

MSCDC450A170AG
Datasheet
SiC Diode Phase Leg Power Module

December 2019



a  **MICROCHIP** company

Contents

1 Revision History.....	1
1.1 Revision 1.0.....	1
2 Product Overview.....	2
Features.....	2
Benefits.....	3
Applications.....	3
3 Electrical Specifications.....	4
Absolute Maximum Ratings.....	4
Electrical Performance.....	4
Typical Performance Curves.....	6
4 Package Specifications.....	7
Package Outline Drawing.....	7

1 Revision History

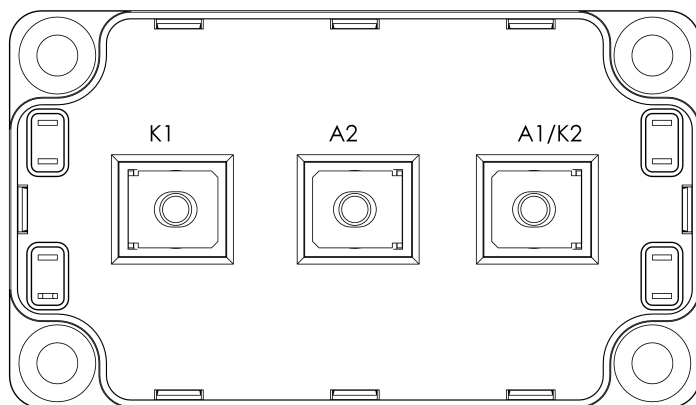
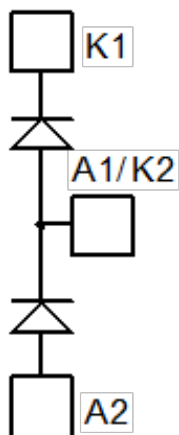
The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

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 _J = 175 °C		2.25		
Q _C	Total capacitive charge	V _R = 900 V			3.69		μC
C	Total capacitance	f = 1 MHz, V _R = 600 V			2.7		nF
		f = 1 MHz, V _R = 900 V			2.25		
R _{thJC}	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

