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IQS263EV02 Evaluation Kit User Guide

IQ Switch® - ProxSense® Series

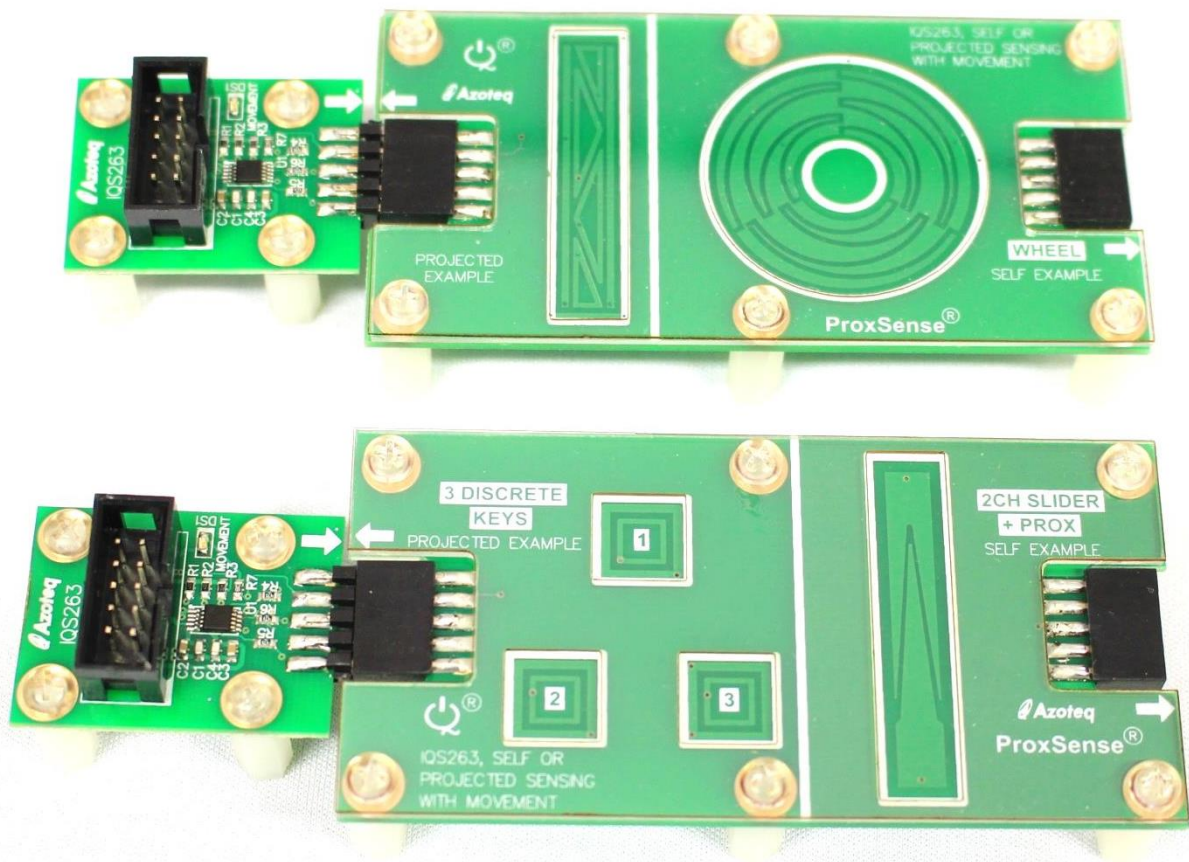




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1 Introduction

This user guide describes the operation of the IQS263EV02 Evaluation Kit. The EV-Kit consists of 4 parts: 2 x driver boards, the wheel demo board and the 3 keys demo board. The quick start guide is also included. To visualise raw data from the EV-Kit, the driver board can be interfaced to any personal computer with USB support, and IQS263 software Graphical User Interface (GUI). The purpose of the IQS263EV02 EV-Kit is to help application and development engineers in evaluating the IQS263's self- and projected-capacitive capabilities. These capabilities will be shown through the use of buttons, sliders and a wheel. A picture of the evaluation kit is shown below.

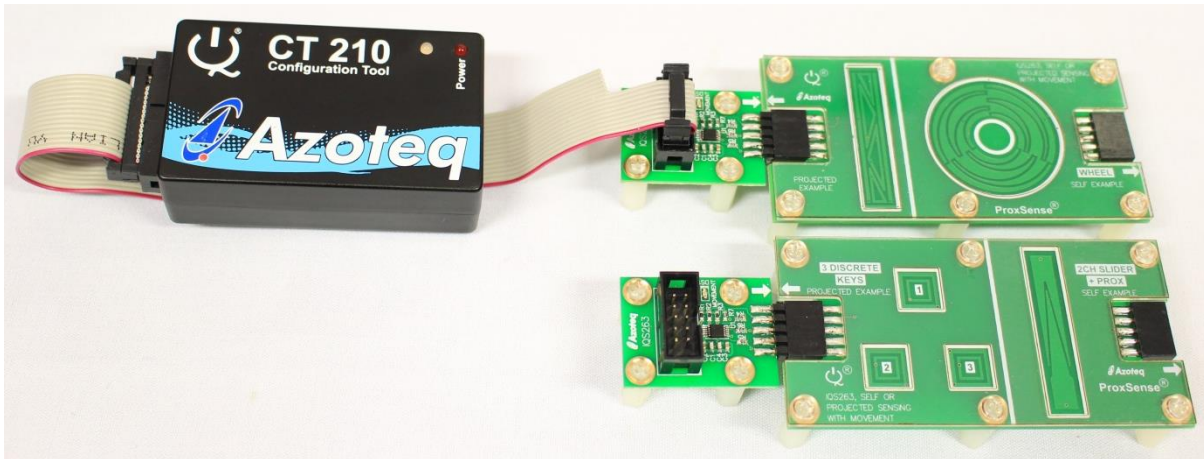


Figure 1.1 CT210 (sold separately) (left), Driver boards (middle top and bottom), Wheel Demo board (right top) and 3 Keys Demo board (right bottom)

This user guide will help a user to use and understand the technology in this evaluation kit. The driver board will be described, followed by the wheel demo board and the 3 keys demo board. This will be shown in conjunction with an IQS263 GUI to simplify explanations.

