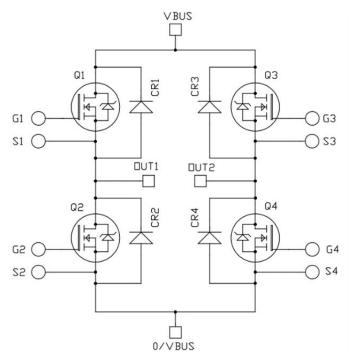
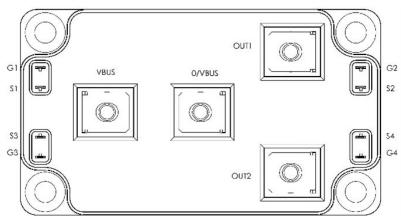
# MSCSM70HM05CAG

## **Full Bridge SiC Power Module**

## **Product Overview**

The MSCSM70HM05CAG device is a full bridge 700 V, 349 A silicon carbide (SiC) power module.





All ratings at  $T_J$  = 25 °C, unless otherwise specified.

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

#### **Features**

The following are key features of the MSCSM70HM05CAG device:

- · SiC Schottky Diode
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature independent switching behavior
  - Positive temperature coefficient on VF
- · SiC Power MOSFET
  - Low R<sub>DS(on)</sub>
  - High temperature performance
- · Kelvin emitter for easy drive
- · Low stray inductance
- · AIN substrate for improved thermal performance
- · M5 power connectors

#### **Benefits**

The following are benefits of the MSCSM70HM05CAG device:

- · High efficiency converter
- · Outstanding performance at high frequency operation
- · Stable temperature behavior
- · Direct mounting to heatsink (isolated package)
- · Low junction-to-case thermal resistance
- · RoHS compliant

#### **Application**

The MSCSM70HM05CAG device is designed for the following applications:

- · Welding converters
- · Switched mode power supplies
- · Uninterruptible power supplies
- EV motor and traction drive

## 1. Electrical Specifications

This section provides the electrical specifications of the MSCSM70HM05CAG device.

#### 1.1 SiC MOSFET Characteristics

The following table lists the absolute maximum ratings per SiC MOSFET of the MSCSM70HM05CAG device.

Table 1-1. Absolute Maximum Ratings

Symbol	Parameter		Maximum Ratings	Unit
$V_{DSS}$	Drain-Source vol	tage	700	V
I <sub>D</sub>		T <sub>C</sub> = 25 °C	349	Α
	drain current	T <sub>C</sub> = 80 °C	278	
I <sub>DM</sub>	Pulsed drain curr	ent	700	
V <sub>GS</sub>	Gate-Source voltage		-10/25	V
R <sub>DS(on)</sub>	Drain-Source ON resistance		6.4	mΩ
$P_D$	Power dissipation	T <sub>C</sub> = 25 °C	966	W

The following table lists the electrical characteristics per SiC MOSFET of the MSCSM70HM05CAG device.

**Table 1-2. Electrical Characteristics** 

Symbol	Characteristics	Test Conditions		Min	Тур	Max	Unit
I <sub>DSS</sub>	Zero gate voltage drain current	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 700 V		_	_	300	μА
R <sub>DS(on)</sub>	Drain-Source	V <sub>GS</sub> = 20 V	T <sub>J</sub> = 25 °C	_	5	6.4	mΩ
	on resistance	I <sub>D</sub> = 120 A	T <sub>J</sub> = 175 °C		6.3		
V <sub>GS(th)</sub>	Gate threshold voltage	$V_{GS} = V_{DS}$ , $I_D = 12 \text{ mA}$		1.9	2.4	_	V
I <sub>GSS</sub>	Gate–Source leakage current	V <sub>GS</sub> = 20 V, V <sub>DS</sub> =	0 V	_	_	300	nA

The following table lists the dynamic characteristics per SiC MOSFET of the MSCSM70HM05CAG device.

**Table 1-3. Dynamic Characteristics** 

Symbol	Characteristics	Test Conditions		Min	Тур	Max	Unit
C <sub>iss</sub>	Input capacitance	V <sub>GS</sub> = 0 V		_	13.5	_	nF
C <sub>oss</sub>	Output capacitance	V <sub>DS</sub> = 700 V		_	1.5	_	
C <sub>rss</sub>	Reverse transfer capacitance	f = 1 MHz		_	0.09	_	
Qg	Total gate charge	V <sub>GS</sub> = -5 V/20 V		_	645	_	nC
Q <sub>gs</sub>	Gate-Source charge	V <sub>Bus</sub> = 470 V		_	174	_	
$Q_{gd}$	Gate-Drain charge	I <sub>D</sub> = 120 A		_	105	_	
T <sub>d(on)</sub>	Turn-on delay time	V <sub>GS</sub> = -5 V/20 V		_	78	_	ns
T <sub>r</sub>	Rise time	V <sub>Bus</sub> = 400 V		_	125	_	
T <sub>d(off)</sub>	Turn-off delay time	$I_D = 240 \text{ A}; T_J = 1$	50 °C	_	214	_	
T <sub>f</sub>	Fall time	$R_{G(ON)} = 9.4 \Omega; R$	$G(OFF) = 5.4 \Omega$	_	92	_	
E <sub>on</sub>	Turn-on energy	V <sub>GS</sub> = -5 V/20 V	T <sub>J</sub> = 150 °C	_	3	_	mJ
E <sub>off</sub>	Turn-off energy	$V_{Bus} = 400 \text{ V}$ $I_{D} = 240 \text{ A}$ $R_{G(ON)} = 9.4 \Omega$ $R_{G(OFF)} = 5.4 \Omega$	T <sub>J</sub> = 150 °C	_	5.3	_	mJ
R <sub>Gint</sub>	Internal gate resistance				1.9	_	Ω
R <sub>thJC</sub>	Junction-to-case thern	nal resistance		_	_	0.155	°C/W

