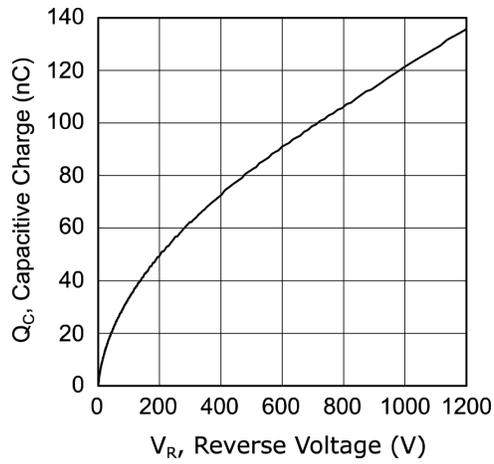


Figure 6 • Total Charge vs. Reverse Voltage

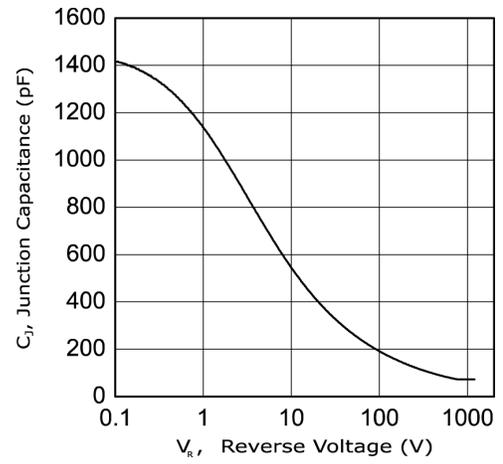


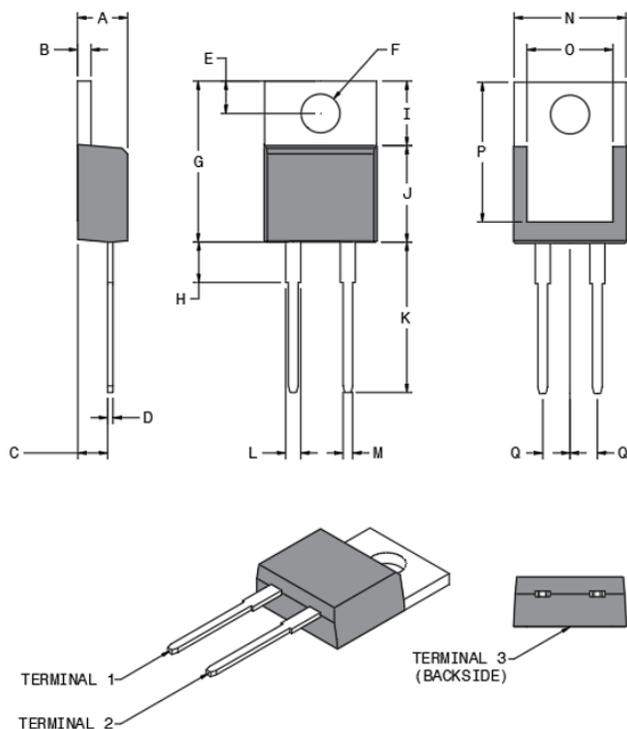
Figure 7 • Capacitance vs. Reverse Voltage

## Package Specification

This section shows the package specification of the MSC020SDA120K device.

### Package Outline Drawing

The following figure illustrates the TO-220 package outline of the MSC020SDA120K device.



**Figure 8 • Package Outline Drawing**

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

**Table 4 • 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

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
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			

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