

QTouch Capacitive Touch Technology



Atmel Industry Presence: Recent Design Wins

Industrial

Consumer



Appliance

Atmel Touch Solutions

Atmel® QTouch®

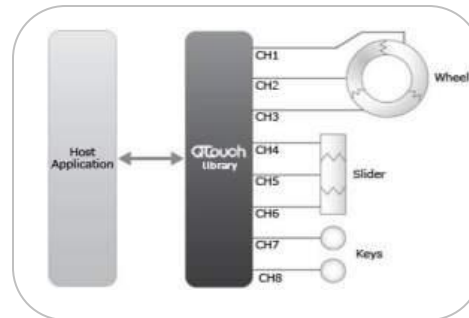
Atmel® maXTouch

Application Specific
(42QTxxxx Series)



Ready-to-Use
Touch Controllers

Atmel QTouch
Library and PTC*



Touch IP on Standard
Atmel MCU

Touchscreens



Small Form
Factor

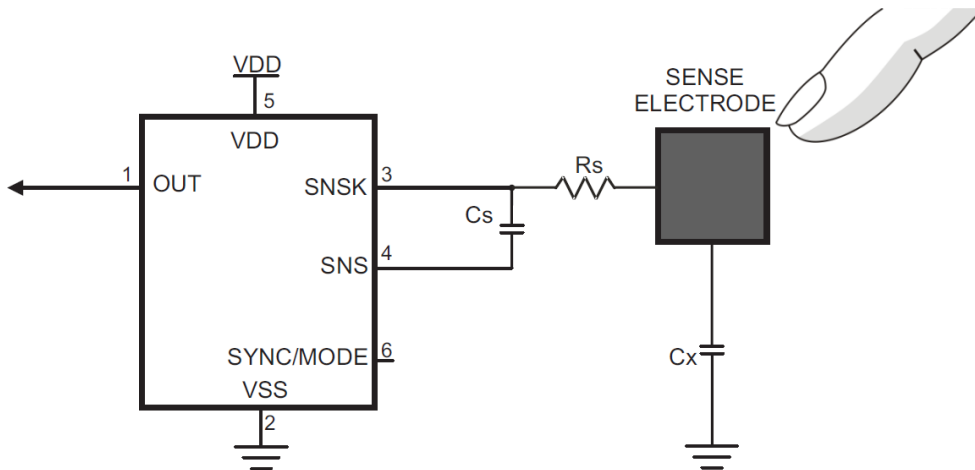
Large
Touchscreen

*PTC - Peripheral Touch Controller

QTouch vs. QMatrix Technologies

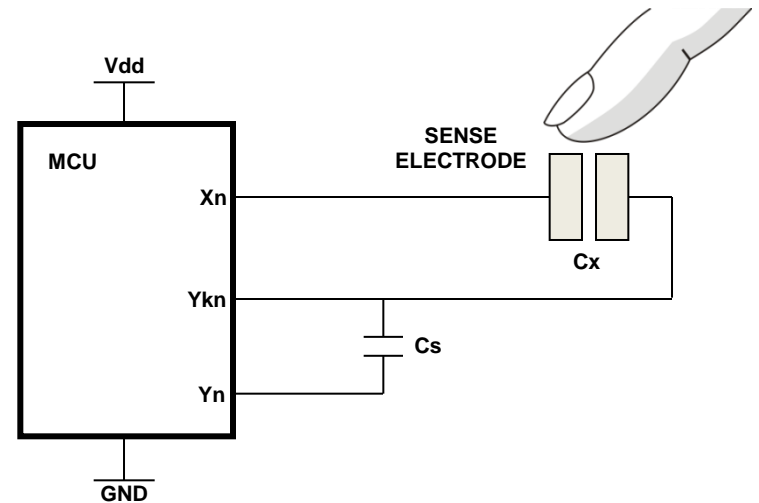
QTouch® Technology

- Self-Capacitance
 - Robust and Simple Electrode Design
 - Ideal for Low Node Count
 - Good Proximity, Providing Better Sensing Distance
 - Virtually Any Electrode Shape Possible
 - Easy-to-tune Sensitivity