The following table lists the body diode ratings and characteristics per SiC MOSFET of the MSCSM70HM05CAG device.

Table 1-4. Body Diode Ratings and Characteristics

Symbol	Characteristics	Test Conditions	Min	Тур	Max	Unit
$V_{SD}$	Diode forward	V <sub>GS</sub> = 0 V; I <sub>SD</sub> = 120 A	_	3.4	_	V
	voltage	$V_{GS} = -5 \text{ V}; I_{SD} = 120 \text{ A}$	_	3.8	_	
t <sub>rr</sub>	Reverse recovery time	$I_{SD} = 120 \text{ A}$ $V_{GS} = -5 \text{ V}$	_	40	_	ns
Q <sub>rr</sub>	Reverse recovery charge	V <sub>R</sub> = 400 V		1.5	_	μC
Irr	Reverse recovery current	di <sub>F</sub> /dt = 3000 A/μs	_	57	_	A

### 1.2 SiC Schottky Diode and Characteristics

The following table lists the SiC diode ratings and characteristics per SiC diode of the MSCSM70HM05CAG device.

Table 1-5. SiC Schottky Diode Ratings and Characteristics

Symbol	Characteristics	Test Conditions		Min	Тур	Max	Unit
$V_{RRM}$	Peak repetitive revers	e voltage		_	_	700	V
I <sub>RRM</sub>	Reverse leakage	V <sub>R</sub> = 700 V	T <sub>J</sub> = 25 °C	_	45	600	μA
	current		T <sub>J</sub> = 175 °C	_	750	_	
I <sub>F</sub>	DC forward current	_	T <sub>C</sub> = 65 °C	_	150	_	Α
V <sub>F</sub>	Diode forward		T <sub>J</sub> = 25 °C	_	1.5	1.8	V
	voltage		T <sub>J</sub> = 175 °C	_	1.9	_	
$Q_{\mathbb{C}}$	Total capacitive charge	V <sub>R</sub> = 400 V	_	_	399	_	nC
С	Total capacitance	f = 1 MHz, V <sub>R</sub> = 200 V		_	744	_	pF
		f = 1 MHz, V <sub>R</sub> = 400 V		_	648	_	
R <sub>thJC</sub>	Junction-to-case therr	mal resistance		_	_	0.326	°C/W

### 1.3 Thermal and Package Characteristics

The following table lists the thermal and package characteristics of MSCSM70HM05CAG device.

Table 1-6. Thermal and Package Characteristics

Symbol	Characteristic	Characteristics				Unit
V <sub>ISOL</sub>	RMS isolation	voltage, any term	inal to case t =1 min,	4000	_	V
	50 Hz/60 Hz					
T <sub>J</sub>	Operating junc	tion temperature	range	-40	175	°C
T <sub>JOP</sub>	Recommended conditions	Recommended junction temperature under switching conditions			T <sub>Jmax</sub> –25	
T <sub>STG</sub>	Storage tempe	Storage temperature range				
T <sub>C</sub>	Operating case	temperature		-40	125	
Torque	Mounting	To heatsink	M6	3	5	N.m
	torque	For terminals	M5	2	3.5	
Wt	Package weigh	Package weight			300	g

#### 1.4 Typical SiC MOSFET Performance Curve

This section shows the typical SiC MOSFET performance curves of the MSCSM70HM05CAG device.

