



IQS7229A User Guide

This User Guide is meant to be used to configure the IQS7229AEV02 using the GUI PC software

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1 Introduction

This document provides an overview of the graphical user interface (GUI) for the IQS7229A Debug and Display software. The GUI can be used to configure the IQS7229A for a specific application and evaluate its performance in real time. This document uses the IQS7229AEV02 EV kit, shown below in Figure 1.1, as an example and thus does not cover all applications. Instead, 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. For guidelines on the hardware and electrode design, please refer to the appropriate application notes. For IC-specific information, operation, and memory map details, please refer to the IQS7229A Datasheet.

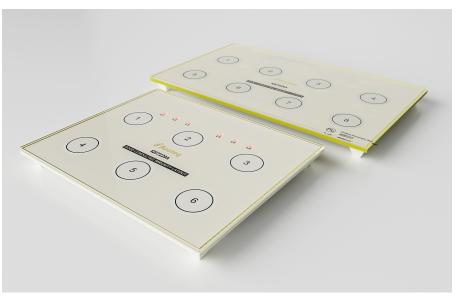


Figure 1.1: IQS7229AEV02 EV Kits



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2 Getting Started

This section describes the process of initial device set-up prior to application-specific tuning. The 8-channel (AZP1376C1) EV kit is used as an example.

2.1 Step 1: GUI Software Installation

Download and install the Azoteq IQS7229A GUI PC Software from the Azoteq website under the Software and Tools page. Extract the downloaded zip file, follow the installation wizard procedure.

2.2 Step 2: Launch GUI Software

Launch the software executable program. The following window should appear:

🖌 Azoteq IQS7229A v1.1											-	
Reset Layout (i) About									QS7	7229/	A 🦉 A	zoteq
DEVICE MANAGER				ACK RESET	SOFT RESET	ATI ALL AN	D READ RES	EED		~	EVE SYSTEM	NTS VIEW LOG FLAGS 0
DS200: COM5 ~ 1		BARS	SCOPE	1							ATI Active	ATI Error
START STREAMING STOP STREAMING					Bar (Chart				-	Reset	Global Halt
DS200: COM5 Connected	1200										Current Po	wer Mode
	1000	Legend Counts								-	Normal Power	Low Power
	1										SYSTEM	FLAGS 1
LOGGING IMPORT H FILE EXPORT H FILE	800									Prox	Prox Event	Touch Event
WRITE CHANGES READ SETTINGS	600 -									Touch	SYSTEM	FLAGS 2
P Cycle Setup 0x8000 P Global Cycle Setup 0x8400 P Button Setup 0 - 2 0x9000	400									-	ATI Event	Power Event
Button Setup 3 - 4 0x9300	1										PROX	STATES
▶ Button Setup 5 - 7 0x9500 ▶ CH0 Setup 0xA000	200 -									-	CH0 Prox	CH1 Prox
CH1 Setup 0xA100	1										CH2 Prox	CH3 Prox
CH2 Setup 0xA200	1										CH4 Prox	CH5 Prox
▷ CH3 Setup 0xA300 ▷ CH4 Setup 0xA400	0 +		1							-	CH6 Prox	CH7 Prox
CH5 Setup 0xA500		CH0	CH1	CH2	СНЗ	CH4	CH5	CH6	CH7		TOUCH	
CH6 Setup 0xA600	Counts:	0	0	0	0	0	0	0	0		CH0 Touch	CH1 Touch
CH7 Setup 0xA700 System Settings 0xD0	LTA:	0	0	0	0	0	0	0	0		CH2 Touch	CH3 Touch
system settings	Delta:	0	0	0	0	0	0	0	0		CH4 Touch CH6 Touch	CH5 Touch CH7 Touch
	Delta:	v	v	U	U	v	v	v	U		CH0 louch	CH/ Iouch

Figure 2.1: Main Window of the Azoteq IQS7229A 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 IQS7229AEV02 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.





If a custom cable or hardware is used, the required connections are shown in Table 2.1 and Figure 2.4 below.

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 its connection and firmware, displaying a 'Device Connected' message in the configuration tool manager section, as shown in the red block in Figure 2.5.

