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IQS620 / IQS620A Datasheet

Combination sensor with dual channel capacitive proximity/touch, Hall-effect sensor and inductive sensing

The IQS620(A) ProxFusion® IC is a multifunctional capacitive, Hall-effect & inductive sensor designed for applications where any or all of the technologies may be required. The IQS620(A) is an ultra-low power solution designed for short or long term activations through any of the sensing channels. The IQS620(A) is fully I²C compatible and can be configured to output main trigger events on GPIOs.

Features

- **Unique combination of sensing technologies:**
  - Capacitive sensing
  - Hall-effect sensing
  - Inductive sensing
- **Capacitive sensing**
  - Full auto-tuning with adjustable sensitivity
  - 2pF to 200pF external capacitive load capability
  - Enhanced temperature stability
- **Hall-effect sensing**
  - On-chip Hall-effect measurement plates
  - Dual direction Hall switch sensor UI
  - 2 level detection (widely variable)
  - Detection range 10mT – 200mT
- **Inductive sensing**
  - 2 level detection and hysteresis for inductive sensing
  - External sense coil required (PCB trace)
- **Multiple integrated UI** options based on years of experience in sensing on fixed and mobile platforms:
  - Proximity wake-up; Touch; SAR; Hysteresis
- **A**utomatic **T**uning **I**mplementation (**ATI**) – performance enhancement (10bit)
- Minimal external components
- Standard **I²C** interface
- Optional **RDY indication** for event mode operation
- **Low power consumption:**
  - 130uA (100Hz response, 1ch inductive)
  - 105uA (100Hz response, 2ch Hall)
  - 90uA (100Hz response, 3ch capacitive)
  - 75uA (100Hz response, 1ch cap. SAR)
  - 46uA (20Hz response, 1ch inductive)
  - 38uA (20Hz response, 2ch Hall)
  - 32uA (20Hz response, 3ch capacitive)
  - 27uA (20Hz response, 1ch cap. SAR)
  - 2.5uA (4Hz response, 1ch cap. wake-up)
- **Supply voltage:**
  - IQS620: 2.0V to 3.3V
  - IQS620A: 1.8V to 3.3V
- **Low profile packages:**
  - DFN(3x3) – 10 pin package
  - WLCSP – 9 pin package

DFN(3x3)-10 | WLCSP-9

Representations only, not actual marking

Applications

- Mobile electronics (phones/tablets)
- SAR safety requirements for laptops, tablets and phones
- Wearable devices
- White goods and appliances
- Human Interface Devices
- Proximity activated backlighting
- Applications with long-term activation
- Aftermarket automotive[1]

Available Packages		
T_A	DFN(3x3)-10	WLCSP-9
-20°C to +85°C	IQS620(A)	IQS620A

[1] The part is not automotive qualified.

Table of Contents

List of abbreviations

AC – Alternating Current
ACK – I²C Acknowledge condition
ATI – Automatic Tuning Implementation
BOD – Brown Out Detection
CS – Sampling Capacitor
DSP – Digital Signal Processing
ESD – Electrostatic Discharge
FOSC – Main Clock Frequency Oscillator
GND – Ground
GPIO – General Purpose Input Output
I²C – Inter-Integrated Circuit
IC – Integrated Circuit
LP – Low Power
LPOSC – Low Power Oscillator
LTA – Long Term Average
LTX – Inductive Transmitting electrode
MCU – Microcontroller unit
MSL – Moisture Sensitive Level
MOV – Movement
MOQ – Minimum Order Quantity
NACK – I²C Not Acknowledge condition
NC – Not Connect
NP – Normal Power
OTP – One Time Programmable
PMU – Power Management Unit
POR – Power On Reset
PWM – Pulse Width Modulation
QRD – Quick Release Detection
RDY – Ready Interrupt Signal
RX – Receiving electrode
SAR – Specific Absorption Rate
SCL – I²C Clock
SDA – I²C Data
SR – I²C Slew rate
THR – Threshold
UI – User Interface
ULP – Ultra Low Power

1 Introduction

1.1 ProxFusion®

The ProxFusion® sensor series provides all of the proven ProxSense® engine capabilities with additional sensors types. A combined sensor solution is available within a single platform.