QMatrix® Technology

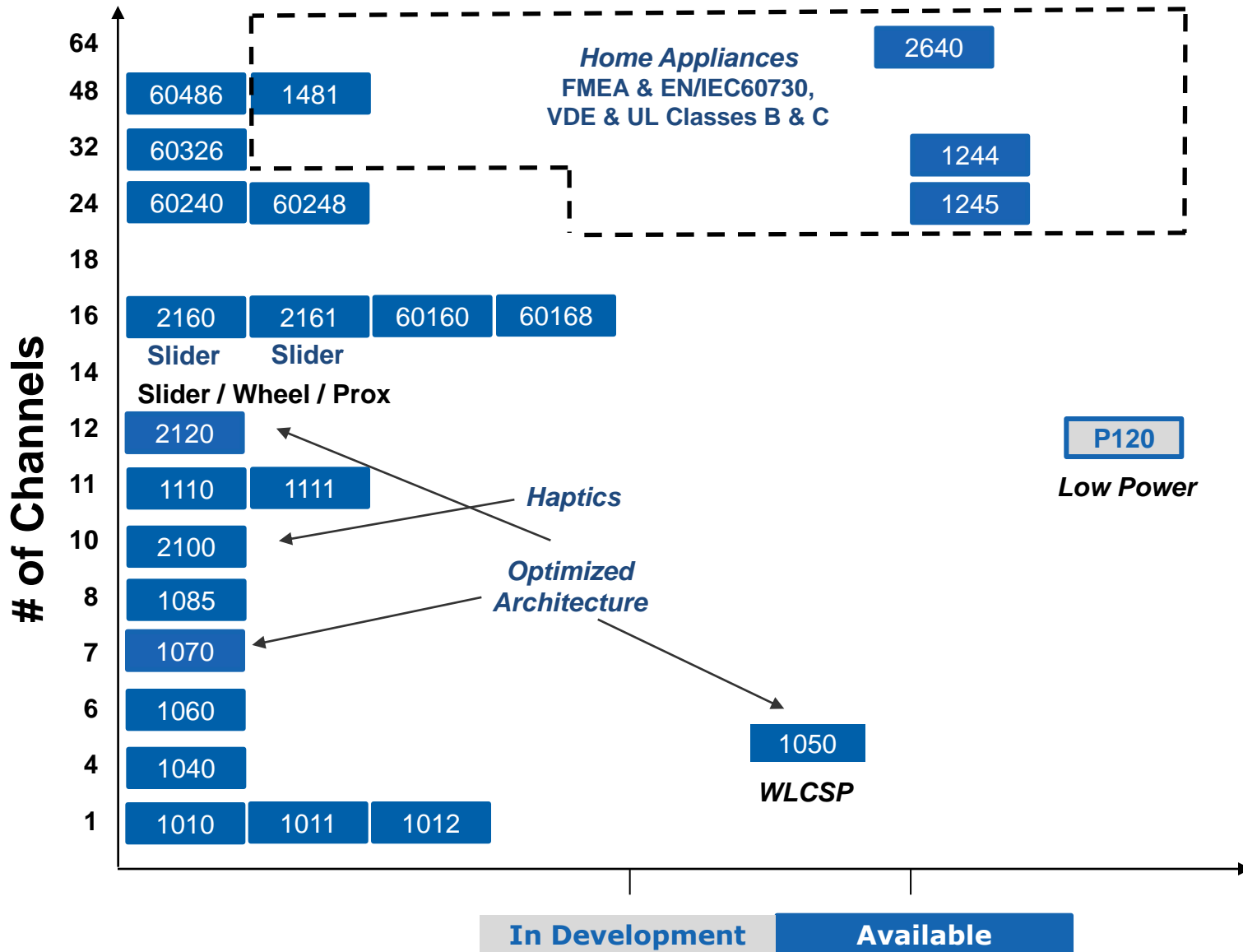
- Mutual-Capacitance
 - Well-defined Key Area for Detection
 - Ideal for High Node Count (>10 Nodes)
 - Very Resilient to Moisture & Environment
 - Passive Tracking – Longer Tracks Possible
 - Very Resilient to Noise and Ground Loading



