# Telematics and infotainment

## SMI130 combined inertial sensor for motion detection

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Invented for life


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### Product benefits

- Target applications
  - Telematics and tolling systems
  - Navigation (dead reckoning) and eCall
  - Vehicle dynamics data logging
  - Car alarm
- Extremely flexible application options
- Cost-effective
- Ultra compact sensor design gives small footprint
- Low power consumption – also at system level
- Billion-fold applied technology (due to CE background)
- RoHS compliant and AEC-Q100 qualification

1 16-pin standard LGA package, 3 mm × 4.5 mm × 0.95 mm

# 72 %

**smaller footprint** compared to an ESP® safety MEMS sensor with 1-axis angular rate and 2-axis accelerometer.

# economical

through its 5 power-safe modes, which give a **very low power consumption**.

**Task** The SMI130 detects acceleration and angular rates in three perpendicular axes and allows tilt, motion, vibration or shock sensing regardless of the mounting orientation of the sensor. In particular it eliminates the need for different sensor housings for slant-angle correction.

**Function** The SMI130 contains a digital 16 bit 3-axis gyroscope ($\Omega_{xyz}$) and a digital 12 bit 3-axis acceleration sensor ($a_{xyz}$). The angular rate sensor is based on the Coriolis vibratory gyroscope principle: High-frequency electrostatic forces generate an oscillation of two seismic masses controlled by a closed loop drive system. When rotating around the nominal axis, the Coriolis forces acting on the oscillators can be measured by capacity changes in the detection system.
The acceleration sensor consists of movable comb-like seismic masses suspended from silicon spring bars and fixed counter-electrodes. As a result of external forces acting on the vehicle, deflections of the seismic masses along the sensitive axis generate changes in the capacity of the system.
Numerous programming options, a low signal noise and a very small footprint make the SMI130 a highly versatile and easily applied combined inertial sensor.

## Technical characteristics gyroscope

| | | |
|---|---|---|
| Measurement ranges[2] (sensitivity) | ±125 °/s | 262.4 LSB/°/s |
| | ±250 °/s | 131.2 LSB/°/s |
| | ±500 °/s | 65.6 LSB/°/s |
| | ±1,000 °/s | 32.8 LSB/°/s |
| | ±2,000 °/s | 16.4 LSB/°/s |
| Digital resolution | 16 bit | |
| Non-linearity | ±1 °/s | |
| Sensitivity tolerance[3] | ±1 % at 2,000 °/s | |
| Sensitivity variation[4] | ±2 % at 2,000 °/s | |
| Zero-point offset[3] | ±1 °/s | |
| Offset variation[4] | ±1 °/s | |
| Band width[2] | 12 Hz to 523 Hz | |
| Noise rms | 0.02 °/s /√Hz | |

## Technical characteristics accelerometer

| | | |
|---|---|---|
| Measurement ranges[2] (sensitivity) | ±2 g | 1,024 LSB/g |
| | ±4 g | 512 LSB/g |
| | ±8 g | 256 LSB/g |
| | ±16 g | 128 LSB/g |
| Digital resolution | 12 bit | |
| Non-linearity | ±25 mg | |
| Sensitivity tolerance[3] | ±4 % at 2 g | |
| Sensitivity variation[4] | ±1.7 % at 2 g | |
| Zero-point offset[3] | ±70 mg | |
| Offset variation[4] | ±65 mg | |
| Band width[2] | 8 Hz to 1000 Hz | |
| Noise rms | 0.19 mg /√Hz | |

## Operating conditions

| | |
|---|---|
| Supply voltage (VDD) | 2.4 to 3.6 V |
| Supply current | <6.5 mA (gyroscope)<br><0.2 mA (accelerometer) |
| Operating temperature | –40 °C to +85 °C |
| Interfaces | SPI and I²C |

[1] Gyroscope and accelerometer can be operated individually
[2] Switchable
[3] At +25 °C
[4] Over temperature (–40 °C to +85 °C); reference +25 °C

**Robert Bosch GmbH** | Postfach 10 60 50 | 70049 Stuttgart | Germany | **www.bosch-semiconductors.com** | **www.bosch-mobility-solutions.de**