

---

## **maXTouch 640-node Touchscreen Controller**

### **Product Brief**

---

#### **Description**

The mXT640U uses a unique charge-transfer acquisition engine to implement Microchip's patented capacitive sensing method. Coupled with a state-of-the-art CPU, the entire touchscreen sensing solution can measure, classify and track a number of individual finger touches with a high degree of accuracy in the shortest response time. The mXT640U allows for both mutual and self capacitance measurements, with the self capacitance measurements being used to augment the mutual capacitance measurements to produce reliable touch information.

#### **maXTouch® Adaptive Sensing Touchscreen Technology**

- Up to 32 X (transmit) lines and 20 Y (receive) lines
- A maximum of 640 nodes can be allocated to the touchscreen
- Touchscreen size 8.17 inches (16:10 aspect ratio), assuming a sensor electrode pitch of 5.5 mm. Other sizes may be possible with different electrode pitches and appropriate sensor material
- Multiple touch support with up to 16 concurrent touches tracked in real time
- Dual-boot OS support for Microsoft® Windows® and Android

#### **Touch Sensor Technology**

- Discrete/out-cell support including glass and PET film-based sensors
- On-cell/touch-on display support including TFT, IPS and OLED
- Synchronization with display refresh timing capability
- Support for standard (for example, Diamond) and proprietary sensor patterns (review of designs by Microchip recommended)

#### **Front Panel Material**

- Works with PET or glass, including curved profiles (configuration and stack-up to be approved by Microchip)
- Glass 0.4 mm to 4.5 mm, dependent on screen size, touch size and stack-up
- Plastic 0.2 mm to 2.2 mm, dependent on screen size, touch size and stack-up

#### **Touch Performance**

- Moisture/Water Compensation
  - No false touch with condensation or water drop up to 22 mm diameter
  - One-finger tracking with condensation or water drop up to 22 mm diameter

- Glove Support
  - Multiple-finger glove touches up to 1.5 mm thickness (subject to stack-up design)
  - Single-finger glove touch up to 5 mm thickness (subject to stack-up design)
- Mutual capacitance and self capacitance measurements supported for robust touch detection
- Noise suppression technology to combat ambient, charger noise, and power-line noise
  - Up to 240 Vpp between 1 Hz and 1 kHz sinusoidal waveform
  - Up to 20 Vpp between 1 kHz and 1 MHz sinusoidal waveform
- Stylus Support
  - Supports passive stylus with 1 mm contact diameter, subject to configuration, stack up, and sensor design
- Scan Speed
  - Up to 250 Hz one finger reporting rate, subject to configuration
  - Typical report rate for 10 touches  $\geq 100$  Hz (subject to configuration)
  - Initial touch latency  $< 20$  ms for first touch from idle, subject to configuration
  - Configurable to allow for power and speed optimization

#### **On-chip Gestures**

- Supports wake up/unlock gestures, including symbol recognition

#### **Keys**

- Up to 32 nodes can be allocated as mutual capacitance sensor keys (subject to other configurations)
- Support for 3 Generic Keys in addition to the touchscreen array (subject to other configurations)
- Adjacent Key Suppression (AKS) technology is supported for false key touch prevention

# MXT640U 1.1

---

## Enhanced Algorithms

- Lens bending algorithms to remove display noise
- Touch suppression algorithms to remove unintentional large touches, such as palm
- Palm Recovery Algorithm for quick restoration to normal state

## Product Data Store Area

- Up to 32 bytes of user-defined data can be stored during production

## Power Saving

- Programmable timeout for automatic transition from active to idle states
- Pipelined analog sensing detection and digital processing to optimize system power efficiency

## Application Interfaces

- I<sup>2</sup>C-compatible slave mode: Standard/Fast mode 400 kHz, Fast-mode Plus 1 MHz, High-speed mode up to 3.4 MHz
- HID-I<sup>2</sup>C interface for Microsoft® Windows® 8.x and later versions
- Interrupt to indicate when a message is available
- SPI Debug Interface to read the real-time raw data for tuning and debugging purposes

## Power Supply

- Digital (Vdd) 3.3 V nominal
- Digital I/O (VddIO) 3.3 V nominal
- Analog (AVdd) 3.3 V nominal
- High voltage internal X line drive (XVdd) 6.6 V with internal voltage pump
- High voltage internal X line drive (XVdd) 9.9 V with internal voltage pump