Figure 1-1. Maximum Thermal Impedance

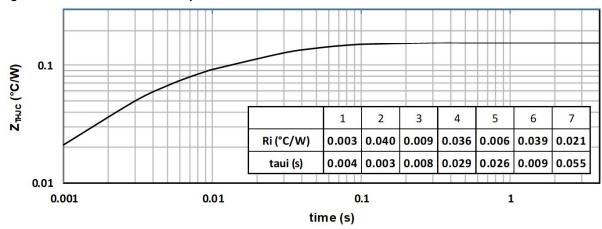


Figure 1-2. Output Characteristics,  $T_J = 25$  °C

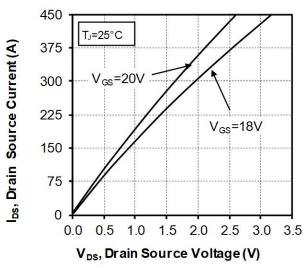


Figure 1-3. Output Characteristics, T<sub>J</sub> = 175 °C

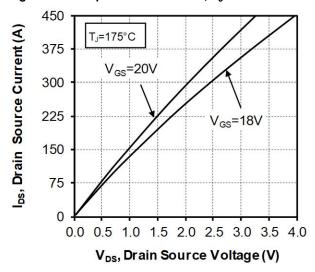


Figure 1-4. Normalized R<sub>DS(on)</sub> vs. Temperature

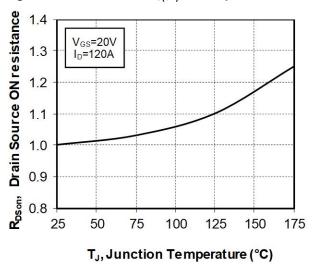


Figure 1-5. Transfer Characteristics

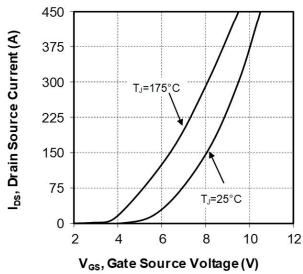


Figure 1-6. Capacitance vs. Drain Source Voltage

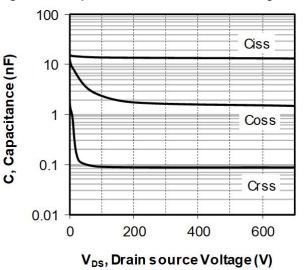


Figure 1-7. Gate Charge vs. Gate Source Voltage

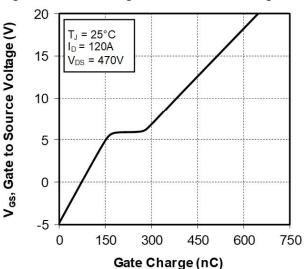


Figure 1-8. Body Diode Characteristics, T<sub>J</sub> = 25 °C

-5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5

(Y)

V<sub>GS</sub>=-5V

-75

V<sub>GS</sub>=-2V

-300

V<sub>DS</sub>, Drain s ource voltage (V)

Figure 1-10. Body Diode Characteristics, T<sub>J</sub> = 175 °C

Figure 1-9. 3rd Quadrant Characteristics, T<sub>J</sub> = 25 °C -5 -2 0 T<sub>J</sub>=25°C l<sub>DS</sub>, Drain source current (A) -75 V<sub>GS</sub>=0V -150 V<sub>GS</sub>=5V -225-300 V<sub>GS</sub>=18V V<sub>GS</sub>=20V -375 -450V<sub>DS</sub>, Drain source voltage (V)

-4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0

V<sub>GS</sub>=-5V

V<sub>GS</sub>=-2V

-300

V<sub>DS</sub>, Drain source voltage (V)

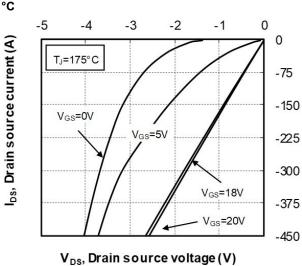


Figure 1-11. 3rd Quadrant Characteristics,  $T_J = 175$ 

Figure 1-12. Switching Energy vs. Current

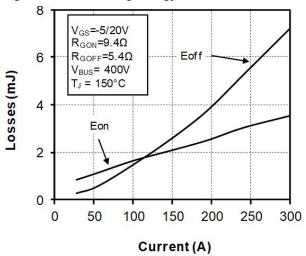


Figure 1-13. Turn On Energy vs. Rg

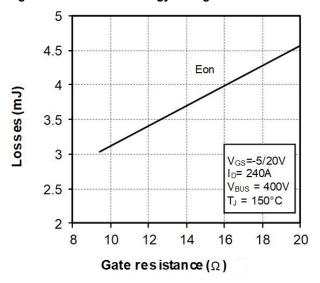


Figure 1-14. Turn Off Energy vs. Rg

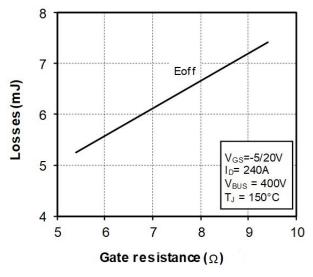
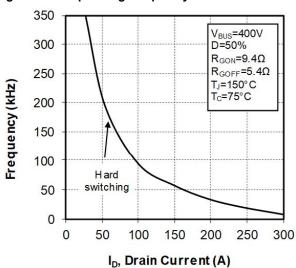


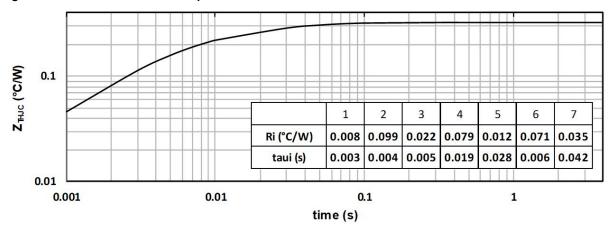
Figure 1-15. Operating Frequency vs. Drain Current



#### 1.5 Typical SiC Diode Performance Curve

This section shows the typical SiC diode performance curves of MSCSM70HM05CAG device.