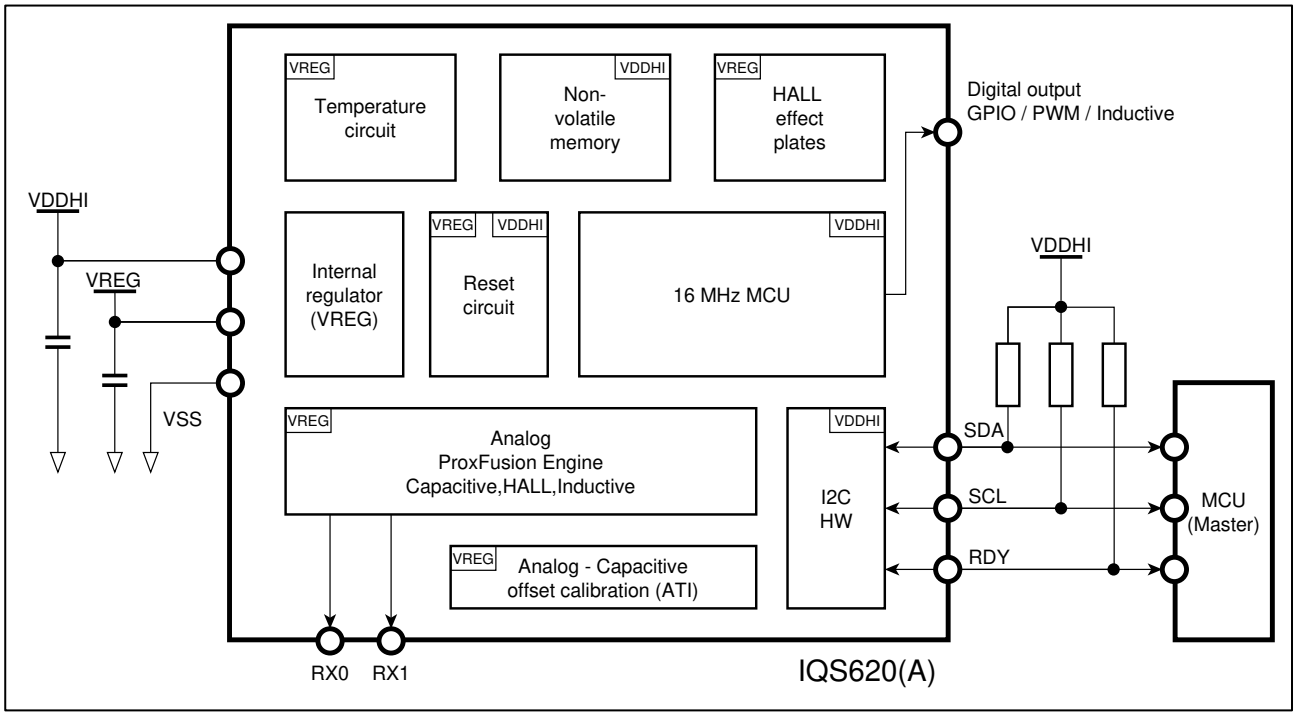


Figure 1.1 IQS620(A) functional block diagram

1.2 Packaging and Pin-Out

1.2.1 DFN(3x3)-10

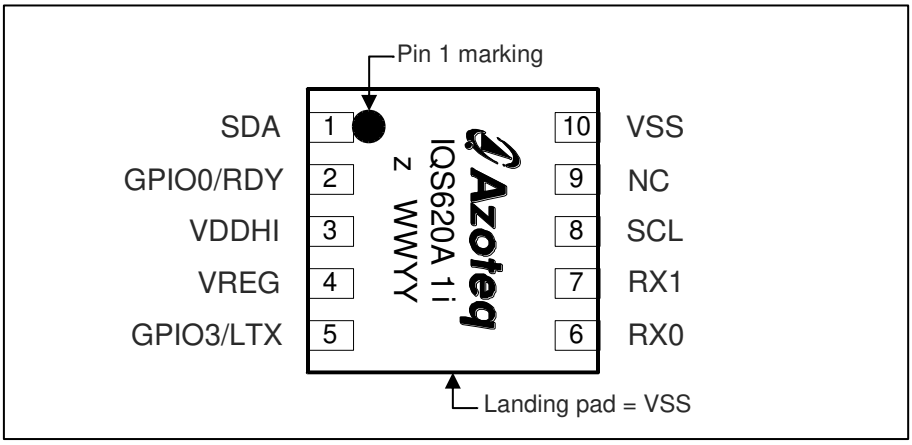


Figure 1.2 IQS620(A) pin-out (DFN(3x3)-10 package top view; markings may differ)

Table 1.1 DFN(3x3)-10 pin-out description

IQS620(A) in DFN(3x3)-10			
Pin	**Name**	**Type**	**Function**
1	SDA	Digital input / output	**SDA** (I^2C Data signal)
2	GPIO0 / RDY	Digital output Open drain active low logic	SAR activation output (higher priority) **RDY** (I^2C Ready interrupt signal; lower priority)
3	VDDHI	Supply input	Supply: IQS620: 2.0V – 3.3V IQS620A: 1.8V – 3.3V
4	VREG	Voltage regulator output	Regulates the system's internal voltage Requires external capacitors to ground
5	GPIO3 / LTX	Digital output / Analogue transmitter electrode	PWM signal output (higher priority) / Connect to inductive sensor's transmitting coil (lower priority)
6	RX0	Analogue receiving electrode	Connect to conductive area intended for sensor receiving
7	RX1	Analogue receiving electrode	Connect to conductive area intended for sensor receiving
8	SCL	Digital input / output	**SCL** (I^2C Clock signal)
9	NC	Not connect	Not connect
10	VSS	Supply input	Common ground reference