Fixed Function Devices



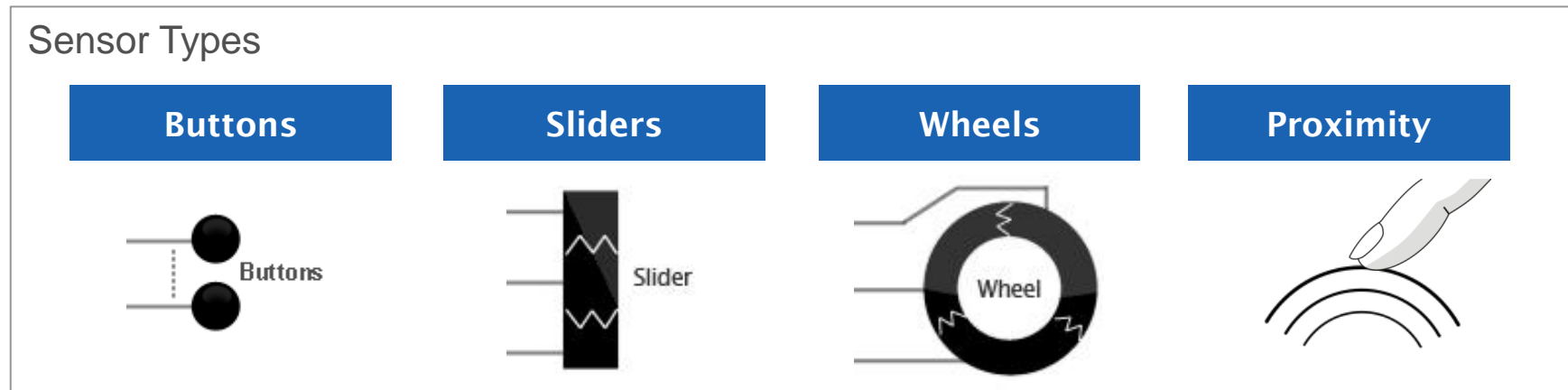
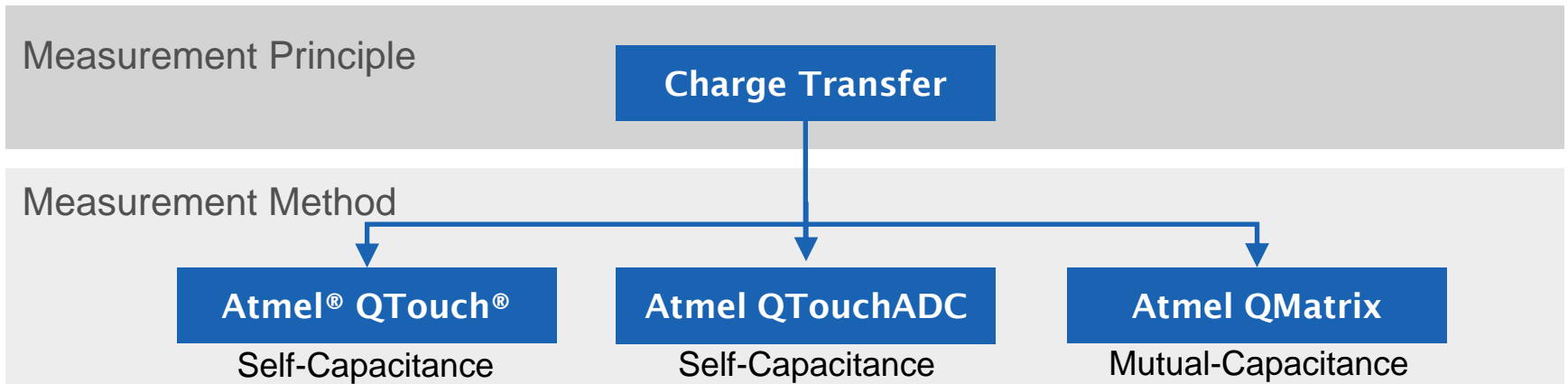
Application Specific Device Roadmap



Capacitive Touch in Microcontrollers



Atmel Charge Transfer Technology



Touch Support for All Micro Families!