Azoteq IQS7229A v1.1													
Reset i About										QS	7229/	A 🤇 A	zotec
DEVICE MAN					ACK RESET	SOFT RESET	ATI ALL AN	ID READ RES	EED		÷	EVE SYSTEM	NTS VIEW LO
DS200: COM5	~ 🚺	E	ARS	SCOPE								ATI Active	ATI Error
		-				Bar (Chart				•	Reset	Global Halt
DS200: COM5 C	onnected	1200										Current Po	wer Mode
1		1000 -	Legend Counts									Normal Power	Low Power
												SYSTEM	FLAGS 1
LOGGING	EXPORT H FILE	800									_	Prox Event	Touch Event
SETTING	S										Prox	PIOX EVENC	Touch Even
READ SETTINGS		600 -									Touch	SYSTEM	FLAGS 2
Cycle Setup Global Cycle Setup Button Setup 0 - 2	Q 0x8000 0x8400 0x9000	400 -										ATI Event	Power Even
Button Setup 3 - 4	0x9000 0x9300	-									-	DROV	STATES
Button Setup 5 - 7 CH0 Setup	0x9500 0xA000	200										CH0 Prox	CH1 Prox
CH0 Setup	0xA100	-									-	CH2 Prox	CH3 Prox
CH2 Setup	0xA200	-										CH4 Prox	CH5 Prox
CH3 Setup	0xA300	0										CH6 Prox	CH7 Prox
CH4 Setup CH5 Setup	0xA400 0xA500											тоисн	STATES
CH6 Setup	0xA600		CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		CH0 Touch	CH1 Touch
CH7 Setup	0xA700	Counts:	0	0	0	0	0	0	0	0		CH2 Touch	CH3 Touch
System Settings	0xD0	LTA:	0	0	0	0	0	0	0	0		CH4 Touch	CH5 Touch
		Delta:	0	0	0	0	0	0	0	0		CH6 Touch	CH7 Touch



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.





DEVICE MANAGER	🖌 Azoteq Firmware Upgrader	– 🗆 X
DS200: COM5 · O UPDAT		🖉 Azoteq
START STOP STREAMING STOP	CURRENTLY CONNECTED: AVAILABLE UPGRADE:	DS200 v1.0.32-b DS200 v1.0.36-b
DS200; COM5 Connected	CONNECTED DEVICE: DS200 v1.0.32-b	^
LOGGING IMPORT H FILE EXPORT H FILE		~
WRITE CHANGES READ SETTINGS USER SETTING	START UPGRADE	

Figure 2.6: DS200 Firmware Upgrade

2.5 Step 5: Initiate IQS7229A Communication (Streaming)

Click on 'Start Streaming' to initiate communications with the IQS7229A. Additional messages will appear and will provide the following information:

- > Power status
- > I²C address
- > Device version information
- > Settings and streaming confirmations or errors, as applicable

	DEVICE MANAG	ER
DS200	: COM5	· •
		STOP STREAMING
VERSION INFO	DS200: COM5 Connected Power On Device Version: 2055:1:0 Settings read from device Started streaming	~
LOGGING		EXPORT H FILE

Figure 2.7: Message Dialogue Results from a Successful IQS7229A Connection

If an error is displayed, please ensure that the device is properly connected and that the IQS7229A'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 text 'ACK Reset' should change colour to black, indicating successful reset acknowledgement, and should remain so thereafter.

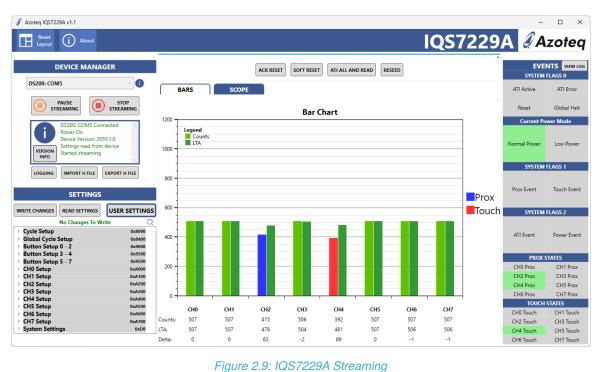


Figure 2.8: ACK Reset Button





The IQS7229A starts in streaming mode, as shown in Figure 2.9. The default settings are *not* an appropriate baseline for a production application.



rigure 2.9. 1007229A Olieanni

2.7 Step 7: Configure IQS7229A EV kit

The device may now be configured by selecting the 'User Settings' button to open the pop-up window, as shown in Figure 2.10 below, with settings organized in menu tabs. Refer to Sections 4, 5 and 6 for more detail. The pop-up user settings window can be used to configure all the IQS7229A device parameters.



