IQS7222C User Guide

The user guide introduces the development tools available for the product and guides the setup of certain key elements.

Contents

1 Introduction

This document provides an overview of the IQS7222C ProxFusion® device, the graphical user interface (GUI), and the IQS7222C evaluation (EV) kits. It aims to equip users with the knowledge needed for configuring, debugging, data logging, and header file export using the GUI software to address their unique applications.

The IQS7222CEV01 is a general-purpose stamp module that can be used for rapid prototyping and development. It can be connected to external sensing electrodes, allowing the user to experiment with their own sensor designs. See the IQS7222CEV01 reference schematic in Section 4.1

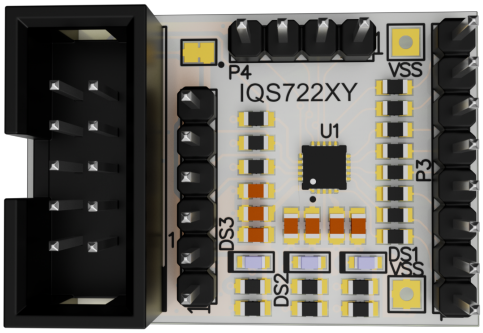


Figure 1.1: IQS7222CEV01 EV Kit

The IQS7222C module in the IQS7222EV02 EV kit showcases a 4-channel self-capacitive wheel and 4 self-capacitive touch buttons. See the IQS7222C reference schematics in Section 4.2.

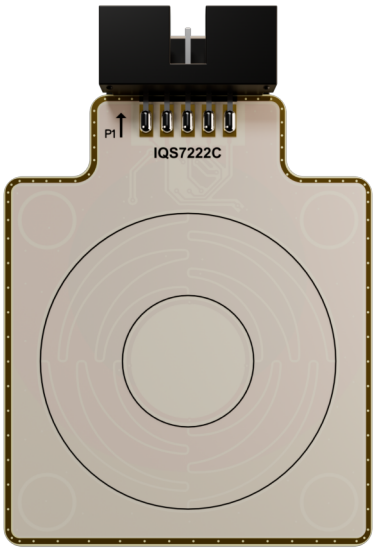


Figure 1.2: IQS7222CEV02 EV Kit

This user guide follows the procedure of configuring the IQS7222C device to perform sensing on the IQS7222C module in the EV02 EV kit.

The following application notes provide background information and design guidelines for the various sensing methods supported by the IQS7222C.

- Azoteq Sensing Technologies: AZD004
- Capacitive Sensing Design Guide: AZD125
- Inductive Design Layout Guide: AZD115

For IC-specific information, operation, and memory map details, please refer to the IQS7222C Datasheet.

2 Getting Started

This section describes the process of initial device and GUI set-up prior to application-specific tuning.

2.1 Step 1: GUI Software Installation

Download and install the Azoteq IQS7222C GUI PC Software from the Azoteq website under the Software and Tools page. Extract the downloaded zip file and follow the installation wizard procedure.

2.2 Step 2: Launch GUI Software

Launch the IQS7222C GUI software executable. The following window should appear:

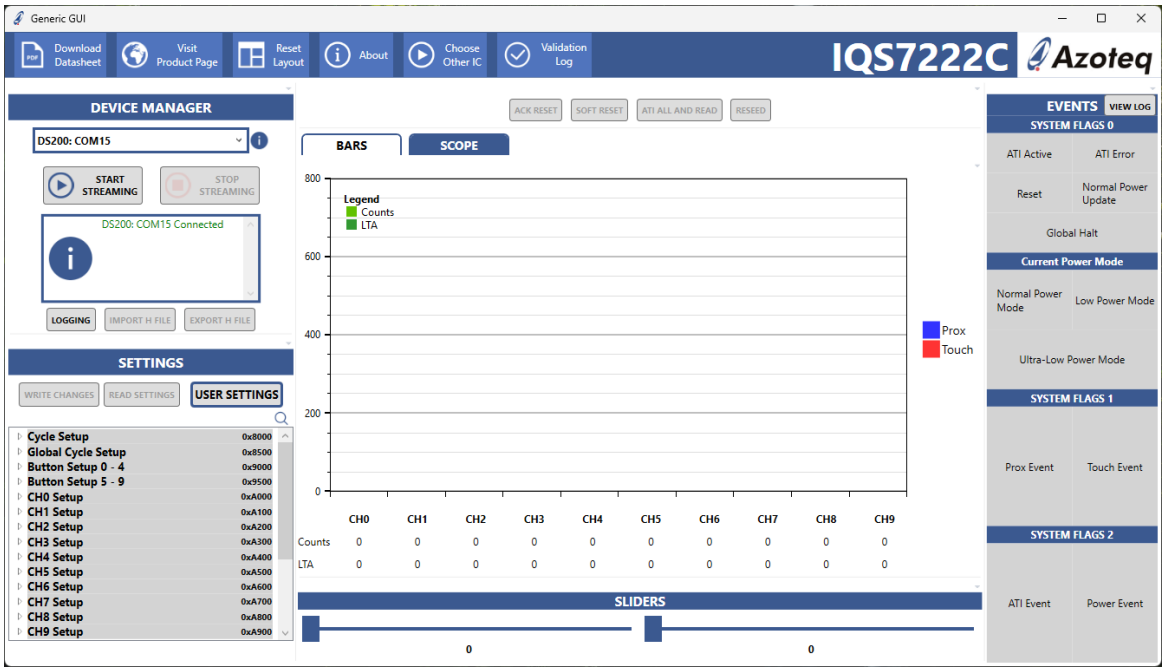


Figure 2.1: Main Window of the Azoteq IQS7222C GUI

2.3 Step 3: Hardware Connections

Connect the DS200 to your PC, using a standard type-C cable. The device under test (DUT), being either an IQS7222C EV kit or an application PCBA, can be interfaced with a suitable 10-to-10 pin ribbon cable connection (or application-specific connections), as shown in Figure 2.2 below.

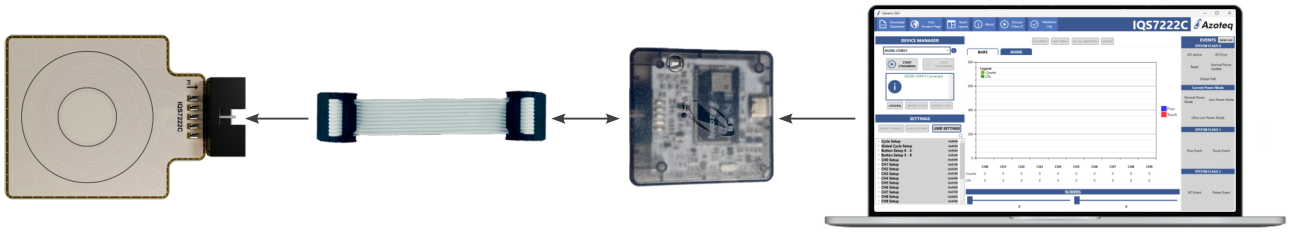


Figure 2.2: DS200 Connection for Streaming and Testing

Note: The CT210A can be used instead of the DS200, along with a standard USB-micro data cable and a suitable 20-to-10 pin ribbon cable connection, as shown in Figure 2.3 below.

