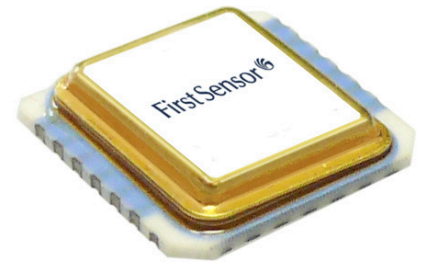


SI-P & SA-P series: high-precision inertial sensors

The capacitive inclinometers and accelerometers are based on single crystal silicon sensor elements and utilize state-of-the-art micromachining technology to achieve large signal-to-noise ratios and excellent stability over temperature. Due to high aspect ratio microstructures (HARMS) the sensors feature ultra-low cross axis sensitivities. The patented AIM (Air gap Insulated Microstructures) technology minimizes parasitic capacitances.



Benefits of the AIM technology

- Ultra-low cross axis sensitivity due to HARMS technology
- Thin-film free mechanical components, single crystal silicon based
- Minimizing of parasitic capacitances due to insulation of the functional components by air gap
- Complete dry processing
- Excellent thermal performance
- Large signal-to-noise ratio
- Mechanical over-damped to reduce parasitic signals
- Customer specific measurement ranges due to flexible adjustment of mass, spring and damping

Features of the sensor system

- Dual axis measurement
- Excellent stability over temperature
- Digital SPI interface
- Configurable bandwidth output filter
- Shock survival 1500 g
- Hermetically sealed package
- Customized sensor solutions for packaging and signal processing

Certificates

- Quality Management System according to EN ISO 9001
- Qualified according to DIN EN 60068, DIN EN 60749, MIL-STD-883
- RoHS and REACH compliant

Applications

- Geoengineering
- Condition monitoring
- Navigation
- Security systems
- Platform control and stabilization
- Tilt sensing and leveling
- Industrial applications

SI-P & SA-P series: high-precision inertial sensors

Typical performance characteristics ⁽¹⁾

Inclinometer SI-11.P4.C-30

Sensor-ASSP system

Parameter	Condition	SI-11.P4.C-30	Unit
Measurement range	Full scale (linear @ ±30°)	±90	°
Resolution	< 10 Hz bandwidth	< 3.5	m°
Scale factor (repeatability)	Short-term	±35	ppm
Scale factor (temperature coefficient)	Without calibration	±50	ppm/K
Bias (repeatability)	Short-term	±3	m°
Bias (temperature coefficient)	Without calibration	±5	m°/K
Non-linearity	Full scale	< 0.3	%
Noise density		< 1.2	m°/√Hz
Output data rate	Range	1...10000	Hz
Power supply	Range	2.7...3.3	V
Current consumption	Measurement	< 500	µA
Digital interface		SPI	

Capacitive sensing element

Noise density	calculated	< 3.0	aF/√Hz
Capacitive sensitivity		450...750	fF/g
Frequency response	3dB frequency	150	Hz
Damping ratio		1.5	
Measurement voltage	RMS	< 1.2	V
Shock survival	Bare die	> 2500	g

Inclinometer SI-07.P4.C-15

Sensor-ASSP system

Parameter	Condition	SI-07.P4.C-15	Unit
Measurement range	Full scale	±30	°
Resolution	< 10 Hz bandwidth	< 2.5	m°
Scale factor (repeatability)	Short-term	±35	ppm
Scale factor (temperature coefficient)	Without calibration	±50	ppm/K
Bias (repeatability)	Short-term	±2	m°
Bias (temperature coefficient)	Without calibration	±3	m°/K
Non-linearity	Full scale	< 0.3	%
Noise density		< 0.8	m°/√Hz
Output data rate	Range	1...10000	Hz
Power supply	Range	2.7...3.3	V
Current consumption	Measurement	< 500	µA
Digital interface		SPI	

Capacitive sensing element

Noise density	calculated	< 4.5	aF/√Hz
Capacitive sensitivity		1100...1400	fF/g
Frequency response	3dB frequency	80	Hz
Damping ratio		1.7	
Measurement voltage	RMS	< 1.0	V
Shock survival	Bare die	> 2500	g

Specification note

(1) Maximum and minimum ratings of the performance parameters depend on the exact set-up of the sensor settings. Please contact First Sensor for further information.

SI-P & SA-P series: high-precision inertial sensors

Typical performance characteristics (cont.) ⁽¹⁾

Accelerometer SA-12.P4.C-3

Sensor-ASSP system

Parameter	Condition	SA-12.P4.C-3	Unit
Measurement range	Full scale	±3	g
Resolution	< 10 Hz bandwidth	< 60	μg
Scale factor (repeatability)	Short-term	±35	ppm
Scale factor (temperature coefficient)	Without calibration	±50	ppm/K
Bias (repeatability)	Short-term	±75	μg
Bias (temperature coefficient)	Without calibration	±250	μg/K
Non-linearity	Full scale	< 0.3	%
Noise density		< 60	μg/√Hz
Output data rate	Range	1...10000	Hz
Power supply	Range	2.7...3.3	V
Current consumption	Measurement	< 500	μA
Digital interface		SPI	