2 Setting up for the IQS263 EV Kit

To interface the IQS263EV02 Evaluation Kit to a PC we advise using the CT210 (CT210 is sold separately). This EV Kit can be setup with the following steps:

- Connect the CT210 to the PC with a USB cable
- Plug the ribbon cable into the CT210
- Connect the driver board to the ribbon cable
- Run the IQS263 GUI (latest version available from the Azoteq.com website)

3 Driver Board and IQS263 IC

The IQS263 IC (Integrated Circuit) is located on the driver board. The IQS263 can be used in projected- or self-capacitive mode with up to 3 channels.

Start the IQS263 GUI with the following:

- Follow the steps as described above
- Read and close the Hints & Tips window

The IQS263 GUI should now resemble the figure shown below.

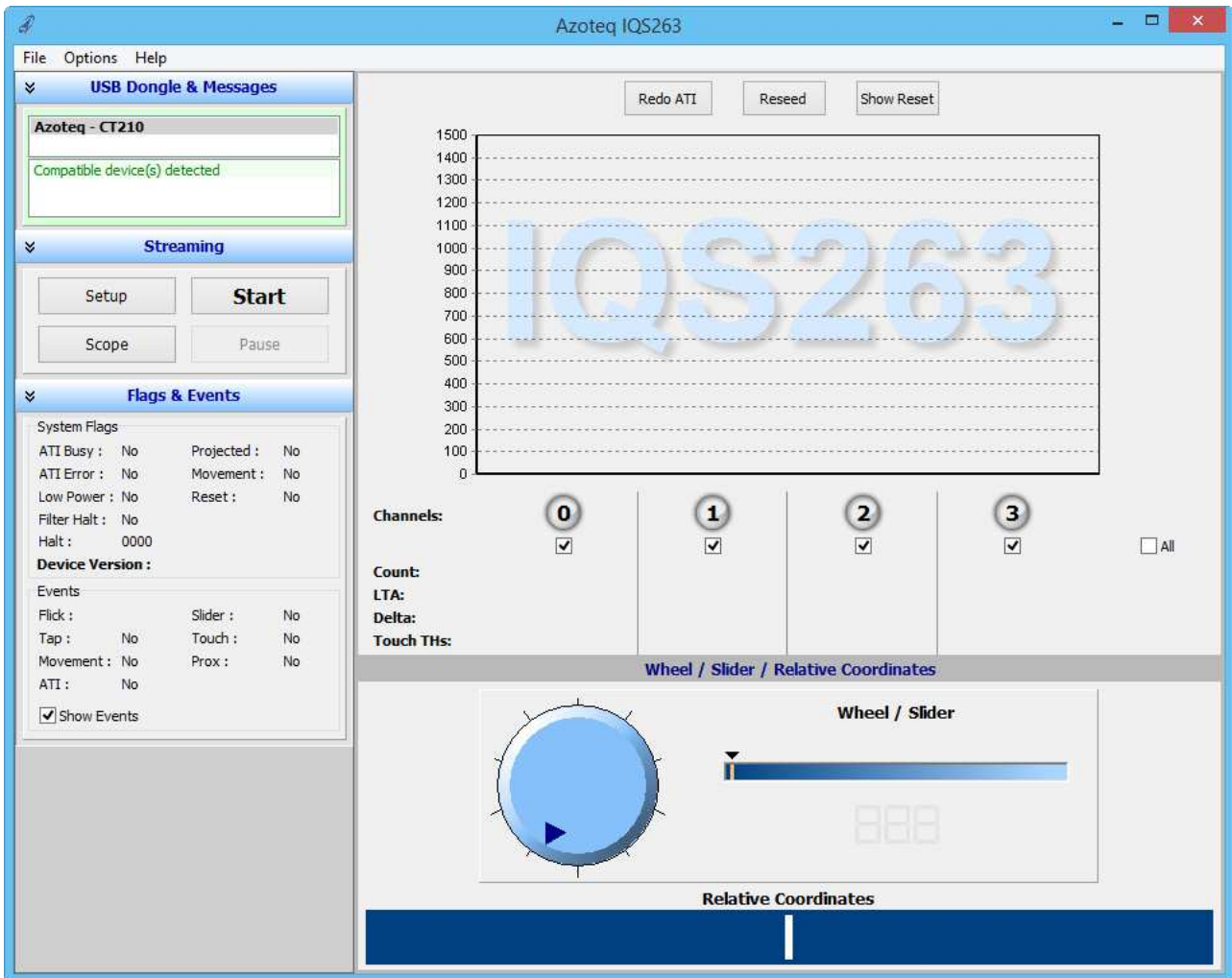


Figure 3.1 IQS263 GUI at start-up

In order to demonstrate the capabilities of the IQS263, we will need a button layout for the driver board. We suggest evaluating the supplied demo boards with the driver board. After this evaluation the user may want to develop other button/slider/wheel boards to connect with the driver board.

3.1 Blue LED on driver board

There is also a blue LED located on the driver board. This LED is used as output when in self-capacitive mode as a proximity indicator. This means that when the proximity threshold is crossed, this LED turns on and when a finger leaves the proximity zone, it turns off.

In projected capacitive mode this LED works as one of the charging channels. It does not represent a proximity event any more.

4 Wheel demo board

Start with evaluating the wheel demo board. Plug this board into the driver board at the wheel socket as shown below.

