

# QST family

Capacitive touch-based controller solution  
for user interfaces

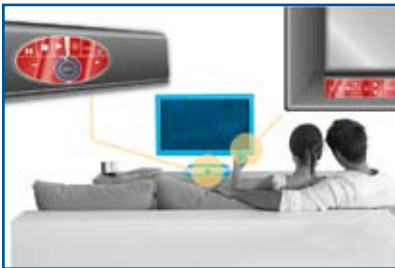


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# QST brings innovation to your fingertips

In applications requiring user interface, touch-sensitive controls are rapidly becoming the solution of choice to replace conventional electro-mechanical switches. They offer an innovative way to create elegant and attractive user interfaces where durability, ease of use and price are major considerations. They also enable completely new ways of approaching human-machine interface challenges to enhance the user experience.

The QST family of capacitive touch sense controllers make it easy to create touch sensing surface controls in robust, durable, contemporary interface designs while reducing touch-panel costs.



## Robust, economical touch-based interfaces

With QST devices, designers can create simple touch-panel sensors using passive electrodes on any conventional or flexible printed circuit board (PCB) material such as FR-2 and CEM-1. The sensing electrodes are part of the PCB layout (a free form shape of copper or printed conductive ink). Device configuration allows flexibility in panel thickness, from extremely thin plastics to 10 mm or more of glass. QST users also benefit from a range of panel construction methods pioneered and patented by Quantum Research Group, and available to STMicroelectronics' customers.



## Controllers for key, slider and wheel interfaces

Three types of QProx technology are available within the standard QST portfolio:

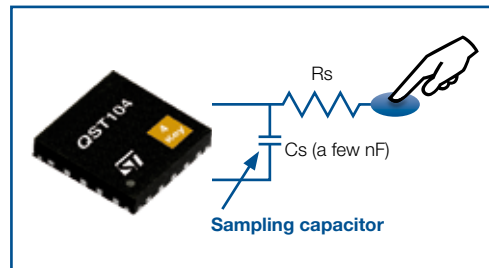
- QTouch™ – simple touch panels of up to 8 keys
- QMatrix™ – high key count panels in small packages, thanks to the X-Y capacitive scanning matrix
- QWheel™/QSlide™ – reliable linear or rotary touch position sensing to a resolution of one part in 256 with only 3 channels (a wheel is made of three interlaced electrodes)

All these technologies support button-based touch screens using clear Indium Tin Oxide (ITO) films over LCD screens.

## Low-cost, solid-state alternative to mechanical switches

QST controllers use a purely digital, firmware-based solution that implements Quantum Research Group's patented, field-proven charge-transfer QProx™ capacitive technology.

By implementing the QProx charge-transfer algorithm, the QST controller detects finger presence (human touch) near electrodes behind a dielectric (usually a glass or plastic panel). The external component count is low, with only one sampling capacitor and one resistor per channel required.



## No production line or user calibration

QST embeds sophisticated drift compensation, auto-calibration, noise filtering and Adjacent Key Suppression (AKS™) to ensure maximum usability and control integrity.

## Reduced development time and cost

QST controllers require no additional software development, and allow different sensing modes selected in firmware and by option resistors. QST provides flexibility in user interface design and offers a stable, reliable capacitive touch solution.

## QST key features

- Up to 16 keys through any panel
- Rotary wheel and linear slider configuration
- I<sup>2</sup>C communication interface
- Standard output mode and LED drive
- Adjacent Key Suppression (AKS)
- Self calibration and calibration after time-out
- Automatic environment drift compensation
- Spread spectrum modulation
- Low-power mode
- Small form factor package
- Beeper control

## QST key benefits

- Easy creation of economic, contemporary, innovative user interfaces
- Solid-state low-cost alternative to mechanical switches
- Any combination of touch keys, wheels and sliders
- Simple electrode design
- Flexibility in panel thickness and type of material
- No software development required
- No production line or user calibration required
- Self-calibrating and self-adjusting
- Spread-spectrum operation for noise reduction
- Low-power chips for battery-powered applications
- Easy serial communication with host function using I<sup>2</sup>C

## QST current and future products

**QMatrix**

**QST516**

**QSlide, QWheel**

**QST608**

**QTouch**

**QST101 QST102 QST104 QST108**

I/Os, I<sup>2</sup>C, LEDs, AKS, Beeper, Auto drift, Self-calibration, reduced EMI

More features like...

