IQS318 User Guide

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

Contents

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1   Introduction

This document provides an overview of the IQS318 ProxFusion® device, the graphical user interface (GUI), and the IQS318 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 IQS318 EV01 (AZP1208A4) 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 IQS318 EV01 reference schematic in Section 5.1
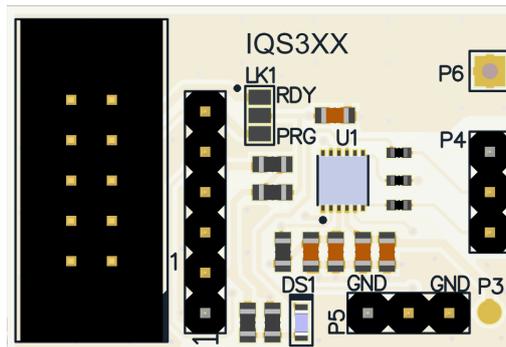

Figure 1.1: IQS318EV01 EV Kit

The IQS318EV02 EV kit contains four modules showcasing the different sensing technologies that the IQS318 provides. See the IQS318EV02 reference schematics in Section 5.2

> Inductive switch module (IQS318-001),
> Inductive key module (IQS318-101),
> Inductive button module (IQS318-201),
> Self-capacitive switch module (IQS318-511).

Figure 1.2: IQS318EV02 EV Kit

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The following application notes provide background information and design guidelines for the various sensing methods supported by the IQS318.

> 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 IQS318 Datasheet.

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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 IQS318 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

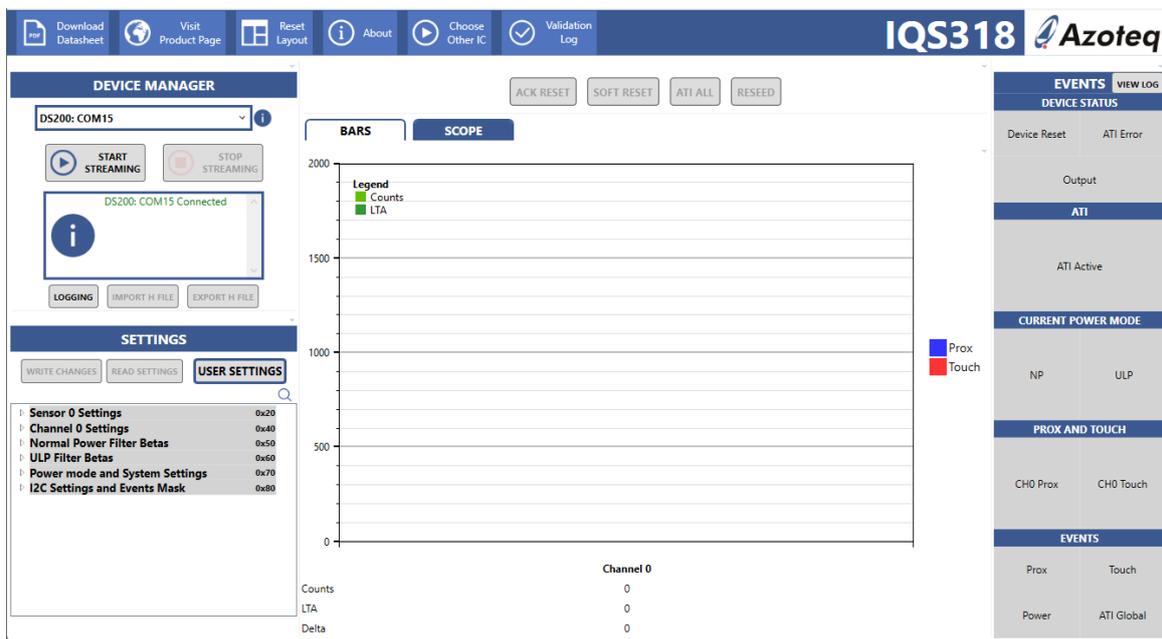Launch the IQS318 GUI software executable. The following window should appear:

Figure 2.1: Main Window of the Azoteq IQS318 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 IQS318 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.
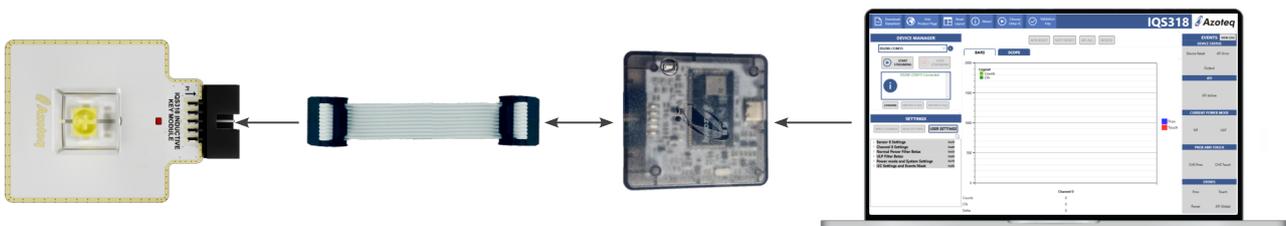

Figure 2.2: DS200 Connection for Streaming and Testing

Note: The CT210A can be used instead of the DS200, along with a standard USB-micro data cable

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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.
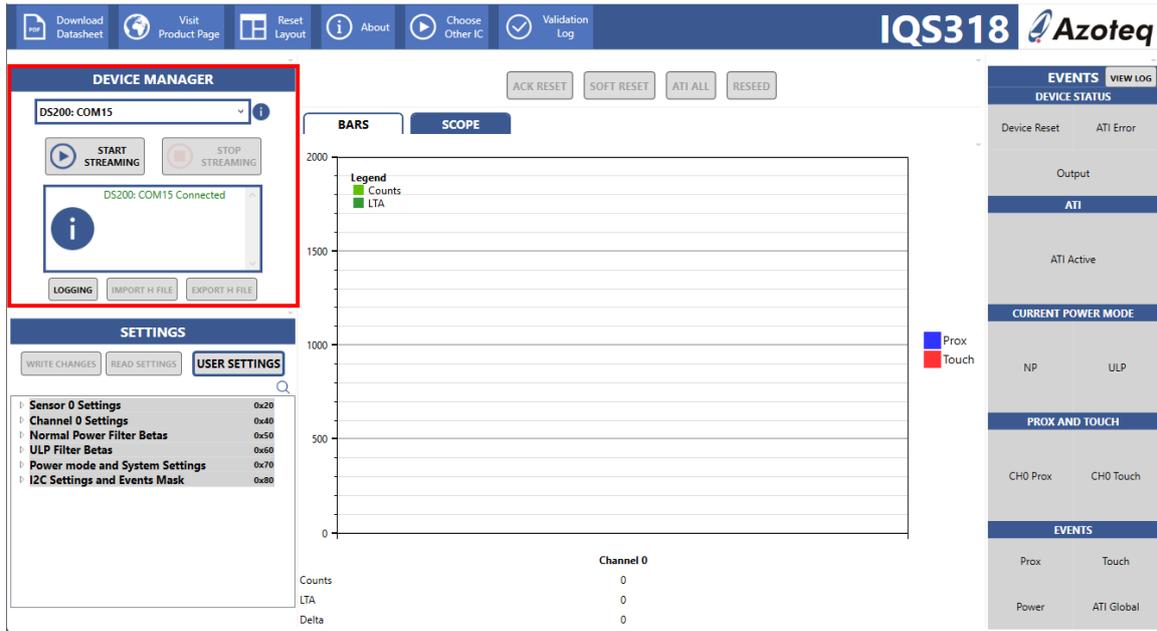
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Figure 2.5: DS200 Recognition and Connection

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.
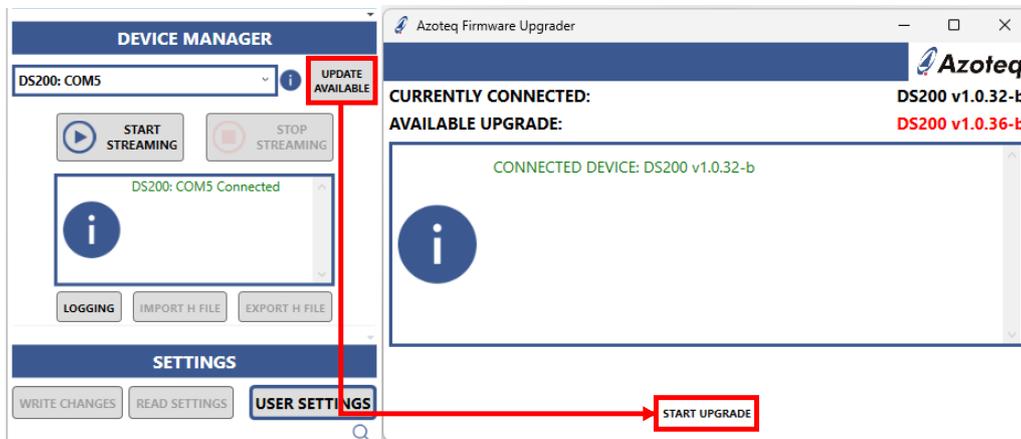

Figure 2.6: DS200 Firmware Upgrade

2.5   Step 5: Initiate IQS318 Communication (Streaming)

Click on 'Start Streaming' to initiate communications with the IQS318. Additional messages will appear and will provide the following information:

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

Note that the IQS318 product can be ordered with different I^{2}C addresses. The GUI will automatically

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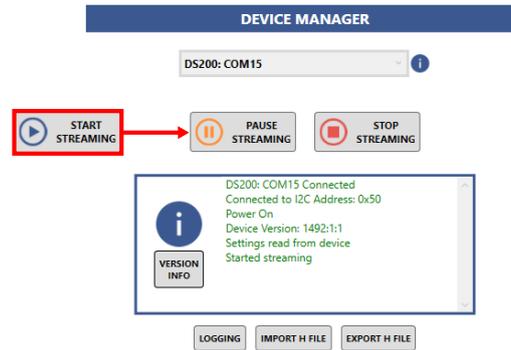
try each address until the device responds.