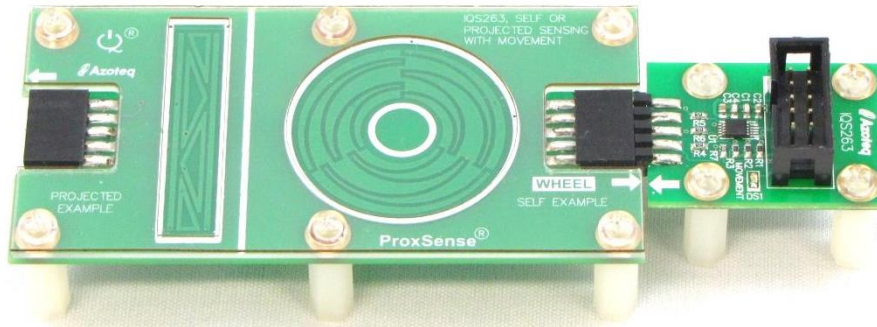


Figure 4.1 Wheel demo board connected to driver board

Now perform the following actions in the GUI.

- Click the Start button
- Select the “Wheel” board in the “Select startup mode :” window

The GUI will load the default settings for the wheel demo board onto the IQS263 on the driver board. The GUI will now resemble the figure shown below.

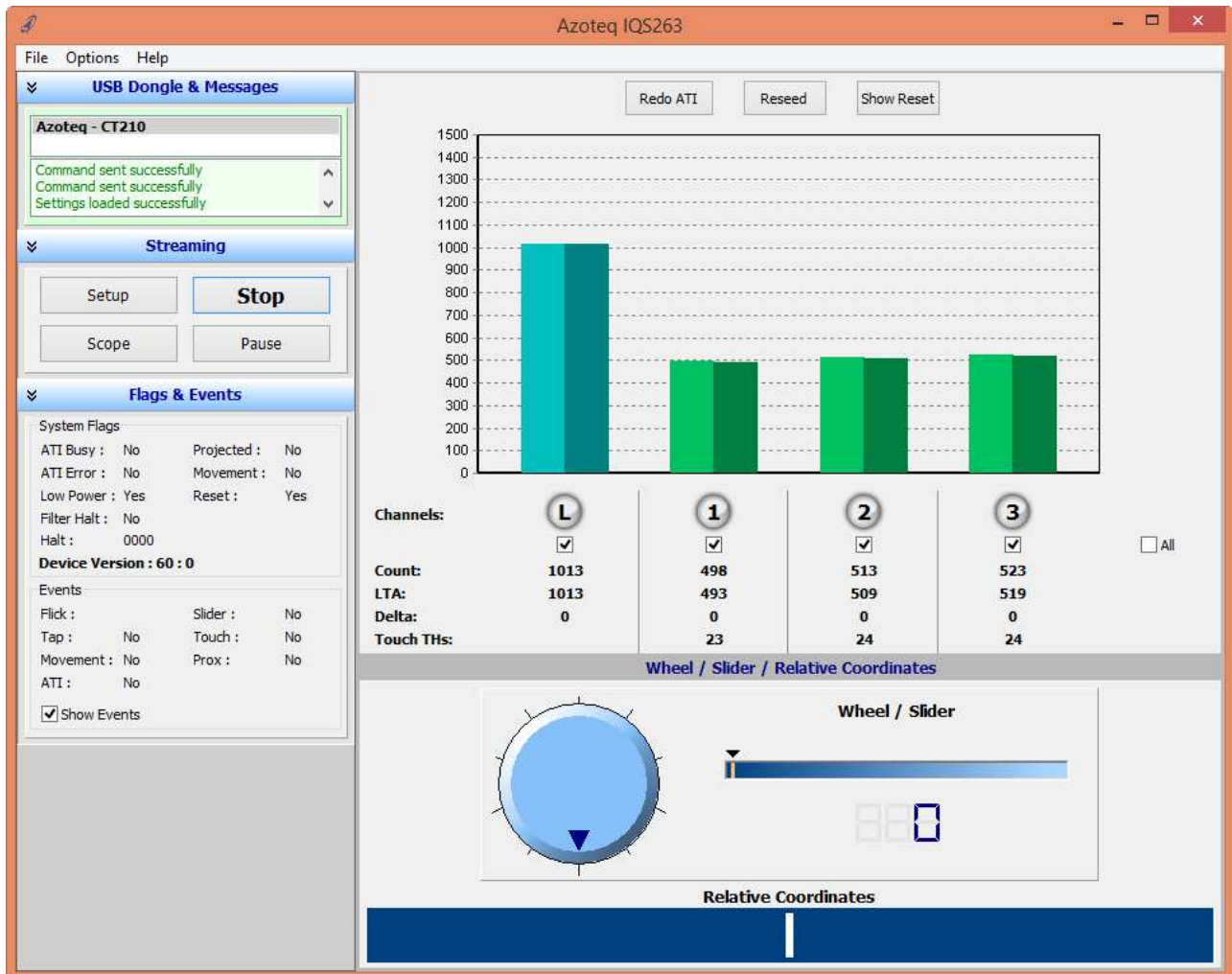


Figure 4.2 IQS263 GUI loaded with wheel demo settings

The GUI consists of a couple areas which gives the information from the IQS263 in different formats. The bars, green and turquoise, gives the touch strength on the wheel channels in this bar format. Below this is each channel’s number, Count, Long Term Average (LTA), Delta and Touch THs values.



4.1 Bar area explained

Each Channel's bar consists of two parts: lighter left side and darker right side. The lighter left side represents the Count value and the darker right side the LTA value. The Delta is the difference between the Count and LTA. When in self-capacitance mode ($LTA - Count$) and when in projected capacitance mode ($Count - LTA$). The Touch THs is the threshold at which a touch event is registered.

The channels numbers are 0 to 3, but channel 0 is an L when in low power mode. Channel 0 is either turquoise (in low power mode); green (in normal power mode) or blue (in normal power mode). When channel 0 turns blue it indicates a proximity event. Channels 1 to 3 are green when not touched and red when touched on the wheel.

4.2 Wheel/Slider area explained

This area combines the 3 buttons to form a 3 channel wheel. The wheel indicates the position of a touch on the wheel by looking at the touch strength on each channel. The slider gives this information in a linear format and the relative coordinates slider in a longer slider that works from the relative coordinates from the last touch position.