Figure 1-16. Maximum Thermal Impedance



C, Capacitance (nF)

Figure 1-17. Forward Characteristics

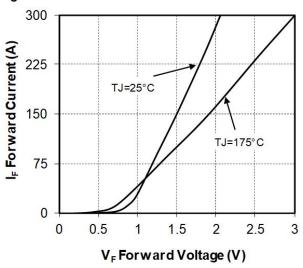
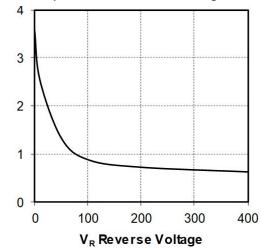


Figure 1-18. Capacitance vs. Reverse Voltage



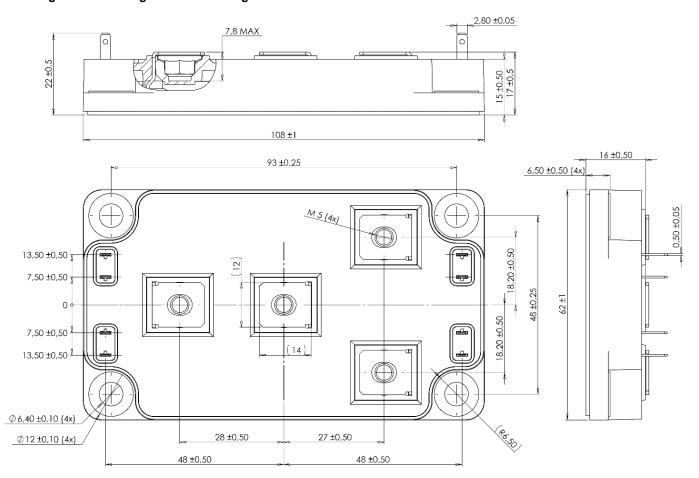
## 2. Package Specifications

The following section shows the package specification of MSCSM70HM05CAG device.

### 2.1 Package Outline

The following figure shows the package outline drawing of MSCSM70HM05CAG device. The dimensions are in millimeters.

Figure 2-1. Package Outline Drawing



Note: See application note APT0601—Mounting instructions for SP6 Power Modules for more information.

# 3. Revision History

Revision	Date	Description
A	04/2021	This is the first publication of this document.

## The Microchip Website

Microchip provides online support via our website at <a href="www.microchip.com/">www.microchip.com/</a>. This website is used to make files and information easily available to customers. Some of the content available includes:

- Product Support Data sheets and errata, application notes and sample programs, design resources, user's
  guides and hardware support documents, latest software releases and archived software
- General Technical Support Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- Business of Microchip Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

### **Product Change Notification Service**

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to www.microchip.com/pcn and follow the registration instructions.

### **Customer Support**

Users of Microchip products can receive assistance through several channels:

- · Distributor or Representative
- · Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

## **Microchip Devices Code Protection Feature**

Note the following details of the code protection feature on Microchip devices:

- · Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features
  of the Microchip devices. We believe that these methods require using the Microchip products in a manner
  outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code
  protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- · Microchip is willing to work with any customer who is concerned about the integrity of its code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code
  protection does not mean that we are guaranteeing the product is "unbreakable." Code protection is constantly
  evolving. We at Microchip are committed to continuously improving the code protection features of our products.
  Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act.
  If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue
  for relief under that Act.

### **Legal Notice**

Information contained in this publication is provided for the sole purpose of designing with and using Microchip products. Information regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

#### **Trademarks**

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, Anyln, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2021, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-7991-8

# **Quality Management System**

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.



