

Data Sheet



SCA830-D07 1-AXIS INCLINOMETER WITH DIGITAL SPI INTERFACE

Features

- 3.3V supply voltage
- ± 1 g measurement range
- Single axis measurement in Y direction
- ± 30 mg offset accuracy over temp range
- SPI digital interface
- Extensive self diagnostics features
- Size 7.6 x 3.3 x 8.6 mm (w x h x l)
- Qualified according to AEC-Q100 standard
- Package, pin-out and SPI protocol compatible with Murata digital accelerometer product family
- RoHS compliant Dual Flat Lead (DFL) plastic package suitable for lead free soldering process and SMD mounting
- Proven capacitive 3D-MEMS technology
- High resolution 16-bit A/D converter

Applications

The SCA830-D07 is targeted to applications with high stability requirements. Typical applications include

- Hill Start Aid (HSA)
- Electronic Parking Brake (EPB)
- Roll Over detection
- Suspension control
- Inclinometers
- Motion and position measurements

General Description

The SCA830-D07 is a single axis inclinometer component based on Murata's capacitive 3D-MEMS technology. The component integrates high accuracy micromechanical acceleration sensing together with a flexible SPI digital interface. Dual Flat Lead (DFL) housing guarantees reliable operation over product lifetime.

The SCA830-D07 is designed, manufactured and tested for high stability, reliability and quality requirements of automotive applications. The inclinometer has an extremely stable output over wide ranges of temperature, humidity and mechanical noise. The component is qualified to the AEC-Q100 standard and has several advanced self diagnostics features. The DFL housing is suitable for SMD mounting and the component is compatible with the RoHS and ELV directives.

The SCA830-D07 is a part of Murata's digital accelerometer family and fully compatible with its single axis accelerometers (SCA800 Series) and other multi axis accelerometers (SCA2100 Series and SCA3100 Series).



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Performance Characteristics

V_{dd}=3.3 V and ambient temperature unless otherwise specified.

Parameter	Condition				Units
		Min	Typ ^{A)}	Max	
Analog and digital V _{dd}		3.0		3.6	V
Current consumption	Active mode		5	6.3	mA
	Power down mode			0.1	mA
Measurement range	Measurement axis (Y)	-1		1	g
		-90		+90	°
Operating temperature		-40		125	°C
Total offset error ^{B)}	Temperature range -40 ... +125 °C	-70		+70	mg
Offset stability ^{C)}	Temperature range -40 ... +125 °C	-25		25	mg
		-1.5		1.5	°
Offset calibration error ^{D)}	@25°C		±20		mg
			±1.1		°
Offset temperature drift	Temperature range -40 ... +125 °C			30 ^{E)}	mg
	Temperature range -20 ... +85 °C		±13 ^{F)}		mg
Sensitivity	16 bit output between ±3°		32 000		Count/g
			0.00179		°/Count
Total sensitivity error	Temperature range -40 ... +125 °C	-4		4	% FS
Sensitivity calibration error	@25 °C ±5°C		±1.4		% FS
Sensitivity temperature drift	Temperature range -40 ... +125 °C		±0.9		% FS
Linearity error	+1g ... -1g range	-20		20	mg
Cross-Axis sensitivity			±2	±3.5	%
Zero acceleration output	2-complement		0		Counts
Amplitude response	-3dB frequency		6.25		Hz
Noise			0.15	5	mg RMS
Power on setup time				0.3	s
Output data rate			125		Hz
Output load				50	pF
SPI clock rate				8	MHz
ESD protection	Human Body Model			2	kV
	Charge Device Model			1	kV
Moisture sensitivity level	IPC/JEDEC J-STD-020C, Level 3				
Mechanical shock				20 000	g
ID register value	Customer readable ID register (27hex)		0A		

A) Typical ± values are ±3 sigma variation limits from validation test population.

