



IQS7228A OVERVIEW

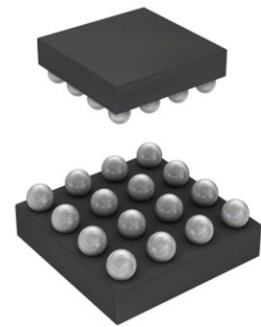
8 Channel capacitive touch and proximity controller with 2 sliders and inductive sensing abilities.

1 Device Overview

The IQS7228A ProxFusion® IC is an 8-channel self/mutual-capacitive proximity and touch controller with best in class sensitivity and signal to noise ratio. In addition, the device offers mixed sensing abilities including inductive sensing. Other features include automatic tuning and differential offset compensation for sense electrodes.

1.1 Main Features

- > Highly flexible 8 channel ProxFusion® device
- > Each channel can be configured with connections to up to 8 external connections
- > **8 external** sensor pad connections:
 - Self/Mutual capacitive sensors
 - Self/Mutual inductive sensors
 - Dedicated reference sensor mode for environmental / mechanically sensitive designs
- > Serial scanning (Single ProxFusion® engine) - up to 8 time-slots
- > Built-in basic functions:
 - Automatic tuning
 - Noise filtering
 - Differential measurements (reference channels)
 - Debounce & hysteresis
 - Dual direction trigger indication
- > Built-in user-interface options:
 - Slider (up to 8 elements with coordinate output, flick/swipe/tap detection)
 - Up to 2 sliders may be defined
- > Pin- and memory map compatible with IQS269A
- > Wide Range of Capacitance Detection (Range of 0 to 400 pF)
- > Multiple custom signal level event triggers (e.g. proximity, touch, deep touch)
- > Automatic reference channel UIs for temperature and mechanical effects. Assign a reference channel to any single or group of sensing channels
- > Options for reduced RF emissions for integration in RF sensitive environments (wide range of charge transfer frequency options)
- > I²C Interface with RDY interrupt line
- > Event mode (including reduced interrupt options such as hysteresis)
- > Assign a touch flag state of any channel to a dedicated GPIO (default: active low, open drain)
- > Supply Voltage 1.8V(-5%) to 3.6V
- > Small package
 - WLCSP16 (1.62 x 1.62 x 0.5 mm)



1.2 Applications

- > SAR compliance in mobile devices
- > Wear detection
- > Low power wake-up buttons / proximity



