
maXTouch 1066-node Touchscreen Controller

Product Brief

Description

The mXT1066TD 1.0.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 mXT1066TD 1.0.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[®] Adaptive Sensing Touchscreen Technology

- Up to 41 X (transmit) lines and 26 Y (receive) lines for use by a touchscreen
- A maximum of 1066 nodes can be allocated to the touch sensor
- Touchscreen size of 12.4 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 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, 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

- 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)

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
- Stylus Support
 - Supports passive stylus with 1.5 mm contact diameter, subject to configuration, stack-up, and sensor design
- Scan Speed
 - Typical report rate for 10 touches ≥85 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

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

- I²C interface 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)
- HID-I²C interface for Microsoft Windows 8.x and later versions
- 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) 1.8V nominal to 3.3V nominal
- Analog (AVdd) 3.3V nominal
- High voltage internal X line drive (XVdd) 6.6V or 9.9V with internal voltage pump

Packages

- 114-ball UFBGA 7 × 5 × 0.65 mm, 0.5 mm pitch, High Density Interconnect
- 117-ball UFBGA 9.5 × 7 × 0.65 mm, 0.65 mm pitch, non-HDI package

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

114-ball UFBGA

	1	2	3	4	5	6	7	8	9	10	11	12	13
A	 X21	 X22	 XVDD	 Y23	 Y19	 Y15	 Y11	 Y7	 Y3	 Y0	 AVDD	 X1	 X0
B	 X23	 X24	 GND	 Y24	 Y20	 Y16	 Y12	 Y8	 Y4	 Y1	 GND	 X3	 X2
C	 X25	 X26	 GND	 Y25	 Y21	 Y17	 Y13	 Y9	 Y5	 Y2	 XVDD	 X5	 X4
D	 X27	 X28	 X29	 AVDD	 Y22	 Y18	 Y14	 Y10	 Y6	 GND	 X8	 X7	 X6
E	 X30	 X31	 X32	 AVDD	 GND				 GND	 VDDIO	 X11	 X10	 X9
F	 X33	 X34	 X35	 VDDIO	 NC	 RESV	 GPIO1	 GPIO5	 <u>DBG_SS</u> TEST	 RESV	 X14	 X13	 X12
G	 X36	 X37	 XVDD	 <u>RESET</u>	 ADDSEL	 I2CMODE	 GPIO0	 GPIO4 HSYNC	 DBG_DATA	 RESV	 XVDD	 X16	 X15
H	 X38	 X39	 EXTCAP0	 EXTCAP2	 SDA	 RESV	 <u>CHG</u>	 GPIO3 VSYNC	 DBG_CLK	 RESV	 RESV	 X18	 X17
J	 X40	 DS0	 EXTCAP1	 EXTCAP3	 SCL	 VDDCORE	 VDD	 GPIO2	 RESV	 RESV	 RESV	 X20	 X19