Figure 2.7: Message Dialogue Results from a Successful IQS318 Connection

If an error is displayed, please ensure that the device is properly connected and that the IQS318's product and version numbers were verified successfully.

2.6 Step 6: Acknowledge Reset and Streaming Mode

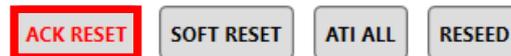Click on the red text button 'ACK Reset' to clear the reset event flag. The 'ACK Reset' text should change colour to black, indicating successful reset acknowledgement.

Figure 2.8: ACK Reset Button

The IQS318 starts in streaming mode, as shown in Figure 2.9. The default settings are *not* an appropriate baseline for a production application.
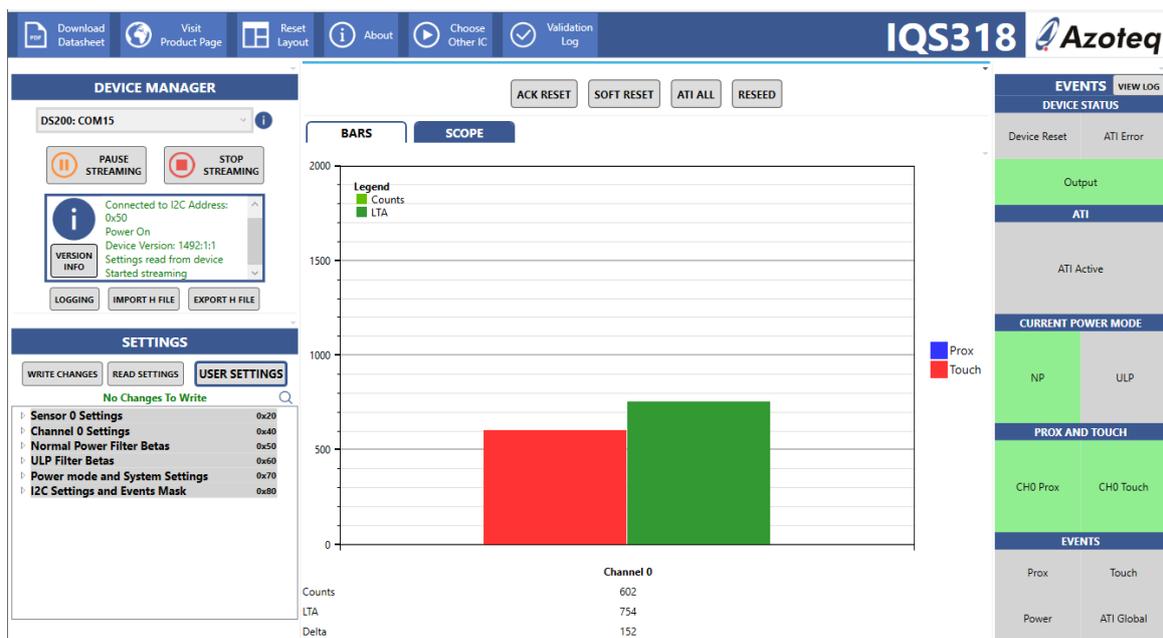

Figure 2.9: IQS318 Streaming

2.7   Step 7: User Settings Window

Open the "User Settings" window, navigate through the settings to configure settings for the demo. Refer to Figure 2.10.
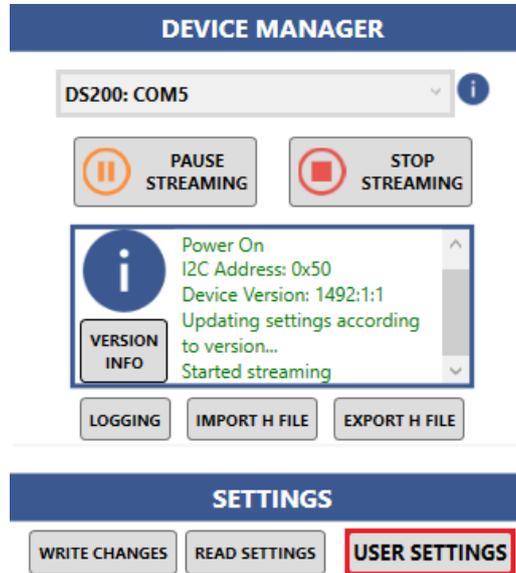

Figure 2.10: Importing the Predefined Demo Configuration

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3 IQS318 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 IQS318 Streaming Data

The IQS318 supports only one ProxFusion® channel. The "counts" of the channel is a representation of the signal strength measured by the sensor.

The IQS318 GUI displays the counts of the 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 the channel.
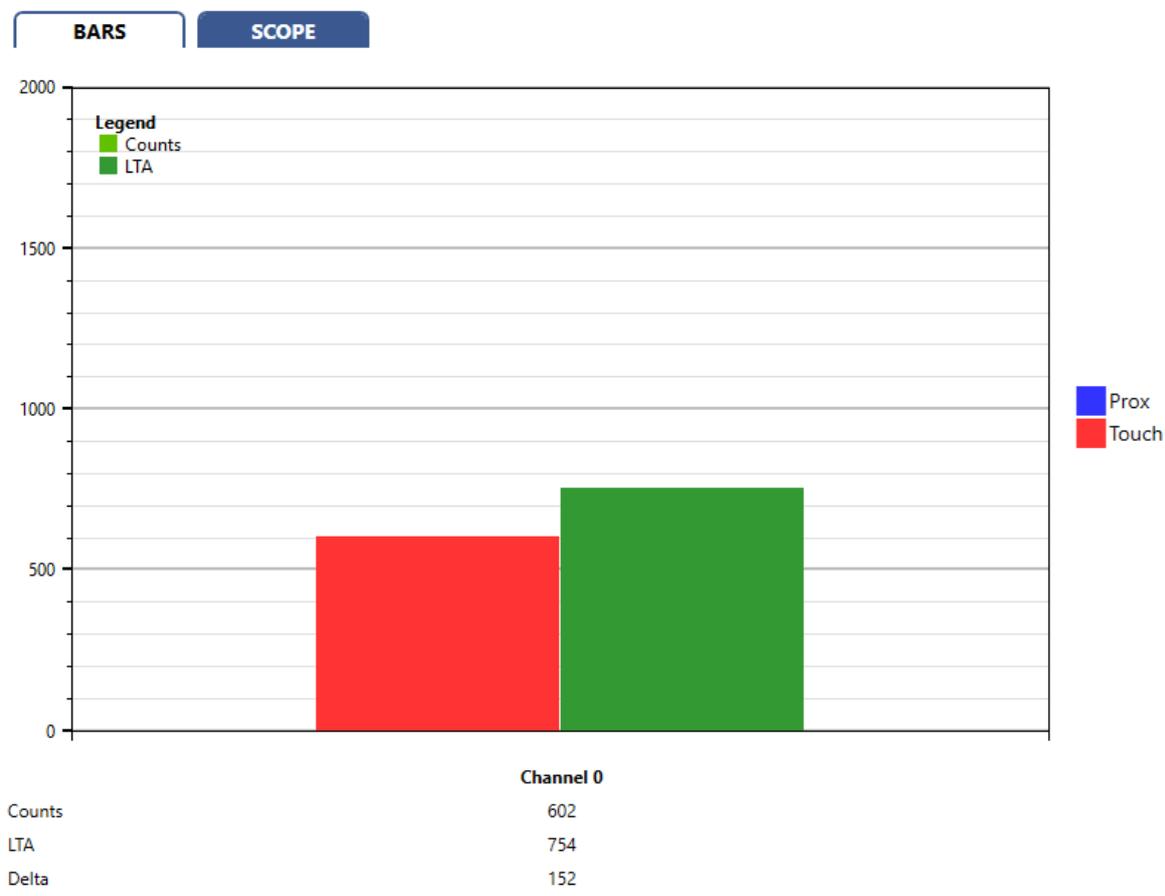
Figure 3.1: Streaming Graphs

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 are read directly from the IC. For more information regarding the register map, please consult the IQS318 datasheet.