- Low voltage
- Higher key counts
- Mix configurations

## QST device summary

Part number	Package	Number of touch keys	Wheel/slider	Com interface	Supply voltage	Operating temperature	Signal processing and other functions
QST101AU6	DFN8	1	-	-	2.4 V/5.5 V	-40 °C/+85 °C	■ Debounced results
QST102AU6	DFN8	2	-	-	2.4 V/5.5 V	-40 °C/+85 °C	■ Self calibration
QST104KT6	LQFP32	4	-	I <sup>2</sup> C	2.4 V/5.5 V	-40 °C/+85 °C	■ Auto-drift compensation
QST108KT6	LQFP32	8	-	I <sup>2</sup> C	2.4 V/5.5 V	-40 °C/+85 °C	■ AKS™
QST608KT6	LQFP32	5	1	I <sup>2</sup> C	2.4 V/5.5 V	-40 °C/+85 °C	■ Key error indication
QST516KT6*	LQFP32	16 (Matrix)	-	I <sup>2</sup> C	2.4 V/5.5 V	-40 °C/+85 °C	■ General purpose I/Os
							■ Beeper output

\*Under development

# High-end features for robustness and fast time to market

## **Self-calibration**

All keys are automatically self-calibrated at power-up. This feature tunes the detection threshold level to provide reliable operation under almost any conditions. During the final test, there is no production line tuning needed.

## **Auto drift compensation**

To avoid false detection or non detection, this feature, over time, compensates for signal drift caused by variations in power supply, sampling capacitor, temperature, humidity, dirt and other environmental effects.

## **Adjacent key suppression (AKS)**

Adjacent Key Suppression (AKS) prevents multiple keys from responding to a single touch. This can happen with closely spaced keys, or a scroll wheel that has buttons very near it.

# Unique features to optimize sensitivity and immunity

## **Detection integrator (DI)**

This feature acts as a digital debounce filter to reduce the effects of noise on the QST devices. The DI mechanism requires consecutive detections over a number of measurements for a touch to be confirmed. Similarly, the end of a touch (loss of signal) has to be confirmed over a number of measurements.

## **Spread spectrum operation**

Spread spectrum operation allows QST devices to be highly robust against external noise sources. Charge-transfer bursts operate over a spread of frequencies, so that external fields have minimal effect on key operation and emissions are very weak.

## Application areas

Digital consumer

- Set-top boxes
- DVDs
- Home theater
- Digital TVs
- Cameras
- Remote control
- GPS

Appliances/small appliances

- Application control
- Washing machines
- Ovens/microwaves
- White goods

Computer and PC peripherals

- Printers
- Scanners
- Laptops
- Notebooks
- Keyboards
- Mice
- Monitors and displays

Industrial

- Industrial keyboards

Building security

- Alarm systems
- Security key panels
- Kiosks

Communications

- Mobile phones
- Portable multimedia

Others

- Home trainer

# Learn, play, design with QST evaluation platform

## QST-Primer evaluation platform

The **QST-Primer** is a complete hardware and software platform for discovering and evaluating QST technology.

The evaluation board implements a rotary wheel, a linear slider and four key electrodes. It connects via USB to a host PC running the QST evaluation graphical user interface.

The GUI displays human touch detection and allows configuration of device parameters such as wheel/slider resolution, key activation, AKS™ modes, low-power mode activation and detection integrator.



QST-Primer

## QST device evaluation boards

A **QST device evaluation board** is available for each QST controller to provide PCB design examples of key, wheel or slider electrodes. These boards provide the perfect tools for demonstrating device features and playing with the capacitive sensing electrodes.

Each evaluation board includes a plastic panel used as a dielectric, a QST device, and a battery. Designers can easily change the sampling capacitor value to adapt key sensitivity to their needs. When available on the device, the I<sup>2</sup>C communication interface is accessible through a dedicated connector.

A QST hardware interface (I<sup>2</sup>C/SPI/I/O to USB) will be available with a dedicated software GUI for configuring device parameters.



QST GUI



QST108 evaluation board (QST108-EVAL)

## Related documentation and software

A range of technical documents are available to help designers understand QST technology and successfully design a touch-based sensing application.

- RM0005 – QST protocol reference manual
- AN2547 – Recommendations for designing a capacitive touch sensor board
- AN2642 – How QST touch control devices work
- AN2643 – How to test and validate your own QST touch control board
- UM0421 – QST-Primer user manual
- QST family capacitive touch demonstrator software PC

For more information and access to the QST user forum, visit [www.st.com/qst](http://www.st.com/qst)



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