Azoteq

World Leader in Capacitive Proximity Sensing

# Capacitive proximity and touch turns a dumb remote into a smart remote.

With the rapid expansion of content available on television, the demand on the remote user interface expanded proportionally. Today's television grew in screen size and offers multiple layers of interaction on the graphical user interface.

The remote control form factor is, however, still governed by the same constraints as the 1970's remote that only offered Channel & Volume UP/DOWN. For example, the user needs to hold it in one hand and operate it with the thumb, whilst looking somewhere else.

It was easy to meet the form factor and user mechanics in 1970, but what about 2012? My suggestion is to solve the conundrum with a shopping list from the ProxSense® portfolio:

Where did I put my remote? To find it in the dark on the table with six other remotes, coffee mugs, magazines and the normal plethora of odds and ends, use IQS127/227 to illuminate backlighting. This is a simple TSOT23-6 device, running sub 4uA.

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## Articles



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

# The Difference between Capacitive and Resistive Touch Screens

There are several different technologies when discussing touch screens, but the two dominate types of touch screens found in the market today are capacitive and resistive touch screens. While there are pros and cons to each technology, development into capacitive touch screens are overcoming advantages that resistive touch screens have.

Resistive Touch Screens:

- Are composed of two bendable sheets coated with resistive material and separated by miniscule metallic dots
- Need to be pressed down for the two sheets to make contact
- Are susceptible to damage by sharp objects

Capacitive Touch Screens:

- Have a glass or plexi-glass insulator between the user and the conductive film(usually Indium Tin Oxide film)
- Measure a change in capacitance with any conductive material
- Allows for air gestures while using sensitive ICs(i.e. IQS550)

## Air Gestures

Using Azoteq's ProxSense®, Air Gestures such as flipping a page, moving a picture on a tablet and more are possible!

## ESD Protection Methods

A Sense Electrode is usually exposed and it is possible that an electric discharge can make its way to the IC. With Azoteq's technology, we have protection built into the circuit. If more protection is needed, a few methods are:

- Placing a series resistor between the ProxSense® IC pin and the sense electrode
- Using a TVS diode
- A spark gap implementation may be sufficient for improved ESD protection

# ..continued from page 1

Intelligent proximity triggered backlighting further means it is ON just before you touch the remote, but OFF when we don't need it.

Are your batteries always flat? Use IQS128/228 for handheld detection and only power the rest of the circuit while the remote is held in the hand. This is also a little TSOT23-6 device that will extend the product battery life well beyond 2 years.

Is 2 years not long enough? I suggest employing a triple action switch: Proximity, Touch, Click - a low cost construction will allow the user to wake the MCU with a wake-up from pin change, while the same sensor will guide your finger with proximity triggered backlight to your touch-sensitive ON/OFF button.


The IQS222/333 will provide an 11 bit wheel resolution for the volume wheel interface to keep the thumb in active standby to kill that annoying 120dB advert in the middle of your favorite show. While the wheel will be positioned such that this is the default position for the thumb, why not integrate an Up/Down/Left/Right (UDLR) navigation key with a low cost (much lower than tactile) solution on the same wheel? Yes: We also do the click capacitive! Actually, while your thumb will be here for 99% of the time, let's just put full XY cursor control here. The IQS550 will provide a full track-pad, wheel, and UDLR click keys, in the same real estate with no mechanical parts: single sensor IC providing 3 layers of totally natural interaction.

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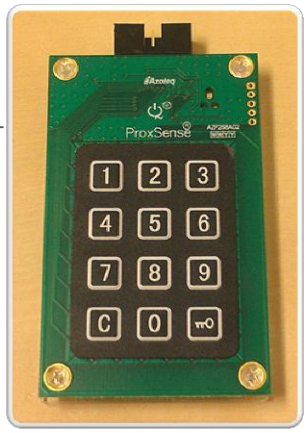
A video best illustrates this example: http://www.azoteq.com/images/stories/videos/Azoteq-Keyboard_Trackpad.mp4

Conventional touch keys have limited use in a remote control, since the user's finger will normally 'search' for a key. This may lead to unintended activations. This problem is overcome with the capacitive click sensors described earlier, or the CAPPO implementation. A positive force is required to trigger the touch, and it is suitable to implement behind a metal top cover. So you could even put Braille on the touch key and don't worry about unintended touches - touch sense for the blind! (CAPPO Video: here)

So all of this is great, but how about capacitive touch keyboards? The IQS550 track-pad controller offers native keyboard key-click support. The IQS550 offers a patented track-pad behind the QWERTY keyboard.




**The IQS550 with 12 buttons**

The keyboard can be implemented with conventional domes or PET layer and track-pad below on the PCB (which was there in the first place, so the track-pad comes at no additional cost). With this innovative approach, the same real estate is used for the track-pad and the QWERTY keyboard, with minimal external cost.

High-end remotes may offer LCD screens, which opens up a dynamic GUI. In an industry where BOM cost is critical, the ProxSense® solution is a non-ITO touch screen. Edge-touch is a patented method to implement an icon based GUI on small screens utilizing conventional glass or PET - no expensive ITO. (http://www.azoteq.com/images/stories/videos/Azoteq-Edge_Touch_for_Appliances.mp4)

ProxSense® certainly has the capacitance to enhance the boring old remote to meet today's demanding interface. The solutions are system based in the sense that minimal BOM cost is added in return for intuitive and innovative user interaction.

## Low Power Mode

Azoteq's ProxSense® ICs also include a low power mode that allows you to adjust how often your device turns on to detect proximity.

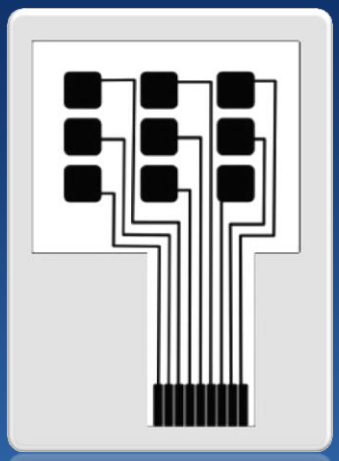
Using this method can help you prolong your device's battery life!

# Tips & Tricks
# Discreet buttons using ITO film

Indium Tin Oxide (ITO) film is generally used in capacitive touch screens. For traditional capacitive touch screens, you would need a pattern etched into the film as well as silver ink used on the edge of the touch screen. Thus adding cost to your overall system.

A different tactic that you can use to still have a touch screen is to etch discreet buttons onto the ITO film (Etching means turning an area from conductive to non-conductive in a pattern that you've laid out).

A good example of an etched ITO pattern for discreet buttons can be seen in the picture to the right.



ITO film can be etched like the picture above, where the black areas are conductive and the white areas are non-conductive.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