


**MICROCHIP**
**mXT2912TD-AT/mXT2912TD-AB 1.0**

## maXTouch 2911-node Touchscreen Controller Product Brief

### Description

The mXT2912TD-AT/mXT2912TD-AB 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 mXT2912TD-AT/mXT2912TD-AB 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<sup>®</sup> Adaptive Sensing Touchscreen Technology

- Up to 41 X (transmit) lines and 71 Y (receive) lines for use by touchscreens, keys and sliders.
- A maximum of 2911 nodes can be allocated to a touchscreen
- Touchscreen size 16.82 inches (16:10 aspect ratio), assuming a sensor electrode pitch of 5.5 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 on a single touchscreen

### Multiple Touch Slider

- Supports implementation of a multiple touch slider
- If required, the slider can use a different electrode material to that used for the touchscreen sensor

### Keys

- Up to 32 nodes can be allocated as mutual capacitance sensor keys (subject to other configurations)
- Adjacent Key Suppression (AKS) technology is supported for false key touch prevention

### Automotive Applications

- AEC-Q100 Qualified
- Developed following Automotive SPICE<sup>®</sup> Level 3 certified processes
- CISPR 25 compliant (for both mutual and self capacitance measurements)

### 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 or a Microchip-qualified touch sensor module partner is recommended)

### Front Panel Material

- 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)
- Glass 0.4 mm to 4.0 mm (dependent on screen size, touch size, configuration and stack-up)
- Plastic 0.2 mm to 3.0 mm (dependent on screen size, touch size, configuration 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
- Hover Support
  - Supports one-finger hover up to 20 mm detection and 15 mm tracking range
  - Supports multiple finger hover detection
- Glove Support
  - Glove touches up to 5 mm thickness (subject to stack-up design)
- Mutual capacitance and self capacitance measurements supported for robust touch detection
- P2P mutual capacitance measurements supported for extra sensitive 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
  - Up to 20 V<sub>PP</sub> between 1 kHz and 1 MHz sinusoidal waveform

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- Burst Frequency
  - Flexible and dynamic Tx burst frequency selection to reduce EMC disturbance
  - Controlled Tx burst frequency drift over process and temperature range
  - Firmware-controlled Tx waveform shaping to reduce emissions
- Scan Speed
  - Up to 100 Hz reporting rate for one finger (subject to configuration)
  - Typical report rate for 5 touches  $\geq 95$  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

## Product Data Store Area

- Up to 60 bytes of user-defined data can be stored during production

## 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 slave with support for Standard mode (up to 100 kHz), Fast mode (up to 400 kHz), Fast-mode Plus (up to 1 MHz)
- SPI slave (up to 8 MHz)
- Interrupt to indicate when a message is available
- SPI Debug Interface to read the raw data for tuning and debugging purposes

## Power Supply

- Digital (V<sub>dd</sub>) 3.3 V nominal
- Digital I/O (V<sub>ddIO</sub>) 3.3 V nominal
- Analog (A<sub>Vdd</sub>) 3.3 V nominal
- High voltage external X line drive (X<sub>Vdd</sub>) up to 8.5 V

## Package

- 176-lead LQFP 24 × 24 × 1.4 mm, 0.5 mm pitch

## Operating Temperature

- mXT2912TD-AT:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (Grade 3)
- mXT2912TD-AB:  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  (Grade 2)

## Design Services

- Review of device configuration, stack-up and sensor patterns
- Custom firmware versions can be considered
- Contact your Microchip representative for more information