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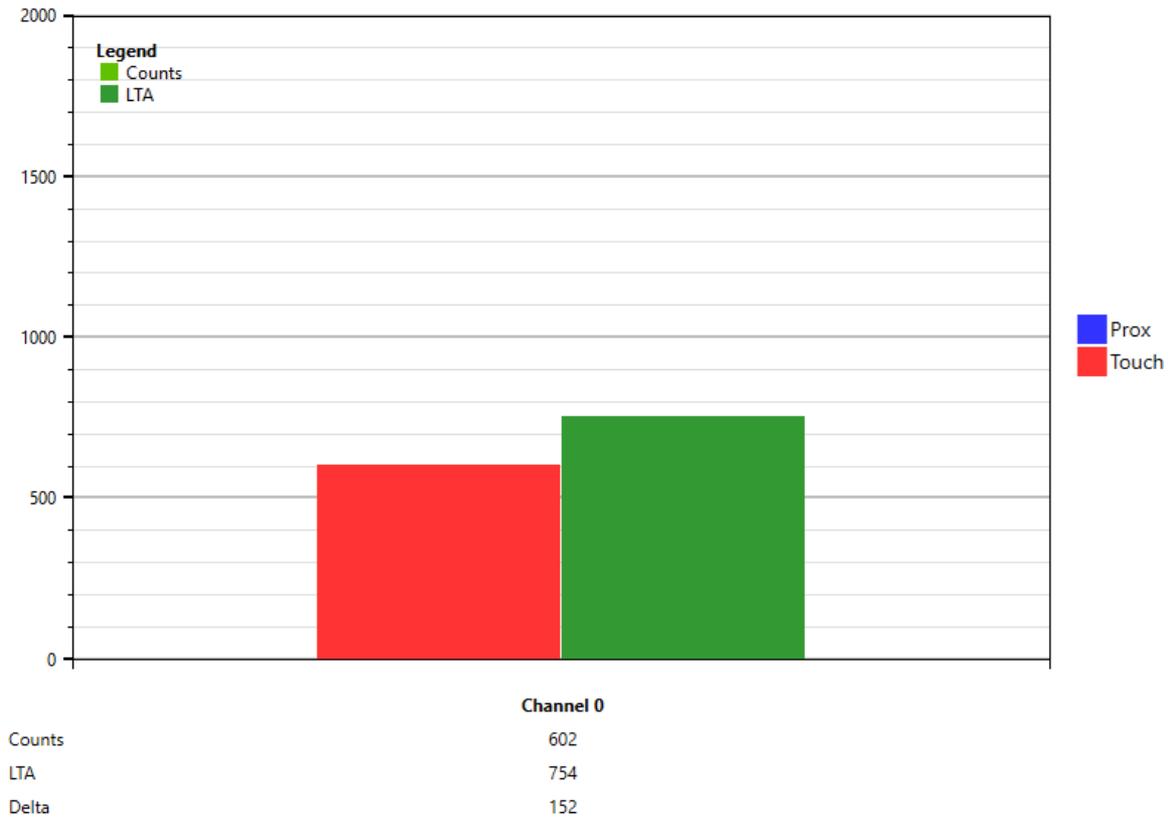January 2026

3.1.1 Bar Graph

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 LTA of the 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.

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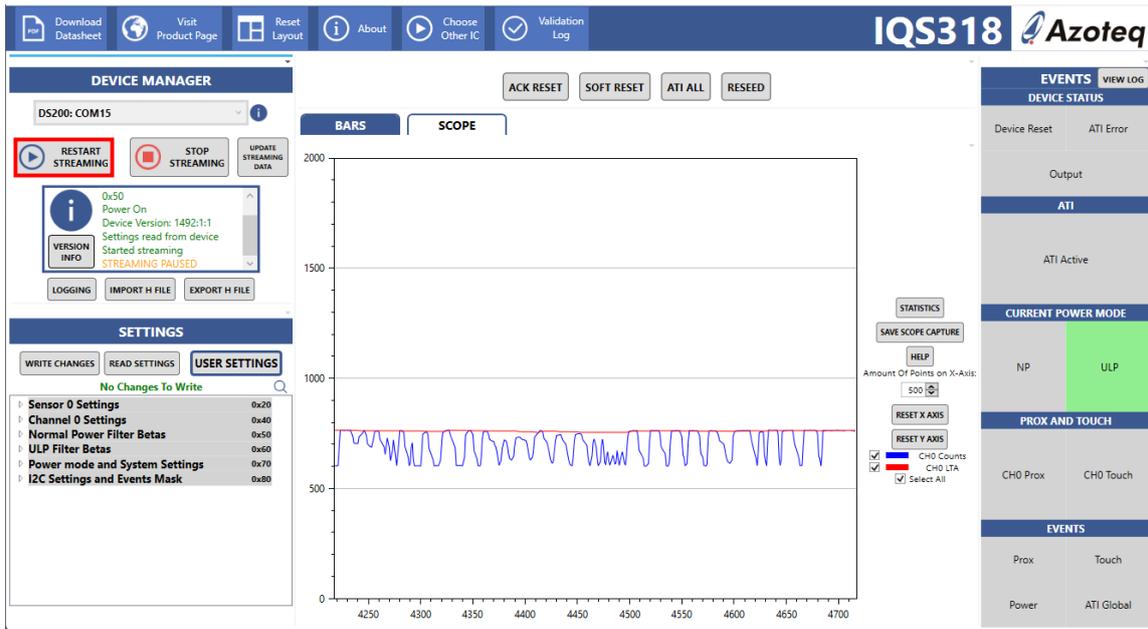
Figure 3.3: Pausing Streamed Data

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.
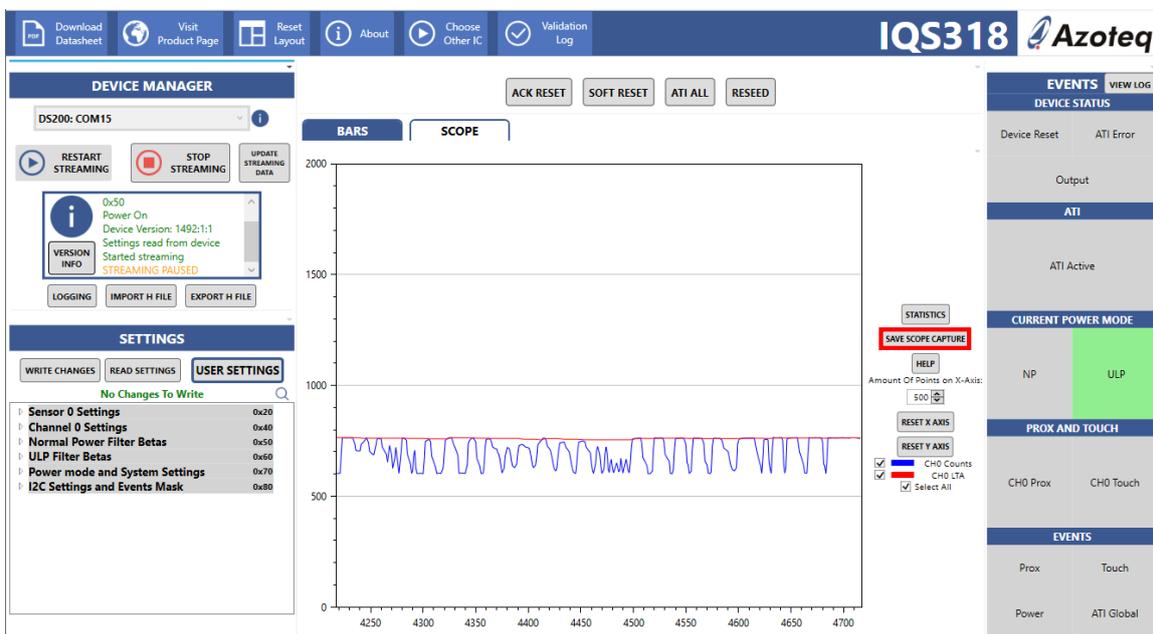

Figure 3.4: Saving Streamed Data

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.
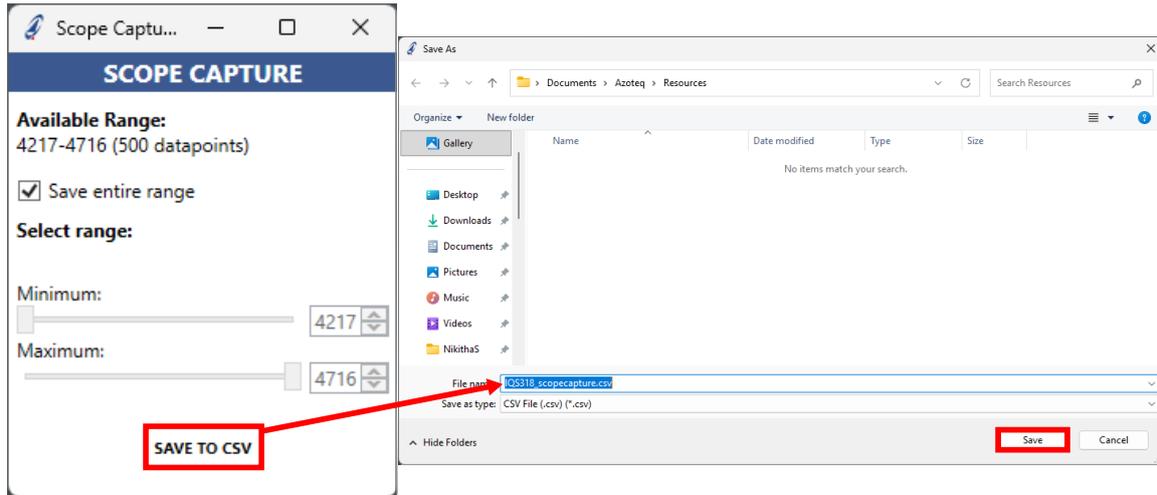
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Figure 3.5: Save Streamed Data to CSV File Format

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 IQS318 to a CSV file. Click the "Logging" button in the Configuration Tool Manager panel to open the logging window.
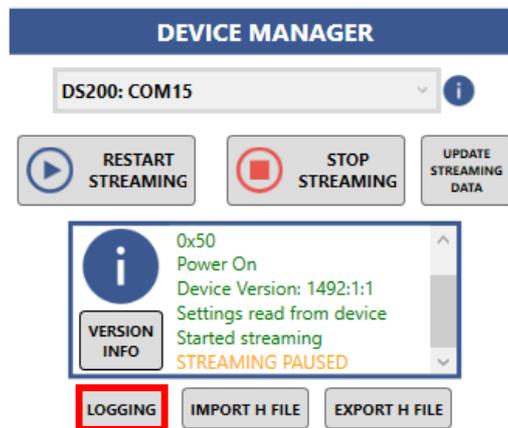
Figure 3.6: Logging Function Using the Configuration Tool Manager

From here, the desired variables from the IQS318 can be enabled or disabled. To start logging, click the "Start Logging" button, and choose the destination of the CSV log file.

