



World Leader in Capacitive Proximity Sensing



User Guide for Isolated digital communications buffer

A technical guide for using an isolated communications buffer device

Many applications use self-capacitance measurement because it is simple and only requires one electrode. Self-capacitance references to ground and the sensitivity varies greatly when the device is grounded compared to when it is powered by a battery in application such as handheld devices. The CT210 and DS100 make it easier to debug but connects the ground the circuit to the computer's ground. A buffer device with an isolated I2C and 1-wire interface enables debugging with a CT210 or DS100 without grounding the circuit.

When using an isolated buffer device, the GUI provides visual observation of the system without affecting the sensor environment (no common signal ground between test device and PC).

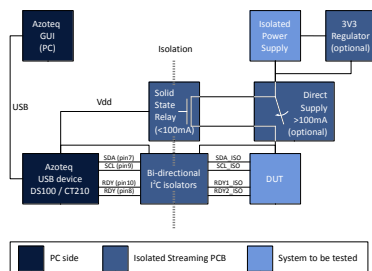


Figure 1: Isolated Communications PCB block diagram

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Azoteq enables next generation user interfaces for users to interact naturally with products through capacitive proximity and touch

The IQS550-TS43 for Touch Panel for 4.3" LCD Displays

Since the release of the IQS550TS-43 Touch Screen Module, it has been selling well. The IQS550 is a capacitive sensing controller designed for multi-touch applications using projected capacitance touch panels. This IC is at the heart of this touch screen solution.

The main features include the 4.3" Touchscreen Panel with a 3584 x 2304 resolution and up to 5 simultaneous touch coordinates. This touch panel requires a supply voltage of 1.65V to 3.6V and communicates with an I2C interface.

Operation Characteristics

The IQS550 requires a master device for reading the following touch point data over I2C:

- Touch ID
- Touch co-ordinates
- Touch strength

The solution can simply be powered and touch data read at a rate of up to about 80 Hz. No special pre-configuration routines are required.

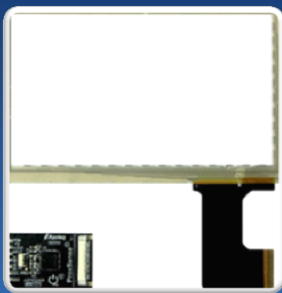
Product info can be found [here](#).



Azoteq's Thermostat Demo

The picture above showcases the IQS550TS-43. It is connected to a BeagleBone Black board running Android

IQS550TS-43 Availability



The IQS550TS-43 is available for purchase on Mouser. Full product link to Mouser is located [here](#).

For more of Azoteq's devices available for sale, please visit Azoteq's product page on Mouser at [Http://www.mouser.com/Azoteq](http://www.mouser.com/Azoteq).

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The isolated streaming PCB plugs directly into the USB device. A standard Azoteq 20-pin male header is provided at the isolated side for connection to the test system.

It is important to note that the isolated streaming PCB does add larger GND to the test system. This effect is minimized in the layout. In addition capacitive coupling to the PC GND is made mostly through the isolation ICs. This amounts to a total of about 3pF as shown in Figure 2.

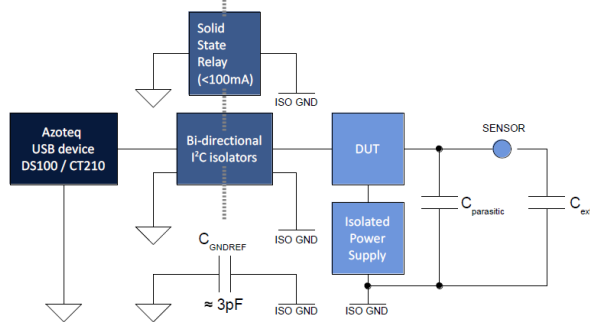


Figure 2: Isolated communications PCB parasitic capacitance model

Signal connections can be made as show in Table 1. More details on the circuit can be seen below.

Signal	Pin (on connector P4)
VDDHI (3V3 / 5V)	2
SDA	4
SCL	5
RDY1	6
RDY2	3
ISO GND	1

Table 1: Isolated streaming buffer pin connections

Device Connections

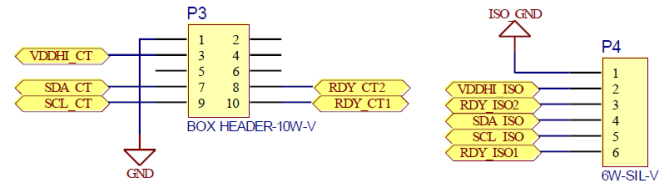


Figure 3: Module connectors, PC side (left), DUT side (right)

The device is plugged into an Azoteq USB device at P3 and plugged into the DUT at P4.