## Packages

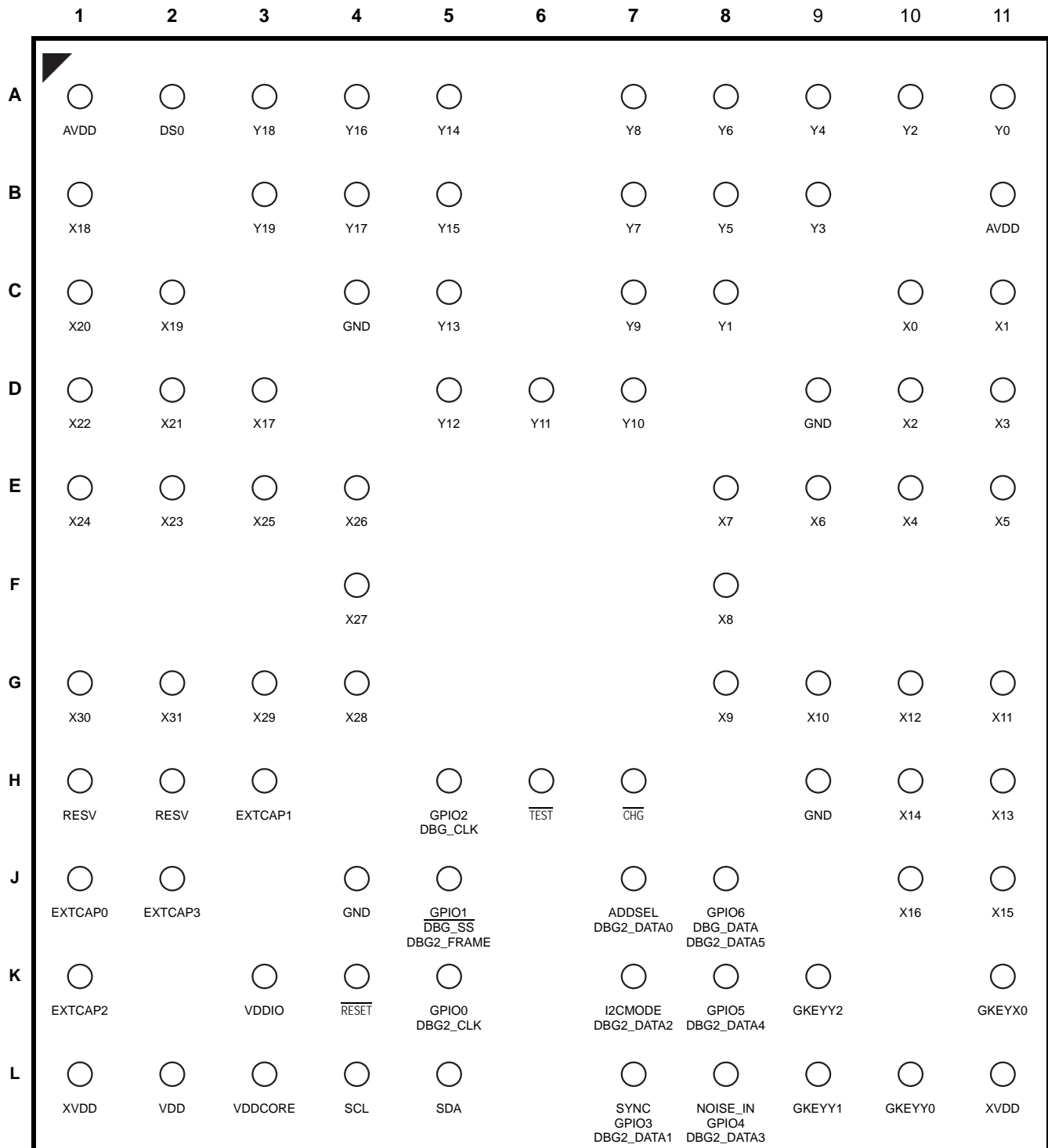
- 88-ball UFBGA 6 × 6 × 0.6 mm, 0.5 mm pitch
- 88-ball X1FBGA 6 × 6 × 0.45 mm, 0.5 mm pitch