Figure 2.3: CT210A Connection for Streaming and Testing

If a custom cable or hardware is used, please refer to Table 2.1 and Figure 2.4 for the required connections.

Table 2.1: DS200 Pin-out

IQS Pins	DS200 Pins
GND	Pin 1
VDD	Pin 3
SDA	Pin 7
SCL	Pin 9
RDY	Pin 10

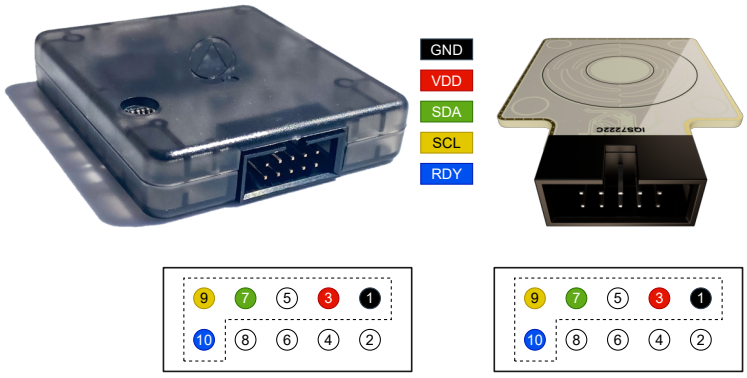


Figure 2.4: DS200 Power, I²C and RDY Connections

2.4 Step 4: PC Connection Verification

After connecting the DS200 device to the computer, the GUI software will automatically install any necessary drivers. It will then verify the DS200 connection and firmware version, displaying a 'Device Connected' message in the configuration tool manager section, as shown in the red block in Figure 2.5.

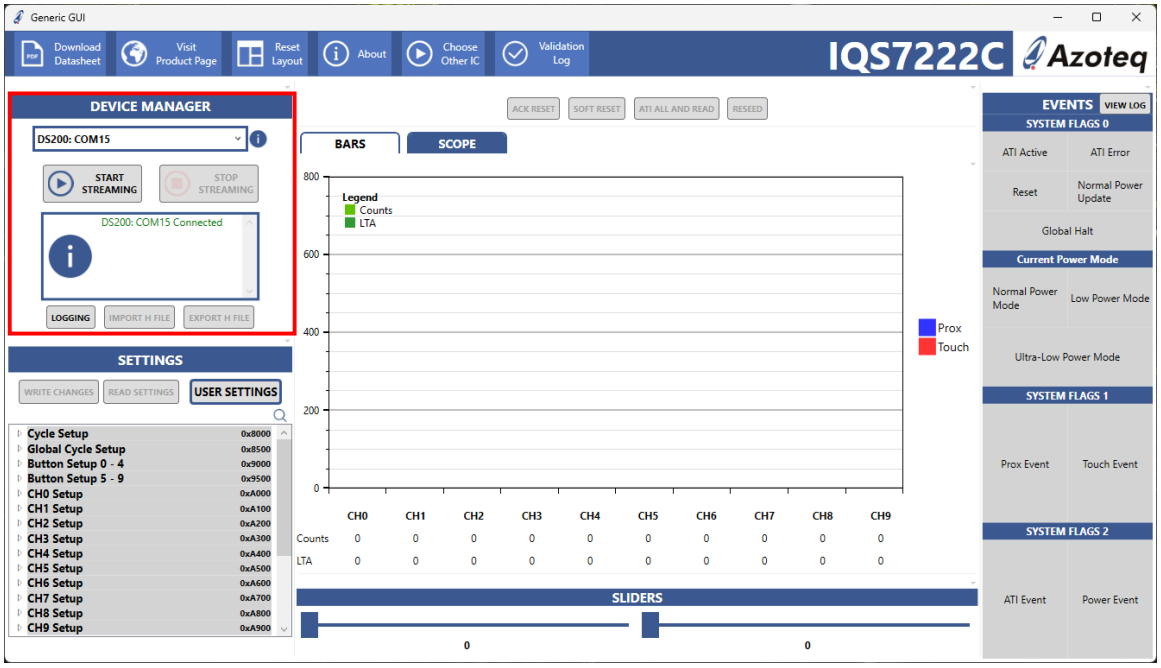


Figure 2.5: DS200 Recognition and Connection

Note: If the connected DS200 device firmware is out of date, an 'Update available' button should automatically appear next to the device enumeration. Click this button to launch the Azoteq firmware upgrade tool and update the firmware, as shown in Figure 2.6.

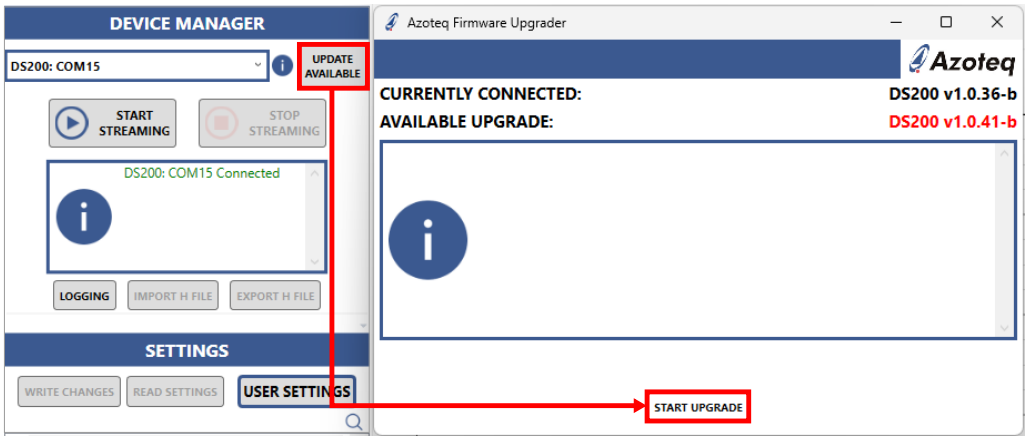


Figure 2.6: DS200 Firmware Upgrade

2.5 Step 5: Initiate IQS7222C Communication (Streaming)

Click on 'Start Streaming' to initiate communications with the IQS7222C. Additional messages will appear and will provide the following information:

- Power status
- I^2C address
- Device version information
- Settings and streaming confirmations or errors, as applicable

Note that the IQS7222C product can be ordered with different I²C addresses. The GUI will automatically try each address until the device responds.