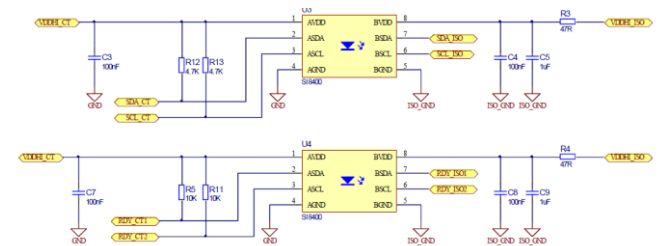


Figure 4: Bi-directional isolated I2C buffers

The SI8400 device offers bi-directional I2C communications. The SDA and SCL pins are open drain I/Os and always require pull-up resistors in order to function.

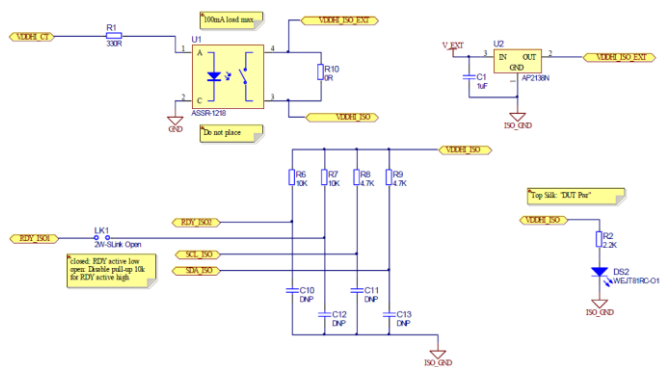


Figure 5: Top left: synchronized VDDHI selection (when U1 is placed), Bottom left: DUT Pull-up selection and Right: Power supply circuitry

The PCB offers the capability of selecting the RDY line to operate in a RDY active low or RDY active high state. This can be set depending on the DUT.

The Response Rate of the IQS213

The ProxSense® IQS213 IC is a fully integrated two or three channel capacitive swipe function sensor with market leading sensitivity and automatic tuning of the sense electrodes. The IQS213 provides a minimalist implementation requiring few external components, with programming options and an I2C compatible interface that allow control to a host MCU for specialized applications.

The IQS213 is a highly configurable device, which delivers touch and proximity detection using either self or mutual capacitive sense electrodes and provides user options to implement SwipeSwitch™ features or use the device in a discrete touch key application.

Touch Response Rate

Many applications require a capacitive touch controller IC with a fast response time while consuming minimal power in a reduced/low power mode. The IQS213 is one example from the ProxSense® series of capacitive touch controllers and in this document the process to measure the touch response time will be explained.

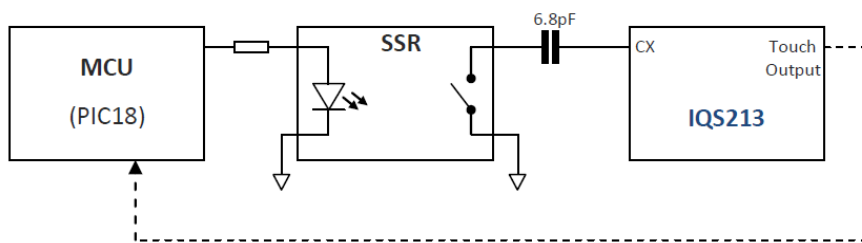
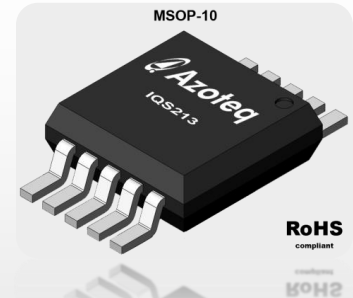


Figure 1: Diagram of IQS213 setup

Connect the IQS213 to an MCU through a solid state relay (SSR) as shown in Figure 1. Note that this setup is only valid for simulating touch events on a self-capacitive sense electrode configuration.

The use of a relay is required to connect and disconnect a load capacitor (e.g. 6.8pF) to the sense electrode pin (CX), whilst isolating the sense electrode from the MCU without adding additional parasitic capacitance on the CX pin. The latter case will occur when using a transistor (e.g. NMOS-FET) to apply the load capacitor.



IQS213 Features

- 2 or 3 channel sensor
- Projected or self-capacitance
- Adjustable Swipe function
- Auto-Off and Advanced Auto-Off Warning Function
- Supply voltage: 1.8V to 3.6V
- Internal voltage regulator and reference capacitor
- Advanced on-chip digital signal processing
- OTP (One Time Programmable) options available
- I2C compatible interface
- Low Power Modes (sub 4 μ A)
- Small outline MSOP-10 package

Full Application Note on [here](#).

Track-Pad Design Guideline

Azoteq is committed to providing the best support for all of our products. One way that we support for our customers is by having informative Application Notes. One such application note is on how to design a track-pad for touch gestures and touch tracking. The Track-Pad Design Guideline can be found on Azoteq's website [here](#).



The IQS525TP-43 Track-Pad Module

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