mXT2113TD-AT/mXT2113TD-AB 2.0

maXTouch 2112-node Touchscreen Controller
Product Brief

Description

The mXT2113TD-AT/mXT2113TD-AB 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 mXT2113TD-AT/mXT2113TD-AB 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.

Automotive Applications

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

maXTouch® Adaptive Sensing Touchscreen Technology

- Up to 33 X (transmit) lines and 64 Y (receive) lines for use by 2 touchscreens, 2 key arrays and slider
- Touchscreen size 15.49 inches (2:1 aspect ratio), assuming a sensor electrode pitch of 5.5 mm. Other sizes are possible with different electrode pitches and appropriate sensor material
- A maximum of 2112 X/Y nodes can be allocated to a touch sensor
- Up to 2 separate touchscreen panels can be defined on the sensor
- 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 in addition to touchscreens, defined as 2 key arrays (subject to availability of X and Y lines and 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, 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 screen 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 screen 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
- Hover Support
  - Supports one-finger hover up to 20 mm detection and 15 mm tracking range
  - Supports multiple finger hover detection
- Mutual capacitance and self capacitance measurements supported for robust touch detection
- P2P mutual capacitance measurements supported for extra sensitive multi-touch sensing

MXT2113TD-AT/MXT2113TD-AB 2.0

- Noise suppression technology to combat ambient and power-line noise
  - Up to 240 V_{PP} between 1 Hz and 1 kHz sinusoidal waveform
  - 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
  - Up to 141 Hz report rate for one finger (subject to configuration)
  - Typical report rate for 10 touches ≥120 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 per touchscreen instance

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^2C 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
- Additional SPI 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 external X line drive (XVdd) up to 8.5V

Package

- 144-lead LQFP 20 × 20 × 1.4 mm, 0.5 mm pitch

Operating Temperature

- ATMXT2113TD-ATVA1: –40°C to +85°C (Grade 3)
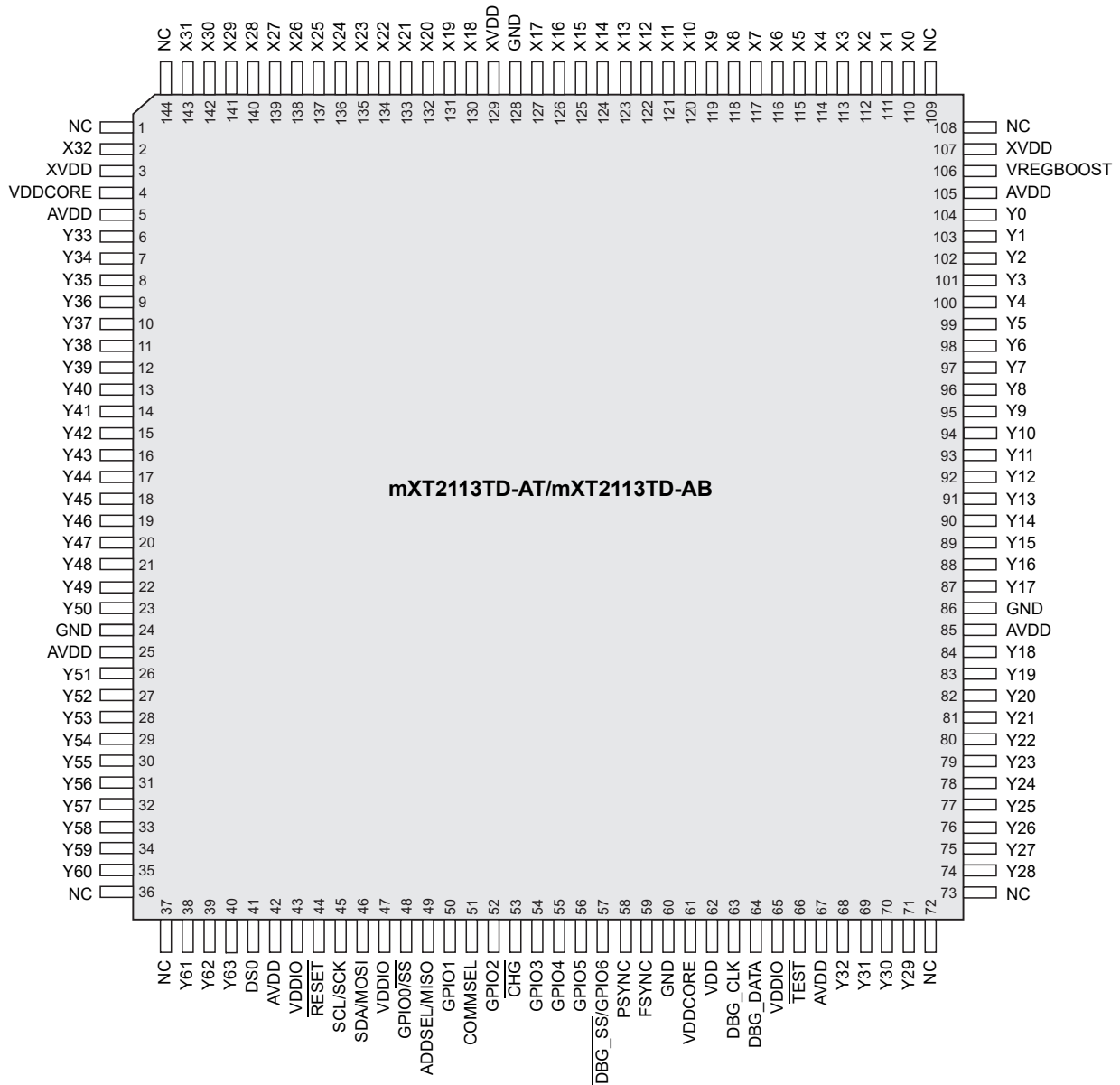- ATMXT2113TD-ABVA1: –40°C to +105°C (Grade 2)