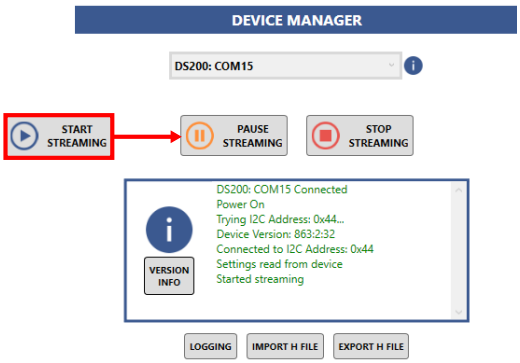


Figure 2.7: Message Dialogue Results from a Successful IQS7222C Connection

If an error is displayed, please ensure that the device is properly connected and that the IQS7222C's product and version numbers were verified successfully.

2.6 Step 6: Acknowledge Reset and Streaming Mode

Click on the red text button 'ACK Reset' to clear the reset event flag. The 'ACK Reset' text should change colour to black, indicating successful reset acknowledgement.

Figure 2.8: ACK Reset Button

The IQS7222C starts in streaming mode, as shown in Figure 2.9. The default settings are *not* an appropriate baseline for a production application.

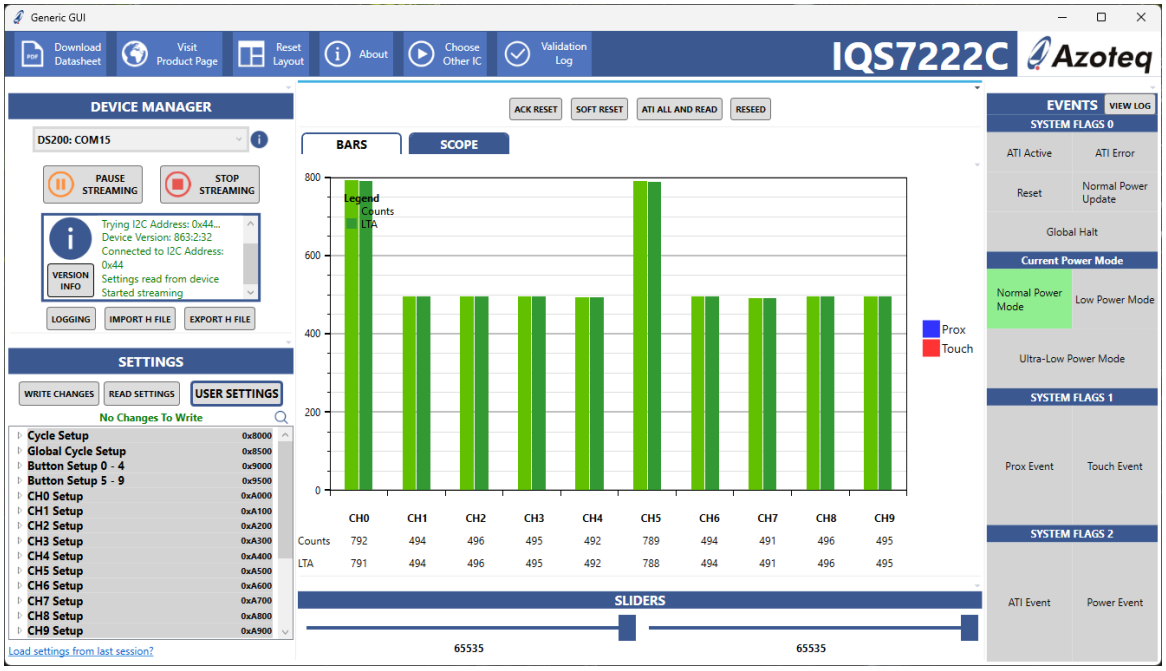


Figure 2.9: IQS7222C Streaming

2.7 Step 7: Load Pre-Configured H-File (Demo Button)

The GUI provides predefined configs for the EV kit module. Open the “User Settings” window, navigate to the first tab named “Demo Settings”, and click on the appropriate image to apply the predefined configuration settings for the demo. Refer to Figure 2.10.

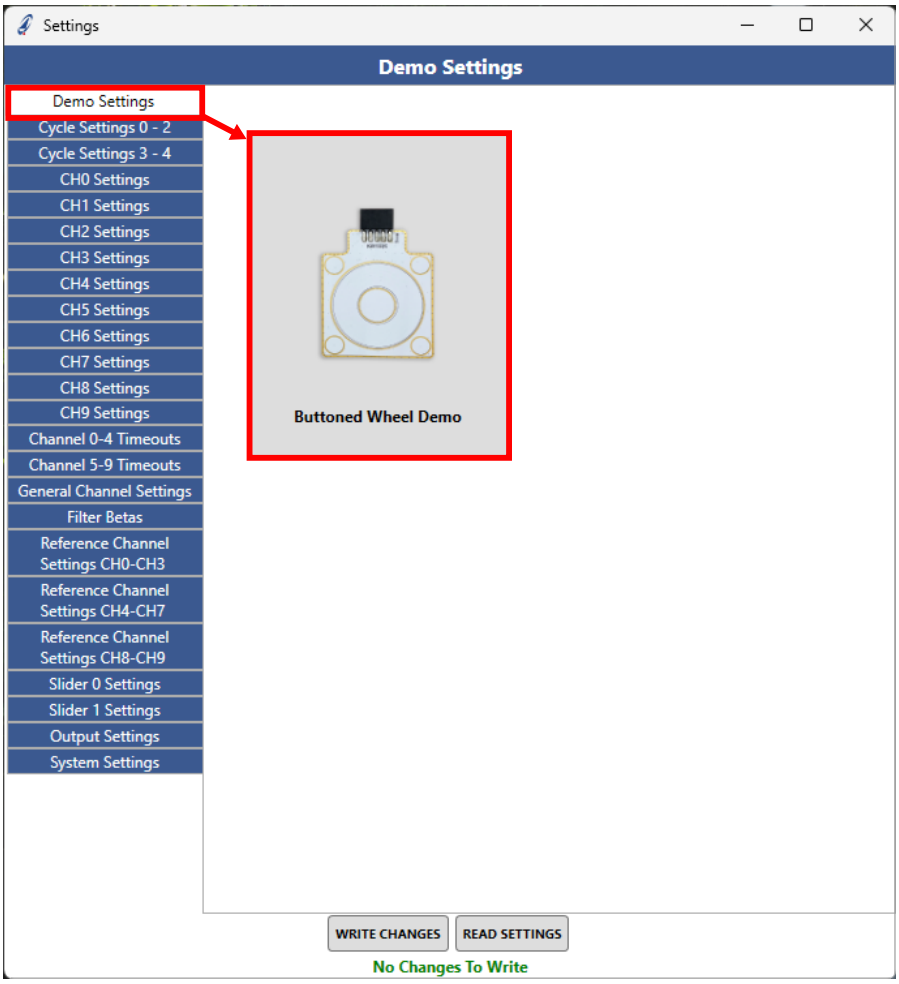


Figure 2.10: Importing the Predefined Demo Configuration

The device may now be configured further via the ‘User Settings’ window.