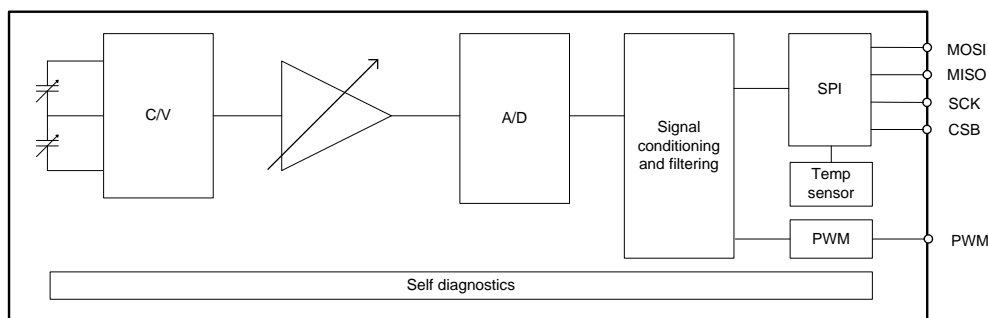
B) Includes offset deviation from 0g value including calibration error and drift over lifetime, temperature and supply voltage.

C) **After mounting of ECU the application and after offset zero-setting at room temperature. Relevant offset failure due to temperature dependency of offset as well as aging over lifetime**

D) Includes offset deviation from 0g value including calibration error and drift over lifetime.

E) Offset drift due to temperature. Value is a relative value and has been centered to zero. Error defined as maximum change of offset in temperature range. Offset (max)-Offset (Min). 100% tested in production.

F) Biggest change of output from RT value due temperature.

