World Leader in Capacitive Proximity Sensing

Azoteq Announces the IQS259 Ultra Low Power Capacitive Touch Controller

The IQS259, Azoteq's latest addition to the ProxSense® family of capacitive proximity and touch controllers, was released on March 8th, 2012.

The IQS259 sets new standards for proximity and touch sensing with power consumption of 8 microampere, which is up to 100 times better than competitive devices.

The IQS259 uses advanced analog and digital circuitry to achieve unparalleled proximity and touch performance. The high sensitivity enables the IQS259 to work reliably through glass up to 25 mm thick and achieves proximity detection up to 250 mm.

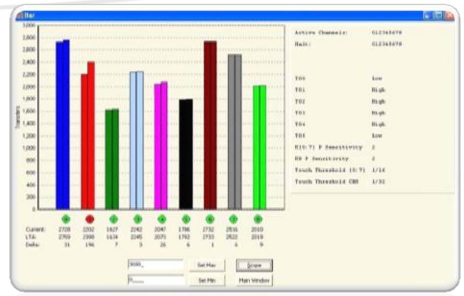
The device can operate from 1.8 to 3.6V and achieves power consumption as low as 8 microampere while still sensing proximity and touch.

Continued on Page 4

Articles

To enable next generation capacitive user interfaces and intelligent switch applications for users to interact naturally with products through capacitive proximity and touch

About Long Term Averaging (LTA)



Long Term Averaging

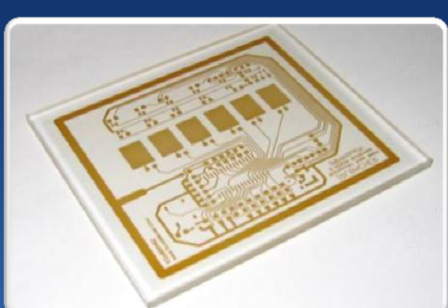
CΔ is determined by the IC threshold setting

All ProxSense® ICs have a built-in long term averaging filter for each sensing channel, which is capable of intelligently tracking very slow changes in the environment. This is the dynamic reference value of a channel, and is referred to as the LTA. The LTA can also be viewed as the baseline one long term steady state value of the sensor.

The filter calculates the average value of the count measurements. When the difference between the count value and LTA exceeds CΔ, an activity is recorded, and a response is generated (this response can be a pin changing polarity / data outputted to another device via a communication protocol). The LTA filter halts for T_{HALT}.

How the filter works: With the detection of a user proximity, the LTA filter will freeze (reference value is kept) for T_{HALT}. If an activity (proximity/touch) is maintained for longer than T_{HALT}, the system will time-out. After this time-out the LTA filter (reference value) will start to recalibrate the system to this condition, causing the response that the IC had to the activity to reset. Sensitivity will be restored after the activity is ended and the system is allowed to calibrate to the undisturbed sensing environment.

T_{HALT} is user configurable in different manners for different ProxSense® ICs.



What factors are the most important when designing a capacitive touch sensor

The four most important factors to consider when designing with capacitive sensing technology are:

- Substrate thickness (thicker is better) - material on which pad/button is placed
- Pad/button size (bigger is better)
- Thickness of overlay (thinner is better) - material between user and pad/button
- Trace length to pad (shorter is better – put the sensor IC as close as possible to the electrodes)

ESD Performance Standards

Many ESD standards such as the Human Body Model (HBM), Machine Model (MM), Charged Device Model (CDM), and IEC 61000-4-2 have been developed to test for robustness and ensure ESD protection.

These standards are often misunderstood and sometimes used interchangeably, which can result in tested, "protected" systems that later fail in the consumer's hands. To ensure better product reliability, it is critical that today's design engineer understand the significant differences between the manufacturing environment and system end user environment ESD testing.

The purpose of traditional ESD testing of integrated circuits in the manufacturing environment is very different than system level testing. HBM, MM and CDM tests are intended to ensure that integrated circuits survive the manufacturing process. Processes such as packaging, final testing, shipment to a board assembly facility, placement on the circuit board, and the soldering process should be performed in controlled ESD environments that limit the level of ESD stress to which the device is exposed.