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## PIN CONFIGURATION

### Pin Configuration – 176-lead LQFP

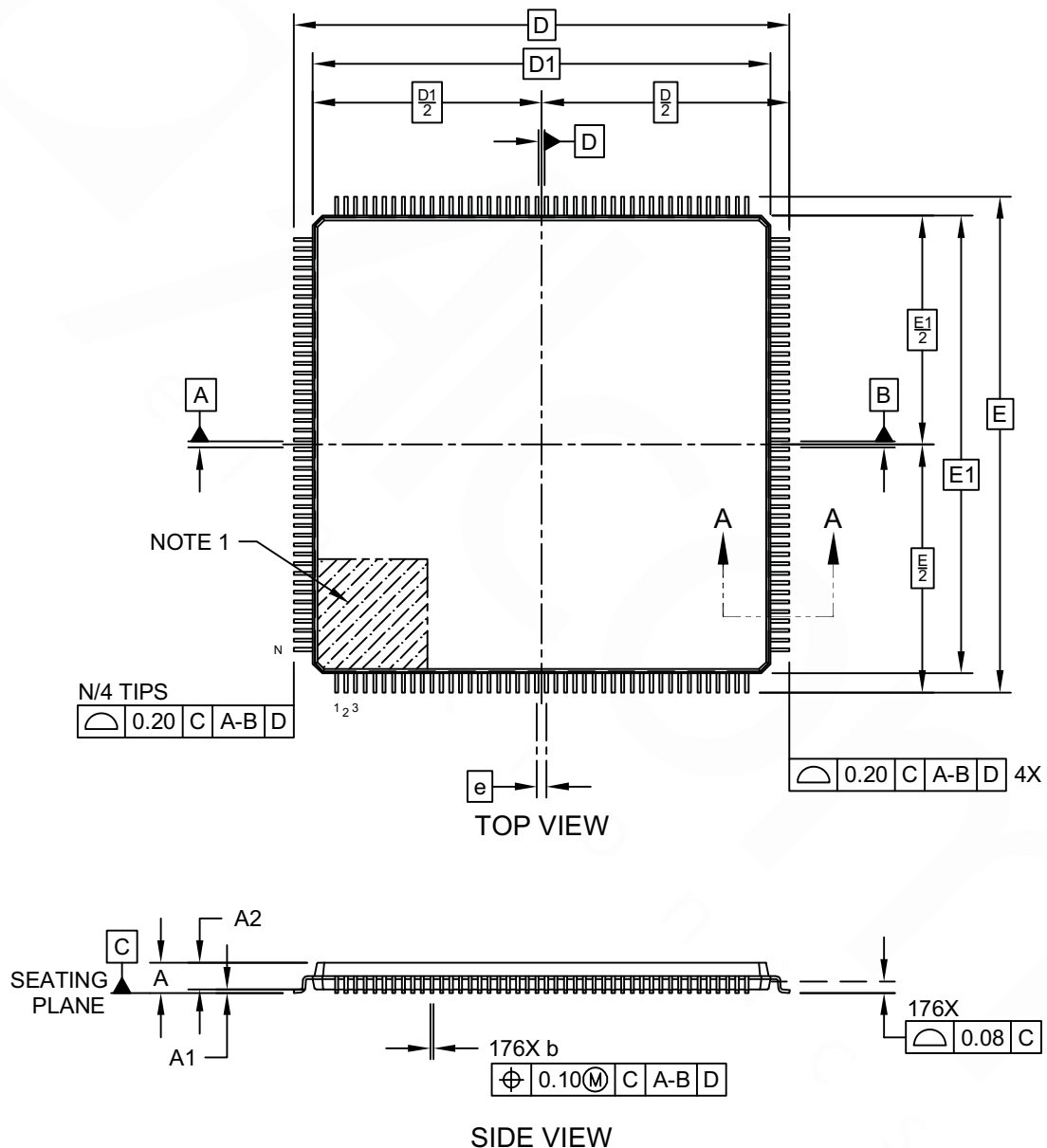


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## 1.0 PACKAGING INFORMATION