🖉 Settings		- 🗆 ×
	System Settings	
System Settings Cycle Settings 0 - 3 CH0 Settings	Interface Selection: I2C Streaming V	Power Mode Selection: Automatic V
CH1 Settings CH2 Settings CH3 Settings	ATI Error Timeout (0.5s) (0 = never retry ATI again) 2	ATI Report Rate (ms)
CH4 Settings CH5 Settings CH6 Settings CH7 Settings	Normal Mode Timeout (ms) (0 = never timeout) 3000 ✿ 3000 ms	Normal Mode Report Rate (ms)
Channel 0-4 Timeouts Channel 5-7 Timeouts General Channel Settings Filter Betas CH0 - CH2 Filter Betas CH3 - CH5	Communication Timeout (ms)	Low Power Mode Report Rate (ms)
Filter Betas CH6 - CH7	Enable Alternate Frequency Set	
	Event enable (set to enable event	
	WRITE CHANGES READ SETT No Changes To Write	INGS

Figure 2.10: User Settings Window



3 IQS7229A 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 IQS7229A Streaming Data

The IQS7229A GUI displays all the streaming data 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. There is an additional scope view that plots additional information over time. This is explained later in this document, where relevant.





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 IQS7229A datasheet.





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. The **delta** is simply the difference between the LTA and the counts, and is used to detect activity or movement.

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.



Azoteq IQS7229A v1.1			-	
Reset i About]	QS7229	A 🤇 A	zoteq
DEVICE MANAGER	ACK RESET SOFT RESET ATI ALL AND READ RESEED	~		NTS VIEW LOG FLAGS 0
DS200: COM5 V	BARS SCOPE		ATI Active	ATI Error
	Scope	•	Reset	Global Halt
DS200: COM5 Connected	1	7	Current Po	ower Mode
Power On Device Version: 2055:1:0 Settings read from device Started streaming	1400	SAVE SCOPE CAPTURE	Normal Power	Low Power
	1200 -	Amount Of Points on X-Axis:	SYSTEM	FLAGS 1
LOGGING IMPORT H FILE EXPORT H FILE SETTINGS	1000	RESET X AXIS	Prox Event	Touch Event
WRITE CHANGES READ SETTINGS USER SETTINGS		CH0 Filtered Counts	SYSTEM	FLAGS 2
No Changes To Write Ox8000 Ø Cycle Setup 0x8000 Ø Global Cycle Setup 0x8400 B Button Setup 0 - 2 0x9000 B Button Setup 3 - 4 0x9300	600	CH3 Filtered Counts CH2 Filtered Counts CH4 Filtered Counts	ATI Event	Power Event
Button Setup 3 - 4 0x9300 Button Setup 5 - 7 0x9500		CH0 Filtered LTA	PROX	STATES
CH0 Setup 0xA000		CH2 Filtered LTA	CH0 Prox	CH1 Prox
CH1 Setup 0xA100	400 1	CH3 Filtered LTA	CH2 Prox	CH3 Prox
CH2 Setup 0xA200 CH3 Setup 0xA300	•	CH5 Filtered LTA	CH4 Prox	CH5 Prox
CH4 Setup 0xA400	200 -	CH7 Filtered LTA	CH6 Prox	CH7 Prox
CH5 Setup 0xA500		Select All	CH0 Touch	STATES CH1 Touch
CH6 Setup 0xA600 CH7 Setup 0xA700			CHU louch CH2 Touch	CH1 Touch CH3 Touch
System Settings 0xD0	<u>1</u>		CH2 Touch CH4 Touch	CH3 Touch CH5 Touch
	700 750 800 850 900 950 1000 1050 1100 1150		CH4 Ibuch CH6 Touch	CH3 Touch

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 green block in Figure 3.4.

