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## **maXTouch 448-node Touchscreen Controller Product Brief**

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### **Description**

The mXT449TD-AT/mXT449TD-AB 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 mXT449TD-AT/mXT449TD-AB 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 32 X (transmit) lines and 20 Y (receive) lines
- A maximum of 448 nodes can be allocated to the touchscreen
- Touchscreen size 6.98 inches (16:9 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

### **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 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 8 mm (dependent on screen size, touch size, configuration and stack-up)
- Plastic 0.2mm to 4 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
  - 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
- P2P mutual capacitance measurements supported for extra sensitive touch sensing
- Noise suppression technology to combat ambient 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
- 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 250 Hz one finger reporting rate (subject to configuration)
  - Typical report rate for 10 touches  $\geq 60$  Hz (subject to configuration)

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- Initial touch latency <25 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

## 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

## 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 states
- Pipelined analog sensing detection and digital processing to optimize system power efficiency

## Application Interfaces

- I<sup>2</sup>C-compatible slave 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)
- SPI slave interface (up to 8 MHz)
- 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 (XVdd = Vdd if voltage pump not used)

## Package

- 100-pin TQFP 14 × 14 × 1 mm, 0.5 mm pitch

## Operating Temperature

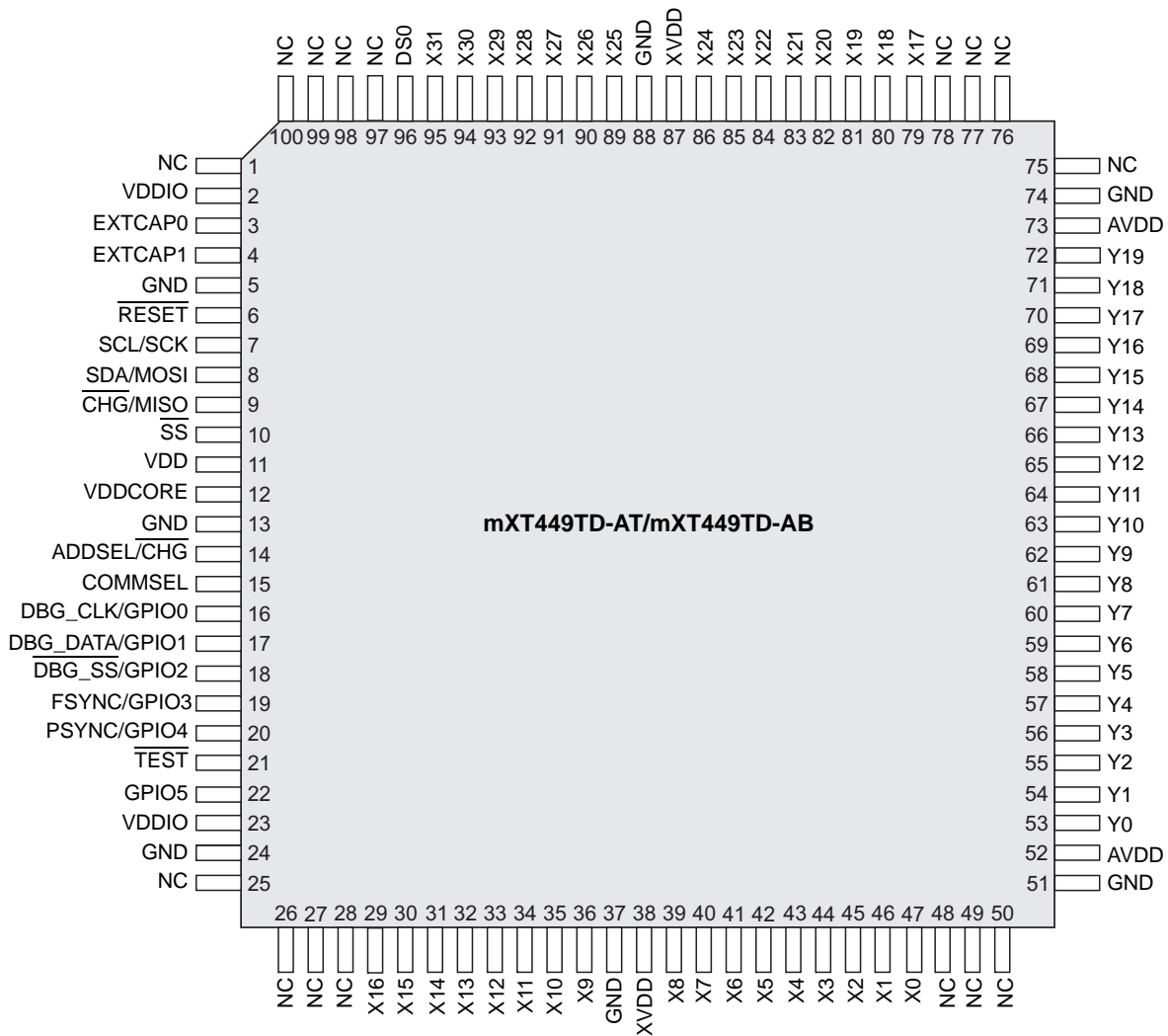
- mXT449TD-AT: -40°C to +85°C (Grade 3)
- mXT449TD-AB: -40°C to +105°C (Grade 2)

## Design Services

- Review of device configuration, stack-up and sensor patterns
- Custom firmware versions can be considered