## Operating Temperature

- –40°C to +85°C

## PIN CONFIGURATION

## 88-ball UFBGA/X1FBGA



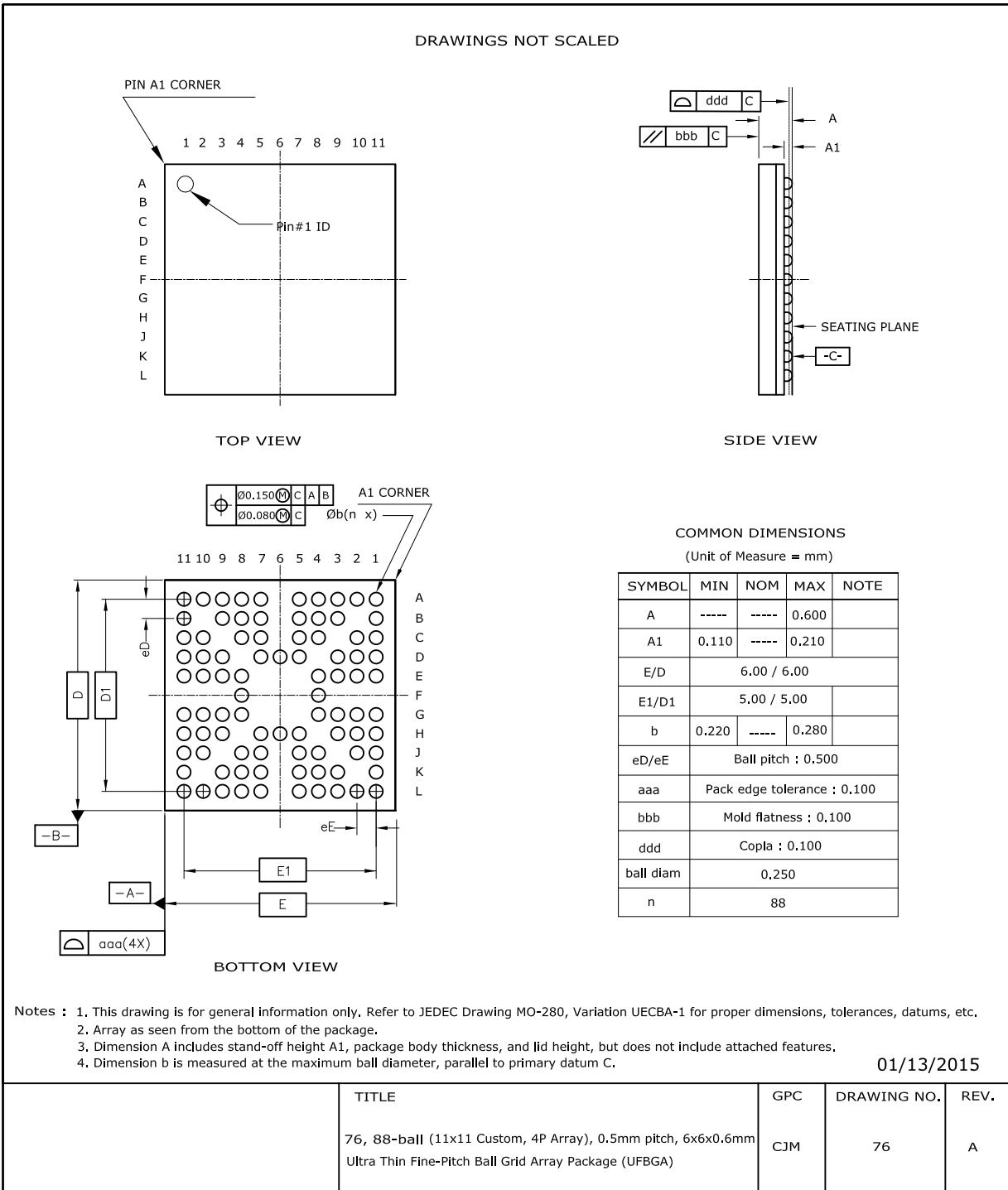
Top View

# MXT640U 1.1

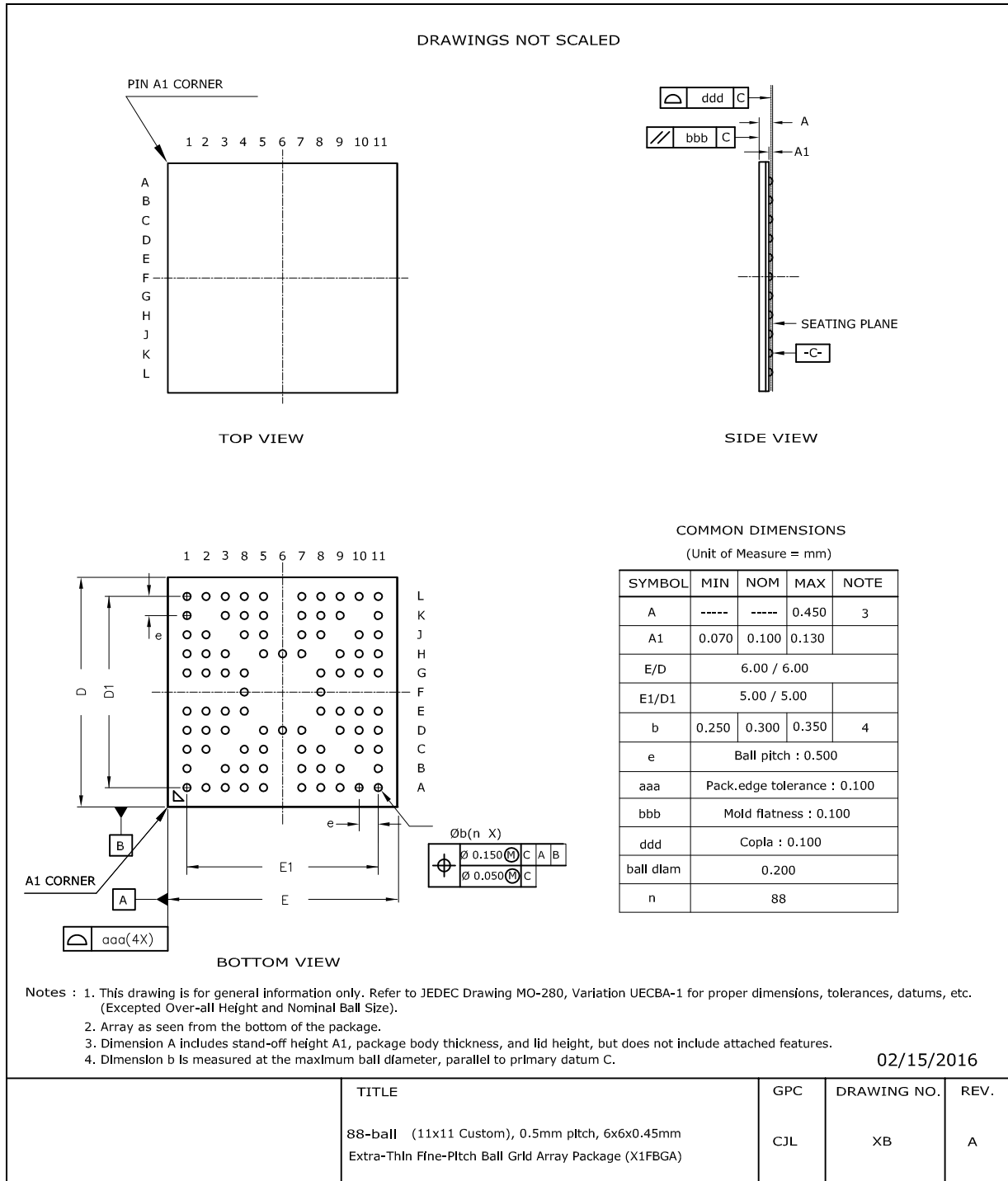
## 1.0 PACKAGING INFORMATION

The following sections give the technical details of the packages for the device.

### 1.1 88-ball UFBGA 6 × 6 × 0.6 mm



## 1.2 88-ball X1FBGA 6 × 6 × 0.45 mm



## APPENDIX A: REVISION HISTORY

### Revision A (September 2017)

Initial edition for firmware revision 1.1 – Release

## PRODUCT IDENTIFICATION SYSTEM

The table below gives details on the product identification system for maXTouch devices. See [“Orderable Part Numbers”](#) below for example part numbers for the MXT640U.

To order or obtain information, for example on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>-XXX</u>	<u>[X]</u>	<u>[XX]</u>	<u>[X]</u>	<u>[XXX]</u>
Device	Package	Temperature Range	Sample Type	Tape and Reel Option	Pattern

Device:

Base device name

Package:

A

=

QFP (Plastic Quad Flatpack)

CCU

=

UFBGA (Ultra Thin Fine-pitch Ball Grid Array)

C2U

=

UFBGA (Ultra Thin Fine-pitch Ball Grid Array)

NHU

=

UFBGA (Ultra Thin Fine-pitch Ball Grid Array)

C4U

=

X1FBGA (Extra Thin Fine-pitch Ball Grid Array)

MAU

=

XQFN (Super Thin Quad Flat No Lead Sawn)

MA5U

=

XQFN (Super Thin Quad Flat No Lead Sawn)

