mXT228UD-MAUHA1 1.0

maXTouch 228-node Touchscreen Controller Product Brief

Description

The mXT228UD-MAUHA1 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 mXT228UD-MAUHA1 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.

Functional Safety

- UL/IEC 60730 Class B support
- Self diagnostics at power-on and as periodic tests during operation
- Heartbeat (alive) signal output to host
- Safety manual available

maXTouch® Adaptive Sensing Touchscreen Technology

- Up to 14 X (transmit) lines and 24 Y (receive) lines for use by a touchscreen
- A maximum of 228 nodes can be allocated to the touch sensor
- Touchscreen size of 5.75 inches (3:2 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 10 concurrent touches tracked in real time

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 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
- 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, charger, 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
  - Controlled Tx burst frequency drift over process and temperature range

- Scan Speed
  - Typical report rate for 10 touches ≥70 Hz (subject to configuration)
  - Initial touch latency <18 ms for first touch from idle (subject to configuration)
  - Configurable to allow for power and speed optimization

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

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 interface with support for Standard mode (up to 100 kHz), Fast mode (up to 400 kHz), Fast-mode Plus (up to 1 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 internal X line drive (XVdd) 6.6V with internal voltage pump (XVdd connected to AVdd if voltage pump not used)

Package

- 56-pin XQFN 6 × 6 × 0.4 mm, 0.35 mm pitch

Operating Temperature

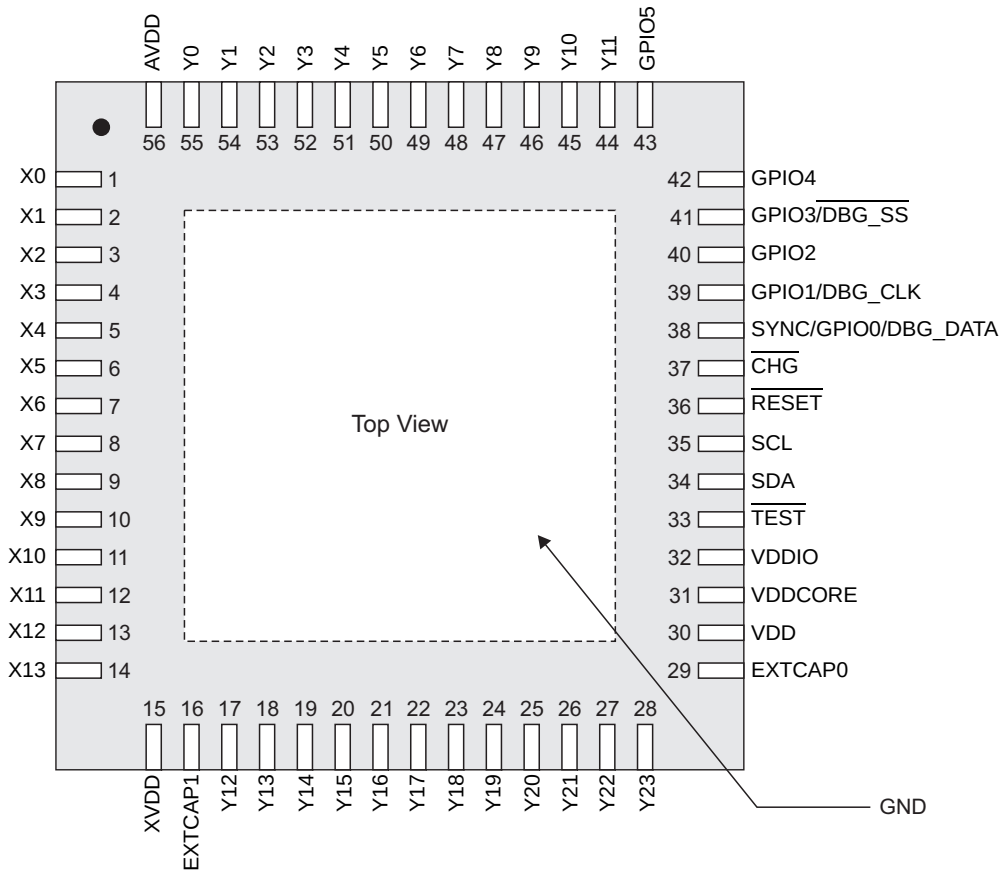
- –40°C to +85°C

Design Services

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