Integrated Circuits (ICs) are inherently susceptible to ESD damage. This damage can occur during the process of assembling the ICs into boards and finished systems, packaging or in the field. There are several current methods for rating ICs for ESD in the manufacturing environment.

The most common include:

- HBM - this standard is intended to simulate a person becoming charged and discharging from a bare finger to ground through the circuit under test.
- MM - intended to simulate a charged manufacturing machine, discharging through the device to ground.
- CDM - simulates an integrated circuit becoming charged and discharging to a grounded metal surface.

The HBM is usually sufficient for the controlled ESD environment of the factory floor, but it is completely inadequate for system level testing. The levels of ESD strikes, both the voltages and the currents, can be much greater in the end user environment.

For this reason, the industry uses a different testing standard for system level ESD testing. This standard is known as the IEC61000-4-2. While most designers are familiar with the classic device level manufacturing tests that are applied to integrated circuits, the most common misunderstanding occurs between the HBM and IEC61000-4-2 standards. These two very different standards are designed for very different purposes.

System designers need to be familiar with the differences between various ESD test standards. Each standard has a legitimate purpose, but misapplying these standards can result in design delays and/or product returns.

Continued from page 1

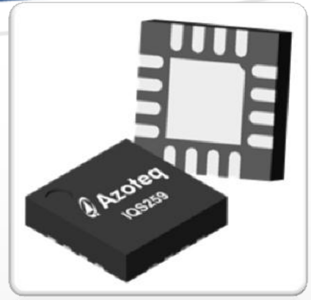
The device can operate from 1.8 to 3.6V and achieves power consumption as low as 8 microampere while still sensing proximity and touch. The I2C-compatible interface allows for full control of the sensor functions from a host controller.

"Azoteq provides the only proximity and touch solutions that enable designers to achieve first-time success with their design due to the auto-tuning and drift compensation features," said Kobus Marneweck, VP of Marketing at Azoteq. "These features also dramatically increase the manufacturability of the product by compensating for any changes in the environment," he added.

Azoteq is releasing a full family of controllers based on the IQS259 technology during Q1 and Q2 of 2012. The expanding feature sets include stand-alone devices, self- and mutual capacitive sensors and lower cost single-channel devices in small packages.

Applications:

- Consumer electronics - TVs, Blu-Ray players, set-top boxes
- White goods and appliances
- Office equipment, educational toys
- Proximity detection that enables activation of backlighting
- Wake-up from standby applications
- Replacement for electromechanical switches
- GUI trigger and GUI control proximity detection
- And More!



Device Features

- 9-channel input device
- Proximity and touch on each channel
- Distributed proximity channel formed by multiple keys
- I2C interface
- Automatic tuning to optimum sensitivity
- Supply voltage 1.8V to 3.6V
- Multiple low-power modes
- Internal voltage regulator and reference capacitor
- Large proximity-detection range
- Automatic drift compensation
- QFN(3x3)-16

Tips & Tricks
Long Trace Electrodes

Here are some things to keep in mind if you have an application where you need a long trace to your electrode:

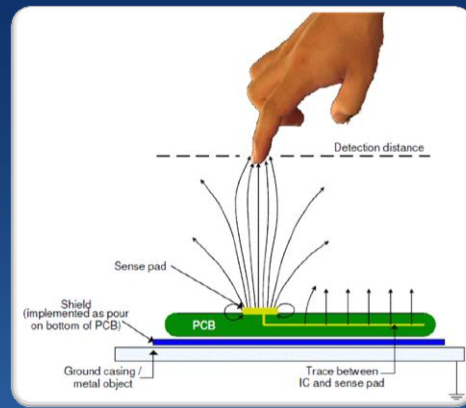
1. Keep traces away from other noise sources such as grounds and other sense electrodes (CX)

2. If the application permits, use shielded cables where the inner wire is the CX and the outer shield is connected to the shield pin of Azoteq's IC.

3. Try to keep the CX traces thin.

4. Board layout is probably the biggest culprit when poor performance is observed

5. Keep the CXs well away from other conductors, grounds, and metallic paints or surfaces



If RF noise is a problem, a 470R resistor together with a 2-7pF capacitor arranged in a low pass filter configuration works wonders

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