3 IQS7222C Debug and Display Software Overview

This section briefly explains the GUI elements such as the sensor graphs, device events, and commands, as well as some additional core functionality such as data logging and exporting of device settings.

3.1 IQS7222C Streaming Data

The IQS7222C supports up to 10 ProxFusion® channels. The “counts” of each channel is a representation of the signal strength measured by the sensor.

The IQS7222C GUI displays the counts of each channel in the graph panel in the centre of the GUI. The default graph view is the bar graph, which plots the instantaneous counts of each channel.

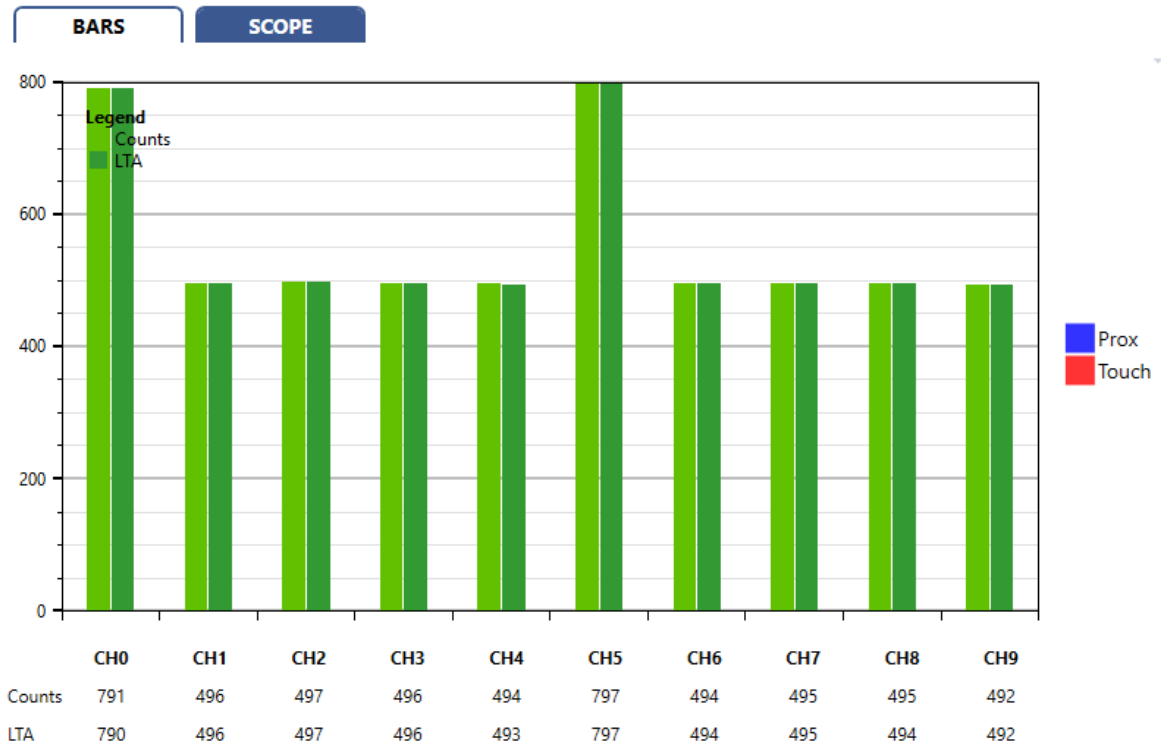


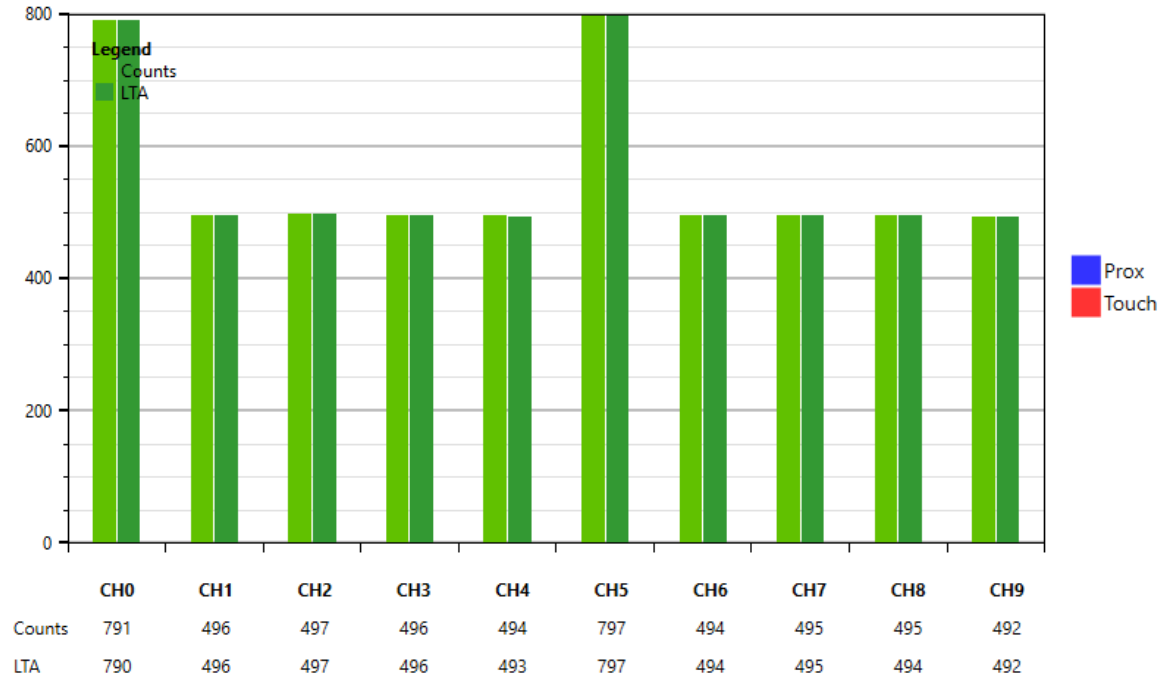
Figure 3.1: Streaming Graphs

The graph views can be manipulated with the following controls:

- Scroll wheel to zoom in and out.
- Hold and drag middle-mouse button to zoom to a bounding box.
- Hold and drag right-mouse button to pan.
- Double left-click to reset the graph view.

Note: All the signals recorded in the graphs and sliders are read directly from the IC. For more information regarding the register map, please consult the IQS7222C datasheet.