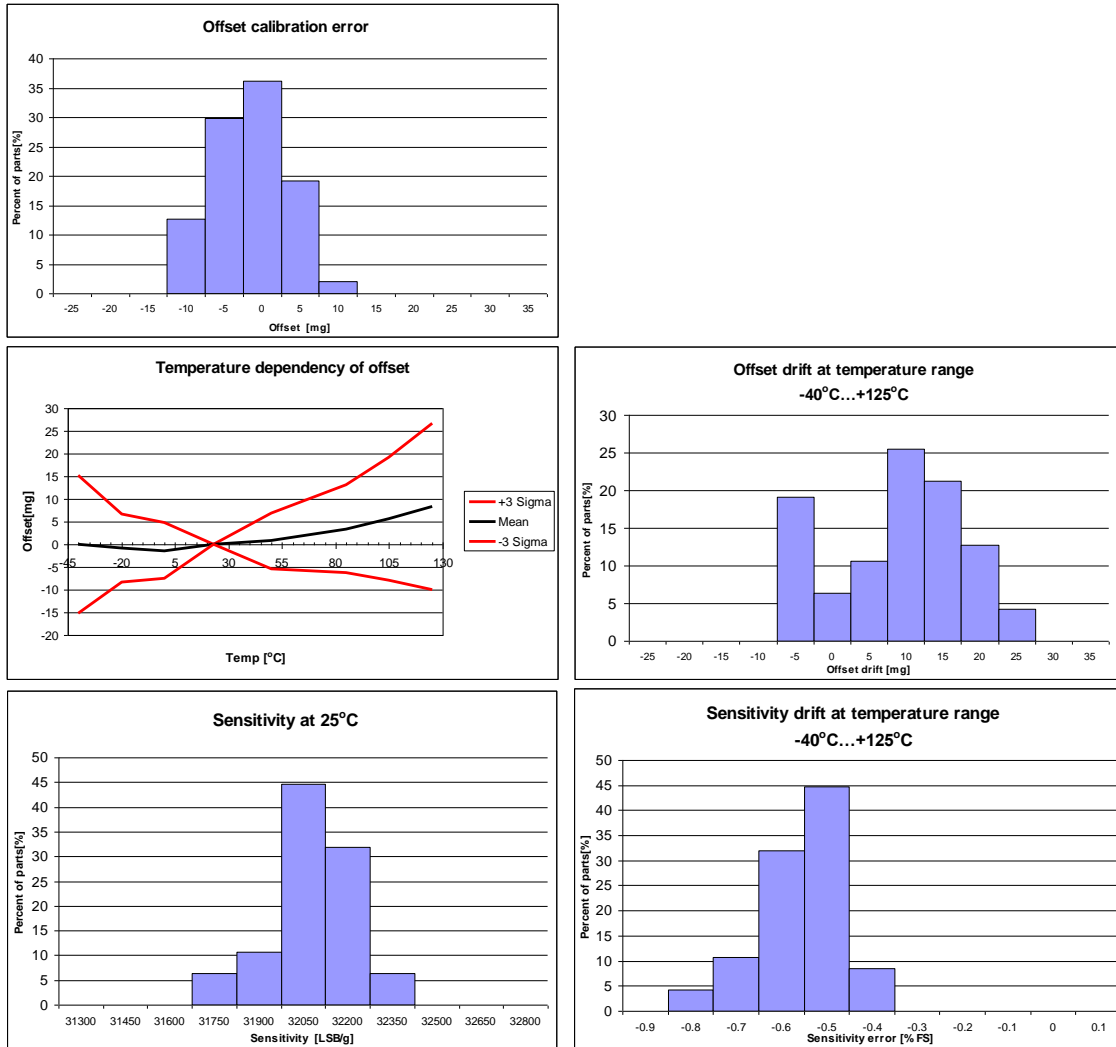




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Figure 1. SCA830-D07 Block diagram

Typical Performance characteristics





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Measurement directions

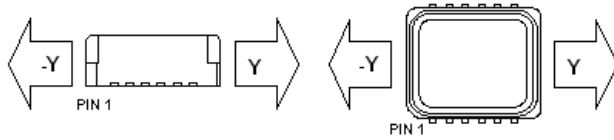


Figure 1. Accelerometer measuring directions

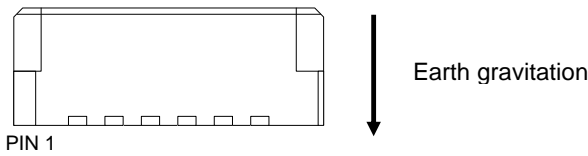


Figure 2. Zero acceleration output position

Housing dimensions

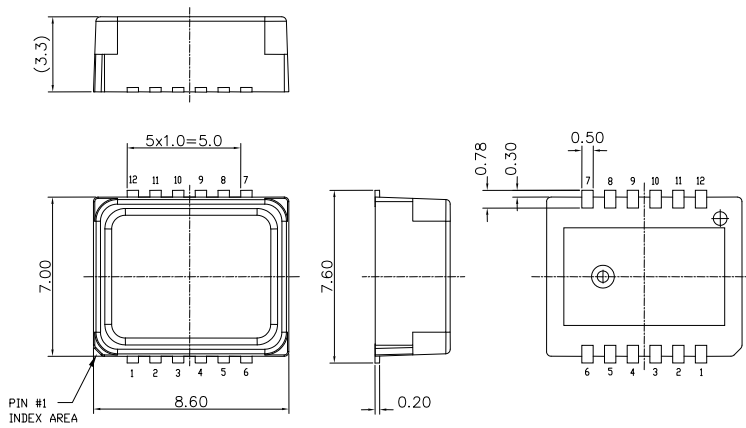


Figure 3. Housing dimensions



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Application Note for Acceleration Output Reading (16 bit output sensitivity)

This is addition to SCA8X0_21X0_3100 Product Family Specification chapter 3.1.

DOUT_LSB

Address: 4h

Bits	Mode	Initial Value	Name	Description
7:0	R	00h	DATA	Acceleration data LSB frame Read always DOUT_MSB prior to DOUT_LSB.

DOUT_MSB

Address: 5h

Bits	Mode	Initial Value	Name	Description
7:0	R	00h	DATA	Acceleration data MSB frame Reading of this register latches DOUT_LSB.

