
maXTouch 2911-node Touchscreen Controller

Product Brief

Description

The ATMXT2952TD-C2UKD 2.0 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 ATMXT2952TD-C2UKD 2.0 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.

The ATMXT2952TD-C2UKD allows for one or more physical knobs to be affixed to the touchscreen. As a knob is rotated, or (if the knob design allows it) pushed, the ATMXT2952TD-C2UKD detects the resulting touches.

Knob-on-Display™ Technology

- Detect and report the detent (click position) of specific capacitive mechanical rotary encoders (knobs) mounted on the touch panel
- Support for up to 4 Knob instances with different size and number of detents (64 detents maximum)
- Position and size of each knob is individually configurable. No specific touch pattern required
- Report absolute or relative detent position as well as the direction of rotation
- Configurable suppression area around the knob to suppress accidental touches from fingers holding the knob
- Optional push/release function
- Design guidance, tools and other services available from Microchip

maXTouch® Adaptive Sensing Technology

- Up to 41 X (transmit) lines and 71 Y (receive) lines for use by a touchscreen and/or key array
- A maximum of 2911 nodes can be allocated to the touch sensor
- Touchscreen size 21 inches (16:9 aspect ratio), assuming a sensor electrode pitch of 6.5 mm. The achievable touchscreen size depends on the knob requirements
- Multiple touch support with up to 16 concurrent touches tracked in real time depending on the number of knobs implemented

Touch Sensor Technology

- On-cell/touch-on display support including OLED and LCD
- Discrete/out-cell support including glass and PET film-based sensors
- 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 (dependent on sensor size, touch size, configuration, stack-up, and dimension and number of detents of the knob)
- KoD™ Knob Designer tool provides guidance on material and thickness
- Configuration and stack-up to be approved by Microchip or a Microchip-qualified touch sensor module partner
- 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
- Multiple acquisition schemes for robust and sensitive multi-touch sensing, including:
 - Mutual capacitance measurements
 - Self Capacitance measurements
 - P2P Mutual Capacitance measurements
- Noise suppression technology to combat ambient and power-line noise
 - Up to 240 V_{PP} between 1 Hz and 1 kHz sinusoidal waveform (no touches)
 - Up to 20 V_{PP} between 1 kHz and 1 MHz sinusoidal waveform

- 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 ≥ 110 Hz (subject to configuration)
 - Initial touch latency < 20 ms for first touch from idle (subject to configuration)
 - Configurable for power and speed optimization
- Touch panel/knob 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
 - Presence of knob detected
 - Configurable test limits

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)
- Adjacent Key Suppression (AKS) technology is supported for false key touch prevention

PWM Signal Generation

- PWM Output for display backlight control, audible speaker/buzzer output, or simple haptic feedback

Enhanced Algorithms

- Dedicated drift calibration algorithm for the knob locations
- Lens bending algorithms to remove display noise
- Touch suppression algorithms to remove unintentional large touches
- Palm Recovery Algorithm for quick restoration to normal state
- Enhanced Touch Separation algorithm for improved two touch separation/tracking in all directions.

Data Store

- 60-byte CRC checksummed data area for use as a run-time Product Data Store Area
- 64-byte data area for user's custom data (not CRC checksummed)

Device Security

- Encrypted configuration parameters and touch coordinate reports (OBP messages) using customer's own security key

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

- I²C client interface for main communication with the device
 - 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)
- Interrupt to indicate when a message is available
- Additional SPI Debug Interface to read the raw data for tuning and debugging purposes

Power Supply

- Digital (V_{dd}) 3.3V nominal
- Digital I/O (V_{ddIO}) 1.8V to 3.3V nominal

- Analog (AVdd) 3.3V nominal
- High voltage external X line drive (XVdd) up to 9.2V