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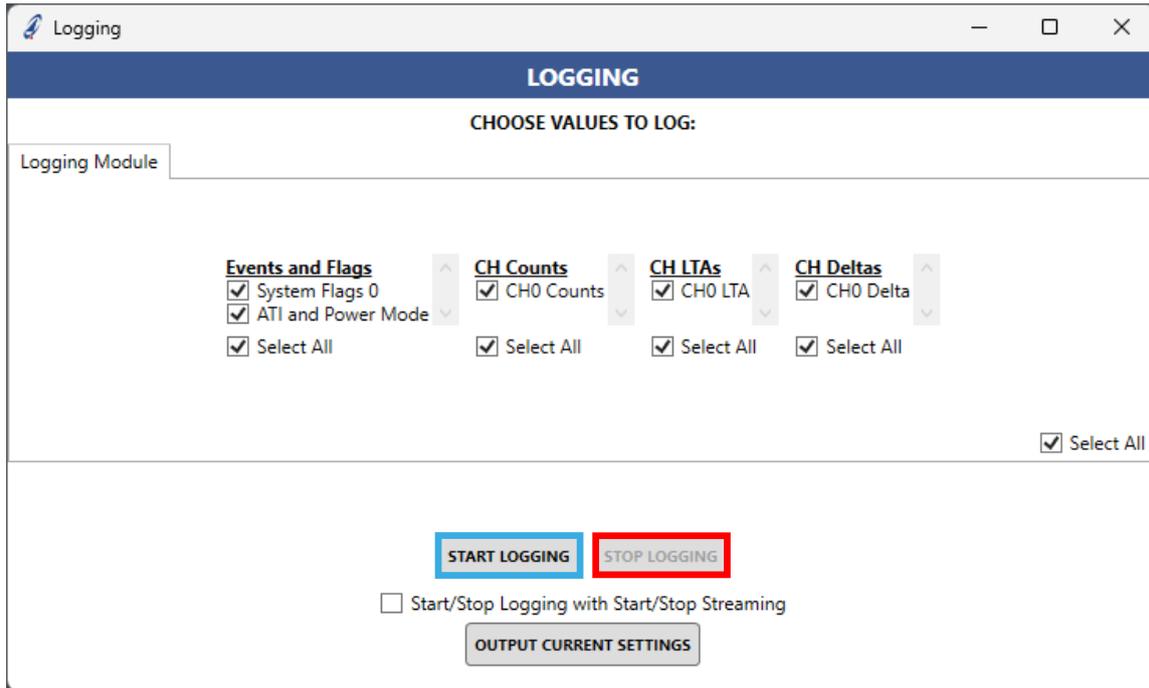
Figure 3.7: Logging Configuration Window

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 IQS318, 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.
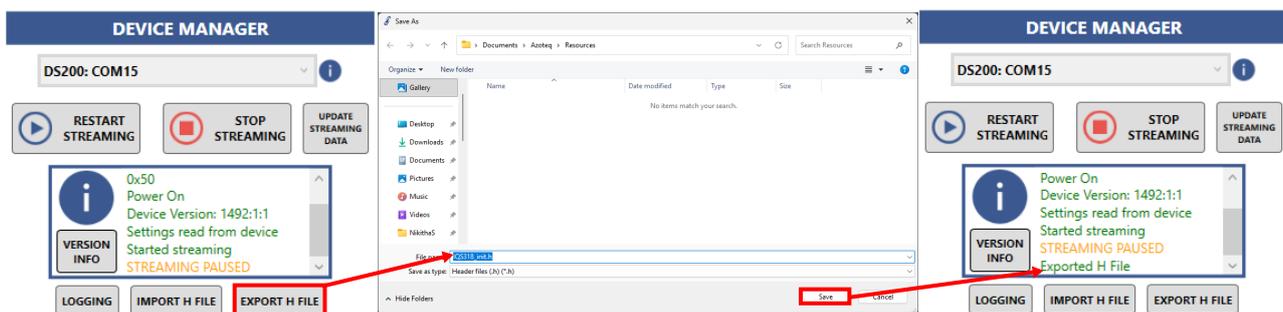

Figure 3.8: Exporting a Defined Configuration

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 IQS318 using the "Import H File" button.
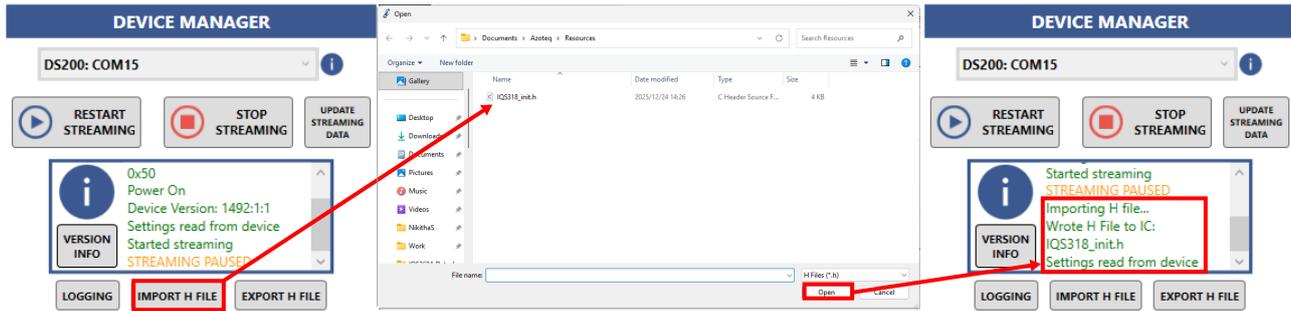
Figure 3.9: Importing a Predefined Configuration

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 IQS318'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 IQS7222A 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 IQS318 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 IQS318. 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 IQS318 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.

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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 IQS318'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 IQS318 is currently calibrating the channels.
> **ATI Error**: The IQS318 failed to calibrate the channel 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 IQS318 is currently performing a "Normal Power" update cycle, which samples the channel and updates the LTA value.
> **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 the channel had changed.
> **Touch**: The touch state of the channel had changed.
> **Power**: The power mode has recently changed.
> **ATI**: An ATI event occurred, and some calibration values may have been updated.

Figure 3.11: Events Panel

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4   Device Setup

This section explains some of the basic channel settings, system settings and commands that are specific to the inductive and/or capacitive sensing option of the IQS318. The settings described in Sections 4.1 - 4.5 can be accessed using the "User Settings" button shown in Figure 4.1 below.
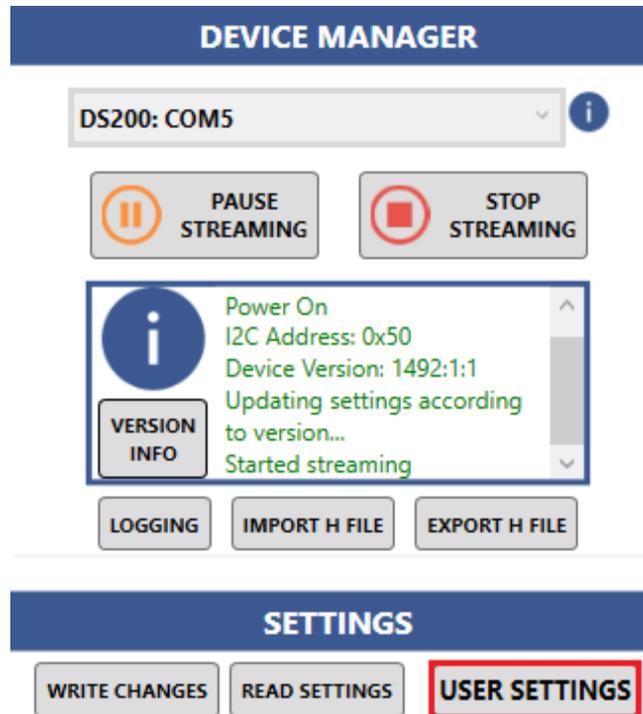
Figure 4.1: User Settings Button

When the "User Settings" button is clicked, a pop-up window will appear with five tabs. The five tabs include power mode and system settings, channel general settings, channel ATI settings, channel user interface settings and filter beta settings. The details of each of the five tabs are provided in Sections 4.1 - 4.5, respectively.