1.2.2 WLCSP-9

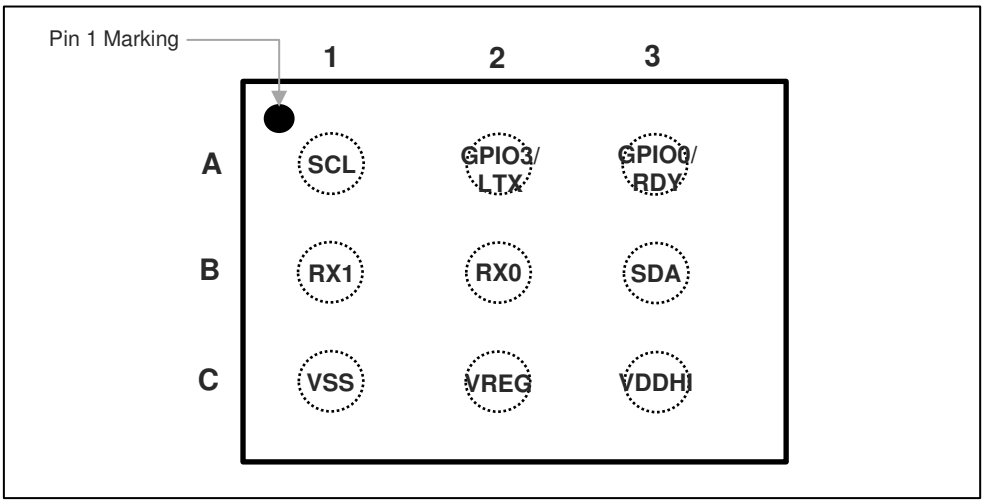


Figure 1.3 IQS620A pin-out (WLCSP-9 package top view; markings may differ)

Table 1.2 WLCSP-9 pin-out description

IQS620A in WLCSP-9			
Pin	**Name**	**Type**	**Function**
A1	SCL	Digital input / output	**SCL** (I^2C Clock signal)
A2	GPIO3 / LTX	Digital output / Analogue transmitter electrode	PWM signal output (higher priority) / Connect to inductive sensor's transmitting coil (lower priority)
A3	GPIO0 / RDY	Digital output Open drain active low logic	SAR activation output (higher priority) **RDY** (I^2C Ready interrupt signal; lower priority)
B1	RX1	Analogue receiving electrode	Connect to conductive area intended for sensor receiving
B2	RX0	Analogue receiving electrode	Connect to conductive area intended for sensor receiving
B3	SDA	Digital input / output	**SDA** (I^2C Data signal)
C1	VSS	Supply input	Common ground reference
C2	VREG	Voltage regulator output	Regulates the system's internal voltage Requires external capacitors to ground
C3	VDDHI	Supply input	Supply: IQS620A: 1.8V – 3.3V