3.1.1 Bar Graph



	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9
Counts	791	496	497	496	494	797	494	495	495	492
LTA	790	496	497	496	493	797	494	495	494	492

Figure 3.2: Bar Graph View of Channel Counts

For each ProxFusion® channel, the bar graph shows the counts of the capacitive/touch sensor. The **counts** value shows the raw measurement of the sensor, after filtering. The **LTA** is the Long Term Average of the counts signal. It tracks slow variations in the environment, and is used as a reference to detect movement; refer to AZD004 for more details.

3.1.2 Scope View

The scope view plots the counts and LTAs of each ProxFusion® channel over time.

The data in the current view of the scope can be saved to a CSV file. To save the data, first click ‘Pause Streaming’ as shown in Figure 3.3.

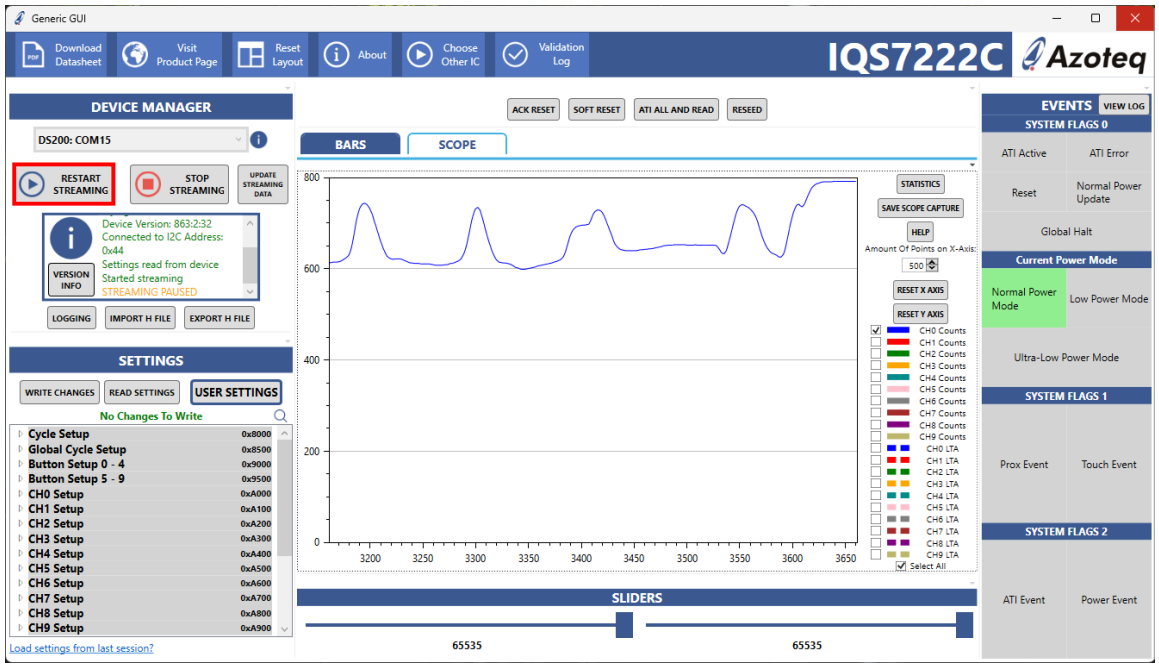


Figure 3.3: Pausing Streamed Data

Then click the ‘Save Scope Capture’ button that appears on the right of the scope view, as indicated with a red block in Figure 3.4.

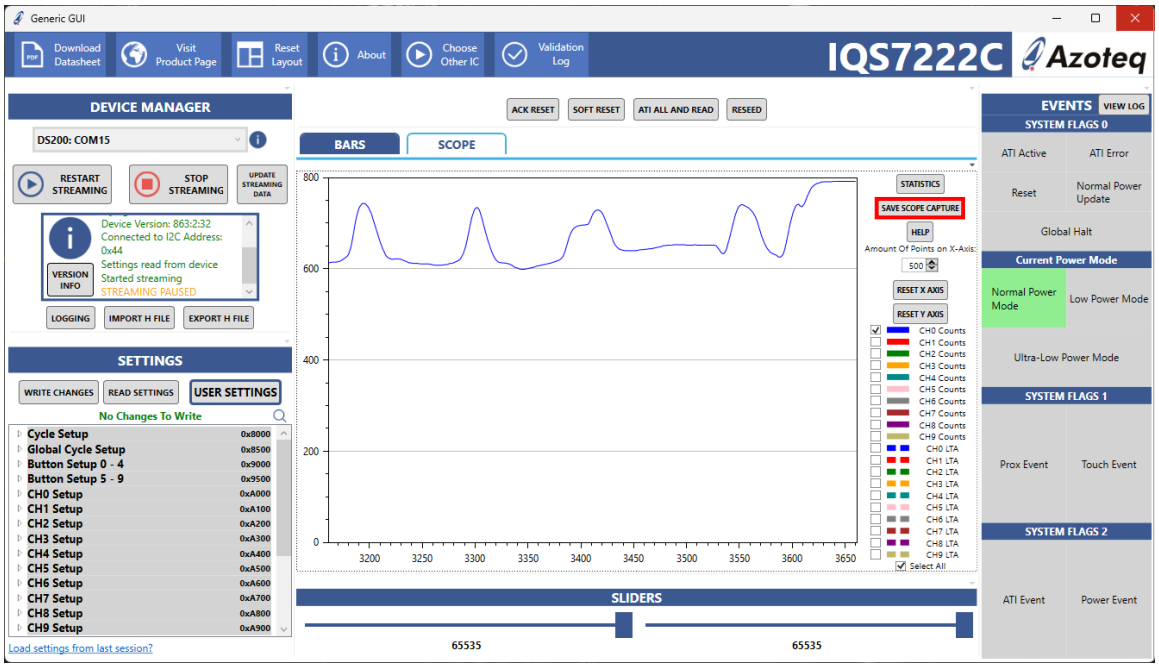


Figure 3.4: Saving Streamed Data

The following window will pop up and prompt the user to select which part of the data should be saved. Select the “Save to CSV" button to save the streamed data.