Top View

mXT1066TD 1.0.AB

117-ball UFBGA

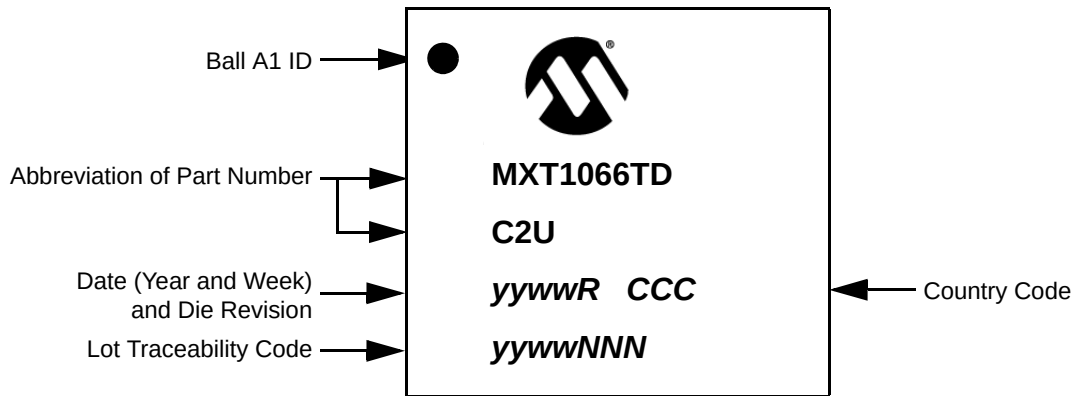
	1	2	3	4	5	6	7	8	9	10	11	12	13
A													
	X21	X22	XVDD	Y23	Y19	Y15	Y11	Y7	Y3	Y0	AVDD	X1	X0
B													
	X23	X24	GND	Y24	Y20	Y16	Y12	Y8	Y4	Y1	GND	X3	X2
C													
	X25	X26	GND	Y25	Y21	Y17	Y13	Y9	Y5	Y2	XVDD	X5	X4
D													
	X27	X28	X29	AVDD	Y22	Y18	Y14	Y10	Y6	GND	X8	X7	X6
E													
	X30	X31	X32	AVDD	GND	VDDCORE	VDD	GND	VDDIO	XVDD	X11	X10	X9
F													
	X33	X34	X35	VDDIO	NC	CHG	GPI03 VSYNC	DBG_DAT A	DBG_SS TEST	RESV	X14	X13	X12
G													
	X36	X37	XVDD	RESET	ADDSEL	RESV	GPI02	DBG_CLK	RESV	RESV	RESV	X16	X15
H													
	X38	X39	EXTCAP0	EXTCAP2	SDA	I2CMODE	GPI01	GPI05	RESV	RESV	RESV	X18	X17
J													
	X40	DS0	EXTCAP1	EXTCAP3	SCL	RESV	GPI00	GPI04 HSYNC	RESV	RESV	RESV	X20	X19