1.3 Reference schematic

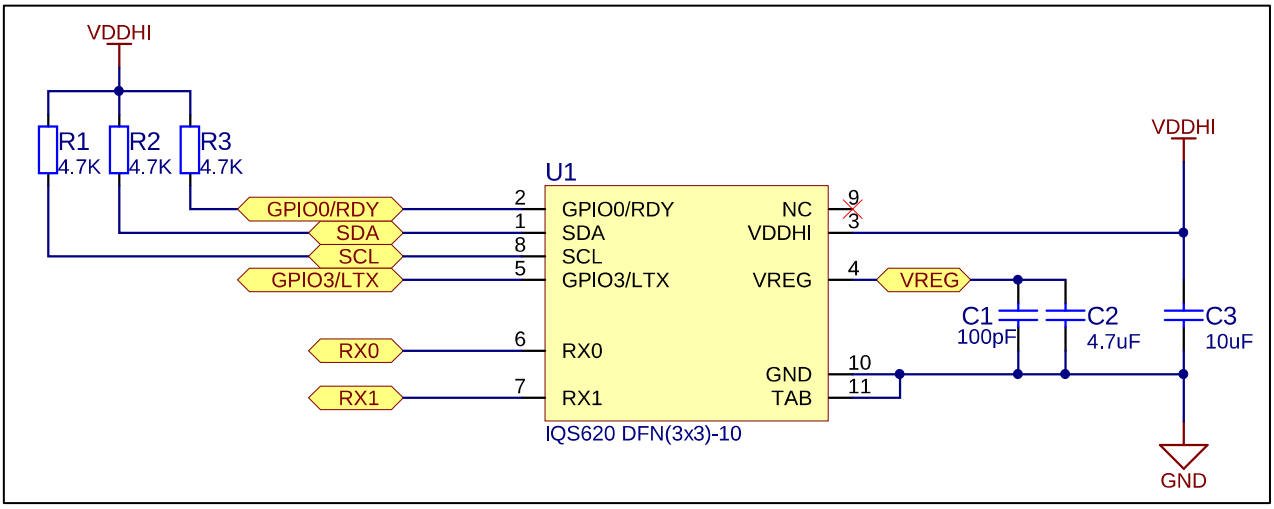


Figure 1.4 IQS620(A) DFN(3x3)-10 reference schematic

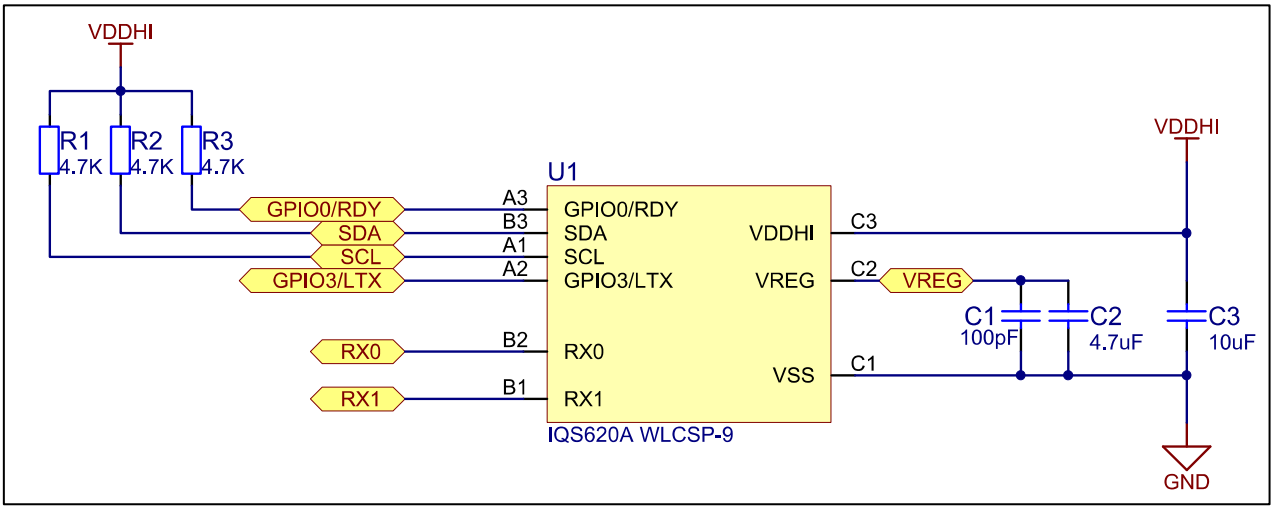


Figure 1.5 IQS620A WLCSP-9 reference schematic

1.4 Sensor channel combinations

The table below summarizes the IQS620(A)'s sensor and channel associations.

Table 1.3 Sensor - channel allocation

	Sensor / UI type	CH0	CH1	CH2	CH3	CH4	CH5
Capacitive	Self capacitive	o	o	o			
	SAR UI 1CH self (2 level + movement)	• Main	• Movement				
	SAR UI 2CH self (3 level)	•	•	•			
	Hysteresis UI			•			
Hall-effect	Hall-effect switch UI					• Positive	• Negative
Inductive	Mutual inductive	o	o	o			
	Hysteresis UI			•			
Temperature	Temperature monitoring				•		

Key:

○ - Optional implementation

● - Fixed use for UI

1.5 ProxFusion® Sensitivity

The measurement circuitry uses a temperature stable internal sample capacitor (C_S) and internal regulated voltage (V_{REG}). Internal regulation provides for more accurate measurements over temperature variation. The size of the C_S capacitor can be decreased to increase sensitivity on the capacitive channels of the IQS620(A).

$$Sensitivity \propto \frac{1}{C_s}$$

The Automatic Tuning Implementation (ATI) is a sophisticated technology implemented on the ProxFusion® device series. It allows for optimal performance of the devices for a wide range of sense electrode capacitances, without modification or addition of external components. The ATI functionality ensures that sensor sensitivity is not affected by external influences such as temperate, parasitic capacitance and ground reference changes.

The ATI process adjusts three values (Coarse multiplier, Fine multiplier, Compensation) using two parameters (ATI base and ATI target) as inputs. A 10-bit compensation value ensures that an accurate target is reached. The base value influences the overall sensitivity of the channel and establishes a base count for the ATI algorithm. A rough estimation of sensitivity can be approximated using the relation:

$$Sensitivity \propto \frac{Target}{Base}$$

As seen from this equation, the sensitivity can be increased by either increasing the Target value or decreasing the Base value. A lower base value will typically result in lower multipliers and more compensation would be required. It should, however, be noted that a higher sensitivity will yield a higher noise susceptibility. Refer to Appendix B: Hall ATI for more information on Hall ATI.

2 Capacitive sensing

2.1 Introduction to ProxSense®

Building on the previous successes from the ProxSense® range of capacitive sensors, the same fundamental sensor engine has been implemented in the ProxFusion® series.

The capacitive sensing capabilities of the IQS620(A) include:

- Self-capacitive sensing.
- Maximum of 3 capacitive channels to be individually configured.
  - Individual sensitivity setups
  - Alternative ATI modes
- Discreet button UI:
  - Fully configurable 2 level threshold setups for prox & touch activation levels.
  - Customizable filter halt time
- Single channel SAR UI:
  - For passing the SAR qualification
  - Movement sensing to distinguish between stationary in-contact objects and human interference
  - Quick release detection feature (fully configurable)
  - GPIO output of SAR activation (on GPIO0) for driving e.g. WWAN module directly
  - Up to three triggers levels (proximity, touch and deep touch) for dynamic power reduction
  - All triggers offer never time-out capability
- Two Channel SAR UI:
  - For passing the SAR qualification latest requirements (EN50566:2013)
  - Up to three dedicated triggers levels per sensor for dynamic power reduction
  - All triggers offer never time-out capability
- Hysteresis UI:
  - 4 Optional prox and touch activation hysteresis selections.
  - Fully configurable 2 level threshold setups for prox & touch activation levels.
  - Customizable filter halt time

2.2 Channel specifications

The IQS620(A) provides a maximum of 3 channels available to be configured for capacitive sensing. Each channel can be setup separately according to the channel's associated settings registers.

There are three distinct capacitive user interfaces available to be used.

a) Self capacitive proximity/touch UI

b) SAR UIs

c) Hysteresis UI

When the single channel SAR UI is activated (ProxFusion Settings4: bit7-6):

- Channel 0 is used for the main capacitive sensing channel for SAR detection and release detection.
- Channel 1 is used for capacitive movement detection.

