

# maXTouch 1664-node Touchscreen Controller Product Brief

#### Description

The mXT1664T3 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 mXT1664T3 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.

# maXTouch<sup>®</sup> Adaptive Sensing Touchscreen Technology

- Up to 32 X (transmit) lines and 52 Y (receive) lines for use by touchscreen.
- A maximum of 1664 nodes can be allocated to the touchscreen
- Touchscreen size of 15.6 inches (16:10 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 16 concurrent touches tracked in real time
- Dual-boot OS support for  $\mathsf{Microsoft}^{\texttt{®}}$   $\mathsf{Windows}^{\texttt{B}}$  and  $\mathsf{Android}^{^{\mathsf{TM}}}$

### **Touch Sensor Technology**

- Discrete/out-cell support including glass and PET filmbased sensors
- 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 4.5 mm (dependent on screen size, touch size, configuration and stack-up)
- Plastic 0.2 mm to 2.2 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

- 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
- Noise suppression technology to combat ambient, charger, and power-line noise
  - Up to 240  $V_{\mbox{\scriptsize PP}}$  between 1 Hz and 1 kHz sinusoidal waveform
  - Up to 20 V<sub>PP</sub> between 1 kHz and 1 MHz sinusoidal waveform
- Stylus Support
  - Supports passive stylus with 1.5 mm contact diameter, subject to configuration, stack-up, and sensor design
- Scan Speed
  - Up to 250 Hz reporting rate for one finger (subject to configuration)
  - Typical report rate for 16 touches ≥100 Hz (subject to configuration)
  - Initial touch latency <10 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 states
- · 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), High Speed mode (up to 3.4 MHz)
- USB HID interface for Microsoft Windows 8.x and later versions
- HID-I<sup>2</sup>C interface for Microsoft Windows 8.x and later versions
- Interrupt to indicate when a message is available
- SPI Debug Interface to read the 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 external X line drive (XVdd) up to 10 V

#### Packages

- 136-ball UFBGA 7 x 7 x 0.6 mm, 0.5 mm pitch
- 162-ball UFBGA 10 × 5 × 0.6 mm, 0.5 mm pitch

#### **Operating Temperature**

• −40°C to +85°C

### **PIN CONFIGURATION**

0.1 136-ball UFBGA

_	1	2	3	4	5	6	7	8	9	10	11	12	13
A	О Х31	O X30	O X28	O X25	O X22	() X19			O X12	O X9	О х6	O x3	O X1
в		О х29	O X27	O X24	O X21	O X18	О X16	O X14	O X11	О Х8	() X5	$\bigcirc_{X2}$	O xo
С	GND		О <sub>Х26</sub>	O X23	O X20	O X17	O X15	О х13	O X10	O X7	О х4	O XVDD	VREGBOOST
D	AVDD		GND									GND	AVDD
Е	O Y27	О У26	AVDD								AVDD	O Y0	О У1
F	О Ү30	О У29	О <sub>Y28</sub>			GPI00	GPIO4	GND			O Y2	О <sub>Y3</sub>	O Y4
G	О <sub>Ү33</sub>	О У32	О <sub>Y31</sub>					D <u>BG_SS</u> TEST			O Y5	О Үб	O Y7
н	О Ү36	О У35	О <sub>Y34</sub>				GPIO3	DBG_DATA XTAL_XOUT		DS0	О Ү8	О Ү9	O Y10
J	О Ү39	О У38	О Ү37								O Y11	O Y12	О <sub>Y13</sub>
к	O Y42	O Y41	O Y40		USBDM	I2CMODE		O PTCXY0	O PTCXY1	NC NC	O Y14	О Y15	О У16
L	О Ү45	O Y44	О Ү43	GND	O SDA		GPIO2	DBG_CLK XTAL_XIN	O PTCXY2	NC	O Y17	О У18	О Y19
м	O Y48	O Y47	О Y46	GND	O SCL	ADDSEL USBDP	GPIO1	GPIO5	O PTCXY3	GND	) Y20	O Y21	О <sub>Y22</sub>
Ν	O Y51	O Y50	О Ү49	AVDD					O PTCXY4	AVDD	O Y23	O Y24	O Y25