Top View

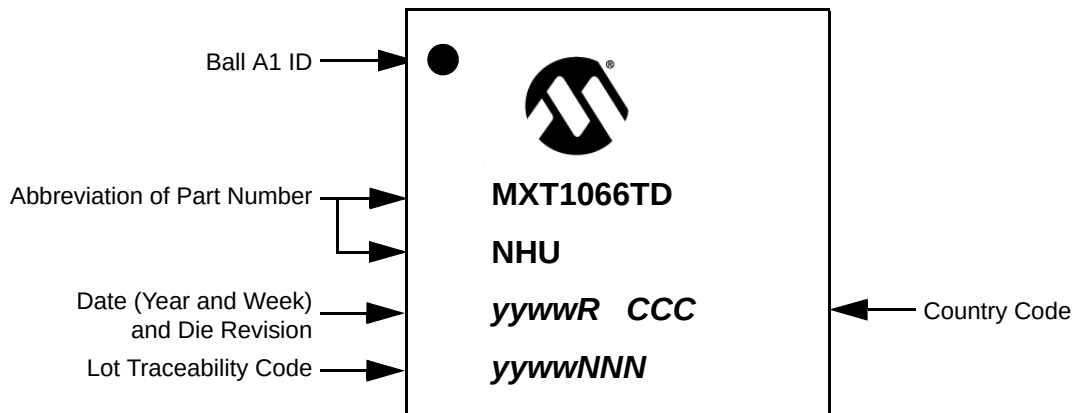
1.0 PACKAGING INFORMATION

1.1 Package Marking Information

1.1.1 114-BALL UFBGA



1.1.2 117-BALL UFBGA



1.1.3 ORDERABLE PART NUMBERS

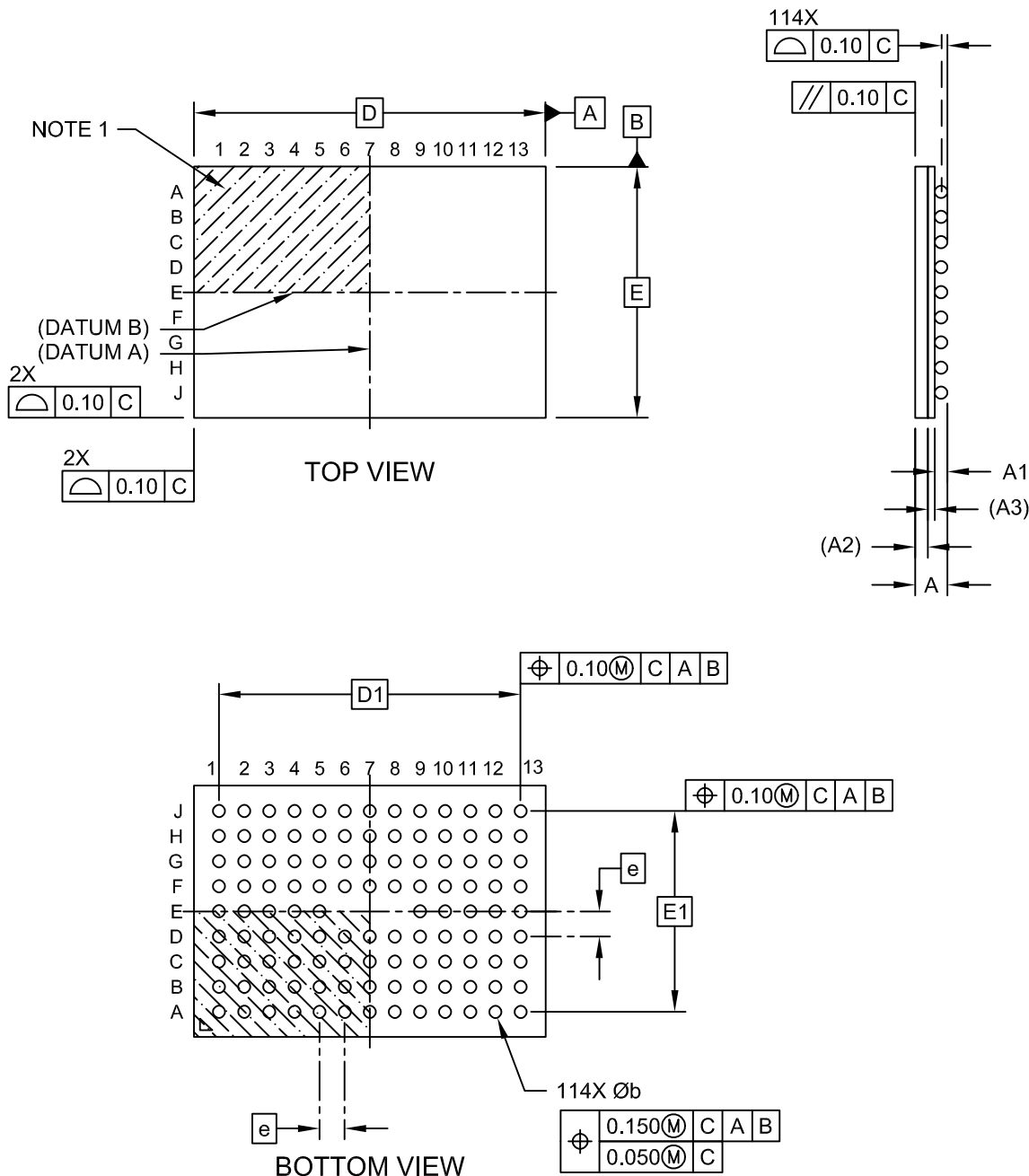
The product identification system for maXTouch devices is described in "[Product Identification System](#)". That section also lists example part numbers for the device.

mXT1066TD 1.0.AB

1.2 Package Details

114-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C2B) - 7x5x0.65 mm Body With 13x9 Array, 0.5 mm Pitch [UFBGA]; Atmel Legacy GPC CBJ