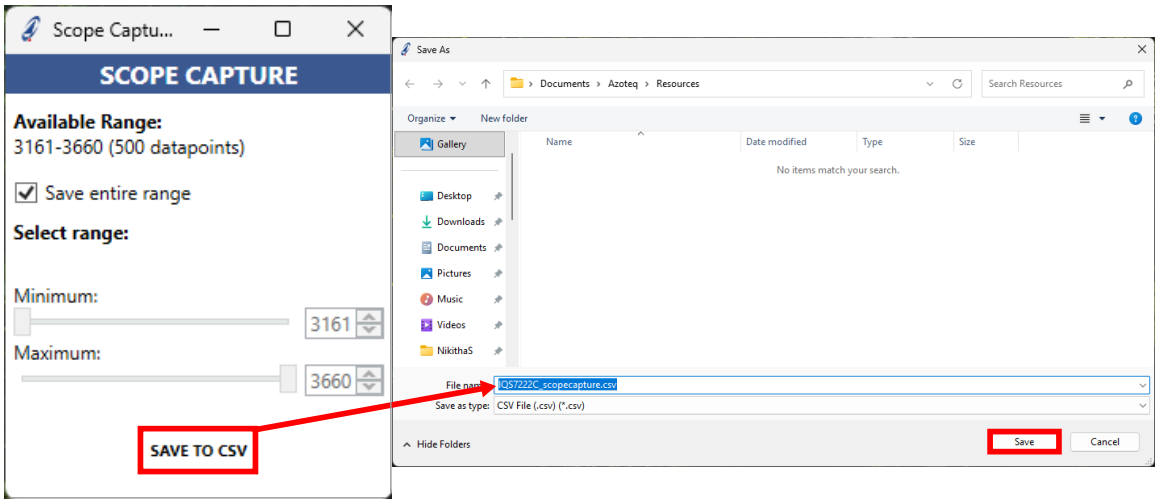


Figure 3.5: Save Streamed Data to CSV File Format

3.1.3 Slider

The IQS7222C can be configured to use up to four capacitive sensors as a touch slider, providing features such as swipe detection. Up to two sliders are supported. The measured coordinates of a finger on each touch slider is shown at the bottom of the GUI window.

3.2 Data Logging

It may be necessary to save all the above streaming data to a file for debugging or testing purposes. The logging function allows the GUI to save all streaming data from the IQS7222C to a CSV file. Click the “Logging” button in the Configuration Tool Manager panel to open the logging window.

Figure 3.6: Logging Function Using the Configuration Tool Manager

From here, the desired variables from the IQS7222C can be enabled or disabled. To start logging, click the “Start Logging” button, and choose the destination of the CSV log file.

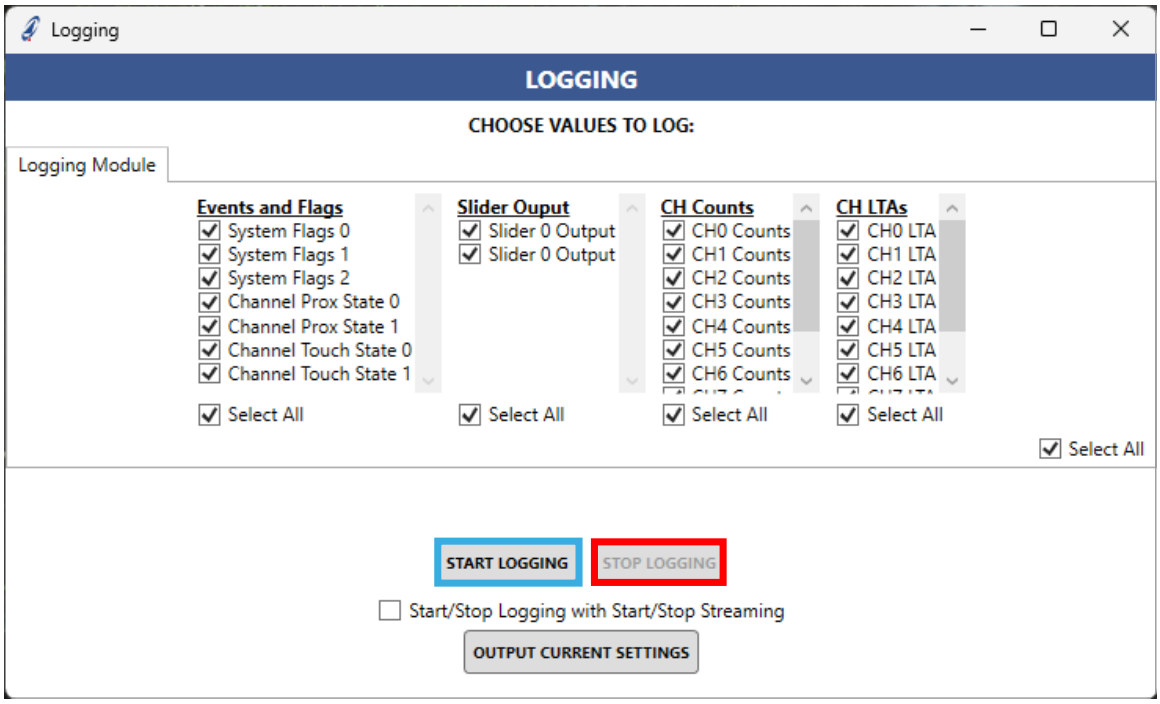


Figure 3.7: Logging Configuration Window

Once the file destination is confirmed, data logging will begin. To stop logging, click the “Stop Logging” button.

3.3 Export Device Configuration to H-File

After configuring the IQS7222C, you can export the new settings for safekeeping, sharing, or future use on the same or another device. The settings are exported as a *.h*-header file using the “Export H File" button.

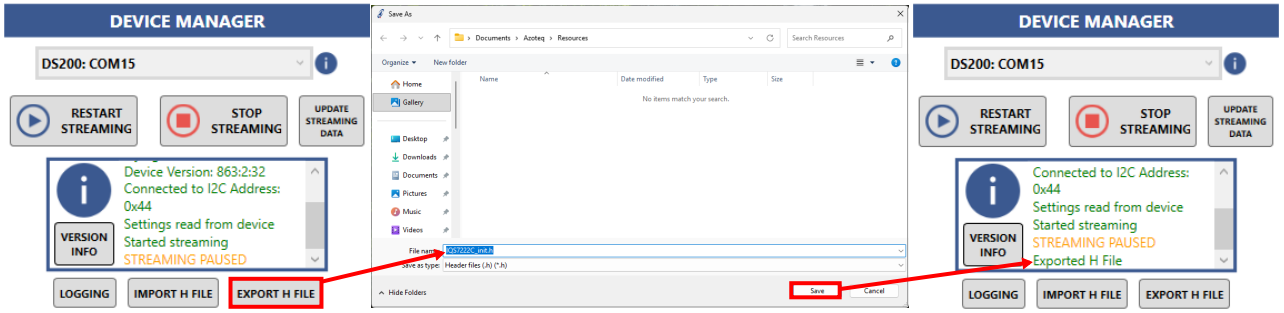


Figure 3.8: Exporting a Defined Configuration

3.4 Import Preconfigured H-File

If the device was previously configured and an associated .h-file was exported from the GUI, the file may now be imported into the GUI and loaded onto the IQS7222C using the “Import H File" button.