The bit level description of acceleration data from DOUT_LSB ... DOUT_MSB registers is presented below. The acceleration data is presented in 2's complement format. At 0 g acceleration the output is ideally 0000h.

+/-1g product	DOUT_MSB bits(7:0)								DOUT_LSB bits(7:0)								16b	
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	[-]	Bits (15:0)
SCA8xx	s	512,0	256,0	128,0	64,0	32,0	16,0	8,0	4,00	2,00	1,00	0,50	0,25	0,13	0,06	0,03	[mg]	[Dec]
+1g position	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1000	32000
-1g position	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	-1000	-32000
+Full-scale	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1023	32767
-Full-scale	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1024	-32768

s = sign bit

Acceleration bits can be converted to mg acceleration (Acc) using following equation

$$Acc[mg] = \frac{1}{32} \left[-s \cdot 2^{15} + b_{14} \cdot 2^{14} + b_{13} \cdot 2^{13} + b_{12} \cdot 2^{12} + b_{11} \cdot 2^{11} + b_{10} \cdot 2^{10} + b_9 \cdot 2^9 + b_8 \cdot 2^8 + b_7 \cdot 2^7 + b_6 \cdot 2^6 + b_5 \cdot 2^5 + b_4 \cdot 2^4 + b_3 \cdot 2^4 \right. \\ \left. + b_2 \cdot 2^3 + b_1 \cdot 2^1 + b_0 \right]$$

Headquarter Switzerland:
Angst+Pfister Sensors and Power AG

Thurgauerstrasse 66
CH-8050 Zurich
Phone +41 44 877 35 00
sensorsandpower@angst-pfister.com

Office Germany:
Angst+Pfister Sensors and Power
Deutschland GmbH
Edisonstraße 16
D-85716 Unterschleißheim
Phone +49 89 374 288 87 0
sensorsandpower.de@angst-pfister.com



We are here for you. Addresses and Contacts.

Sales Germany & Austria

Geometrical sensors
Other products

Kurt Stritzelberger
Phone +49 89 374 288 87 22
kurt.stritzelberger@angst-pfister.com

Pressure sensors
Other products

Gerhard Vetter
Phone +49 89 374 288 87 26
gerhard.vetter@angst-pfister.com

Gas sensors and modules

Peter Felder
Phone +41 44 877 35 05
peter.felder@angst-pfister.com

Sales Switzerland & Liechtenstein

Postcode 3000 – 9999

Basil Frei
Phone +41 44 877 35 18
basil.frei@angst-pfister.com

Postcode 1000 – 2999

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@angst-pfister.com

Sales International Key Accounts

Peter Felder
Phone +41 44 877 35 05
peter.felder@angst-pfister.com

Sales Other Countries / Product Management

Pressure Sensors
Load Cells

Philipp Kistler
Phone +41 44 877 35 03
philipp.kistler@angst-pfister.com

Gas sensors
Gas sensor modules

Dr. Thomas Clausen
Phone +49 89 374 288 87 24
thomas.clausen@angst-pfister.com

Flow / Level / Medical products

Dr. Adriano Pittarelli
Phone +49 89 374 288 87 67
adriano.pittarelli@angst-pfister.com

Power supplies

Sebastiano Leggio
Phone +41 44 877 35 06
sebastiano.leggio@angst-pfister.com

Linear position sensors
Angle sensors

Eric Letsch
Phone +41 44 877 35 14
eric.letsch@angst-pfister.com

Accelerometers
Sensor elements

Christoph Kleye
Phone +49 89 374 288 87 61
christoph.kleye@angst-pfister.com

Drive technology
CH Postcode 5000 – 9999 / DE

Roman Homa
Phone +41 76 444 00 86
roman.homa@angst-pfister.com

Drive technology
CH Postcode 1000 – 4999 / AT / IT / FR

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@angst-pfister.com

Harald Thomas
Phone +49 89 374 288 87 23
harald.thomas@angst-pfister.com