PIN CONFIGURATION

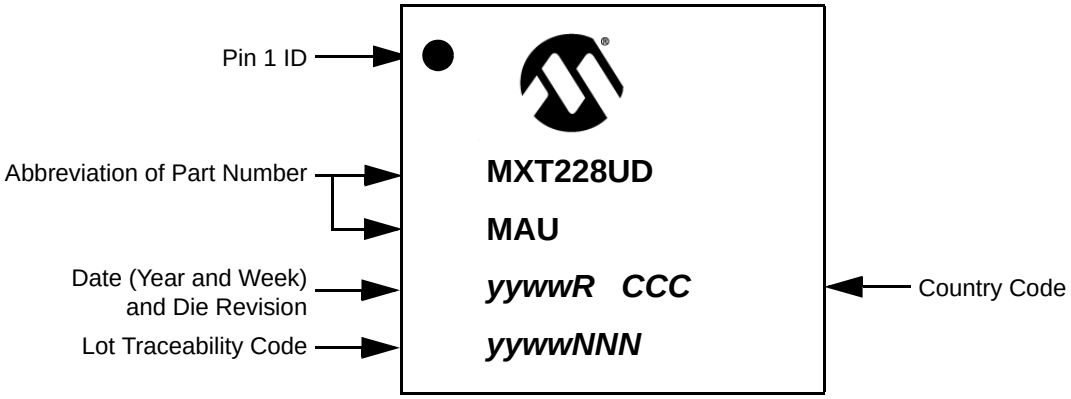
Pin Configuration – 56-pin XQFN



1.0 PACKAGING INFORMATION

1.1 Package Marking Information

1.1.1 56-PIN XQFN



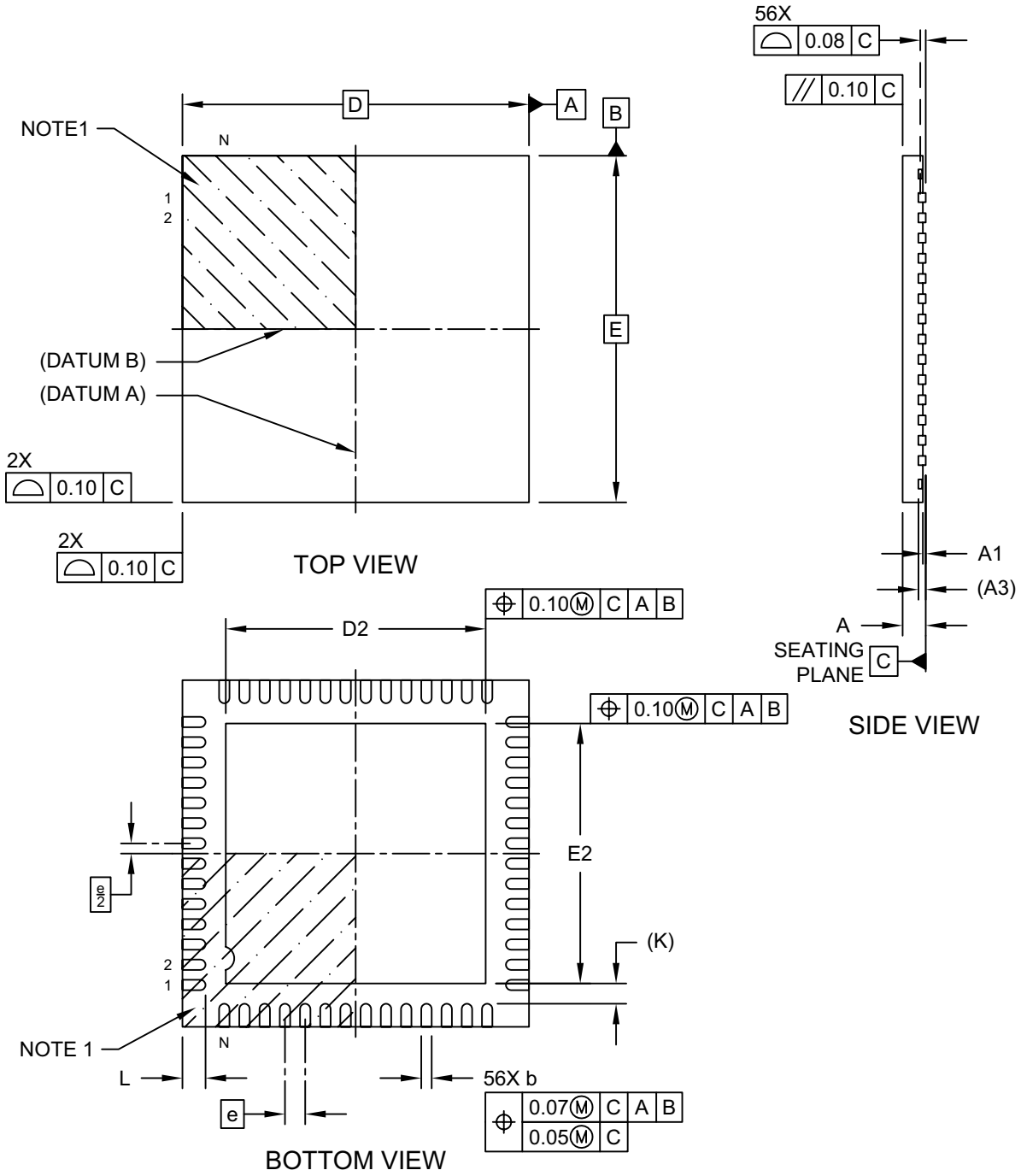
1.1.2 ORDERABLE PART NUMBERS

The product identification system for maXTouch devices is described in "Product Identification System". That section also lists example part numbers for the device.

1.2 Package Details

56-Lead Extremely Thin Quad Flatpack No-Lead Package (TWB) - 6x6x0.4 mm Body [XQFN] Wlth 4.5x4.5 mm Exposed Pad; Atmel Legacy Global Package Code ZIX

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



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56-Lead Extremely Thin Quad Flatpack No-Lead Package (TWB) - 6x6x0.4 mm Body [XQFN] Wlth 4.5x4.5 mm Exposed Pad; Atmel Legacy Global Package Code ZIX

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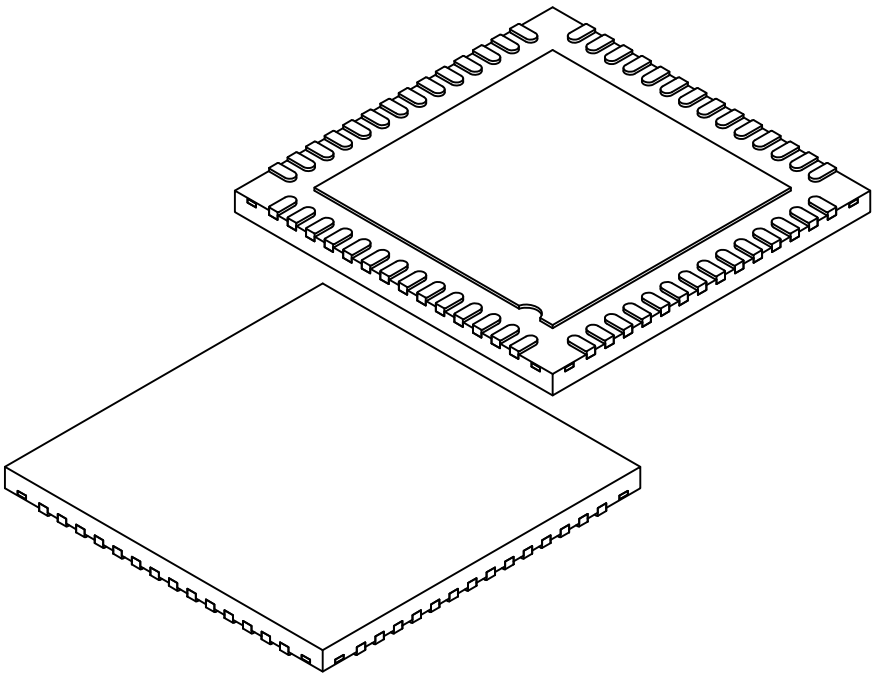