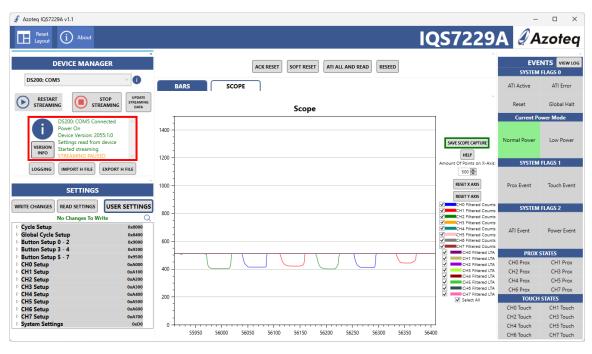


Figure 3.4: Saving Streamed Data

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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🖋 Scope Captu —	o x	<							
			🖉 Save As						×
SCOPE CAPTUR	KE		\leftarrow \rightarrow \vee \uparrow 🚞 > Documents > Azoteq > Resources			~ C	Search Resources	5	م
Available Range:			Organize 👻 New folder					≣ •	0
55909-56408 (500 datapoints)			Rallery Name	Date modified	Туре	Size			
				No items match y	our search.				
 Save entire range 			📒 Desktop 🖈						
Select range:			🛓 Downloads 🖈						
Sciect runger			Documents *						
			Rictures 🖈						
Minimum:		_	🕑 Music 🖈						
	55909	×	🛂 Videos 🛷						
Maximum:			File name: IQS7229A_scopecapture.csv						~
	56408	×	CSV File (.csv) (*.csv)						~
SAVE TO CSV			∧ Hide Folders				Save	Cancel	
]						

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 IQS7229A to a CSV file. Click the "Logging" button in the Configuration Tool Manager panel to open the logging window.

DEVICE MANAGER					
DS200: COM5	~ ()				
RESTART STREAMING STREAMING	UPDATE STREAMING DATA				
DS200: COM5 Connected Power On Device Version: 2055:1:0 Settings read from device Started streaming STREAMING PAUSED					
LOGGING IMPORT H FILE EXPORT H	IFILE				

Figure 3.6: Logging Function Using the Configuration Tool Manager

From here, the desired variables from the IQS7229A can be enabled or disabled. To start logging, click the "Start Logging" button, and choose the destination of the CSV log file.



LOGGING CHOOSE VALUES TO LOG: Logging Module Events and Flags CH Counts CH1TAs CH0 Raw Counts CH1 Raw Counts CH2 Raw Counts CH3 f0 Raw Counts CH Ref LTA System Flags 1 CH0 Counts CH1 ITA CH0 f0 Raw Counts CH1 f0 Raw Counts CH2 f10 Raw Counts CH3 f0 Raw Counts CH3 f0 Raw Counts CH3 f1 Raw Counts
Events and Flags CH Counts CH ITAs CH0 Raw Counts CH1 Raw Counts CH2 Raw Counts CH3 Raw Counts CH Ref LTA Ø System Flags 0 Ø CH0 Counts Ø CH0 Cints Ø CH0 UTA CH0 07 Raw Counts CH1 f0 Raw Counts CH2 Raw Counts CH3 f0 Raw Counts Glabal R Ø System Flags 1 Ø CH1 Counts Ø CH1 LTA CH0 07 Raw Counts CH1 f1 Raw Counts CH2 f1 Raw Counts CH3 f1 Raw Counts Glabal R Ø System Flags 2 Ø CH2 Counts Ø CH1 LTA CH0 f1 Raw Counts CH1 f1 Raw Counts CH2 f1 Raw Counts CH3 f1 Raw Counts Glabal R Ø Channel Prox State 0 Ø CH3 COunts Ø CH4 LTA CH0 f2 Raw Counts CH1 f2 Raw Counts CH3 f2 Raw Counts Ø Channel Prox State 0 Ø CH4 COunts Ø CH4 LTA CH0 f2 Raw Counts CH3 f2 Raw Counts CH3 f2 Raw Counts
Events and Flags CH Counts CH UTAs CH0 Raw Counts CH1 Raw Counts CH2 Raw Counts CH3 Raw Counts CH Ref LTA Ø System Flags 0 Ø CH0 Counts Ø CH0 UTA CH0 17A CH1 7A
Øystem Flags 0 Ø CH0 Counts Ø CH0 LTA CH0 f0 Raw Counts CH1 f0 Raw Counts CH1 f0 Raw Counts CH3 f0 Raw Counts Global R Ø System Flags 1 Ø CH1 Counts Ø CH1 LTA CH0 f1 Raw Counts CH1 f0 Raw Counts CH2 f1 Raw Counts Global R Ø System Flags 2 Ø CH2 Counts Ø CH2 LTA CH0 f2 Raw Counts CH1 f2 Raw Counts CH2 f1 Raw Counts CH3 f1 Raw Counts Ø Channel Prox State 0 Ø CH3 Counts Ø CH3 LTA CH0 f2 Raw Counts CH1 f2 Raw Counts CH3 f2 Raw Counts Ø Channel Prox State 0 Ø CH3 COunts Ø CH4 LTA CH0 f2 Raw Counts CH1 f2 Raw Counts CH3 f2 Raw Counts
Image: Control of Contro of Control of Control of Control of Control of Control of

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 IQS7229A, 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.

