



Single Key Capacitive Touch Controllers

The AT42QT101x single key capacitive touch controller family provide touch key replacements for mechanical buttons. The ICs are low cost, and as such can be added to designs with minimal impact on the bill of materials.

Each Device has Different Operation:

- AT42QT1010 (QT1010)
Single key with timer to reset “stuck key” condition.
- AT42QT1011 (QT1011)
Single key with no reset timer.
- AT42QT1012 (QT1012)
Single key with touch-on/touch off or “toggle” operation and power down timer

The Devices have the following Features in Common

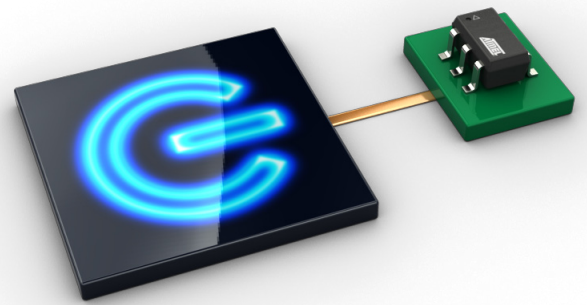
- 2.9 mm x 1.6 mm SOT-23 package
- Low power consumption (17 μ A at 1.8V)
- Low cost
- Easy to implement
- Range of response speed settings
- Can be configured for use as a proximity sensor

AT42QT1010 and AT42QT1011

The AT42QT1010 and AT42QT1011 are identical apart from their behavior when the sensor is “in detect” for an extended period.

The AT42QT1010 has a “maximum on” duration of ~ 60s. If there is an obstruction on the sensor, the device output will go low after the “maximum on” detection period, so that subsequent touches can be detected.

The AT42QT1011 has no timer and the device will remain on whilst the sensor is activate.



Speed Settings

The AT42QT1010 and AT42QT1011 have three speed settings:

- For devices where a quick response is required, a fast response setting is available with a 12.2 ms maximum response time.
- It is also possible to set up the device for low power consumption, at the expense of a slower response time of up to 88.6 ms.
- A third option is to synchronize the device to an external clock which makes it possible to synchronize several ICs in the same device. This technique can be used to enhance noise immunity by syncing to a noise source such as mains. The response time is then dependent on the external clock.

When the device is in low power mode or when the synchronisation mode is selected, a HeartBeat™ output is available. This provides a pulse whilst the device isn't in detect which can be used to verify the device is working correctly.

AT42QT1012

The device is similar to the AT42QT1010 and AT42QT1011 but it has touch-on/touch-off (toggle) functionality and a power down timer.

Auto Off Timers

The QT1012 has a number of options for automatic power down which can be used to conserve power in situations where the device could be left on inadvertently. There are predefined power down settings which can be used to power the device down after 15 minutes or 60 minutes. There is also the option for no power down timer so the device remains on until touched again.

Single-Key Touch Controllers

AT42QT1010

Single button or proximity sensor

Prolonged touch timeout after 60 seconds

AT42QT1011

Single button or proximity sensor

No power down, remains active while touch present

AT42QT1012

Single button or proximity sensor

Toggle (touch on/off) functionality

Power down after configurable time period

Standard Features

The following functionality is common to all three ICs in the AT42QT101X family.

Drift Compensation

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

Spread Spectrum Acquisition

The devices modulate their frequency whilst measurements are taken. This has the effect of reducing emission levels and susceptibility to interference as there is no single burst frequency.

Power Consumption

All the devices have a range of power modes depending on the response time required. The power consumption is kept to a minimum whatever power mode the device is in. This, combined with the auto-off functionality available on the QT1012 means that for portable devices, adding capacitive sensing functionality does not significantly impact on the battery lifetime.

Sensitivity

By careful capacitor selection and key design, the sensitivity of a capacitive button can be set to work with a wide range of panel thicknesses and materials. As the sensitivity of the key can be varied significantly it is also possible to use any of the single key devices as proximity sensors. Such functionality can be used in toys or used to illuminate “hidden until lit” user interfaces.

Calibration

The device will automatically calibrate on power up. If there is an obstruction on the key for a prolonged period, the sensor will re-calibrate after a set time period (with the exception of the QT1011, which will indicate a touch condition as long as the sensor is “in detect”). This ensures that the device will detect a new touch correctly.

Detection

In order for the sensors to only go active on intended touches, the ICs include signal processing which helps to suppress detections caused by electrical noise and quick brushes with the surface.

Typical Applications

- Power switches
- Hearing aids
- Isolated buttons/sensors
- Children's toy
- Timers
- Proximity sensors



Headquarters

Atmel Corporation
2325 Orchard Parkway
San Jose, CA 95131
USA
Tel: (1) 408 441-0311
Fax: (1) 408 487-2600

International

Atmel Asia
Unit 01-05 & 16, 19/F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon
Hong Kong
Tel: (852) 2245-6100
Fax: (852) 2722-1369

Atmel Europe
Le Krebs
8, Rue Jean-Pierre Timbaud
BP 309
78054 St Quentin-en-
Yvelines Cedex
France
Tel: (33) 1-30-60-70-00
Fax: (33) 1-30-60-71-11

Atmel Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Product Contact

Product Line
email touch@atmel.com

Literature Requests
www.atmel.com/literature

Web Site
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Specifications

System	
Number of Keys	1
Number of I/O lines	1 output channel
Key outline sizes	6 mm x 6 mm recommended or arbitrary shape
Signal processing	Noise filtering, self calibration on startup, automatic drift compensation

Recommended Operating Conditions	AT42QT1010	AT42QT1011	AT42QT1012
Power Supply	1.8V-5.5V	1.8V-5.5V	1.8V-5.5V
Power Supply Ripple + Noise	20 mV	20 mV	20mV

Environmental Specifications			
Operating Temperature	-40 to 85°C	-40 to 85°C	-40 to 85°C
Storage Temperature	-65 to 150°C	-65 to 150°C	-65 to 150°C

DC Specifications			
Supply Current (Slow mode)	17 µA	17 µA	31.5 µA
Supply Current (Fast mode) (1.8V Supply Current)	219 µA (1.8V Supply Current)	219 µA (1.8V Supply Current)	N/A

Package Options			
6-pin	2.9 mm x 1.6 mm SOT-23	2.9 mm x 1.6 mm SOT-23	2.9 mm x 1.6 mm SOT-23

Visit <http://www.atmel.com/singletouch> for more information

<http://www.atmel.com/touch>

Device selection guides, Datasheets, Application Notes, Tools, Software

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