Azoteq

World Leader in Capacitive Proximity Sensing

The many uses of an intelligent capacitive swipe-switch

N.J. de Jager and G. Avenant, Azoteq

The limitations of conventional tactile or electromechanical switches have made electronic counterparts not only desirable, but necessary. The susceptibility to mechanical failure and the relatively high cost of tactile switches are only two of the factors fuelling the trend to replace them with electronic switches. With modern processing speeds that allow sampling periods in the nanosecond range, the switching transients or "bounce" of conventional switches have become unacceptable.

For these reasons, electronic switches such as capacitive touch sensors are becoming the technology of choice for modern applications. The benefits of capacitive sensors include reliable, invariable functioning, better sensitivity, higher levels of safety…

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Content

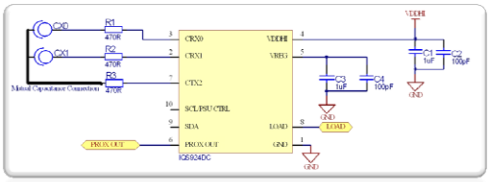
To enable next generation capacitive user interfaces and intelligent switch applications for users to interact naturally with products through capacitive proximity and touch

Introducing the IQS924 Two Channel Capacitive Touch Dimmer

The IQS924 ProxSense® IC is a fully integrated dual channel capacitive contact and proximity sensors with built in controller for dimming applications. With market leading sensitivity and automatic tuning of the sense electrode, the IQS924 provides an extremely cost effective minimalist implementation requiring very few external components. The device is ready for use in a large range of lighting applications, while programming options allow flexible fine tuning in specialized applications.

Typical Applications

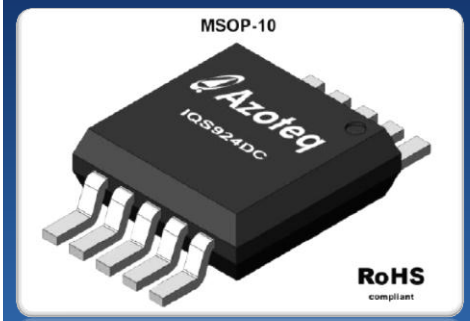
- General LED Dimming
- Toys
- Camping lights
- Flash lights
- Floor/Corridor and stairway lighting
- Under cabinet lighting
- Replacement for electromechanical switches
- Proximity detection that enables backlighting activation (Patented)



Two Channel Sensing

With Two channels, you are able to more robustly design your application! The picture above shows just how easy it is to design the IQS924 into your next application!

The IQS924 Features



- Two channel capacitive proximity and touch controller
- Integrated for low system cost
- Dimmer user interface
- Touch dimming control
- Proximity and dimming control channels
- Proximity Find-In-The-Dark
- LED backlight for user feedback
- Auto Tuning Implementation for optimum sensitivity
- I2CTM Interface
- Supply Voltage 1.8V to 3.3V
- Configurable low power modes.
- Low Power consumption <6uA
- Package MSOP-10, SOIC-14

Page 1 Continued

improved immunity against aqueous substances, and ultra-low power consumption, especially for portable and battery operated devices.

Thus capacitive touch sensors are an ideal approach to designing the electronic switch, but the technology does have minor limitations.

All materials or objects possess a certain electrical permittivity or dielectric constant, thus the detection of foreign objects in the sense environment is inevitable and the unintended activation of a device may be produced by metallic objects or electrically conductive or ionic solutions. This may raise safety concerns for use in products such as hot appliances (e.g. stove tops, hairdryers etc.)

Further limitations of capacitive sensors include their uninterrupted power dissipation and the fact that portable devices are introduced to continuously changing environments, which may influence the sensor's sensitivity due to a varying reference potential.

However, by implementing refined semiconductor technology together with innovative capacitive sense electrode designs and advanced processing algorithms, an intelligent capacitive "swipe-switch" may be implemented to circumvent these limitations.

Design and Implementation

A capacitive swipe-switch is based on a 2- or 3-channel capacitive sense electrode. The signals must satisfy specified control algorithms to register as valid swipe or gesture actions. This concept is illustrated in Figure 1, which depicts a simple 3-channel self-capacitance sense electrode that can be implemented to perform the swipe detection.

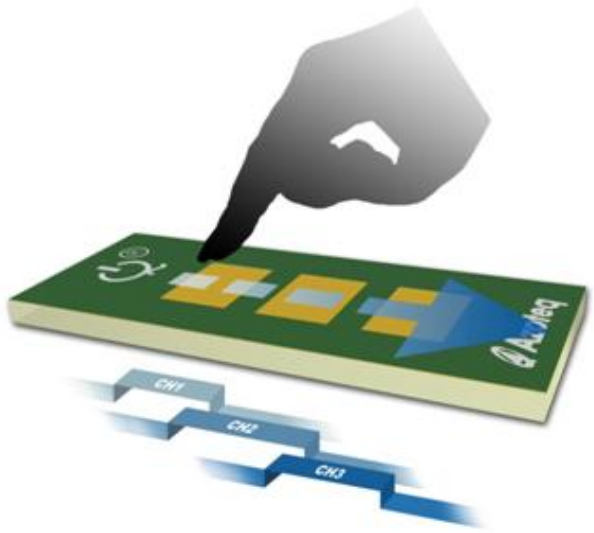


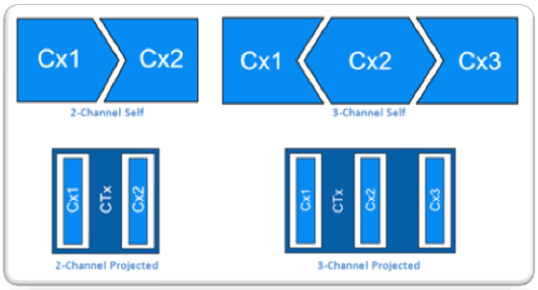
Figure 1: A 3-channel sense electrode for a swipe-switch device

User input is identified by sequences of a combination of input states, where a number (e.g. 1, 2, or 3) indicates a touch condition/state on the corresponding channel and a z-character indicates a zero condition/state.