4.3 Flags & Events window explained

This window gives more information about the System Flags and Events on the IQS263. The Low Power indicates low power consumption on the IQS263 and the Halt indicates an LTA Halt on each channel. For further explanation of these flags it is advised to consult the datasheet.

The Events gives information about certain events that are happening. For the wheel demo board the slider event becomes active when touched. When moved between channels the touch event is triggered by touches or releases of channels, this event is activated and cleared. The prox event is also activated and cleared when entering and leaving prox. When a quick touch and release on a channel is made a tap event is triggered, this is shown here under events and also on the bar area. The time within which a quick touch has to happen for it to be considered a tap is default at 352ms.

5 Wheel demo board (Projected Example side)

The wheel demo board can be turned around to demonstrate the projected slider. Do this by following these steps:

- Click the Stop button in the GUI
- Unplug, turn the wheel demo board around and plug back in

The board setup should now look as shown below.

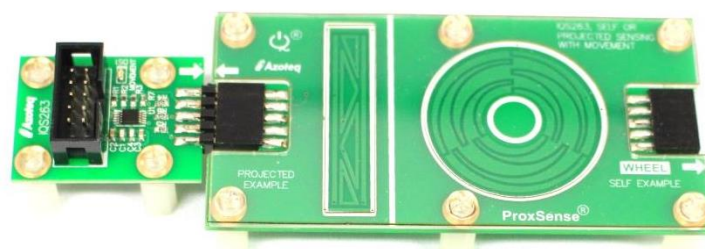


Figure 5.1 Projected example side of wheel demo board connected to driver board

Return to the GUI and do the following:

- Click the Start button
- Select the 3 Channel Slider in the "Select startup mode :"

The GUI will look very similar to the one shown above with the wheel demo board (wheel side). Some of the differences will be described. Channel 0 stays green as the low power option has been disabled for this demo board. The IQS263 is programmed in Projected Capacitance mode and thus Counts increase instead of decrease when a touch is made. The wheel has been



deactivated while the slider and relative coordinates slider give an indication of position on the slider. An example of this GUI is shown below.

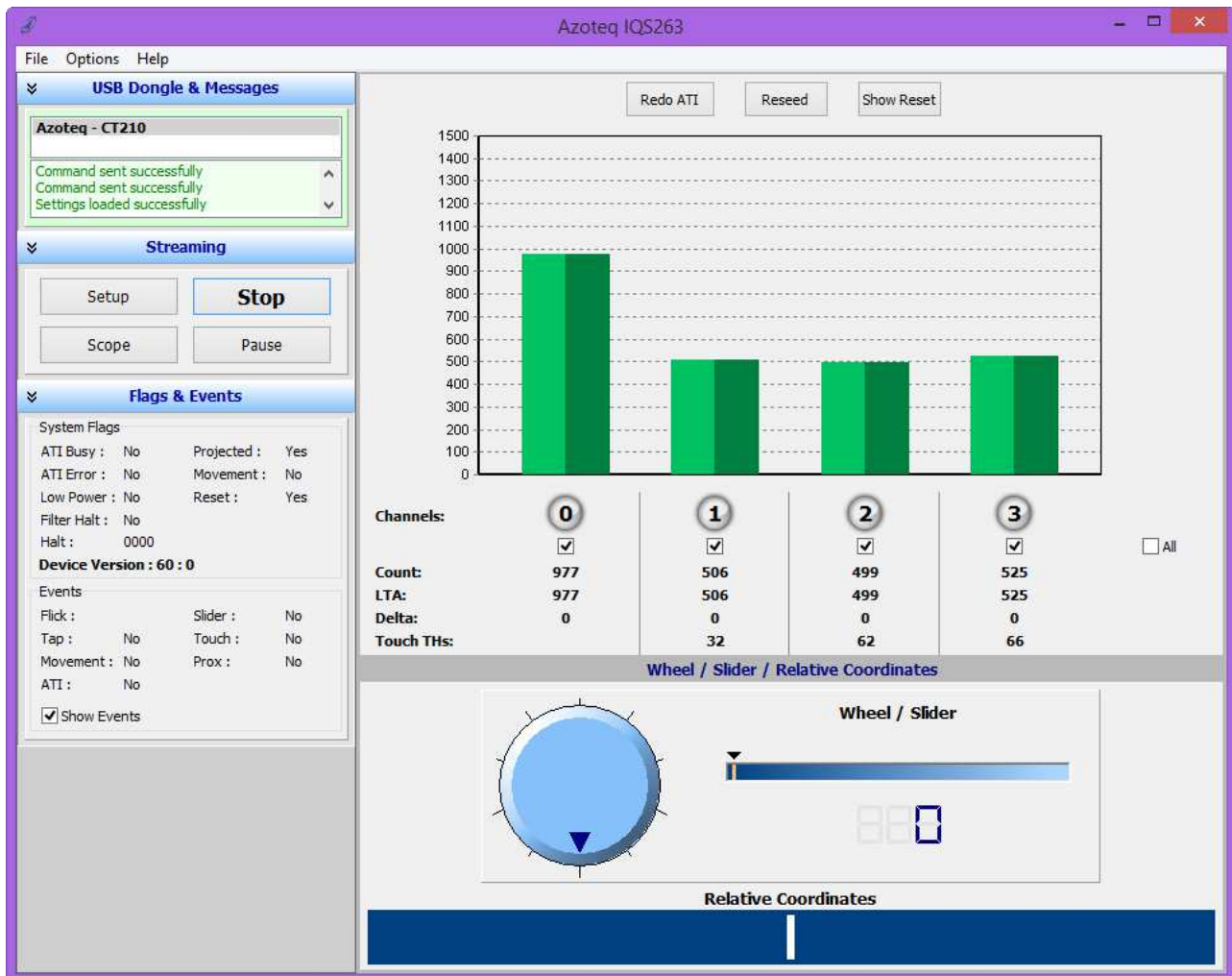


Figure 5.2 IQS263 GUI loaded with wheel demo (Projected Example side) settings

This setup and GUI is similar to the wheel demo board setup.