Product Brief

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

144-lead LQFP

Top view

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1.0   PACKAGING INFORMATION

144-Lead Plastic Quad Flatpack (2SB) - 20x20x1.4 mm Body [LQFP]
Atmel Legacy Global Package Code AEI

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

TOP VIEW

SIDE VIEW
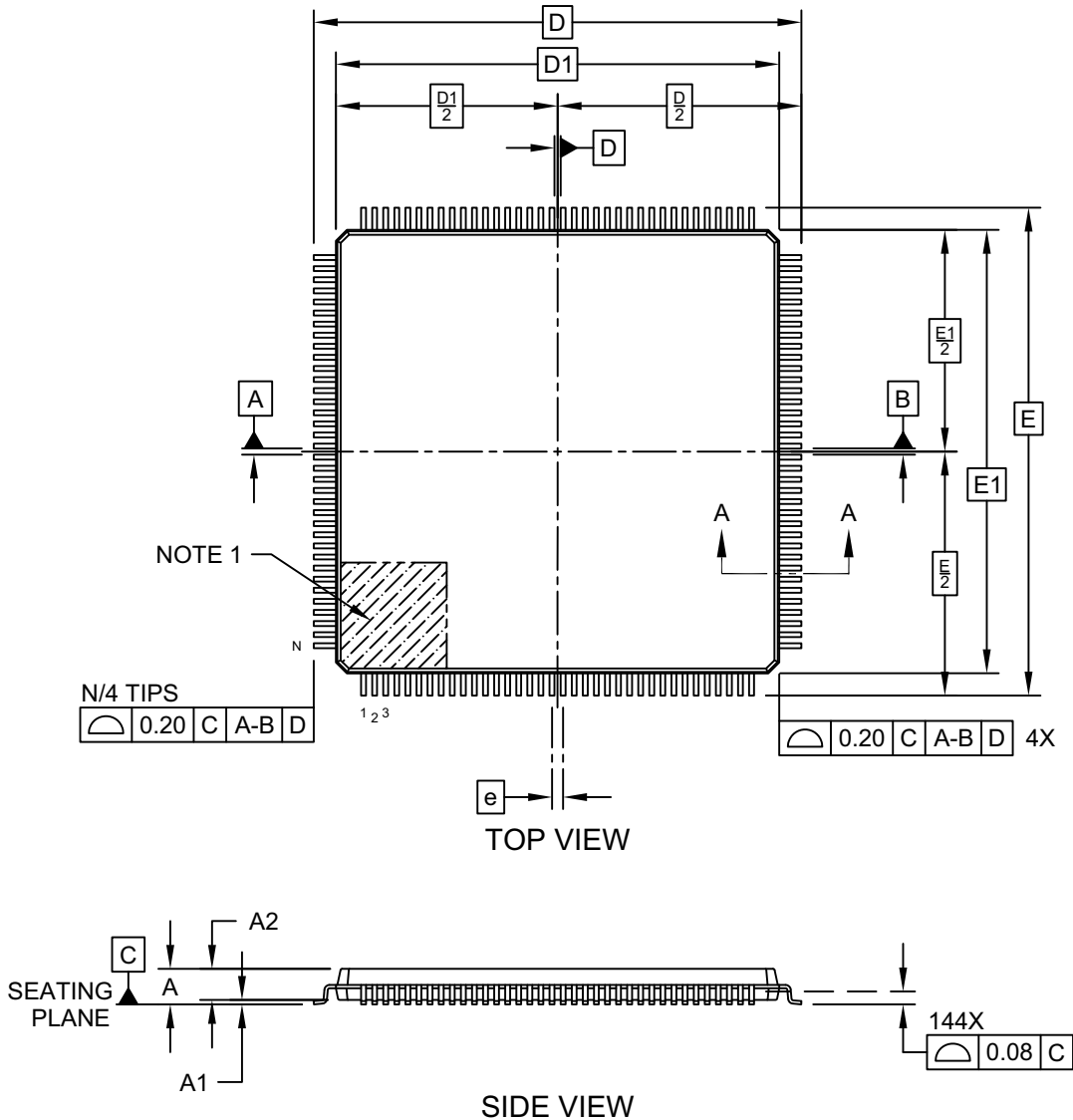
Microchip Technology Drawing C04-21010 Rev A Sheet 1 of 2