# **Worldwide Sales and Service**

Martical				
Table   1-80-090-04444   Tel: 43-7242-2244-39   Tel: 480-792-7270   Tel: 480-792-7277   China - Beigling   India - New Delhi   Tel: 43-7242-2244-39   Tel: 480-792-7277   China - Chongdu   India - New Delhi   Tel: 49-14160-8631   Demmark - Copenhagen   Tel: 480-792-7277   Tel: 480-792-7277   China - Chongdu   India - New China   Tel: 49-4485-9910   Tel: 480-4825-9910   Tel: 480-4825-	AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Chandler, AZ 85224-6199   Tell: 480-792-7270   Tell: 861-0-8589-7000   Tell: 480-792-7270   Tell: 861-0-8589-7000   Tell: 480-792-7277   Tell: 480-8589   Tell: 882-28898-9588   Tell: 882-2898-9588   Tell: 882-2898-9588   Tell: 881-6-152-7160   Tell: 582-98-922-920   Tell: 882-2898-9588   Tell: 881-6-152-7160   Tell: 588-9-420-220   Tell: 882-898-9588   Tell: 881-6-152-7160   Tell: 588-9-420-220   Tell: 882-898-9588   Tell: 881-6-152-7160   Tell: 588-9-420-220   Tell: 882-898-9588   Tell: 881-6-152-7160   Tell: 588-9-420-220   Tell: 882-898-9589   Tell: 882-898-9579   Tell: 882-898-9579   Tell: 882-898-9579   Tell: 882-898-9589   Tell: 882-898-957-998   Tell: 882-898-957-998   Tell: 882-898-957-998   Tell: 882-898-9589   Tell: 882-898-957-998   Tell: 882-898-957-998   Tell: 882-898-957-998   Tell: 882-898-978-998   Tell: 882-898-978-998   Tell: 882-898-978-998   Tell: 882-988-978-998   Tell: 882-988-978-989   Tell: 882-988-978-998   Tell: 882-988-9	Corporate Office	Australia - Sydney	India - Bangalore	Austria - Wels
Tel: 48-0792-7200 Tel: 88-10-8583-7000 Tel: 81-11-41-4160-8631 India - Pune Technical Support Technical Support Tel: 88-28-8665-5511 Tel: 91-20-4121-0141 Tel: 45-4485-2829 Tel: 45-45-458-2829	2355 West Chandler Blvd.	Tel: 61-2-9868-6733	Tel: 91-80-3090-4444	Tel: 43-7242-2244-39
Fax: 480-792-7277	Chandler, AZ 85224-6199	China - Beijing	India - New Delhi	Fax: 43-7242-2244-393
Technical Support	Tel: 480-792-7200	Tel: 86-10-8569-7000	Tel: 91-11-4160-8631	Denmark - Copenhagen
News.microchip.com/	Fax: 480-792-7277	China - Chengdu	India - Pune	Tel: 45-4485-5910
Veb Address:   Tel: 86-23-8980-9588   Tel: 81-6-6152-7160   Tel: 358-4-520-820   Www.microchip.com   China - Dongguan   Japan - Tokyo   France - Paris   Tel: 81-6-98-702-9880   Tel: 81-3-6860-3770   Tel: 33-1-89-53-63-20   Tel: 82-57-9614   Tel: 678-957-9614   Tel: 86-26-975-58029   Tel: 82-53-744-4301   Germany - Garching   Fax: 678-957-1455   China - Hangzhou   Korea - Seoul   Tel: 49-8931-9700   Tel: 49-8931-9700   Tel: 512-2257-3370   China - Hangzhou   Tel: 512-2257-3370   Tel: 852-2943-5100   Tel: 502-2943-5100   Tel: 852-2943-5100   Tel: 852-2943-5100   Tel: 86-22-547-7206   Germany - Hain   Tel: 74-760-0087   Tel: 86-25-8473-2460   Tel: 60-4-227-8870   Germany - Karlsunbert   Tel: 69-28-9473-2460   Tel: 86-25-8873-2460   Tel: 86-25-8873-2460   Tel: 86-25-8873-2460   Tel: 86-52-8873-2460   Tel: 86-52-8873   Tel: 81-24-8870   Tel: 88-6-21-44-40   Tel: 88-6-21-44-40   Tel: 88-6-28-800   Tel: 88-52-880-270   Tel: 88-52-880-270   Tel: 88-52-880-270   Tel: 88-52-880-270   Tel: 88-52-880-270   Tel: 88-75-8884-2200   Tel: 88-75-8804-2200   Tel: 88-75-8884-2200   Tel: 88-75-8880-2200   Tel: 88-75-8880-2200   Tel: 88-75-8880-2200   Tel: 88-75-8880-2200	Technical Support:	Tel: 86-28-8665-5511	Tel: 91-20-4121-0141	Fax: 45-4485-2829
Atlanta	www.microchip.com/support	China - Chongqing	Japan - Osaka	Finland - Espoo
Atlanta	Web Address:	Tel: 86-23-8980-9588	Tel: 81-6-6152-7160	Tel: 358-9-4520-820
Dututh, GA	www.microchip.com	China - Dongguan	Japan - Tokyo	France - Paris
Tel: 68-26-875-8029	Atlanta	Tel: 86-769-8702-9880	Tel: 81-3-6880- 3770	Tel: 33-1-69-53-63-20
Fax: 678-957-1455	Duluth, GA	China - Guangzhou	Korea - Daegu	Fax: 33-1-69-30-90-79
Austin_TX	Tel: 678-957-9614	Tel: 86-20-8755-8029	Tel: 82-53-744-4301	Germany - Garching