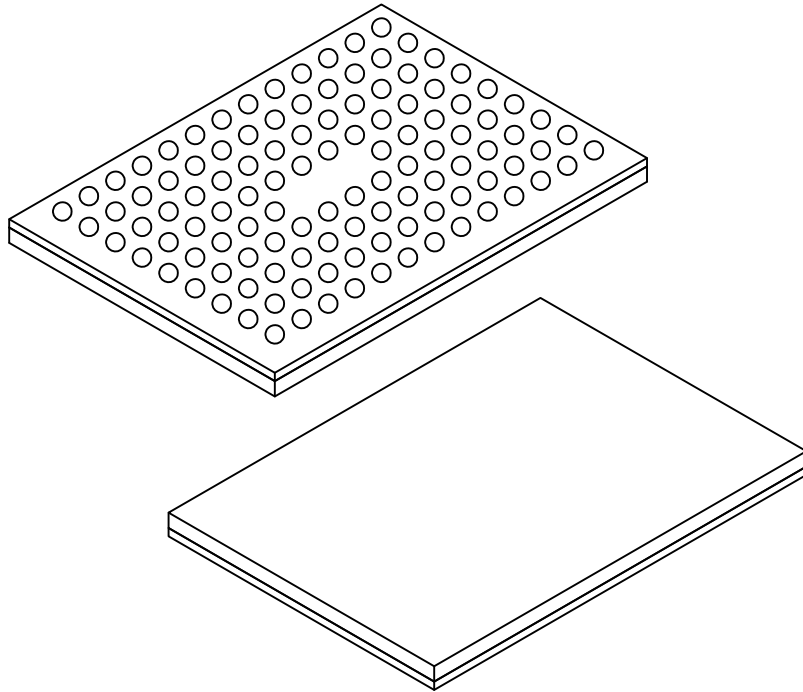
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-21163 Rev A Sheet 1 of 2

**114-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C2B) - 7x5x0.65 mm Body
With 13x9 Array, 0.5 mm Pitch [UFBGA]; Atmel Legacy GPC CBJ**

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



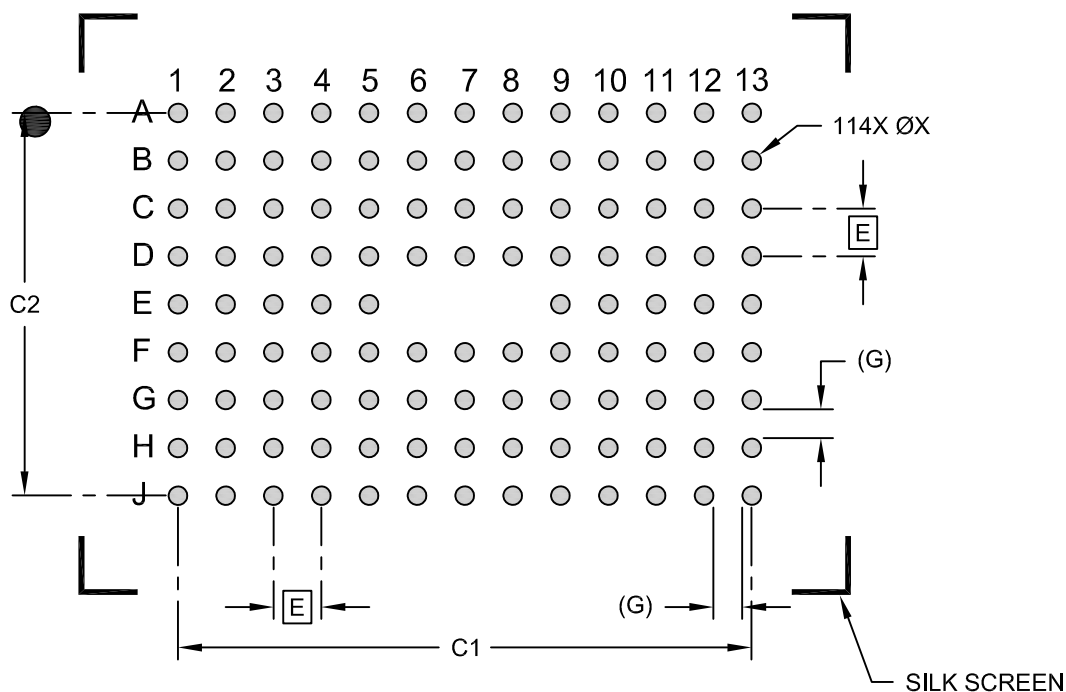
Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N	114		
Pitch	e	0.50 BSC		
Overall Height	A	-	-	0.65
Ball Height	A1	0.140	-	0.240
Mold Thickness	A2	0.250 REF		
Substrate Thickness	A3	0.136 REF		
Overall Length	D	7.00 BSC		
Ball Array Length	D1	6.00 BSC		
Overall Width	E	5.00 BSC		
Ball Array Width	E1	4.00 BSC		
Ball Width	b	0.200	-	0.300
Ball Diameter		0.250 REF		

Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated
- 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.