For a 2-channel electrode, a simple swipe or gesture can be seen as a touch on the first electrode (1z), followed by a touch (12) on both electrodes, and lastly followed by a touch on the second electrode (z2). The required sequence of state combinations can be summarized as: 1z, 12, z2. If a swipe event is to be recognized in the opposite/reverse direction, the required swipe sequence will be: z2, 12, 1z. Any combination of states not seen in these orders will clear the current state machine, and the switch will wait for the next valid start condition.

For the full article, visit Embedded.com, here.

The IQS213 SwipeSwitch™ Demo Kit

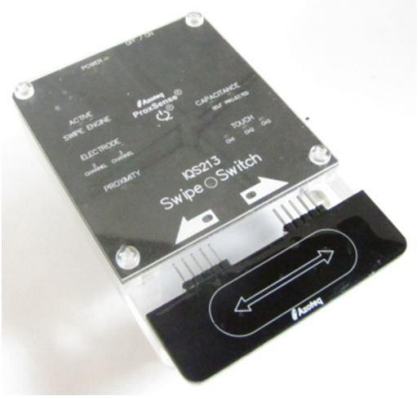


Azoteq's IQS213EV03 Evaluation Kit demonstrates the SwipeSwitch™ ease of use and versatility of design. The EV-Kit is manufactured in five parts, consisting of the mainboard device, and four separate swipe plug-in module boards.

Figure 1 IQS213EV03 EV-Kit

To visualize raw data from the EV-Kit, the main board can be interfaced to any personal computer with USB support, and IQS213 software GUI. The purpose of the IQS213EV03 EV-Kit is to help application and development engineers in evaluating the IQS213 proximity, touch and swipe sensor, in both self-capacitance and projected capacitance modes.

Figure 1 above illustrates the evaluation kit mainboard and a plug-in swipe module board. Simply plug in the desired swipe module board and turn on the power switch, as depicted in the picture below.



For more information on how to use the SwipeSwitch™ EV-Kit, visit here.

Features

- Modular design: Connect one of the supplied plug-in modules into the mainboard, to evaluate and compare swipe performance
- Reference designs for IQS213 with user proximity, touch and swipe detection ability
- Four separate module boards to evaluate 2 or 3 channel swipe operation, in either projected capacitance mode, or self-capacitance mode
- Used in Data Streaming Mode: EV-KIT requires Mini-USB cable
- Powered by supplied battery, or by Mini-USB cable

What to keep in mind when designing your Track-pad

There are many design choices that must be considered when designing a track-pad. Some things to keep in mind are:

- Use non-conductive overlay such as plexiglass or PET
- Minimize the air gap
- Locate the snap dome positions between Rx's and Tx's
- Use a uniform diamond pattern
- Route the Tx's and Rx's separately
- Ensure a rigid mechanical housing

If backlighting is needed, LEDs can be placed in the center of a diamond. If the cut-out is kept to a minimum, the tracking will not be negatively affected.

Sales

Azoteq International

Jean Viljoen

+27 21 863 0033

jean.viljoen@azoteq.com

Azoteq USA

Kobus Marneweck

+1 512 538 1995

kobusm@azoteq.com

Azoteq Asia

Lina Yu

+86 (138) 2696 0845

linayu@azoteq.com.cn

Distributors

Worldwide
Mouser Electronics

+1 800 346 6873

Sales@mouser.com

Worldwide
Future Electronics

+1 514 694 7710

Taiwan
Holy Stone Enterprise Co. Ltd

Terry Chiang

+886 2 2659 6722 ext 302

terrychiang@holystone.com.tw

South Korea
PCTRONIX Corp

Sunny Baek

+82 2 886 0401/2

sunny@pctronix.co.kr

South Korea
SPCorporation

Moon Pack

+82 16 729 6070
+82 2 3012 6070

mpack671@yahoo.co.kr

China
Infortech

Summer Yin

+86 21 51087875 ext 355

summer_yin@infortech.net.cn

South East Asia
Locus Marketing Pte. Ltd

Sam Liew

+65 6299 7308
+65 6292 5848

samliew@locus.com.sg

Representatives

USA- Southern California
O'Donnell South
+1 310 781 2255
sales@odas.com

USA- Northern California
O'Donnell Associates North
+1 408 456 2950
wepich@odonnell.com

Europe – UK, Ireland
Clere Electronics
+44 (0) 1635 291666
peb@clere.com

USA- GA, NC, SC, TN, MS, AL
Quantum Marketing, Inc
+1 310 781 2255
jeannette.ayerbe@qmirep.com

USA- TX, LA
Logic 1 Sales
+1 512 656 4686
david_lykes@logic1sales.com

USA- NY, NJ, PA, DE, MD, VA
Analectro
+1 856 795 6676
sales@analectro.com

Central Europe
ActiveRep GmbH
+49 (0) 812 2227 9270
+49 (0) 171 3098 721
brendon.hutton@activerep.com