Tel: 512-257-3370	Fax: 678-957-1455	China - Hangzhou	Korea - Seoul	Tel: 49-8931-9700
Deston   Tel: 852-2943-5100   Tel: 863-3-7651-7906   Malaysia - Penang   Tel: 49-7131-72400   Tel: 62-58-8473-2460   Tel: 66-2-58473-2460   Tel: 66-2-58473-2460   Tel: 66-2-632-8502-7355   Tel: 60-4-2278-8870   Tel: 49-721-625370   Tel: 630-285-0071   Tel: 86-532-8502-7355   Tel: 632-634-9055   Germany - Munich   Tel: 49-721-625370   Tel: 630-285-0071   Tel: 86-21-3326-8000   Tel: 65-6334-8870   Fax: 49-89-627-144-0   Tel: 630-285-0075   China - Shenyang   Tel: 86-24-334-2829   Tel: 86-24-334-2829   Tel: 86-24-334-2829   Tel: 86-24-334-2829   Tel: 86-25-334-8870   Tel: 49-89-627-144-0   Tel: 97-28-18-7423   Tel: 86-24-334-2829   Tel: 86-35-866-2200   Tel: 866-57-8366   Tel: 49-8031-354-550   Tel: 97-28-18-7423   Tel: 86-58-868-2200   Tel: 886-57-78-356   Tel: 97-29-744-7705   Tel: 86-18-623-1526   Tel: 86-2-58-866-2508-8600   Tel: 39-0331-742611   Tel: 248-848-4000   Tel: 86-18-623-1526   Tel: 86-2-598-8600   Tel: 39-0331-742611   Tel: 248-848-84000   Tel: 86-27-5980-5300   Tel: 86-2-598-8630   Tel: 39-0331-742611   Tel: 248-848-8938   Tel: 86-27-5980-5300   Tel: 86-2-598-4-1351   Tel: 86-292-2388138   Tel: 86-298-833-7252   Tel: 86-29-2388138   Tel: 86-392-2388138   Tel: 86-392-2388138   Tel: 86-392-2388138   Tel: 86-392-2388138   Tel: 86-756-3210040   Tel: 86-756-3210040   Tel: 86-77-8008   Tel: 86-77-8009   Tel: 86-77	Austin, TX	Tel: 86-571-8792-8115	Tel: 82-2-554-7200	Germany - Haan
Westborough, MA	Tel: 512-257-3370	China - Hong Kong SAR	Malaysia - Kuala Lumpur	Tel: 49-2129-3766400
Tel: 774-760-0087	Boston	Tel: 852-2943-5100	Tel: 60-3-7651-7906	Germany - Heilbronn
Tel: 774-760-0087	Westborough, MA	China - Nanjing	Malaysia - Penang	Tel: 49-7131-72400
Tel: 86-532-8502-7355   Tel: 63-2-634-9065   Germany - Munich	<del>-</del>	Tel: 86-25-8473-2460	Tel: 60-4-227-8870	Germany - Karlsruhe
Itasca,   IL	Fax: 774-760-0088	China - Qingdao	Philippines - Manila	Tel: 49-721-625370
Itasca,   I.   China - Shanghai   Tel: 49-80-627-144-0   Tel: 49-80-627-144-0   Tel: 630-285-0071   Tel: 86-21-3326-8000   Tel: 65-6334-8870   Fax: 49-98-627-144-44   Fax: 630-285-0075   China - Shenyang   Taiwan - Hsin Chu   Germany - Rosenheim   Tel: 86-24-2334-2829   Tel: 868-3-577-8366   Tel: 49-8031-354-560   Italy - Milan   Tel: 972-818-7423   Tel: 86-755-8864-2200   Tel: 886-3-577-8366   Tel: 49-8031-354-560   Italy - Milan   Tel: 972-918-2924   China - Suzhou   Taiwan - Kaohslung   Tel: 972-9-744-7705   Tel: 866-72-13-7830   Tel: 972-9-744-7705   Tel: 866-72-13-7830   Tel: 972-9-744-7705   Tel: 868-848-4000   Tel: 86-823-1526   Tel: 886-2-2508-8600   Tel: 39-0331-742611   Tel: 248-848-4000   Tel: 86-27-5880-5300   Tel: 68-27-5880-5300   Tel: 68-27-5880-5300   Tel: 68-27-5880-5300   Tel: 86-28-45811   taly - Padova   Tel: 86-829-8833-7252   Tel: 86-294-1351   taly - Padova   Tel: 39-049-7625286   Tel: 86-592-238138   Tel: 86-592-238138   Tel: 86-592-238138   Tel: 86-592-238138   Tel: 86-592-238138   Tel: 86-756-3210040   Tel: 86-592-2388138   Tel: 47-728-8333   Tel: 87-773-8323   Tel: 86-756-3210040   Tel: 86-756-3210040   Tel: 86-756-8210040   Tel: 86-756-8210	Chicago	Tel: 86-532-8502-7355	Tel: 63-2-634-9065	Germany - Munich
Fax: 630-285-0075	<u>-</u>	China - Shanghai	Singapore	
Dallas	Tel: 630-285-0071	Tel: 86-21-3326-8000		Fax: 49-89-627-144-44
Dallas	Fax: 630-285-0075	China - Shenyang	Taiwan - Hsin Chu	Germany - Rosenheim
Tel: 972-818-7423 Tel: 96-755-8864-2200 Tel: 86-755-8864-2200 Tel: 86-755-8864-2200 Tel: 86-755-8864-2200 Tel: 86-755-8864-2200 Tel: 86-86-23-1526 Tel: 86-86-2508-8600 Tel: 39-0331-742611 Tel: 248-848-4000 Tel: 86-27-5980-5300 Tel: 66-2-694-1351 Tel: 66-2-694-1351 Tel: 39-0331-466781 Tel: 39-0391-466781 Tel: 38-94-5983 Tel: 86-29-833-7252 Tel: 86-29-833-7252 Tel: 86-29-833-7252 Tel: 86-29-833-7252 Tel: 86-592-2388138 Tel: 317-773-8323 China - Zhuhai Tel: 317-773-8323 China - Zhuhai Tel: 317-536-2380 Los Angeles Mission Viejo, CA Tel: 98-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 63-32-704-60-40 Tel: 63-4270 Canada - Toronto Tel: 905-695-1980  Tel: 905-695-1980	Dallas		Tel: 886-3-577-8366	