4.1 Power Mode and System Settings

The "Power Mode and Setting Settings" tab, shown in Figure 4.2 below, can be used to configure general settings, such as the device interface and power mode selection. Furthermore, the system timing settings can also be configured, including the report rate, power mode timeout and ultra-low power settings.

Event reporting is possible when the I^2C interface is enabled and at least one of the event bits is enabled. As shown in Figure 4.2, all event bits are enabled by default.
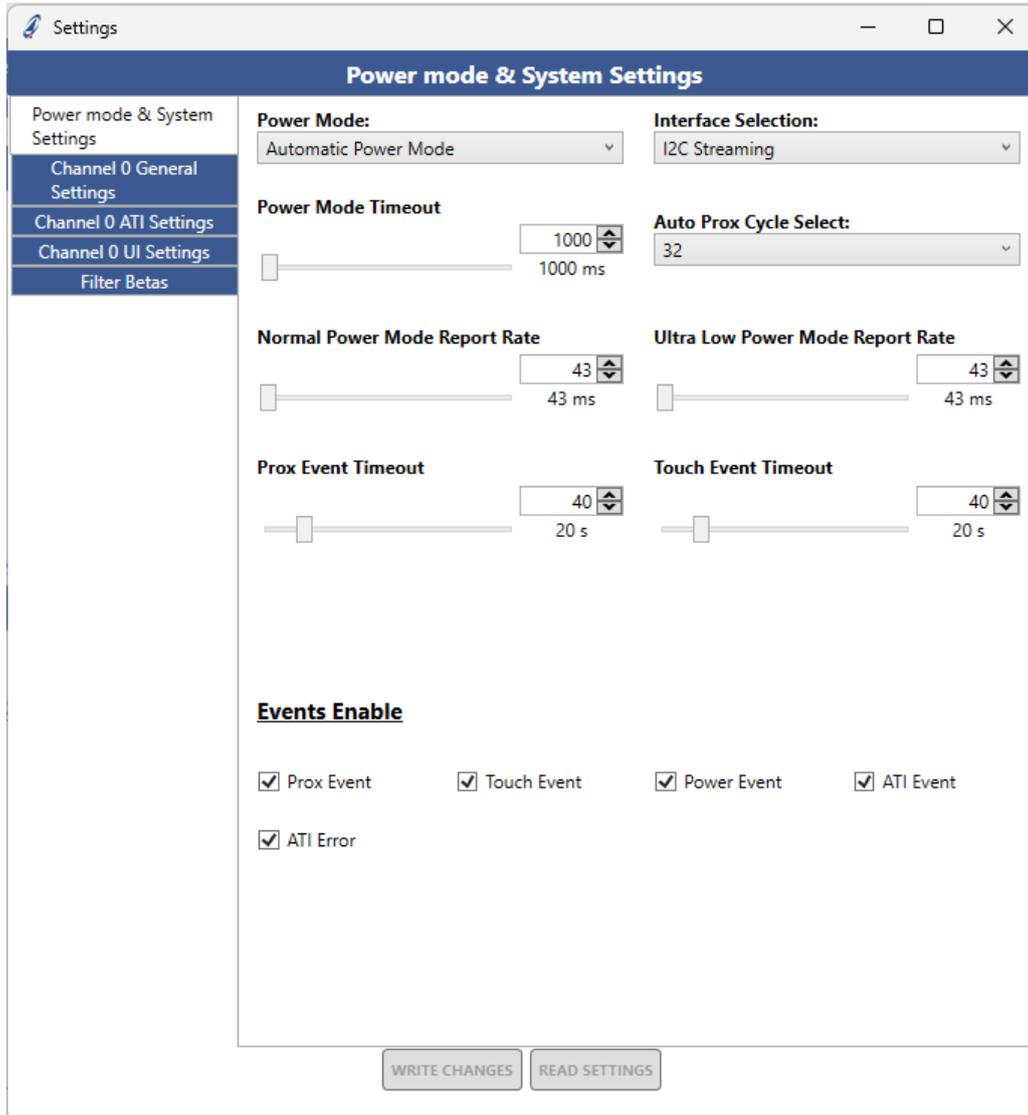
Figure 4.2: System Settings

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4.2 Channel General Settings

The "Channel General Settings" tab, shown in Figure 4.3, can be used to configure channel settings such as sensing mode, conversion frequency, channel pin selection, and other channel settings.

4.2.1 Inductive Setup

To set up the IQS318 for inductive sensing:

> Select mutual inductance sensing mode
> Set the conversion frequency to 2.33MHz
> Set Tx at FOsc
> Set CTx pin to CTx0 and CRx pin to Rx1

Other inductive settings are shown in Table table 4.1.

Table 4.1: IQS318 Inductive Order Code Settings

	IQS318-0xx	IQS318-1xx	IQS318-2xx
Linearise	Set	Set	Disable
Inverse	Disable	Disable	Set
Dual Direction	Set	Disable	Disable

4.2.2 Capacitive Setup

To set up the IQS318 for self-capacitive sensing:

> Select self-capacitance sensing mode
> Set the conversion frequency to 1MHz
> Set dead time
> Set dual direction
> Disable Tx at FOsc
> Disable linearise
> Set CTx pin to CTx0 and CRx pin to Rx0

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Figure 4.3: Channel General Settings

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4.3 Channel ATI Settings

The "Channel ATI Settings" tab, shown in Figure 4.4, can be used to configure channel ATI settings such as ATI mode, ATI resolution, ATI band, ATI base and target, mirror values and compensation values. The ATI target can be calculated using the ATI base and the ATI resolution as shown below.

$$\text{ATI Target} = \text{Actual ATI Base} \times \frac{\text{ATI Resolution Factor}}{16}.$$

Set the ATI base and target values according to the sensitivity requirement. Refer to the IQS318 Datasheet.
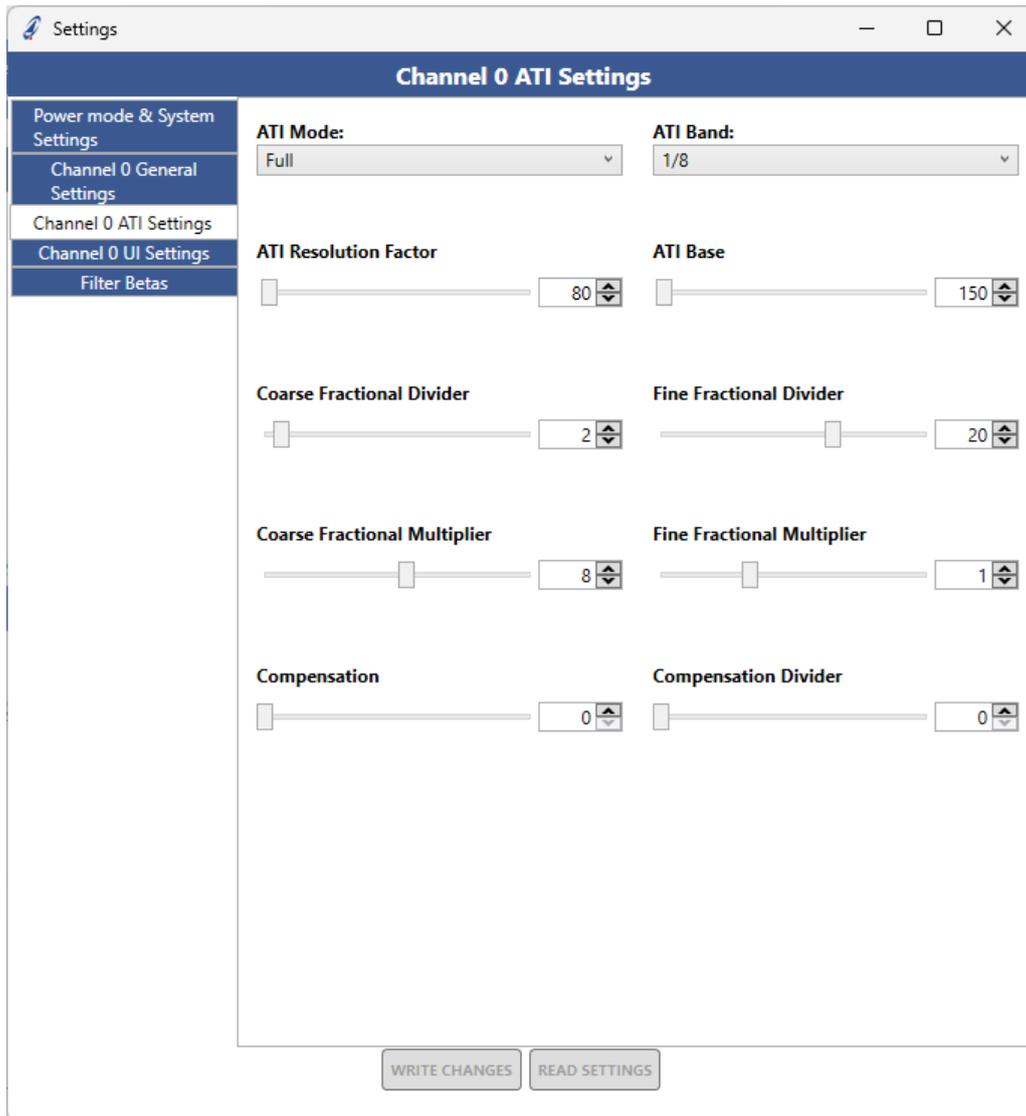
Figure 4.4: Channel ATI Settings