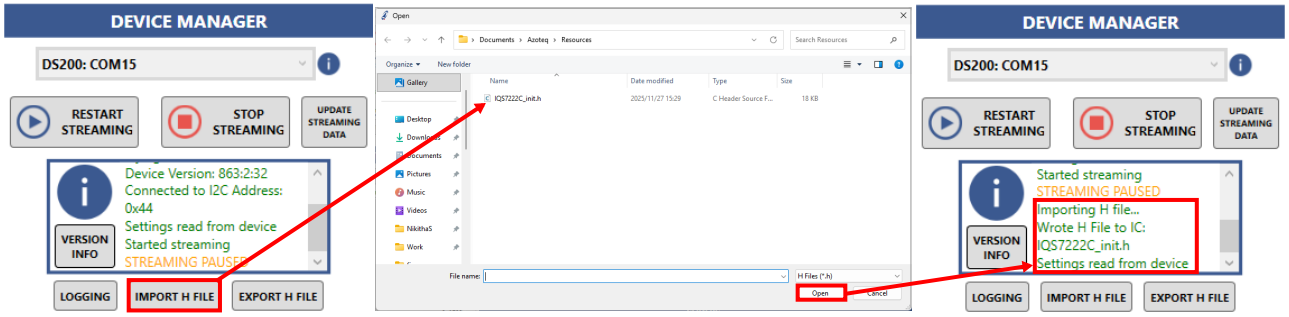


Figure 3.9: Importing a Predefined Configuration

3.5 Command Buttons

At the top centre of the GUI is a row of buttons that execute commonly-used commands.

Figure 3.10: Command Buttons

3.5.1 Acknowledge Reset

The “Ack Reset” button clears the IQS7222C’s reset flag by writing the **Acknowledge Reset** bit to the IC. This should be the first step after powering on any Azoteq IQS-device. On start-up, the IC will set its Reset flag to indicate that a reset event has occurred. Writing a ‘1’ to the Acknowledge Reset bit clears this Reset flag.

If a reset of the IQS7222C occurs, the GUI will indicate this by changing the Ack Reset button colour to red.

3.5.2 Soft Reset

The “Soft Reset” button issues a command to the IQS7222C to perform a soft reset. This can be used to clear any configured settings back to their default values.

3.5.3 ATI All and Read

The “ATI All and Read” button writes the **Re-ATI** command to the IQS7222C. The ATI routine is a calibration algorithm on the IC that will recalibrate all the sensors to their target or reference counts.

Once ATI is complete, the GUI reads all the IQS7222C settings to update any parameters that the ATI routine may have changed.

3.5.4 Reseed

The “Reseed” command can be used to update the LTA of the ProxFusion channel by setting it equal to the counts. Note that the Reseed command may trigger an ATI routine if the resulting LTA is significantly different from the target.

3.6 Events

The panel on the right-hand side of the GUI shows the current event flags that are set on the IC, as shown in Figure 3.11. These indicators are read from the IQS7222C's status registers.

The conditions for each event to trigger are described in the device datasheet.

3.6.1 System Status

The following flags are read from the *System Status* register.

- **ATI Active**: The IQS7222C is currently calibrating the channels.
- **ATI Error**: The IQS7222C failed to calibrate one or more channels correctly.
- **Reset**: A reset event has occurred, and all settings have been reset to defaults.
- **Normal Power Update**: In Ultra-Low Power (ULP) mode, the IQS7222C is currently performing a "Normal Power" update cycle, which samples all channels and updates all LTA values.
- **Global Halt**: The LTA values are halted for all channels that have Global Halt enabled. The Global Halt flag is set whenever one of the channels with Global Halt enabled is in a prox or touch state.
- **Current Power Mode**: Indicates the current power mode of the device.

3.6.2 Events

The following flags are read from the *Events* register.

- **Prox**: The proximity state of one of the channels had changed.
- **Touch**: The touch state of one of the channels had changed.
- **ATI**: An ATI event occurred, and some calibration values may have been updated.
- **Power**: The power mode has recently changed.