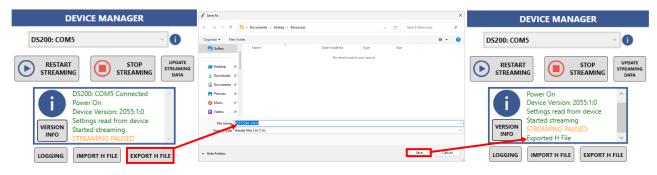


Figure 3.8: Exporting a Defined Configuration

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 using the 'ImportT H File' button. Additional information will be provided, to verify that the file was imported correctly:

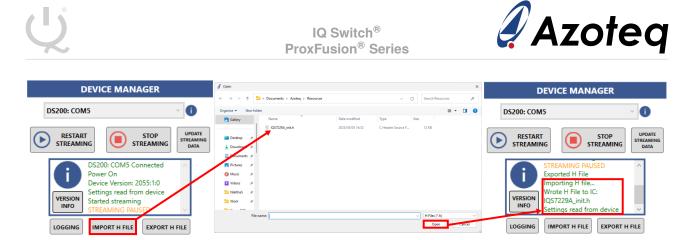


Figure 3.9: Importing a Predefined Configuration

3.5 Command Buttons

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

	ACK RESET	SOFT RESET	ATI ALL AND READ	RESEED
--	-----------	------------	------------------	--------

Figure 3.10: Command Buttons

3.5.1 Acknowledge Reset

The "Ack Reset" button clears the IQS7229A's reset flag by writing the **Acknowledge Reset** bit to the IC. This should be the fist 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.

The GUI will show that a reset has occurred by changing the Ack Reset button colour to red.

3.5.2 Soft Reset

The "Soft Reset" button issues a command to the IQS7229A 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 **Force ATI** command to the IQS7229A. 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 IQS7229A 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 IQS7229A's status registers.

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

3.6.1 System Status

The following events are read from the System Status register.

> System Flags 0

- ATI Active: The IQS7229A is currently calibrating the channels.
- ATI Error: The IQS7229A failed to calibrate one or more channels correctly.
- Reset: A reset event has occurred, and all settings have been reset to defaults.
- Global Halt: Active when any channels' LTA value is halted by a prox or touch detection (requires global halt to be enabled).
- > **Current Power Mode**: Indicates the current power mode of the device.
- > System Flags 1:
 - Prox Event: The proximity state of one of the channels had changed.
 - Touch Event: The touch state of one of the channels had changed.
- > System Flags 2
 - ATI Event: An ATI event occurred, and some calibration values may have been updated.
 - Power Event: The power mode has recently changed.
- > **Touch-Prox Status**: These flags indicate the proximity and touch status of each channel.

EVE	NTS V	
SYSTEM	FLAGS 0	
ATI Active	ATI I	Error
Reset	Globa	l Halt
Current Po	wer Mod	le
Normal Power		ower
SYSTEM	FLAGS 1	
Prox Event	Touch	Event
SYSTEM	FLAGS 2	
ATI Event		
ATI Event PROX S	Power	
	Power	Event
PROX	Power	· Event Prox
PROX S CH0 Prox	Power STATES CH1	Event Prox Prox
CH0 Prox CH2 Prox CH2 Prox CH4 Prox CH6 Prox	Power STATES CH1 CH3 CH5 CH7	Prox Prox Prox Prox Prox
CH0 Prox CH2 Prox CH2 Prox CH4 Prox CH6 Prox	Power CTATES CH1 CH3 CH5 CH7 STATES	Event Prox Prox Prox Prox Prox
CH0 Prox CH2 Prox CH2 Prox CH4 Prox CH6 Prox	Power STATES CH1 CH3 CH5 CH7	Event Prox Prox Prox Prox Prox
PROX S CH0 Prox CH2 Prox CH4 Prox CH6 Prox TOUCH	Power CTATES CH1 CH3 CH5 CH7 STATES	Event Prox Prox Prox Prox Prox
PROX S CH0 Prox CH2 Prox CH4 Prox CH6 Prox TOUCH CH0 Touch	Power CH1 CH3 CH5 CH7 STATES CH1 T CH3 T CH3 T	Event Prox Prox Prox Prox Touch Touch
PROX S CH0 Prox CH2 Prox CH4 Prox CH6 Prox TOUCH CH0 Touch CH2 Touch	Power CH1 CH3 CH5 CH7 STATES CH1 T CH3 T CH3 T	Event Prox Prox Prox Prox Prox Touch