144-Lead Plastic Quad Flatpack (2SB) - 20x20x1.4 mm Body [LQFP]
Atmel Legacy Global Package Code AEI

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SECTION A-A
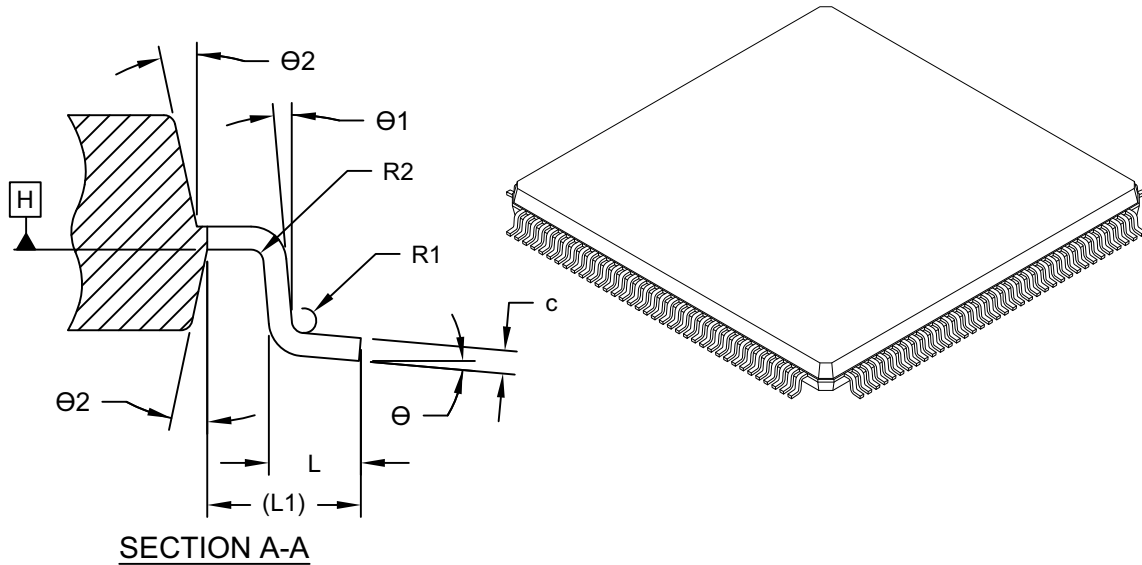
Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		144	
Pitch	e		0.50 BSC	
Overall Height	A	-	-	1.60
Standoff	A1	0.05	0.02	0.15
Molded Plastic Height	A2	1.35	1.40	1.45
Overall Length	D		22.00 BSC	
Exposed Pad Length	D1		20.00 BSC	
Overall Width	E		22.00 BSC	
Exposed Pad Width	E1		20.00 BSC	
Terminal Width	b	0.17	0.22	0.27
Terminal Width	c	0.09	0.15	0.20
Terminal Length	L	0.45	0.60	0.75
Footprint	L1		1.00 REF	
Terminal Bend Radius	R1	0.08	-	-
Terminal Bend Radius	R2	0.08	-	0.20
Terminal Angle	Ө	0°	3.5°	7°
Terminal Angle	Ө1	0°	-	-
Mold Draft Angle	Ө2	11°	12°	13°

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.