Package

- 162-ball UFBGA 10 × 5 × 0.6 mm, 0.5 mm pitch

Operating Temperature

- –40°C to +85°C

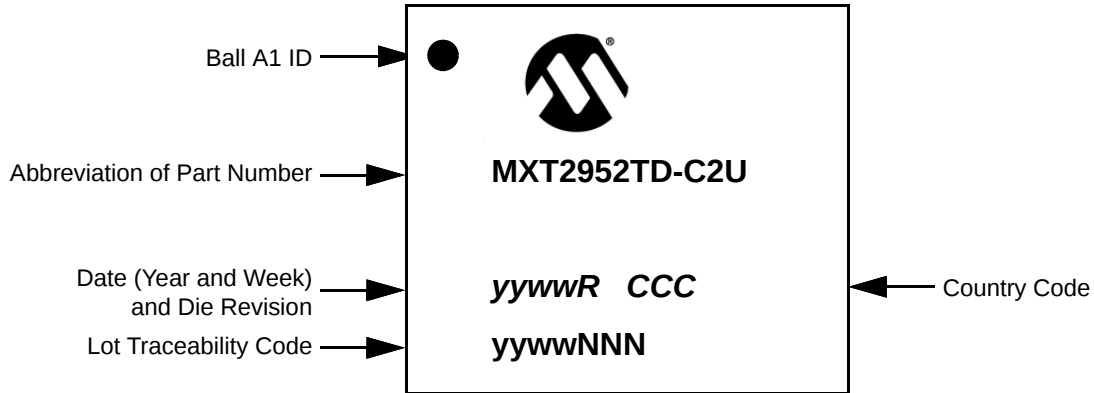
Design Services

- Specific design and tuning tools available as maXTouch Studio plug-ins

1.0 PACKAGING INFORMATION

1.1 Package Marking Information

1.1.1 162-BALL UFBGA



1.1.2 ORDERABLE PART NUMBERS

The product identification system for maXTouch devices is described in ["Product Identification System" on page 10](#). That section also lists example part numbers for the device.