Button, Slider, Wheel, Proximity

	QTouch®		QMatrix®	
	#channels	# Slider maximum	#channels	# Slider maximum
Tiny 2K	1-4* ¹	-	-	-
Tiny	1-11	3	1-16	4
Mega	1-16	4	1-64	8
Xmega	1-16	4	1-56	8
SAM3/4	1-32	8	-	-
SAMD2x	1-16* ²	5	1-256* ³	8

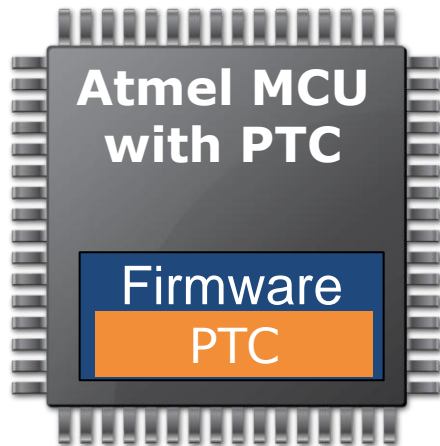
*1 Supports Button Only

*2 PTC self capacitance - Button/Slider/Wheel

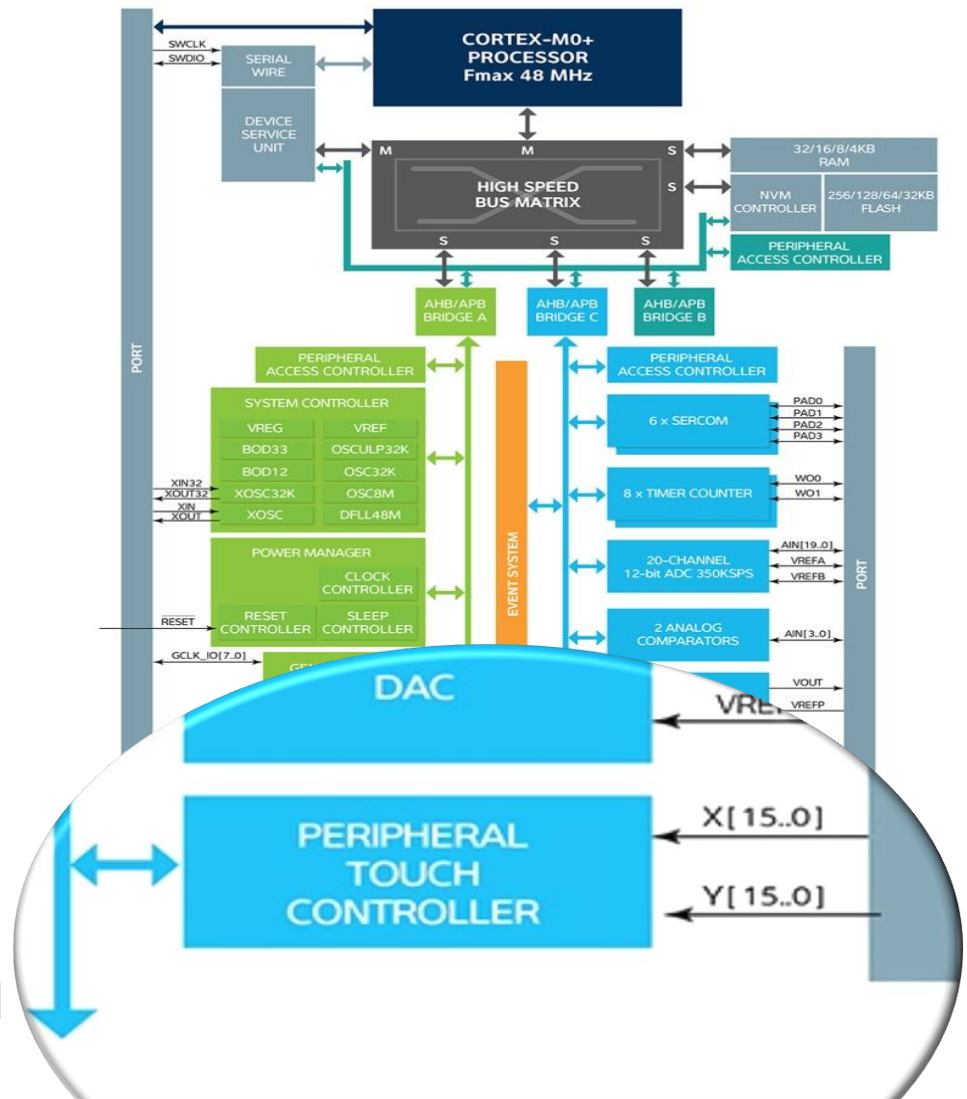
*3 PTC mutual capacitance - Button/Slider/Wheel

