maXTouch 224-node Touchscreen Controller

Product Brief

Description
The mXT225TD-AT/mXT225TD-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 mXT225TD-AT/mXT225TD-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 32 X (transmit) lines and 20 Y (receive) lines
- A maximum of 224 nodes can be allocated to the touchscreen
- Touchscreen size 5.5 inches (8:3 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

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

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 8 mm (dependent on screen size, touch size, configuration and stack-up)
- Plastic 0.2mm to 4 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
- Hover Support
  - Supports one-finger hover up to 20 mm detection and 15 mm tracking range
  - Supports multiple finger hover detection
- 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
- P2P mutual capacitance measurements supported for extra sensitive touch sensing
- Noise suppression technology to combat ambient 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
- Burst Frequency
  - Flexible and dynamic Tx burst frequency selection to reduce EMC disturbance
  - Controlled Tx burst frequency drift over process and temperature range
  - Firmware-controlled Tx waveform shaping to reduce emissions
- Scan Speed
  - Up to 250 Hz one finger reporting rate (subject to configuration)
  - Typical report rate for 10 touches ≥60 Hz (subject to configuration)
- Initial touch latency <25 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 runtime 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

**Keys**
- Up to 32 nodes can be allocated as mutual capacitance sensor keys (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 60 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**
- I²C-compatible 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)
- SPI slave interface (up to 8 MHz)
- 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 (XVdd = Vdd if voltage pump not used)

**Package**
- 100-pin TQFP 14 × 14 × 1 mm, 0.5 mm pitch

**Operating Temperature**
- mXT225TD-AT: −40°C to +85°C (Grade 3)
- mXT225TD-AB: −40°C to +105°C (Grade 2)

**Design Services**
- Review of device configuration, stack-up and sensor patterns
- Custom firmware versions can be considered
PIN CONFIGURATION

100-pin TQFP
1.0 PACKAGING INFORMATION

The following section gives the technical details of the package for the device.

1.1 100-pin TQFP 14 × 14 × 1 mm

**Notes:**
1. This drawing is for general information only. Refer to JETDEC Drawing MS-026, Variation AED.
2. Dimensions D1 and E1 do not include mold protrusion. Allowable protrusion is 0.25mm per side.
3. Dimensions D1 and E1 are maximum plastic body size dimensions including mold mismatch.
4. Lead coplanarity is 0.08mm maximum.

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**12/05/2016**

Title: Thin Profile Plastic Quad Flat Package (TQFP)
APPENDIX A:  REVISION HISTORY

Revision A (August 2017)
Initial edition for firmware revision 1.0.AA – Release

Revision B (October 2017)
Updated for firmware revision 1.0.AC – Release
This revision incorporates the following updates:
• Features:
  - Front Panel Material: Recommended panel thickness for glass and plastic revised
• “Product Identification System”:
  - “Orderable Part Numbers”: Orderable part numbers and firmware version updated
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 mXT225TD-AT/mXT225TD-AB.

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

### Orderable Part Numbers

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<th>Orderable Part Number</th>
<th>Firmware Revision</th>
<th>Description</th>
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<td>ATMXT225TD-AT081 (Supplied in trays)</td>
<td>1.0.AC</td>
<td>100-pin TQFP 14 × 14 × 1 mm, RoHS compliant Operating temperature range –40°C to +85°C (Grade 3) Automotive grade sample; suitable for automotive characterization</td>
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<tr>
<td>ATMXT225TD-ATR081 (Supplied in tape and reel)</td>
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<td>100-pin TQFP 14 × 14 × 1 mm, RoHS compliant Operating temperature range –40°C to +85°C (Grade 3) Automotive grade sample; suitable for automotive characterization</td>
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<td>ATMXT225TD-AB081 (Supplied in trays)</td>
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<td>100-pin TQFP 14 × 14 × 1 mm, RoHS compliant Operating temperature range –40°C to +105°C (Grade 2) Automotive grade sample; suitable for automotive characterization</td>
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<td>ATMXT225TD-ABR081 (Supplied in tape and reel)</td>
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<td>100-pin TQFP 14 × 14 × 1 mm, RoHS compliant Operating temperature range –40°C to +105°C (Grade 2) Automotive grade sample; suitable for automotive characterization</td>
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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.
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.
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