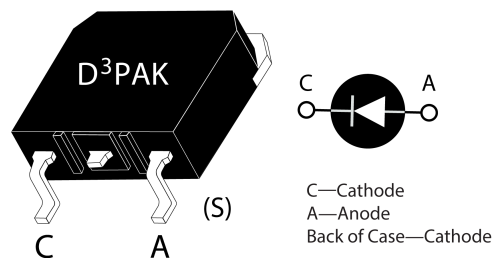


# MSC050SDA170S Zero Recovery Silicon Carbide Schottky Diode

## 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 MSC050SDA170S is a 1700 V, 50 A SiC SBD in a TO-268 (D3PAK) package.



### Features

The following are key features of the MSC050SDA170S device:

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

### Benefits

The following are benefits of the MSC050SDA170S device:

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

### Applications

The MSC050SDA170S 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 MSC050SDA170S device.

### Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the MSC050SDA170S device.  $T_C = 25\text{ }^{\circ}\text{C}$  and 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	$T_C = 25\text{ }^{\circ}\text{C}$	136	A
		$T_C = 135\text{ }^{\circ}\text{C}$	62	
		$T_C = 145\text{ }^{\circ}\text{C}$	51	
$I_{FRM}$	Repetitive peak forward surge current ( $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)		192	
$I_{FSM}$	Non-repetitive forward surge current ( $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 8.3\text{ ms}$ , half sine wave)		432	
$P_{TOT}$	Total power dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	652	W
		$T_C = 110\text{ }^{\circ}\text{C}$	283	
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$ , peak $I_L = 50\text{ A}$ )		100	mJ

The following table shows the thermal and mechanical characteristics of the MSC050SDA170S device.

**Table 2 • Thermal and Mechanical Characteristics**

Symbol	Characteristic/Test Conditions	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance		0.15	0.23	$^{\circ}\text{C}/\text{W}$
$T_J, T_{STG}$	Operating junction and storage temperature range	-55		175	$^{\circ}\text{C}$
$T_L$	Lead temperature for 10 seconds			300	
Wt	Package weight		0.14		oz
			4.0		g

## Electrical Performance

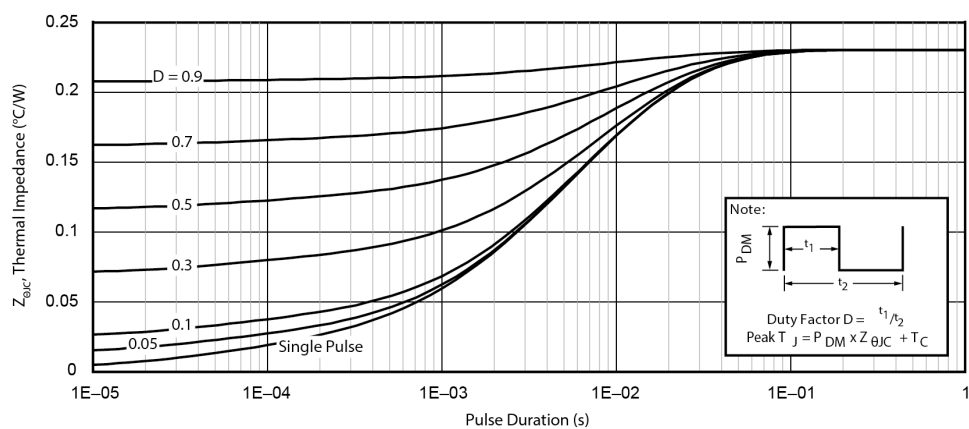
The following table shows the static characteristics of the MSC050SDA170S device.  $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

**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
		$I_F = 50\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$		2.0		
$I_{RM}$	Reverse leakage current	$V_R = 1700\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$		50	200	$\mu\text{A}$
		$V_R = 1700\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$		250		
$Q_C$	Total capacitive charge	$V_R = 900\text{ V}$		410		nC
$C_J$	Junction capacitance	$V_R = 1\text{ V}$ , $f = 1\text{ MHz}$		4450		pF
	Junction capacitance	$V_R = 600\text{ V}$ , $f = 1\text{ MHz}$		300		
	Junction capacitance	$V_R = 900\text{ V}$ , $f = 1\text{ MHz}$		250		

## Typical Performance Curves

This section shows the typical performance curves of the MSC050SDA170S device.