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4.4   User Interface Settings

The "User Interface (UI) Settings" tab can be used to configure the channel event timeout and filter settings as shown in Figure 4.5. Other settings, such as channel proximity and touch thresholds, debounce values, and hysteresis settings, can also be configured as shown in Figure 4.5.
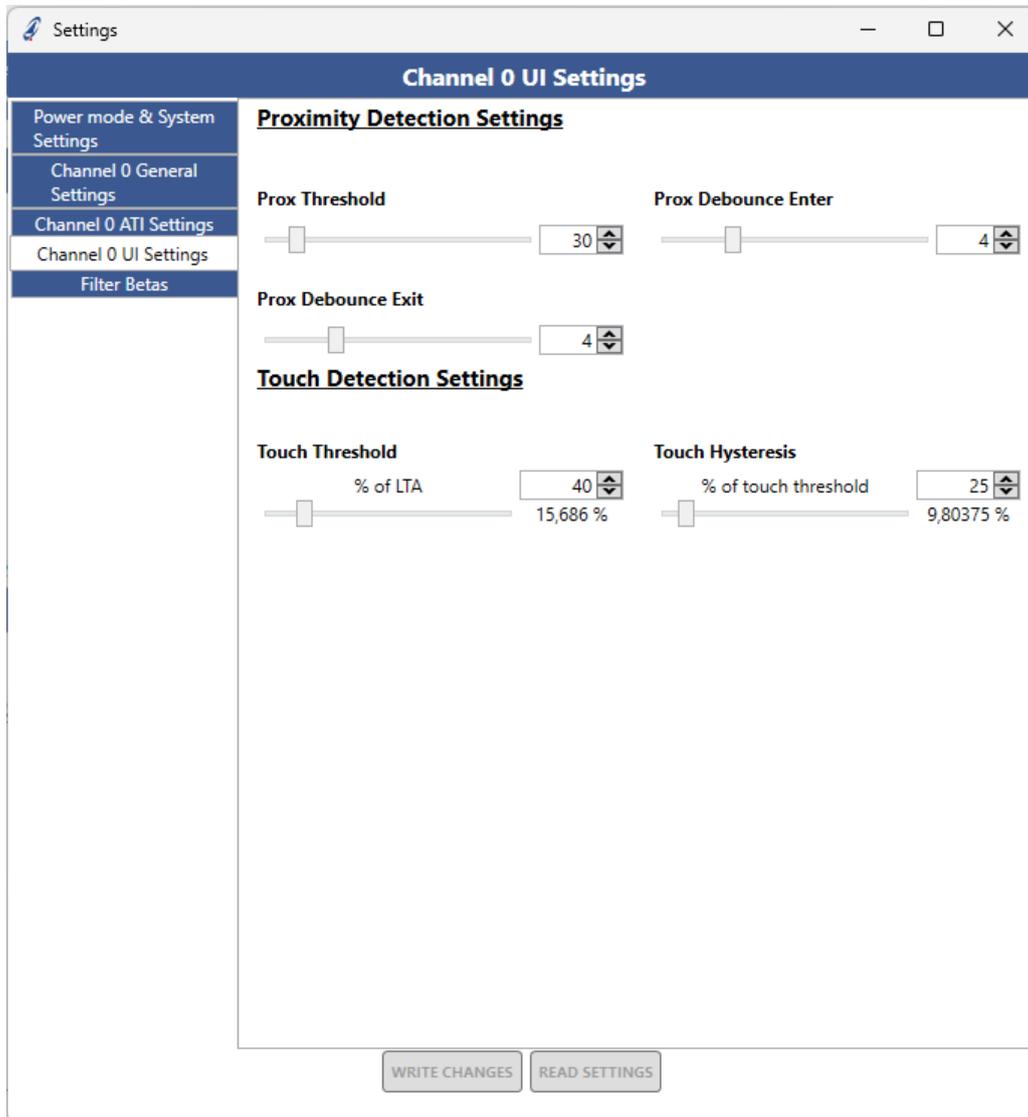
Figure 4.5: Channel User Interface Settings

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4.5 Filter Beta Settings

The "Filter Beta Settings" tab can be used to configure the channel filter settings as shown in Figure 4.6. Filter beta settings include normal power and ultra-low power filter beta settings such as counts filter beta, LTA filter beta, LTA fast filter beta, and fast filter band.
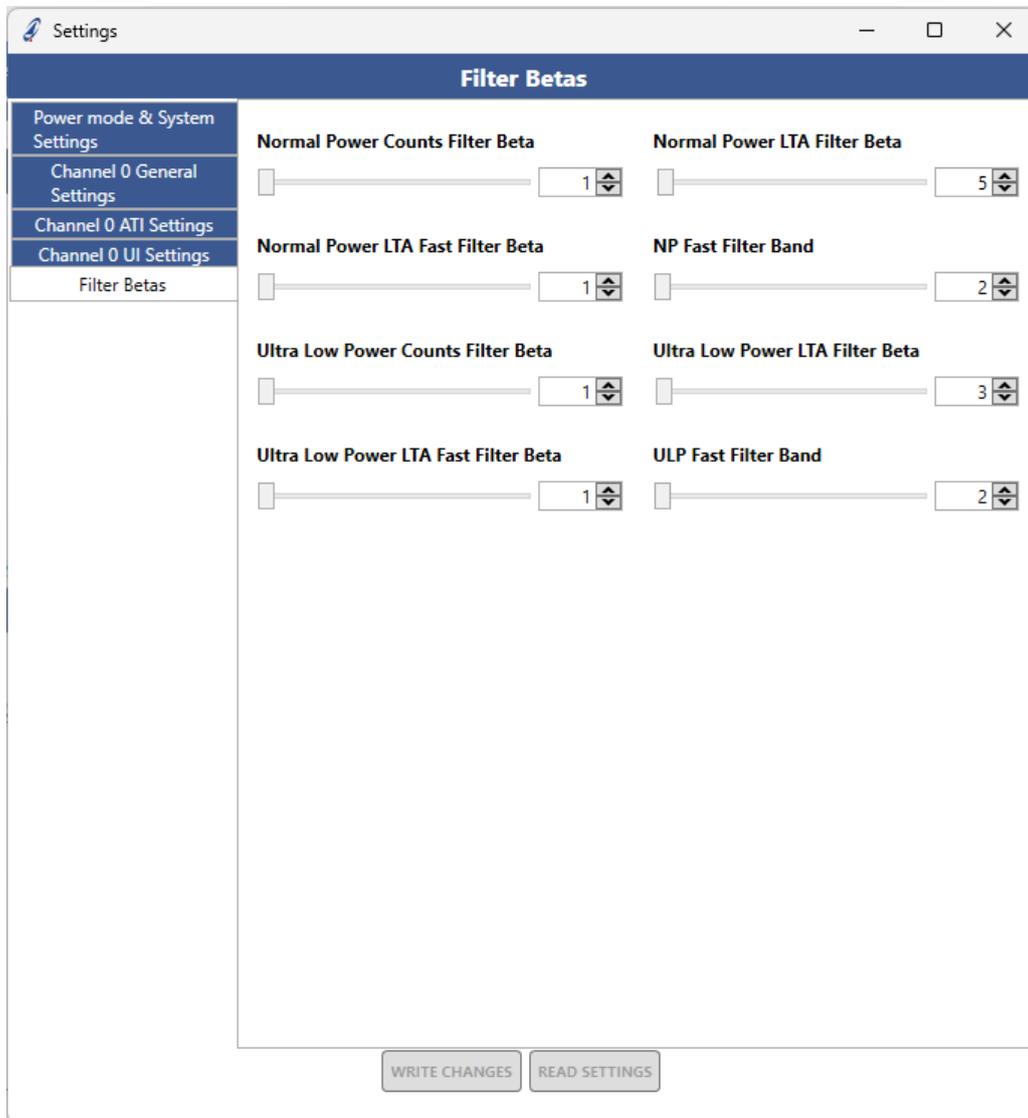
Figure 4.6: Channel Filter Beta Settings

