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

### **Product Brief**

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#### **Description**

The mXT640UD-CCU001 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-CCU001 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.

#### **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  $\geq 100$  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
- Touch panel failure detection
  - Automatic touch sensor diagnostics during run time to support the implementation of safety critical features
  - Diagnostics reported using dedicated output pin or by standard Object Protocol messages
  - Configurable test limits

## 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

- 32-byte CRC-checksummed data area for use as a run-time Product Data Store Area
- 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

- Client interface for main communication with the device. Can be one of:
  - I<sup>2</sup>C interface, 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)
  - HID-I<sup>2</sup>C interface for Microsoft Windows 8.x and later versions
- Interrupt to indicate when a message is available
- 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 × 6 × 0.6 mm, 0.5 mm pitch

## Operating Temperature

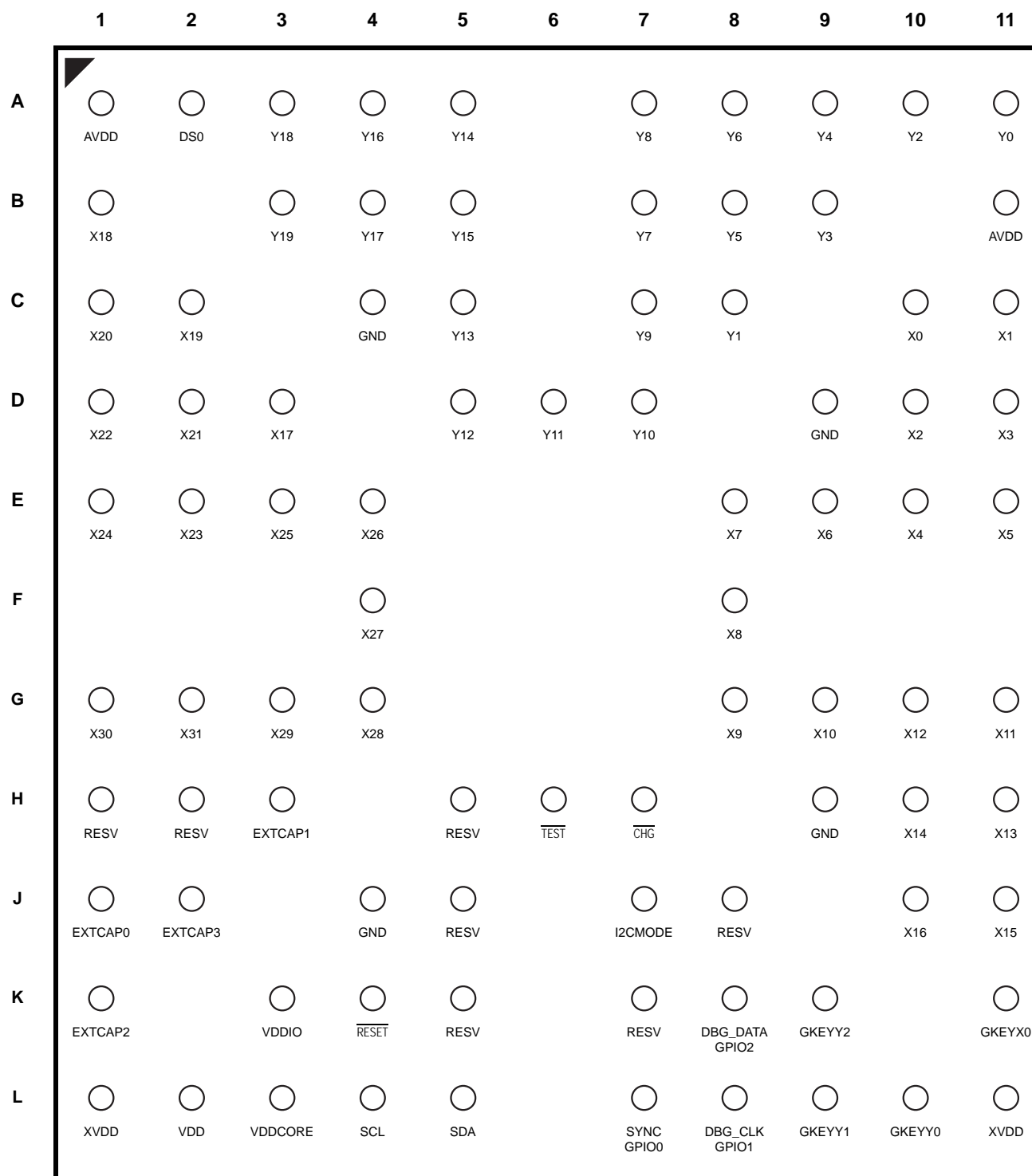
- $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## Design Services

