The AT42QT1040 (QT1040) IC is a convenient and easy-to-use touch sensor controller for up to four capacitive touch keys. The device comes in an ultra-small 20-pin 3 mm x 3 mm VQFN package, making it ideal for use in space-constrained mobile devices. This new low-cost IC makes it possible to replace mechanical buttons in mobile and consumer devices with Atmel’s QTouch™ technology.

- 4-channel touch sensor IC
- 4 outputs for per-channel touch indication
- Low operating voltage 1.8 to 5.5 V
- Ultra-low power consumption (31 µA, 64 ms between acquisitions, 1.8 V)
- Option to configure output as proximity sensor
- 2 response speed settings
- Debug output provided to aid design
- RoHS-compliant package

### Key Sensitivity

The channels on the QT1040 are individually configurable for sensitivity to support a wide range of front panel materials and thicknesses. It is possible to configure any one of the channels as a proximity sensor that can be used to illuminate “hidden until lit” keys on an approaching hand.

### Response Speed

The response speed can be configured either for low latency (16 ms), or for a slightly slower response (64 ms) with the benefit of reduced power consumption. The setting used depends on product requirements.

### Reliability

As with all Atmel devices, the QT1040 is extremely reliable, thanks to Atmel’s patented technology.

Tightly spaced key pads can prove a challenge when using capacitive touch buttons: nearby fingers can cause false detections, or a hovering hand can activate channels. Atmel’s patented Adjacent Key Suppression™ (AKS™) technology overcomes these issues. AKS isolates the key with the largest signal, and then suppresses signals from all other keys whilst the selected key is pressed, so false key detections do not occur.
Self-calibration

The device automatically self-calibrates within 0.1 seconds of applying power. If a touch key is miscalibrated at power-on (for example, if a finger is held over the key), the device automatically recalibrates as the finger is removed. Similarly, a recalibration takes place if a channel is triggered for longer than a specified time-out period.

Auto Drift Compensation

Drift compensation algorithms constantly adjust the reference level in the device to ensure that the keys remain calibrated even if there is a large change in background capacitance.

Debugging Output

The QT1040’s debugging mode can be used to watch selected variables in the device. Data is clocked at a rate of 200 kHz, which means that channels can be monitored with great accuracy. The ability to log the behavior of the device in this way means quicker isolation and resolution of issues, and a shorter design life cycle.

Electrical and Environmental Specifications

<table>
<thead>
<tr>
<th>System</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of keys</td>
<td>Up to 4</td>
</tr>
<tr>
<td>Number of I/O lines</td>
<td>4 output channels</td>
</tr>
<tr>
<td>Key outline sizes</td>
<td>Typically 8–10 mm advised, although they can be smaller; and of varied shapes</td>
</tr>
<tr>
<td>Key spacings</td>
<td>7 mm center to center typical; depends on panel thickness</td>
</tr>
<tr>
<td>Signal processing</td>
<td>Adjacent Key Suppression, noise filtering, self-calibration on start-up, automatic drift compensation</td>
</tr>
</tbody>
</table>

Recommended Operating Conditions

- Power supply: 1.8V to 5.5V
- Power supply ripple + noise: ±5 mV

Environmental Specifications

- Operating temperature: -4°C to +85°C
- Storage temperature: -55°C to +125°C

DC Specifications

- Supply current, slow mode, 64 ms between acquisitions: 31 µA @ 1.8V
- Supply current, fast mode, 16 ms between acquisitions: 104 µA @ 1.8V

Package Options

- 20-pin 3 mm x 3 mm x 0.85 mm VQFN RoHS compliant

More Information?

The QT1040 datasheet is available from our website – www.atmel.com/products/touch

There is also an evaluation kit available (EVK1040A) that allows you to experiment with different configurations and settings. It is supplied ready to use, with documentation.