**Figure 1 • Maximum Transient Thermal Impedance**

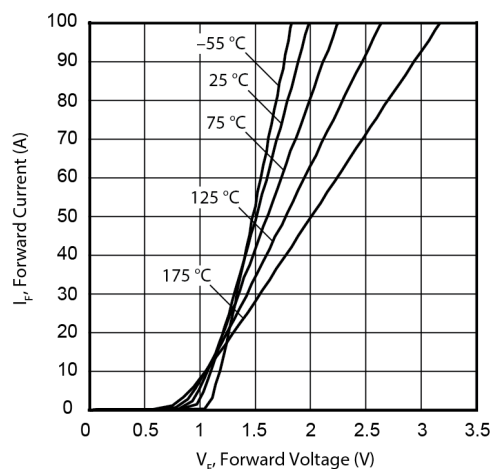


Figure 2 • Forward Current vs. Forward Voltage

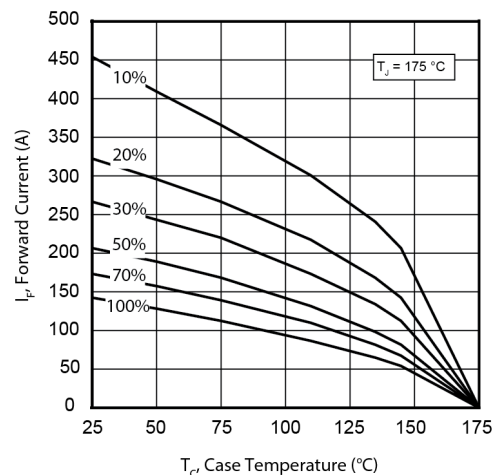


Figure 3 • Max. Forward Current vs. Case Temp.

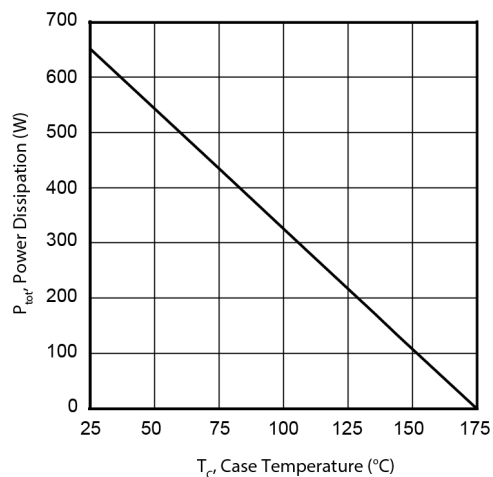


Figure 4 • Max. Power Dissipation vs. Case Temp.