When the two channel SAR UI is active (ProxFusion Settings4: bit7-6):

- Channel 0 & 1 is used for the first or main SAR antenna sensor (Rx0)
- Channel 2 is used for a second SAR antenna sensor (Rx1)

Table 2.1 Capacitive sensing - channel allocation

Mode	CH0	CH1	CH2	CH3	CH4	CH5
Self capacitive	o	o	o			
Single SAR UI self	• Main	• Movement				
Two channel SAR UI self	•	•	•			
Hysteresis UI			•			

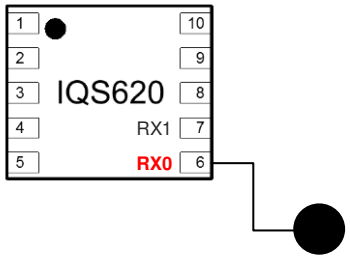
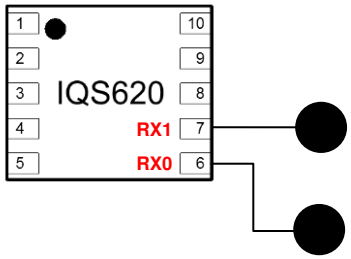
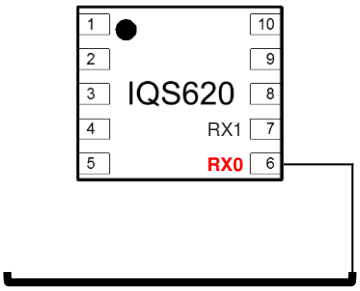
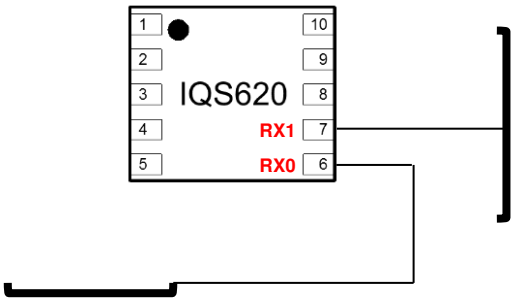
Key:

○ - Optional implementation
• - Fixed use for UI

2.3 Hardware configuration

In the table below are multiple options of configuring sensing (Rx) electrodes to realize different implementations (combinations not shown).

Table 2.2 Capacitive sensing - hardware description

	Self capacitive configuration
1 button	
2 buttons	
Single SAR antenna	
Two SAR antenna	

2.4 Software configuration

2.4.1 Registers to configure for capacitive sensing:

Table 2.3 Capacitive sensing settings registers

Address	Name	Description	Recommended setting
0x40 0x41 0x42	ProxFusion Settings 0	Sensor mode and configuration of each channel.	Sensor mode should be set to capacitive mode An appropriate RX should be chosen
0x43 0x44 0x45	ProxFusion Settings 1	Channel settings for the ProxSense sensors	Full ATI is recommended for fully automated sensor tuning.
0x46 0x47 0x48	ProxFusion Settings 2	ATI settings for ProxSense sensors	ATI target should be more than ATI base to achieve an ATI
0x49 0x4A 0x4B	ProxFusion Settings 3	Additional Global settings for ProxSense sensors	None
0x50	ProxFusion Settings 4	UI enable command and filter settings	Choose Normal 2 Channel, Single SAR or 3 level dual SAR UI
0x51	ProxFusion Settings 5	Advance sensor settings	None

2.4.2 Registers to configure for the standard UI (proximity / touch):

Please note: If the standard UI (proximity / touch) is used then the single SAR UI (proximity / touch / movement) cannot be used and the special SAR registers should not be configured or used. Initializing inactive UI registers can corrupt other active UI's.

Table 2.4 standard UI settings registers

Address	Name	Description
0x60 0x62 0x64	Proximity threshold	Proximity Thresholds for all capacitive channels (except for single channel SAR active on channel 0)
0x61 0x63 0x65	Touch threshold	Touch Thresholds for all capacitive channels
0x66	ProxFusion standard UI halt time	Halt timeout setting for all capacitive channels

2.4.3 Registers to configure for the two channel SAR UI (proximity / touch / deep touch):

Please note: If the two channel SAR UI is used then the special SAR UI registers (proximity, movement, release detection) cannot be used and the settings registers should be used as shown in the table below. Initializing inactive UI registers can corrupt other active UI's.

Table 2.5 Two channel SAR UI settings registers

Address	Name	Description
0x50	ProxFusion settings 4	Two channel SAR UI enable command (bit7-6).
0x80	Hysteresis settings	Disable Hysteresis for proximity and touch thresholds
0x60	CH0 Proximity threshold	SAR Antenna 1 proximity threshold
0x61	CH0 Touch threshold	SAR Antenna 1 touch threshold
0x63	CH1 Touch threshold	SAR Antenna 1 deep touch threshold
0x81	CH2 filter halt threshold	SAR Antenna 2 proximity threshold
0x82	CH2 proximity threshold	SAR Antenna 2 touch threshold
0x83	CH2 touch threshold	SAR Antenna 2 deep touch threshold
0x66	ProxFusion standard UI halt time	Halt timeout setting for all capacitive channels. Set to 0xFF for no time-out as required by SAR applications

2.4.4 Registers to configure for the single channel SAR UI:

Please note: If the single SAR UI is used then the discreet button UI cannot be used and the ProxFusion discrete UI settings registers should not be configured or used. Initializing inactive UI registers can corrupt other active UI's.