Tel: 972-818-7423 Fax: 972-818-7423 Fax: 972-818-2924 China - Suzhou Tel: 86-186-623-1526 Tel: 86-186-623-1526 Tel: 86-186-623-1526 Tel: 86-2-508-8600 Tel: 39-0331-742611 Tel: 39-0331-742611 Tel: 248-848-4000 Tel: 26-2-5980-5300 Tel: 66-2-694-1351 Tel: 66-2-694-1351 Tel: 39-0331-466781 Tel: 39-0331-466781 Tel: 281-894-5983 Tel: 86-29-833-7252 Tel: 86-29-833-7252 Tel: 84-28-5448-2100 Netherlands - Drunen Indianapolis Noblesville, IN Tel: 86-592-2388138 Tel: 317-773-8323 China - Zhuhai Tel: 317-773-8523 Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 981-273-7800 Raleigh, NC Tel: 998-44-7510 New York, NY Tel: 631-356-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-735-9110 Tel: 408-735-9110 Tel: 905-695-1980  Tel: 905-695-1980	Addison, TX	China - Shenzhen	Taiwan - Kaohsiung	Israel - Ra'anana
Detroit	Tel: 972-818-7423	Tel: 86-755-8864-2200		Tel: 972-9-744-7705
Detroit	Fax: 972-818-2924	China - Suzhou	Taiwan - Taipei	Italy - Milan
Tel: 248-848-4000 Houston, TX Tel: 281-894-5983 Tel: 86-27-5980-5300 China - Xian Tel: 281-894-5983 Tel: 86-29-8833-7252 Indianapolis China - Xiamen Noblesville, IN Tel: 34-690340 Tel: 86-592-2388138 Tel: 86-592-2388138 Tel: 86-592-2388138 Tel: 86-756-3210040 Tel: 317-773-8423 Tel: 86-756-3210040 Tel: 317-73-8423 Tel: 86-756-3210040 Tel: 86-756	Detroit	Tel: 86-186-6233-1526	Tel: 886-2-2508-8600	Tel: 39-0331-742611
Houston, TX	Novi, MI	China - Wuhan		Fax: 39-0331-466781
Houston, TX	Tel: 248-848-4000	Tel: 86-27-5980-5300	Tel: 66-2-694-1351	Italy - Padova
Indianapolis	Houston, TX	China - Xian	Vietnam - Ho Chi Minh	Tel: 39-049-7625286
Noblesville, IN Tel: 86-592-2388138 China - Zhuhai Tel: 317-773-8323 Tel: 317-773-5453 Tel: 86-756-3210040 Tel: 47-72884388 Tel: 47-72884388 Poland - Warsaw Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  Tel: 905-695-1980  Tel: 86-756-3210040 Tel: 86-756-3210040 Tel: 46-31-704-60-40 Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5820	Tel: 281-894-5983	Tel: 86-29-8833-7252	Tel: 84-28-5448-2100	Netherlands - Drunen
Tel: 317-773-8323 Fax: 317-773-5453 Tel: 317-536-2380 Los Angeles Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-436-4270 Canada - Toronto Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  China - Zhuhai Tel: 47-72884388 Poland - Warsaw Tel: 47-72884388 Poland - Warsaw Tel: 47-72884388 Poland - Warsaw Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 408-436-4270 Fax: 44-118-921-5820	Indianapolis	China - Xiamen		Tel: 31-416-690399
Fax: 317-773-5453 Tel: 317-536-2380 Los Angeles Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 40-21-407-87-50 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 40-21-5820 Tel: 40-21-5820 Tel: 905-695-1980	Noblesville, IN	Tel: 86-592-2388138		Fax: 31-416-690340
Fax: 317-773-5453       Tel: 86-756-3210040       Tel: 47-72884388         Tel: 317-536-2380       Poland - Warsaw         Los Angeles       Tel: 48-22-3325737         Mission Viejo, CA       Romania - Bucharest         Tel: 949-462-9523       Tel: 40-21-407-87-50         Fax: 949-462-9608       Spain - Madrid         Tel: 951-273-7800       Tel: 34-91-708-08-90         Raleigh, NC       Fax: 34-91-708-08-91         Tel: 919-844-7510       Sweden - Gothenberg         New York, NY       Tel: 46-31-704-60-40         Tel: 631-435-6000       Sweden - Stockholm         Tel: 408-735-9110       Tel: 408-436-4270         Canada - Toronto       Fax: 44-118-921-5800         Tel: 905-695-1980       Fax: 44-118-921-5820		China - Zhuhai		Norway - Trondheim