6 3 Keys demo board

To evaluate the 3 Keys demo board, plugin this board and setup the GUI for the 3 buttons. The following steps can be followed:

- Click the Stop button
- Swap out the current board for the 3 Keys demo board

An example of this setup is shown below



Figure 6.1 3 Keys demo board connected to driver board

To setup the GUI for this board, do the following:



- Click the Start button
- Select the 3 Discrete Keys option in the “Select startup mode : ” window

The GUI will look as shown below.

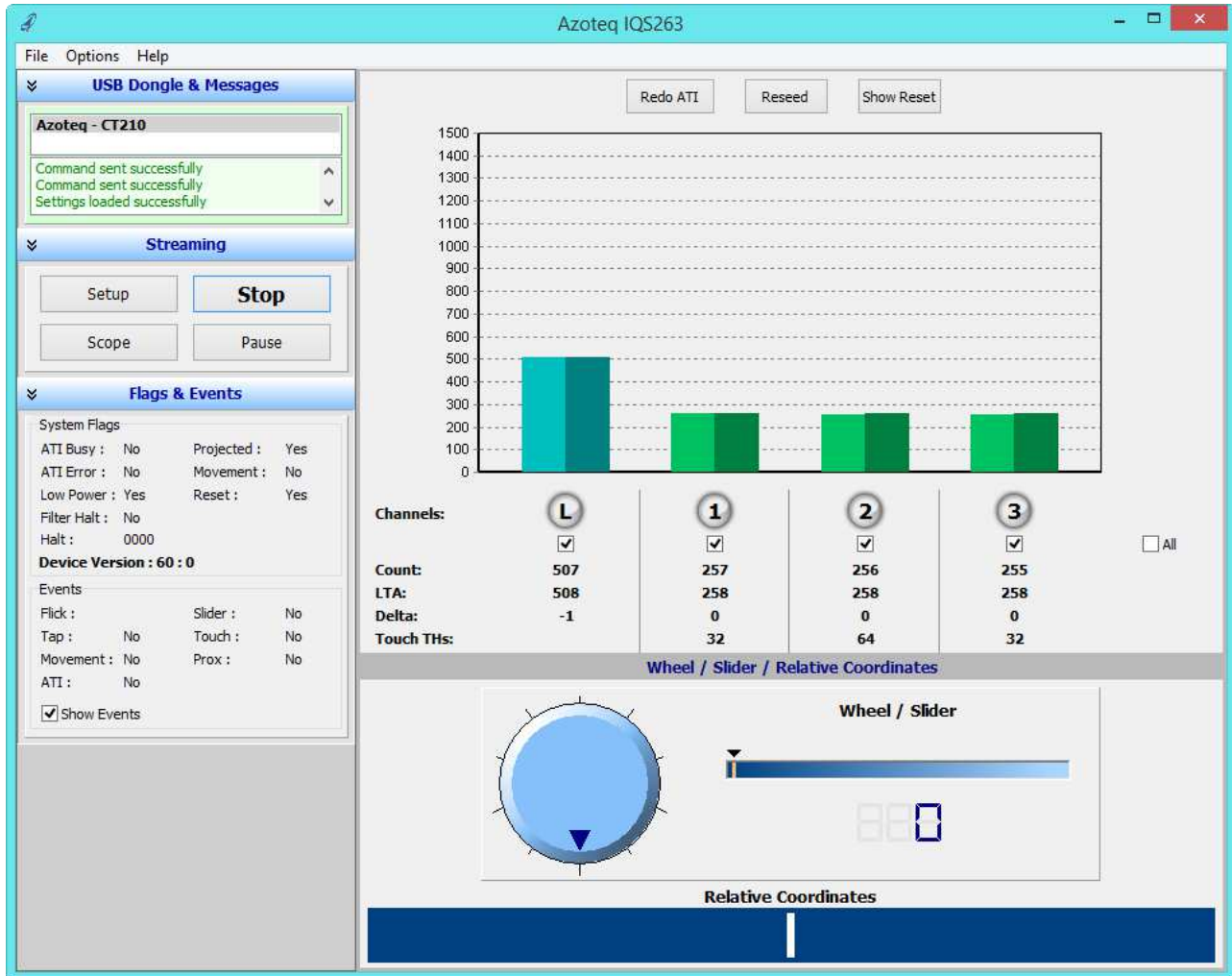


Figure 6.2 IQS263 GUI loaded with 3 keys settings

Touch the keys with a finger to evaluate this board. This board is used in projected capacitance mode and thus the counts will rise when a touch is made. This board is also programmed for low power and thus channel 0 is turquoise when in low power and green when in normal power. When a finger comes close to the button, channel 0 will turn blue and trigger proximity. The IQS263 will also change from low power mode to normal power mode if it was in low power mode. When a key is touched the relevant channel will turn red.

The Halt bits in the flags menu will also indicate when touches are made. The prox and touch events will also trigger in the events menu. A tap will trigger when a touch and release is made on a channel within a specified time. This time is programmed to be 352ms, which sets the limit for a touch and release to be considered a tap. The default timer is dependent on the amount of charge cycles made. Each charge cycle is default 22ms, and the default tap time multiplier is chosen at 16. This and many other settings can be set in the Settings window, which is accessed through the Setup button.

7 2 Channel Slider + Prox

To evaluate the 2 channel slider + Prox demo board, plugin this board and setup the GUI for this board. Follow these steps:

- Click the Stop button
- Unplug, turn the 3 keys demo board around and plug back in



The board setup should now look as shown below.

