



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

### **Description**

The mXT640UD-CCUBHA1 1.0 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 mXT640UD-CCUBHA1 1.0 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.

### **Functional Safety**

- UL/IEC 60730 Class B support
- Self diagnostics at power-on and as periodic tests during operation
- Heartbeat (alive) signal output to host

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

- Up to 32 X (transmit) lines and 20 Y (receive) lines for use by a touchscreen and/or key array
- A maximum of 640 nodes can be allocated to the touch sensor
- Touchscreen size of 9.7 inches (16:10 aspect ratio), assuming a sensor electrode pitch of 6.5 mm. Other sizes are possible with different electrode pitches and appropriate sensor material
- Multiple touch support with up to 16 concurrent touches tracked in real time

### **Keys**

- Up to 32 nodes can be allocated as mutual capacitance sensor keys in addition to the touchscreen, defined as 1 key array (subject to availability of X and Y lines and other configurations)
- Support for up to 3 mutual capacitance Generic Keys as an alternative to the touchscreen key array (subject to other configurations)
- Adjacent Key Suppression (AKS) technology is supported for false key touch prevention

### **Touch Sensor Technology**

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

### **Front Panel Material and Design**

- Works with PET or glass, including curved profiles (configuration and stack-up to be approved by Microchip or a Microchip-qualified touch sensor module partner)
- 10 mm glass (or 5 mm PMMA) with bare finger (dependent on sensor size, touch size, configuration and stack-up)
- 6 mm glass (or 3 mm PMMA) with multi-finger 5 mm glove (2.7 mm PMMA equivalent) (dependent on sensor size, touch size, configuration and stack-up)
- Support for non-rectangular sensor designs (for example, circular, rounded or with cutouts)

### **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
- Mutual capacitance and self capacitance measurements supported for robust touch detection
- P2P mutual capacitance measurements supported for extra sensitive multi-touch sensing
- Noise suppression technology to combat ambient and power-line noise
  - Up to 240 V<sub>PP</sub> between 1 Hz and 1 kHz sinusoidal waveform (no touches)
  - IEC 61000-4-6, 10 Vrms, Class A (normal touch operation) conducted noise immunity
- Stylus Support
  - Supports passive stylus with 1.5 mm contact diameter, subject to configuration, stack-up, and sensor design

- Burst Frequency
  - Flexible and dynamic Tx burst frequency selection to reduce EMC disturbance
  - Configurable Tx waveform shaping to reduce emissions
- Scan Speed
  - Typical report rate for 10 touches  $\geq$ 90 Hz (subject to configuration)
  - Initial touch latency <25 ms for first touch from idle (subject to configuration)
  - Configurable to allow for power and speed optimization

## On-chip Gestures

- Reports one-touch and two-touch gestures

## 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

## Data Store

- Up to 64 bytes of user's custom data (not CRC checksummed)

## Power Saving

- Programmable timeout for automatic transition from Active to Idle state
- Pipelined analog sensing detection and digital processing to optimize system power efficiency

## Application Interfaces

- I<sup>2</sup>C client interface for main communication with the device, with support for Standard mode (up to 100 kHz), Fast mode (up to 400 kHz), Fast-mode Plus (up to 1 MHz), High Speed mode (up to 3.4 MHz)
- Optional secondary SPI interface for separate messaging (up to 8 MHz)
- Two separate interrupts to indicate when messages are available on the corresponding interfaces
- Additional Hardware Debug Interface to read the raw data for tuning and debugging purposes