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

## PIN CONFIGURATION

## 88-ball UFBGA



Top View

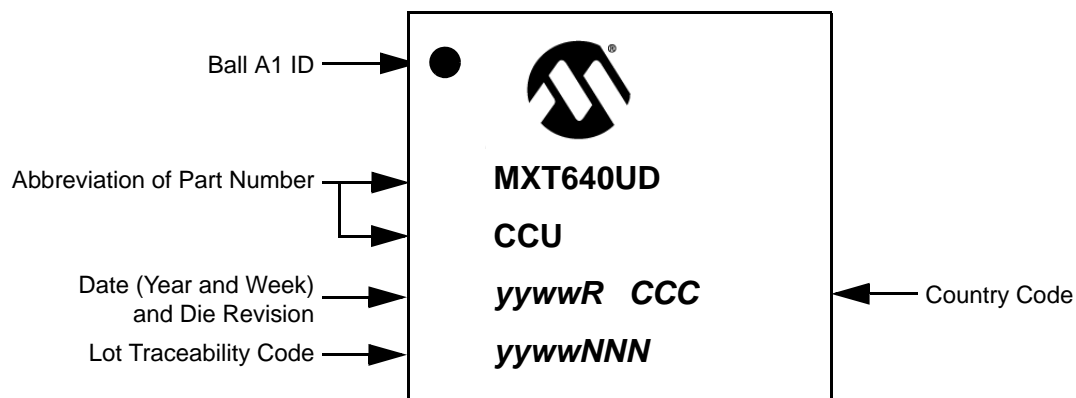
# mXT640UD-CCU001 1.0

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## 1.0 PACKAGING INFORMATION