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5   Reference Design

5.1   IQS318EV01

5.1.1   General-Purpose Stamp Module
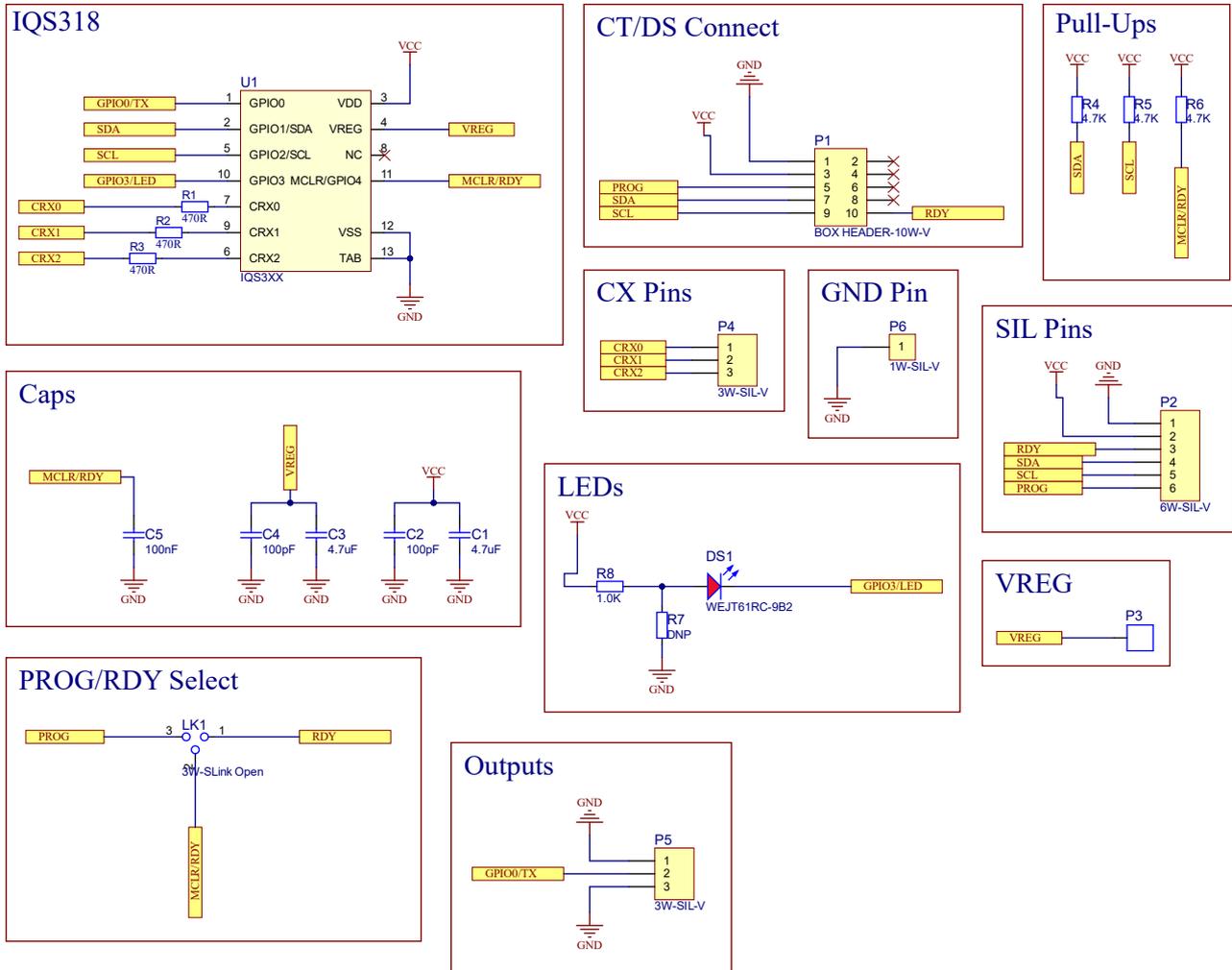
Figure 5.1: General-Purpose Stamp Reference Schematic

5.2   IQS318EV02

5.2.1   Inductive Switch Module
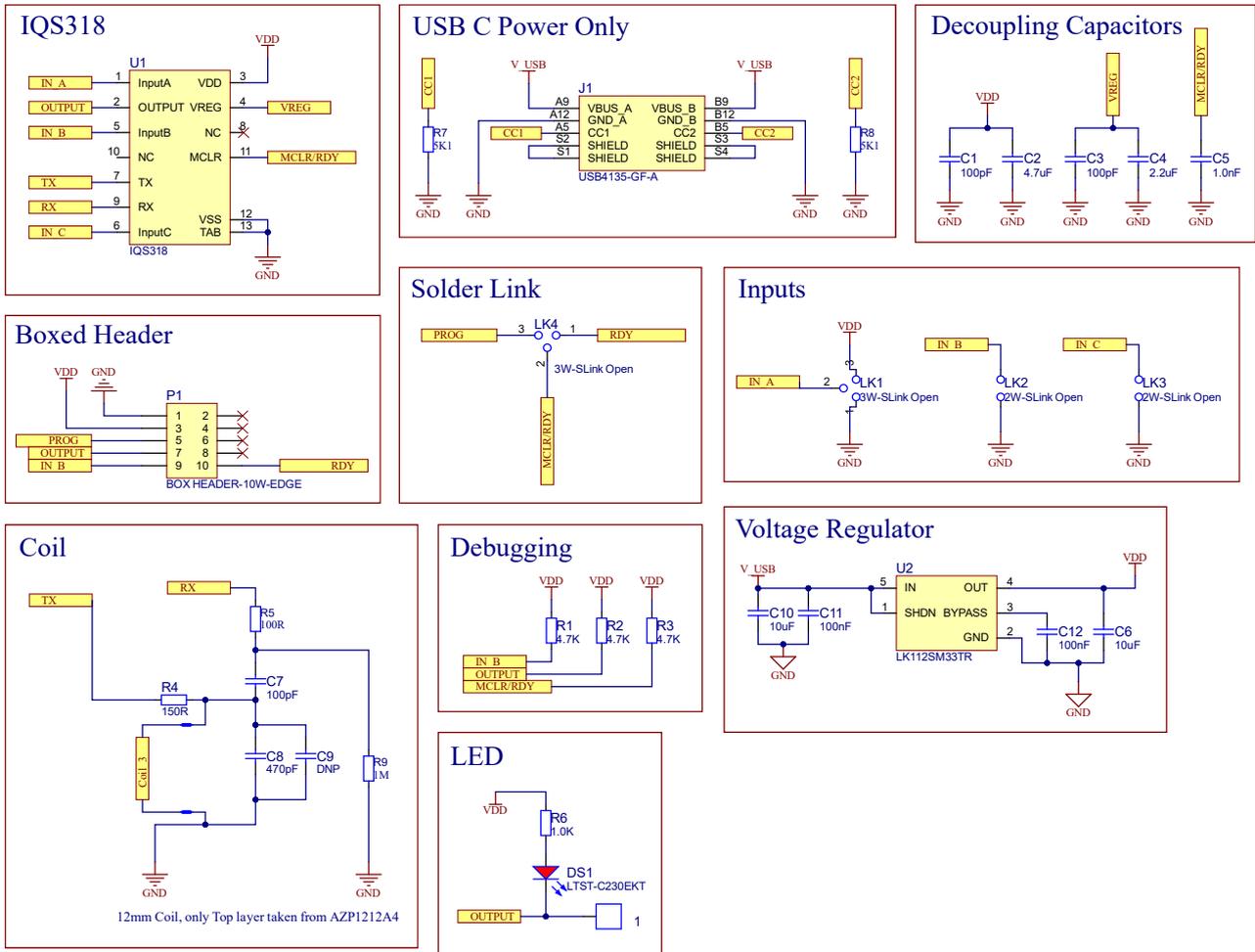
Figure 5.2: Inductive Switch Reference Schematic

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5.2.2 Inductive Key Module
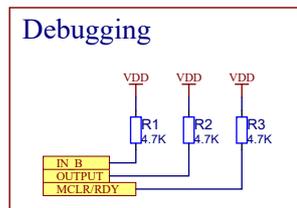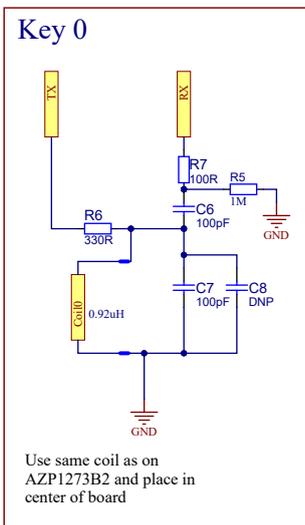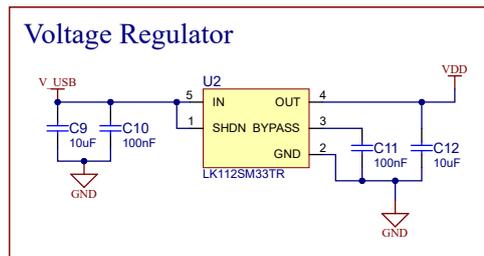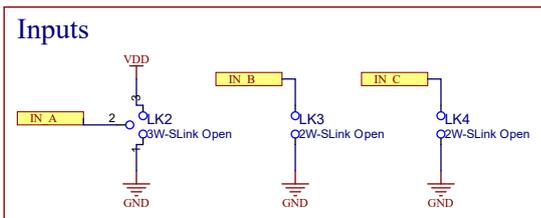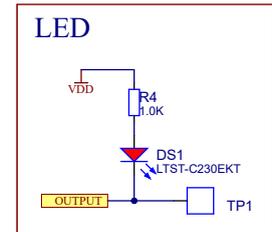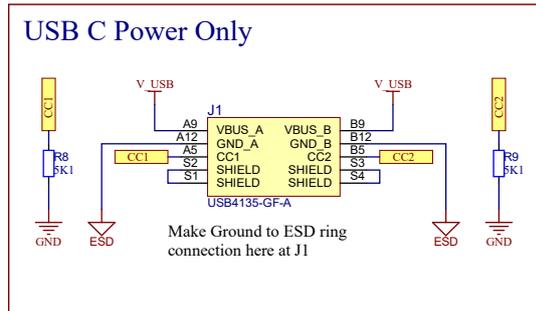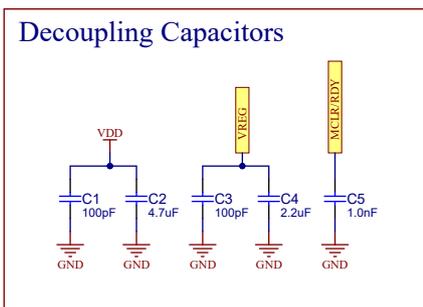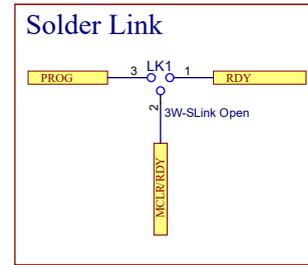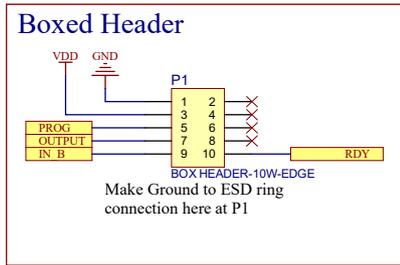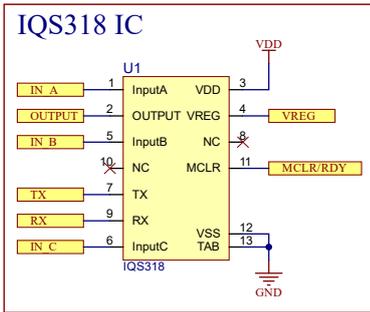
Figure 5.3: Inductive Key Reference Schematic