## Power Supply

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

## Package

- 88-ball UFBGA 6 x 6 x 0.6 mm, 0.5 mm pitch

## Operating Temperature

- -40°C to +105°C

## Design Services

- Review of device configuration, stack-up and sensor patterns

## PIN CONFIGURATION

## 88-ball UFBGA

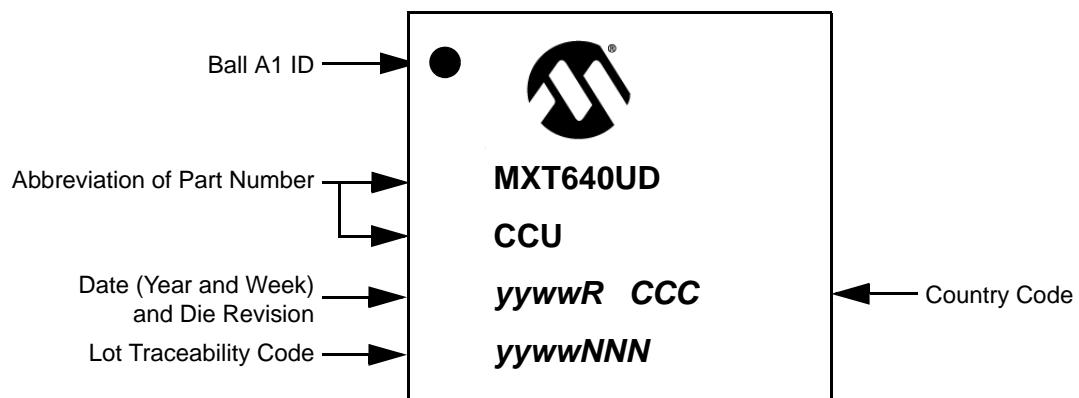
	1	2	3	4	5	6	7	8	9	10	11
A	○	○	○	○	○		○	○	○	○	○
	AVDD	DS0	Y18	Y16	Y14		Y8	Y6	Y4	Y2	Y0
B	○		○	○	○		○	○	○		○
	X18		Y19	Y17	Y15		Y7	Y5	Y3		AVDD
C	○	○		○	○		○	○		○	○
	X20	X19		GND	Y13		Y9	Y1		X0	X1
D	○	○	○		○	○	○		○	○	○
	X22	X21	X17		Y12	Y11	Y10		GND	X2	X3
E	○	○	○	○				○	○	○	○
	X24	X23	X25	X26				X7	X6	X4	X5
F				○				○			
				X27				X8			
G	○	○	○	○				○	○	○	○
	X30	X31	X29	X28				X9	X10	X12	X11
H	○	○	○		○	○	○		○	○	○
	RESV	RESV	EXTCAP1		SCK	TEST	CHG_I2C		GND	X14	X13
J	○	○		○	○		○	○		○	○
	EXTCAP0	EXTCAP3		GND	SS		RESV	MOSI		X16	X15
K	○		○	○	○		○	○	○		○
	EXTCAP2		VDDIO	RESET	MISO		CHG_SPI	DBG_DATA_GPIO2	GKEYYY2		GKEYX0
L	○	○	○	○	○		○	○	○	○	○
	XVDD	VDD	VDDCORE	SCL	SDA		SYNC_GPIO0	DBG_CLK_GPIO1	GKEYYY1	GKEYYY0	XVDD

