mXT640U 1.1

maXTouch 640-node Touchscreen Controller
Product Brief

Description

The mXT640U 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 mXT640U 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® Adaptive Sensing Touchscreen Technology

- Up to 32 X (transmit) lines and 20 Y (receive) lines
- A maximum of 640 nodes can be allocated to the touchscreen
- Touchscreen size 8.17 inches (16:10 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
- Dual-boot OS support for Microsoft® Windows® and Android

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 4.5 mm, dependent on screen size, touch size and stack-up
- Plastic 0.2 mm to 2.2 mm, dependent on screen size, touch size 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 noise, 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
- Stylus Support
  - Supports passive stylus with 1 mm contact diameter, subject to configuration, stack up, and sensor design
- Scan Speed
  - Up to 250 Hz one finger reporting rate, subject to configuration
  - Typical report rate for 10 touches ≥100 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

On-chip Gestures

- Supports wake up/unlock gestures, including symbol recognition

Keys

- Up to 32 nodes can be allocated as mutual capacitance sensor keys (subject to other configurations)
- Support for 3 Generic Keys in addition to the touchscreen array (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 32 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^{2}C-compatible slave mode: Standard/Fast mode 400 kHz, Fast-mode Plus 1 MHz, High-speed mode up to 3.4 MHz
- HID-I^{2}C interface for Microsoft® Windows® 8.x and later versions
- 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
- High voltage internal X line drive (XVdd) 9.9 V with internal voltage pump
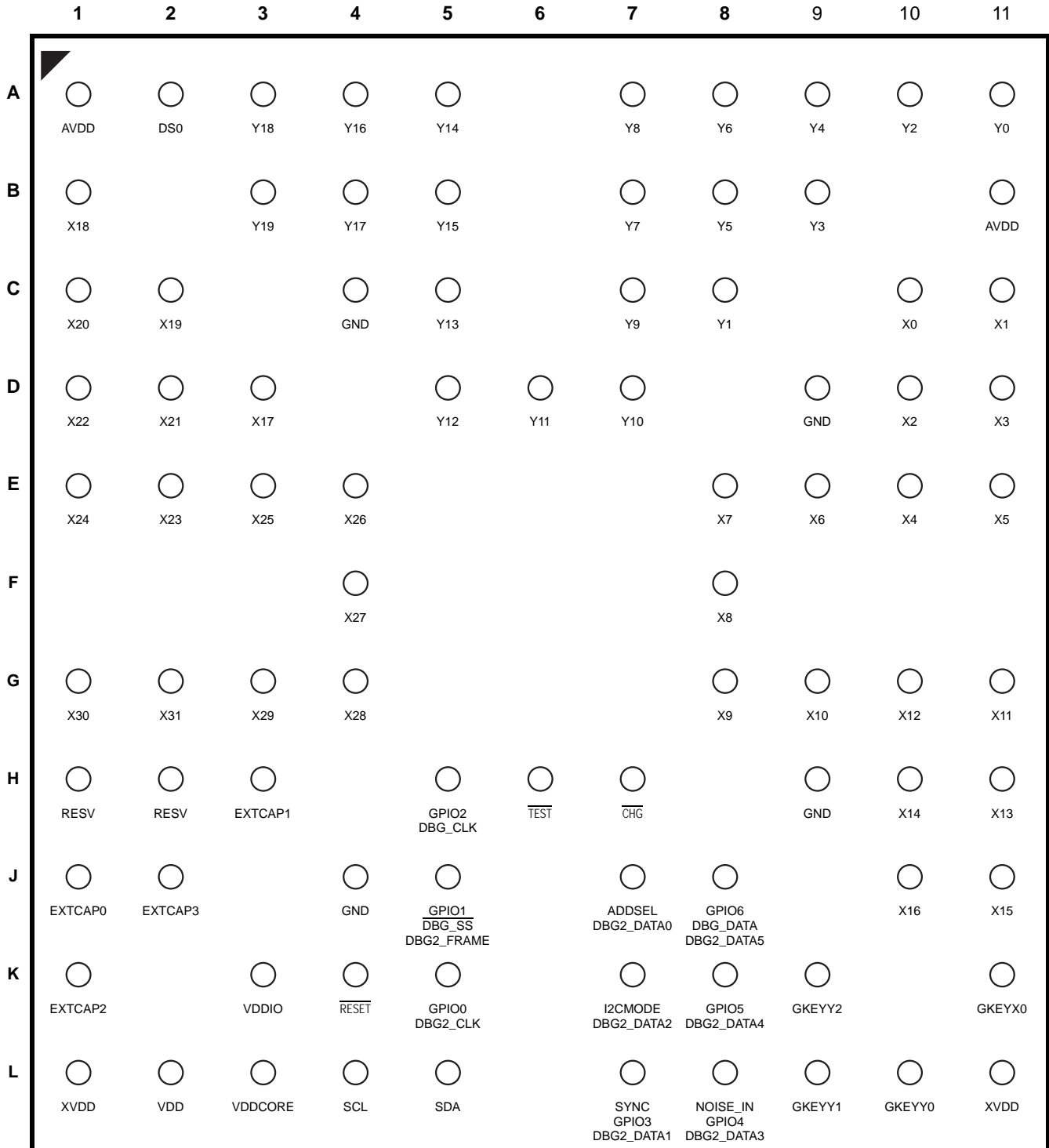
Packages

