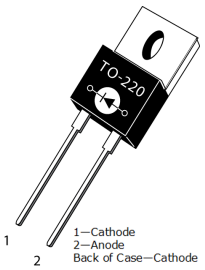
MSC020SDA120K Zero Recovery Silicon Carbide Schottky Diode

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 °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 °C	49	A
		T_C = 135 °C	22	
		T_C = 145 °C	18	
I_{FRM}	Repetitive peak forward surge current (T_C = 25 °C, t_p = 8.3 ms, half sine wave)		64	
I_{FSM}	Non-repetitive forward surge current (T_C = 25 °C, t_p = 8.3 ms, half sine wave)		115	
P_{TOT}	Power dissipation	T_C = 25 °C	186	W
		T_C = 110 °C	80	
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, peak I_L = 20 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 °C unless otherwise specified.

Table 3 • Static Characteristics

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

Typical Performance Curves

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

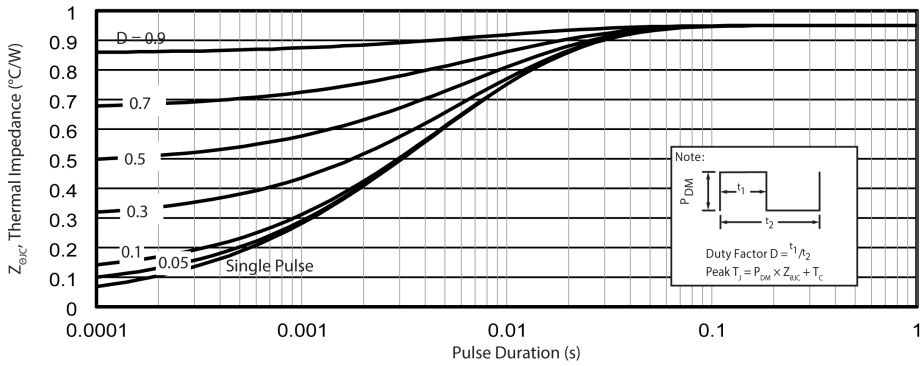


Figure 1 • Maximum Transient Thermal Impedance

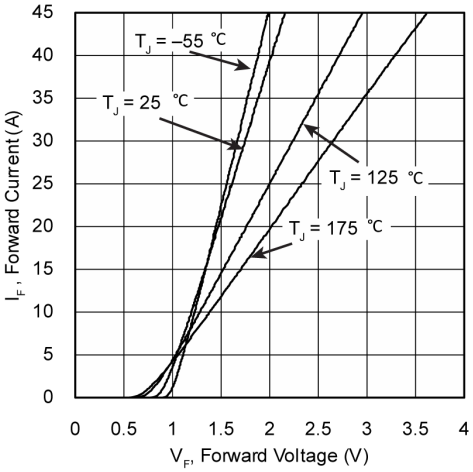


Figure 2 • Forward Current vs. Forward Voltage

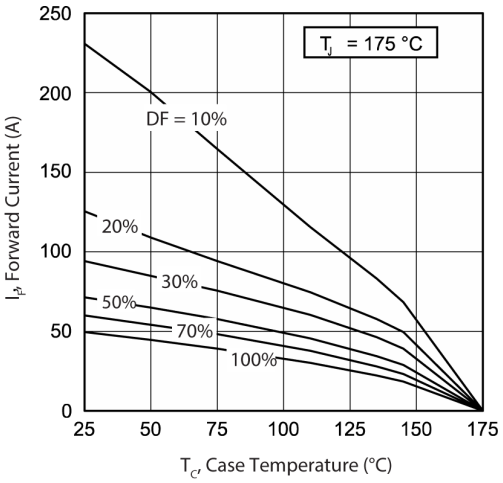


Figure 3 • Max. Forward Current vs. Case Temp.

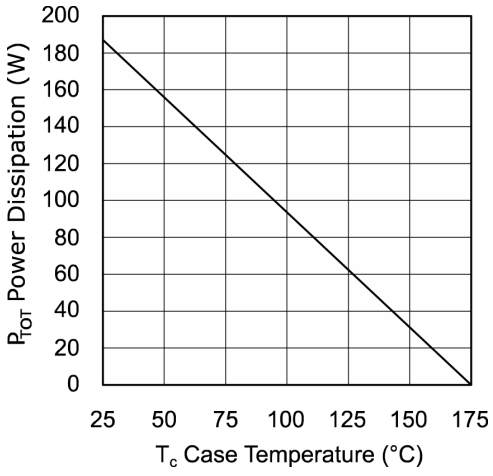


Figure 4 • Max. Power Dissipation vs. Case Temp.