Table 2.6 Single channel SAR UI settings registers

Address	Name	Description
0x50	ProxFusion settings 4	Single channel SAR UI (prox / touch / movement) enable command (bit7-6).
0x70	SAR UI Settings 0	Filter settings for movement and QRD, SAR activation output to GPIO0 (RDY signal disabled)
0x71	SAR UI Settings 0	LTA halt timeout and movement threshold settings
0x72	Quick release threshold Ch0	Threshold setting to trigger a quick release based on the Quick release count values in register 0xF2 & 0xF3.
0x73	Filter halt threshold Ch0	Threshold value for channel 0 LTA filter halt
0x74	SAR Proximity threshold Ch0	Proximity threshold used for SAR activations on channel 0
0x75	Quick release halt time	Halt timeout setting for channel 0 LTA after a quick release trigger with zero movement

2.4.5 Registers to configure for the Hysteresis UI:

Please note: Only channel 2 can be used with the Hysteresis UI. Please setup channel 2 accordingly if required. The Hysteresis UI can be used simultaneously with the discrete button UI or SAR UI.

Table 2.7 Hysteresis UI settings registers

Address	Name	Description
0x50	ProxFusion settings 4	Hysteresis UI enable command (bit6).
0x80	Hysteresis UI settings	Hysteresis selection options for prox and touch activations
0x81	Hysteresis UI filter halt threshold	UI filter halt threshold value to halt the LTA value from following
0x82	Hysteresis UI prox threshold	Threshold setting to trigger a prox activation on channel 2 data.
0x83	Hysteresis UI touch threshold	Threshold value to trigger a touch activation on channel 2 data.

2.4.6 Example code:

Example code for an Arduino Uno can be downloaded at:

www.azoteq.com//images/stories/software/IQS62x_Demo.zip

2.5 Sensor data output and flags

The following registers should be monitored by the master to detect capacitive sensor output and SAR activations.

a) The **Global events register (0x11)** will show the IQS620(A)'s main events. Bit0 is dedicated to the ProxSense activations and two other bits (bit7 & bit1) is provided to show the state of the single channel SAR UI. SINGLE_SAR_ACTIVE (bit7) will be constantly active during SAR detection. SAR event (bit1) will toggle upon each SAR qualified event or change of SAR status. Bit3 is dedicated to the Hysteresis UI activations (for ch2 data only).

Global Events (0x11)								
Bit Number	**7**	6	5	4	**3**	2	**1**	**0**
Data Access	**R**	R	R	R	**R**	R	**R**	**R**
Name	**SINGLE SAR ACTIVE**	PMU EVENT	SYS EVENT	TEMP EVENT	**HYSTE-RESIS UI EVENT**	HALL EVENT	**SINGLE SAR EVENT**	**PROX SENSE EVENT**

b) The **ProxFusion UI flags (0x12)** and **SAR UI flags (0x13)** provide more detail regarding the outputs. A prox and touch output bit for each channel 0 to 3 is provided in the ProxFusion UI flags register.

c) The **SAR UI Flags (0x13)** register will show detail regarding the state of the SAR output as well as Quick release toggles, movement activations and the state of the filter (halted or not). The SAR UI can also be used with the inductive sensing capabilities and is explained in section 4. Inductive sensing.

ProxFusion UI flags (0x12)								
Bit Number	7	**6**	**5**	**4**	3	**2**	**1**	**0**
Data Access	-	**R**	**R**	**R**	-	**R**	**R**	**R**
Name	-	**CH2_T**	**CH1_T**	**CH0_T**	-	**CH2_P**	**CH1_P**	**CH0_P**
SAR UI flags (0x13)								
Bit Number	7	6	5	**4**	3	**2**	**1**	**0**
Data Access	-	-	-	**R**	-	**R**	**R**	**R**
Name	-	-	-	**SAR ACTIVE**	-	**QUICK RELEASE**	**MOVE-MENT**	**FHALT**
Hysteresis UI flags (0x13)								
Bit Number	**7**	**6**	**5**	4	3	2	1	0
Data Access	**R**	**R**	**R**	-	-	-	-	-
Name	**Signed output**	**TOUCH**	**PROX**	-	-	-	-	-

d) When the "Two channel SAR UI" is chosen for proximity, touch and deep touch on two channels, the ProxFusion UI flags and Hysteresis UI flags are defined as shown below:

Two channel SAR UI flags (0x12)								
Bit Number	7	6	**5**	**4**	3	**2**	1	**0**
Data Access	-	R	**R**	**R**	-	**R**	R	**R**
Name	-	-	**ANT 1 DEEP TOUCH**	**ANT 1 TOUCH**	-	**ANT 2 PROX**	-	**ANT 1 PROX**
Two channel SAR UI flags 2 (0x13)								
Bit Number	7	**6**	**5**	4	3	2	1	0
Data Access	R	**R**	**R**	R	-	R	R	R
Name	-	**ANT 2 DEEP TOUCH**	**ANT 2 TOUCH**	-	-	-	-	-

3 Hall-effect sensing

3.1 Introduction to Hall-effect sensing

The IQS620(A) has an internal Hall-effect sensing plate (on chip). No external sensing hardware is required for Hall-effect sensing.

The Hall-effect sensor measures the generated voltage difference across the plate, which can be modelled as a Wheatstone bridge. The voltage difference is converted to a current using an operational amplifier in order to be measured by the same ProxSense® sensor engine.

Advanced digital signal processing is performed to provide sensible output data.

- Two threshold levels are provided (prox & touch).
- Hall-effect output can be linearized through an selectable inverse calculator option.
- North/South field direction indication provided.
- Differential Hall-Effect sensing:
  - Removes common mode disturbances
  - North-South field indication

3.2 Channel specifications

Channels 4 and 5 are dedicated to Hall-effect sensing. Channel 4 performs the positive direction measurements and channel 5 will handle all measurements in the negative direction. These two channels are used in conjunction to acquire differential Hall-effect data and will always be used as input data to the Hall-effect UI's.