Microchip Technology Drawing C04-21010 Rev A Sheet 2 of 2

144-Lead Plastic Quad Flatpack (2SB) - 20x20x1.4 mm Body [LQFP]
Atmel Legacy Global Package Code AEI

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> http://www.microchip.com/packaging
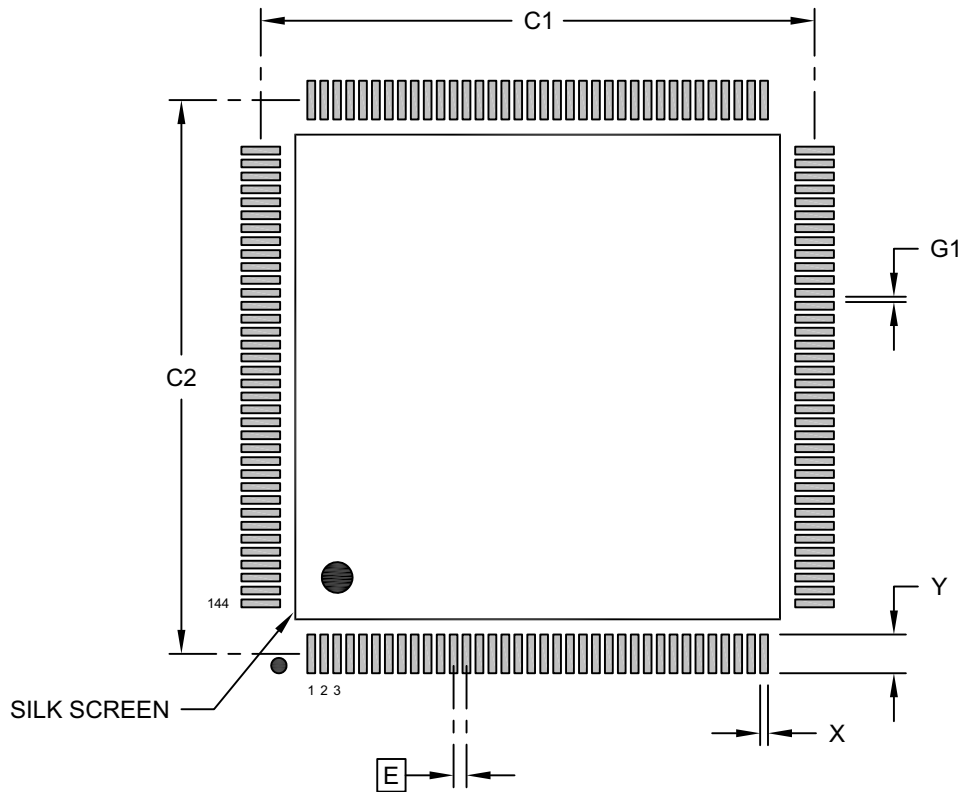
RECOMMENDED LAND PATTERN

	Units	MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Contact Pad Spacing	C1		21.40	
Contact Pad Spacing	C2		21.40	
Contact Pad Width (X144)	X1			0.30
Contact Pad Length (X144)	Y1			1.50
Contact Pad to Contact Pad (X140)	G1	0.20		

Notes:

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

Microchip Technology Drawing C04-23010 Rev A

APPENDIX A: REVISION HISTORY

Revision A (September 2019)

Initial edition for firmware revision 2.0.00 – 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 mXT2113TD-AT/mXT2113TD-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]	[X]	[XXX]
Device	Package	Temperature Range	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:	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 [1]
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
ATMXT2113TD-ATVA1 (Supplied in trays)	2.0.AA	144-lead LQFP 20 × 20 × 1.4 mm, RoHS compliant Operating temperature range –40°C to +85°C (Grade 3)
ATMXT2113TD-ATRVA1 (Supplied in tape and reel)		
ATMXT2113TD-ABVA1 (Supplied in trays)	2.0.AA	144-lead LQFP 20 × 20 × 1.4 mm, RoHS compliant Operating temperature range –40°C to +105°C (Grade 2)
ATMXT2113TD-ABRVA1 (Supplied in tape and reel)		

NOTES:

Product Brief

Note the following details of the code protection feature on Microchip devices:

• 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."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

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