114-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C2B) - 7x5x0.65 mm Body With 13x9 Array, 0.5 mm Pitch [UFBGA]; Atmel Legacy GPC CBJ

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Optional Pad Diameter (X114)	X			0.20
Contact Pad Spacing	C1		6.00	
Contact Pad Spacing	C2		4.00	
Column and Row Spacing	G	0.30 REF		

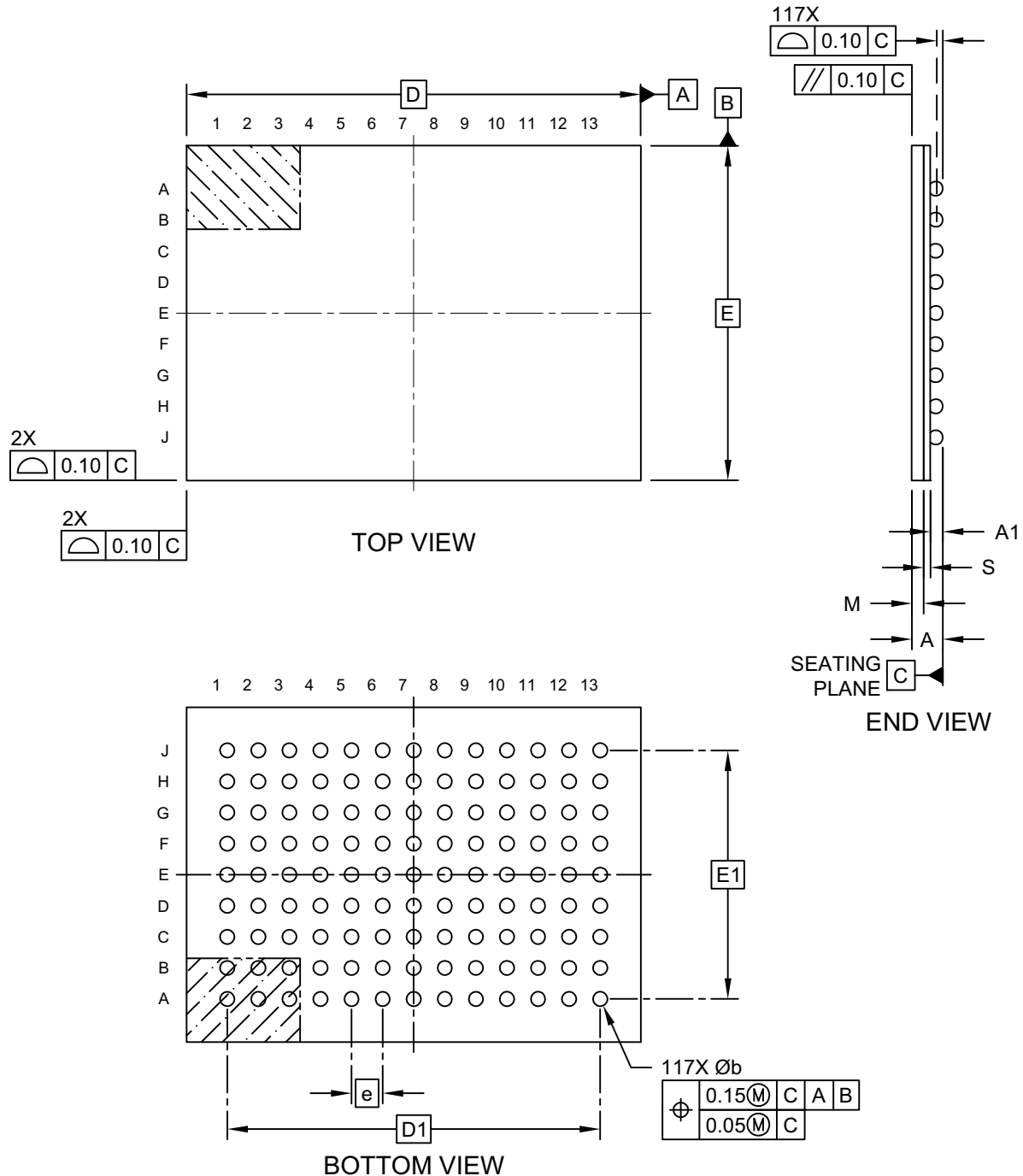
Notes:

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 C04-23163 Rev A

117-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C5B) - 9.5x7.0x0.65 mm Body [UFBGA]

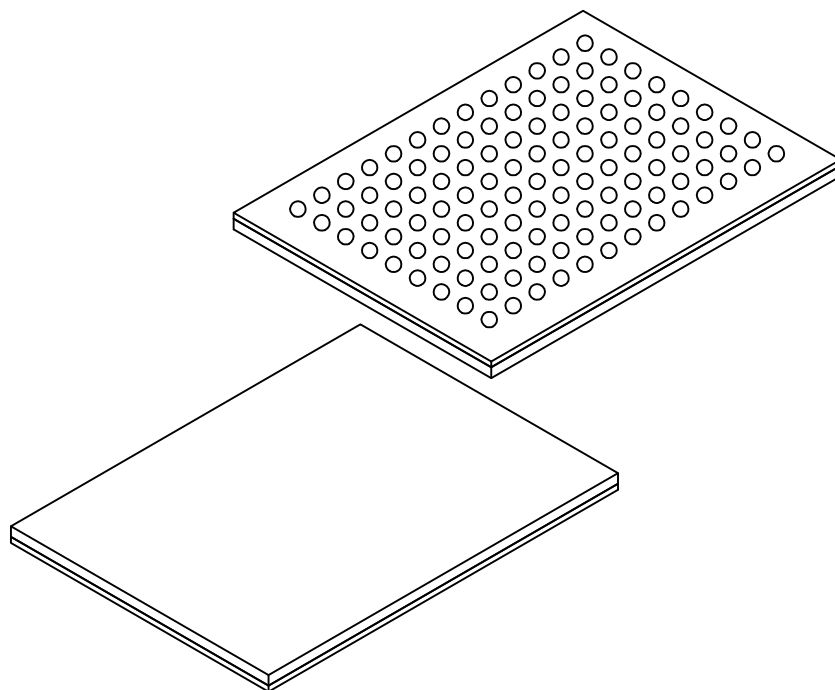
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-21166 Rev A Sheet 1 of 2

117-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C5B) - 9.5x7.0x0.65 mm Body [UFBGA]

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



		Units	MILLIMETERS		
Dimension Limits			MIN	NOM	MAX
Number of Terminals	N		117		
Pitch	e		0.65 BSC		
Overall Height	A		–	–	0.65
Ball Height	A1		0.16	0.21	0.26
Mold Thickness	M		0.25 REF		
Substrate Thickness	S		0.136 REF		
Overall Length	D		9.50 BSC		
Ball Array Length	D1		7.80 BSC		
Overall Width	E		7.00 BSC		
Ball Array Width	E1		5.20 BSC		
Ball Diameter	b		0.25	0.30	0.35