**176-Lead Plastic Quad Flatpack (2VB) - 24x24x1.4 mm Body [LQFP]**  
**Atmel Legacy Global Package Code AGR**

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

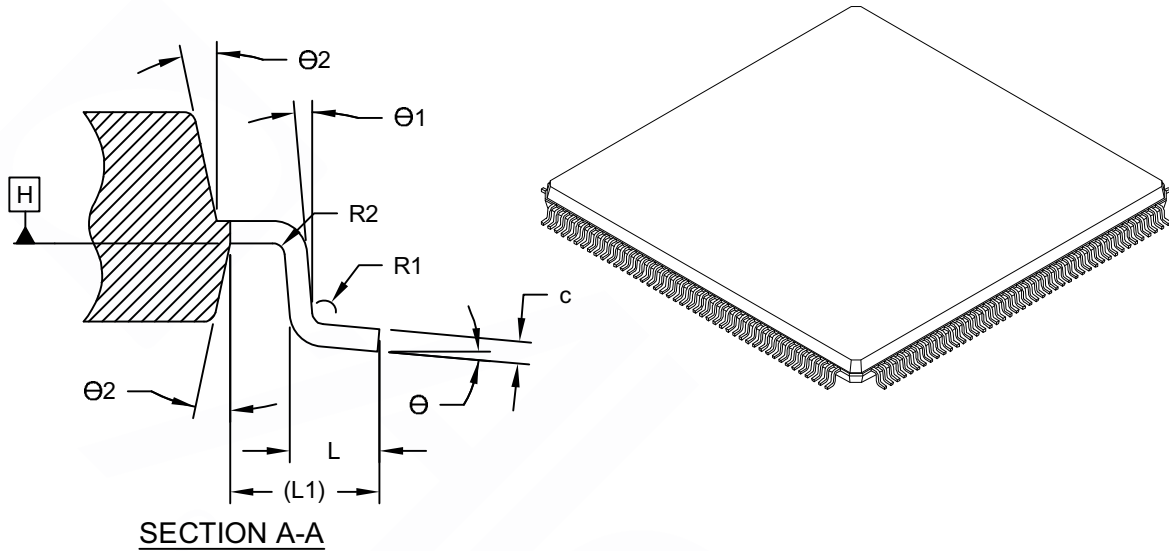


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## 176-Lead Plastic Quad Flatpack (2VB) - 24x24x1.4 mm Body [LQFP] Atmel Legacy Global Package Code AGR

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



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Terminals	N	176		
Pitch	e	0.50 BSC		
Overall Height	A	-	-	1.60
Standoff	A1	0.05	-	0.15
Molded Package Thickness	A2	1.35	1.40	1.45
Overall Length	D	26.00 BSC		
Molded Package Length	D1	24.00 BSC		
Overall Width	E	26.00 BSC		
Molded Package Width	E1	24.00 BSC		
Terminal Width	b	0.17	0.22	0.27
Terminal Thickness	c	0.09	-	0.20
Terminal Length	L	0.45	0.60	0.75
Footprint	L1	1.00 REF -		
Lead Bend Radius	R	0.08	-	-
Lead Bend Radius	R2	0.08	-	0.20
Foot Angle	θ	0°	3.5°	7°
Lead Angle	θ1	0°	-	-
Terminal-to-Exposed-Pad	θ2	11°	12°	13°