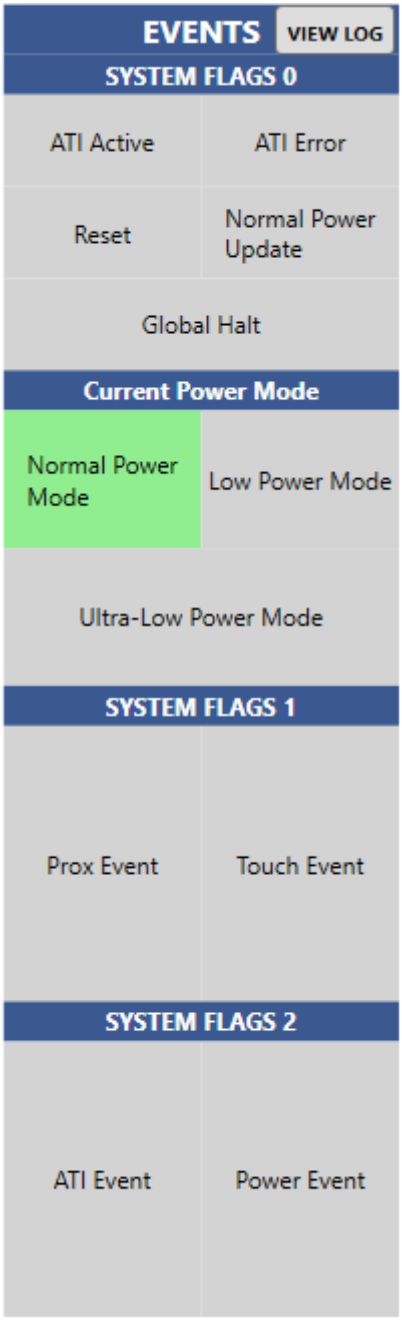


Figure 3.11: Events Panel

4 Reference Design

4.1 IQS7222CEV01

4.1.1 General-Purpose Stamp Module

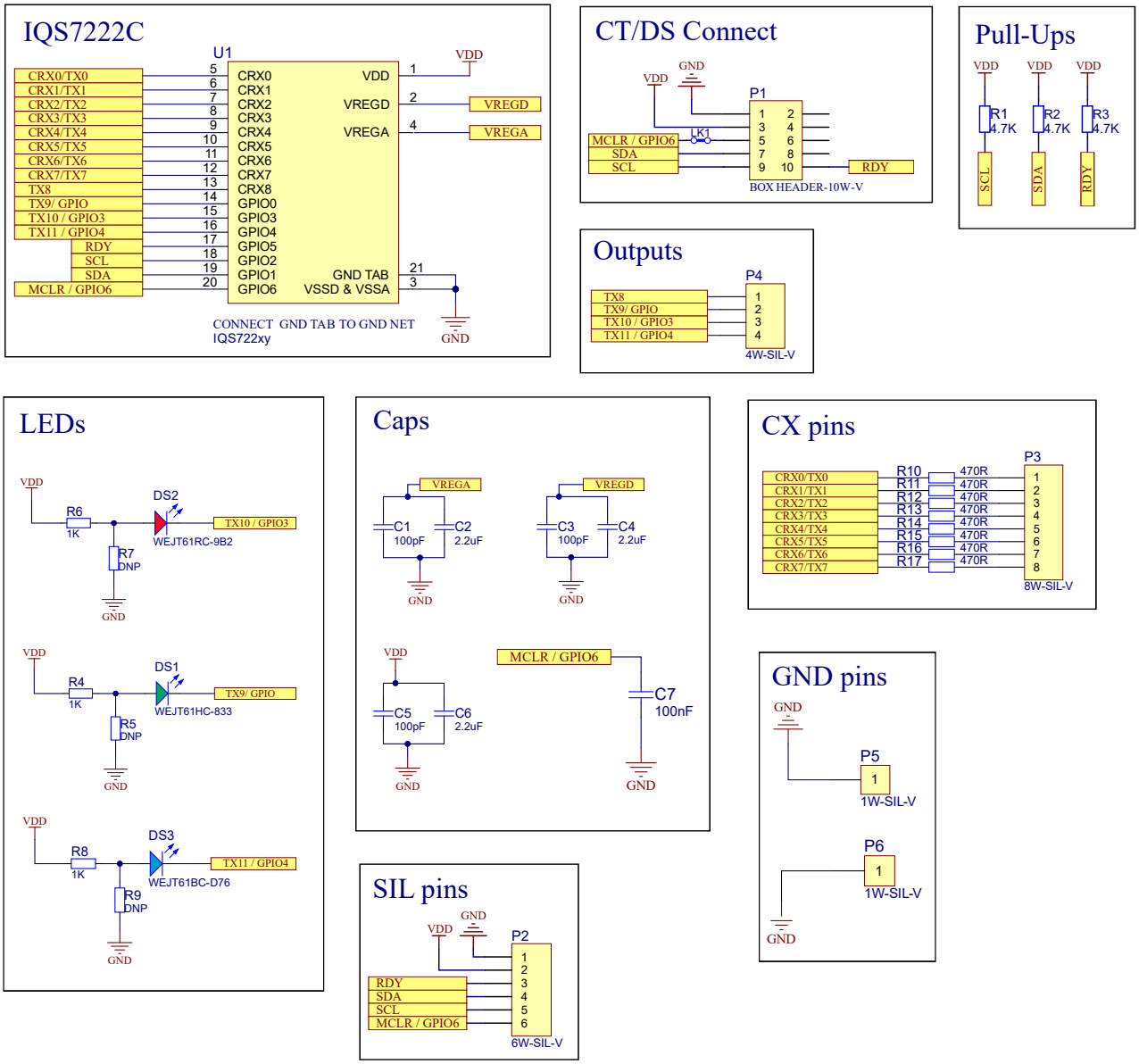


Figure 4.1: General-Purpose Stamp Reference Schematic

4.2 IQS7222C Module in the EVO2 EV Kit

4.2.1 Touch Slider and Button Module

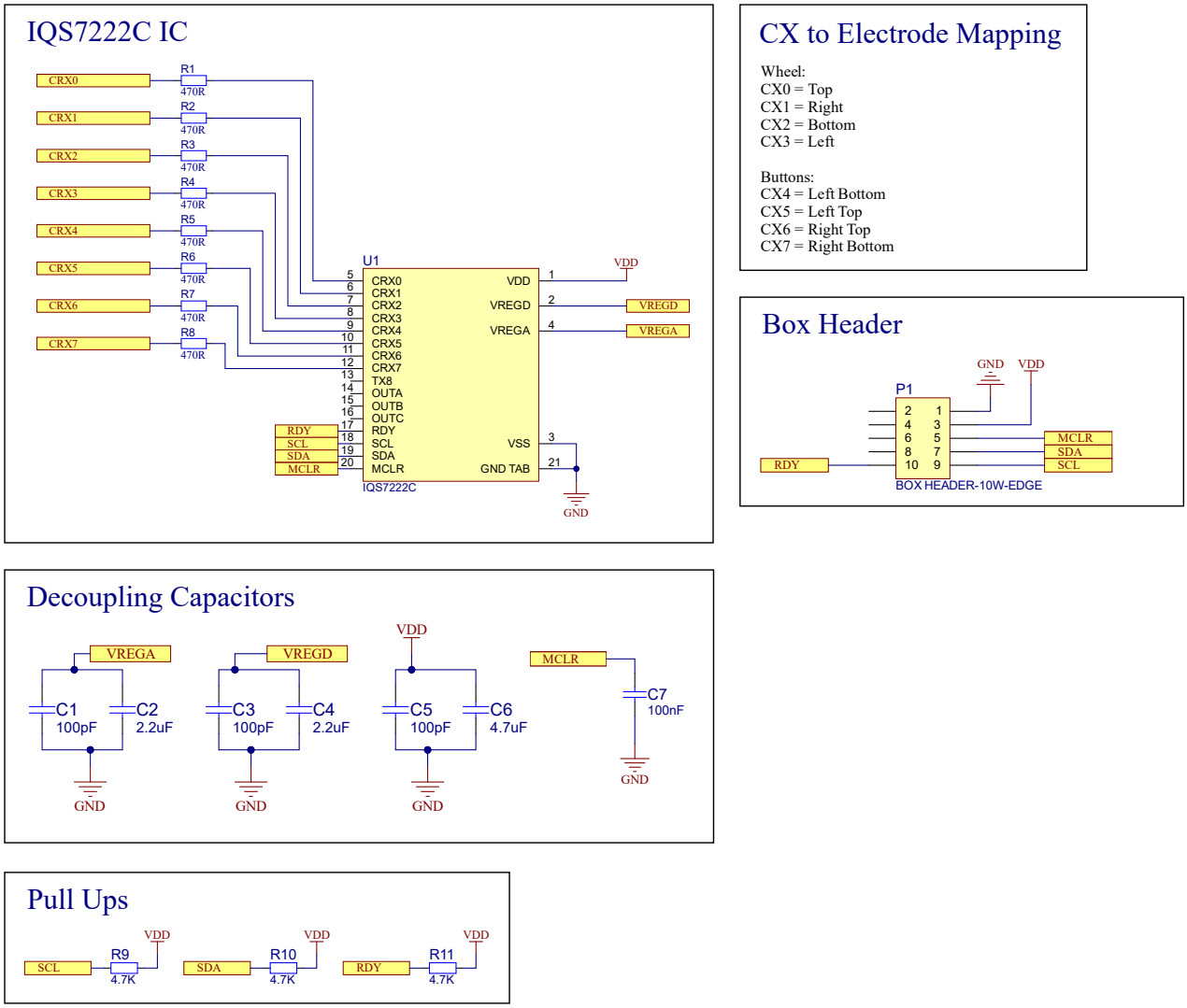


Figure 4.2: Touch Slider and Button Reference Schematic

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