Top View

## 1.0 PACKAGING INFORMATION

### 1.1 Package Marking Information

#### 1.1.1 88-BALL UFBGA



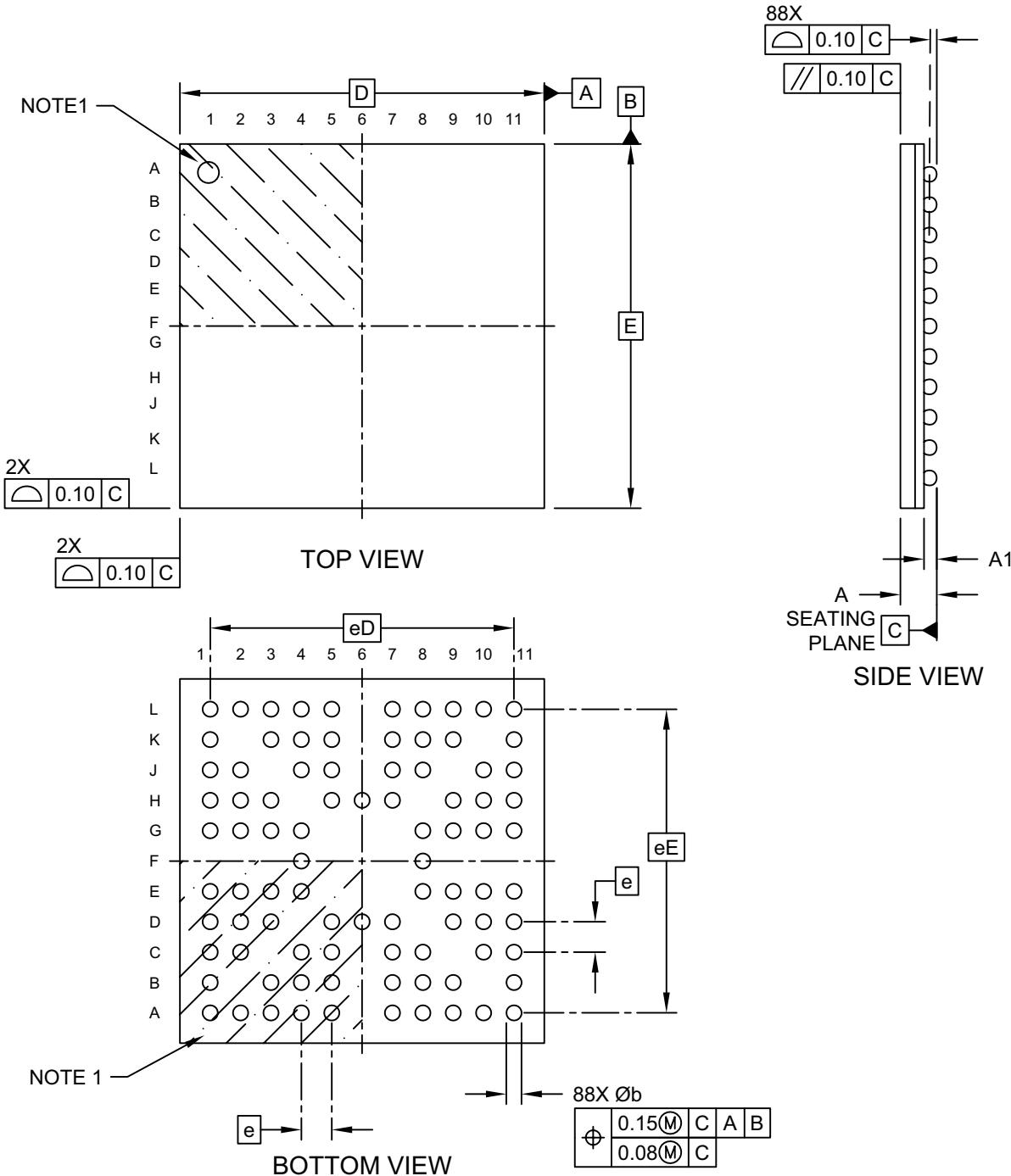
#### 1.1.2 ORDERABLE PART NUMBERS

The product identification system for maXTouch devices is described in ["Product Identification System" on page 9](#). That section also lists example part numbers for the device.

## 1.2 Package Details

## 88-Ball Ultra Thin Fine Pitch Ball Grid Array (BVB) - 6x6x0.6 mm Body [UFBGA] Atmel Legacy Global Package Code CJM

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

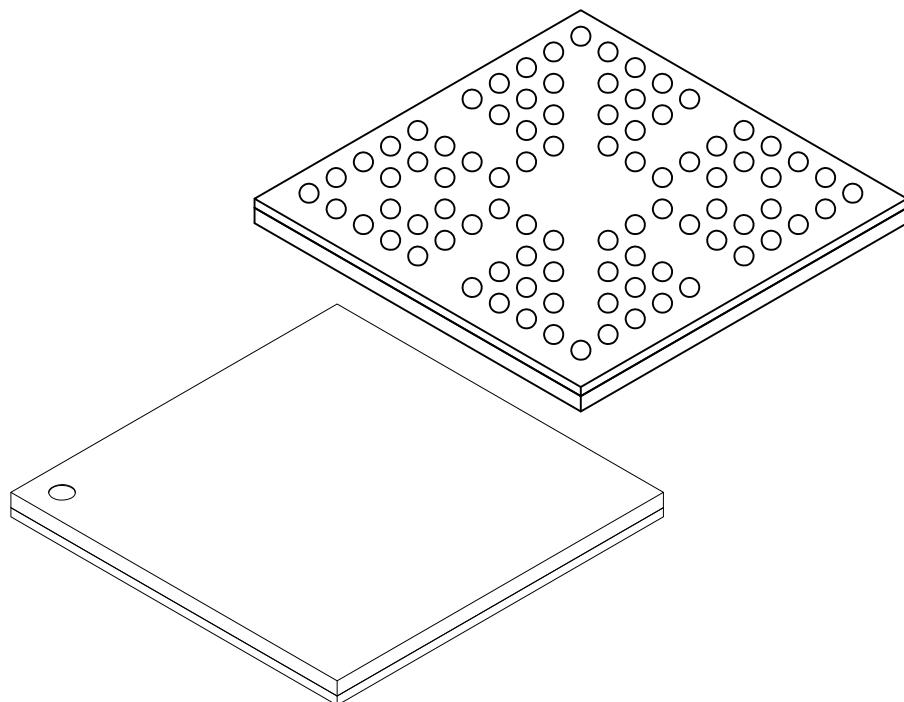


# mXT640UD-CCUBHA1 1.0

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**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals		N		88
Pitch		e		0.50 BSC
Overall Terminal Spacing		eD		5.00 BSC
Overall Terminal Spacing		eE		5.00 BSC
Overall Height		A		0.60
Standoff		A1		0.21
Overall Length		D		6.00 BSC
Overall Width		E		6.00 BSC
Terminal Diameter		b		0.22
		0.25		0.28

Notes:

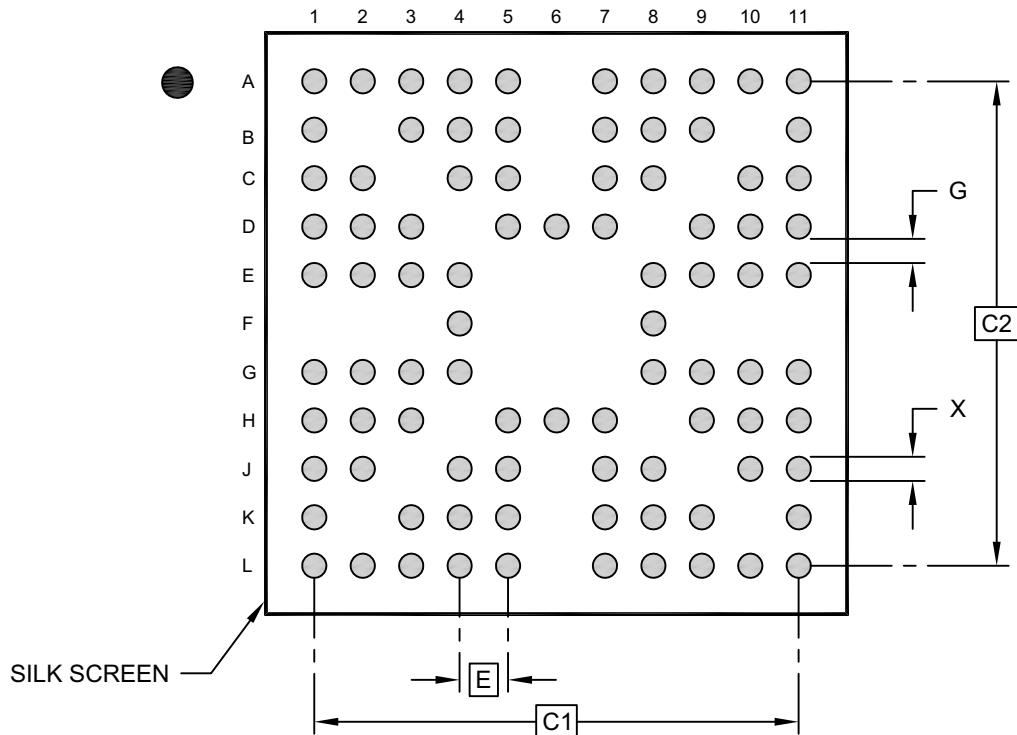
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

REF: Reference Dimension, usually without tolerance, for information purposes only.

**88-Ball Ultra Thin Fine Pitch Ball Grid Array (BVB) - 6x6x0.6 mm Body [UFBGA]  
Atmel Legacy Global Package Code CJM**

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



**RECOMMENDED LAND PATTERN**

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50	BSC	
Overall Contact Pitch	C1	5.00	BSC	
Overall Contact Pitch	C2	5.00	BSC	
Contact Pad Diameter	X			0.28
Contact Pad to Contact Pad	G	0.25		

**Notes:**

1. Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

## APPENDIX A: REVISION HISTORY

### Revision A (September 2021)

Initial edition for firmware revision 1.0.AA – 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 mXT640UD-CCUBHA1.

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

PART NO.	—XXX	[X]	[X]	[XXX]		
Device	Package	Temperature Range	Tape and Reel Option	Pattern		
Device:	Base device name					
Package:	CCU = UFBGA (Ultra Thin Fine-pitch Ball Grid Array) C2 = UFBGA (Ultra Thin Fine-pitch Ball Grid Array) NH = UFBGA (Ultra Thin Fine-pitch Ball Grid Array) C4 = X1FBGA (Extra Thin Fine-pitch Ball Grid Array) MA = XQFN (Super Thin Quad Flat No Lead Sawn) MA5 = XQFN (Super Thin Quad Flat No Lead Sawn)					
Temperature Range:	U	=	−40°C to +85°C (Grade 3)			
	T	=	−40°C to +85°C (Grade 3)			
	B	=	−40°C to +105°C (Grade 2)			
Tape and Reel Option:	Blank	=	Standard Packaging (Tube or Tray)			
	R	=	Tape and Reel <sup>(1)</sup>			
Pattern:	Extension, QTP, SQTP, Code or Special Requirements (Blank Otherwise)					
<b>Note 1:</b> 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 " <a href="#">Orderable Part Numbers</a> " 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
ATMXT640UD-CCUBHA1 (Supplied in trays)	1.0.AA	88-ball UFBGA 6 x 6 x 0.6 mm, RoHS compliant
ATMXT640UD-CCUBRHA1 (Supplied in tape and reel)		

# **mXT640UD-CCUBHA1 1.0**

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## **NOTES:**

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

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