There are two distinct Hall-effect user interfaces available:

a) General Hall-effect sensing

b) Hall-effect switch UI

Table 3.1 Hall-effect sensor – channel allocation

Mode	CH0	CH1	CH2	CH3	CH4	CH5
Hall-effect switch UI						
Smart cover					● Positive	● Negative
Slide switch						

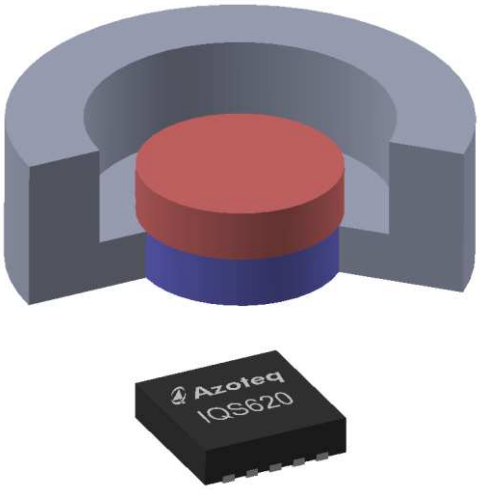
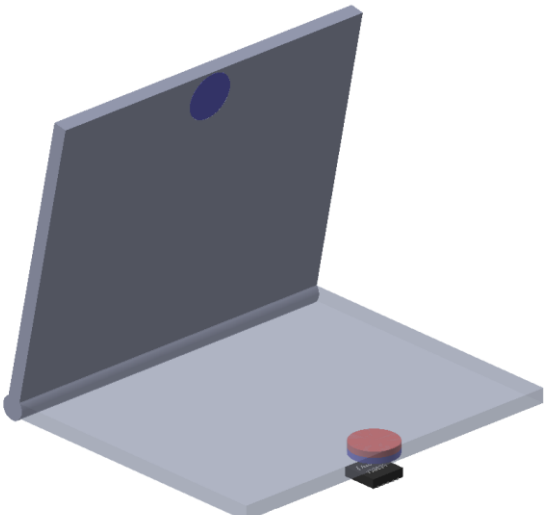
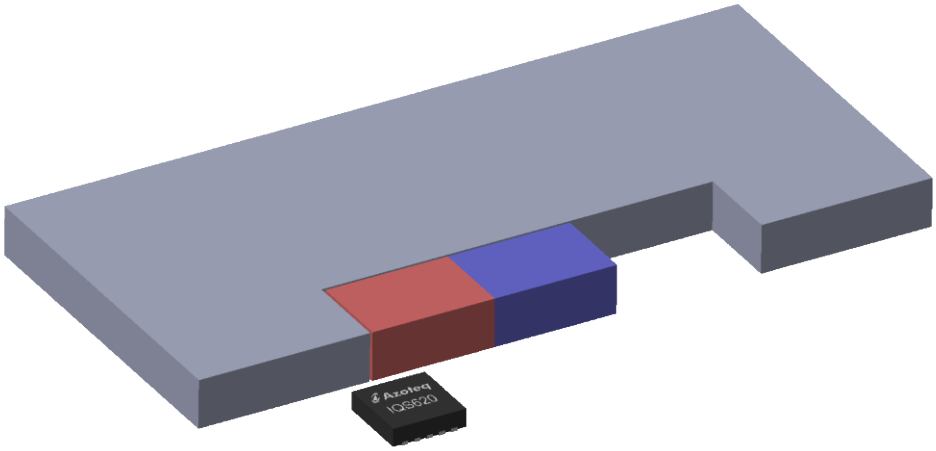
Key:

○ - Optional implementation

● - Fixed use for UI

3.3 Hardware configuration

Rudimentary hardware configurations

	Axially polarized magnet (linear movement or magnet presence detection)
Hall-effect push switch	
Smart cover	
	Bar magnet (linear movement and magnet field detection)
Slide switch	

3.4 Software configuration

3.4.1 Registers to configure for Hall-effect sensing:

Table 3.2 Hall-effect sensing settings registers

Address	Name	Description	Recommended setting
0x90	Hall-effect settings 0	Charge frequency divider and ATI mode settings	Charge frequency adjusts the conversion rate of the Hall-effect channels. Faster conversions consume less current. Full ATI is recommended for fully automated sensor tuning.
0x91	Hall-effect settings 1	ATI base and target selections	ATI target should be more than ATI base to achieve an ATI
0xA0	Hall-effect switch UI settings	Various settings for the Hall-effect switch UI	None
0xA1	Hall-effect switch UI proximity threshold	Proximity Threshold for UI	Less than touch threshold
0xA2	Hall-effect switch UI touch threshold	Touch Threshold for UI	None

3.4.2 Example code:

Example code for an Arduino Uno can be downloaded at:

www.azoteq.com//images/stories/software/IQS62x_Demo.zip

3.5 Sensor data output and flags

The following registers can be monitored by the master to detect Hall-effect related events.

a) One bit in the **Global events (0x11)** register is dedicated to the Hall-effect output. Bit2 **HALL_EVENT** will be toggled for any Hall-effect UI detections.