Figure 3.11: Events Panel



4 System Settings

This section quickly explains some of the basic system settings and commands that are not specific to any sensor or UI. These settings can be accessed in the "User Settings" window, on the first tab.

<i> </i>		– 🗆 X
	System Settings	
System Settings Cycle Settings 0 - 3	Interface Selection: I2C Streaming Y	Power Mode Selection: 4.1 Automatic
CH0 Settings CH1 Settings CH2 Settings	ATI Error Timeout (0.5s) (0 = never retry ATI again) 2	ATI Report Rate (ms)
CH3 Settings CH4 Settings CH5 Settings	Normal Mode Timeout (ms)	0 ms 4.1 Normal Mode Report Rate (ms)
CH6 Settings CH7 Settings Channel 0-4 Timeouts	(0 = never timeout) 3000 ♀ 3000 ms	10 🗢 10 ms
Channel 5-7 Timeouts General Channel Settings Filter Betas CH0 - CH2	Communication Timeout (ms)	Low Power Mode Report Rate (ms)
Filter Betas CH3 - CH5 Filter Betas CH6 - CH7	Enable Alternate Frequency Set	
		4.2
	Event enable (set to enable event i Image: Prox Event i	
	WRITE CHANGES READ SETTI	INGS
	No Changes To Write	

Figure 4.1: IQS7229A System Settings

4.1 Power Modes

The IQS7229A supports a number of different power modes. The current power mode of the IQS7229A can be set via the Power Modes dropdown menu in Figure 4.1.

- > Normal Power (NP): Flexible key scan rate.
- > Low Power (LP): Flexible key scan rate. Typically set to a slower rate than NP.
- > Automatic Power Modes: Automatically switches between power modes.

In order to optimise power consumption and performance, power modes are "stepped" by default in





order to move to power-efficient modes when no interaction has been detected for a certain (configurable) time known as the "mode timeout". The value for the power mode to never timeout (i.e., the current power mode will never progress to a lower power mode), is zero.

The sample rate of each power mode can be configured by changing the associated report rate. The report rate is the time between consecutive cycles, in milliseconds, where each cycle performs measurements on all channels. Higher power modes may sample faster at the cost of higher current consumption.

4.2 Event Mask

The event mask is used to enable or disable specific events, and is particularly useful in event mode, as disabled events will not open new communication windows. As an example, it is often useful to ignore ATI events. By clearing the ATI Event Mask bit, the IQS7229A will not open a communication window to report ATI events.

This only affects the behaviour of I²C Event Mode — the associated event flags will still be set.



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5 Cycle Setup

All the cycles of the IQS7229A are configured in self-capacitance mode and a conversion frequency of 500kHz as shown in Figure 5.1.

The IQS7229A device utilises CRx0 - CRx3 for ProxFusion[®] Engine A and CRx4 - CRx7 for ProxFusion[®] Engine B. Table 5.1 provides a full summary of the transmitter-receiver pin combinations of the different channels.

Note: The Tx corresponding to the CRx number needs to be selected to get the hardware correct for self-capacitive sensing.