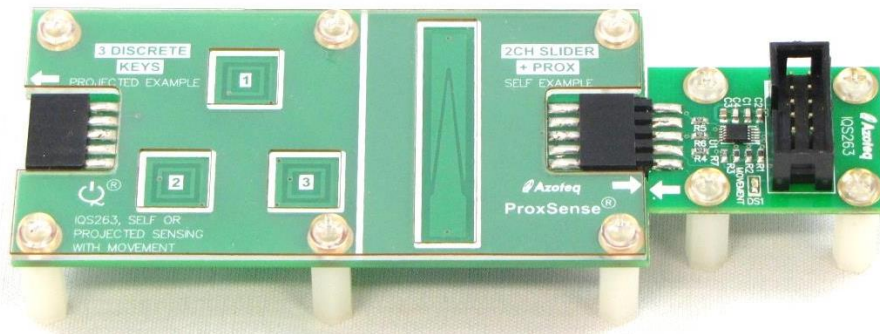


Figure 7.1 2 channel slider + prox demo board connected to driver board

To setup the GUI for this board, do the following:

- Click the Start button
- Select the 2 Channel Slider + Prox option in the “Select startup mode :” window

The GUI will look as shown below.

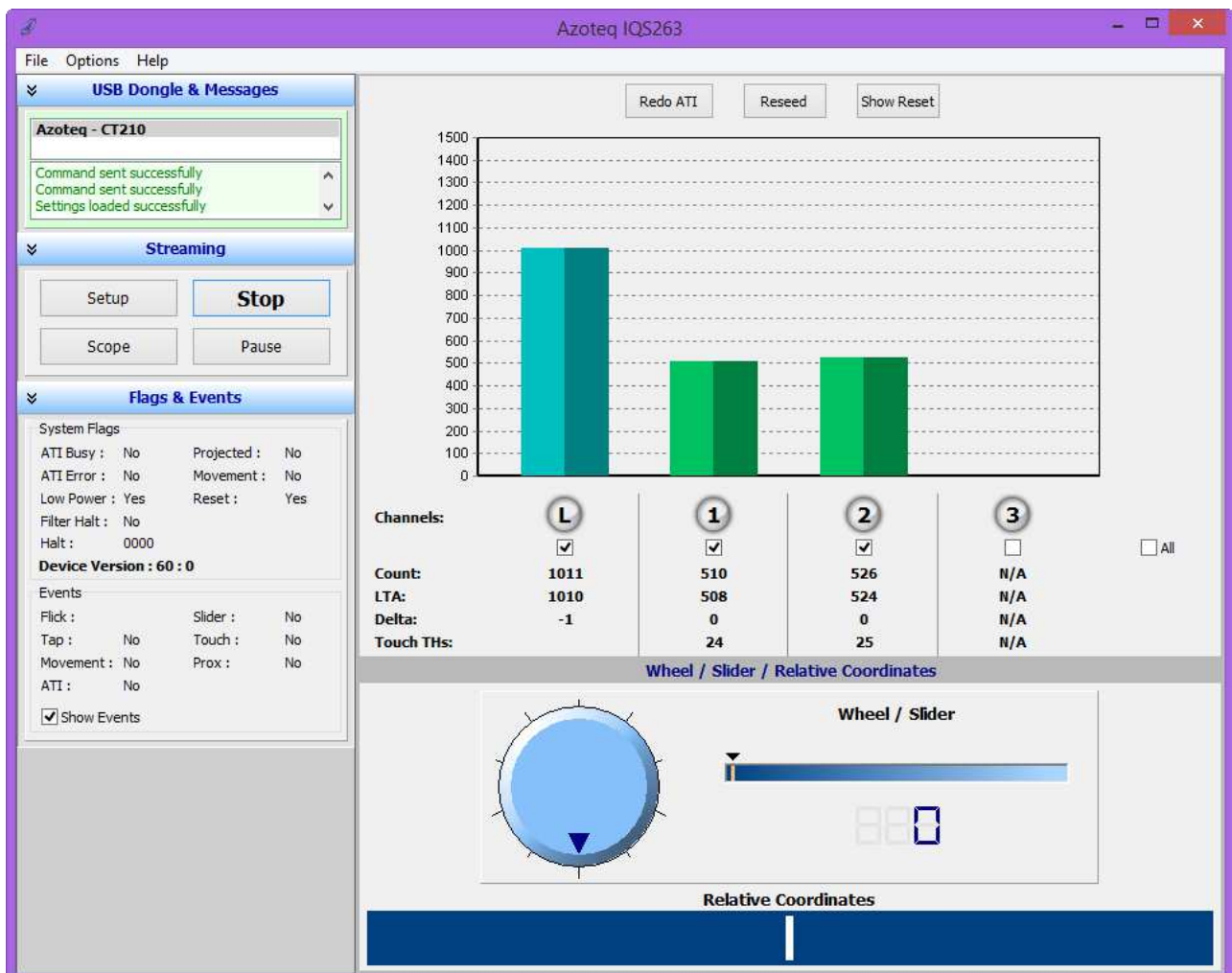


Figure 7.2 IQS263 GUI loaded with 2 channel slider + prox settings

This demo board shows a prox channel at channel 0 and channel 1 and 2 forms a slider. When a hand approaches the board the proximity channel triggers when it is close enough. The proximity distance is very dependent on the environment and can in some cases reach up to 10cm.



Evaluate the prox and slider by coming close with a hand. The proximity channel activates which indicates that a touch event might happen. When the slider is touched, channels 1 and 2 will activate. The wheel, slider and relative coordinates slider will move according to the movement taking place on the slider.

Events can also be triggered. The Tap event happens when a quick touch and release is made on the slider. The GUI will indicate under the events menu that a Tap event has occurred and a Tap message will appear on the bar area.

Flick events are handled in a similar way. A flick can be defined as touching the slider, moving in a direction and releasing the slider all in one fast motion. The IQS263 can detect left and right flicks. Left and right flicks are indicated under the events menu with a left and right arrow. A “Flick Left” or “Flick Right” message also appears on the bar area.

8 Choosing settings (For advanced users)

The settings on the IQS263 can be altered in the Settings window. To access this window, click on the Setup button in the Streaming section of the GUI. The Settings window will look as shown below.