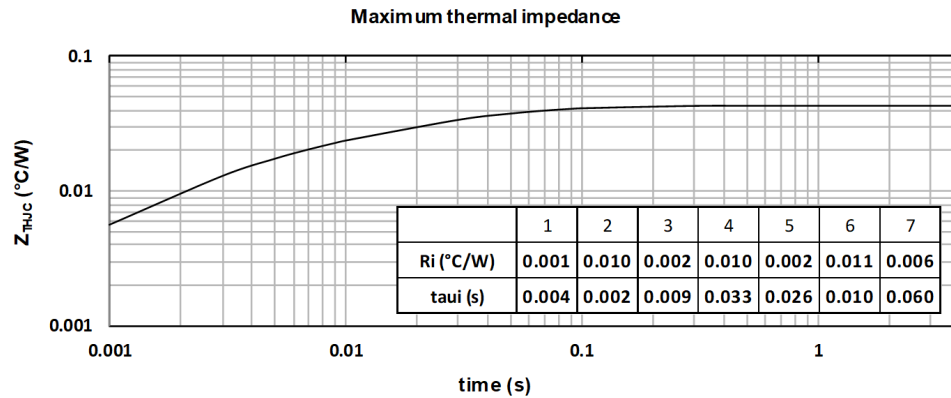


Figure 2 • Forward Current vs. Forward Voltage

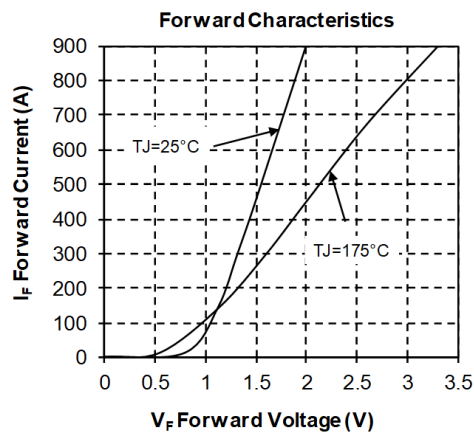
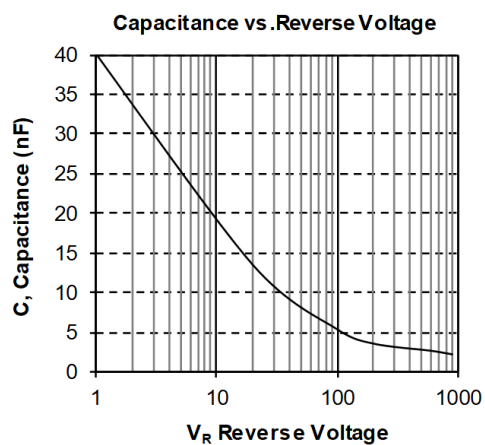


Figure 3 • Capacitance vs. Reverse Voltage



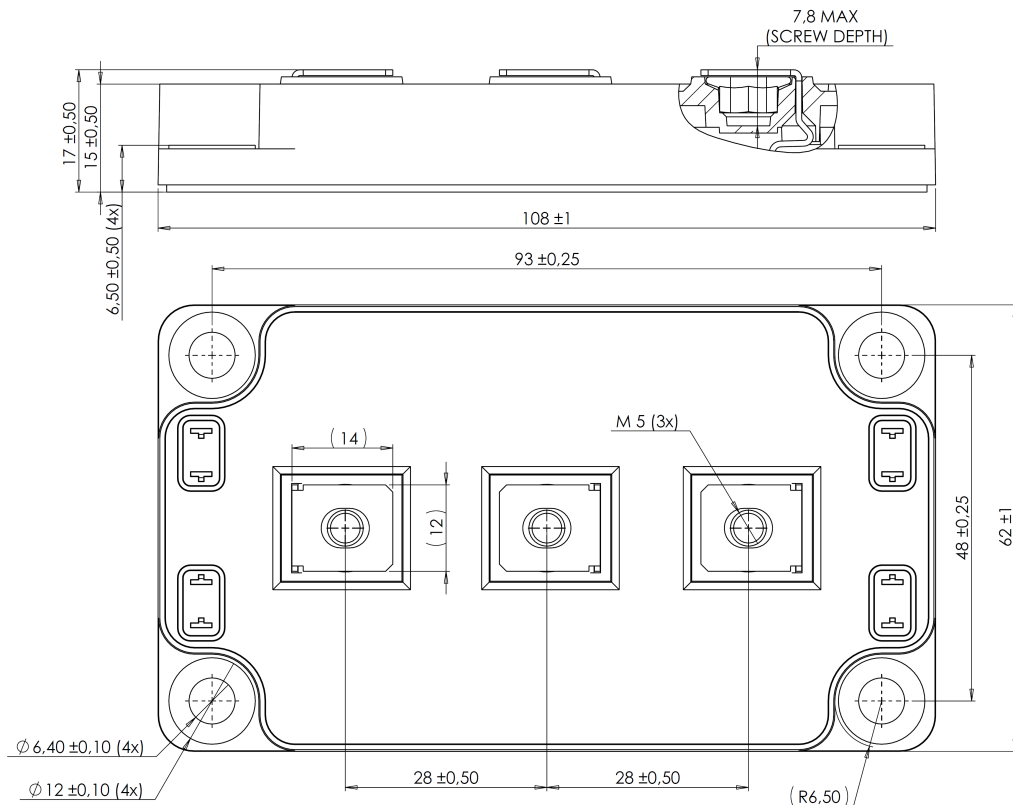
4 Package Specifications

This section shows the package specifications for the MSCDC450A170AG device.

4.1 Package Outline Drawing

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

Figure 4 • Package Outline Drawing





Microchip Technology Inc.
2355 West Chandler Blvd.
Chandler, Arizona, USA 85224-6199

Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996
Email: sales.support@microsemi.com
www.microsemi.com

© 2019 Microsemi. All rights reserved.
Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

Microsemi, a wholly owned subsidiary of Microchip Technology Inc. (Nasdaq: MCHP), offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Learn more at www.microsemi.com.

MSCC-0344-DS-01041-1.0-1219