### 1.1 Package Marking Information

#### 1.1.1 88-BALL UFBGA



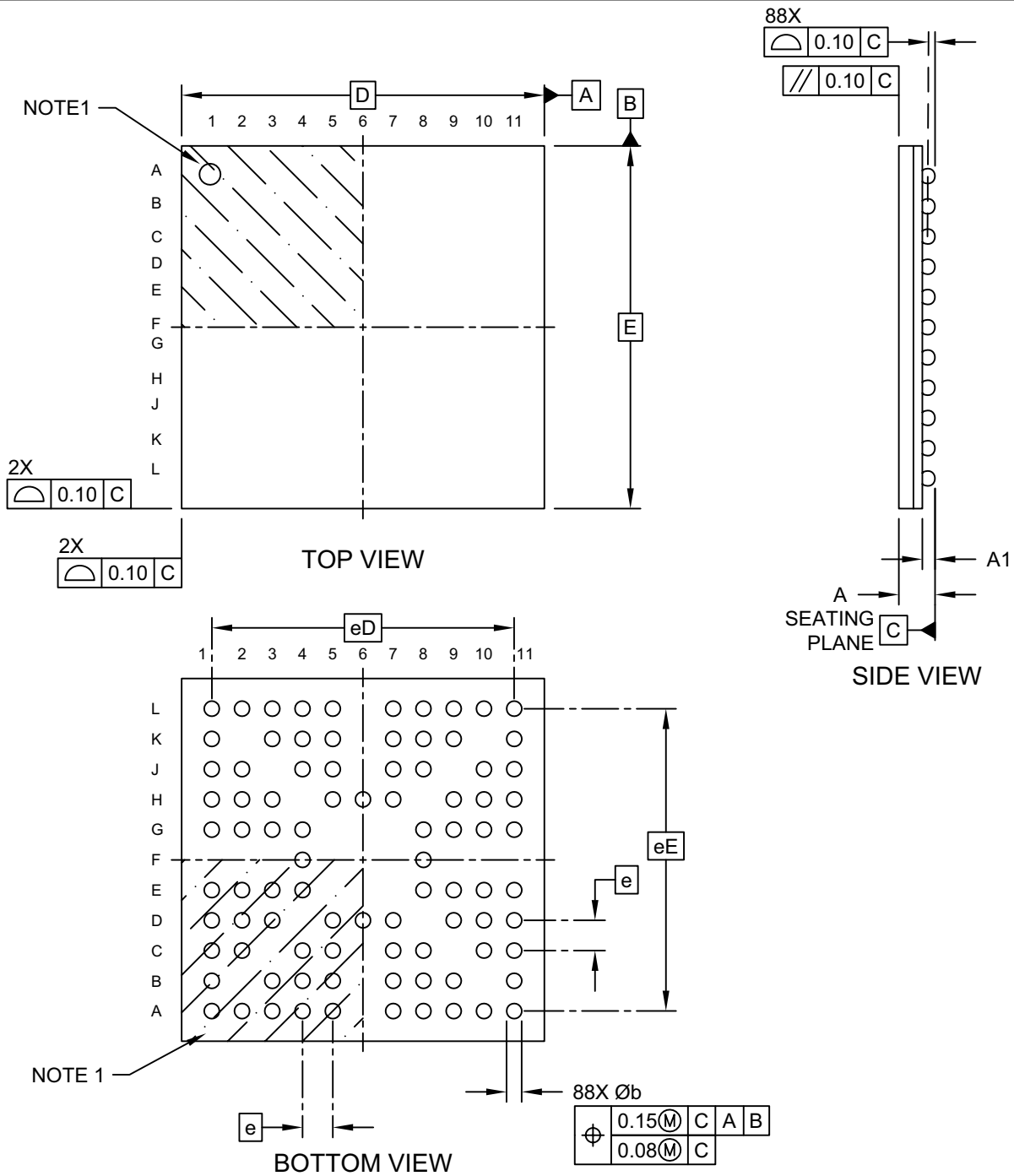
#### 1.1.2 ORDERABLE PART NUMBERS

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**

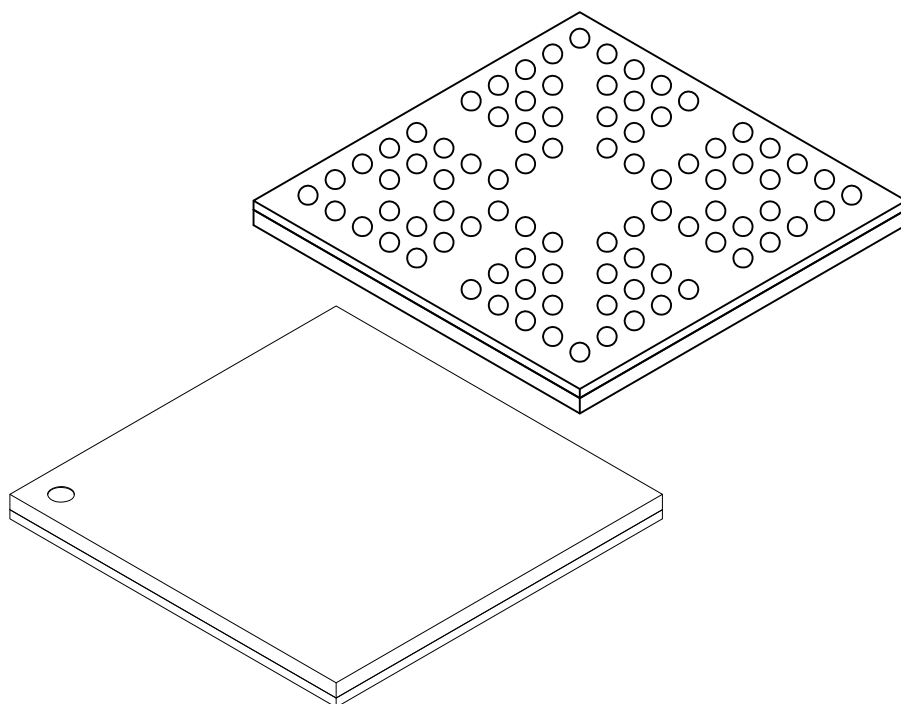
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-21158 Rev A Sheet 1 of 2