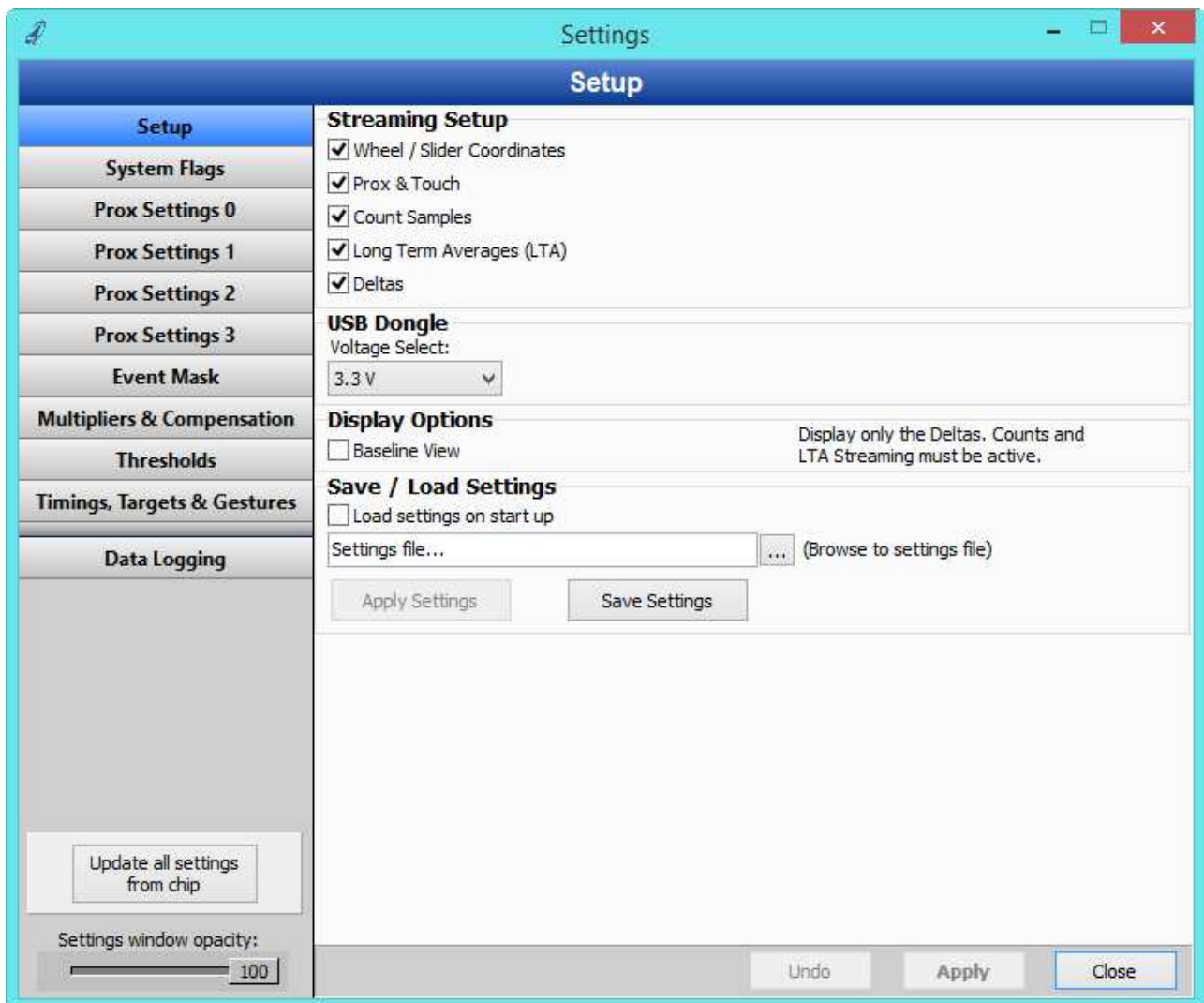


Figure 8.1 Settings window for IQS263 GUI

All the adjustable settings can be changed here to optimise the IQS263 for a specific application. These settings can be changed and the effect can be seen in the GUI. After settings have been sent to the IQS263 it is advised to perform a “Redo ATI” as this will ensure the changes are applied on the IQS263.



8.1 Settings window

A brief description of each section in the Settings window will be given.

8.1.1 Setup

This section gives the user the choice to enable or disable the information shown in the GUI.

8.1.2 System Flags

Here the Self-/Projected Capacitance can be set.

8.1.3 Prox Settings 0

A byte used for the prox settings can be set here. This includes the following:

- Auto Tuning Implementation (ATI)
- ATI Partial
- ATI Band
- Stream ATI
- Oscillator
- Force Halt

8.1.4 Prox Settings 1

The next byte for prox settings is as follow:

- WDT Enable
- Event Mode
- LTA Beta
- Slider
- Count Filter

8.1.5 Prox Settings 2

The following byte includes:

- Sleep Halt
- Wake 2 Directions
- Wheel / Slider Filter
- Movement
- Out

8.1.6 Prox Settings 3

The last byte for the prox settings includes the following:

- Touch Debounce
- CS Cap
- Projected Bias
- Float CX
- Auto Threshold Algorithm (ATA)
- Turbo Mode
- Filtered Touches
- Charge Transfer

8.1.7 Event Mask

Enable / Disable events in this section.

- Flick Left
- Flick Right
- Tap
- Movement
- ATI
- Slider
- Touch
- Prox



8.1.8 Multipliers & Compensation

The multipliers, base and compensation values can be set here.

8.1.9 Thresholds

The thresholds for the prox and touch events are set here.

8.1.10 Timings, Targets & Gestures

The low power timing, target for each channel and the tap and flick gesture parameters are set here.

8.1.11 Data Logging

The channels data and events can be logged in a text (.txt) file.

For more information on these settings, consult the datasheet.

9 Reference Designs

For further technical detail the datasheet should be consulted and can be found at the Azoteq website. Some reference designs from the datasheet are shown below.