Touch Acquisition: Benefit of HW solution

Introduced in the SAMD family



- ✓ Dedicated hardware touch controller
- ✓ Works great with any application code
- ✓ Easily passes 10V conducted immunity tests



Technology Comparison

HW Platform	Measurement method	External components	Number of pins/channel	CPU Utilization	Response time / noise tolerance	Power consumption
Standard MCU with Firmware	QTouch	2 per channel	2	Highest	Better	Low
	QMatrix	$2x\sqrt{n}$	$3x\sqrt{n}$	Highest	Better	Low
MCU with PTC	Self-Capacitance	None*	1	Low	Best	Lowest
	Mutual Capacitance	None*	$2x\sqrt{n}$	Low	Best	Lowest

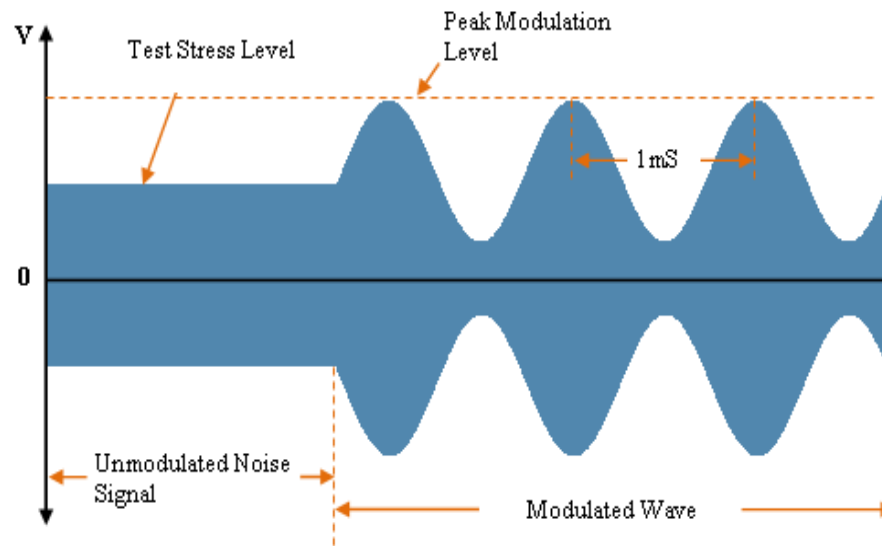
*) Depends on conducted immunity requirements

SAM D20 Robustness Demo – CI Solution

Test Results



- IEC/EN 61000-4-6
- Test Level 3: 10Vrms
- Frequency Range: 150kHz to 80MHz
- Step: 1%
- Modulation: 1kHz



- Both Self Cap. and Mutual Cap. sensors are unaffected by CI noise.
- No false detects or out of detects observed throughout the test range.