## 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>



|                          |    | 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 |       | 0.11        | –    | 0.21 |
| Overall Length           | D  |       | 6.00 BSC    |      |      |
| Overall Width            | E  |       | 6.00 BSC    |      |      |
| Terminal Diameter        | b  |       | 0.22        | 0.25 | 0.28 |

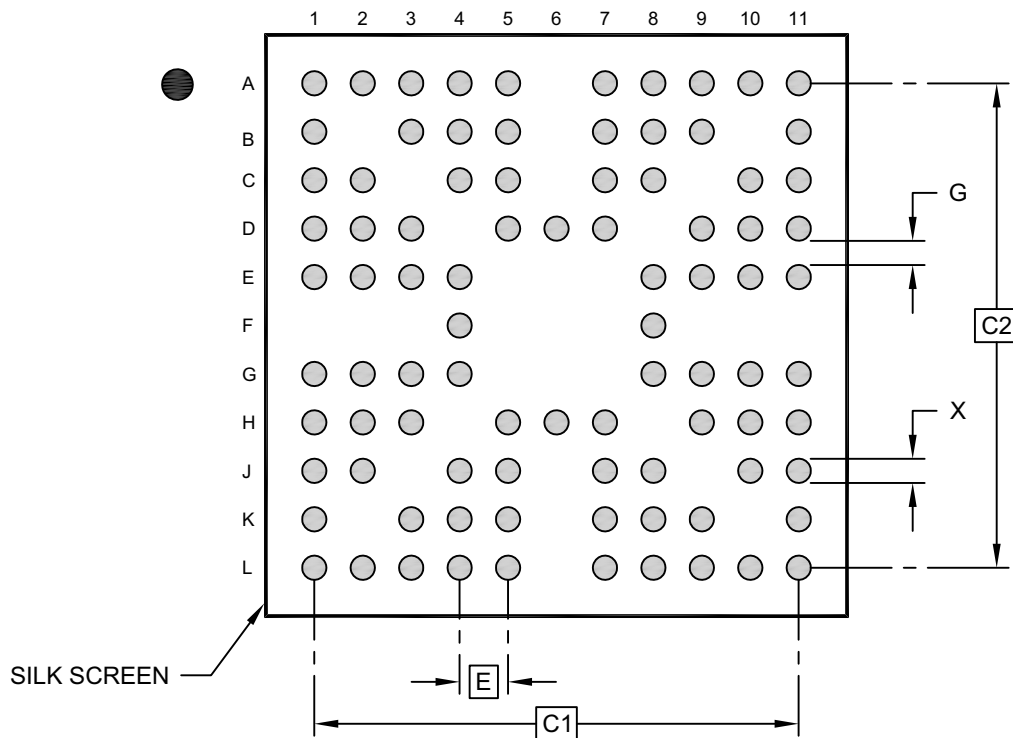
### Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- 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.

Microchip Technology Drawing C04-21158 Rev A Sheet 2 of 2

# 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:

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

Microchip Technology Drawing C04-23158 Rev A

## APPENDIX A: REVISION HISTORY

### **Revision A (June 2021)**

Initial edition for firmware revision 1.0.AA – Release

### **Revision B (November 2021)**

Updated for firmware revision 1.0.AB – 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-CCU001.

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>[X]</u>           | <u>[XXX]</u> |
| Device          | Package     | Temperature Range | Tape and Reel Option | Pattern      |

Device:

Base device name

Package:

CC

=

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)

**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  |
|---|-------------------|--|
| ATMXT640UD-CCU001<br>(Supplied in trays)          | 1.0.AB            | 88-ball UFBGA 6 × 6 × 0.6 mm, RoHS compliant<br>Industrial grade; not suitable for automotive characterization |
| ATMXT640UD-CCUR001<br>(Supplied in tape and reel) |                   |  |

NOTES:

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