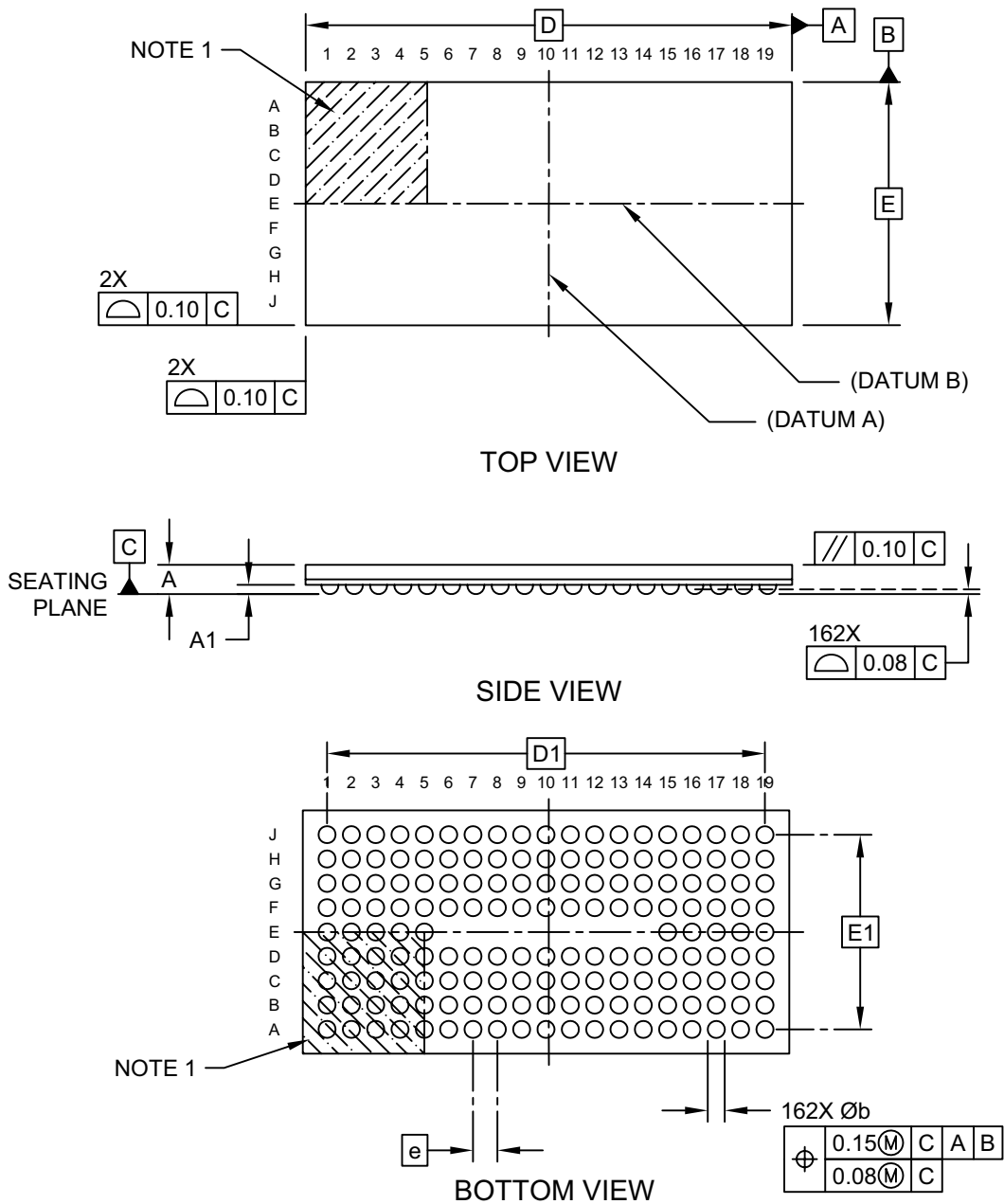
ATMXT2952TD-C2UKD 2.0

1.2 Package Details

162-Ball Ultra Thin Fine Pitch Ball Grid Array (C6B) - 10x5x0.6 mm Body [UFBGA]