- 88-ball UFBGA 6 × 6 × 0.6 mm, 0.5 mm pitch
- 88-ball X1FBGA 6 × 6 × 0.45 mm, 0.5 mm pitch

Operating Temperature

- –40°C to +85°C

Product Brief

PIN CONFIGURATION

88-ball UFBGA/X1FBGA

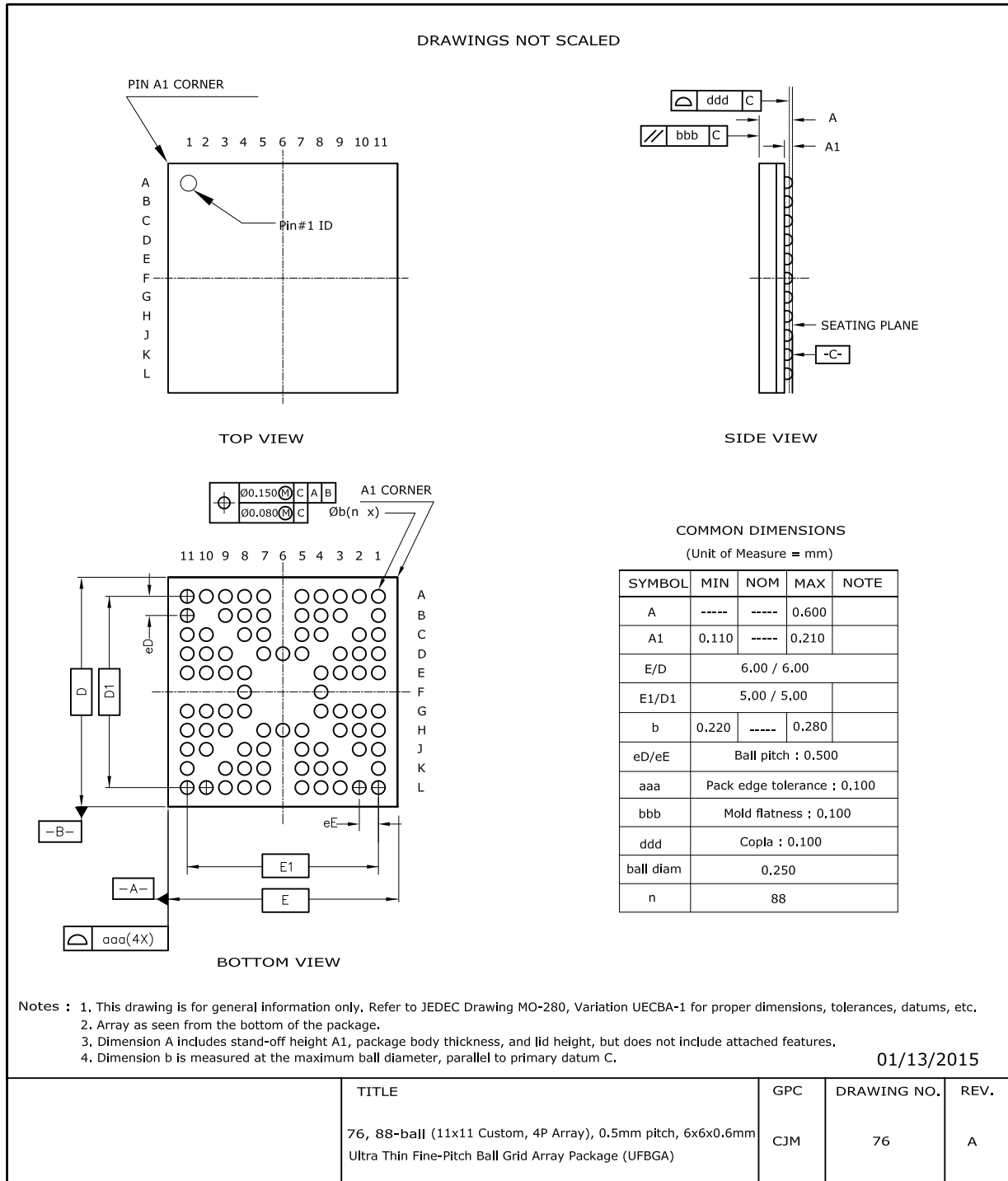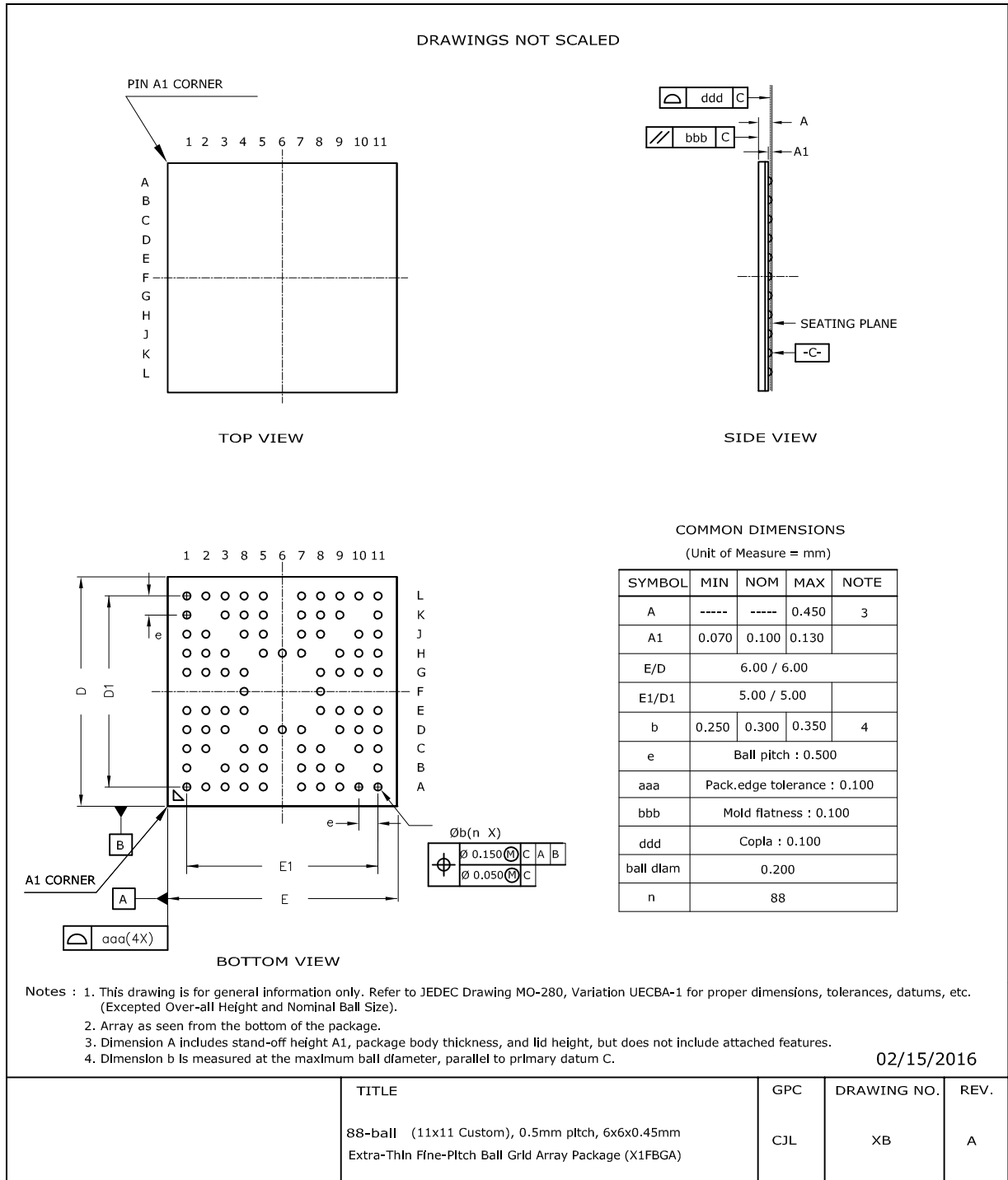|	1	2	3	4	5	6	7	8	9	10	11
A	AVDD	DS0	Y18	Y16	Y14		Y8	Y6	Y4	Y2	Y0
B	X18		Y19	Y17	Y15		Y7	Y5	Y3		AVDD
C	X20	X19		GND	Y13		Y9	Y1		X0	X1
D	X22	X21	X17		Y12	Y11	Y10		GND	X2	X3
E	X24	X23	X25	X26				X7	X6	X4	X5
F				X27				X8			
G	X30	X31	X29	X28				X9	X10	X12	X11
H	RESV	RESV	EXTCAP1		GPIO2 DBG_CLK	$\overline{\text{TEST}}$	$\overline{\text{CHG}}$		GND	X14	X13
J	EXTCAP0	EXTCAP3		GND	GPIO1 $\overline{\text{DBG\_SS}}$ DBG2_FRAME		ADDSEL DBG2_DATA0	GPIO6 DBG_DATA DBG2_DATA5		X16	X15
K	EXTCAP2		VDDIO	$\overline{\text{RESET}}$	GPIO0 DBG2_CLK		I2CMODE DBG2_DATA2	GPIO5 DBG2_DATA4	GKEYY2		GKEYX0
L	XVDD	VDD	VDDCORE	SCL	SDA		SYNC GPIO3 DBG2_DATA1	NOISE_IN GPIO4 DBG2_DATA3	GKEYY1	GKEYY0	XVDD