1.3 Block Diagram

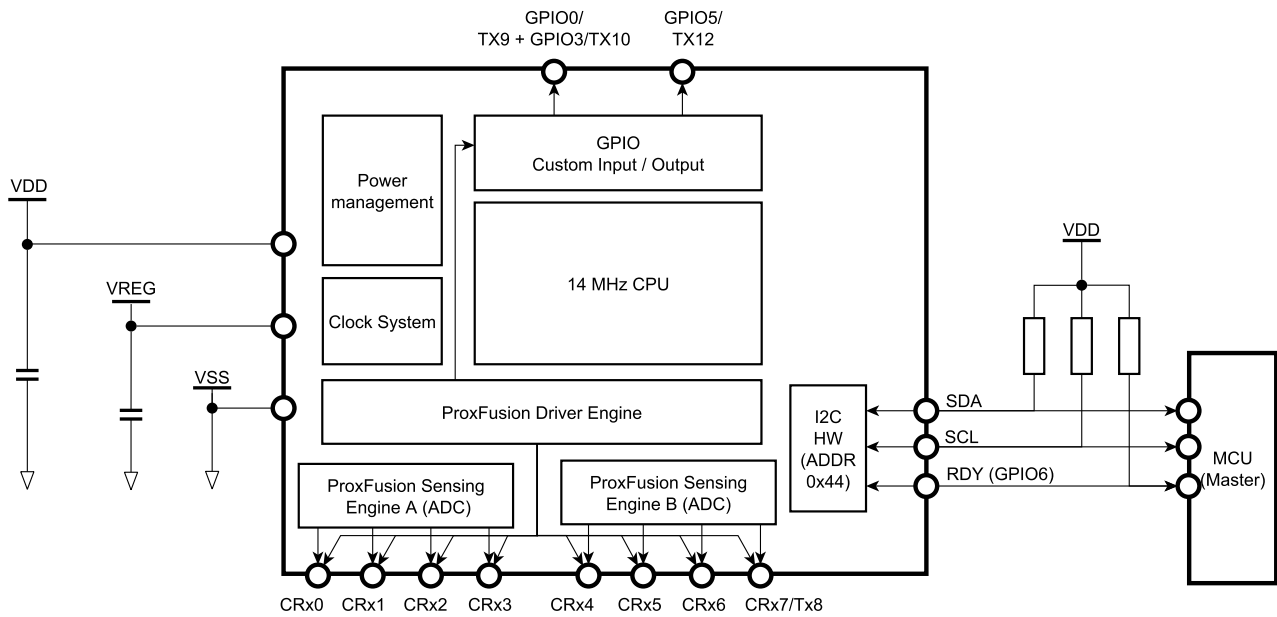


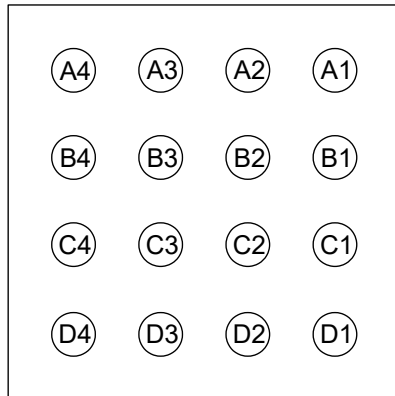
Figure 1.1: Functional Block Diagram



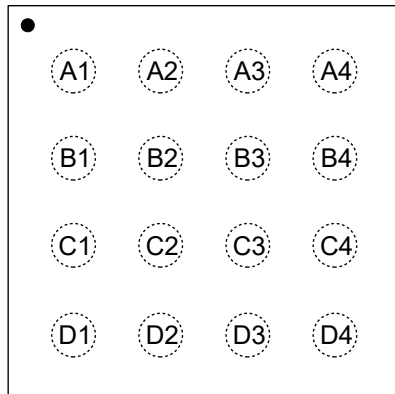
2 Hardware Connection

2.1 WLCSP16 Pin Diagrams

Table 2.1: 16-pin WLCSP16 Package (Bottom/Ball-side View)



Bottom view
(Ball side view)



Top view
(A1 indicator side)

Pin no.	Signal
A1	CRx0
A2	CRx1
A3	CRx5
A4	CRx7/CTx8
B1	CRx2
B2	CRx3
B3	CRx4
B4	CRx6
C1	VDD
C2	GPIO5 / Tx12
C3	GPIO1 / SDA / MOSI
C4	VSS
D1	GPIO0 / Tx9 / TP0 + GPIO3 / Tx10 / TP1
D2	GPIO2 / SCL / SCLK
D3	GPIO6 / RDY
D4	VREG