Capacitive sensing element

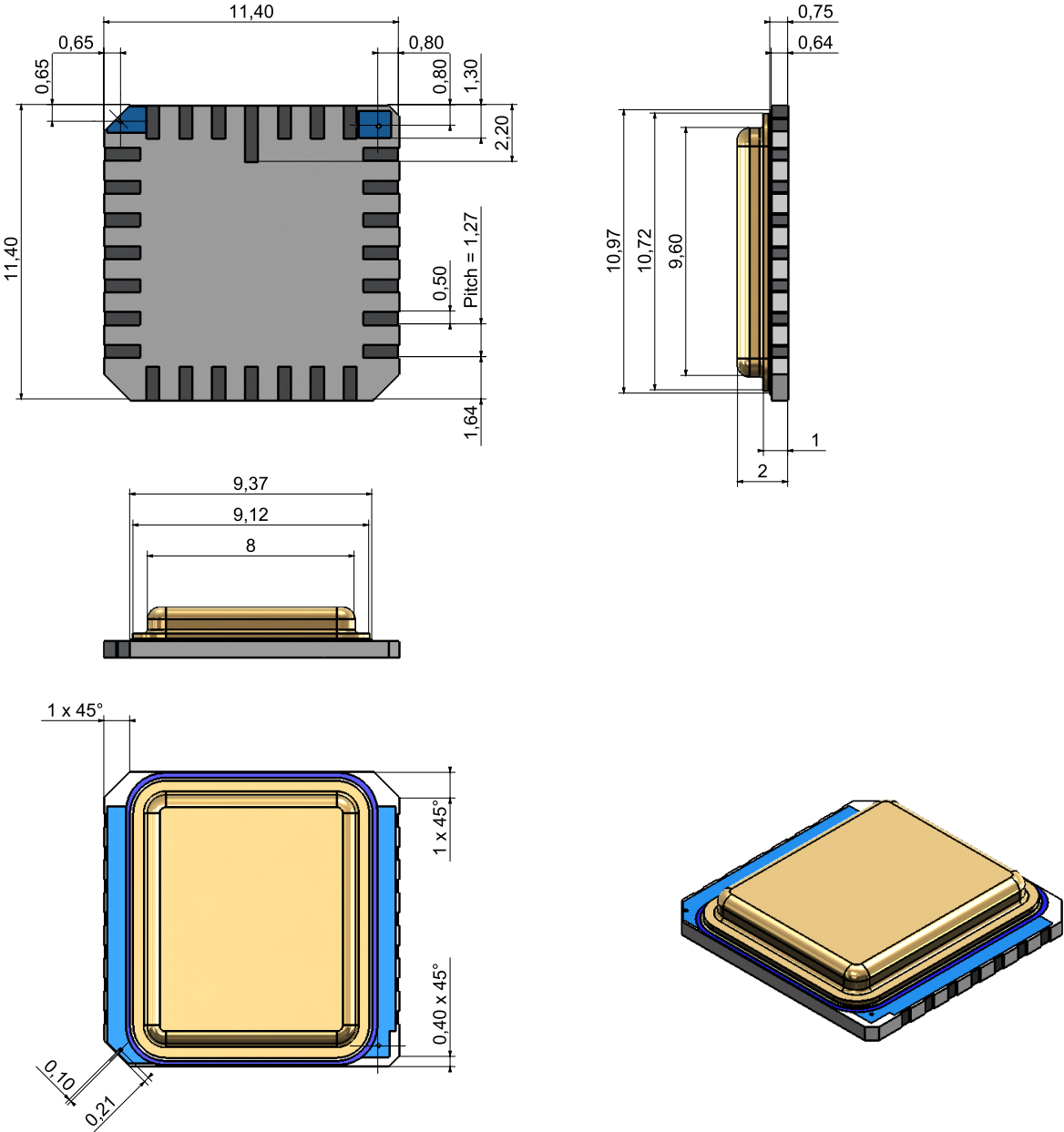
Noise density	calculated	< 1.0	aF/√Hz
Capacitive sensitivity		175...250	fF/g
Frequency response	3dB frequency	900	Hz
Damping ratio		0.9	
Measurement voltage	RMS	< 1.8	V
Shock survival	Bare die	> 2500	g

Specification note

(1) Maximum and minimum ratings of the performance parameters depend on the exact set-up of the sensor settings. Please contact First Sensor for further information.

SI-P & SA-P series: high-precision inertial sensors

Dimensional drawing



dimensions in mm

SI-P & SA-P series: high-precision inertial sensors

Electrical connection

Pin assignment

Pin	Mnemonic	Description	Comment
01...04	NC	Not connected	Should be left as an open pin
05	GND	Ground pin	
06	MISO	Master in - slave out for SPI	
07	GND	Ground pin	
08	VDD	Power supply	10 μ F bypass capacitor to GND
09	MOSI	Master out - slave in for SPI	
10	SCK	Serial clock for SPI	
11	INTN	Interrupt	
12...18	NC	Not connected	Should be left as an open pin
19	VDD18	Core power supply	Connect 10 μ F capacitor to GND
20	VDD	Power supply	10 μ F bypass capacitor to GND
21	PTOUT	Capacitor temperature	Connect 10 nF capacitor to GND
22	SSN	Serial select line for SPI	
23...28	NC	Not connected	Should be left as an open pin

Pin layout