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5.2.3 Inductive Button Module
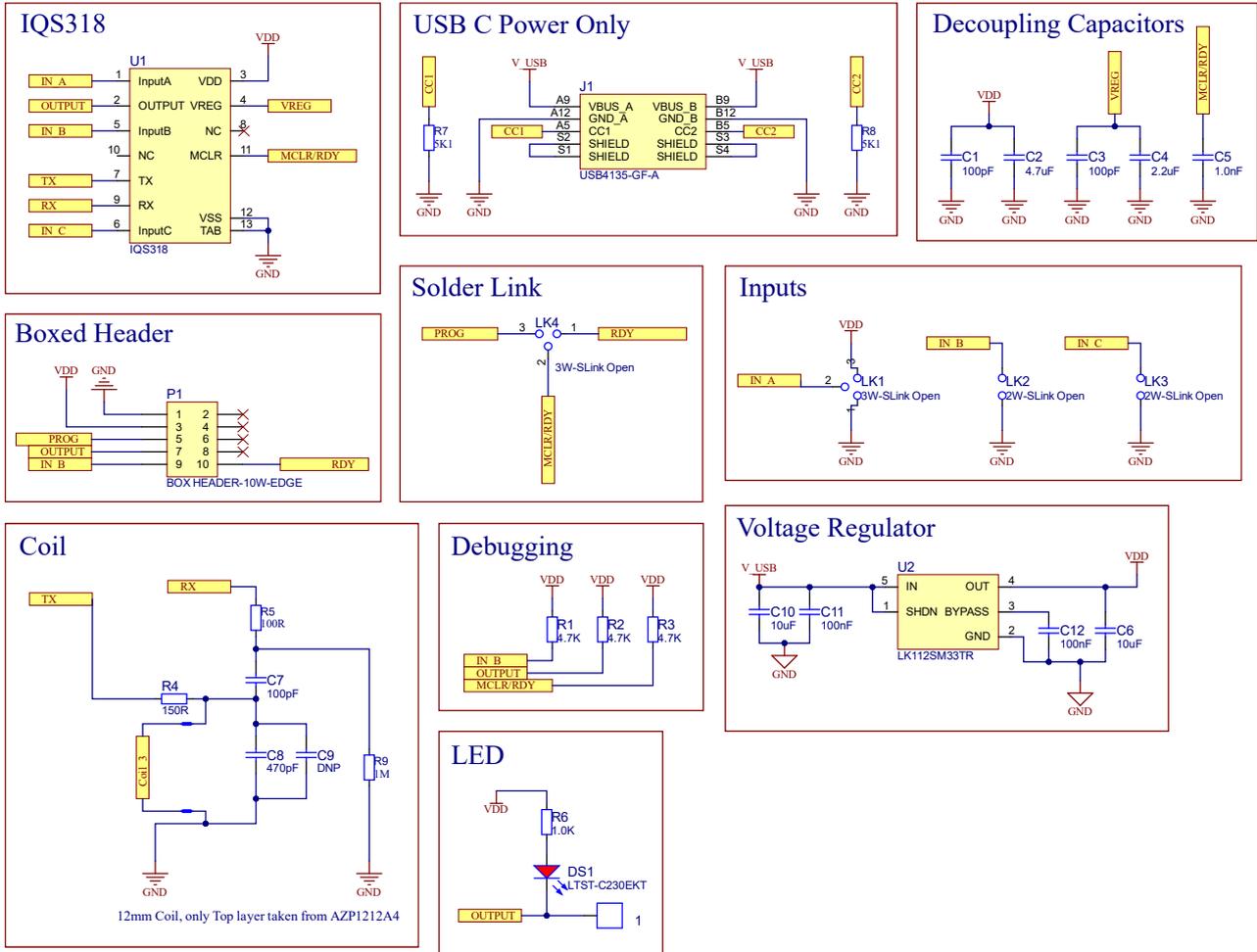
Figure 5.4: Inductive Button Reference Schematic

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5.2.4 Self-Capacitive Switch Module
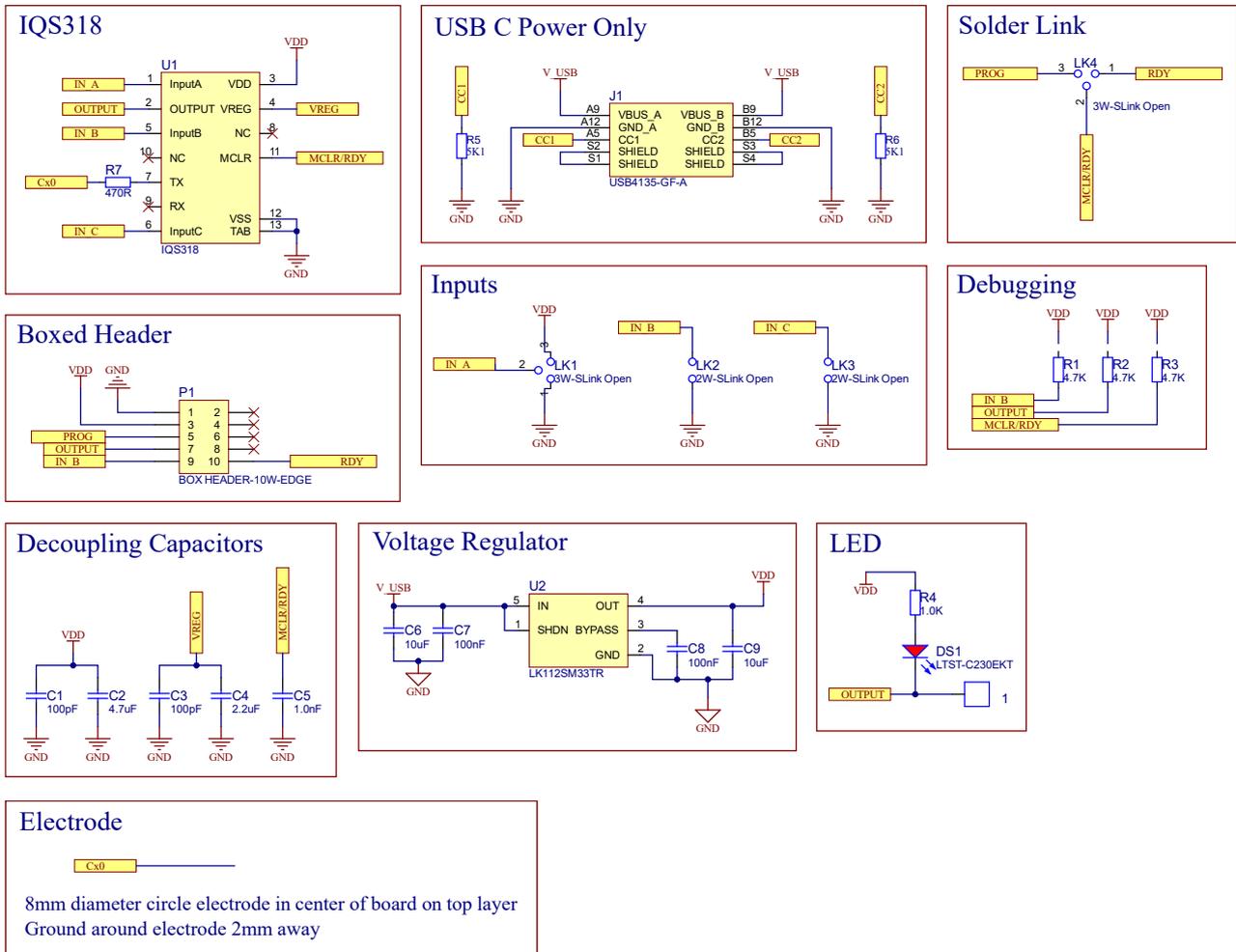
Figure 5.5: Self-Capacitive Switch Reference Schematic

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