Channels	Receiver
CH0	CRx0
CH1	CRx1
CH2	CRx2
CH3	CRx3
CH4	CRx4
CH5	CRx5
CH6	CRx6
CH7	CRx7

Table 5.1: Channel receiver pins



🧳 Settings		- 🗆 ×
	Cycle Settings 0 - 3	
System Settings	Cycle 0 - CH0 & CH4	
Cycle Settings 0 - 3	PXS Mode:	Cycle 0 Conversion Frequency:
CH0 Settings	Self Capacitance ~	500kHz ~
CH1 Settings	Tx Select	
CH2 Settings		
CH3 Settings		
CH4 Settings		
CH5 Settings		
CH6 Settings	Cycle 1 - CH1 & CH5	
CH7 Settings	PXS Mode:	Cycle 1 Conversion Frequency:
Channel 0-4 Timeouts	Self Capacitance v	500kHz ×
Channel 5-7 Timeouts	Tx Select	
General Channel Settings	□ CTx0 ✔ CTx1 □ CTx2 □ CTx3 □ CT	x4 🗹 CTx5 🗌 CTx6 🗌 CTx7
Filter Betas CH0 - CH2		
Filter Betas CH3 - CH5		
Filter Betas CH6 - CH7	Cycle 2 - CH2 & CH6	
	PXS Mode: Self Capacitance	Cycle 2 Conversion Frequency: 500kHz ~
		SUUKHZ
	Tx Select	
	□ CTx0 □ CTx1 🗹 CTx2 □ CTx3 □ CT	x4 CTx5 🖌 CTx6 CTx7
	Cycle 3 - CH3 & CH7	
	PXS Mode:	Cycle 3 Conversion Frequency:
	Self Capacitance v	500kHz ×
	Tx Select	
	 CTx0 CTx1 CTx2 ✔ CTx3 CT	х4 □ СТх5 □ СТх6 ✔ СТх7
	WRITE CHANGES READ SETTIN	55
	No Changes To Write	

Figure 5.1: IQS7229A Cycle Setup



6 Button Setup

The configurable button settings as shown in Figure 6.1 below include proximity threshold, proximity enter and exit debounce, touch threshold and hysteresis, and ATI settings.

🖉 Settings		– 🗆 X
	CH0 Settings	
System Settings	Rx Select:	Channel Activation:
Cycle Settings 0 - 3 CH0 Settings	CRx0 CRx1 CRx2 CRx3	CH0 Enabled
CH1 Settings CH2 Settings CH3 Settings	ATI Band: Cs Size: 1/8 * Target * 40 pF *	
CH4 Settings CH5 Settings CH6 Settings CH7 Settings	Button 0 Prox Threshold 50 🗲 50 counts	
Channel 0-4 Timeouts	Button 0 Debounce samples Enter	Button 0 Debounce samples Exit
Channel 5-7 Timeouts General Channel Settings	4	4
Filter Betas CH0 - CH2 Filter Betas CH3 - CH5 Filter Betas CH6 - CH7	Button 0 Touch Threshold threshold*LTA/256 46 🜩 92 counts	Button 0 Touch Hysteresis % of touch threshold 0 0 %
	CH0 ATI Base 7	CH0 ATI Target 64 🗢 512 counts
	CH0 ATI Mode: Full ATI ~	CH0 Coarse Fractional Multiplier
	CH0 Coarse Fractional Divider	CH0 Fine Fractional Divider
	CH0 Compensation Selection	CH0 Compensation Divider
	Global Halt	
	WRITE CHANGES READ SETTIN	GS
	No Changes To Write	

Figure 6.1: IQS7229A Button Setup

All the buttons have the same settings. Again, take note of the displayed values and units below each slider, as not all settings are shown in decimal units. Some settings are presented in fixed steps or percentages. The threshold can be calculated as shown in Equation 1.

Button touch threshold =
$$\frac{\text{threshold decimal setting}}{256} \times \text{LTA}$$
 (1)

The ATI is a sophisticated technology implemented in the new ProxSense® devices to allow optimal performance of the devices for a wide range of sensing electrode capacitances, without modification to external components. The ATI settings allow tuning of various parameters. Re-ATI will be triggered



if certain conditions are met. One of the most important features of the Re-ATI is that it allows easy and fast recovery from an incorrect ATI, such as when performing ATI during user interaction with the sensor. The re-ATI boundary can be calculated as shown in Equation 2.

Re-ATI Boundary = ATI Target
$$\pm \left(\frac{1}{8} \times \text{ATI Target}\right)$$
 (2)

Other configurable settings as shown in Figures 6.2 and 6.3 include proximity event timeout, touch event timeout, and beta filters. After a prox or touch event timeout, a reseed of the LTA is forced. If the LTA is outside of the LTA ATI band a re-ATI event will occur if ATI is not disabled.