Global events (0x11)								
Bit Number	7	6	5	4	3	**2**	1	0
Data Access	R	R	R	R	R	**R**	R	R
Name	SAR ACTIVE	PMU EVENT	SYS EVENT	TEMP EVENT	HYSTE-RESIS UI EVENT	**HALL EVENT**	SAR EVENT	PROX SENSE EVENT

b) The **Hall-effect UI flags (0x16)** register provides the standard two level activation output (prox = **HALL_POUT** & touch = **HALL_TOUT**) as well as a **HALL_N/S** bit to indicate the magnet polarity orientation.

Hall-effect UI flags (0x16)								
Bit Number	7	6	5	4	3	**2**	**1**	**0**
Data Access	-	-	-	-	-	**R**	**R**	**R**
Name	-	-	-	-	-	**HALL TOUT**	**HALL POUT**	**HALL N/S**

c) The **Hall-effect UI output (0x17 & 0x18)** registers provide a 16-bit value of the Hall-effect amplitude detected by the sensor.

Hall-effect UI Output (0x17 - 0x18)								
Bit Number	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Data Access	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Name	**Hall-effect UI output low byte**							
Bit Number	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Data Access	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Name	**Hall-effect UI output high byte**							

4 Inductive sensing

4.1 Introduction to inductive sensing

The IQS620(A) provides inductive sensing capabilities in order to detect the presence of metal/metal-type objects. Prox and touch thresholds are widely adjustable and individual hysteresis settings are definable for each using the Hysteresis UI.

4.2 Channel specifications

The IQS620(A) requires both Rx sensing pins as well as the Tx pin for mutual inductive sensing.

Channels 0, 1 and/or 2 can be setup for inductive sensing although only channel 2 can be used for the Hysteresis UI which is attractive as an inductive data processing UI.

The Hysteresis UI provides superior options for prox and touch activation with filter halt and hysteresis settings.

a) Hysteresis UI (Dedicated to CH2)

Table 4.1 Inductive sensor – channel allocation

Mode	CH0	CH1	CH2	CH3	CH4	CH5
Mutual inductive	o	o	o			
Hysteresis UI			•			

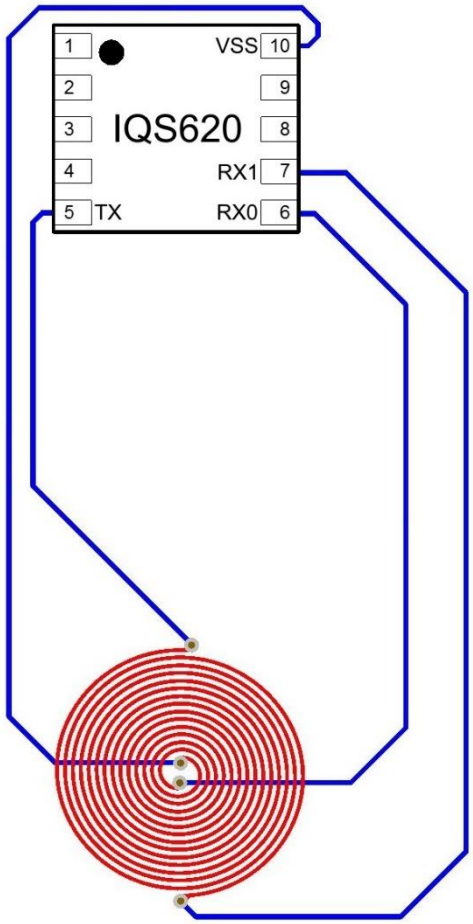
Key:

- ○ - Optional implementation
- ● - Fixed use for UI

4.3 Hardware configuration

Rudimentary hardware configuration. Please refer to application note for design details.

Table 4.2 Inductive hardware description

Mutual inductive


4.4 Software configuration

4.4.1 Registers to configure for inductive sensing:

Please note: If the discreet button UI is used then the SAR UI cannot be used and the SAR registers should not be configured or used. Initializing inactive UI registers can corrupt other active UI's.

Table 4.3 Inductive sensing settings registers

Address	Name	Description	Recommended setting
0x42	ProxFusion Settings 0	Sensor mode and configuration of channel 2.	Sensor mode should be set to inductive mode Both RX0 and RX1 should be active on channel 2
0x45	ProxFusion Settings 1	Channel 2 settings for the inductive sensor	Full ATI is recommended for fully automated sensor tuning.
0x48	ProxFusion Settings 2	ATI settings for the inductive sensor	ATI target should be more than ATI base to achieve an ATI
0x4B	ProxFusion Settings 3	Additional settings for the inductive sensor	None
0x50	ProxFusion Settings 4	UI enable command and filter settings	Enable the Hysteresis UI filter according to application

4.4.2 Registers to configure for the Hysteresis UI:

Please note: Only channel 2 can be used with the Hysteresis UI. Please setup channel 2 accordingly if required. The Hysteresis UI can be used simultaneously with the discrete button UI or SAR UI.

Table 4.4 Hysteresis UI settings registers

Address	Name	Description
0x50	ProxFusion settings 4	Hysteresis UI enable command
0x80	Hysteresis UI Settings	Hysteresis settings for the Hysteresis UI prox and touch output
0x81	Hysteresis UI filter halt threshold	Threshold setting to trigger a filter halt for sensor data on channel 2
0x82	Hysteresis UI proximity threshold	Proximity threshold used for sensor data on channel 2
0x83	Hysteresis UI touch threshold	Touch threshold used for sensor data on channel 2