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		56	
Pitch	e		0.35 BSC	
Overall Height	A	–	–	0.400
Standoff	A1	0.00	–	0.05
Terminal Thickness	A3		0.127 REF	
Overall Length	D		6.00 BSC	
Exposed Pad Length	D2	4.40	4.50	4.60
Overall Width	E		6.00 BSC	
Exposed Pad Width	E2	4.40	4.50	4.60
Terminal Width	b	0.13	0.18	0.23
Terminal Length	L	0.35	0.40	0.45
Terminal-to-Exposed-Pad	K		0.35 REF	

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. 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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56-Lead Extremely Thin Quad Flatpack No-Lead Package (TWB) - 6x6x0.4 mm Body [XQFN] Wlth 4.5x4.5 mm Exposed Pad; Atmel Legacy Global Package Code ZIX

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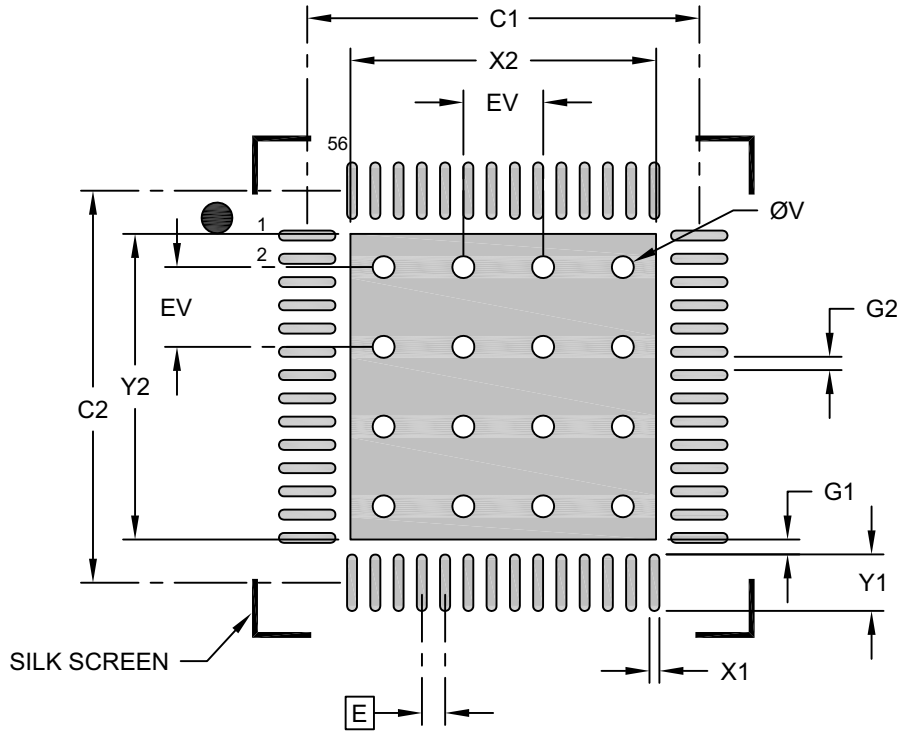

RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		0.35 BSC	
Optional Center Pad Width	X2			4.60
Optional Center Pad Length	Y2			4.60
Contact Pad Spacing	C1		5.90	
Contact Pad Spacing	C2		5.90	
Contact Pad Width (X56)	X1			0.15
Contact Pad Length (X56)	Y1			0.85
Contact Pad to Center Pad (X56)	G1	0.23		
Contact Pad to Contact Pad (X52)	G2	0.20		
Thermal Via Diameter	V		0.33	
Thermal Via Pitch	EV		1.20	

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-23448 Rev A

APPENDIX A: REVISION HISTORY

Revision A (October 2020)

Initial edition 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 mXT228UD-MAUHA1.

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)
	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 (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
ATMXT228UD-MAUHA1 (Supplied in trays)	1.0.AB	56-pin XQFN 6 × 6 × 0.4 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT228UD-MAURHA1 (Supplied in tape and reel)		

NOTES:

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

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
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