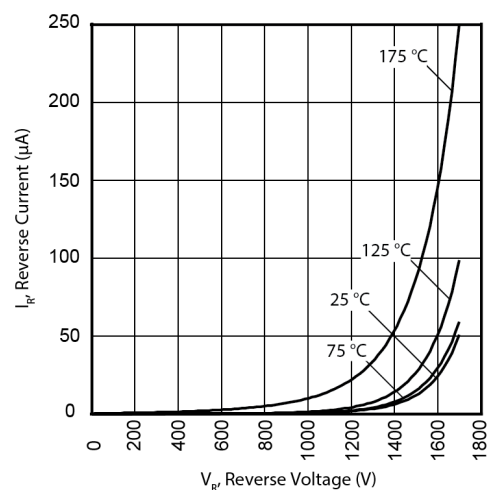


Figure 5 • Reverse Current vs. Reverse Voltage

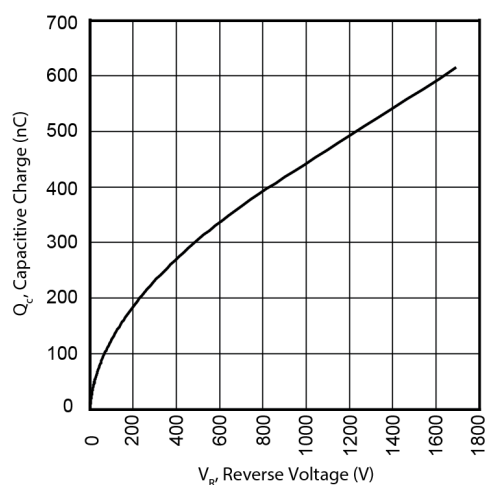


Figure 6 • Total Charge vs. Reverse Voltage

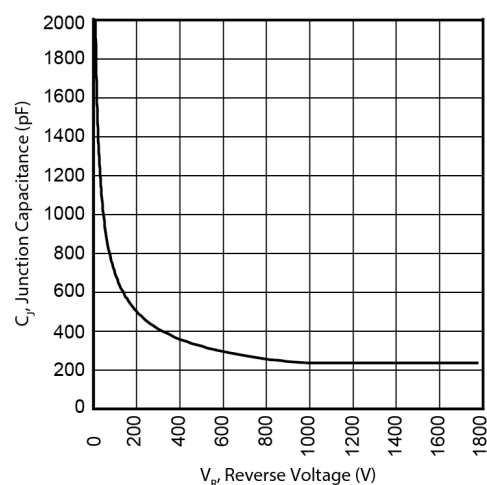


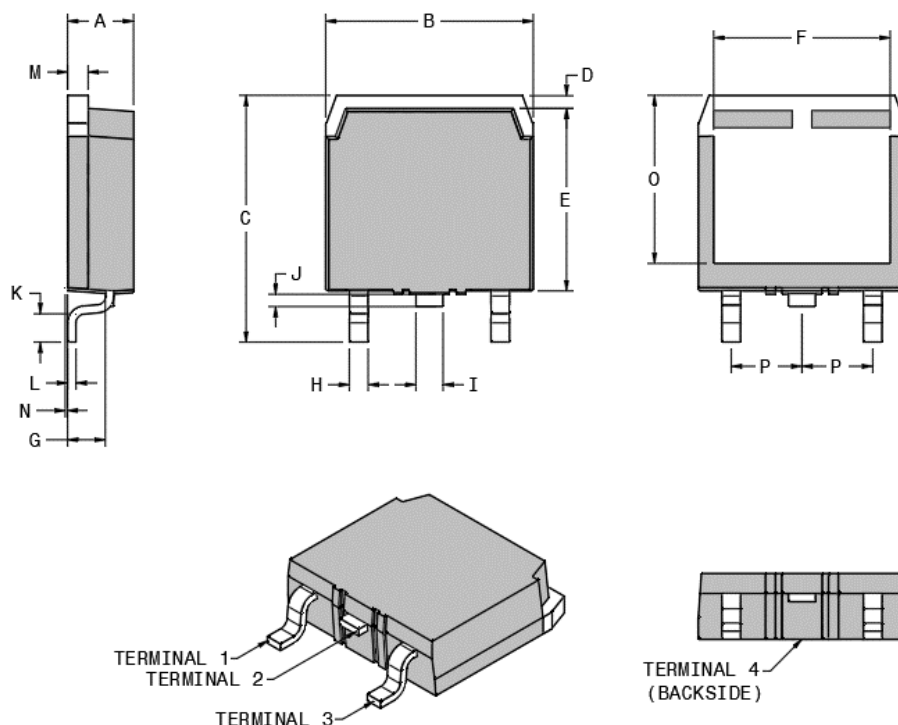
Figure 7 • Capacitance vs. Reverse Voltage

## Package Specification

This section shows the package specification of the MSC050SDA170S device.

### Package Outline Drawing

The following figure illustrates the TO-268 package outline of the MSC050SDA170S device.



**Figure 8 • Package Outline Drawing**

The following table shows the TO-268 dimensions and should be used in conjunction with the package outline drawing.

**Table 4 • TO-268 Dimensions**

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
A	4.90	5.10	0.193	0.201
B	15.85	16.20	0.624	0.638
C	18.70	19.10	0.736	0.752
D	1.00	1.25	0.039	0.049
E	13.80	14.00	0.543	0.551
F	13.30	13.60	0.524	0.535

Symbol	Min (mm)	Max (mm)	Min (in.)	Max (in.)
G	2.70	2.90	0.106	0.114
H	1.15	1.45	0.045	0.057
I	1.95	2.21	0.077	0.087
J	0.94	1.40	0.037	0.055
K	2.40	2.70	0.094	0.106
L	0.40	0.60	0.016	0.024
M	1.45	1.60	0.057	0.063
N	0.00	0.18	0.000	0.007
O	12.40	12.70	0.488	0.500
P	5.45 BSC (nom.)		0.215 BSC (nom.)	
Terminal 1	Cathode			
Terminal 2	Cathode			
Terminal 3	Anode			
Terminal 4	Cathode			

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