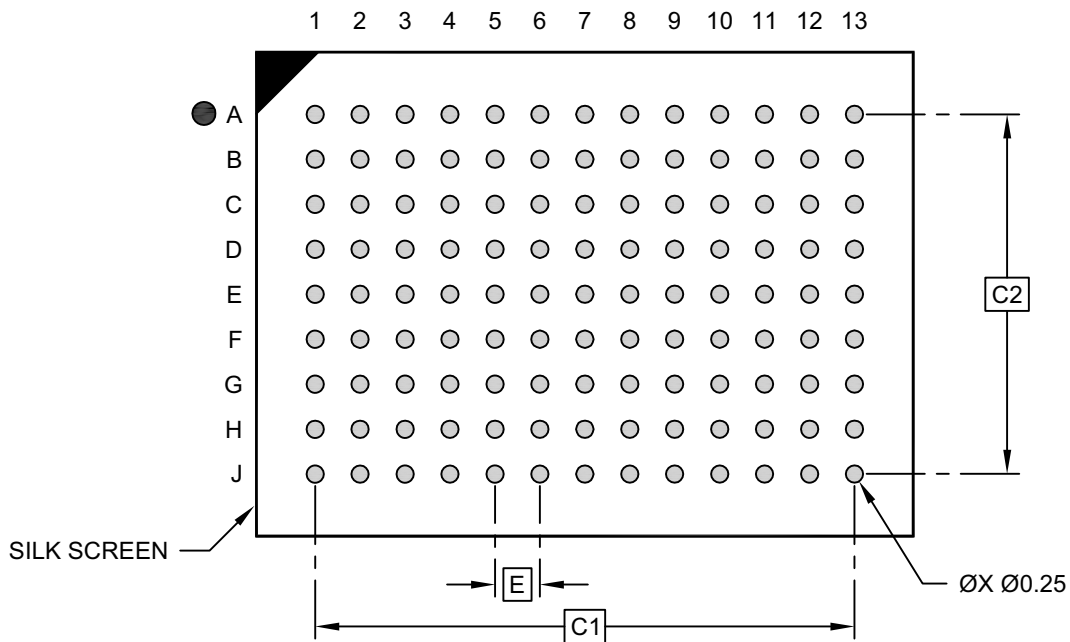
Notes:

1. Ball A1 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 C04-21166 Rev A Sheet 2 of 2

117-Ball Ultra Thin Fine-Pitch Ball Grid Array Package (C5B) - 9.5x7.0x0.65 mm Body [UFBGA]

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.65 BSC		
Contact Pad Spacing	C1	7.80 BSC		
Contact Pad Spacing	C2	5.20 BSC		
Contact Pad Width (Xnn)	X			0.25

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing C04-23166 Rev A

APPENDIX A: REVISION HISTORY

Revision A (January 2021)

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 mXT1066TD.

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

<u>PART NO.</u>	<u>-XXX</u>	<u>[X]</u>	<u>[X]</u>	<u>[XXX]</u>
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
ATMXT1066TD-C2U002 (Supplied in trays)	1.0.AB	114-ball UFBGA 7 × 5 × 0.65 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT1066TD-C2UR002 (Supplied in tape and reel)		
ATMXT1066TD-NHU002 (Supplied in trays)	1.0.AB	117-ball UFBGA 9.5 × 7 × 0.65 mm, RoHS compliant Industrial grade; not suitable for automotive characterization
ATMXT1066TD-NHUR002 (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.
 - Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "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.
-

Information contained in this publication is provided for the sole purpose of designing with and using Microchip products. Information regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Klear, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2021, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-7525-5

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

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](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

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

China - Beijing
 Tel: 86-10-8569-7000

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

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

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

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

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

China - Hong Kong SAR
 Tel: 852-2943-5100

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

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

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

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

China - Shenzhen
 Tel: 86-755-8864-2200

China - Suzhou
 Tel: 86-186-6233-1526

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

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

China - Xiamen
 Tel: 86-592-2388138

China - Zhuhai
 Tel: 86-756-3210040

ASIA/PACIFIC

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

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

India - Pune
 Tel: 91-20-4121-0141

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

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

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

Korea - Seoul
 Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
 Tel: 60-3-7651-7906

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

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

Singapore
 Tel: 65-6334-8870

Taiwan - Hsin Chu
 Tel: 886-3-577-8366

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

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

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

Vietnam - Ho Chi Minh
 Tel: 84-28-5448-2100

EUROPE

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

Denmark - Copenhagen
 Tel: 45-4485-5910
 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

Germany - Garching
 Tel: 49-8931-9700

Germany - Haan
 Tel: 49-2129-3766400

Germany - Heilbronn
 Tel: 49-7131-72400

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: 47-7288-4388

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