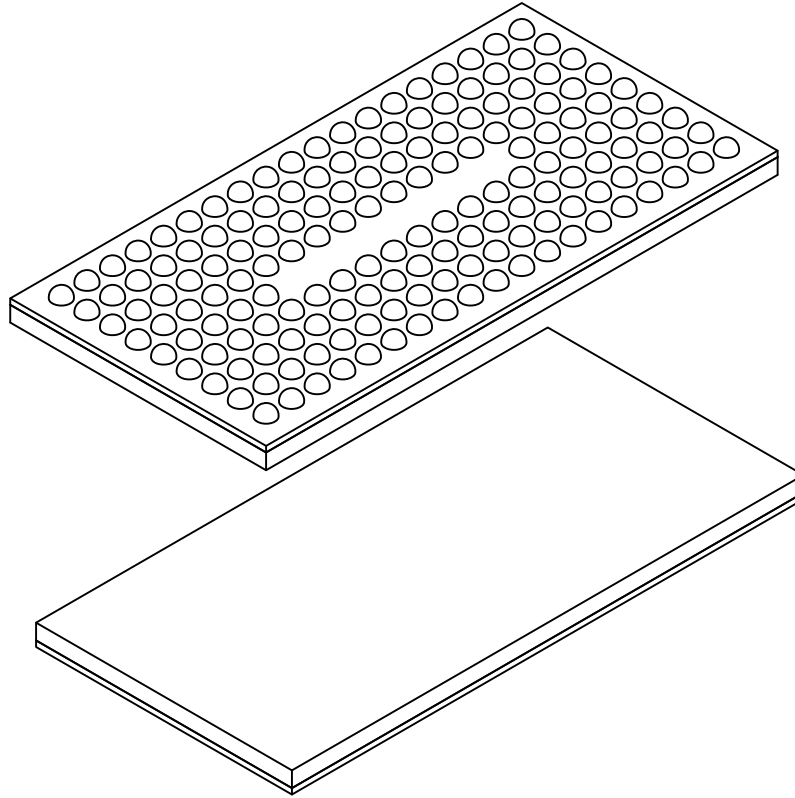
Atmel Legacy Global Package Code CAK

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



**162-Ball Ultra Thin Fine Pitch Ball Grid Array (C6B) - 10x5x0.6 mm Body [UFBGA]
Atmel Legacy Global Package Code CAK**

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	162		
Pitch	e	0.50 BSC		
Overall Height	A	0.488	0.546	0.60
Standoff	A1	0.120	0.155	0.190
Overall Length	D	10.00 BSC		
Overall Ball Spacing	D1	9.00 BSC		
Overall Width	E	5.00 BSC		
Exposed Pad Width	E1	4.00 BSC		
Ball Diameter	b	0.20	0.25	0.30

Notes:

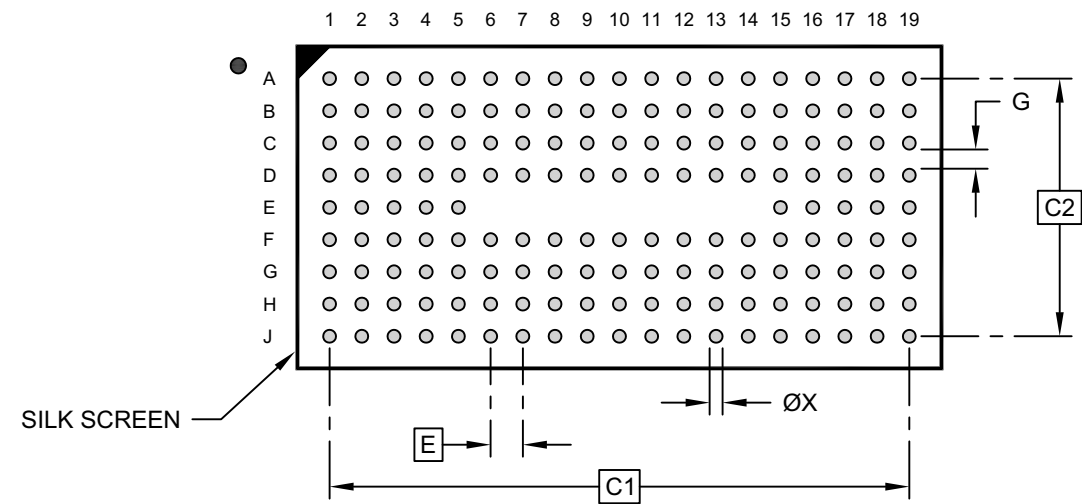
- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-21167 Rev A Sheet 2 of 2

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162-Ball Ultra Thin Fine Pitch Ball Grid Array (C6B) - 10x5x0.6 mm Body [UFBGA] Atmel Legacy Global Package Code CAK

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		
Contact Pad Spacing	C1	9.00 BSC		
Contact Pad Spacing	C2	4.00 BSC		
Contact Pad Diameter (X162)	X1			0.20
Contact Pad to Contact Pad	G	0.30		

- Notes:
1. Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-23167 Rev A

APPENDIX A: REVISION HISTORY

Revision A (April 2024)

Initial edition for firmware revision 2.0.AA – Release

ATMXT2952TD-C2UKD 2.0

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 ATMXT2952TD-C2UKD.

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:	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)	
Tape and Reel Option: ⁽¹⁾	Blank	=	Standard Packaging (Tube or Tray)	
	R	=	Tape and Reel	
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	Family ID	Variant ID	Description
ATMXT2952TD-C2UKD1 (Supplied in trays)	2.0.AA	0xA4	0x5A	162-ball UFBGA 10 × 5 × 0.6 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT2952TD-C2URKD1 (Supplied in tape and reel)				

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