

**MSCDC450A170AG**  
**Datasheet**  
**SiC Diode Phase Leg Power Module**

December 2019



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a  **MICROCHIP** company

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# 1 Revision History

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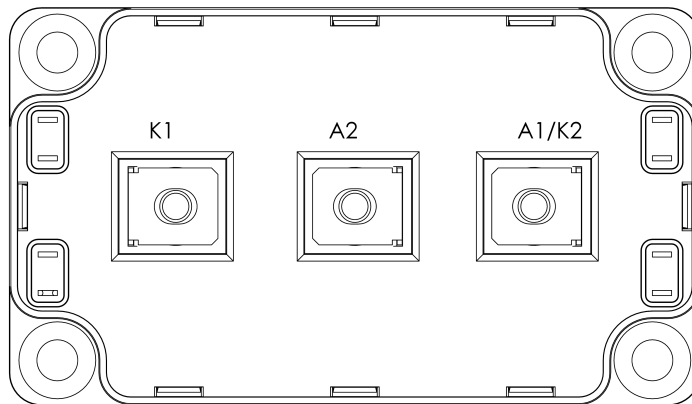
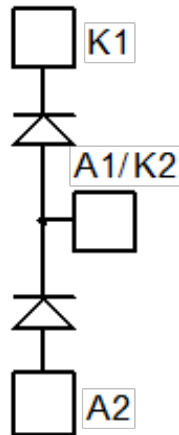
The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

## 1.1 Revision 1.0

Revision 1.0 was published in December 2019. It is the first publication of this document.

## 2 Product Overview

This section provides the product overview for the MSCDC450A170AG device.



All ratings at  $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified.

**Caution:** These devices are sensitive to electrostatic discharge. Proper handling procedures should be followed.

### 2.1 Features

The following are key features of the MSCDC450A170AG device:

- Silicon Carbide (SiC) Schottky diode
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature independent switching behavior
  - Positive temperature coefficient on VF
- Low stray inductance
- M5 power connectors
- High level of integration

- Aluminum nitride (AlN) substrate for improved thermal performance

## 2.2 Benefits

The following are benefits of the MSCDC450A170AG device:

- Outstanding performance at high frequency operation
- Low noise switching
- Direct mounting to heatsink (isolated package)
- Low junction-to-case thermal resistance
- RoHS compliant

## 2.3 Applications

The MSCDC450A170AG device is designed for the following applications:

- Uninterruptible power supply (UPS)
- Induction heating
- Welding equipment
- High-speed rectifiers

## 3 Electrical Specifications

This section provides the electrical specifications for the MSCDC450A170AG device.

### 3.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings per diode for the MSCDC450A170AG device.

**Table 1 • Absolute Maximum Ratings**

Symbol	Parameter		Max Ratings	Unit
$V_{RRM}$	Repetitive peak reverse voltage		1700	V
$I_F$	DC forward current	$T_C = 125\text{ }^{\circ}\text{C}$	450	A

The following table shows the Thermal and Package Characteristics of the MSCDC450A170AG device.

**Table 2 • Thermal and Package Characteristics**

Symbol	Characteristic			Min	Max	Unit
$V_{ISOL}$	RMS isolation voltage, any terminal to case $t = 1$ minute, 50 Hz/60 Hz			4000		V
$T_J$	Operating junction temperature range			-40	175	$^{\circ}\text{C}$
$T_{JOP}$	Recommended junction temperature under switching conditions			-40	$T_{Jmax} - 25$	
$T_{STG}$	Storage temperature range			-40	125	
$T_C$	Operating case temperature			-40	125	
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package weight				300	g

### 3.2 Electrical Performance

The following table shows the electrical characteristics per diode of the MSCDC450A170AG.

**Table 3 • Electrical Characteristics**

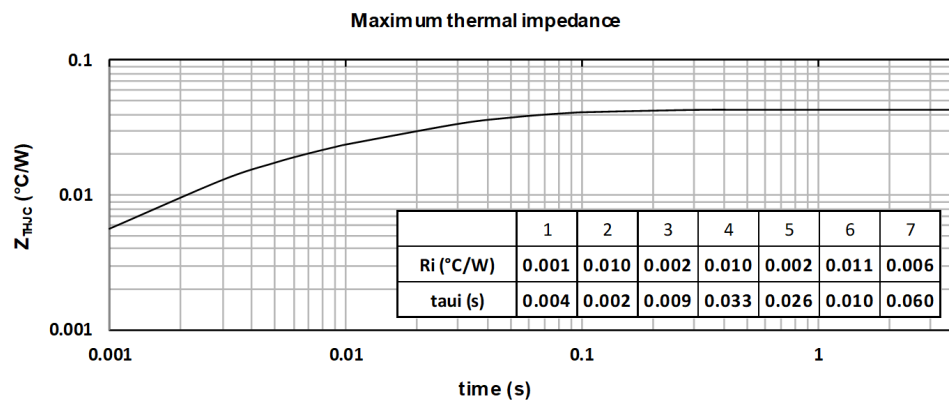
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$V_F$	Diode forward voltage	$I_F = 450\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$		1.5	1.8	V
			$T_J = 175\text{ }^{\circ}\text{C}$		2		
$I_{RM}$	Reverse leakage current	$V_R = 1700\text{ V}$	$T_J = 25\text{ }^{\circ}\text{C}$		0.45	1.8	mA

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
			T <sub>J</sub> = 175 °C		2.25		
Q <sub>C</sub>	Total capacitive charge	V <sub>R</sub> = 900 V			3.69		μC
C	Total capacitance	f = 1 MHz, V <sub>R</sub> = 600 V			2.7		nF
		f = 1 MHz, V <sub>R</sub> = 900 V			2.25		
R <sub>thJC</sub>	Junction-to-case thermal resistance					0.043	°C/W

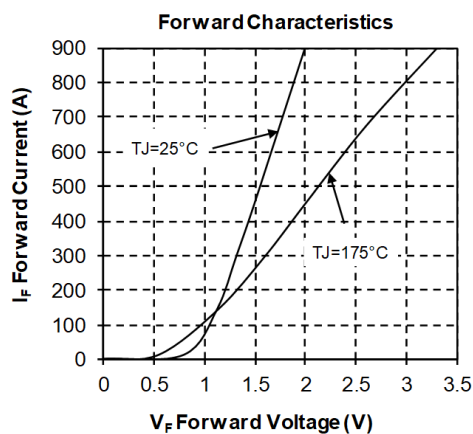
### 3.3 Typical Performance Curves

This section shows the typical performance curves for the MSCDC450A170AG device.

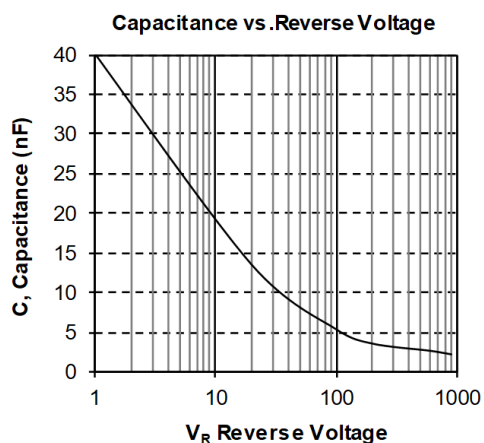
**Figure 1 • Maximum Transient Thermal Impedance**



**Figure 2 • Forward Current vs. Forward Voltage**



**Figure 3 • Capacitance vs. Reverse Voltage**





This section shows the package specifications for the MSCDC450A170AG device.

The following image illustrates the package outline of MSCDC450A170AG device. The dimensions in the following figure are in millimeters.



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