UU

=

WLCSP (Wafer Level Chip Scale Package)

Temperature Range:

Blank

=

-40°C to +85°C (Grade 3)

T

=

-40°C to +85°C (Grade 3)

B

=

-40°C to +105°C (Grade 2)

Sample Type:

Blank

=

Release Sample

ES

=

Pre-release (Engineering) Sample

Tape and Reel Option:

Blank

=

Standard Packaging (Tube or Tray)

R

=

Tape and Reel <sup>(1)</sup>

Pattern:

QTP, SQTP, Code or Special Requirements (Blank Otherwise)

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. See [“Orderable Part Numbers”](#) below or check with your Microchip Sales Office for package availability with the Tape and Reel option.

## Orderable Part Numbers

Orderable Part Number	Firmware Revision	Description
ATMXT640U-CCU023 (Supplied in trays)	1.1.AA	88-ball UFBGA 6 × 6 × 0.6 mm, RoHS compliant Industrial grade sample; not suitable for automotive characterization
ATMXT640U-CCUR023 (Supplied in tape and reel)		
ATMXT640U-C4U023 (Supplied in trays)	1.1.AA	88-ball X1FBGA 6 × 6 × 0.45 mm, RoHS compliant Industrial grade sample; not suitable for automotive characterization
ATMXT640U-C4UR023 (Supplied in tape and reel)		

# MXT640U 1.1

---

NOTES:



---

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

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “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.

---

Information contained in this publication 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. 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 ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. 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.

*Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*

**QUALITY MANAGEMENT SYSTEM  
CERTIFIED BY DNV  
= ISO/TS 16949 =**

**Trademarks**

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BeaconThings, BitCloud, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Helder, JukeBlox, KEELOQ, KEELOQ logo, Klear, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, RightTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, chipKIT, chipKIT logo, CodeGuard, CryptoAuthentication, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PureSilicon, QMatrix, RightTouch logo, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, 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.

Silicon Storage Technology is a registered trademark 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.

© 2017, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-1932-7

## Worldwide Sales and Service

### AMERICAS

**Corporate Office**  
 2355 West Chandler Blvd.  
 Chandler, AZ 85224-6199  
 Tel: 480-792-7200  
 Fax: 480-792-7277  
 Technical Support:  
[http://www.microchip.com/  
 support](http://www.microchip.com/support)  
 Web Address:  
[www.microchip.com](http://www.microchip.com)

**Atlanta**  
 Duluth, GA  
 Tel: 678-957-9614  
 Fax: 678-957-1455

**Austin, TX**  
 Tel: 512-257-3370

**Boston**  
 Westborough, MA  
 Tel: 774-760-0087  
 Fax: 774-760-0088

**Chicago**  
 Itasca, IL  
 Tel: 630-285-0071  
 Fax: 630-285-0075

**Dallas**  
 Addison, TX  
 Tel: 972-818-7423  
 Fax: 972-818-2924

**Detroit**  
 Novi, MI  
 Tel: 248-848-4000

**Houston, TX**  
 Tel: 281-894-5983

**Indianapolis**  
 Noblesville, IN  
 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: 408-735-9110  
 Tel: 408-436-4270