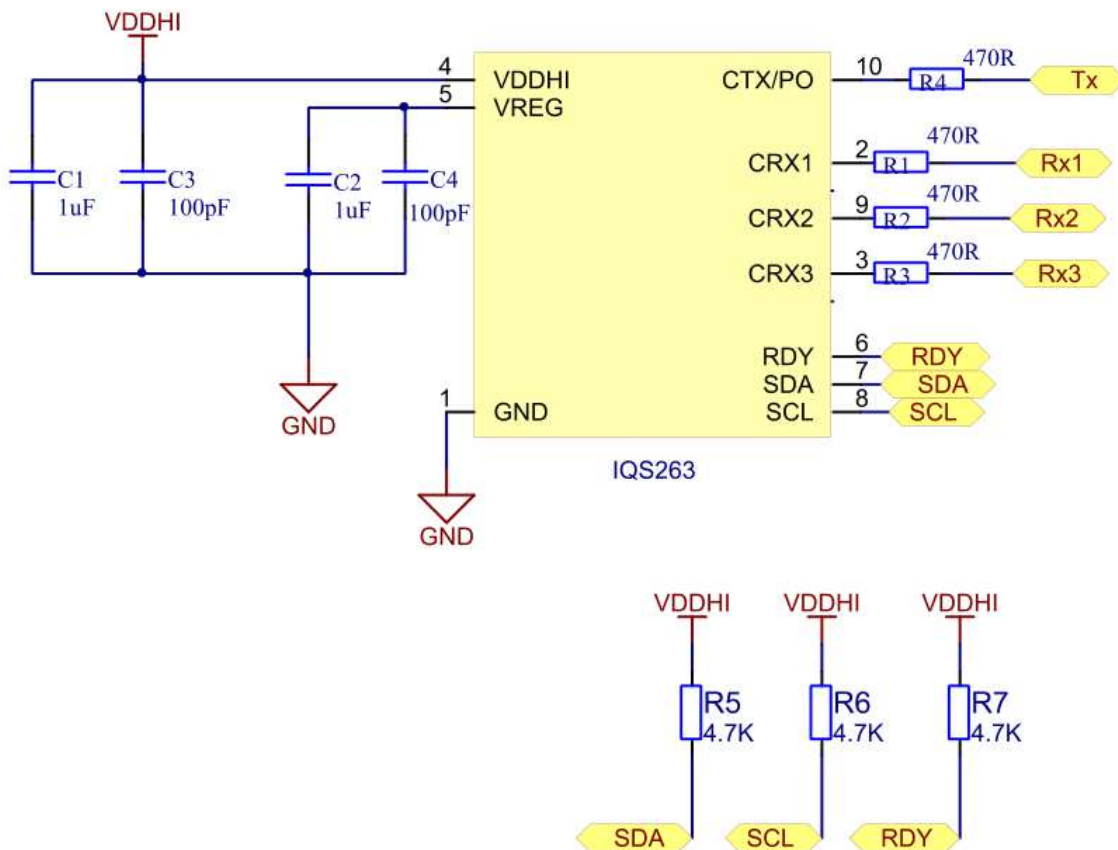


Figure 9.1 IQS263 Projected Capacitive Reference Design

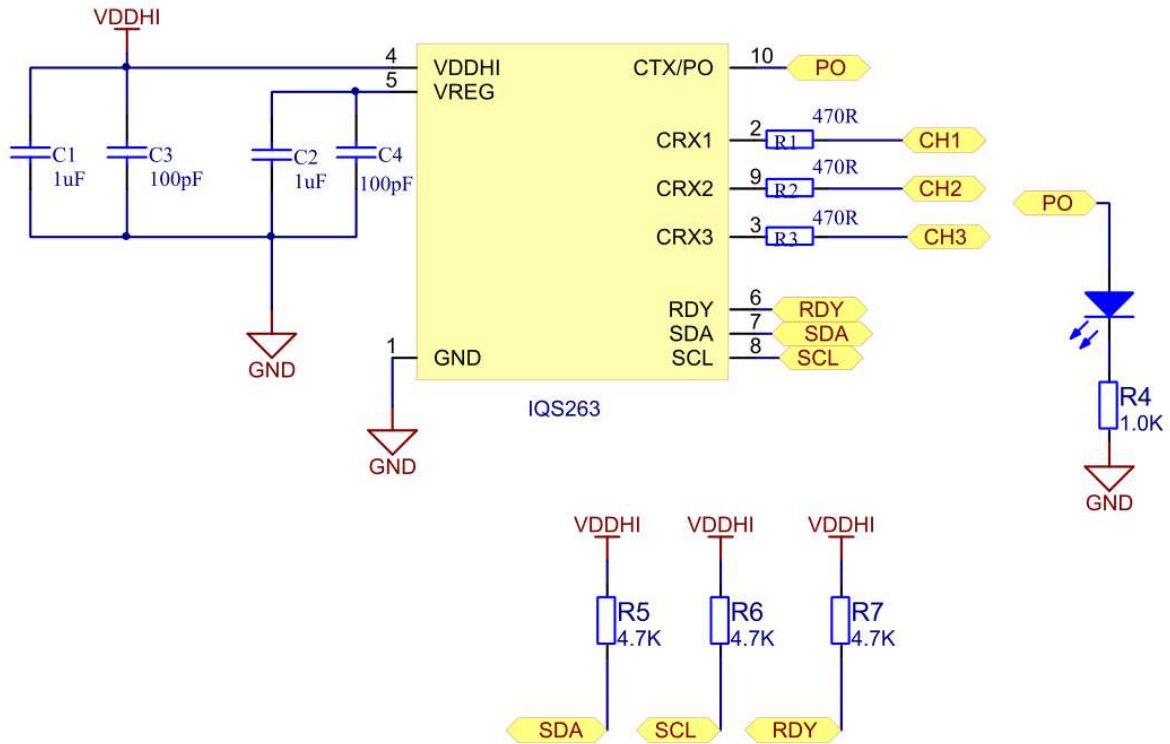


Figure 9.2 IQS263 Self-Capacitive Reference Design



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