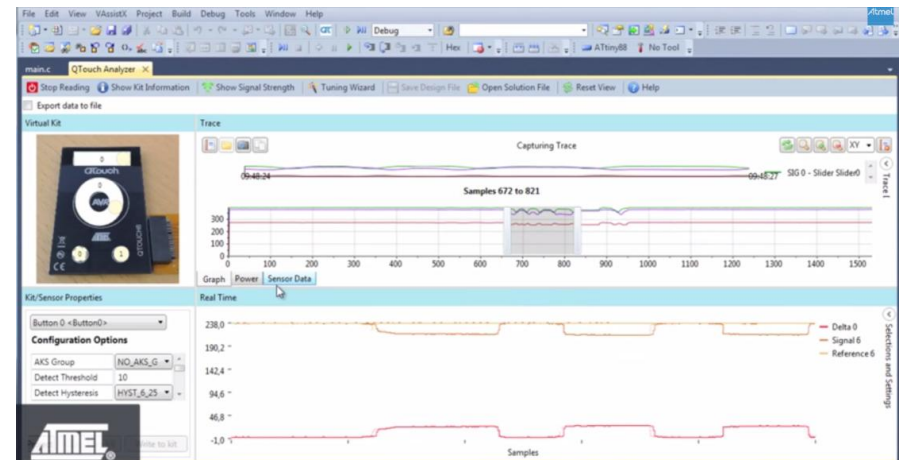
Qtouch Composer

Built-in Hardware Support for Touch

- Ease of use
 - Project builder wizard autogenerates QTouch code
 - Seamless integration with Atmel Software Framework (ASF)
 - Built-in noise filtering and frequency hopping

Sensor	Channel	Sensing Pin	Gain
Button0	0	Y0-PA2	2
Button1	1	Y1-PA3	2
Wheel0	2	Y2-PA4	4
Wheel0	3	Y3-PA5	4
Wheel0	4	Y4-PA6	4
Slider0	5	Y5-PA7	1
Slider0	6	Y6-PB0	1
Slider0	7	Y7-PB1	1

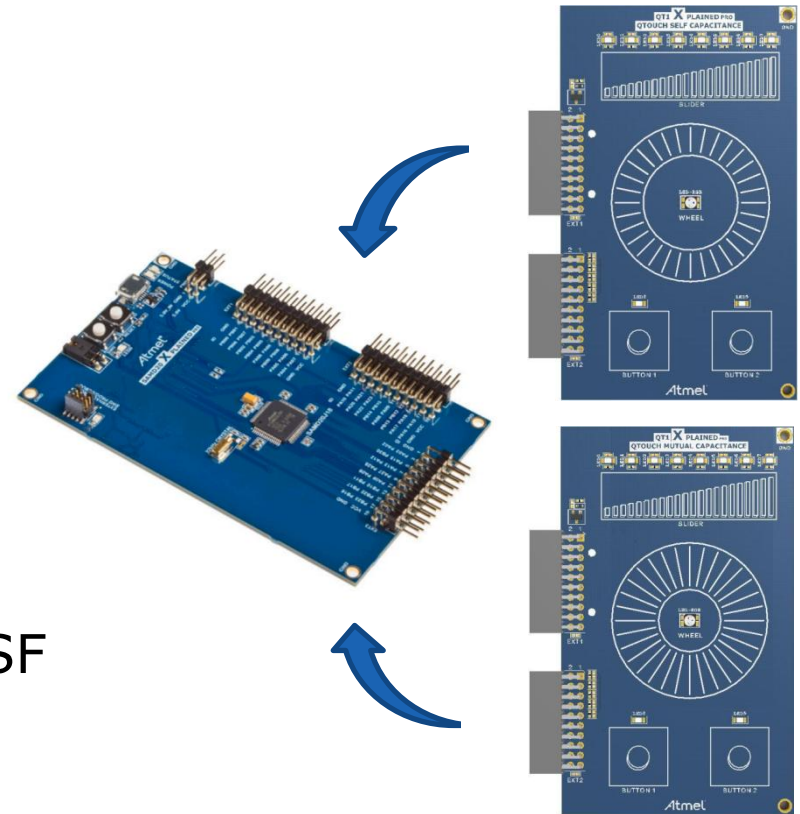
- Create Touch projects for any platform
- Analyze SAM D20 QTouch acquisition



Full integration with **Atmel Studio** !

QT1 Xplained Pro Extension

- Interfaces to SAM D20 Xplained Pro
- One kit, two boards
 - Mutual-capacitance board
 - Self-capacitance board
- Different sensing methods, same feature set
 - 2 buttons with yellow LEDs
 - 1 slider with 8 yellow LEDs
 - 1 wheel with RGB LED
- Example projects available in ASF



Summary

- High-performance QTouch is available for the SAM D20
 - Low power consumption
 - Low CPU utilization
 - Short response times
 - High noise tolerance
- Easy to use
 - No external components
 - Easy gain and filter adjustments
 - Automatic calibration and recalibration in QTouch Library
 - Intuitive project building and performance analysis in QTouch Composer
 - FMEA & UL Certified code available soon



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