Top View

MXT640U 1.1

1.0 PACKAGING INFORMATION

The following sections give the technical details of the packages for the device.

1.1 88-ball UFBGA 6 × 6 × 0.6 mm

DRAWINGS NOT SCALED

PIN A1 CORNER

Pin#1 ID

TOP VIEW

SIDE VIEW

SEATING PLANE

A1 CORNER

BOTTOM VIEW

COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	-----	-----	0.600	
A1	0.110	-----	0.210	
E/D	6.00 / 6.00			
E1/D1	5.00 / 5.00			
b	0.220	-----	0.280	
eD/eE	Ball pitch : 0.500			
aaa	Pack edge tolerance : 0.100			
bbb	Mold flatness : 0.100			
ddd	Copla : 0.100			
ball diam	0.250			
n	88			

Notes : 1. This drawing is for general information only. Refer to JEDEC Drawing MO-280, Variation UECBA-1 for proper dimensions, tolerances, datums, etc.
2. Array as seen from the bottom of the package.
3. Dimension A includes stand-off height A1, package body thickness, and lid height, but does not include attached features.
4. Dimension b is measured at the maximum ball diameter, parallel to primary datum C.

01/13/2015

	TITLE	GPC	DRAWING NO.	REV.
	76, 88-ball (11x11 Custom, 4P Array), 0.5mm pitch, 6x6x0.6mm Ultra Thin Fine-Pitch Ball Grid Array Package (UFBGA)	CJM	76	A

1.2 88-ball X1FBGA 6 × 6 × 0.45 mm

DRAWINGS NOT SCALED

TOP VIEW

SIDE VIEW

BOTTOM VIEW

COMMON DIMENSIONS

(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	-----	-----	0.450	3
A1	0.070	0.100	0.130	
E/D	6.00 / 6.00			
E1/D1	5.00 / 5.00			
b	0.250	0.300	0.350	4
e	Ball pitch : 0.500			
aaa	Pack.edge tolerance : 0.100			
bbb	Mold flatness : 0.100			
ddd	Copla : 0.100			
ball diam	0.200			
n	88			

Notes : 1. This drawing is for general information only. Refer to JEDEC Drawing MO-280, Variation UECBA-1 for proper dimensions, tolerances, datums, etc. (Excepted Over-all Height and Nominal Ball Size).
2. Array as seen from the bottom of the package.
3. Dimension A includes stand-off height A1, package body thickness, and lid height, but does not include attached features.
4. Dimension b is measured at the maximum ball diameter, parallel to primary datum C.

02/15/2016

	TITLE	GPC	DRAWING NO.	REV.
	88-ball (11x11 Custom), 0.5mm pitch, 6x6x0.45mm Extra-Thin Fine-Pitch Ball Grid Array Package (X1FBGA)	CJL	XB	A

APPENDIX A: REVISION HISTORY

Revision A (September 2017)

Initial edition for firmware revision 1.1 – Release

Product Brief

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 mXT640U.

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:	*Blank*	=	–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 [1]
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
ATMXT640U-CCU023 (Supplied in trays)	1.1.AA	88-ball UFBGA 6 × 6 × 0.6 mm, RoHS compliant Industrial grade sample; not suitable for automotive characterization
ATMXT640U-CCUR023 (Supplied in tape and reel)		
ATMXT640U-C4U023 (Supplied in trays)	1.1.AA	88-ball X1FBGA 6 × 6 × 0.45 mm, RoHS compliant Industrial grade sample; not suitable for automotive characterization
ATMXT640U-C4UR023 (Supplied in tape and reel)		

NOTES:

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.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
═ **ISO/TS 16949** ═

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/
support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon

Hong Kong
Tel: 852-2943-5100
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

China - Hong Kong SAR
Tel: 852-2943-5100
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-3326-8000
Fax: 86-21-3326-8021

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

ASIA/PACIFIC

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880- 3770
Fax: 81-3-6880-3771

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

France - Saint Cloud
Tel: 33-1-30-60-70-00

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7289-7561

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820