2.2 Reference Schematic

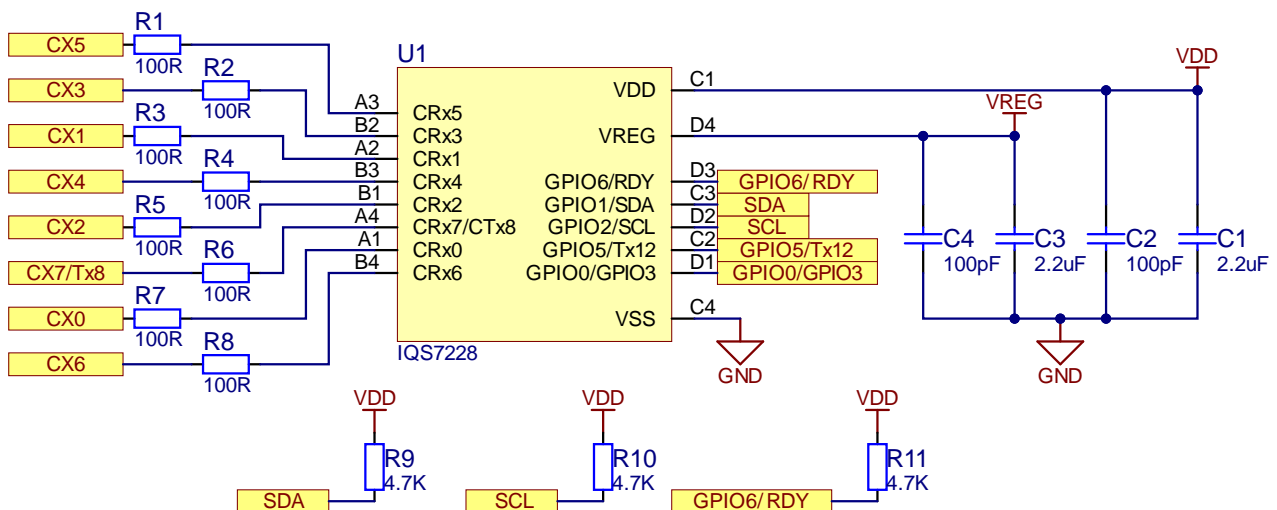


Figure 2.1: IQS7228A Reference Schematic



3 Electrical Characteristics

3.1 Absolute Maximum Ratings

	Min	Max	Unit
Voltage applied at VDD pin to VSS	1.71	3.5	V
Voltage applied to any ProxFusion® pin	-0.3	VREG	V
Voltage applied to any other pin (referenced to VSS)	-0.3	VDD + 0.3 (3.5V max)	V
Storage temperature, T _{stg}	-40	85	°C

3.2 ESD Rating

	Value	Unit
V _(ESD) Electrostatic discharge Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁱ	± 4000	V

3.3 Recommended Operating Conditions

Recommended operating conditions		Min	Nom	Max	Unit
VDD	Supply voltage applied at VDD pin	1.71		3.5	V
Vreg	Regulator output at Vreg	1.5		1.63 ⁱⁱ	V
VSS	Supply voltage applied at VSS pin	0	0	0	V
T _A	Operating free-air temperature	-40	25	85	°C
C _{VDD}	Recommended capacitor at VDD	1	2	10	μF
C _{VREG}	Recommended external buffer capacitor at VREG, ESR ≤ 200mΩ	1	2	10	μF
C _{X_SELF-VSS}	Maximum capacitance of all external electrodes on all ProxFusion® blocks (self-capacitance mode)	-	-	400	pF
C _{m_CTX-CRX}	Capacitance of all external electrodes on all ProxFusion® blocks (mutual-cap mode)	0.1	-	90	pF
C _{X_CRX-VSS-1M}	Maximum capacitance of all external electrodes on all ProxFusion® blocks (mutual-capacitance mode @ f _{xfer} =1MHz)			100	pF
C _{X_CRX-VSS-4M}	Maximum capacitance of all external electrodes on all ProxFusion® blocks (mutual-capacitance mode @ f _{xfer} =4MHz sensing)			25	pF
$\frac{C_{X_{CRX-VSS}}}{C_{m_{CTX-CRX}}}$	Capacitance ratio for optimal SNR in mutual capacitance mode	10		20	n/a
RC _{X_CRX/CTX}	Series (in-line) resistance of all mutual capacitance pins (Tx & Rx pins) in mutual capacitance mode	0 ⁱⁱⁱ	0.47	10 ^{iv}	kΩ
RC _{X_SELF}	Series (in-line) resistance of all self capacitance pins in self capacitance mode	0 ⁱⁱ	0.47	10 ^{iv}	kΩ

ⁱJEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Pins listed as ±4000 V may actually have higher performance.

ⁱⁱMax VREG = 1.8V if Vdd ≥ 2V

ⁱⁱⁱNominal series resistance of 470Ω is recommended to prevent received and emitted EMI effects. Typical resistance also adds additional ESD protection

^{iv}Series resistance limit is a function of f_{xfer} and the circuit time constant, RC. $R_{max} \times C_{max} = \frac{1}{(6 \times f_{xfer})}$ where "C" is the pin capacitance to Vss.



3.4 Current Consumption

Event Mode: No activation	Active Channels	μA		Report Timing (ms)
Operating Voltage:		3.3V	1.8V	
Normal Power Mode	Wear, touch & Hall	TBC	TBC	TBC
	Touch	TBC	TBC	TBC
Low Power Mode	Wear, touch & Hall	TBC	TBC	TBC
	Touch	TBC	TBC	TBC
Ultra Low Power Mode	Wear, touch & Hall	TBC	TBC	TBC
	Touch wake-up and Wear	19	TBC	160ms
	Touch wake-up only	18	TBC	160ms

Preliminary



4 Ordering Information

IQS7228A zzz ppb

IC NAME	IQS7228A	=	IQS7228A	
POWER-ON CONFIGURATION	zzz	=	000	I ² C with initialize settings requirements
PACKAGE TYPE	pp	=	CS	WLCSP-16 package
BULK PACKAGING	b	=	R	WLCSP-16 Reel (3000pcs/reel)