Top View

0.2 162-ball UFBGA

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_					익				Data ī
2			OMMSEL				GPI04		DBG SS TEST
е									
4		O <sup>y</sup>	⊖ <sup>o</sup> z					Y34	735 (
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9	⊖ <sup>y</sup>	O ₽	O <sup>y</sup>	O <sup>g</sup>		Y25	Y 26	V27	Y28
7	O <sup>9</sup> ₂	O <sup>g</sup>	O <sup>♀</sup>	O <sup>g</sup>		$\bigcirc$ $\stackrel{Y}{\sim}$	$\bigcirc$ $\stackrel{Y}{\sim}$	Y23	Y24
œ		O <sup>g</sup>	⊖ <sup>g</sup>	⊖ <sup>y</sup>		$\bigcirc \frac{1}{2}$		<sup>∠</sup> O	
6		O <sup>g</sup>	O <sup>oy</sup>	75 Y5				۲ ۲	
10	₹50	\ \ \ \ \ \ \ \ \ \ \ \ \ \	\ \ \ \ \ \ \ \ \ \ \ \ \ \	Y47		Ó ž	Y12	⊖ <sup>₹3</sup>	$\bigcirc \frac{1}{4}$
£	√ <sup>46</sup>	√ <sup>45</sup>	\ ↓ ↓	×43		O≿	Q ≈		۲. ۲۵
12	Y42	$\bigcirc$ $\frac{1}{2}$	√40	×39		S S		$\bigcirc$ ${\sim}$	Q ã
13			×37	×36		O <sup>⋟</sup>	⊃ ≿	S S	
14									GND G
15	O g	O g	X28 X28	X23	O GN	O x4 ₽	⊖ ∞̃	○ <sub>¥</sub> ×	VREGBOOST
16		O ₽	⊖ <sup>s</sup> ×	X24	⊖ <sub>€</sub> ×	$\bigcirc \overset{\times}{_{15}}$	○ ×	$\bigcirc^{\times}$	○ ×
17	O <sup>D</sup>	⊖ <sup>y</sup>	⊖ <sup>∞</sup>	X25	∑ <sup>∞</sup>	⊖ <sup>×</sup> <sub>ã</sub>	○ ž	○ <sup>∞</sup> ×	○ ×
18	⊖ <sup>y</sup>	O ₽	○ ž	X26 V	∑ ∑	○ <sup>×</sup>	X12 X12	× ○	○ ¤
19	O <sup>D</sup>	O <sup>y</sup>	⊖ <sup>Ŋ</sup>	×27 ○	$\bigcirc$ $\overset{X22}{\sim}$	O <sup>x</sup> <sub>10</sub>	⊂ x <sup>3</sup>	$\bigcirc \overset{\approx}{\sim}$	○ ×

Top View

### 1.0 PACKAGING INFORMATION

#### 1.1 136-ball UFBGA 7 × 7 × 0.6 mm

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



#### 1.2 162-ball UFBGA 10 × 5 × 0.6 mm





## APPENDIX A: REVISION HISTORY

## **Revision A (August 2018)**

Initial edition for firmware revision 2.0 - 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 mXT1664T3.

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

	PART NO.	- <u>xxx</u> 	[X] 	[ <u>XX]</u>	[X] 	[ <u>XXX]</u>
	Device	Package	Temperatur Range	re Sample Type	Tape and Reel Option	Pattern
Device:		Base d	evice name			
Package:		А	= 0	QFP (Plastic 0	Quad Flatpack)	1
		CC	= l	JFBGA (Ultra	Thin Fine-pitcl	h Ball Grid Array)
		C2	= l	JFBGA (Ultra	Thin Fine-pitcl	h Ball Grid Array)
		NH	= l	JFBGA (Ultra	Thin Fine-pitcl	h Ball Grid Array)
		C4	= )	X1FBGA (Exti	a Thin Fine-pit	tch Ball Grid Array)
		MA	= )	XQFN (Super	Thin Quad Fla	t No Lead Sawn)
		MA5	= )	XQFN (Super	Thin Quad Fla	t No Lead Sawn)
Temperature Range:		U	= -	-40°C to +85°	C (Grade 3)	
		Т	= -	–40°C to +85°	C (Grade 3)	
		В	= -	-40°C to +105	5°C (Grade 2)	
Sample Type:		Blank	= F	Release Sam	ole	
		ES	= F	Pre-release (E	Engineering) Sa	ample
Tape and Reel Option:		Blank	= 5	Standard Pack	kaging (Tube o	r Tray)
		R	= -	Tape and Ree	(1)	
Pattern:		QTP, SQTP, Code or Special Requirements (Blank Otherwise)				

check with your Microchip Sales Office for package availability with the Tape and Reel option.

#### **Orderable Part Numbers**

Orderable Part Number	Firmware Revision	Description
ATMXT1664T3-CCU035 (Supplied in trays)	2.0.AA	136-ball UFBGA 7 $\times$ 7 $\times$ 0.6 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT1664T3-CCUR035 (Supplied in tape and reel)		
ATMXT1664T3-C2U035 (Supplied in trays)	2.0.AA	162-ball UFBGA 10 $\times$ 5 $\times$ 0.6 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT1664T3-C2UR035 (Supplied in tape and reel)		

#### Atmel SL Code

An SL (QS) code was required on Atmel purchase orders, but is no longer used by Microchip. The SL code has been replaced by the 3-digit QTP code suffix on all Microchip industrial grade orderable part numbers.

The legacy Atmel SL (QS) code for mXT1664T3 2.0.AA is QS976.

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- Microchip products meet the specification contained in their particular Microchip Data Sheet.
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