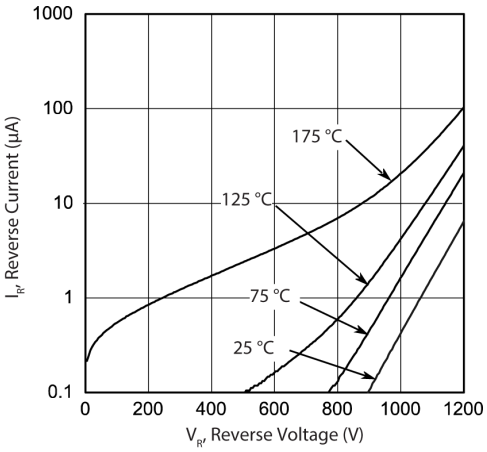


Figure 5 • Reverse Current vs. Reverse Voltage

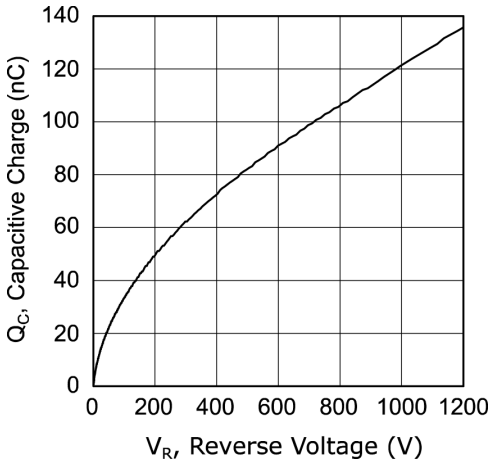


Figure 6 • Total Charge vs. Reverse Voltage

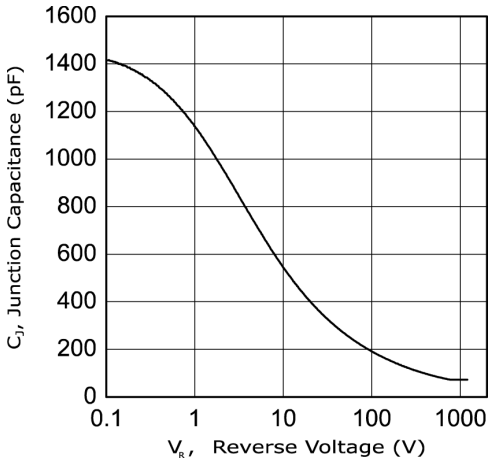


Figure 7 • Capacitance vs. Reverse Voltage

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.

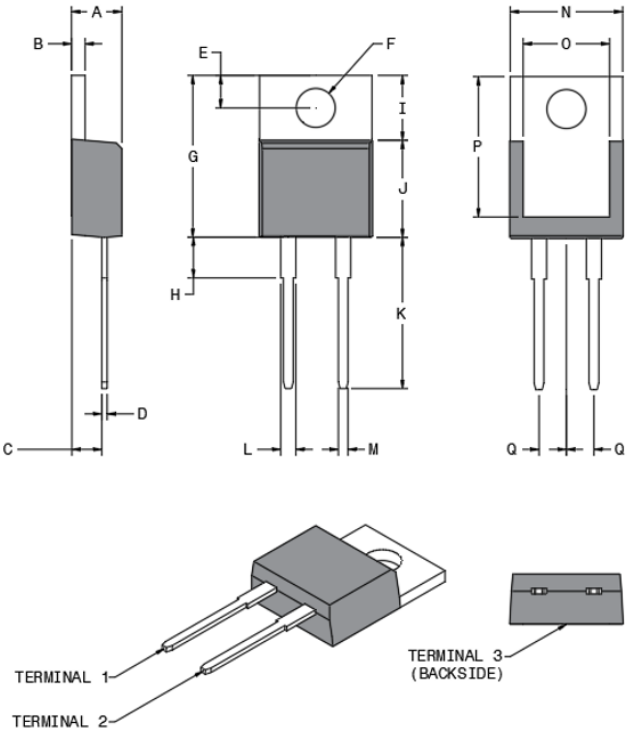


Figure 8 • Package Outline Drawing

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			

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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