## PIN CONFIGURATION

### 100-pin TQFP



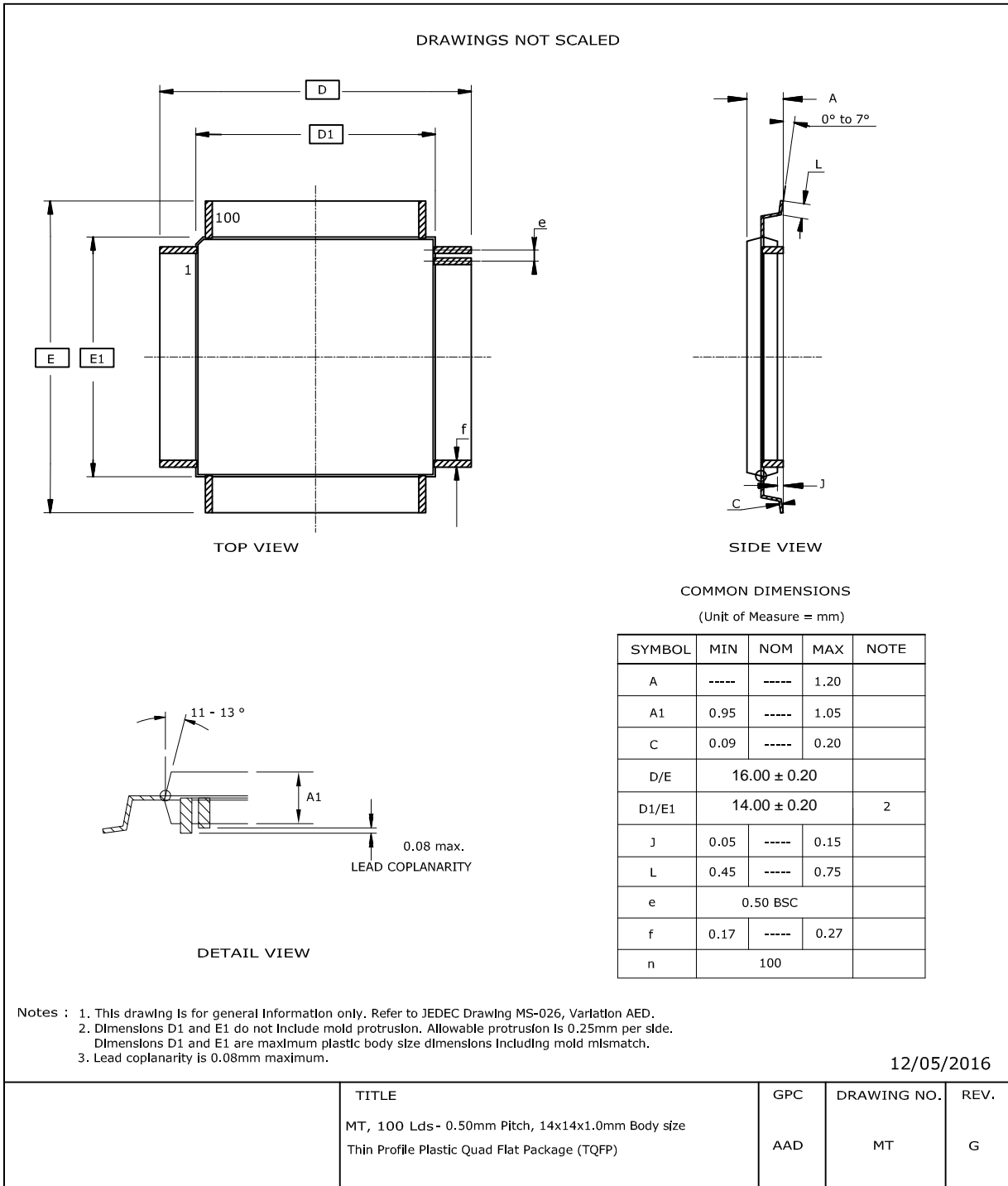
Top view

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## 1.0 PACKAGING INFORMATION

The following section gives the technical details of the package for the device.

### 1.1 100-pin TQFP 14 x 14 x 1 mm



## APPENDIX A: REVISION HISTORY

### Revision A (August 2017)

Initial edition for firmware revision 1.0.AA – Release

### Revision B (October 2017)

Updated for firmware revision 1.0.AC – Release

This revision incorporates the following updates:

- Features:
  - Front Panel Material: Recommended panel thickness for glass and plastic revised
- “[Product Identification System](#)”:
  - “[Orderable Part Numbers](#)”: Orderable part numbers and firmware version updated

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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 mXT449TD-AT/mXT449TD-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)		
	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:	<i>Blank</i>	=	-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:	<i>Blank</i>	=	Release Sample		
	ES	=	Pre-release (Engineering) Sample		
Tape and Reel Option:	<i>Blank</i>	=	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
ATMXT449TD-AT081 (Supplied in trays)	1.0.AC	100-pin TQFP 14 x 14 x 1 mm, RoHS compliant Operating temperature range -40°C to +85°C (Grade 3) Automotive grade sample; suitable for automotive characterization
ATMXT449TD-ATR081 (Supplied in tape and reel)		
ATMXT449TD-AB081 (Supplied in trays)	1.0.AC	100-pin TQFP 14 x 14 x 1 mm, RoHS compliant Operating temperature range -40°C to +105°C (Grade 2) Automotive grade sample; suitable for automotive characterization
ATMXT449TD-ABR081 (Supplied in tape and reel)		

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