Los Angeles       Tel: 48-22-3325737         Mission Viejo, CA       Romania - Bucharest         Tel: 949-462-9523       Tel: 40-21-407-87-50         Fax: 949-462-9608       Spain - Madrid         Tel: 951-273-7800       Tel: 34-91-708-08-90         Raleigh, NC       Fax: 34-91-708-08-91         Tel: 919-844-7510       Sweden - Gothenberg         New York, NY       Tel: 46-31-704-60-40         Tel: 631-435-6000       Sweden - Stockholm         San Jose, CA       Tel: 408-735-9110         Tel: 408-436-4270       UK - Wokingham         Tel: 408-436-4270       Fax: 44-118-921-5800         Canada - Toronto       Fax: 44-118-921-5820	Fax: 317-773-5453	Tel: 86-756-3210040		_
Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 40-21-708-08-90 Tel: 34-91-708-08-90 Tel: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 408-436-4270 Fax: 44-118-921-5800 Fax: 44-118-921-5820	Tel: 317-536-2380			Poland - Warsaw
Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	Los Angeles			Tel: 48-22-3325737
Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 Raleigh, NC Tel: 919-844-7510 New York, NY Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820	Mission Viejo, CA			Romania - Bucharest
Tel: 951-273-7800  Raleigh, NC  Tel: 919-844-7510  New York, NY  Tel: 631-435-6000  San Jose, CA  Tel: 408-735-9110  Tel: 408-436-4270  Canada - Toronto  Tel: 905-695-1980  Tel: 34-91-708-08-90  Fax: 34-91-708-08-91  Sweden - Gothenberg  Tel: 46-31-704-60-40  Sweden - Stockholm  Tel: 46-8-5090-4654  UK - Wokingham  Tel: 44-118-921-5800	<u>-</u>			Tel: 40-21-407-87-50
Tel: 951-273-7800  Raleigh, NC  Tel: 919-844-7510  New York, NY  Tel: 631-435-6000  San Jose, CA  Tel: 408-735-9110  Tel: 408-436-4270  Canada - Toronto  Tel: 905-695-1980  Tel: 34-91-708-08-90  Fax: 34-91-708-08-91  Sweden - Gothenberg  Tel: 46-31-704-60-40  Sweden - Stockholm  Tel: 46-8-5090-4654  UK - Wokingham  Tel: 44-118-921-5800	Fax: 949-462-9608			Spain - Madrid
Raleigh, NC       Fax: 34-91-708-08-91         Tel: 919-844-7510       Sweden - Gothenberg         New York, NY       Tel: 46-31-704-60-40         Tel: 631-435-6000       Sweden - Stockholm         San Jose, CA       Tel: 46-8-5090-4654         Tel: 408-735-9110       UK - Wokingham         Tel: 408-436-4270       Tel: 44-118-921-5800         Canada - Toronto       Fax: 44-118-921-5820	Tel: 951-273-7800			·
Tel: 919-844-7510  New York, NY  Tel: 631-435-6000  San Jose, CA  Tel: 408-735-9110  Tel: 408-436-4270  Canada - Toronto  Tel: 905-695-1980  Sweden - Gothenberg  Tel: 46-31-704-60-40  Sweden - Stockholm  Tel: 46-8-5090-4654  UK - Wokingham  Tel: 44-118-921-5800  Fax: 44-118-921-5820				
New York, NY       Tel: 46-31-704-60-40         Tel: 631-435-6000       Sweden - Stockholm         San Jose, CA       Tel: 46-8-5090-4654         Tel: 408-735-9110       UK - Wokingham         Tel: 408-436-4270       Tel: 44-118-921-5800         Canada - Toronto       Fax: 44-118-921-5820         Tel: 905-695-1980       Fax: 44-118-921-5820	Tel: 919-844-7510			Sweden - Gothenberg
Tel: 631-435-6000 San Jose, CA Tel: 408-735-9110 Tel: 408-436-4270 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Tel: 905-695-1980				_
San Jose, CA       Tel: 46-8-5090-4654         Tel: 408-735-9110       UK - Wokingham         Tel: 408-436-4270       Tel: 44-118-921-5800         Canada - Toronto       Fax: 44-118-921-5820         Tel: 905-695-1980       Fax: 44-118-921-5820	•			
Tel: 408-735-9110 Tel: 408-436-4270 Canada - Toronto Tel: 905-695-1980  UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820				
Tel: 408-436-4270  Canada - Toronto Tel: 905-695-1980  Tel: 44-118-921-5800 Fax: 44-118-921-5820				
Canada - Toronto         Fax: 44-118-921-5820           Tel: 905-695-1980         Fax: 44-118-921-5820				_
Tel: 905-695-1980				

# **Mouser Electronics**

**Authorized Distributor** 

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Microchip:

MSCSM70HM05CAG