

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, self-calibration and Driven Shield Plus, the enhanced PTC offers superb sensitivity and water/noise tolerance even under harsh environments and minimizes the sensitivity tuning efforts. This makes microcontrollers with integrated PTC ideal for any touch application.

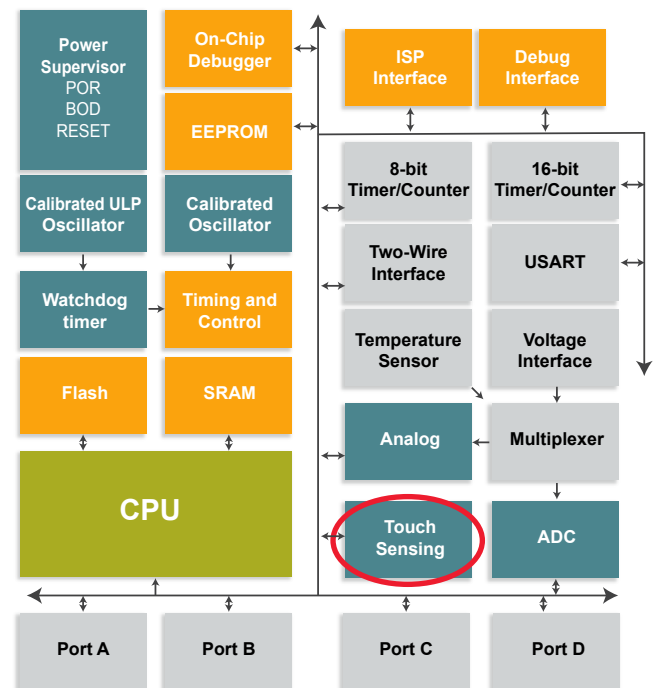


Highlights

- Low-power, high-sensitivity and robust capacitive touch
- Superior water tolerance and excellent 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 μ A standby with multi-button wake-up on touch
- Excellent conducted immunity and EMC performance
 - Built-in hardware and firmware for noise filtering
 - Easily passes 15V conducted immunity tests



32-bit Microcontrollers With Integrated PTC and Touch Library Support

Features	SAMD10/D11	SAMD20/D21	SAMDA1	SAML21/L22	SAMC20/C21	SAMD51/SAME5x	SAML10	SAML11
PTC (ch)	Up to 72	Up to 256	Up to 256	Up to 169/256	Up to 256	Up to 256	Up to 100, 4x faster with parallel acquisition	
Driven Shield Plus	–	–	–	–	–	–	Yes	
CPU Speed	48 MHz			48/32 MHz	48 MHz	120 MHz	32 MHz	
Flash (KB)	8/16	16–256	16–64	32–256	32–256	256–1024	16–64	
SRAM (KB)	4	2–32	4–8	4–32	4–32	128–256	4–16	8–16
DMA	6 ch	12 ch	8 ch	16 ch	12 ch	32 ch	8 ch	
ADC	12-bit ADC, 350 ksp/s			12-bit ADC, 1 Msp/s	3 x 16-bit SDADC, 2 x 12-bit ADC, 1 Msp/s	2 x 12-bit ADC, 1 Msp/s	12-bit ADC, 1 Msp/s	
DAC	10-bit DAC			2 x 12-bit DAC/-	- /10-bit DAC	2 x 12-bit DAC	10-bit DAC	
USB	- /FS USB Device	- /FS USB Host and Device	FS USB Host and Device	FS USB Host and Device	–	FS USB Host and Device	–	–
CAN	–	–	–	–	–	CAN-FD CAN 2.0	CAN-FD CAN 2.0	–
Ethernet	–	–	–	–	–	–	1	–
TrustZone®	–	–	–	–	–	–	–	Yes
Secure Boot	–	–	–	–	–	–	–	Yes
Pin Options	14, 20, 24	32, 48, 64		32, 48, 64, 100	32, 48, 56, 64, 100	48, 64, 100, 128	24, 32	

Developing Touch Projects with 32-bit Microcontrollers

Software Tools

The Touch modular library and configurator 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 and fine-tune the touch designs. The royalty-free touch 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

Tools	Description
ATQT1-XPRO	QT1 Xplained Pro Extension Board, including two boards
ATQT2-XPRO	QTouch® Surface Extension Board for Xplained Pro 16 nodes, 10 mm node pitch surface.
ATQT3-XPRO	QTouch Keypad Extension Board for Xplained Pro, 12-node keypad.
ATQT4-XPRO	QTouch Proximity Extension Board for Xplained Pro. Two proximity sensors – one driven shield, one unshielded. Two standard QTouch buttons.
ATQT5-XPRO	QT5 Xplained Pro, 5V tolerant extension board. Mutual-capacitance slider and buttons with two 7-segment displays.
ATQT6-XPRO	QTouch Surface Extension Board for Xplained Pro. 100 nodes, 5 mm node pitch surface.
ATQT7-XPRO	QT7 Xplained Pro, water tolerant touch extension board using Driven Shield
ATQT8 Xplained Pro Kit	QT8 Xplained Pro kit (part# AC164161) is an extension board that enables easy evaluation of the 2D surface touch with water tolerance and noise immunity.
ATSAMC20-QTRDEMO ATSAMD20-QTRDEMO	The SAMC20 (or D20) QTouch Robustness Evaluation Kit demonstrates best-in-class capacitive touch performance, especially targeting the home appliance and industrial markets.
SAML Touch Click	SAML touch click (PID: MIKROE-3414) is based on the ultra-low power SAML10 MCU featuring Driven Shield Plus. It is targeted for exceptional touch designs that require superior water tolerance, excellent noise immunity & responsiveness. SAML click is supported by a mikroSDK compliant library, which includes functions that simplify software development and can be used on a system equipped with the mikroBUS™ socket.
SAML21 Ultra-Low Power Touch Demo	Please contact local Microchip sales for availability.

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