**Canada - Toronto**  
 Tel: 905-695-1980  
 Fax: 905-695-2078

### ASIA/PACIFIC

**Asia Pacific Office**  
 Suites 3707-14, 37th Floor  
 Tower 6, The Gateway  
 Harbour City, Kowloon

**Hong Kong**  
 Tel: 852-2943-5100  
 Fax: 852-2401-3431

**Australia - Sydney**  
 Tel: 61-2-9868-6733  
 Fax: 61-2-9868-6755

**China - Beijing**  
 Tel: 86-10-8569-7000  
 Fax: 86-10-8528-2104

**China - Chengdu**  
 Tel: 86-28-8665-5511  
 Fax: 86-28-8665-7889

**China - Chongqing**  
 Tel: 86-23-8980-9588  
 Fax: 86-23-8980-9500

**China - Dongguan**  
 Tel: 86-769-8702-9880

**China - Guangzhou**  
 Tel: 86-20-8755-8029

**China - Hangzhou**  
 Tel: 86-571-8792-8115  
 Fax: 86-571-8792-8116

**China - Hong Kong SAR**  
 Tel: 852-2943-5100  
 Fax: 852-2401-3431

**China - Nanjing**  
 Tel: 86-25-8473-2460  
 Fax: 86-25-8473-2470

**China - Qingdao**  
 Tel: 86-532-8502-7355  
 Fax: 86-532-8502-7205

**China - Shanghai**  
 Tel: 86-21-3326-8000  
 Fax: 86-21-3326-8021

**China - Shenyang**  
 Tel: 86-24-2334-2829  
 Fax: 86-24-2334-2393

**China - Shenzhen**  
 Tel: 86-755-8864-2200  
 Fax: 86-755-8203-1760

**China - Wuhan**  
 Tel: 86-27-5980-5300  
 Fax: 86-27-5980-5118

**China - Xian**  
 Tel: 86-29-8833-7252  
 Fax: 86-29-8833-7256

### ASIA/PACIFIC

**China - Xiamen**  
 Tel: 86-592-2388138  
 Fax: 86-592-2388130

**China - Zhuhai**  
 Tel: 86-756-3210040  
 Fax: 86-756-3210049

**India - Bangalore**  
 Tel: 91-80-3090-4444  
 Fax: 91-80-3090-4123

**India - New Delhi**  
 Tel: 91-11-4160-8631  
 Fax: 91-11-4160-8632

**India - Pune**  
 Tel: 91-20-3019-1500

**Japan - Osaka**  
 Tel: 81-6-6152-7160  
 Fax: 81-6-6152-9310

**Japan - Tokyo**  
 Tel: 81-3-6880-3770  
 Fax: 81-3-6880-3771

**Korea - Daegu**  
 Tel: 82-53-744-4301  
 Fax: 82-53-744-4302

**Korea - Seoul**  
 Tel: 82-2-554-7200  
 Fax: 82-2-558-5932 or  
 82-2-558-5934

**Malaysia - Kuala Lumpur**  
 Tel: 60-3-6201-9857  
 Fax: 60-3-6201-9859

**Malaysia - Penang**  
 Tel: 60-4-227-8870  
 Fax: 60-4-227-4068

**Philippines - Manila**  
 Tel: 63-2-634-9065  
 Fax: 63-2-634-9069

**Singapore**  
 Tel: 65-6334-8870  
 Fax: 65-6334-8850

**Taiwan - Hsin Chu**  
 Tel: 886-3-5778-366  
 Fax: 886-3-5770-955

**Taiwan - Kaohsiung**  
 Tel: 886-7-213-7830

**Taiwan - Taipei**  
 Tel: 886-2-2508-8600  
 Fax: 886-2-2508-0102

**Thailand - Bangkok**  
 Tel: 66-2-694-1351  
 Fax: 66-2-694-1350

### EUROPE

**Austria - Wels**  
 Tel: 43-7242-2244-39  
 Fax: 43-7242-2244-393

**Denmark - Copenhagen**  
 Tel: 45-4450-2828  
 Fax: 45-4485-2829

**Finland - Espoo**  
 Tel: 358-9-4520-820

**France - Paris**  
 Tel: 33-1-69-53-63-20  
 Fax: 33-1-69-30-90-79

**France - Saint Cloud**  
 Tel: 33-1-30-60-70-00

**Germany - Garching**  
 Tel: 49-8931-9700  
**Germany - Haan**  
 Tel: 49-2129-3766400

**Germany - Heilbronn**  
 Tel: 49-7131-67-3636

**Germany - Karlsruhe**  
 Tel: 49-721-625370

**Germany - Munich**  
 Tel: 49-89-627-144-0  
 Fax: 49-89-627-144-44

**Germany - Rosenheim**  
 Tel: 49-8031-354-560

**Israel - Ra'anana**  
 Tel: 972-9-744-7705

**Italy - Milan**  
 Tel: 39-0331-742611  
 Fax: 39-0331-466781

**Italy - Padova**  
 Tel: 39-049-7625286

**Netherlands - Drunen**  
 Tel: 31-416-690399  
 Fax: 31-416-690340

**Norway - Trondheim**  
 Tel: 47-7289-7561

**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: 46-8-5090-4654

**UK - Wokingham**  
 Tel: 44-118-921-5800  
 Fax: 44-118-921-5820

# Mouser Electronics

Authorized Distributor

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

[Microchip:](#)

[ATMXT640U-CCU](#) [ATMXT640UC3UR](#) [ATMXT640UESC4U](#) [ATMXT640UC4U](#) [ATMXT640UC3U](#)  
[ATMXT640UESC4UR](#) [ATMXT640UC4UR](#) [ATMXT640U-CCUR](#) [ATMXT640UESC3UR](#) [ATMXT640UESC3U](#)