**Notes:**

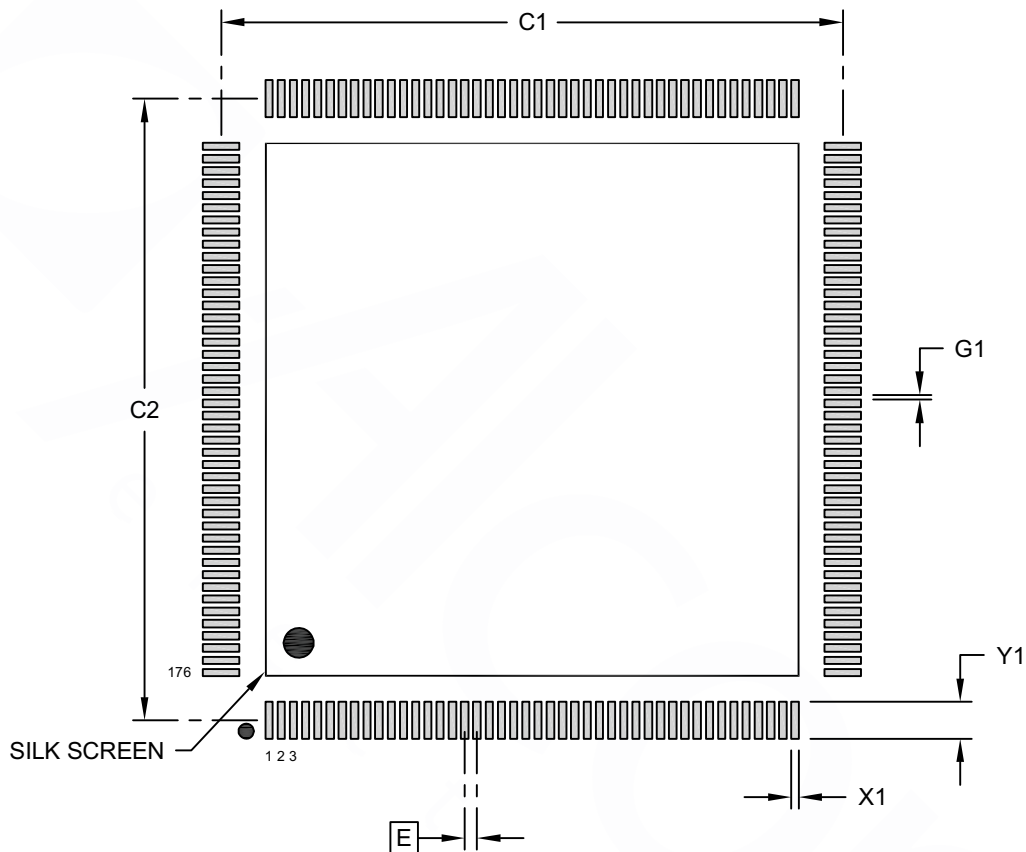
- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.  
REF: Reference Dimension, usually without tolerance, for information purposes only.

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## 176-Lead Plastic Quad Flatpack (2VB) - 24x24x1.4 mm Body [LQFP] Atmel Legacy Global Package Code AGR

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



### RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Contact Pad Spacing	C1		25.40	
Contact Pad Spacing	C2		25.40	
Contact Pad Width (X176)	X1			0.30
Contact Pad Length (X176)	Y1			1.50
Contact Pad to Center Pad (X172)	G1	0.20		

**Notes:**

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

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## APPENDIX A: REVISION HISTORY

### Revision A (October 2018)

Initial edition for firmware revision 1.0 – Release

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## 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 mXT2912TD-AT/mXT2912TD-AB.

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

PART NO.	-XXX	[X]	[XX]	[X]	[XXX]
Device	Package	Temperature Range	Sample Type	Tape and Reel Option	Pattern
Device:	Base device name				
Package:	A	=	QFP (Plastic Quad Flatpack)		
	AM	=	VQFN (Plastic Very Thin Quad Flat No Lead)		
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)		
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:	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
ATMXT2912TD-ATVAO (Supplied in trays)	1.0.AA	176-lead LQFP 24 × 24 × 1.4 mm, RoHS compliant Operating temperature range -40°C to +85°C (Grade 3)
ATMXT2912TD-ATRVAO (Supplied in tape and reel)		
ATMXT2912TD-ABVAO (Supplied in trays)	1.0.AA	176-lead LQFP 24 × 24 × 1.4 mm, RoHS compliant Operating temperature range -40°C to +105°C (Grade 2)
ATMXT2912TD-ABRVAO (Supplied in tape and reel)		



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- 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."

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