

# Telematics and infotainment

SMI230 combined inertial sensor for motion detection



**BOSCH**  
Invented for life



## PRODUCT BENEFITS

- ▶ Target applications
  - High-end navigation (dead reckoning) and eCall
  - Telematics and tolling systems
  - Vehicle dynamics data logging
  - Car alarm
- ▶ High accuracy - best in class accelerometer and gyro
- ▶ Cost-effective
- ▶ Ultra compact sensor design gives small footprint
- ▶ Low power consumption – also at system level
- ▶ RoHS compliant and AEC-Q100 Grade 2 qualification

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

# flexible

accelerometer and gyro can be operated individually, but can also be tied together for data synchronization.

## TASK

The SMI230 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 SMI230 contains a digital 16 bit 3-axis gyroscope ( $\Omega_{xyz}$ ) and a digital 16 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 SMI230 a highly versatile and easily applied combined inertial sensor.

## TECHNICAL CHARACTERISTICS GYROSCOPE

|  |                 |               |
|--|-----------------|---------------|
| Measurement ranges <sup>1</sup><br>(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                                    | ±0.05 % FS      |               |
| Zero-point offset <sup>2</sup>                   | ±1 °/s          |               |
| Offset variation <sup>3</sup>                    | ±1 °/s          |               |
| Band width <sup>1</sup>                          | 12 Hz to 523 Hz |               |
| Noise (rms)                                      | 0.02 °/s /√Hz   |               |

# economical

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

## TECHNICAL CHARACTERISTICS ACCELEROMETER

|  |                    |              |
|--|--------------------|--------------|
| Measurement ranges <sup>1</sup><br>(sensitivity) | ±2 g               | 16,384 LSB/g |
|  | ±4 g               | 8,192 LSB/g  |
|  | ±8 g               | 4,096 LSB/g  |
|  | ±16 g              | 2,048 LSB/g  |
| Digital resolution                               | 16 bit             |              |
| Non-linearity                                    | ±0.5 % FS          |              |
| Zero-point offset <sup>2</sup>                   | ±20 mg             |              |
| Offset variation <sup>3</sup>                    | ±13 mg             |              |
| Band width <sup>1</sup>                          | 12.5 Hz to 1600 Hz |              |
| Noise (rms)                                      | 0.12 mg /√Hz       |              |

## TECHNICAL CHARACTERISTICS TEMPERATURE SENSOR

|                    |                    |
|--------------------|--------------------|
| Measurement range  | −104 °C to +150 °C |
| Digital resolution | 11 bit             |

## OPERATING CONDITIONS

|                                    |                          |
|------------------------------------|--------------------------|
| Supply voltage (VDD)               | 2.4 to 3.6 V             |
| Supply current<br>(full operation) | 5.15 mA                  |
| Operating temperature              | −40 °C to +105 °C        |
| Interfaces                         | SPI and I <sup>2</sup> C |

<sup>1</sup> Switchable

<sup>2</sup> At +25 °C

<sup>3</sup> Over temperature (−40 °C to +105 °C); reference +25 °C