Figure 4.1: Order Code Description

Preliminary

5 Package Specification

5.1 Package Outline Description - WLCSP16

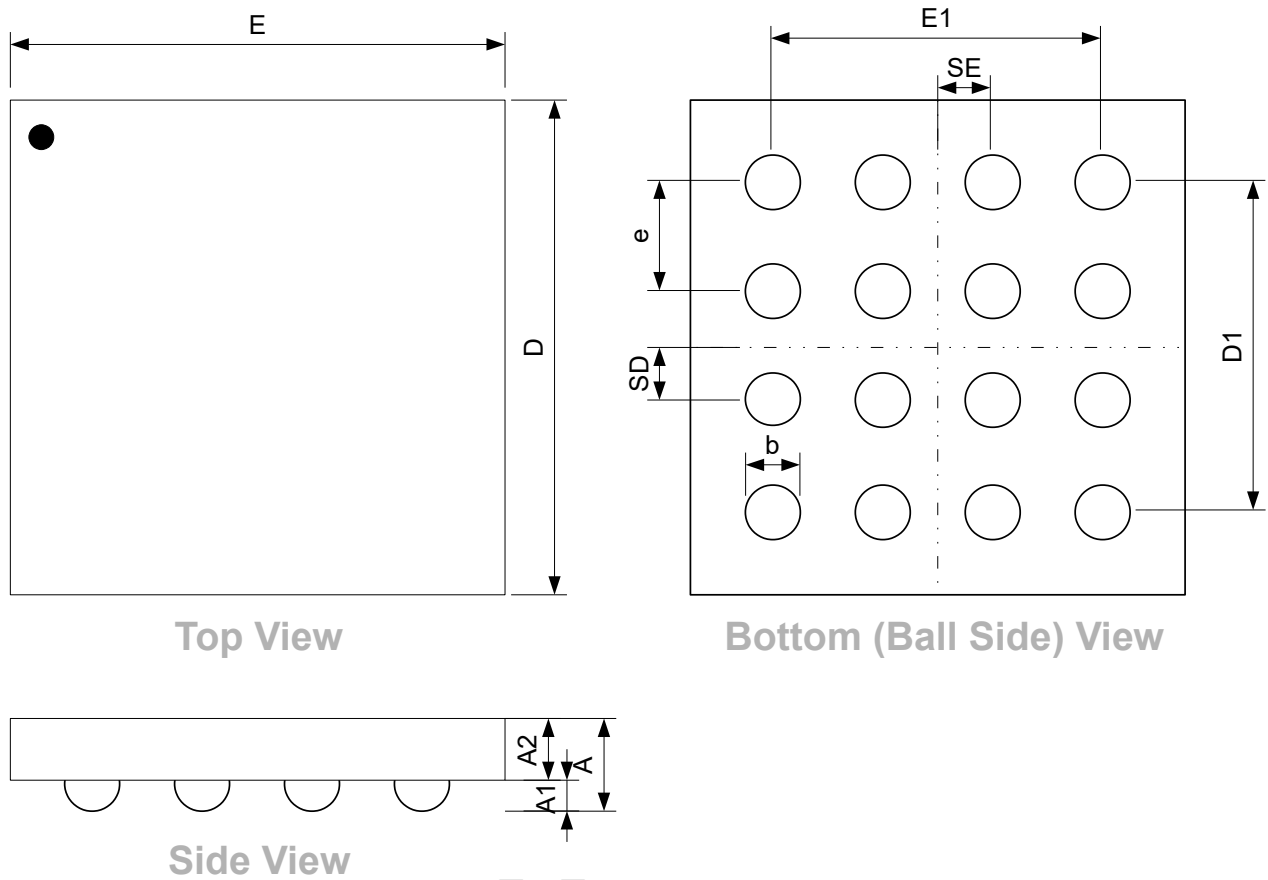


Figure 5.1: WLCSP (1.62x1.62) - 16 Package Outline Visual Description

Table 5.1: WLCSP (1.62x1.62) - 18 Package Outline Visual Description

Dimension	[mm]	Dimension	[mm]
A	0.525 ± 0.05	D1	1.2
A1	0.2 ± 0.02	E	1.620 ± 0.015
A2	0.3 ± 0.025	E1	1.2
b	0.260 ± 0.39	e	0.4
D	1.620 ± 0.015	SE	0.2
SD	0.2		




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