32-bit Microcontrollers with Integrated Capacitive Touch Hardware

Summary
The Microchip Peripheral Touch Controller (PTC) is an integrated hardware module for capacitive touch measurement on sensors that function as buttons, sliders, wheels and surfaces with up to 256 channels. The PTC can support both self- and mutual-capacitance sensor layouts in the same application, resulting in a greater flexibility in the system design. Given its autonomous operation, the PTC requires very little CPU resources and power. With built-in automatic tuning and self-calibration, the PTC offers superb sensitivity and noise tolerance even under harsh environments and minimizes the sensitivity tuning efforts. This makes microcontrollers with integrated PTC ideal for any touch application.

Highlights
- Low-power, high-sensitivity and robust capacitive touch
- Excellent moisture and noise immunity
- Hardware-based peripheral, reducing CPU load and improving responsiveness
- No external components needed; minimal tuning required
- Comprehensive development environment and software resources

Key Features
- Supports low-power, high-sensitivity, robust touch buttons, sliders, wheels and touch surfaces
- Mutual- and self-capacitive touch
  - High channel count: up to 256 mutual-cap channels; up to 32 self-cap channels
  - Can run both modes at the same time: greater flexibility in system design
  - One pin per electrode: no external components needed
- Superior sensitivity: self-calibrating; minimum tuning needed
- Low CPU utilization: autonomous operation with non-blocking interrupt behavior
- Lowest standby power consumption: 4 µA standby with multi-button wake-up on touch
- Excellent Conducted Immunity (ECI) and EMC performance
  - Built-in hardware and firmware for noise filtering
  - Easily passes 10V conducted immunity tests

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### Developing Touch Projects with 32-bit Microcontrollers

**Software Tools**

Atmel Studio 7, together with QTouch library firmware and QTouch composer tool allows you to seamlessly embed capacitive-touch functionality into general-purpose MCU applications. This simplifies the design process by tying together the tools required to edit the code in Studio 7 and tune the touch design in QTouch composer. The royalty-free QTouch library provides several library files for each device and supports different numbers of touch channels, enabling both flexibility and efficiency in touch applications. This provides you with considerable latitude to implement buttons, sliders, wheels and surfaces in a variety of combinations on a single touch interface.

**Hardware Tools**

<table>
<thead>
<tr>
<th>Tools</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATQT1-XPRO</td>
<td>QTouch® Xplained Pro Extension Board, including two boards</td>
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<tr>
<td>ATQT2-XPRO</td>
<td>QTouch® Surface Extension Board for Xplained Pro 16 nodes, 10 mm node pitch surface.</td>
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<td>ATQT3-XPRO</td>
<td>QTouch Keypad Extension Board for Xplained Pro, 12-node keypad.</td>
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<td>ATQT4-XPRO</td>
<td>QTouch Proximity Extension Board for Xplained Pro. Two proximity sensors – one driven shield, one unshielded. Two standard QTouch buttons.</td>
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<td>ATQT5-XPRO</td>
<td>QTouch Xplained Pro, 5V tolerant extension board. Mutual-capacitance slider and buttons with two 7-segment displays.</td>
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<tr>
<td>ATQT6-XPRO</td>
<td>QTouch Surface Extension Board for Xplained Pro. 100 nodes, 5 mm node pitch surface.</td>
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<tr>
<td>ATSAMC20-QTRDEMO</td>
<td>The SAMC20 (or D20) QTouch Robustness Evaluation Kit demonstrates best-in-class capacitive touch performance, especially targeting the home appliance and industrial markets.</td>
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<td>ATSAMD20-QTRDEMO</td>
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<td>SAML21</td>
<td>Ultra-Low Power Touch Demo</td>
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Please contact local Microchip sales for availability.