		-	
	Channel 0-4 Time	eouts	
System Settings	Channel 0		
Cycle Settings 0 - 3 CH0 Settings CH1 Settings CH2 Settings CH3 Settings CH4 Settings CH5 Settings	Prox Event Timeout (0 = never timeout) 4 s Channel 1	Touch Event Timeout (0 = never timeout)	20 文 = 10 s
CH3 Settings CH6 Settings CH7 Settings Channel 0-4 Timeouts Channel 5-7 Timeouts General Channel Settings Filter Betas CH0 - CH2	Prox Event Timeout (0 = never timeout) 4 s Channel 2	Touch Event Timeout	20 🗲 = 10 s
Filter Betas CH3 - CH5 Filter Betas CH6 - CH7	Prox Event Timeout (0 = never timeout) 4 s Channel 3	Touch Event Timeout	20 文 = 10 s
	Prox Event Timeout (0 = never timeout) 4 s Channel 4	Touch Event Timeout (0 = never timeout)	20 🗢 10 s
	Prox Event Timeout (0 = never timeout)	Touch Event Timeout	20 🗲 10 s
		SETTINGS	
	No Changes To Wi	rite	

Figure 6.2: IQS7229A Button Timeout Setup





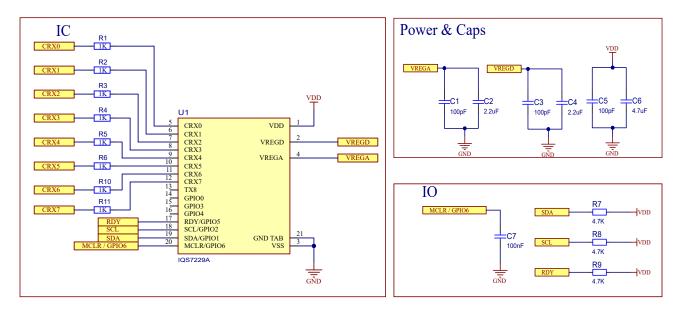
Figure 6.3: IQS7229A Button Beta Setup

The default beta parameter options have been selected to accommodate the most common and generic applications. They are intended to filter according to specific power mode operations, thereby ensuring minimal noise while maintaining substantial response without lagging outputs. The parameters should also be adjusted to modify LTA amounts for slowly varying counts and to utilise the fast LTA beta for rapidly responding to count behaviour contrary to normal activations. These defaults are the recommended values and serve as a good starting point.





7 Reference Design



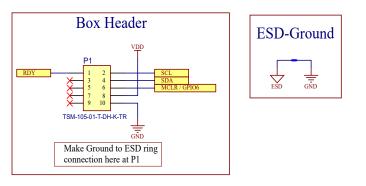
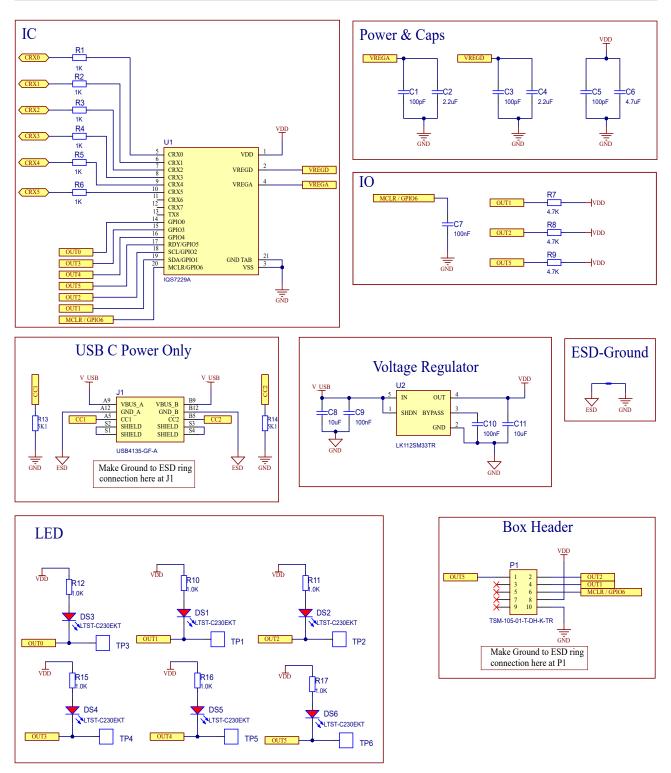


Figure 7.1: 8 Button Self-Capacitance Reference Schematic (AZP1376C1)









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