

# Active safety systems

SMI860 combined inertial sensor for vehicle dynamics control



**BOSCH**

Invented for life



## PRODUCT BENEFITS

- ▶ Target applications
  - ESP®
  - Roll-over sensing
  - Adaptive cruise control
  - Short-term localization
  - and other safety and ADAS functions
- ▶ Excellent vibration robustness and offset stability
- ▶ Developed for systems with requirements up to ASIL D

- 1 Ball grid array package (BGA),  
7 mm × 7 mm × 1.5 mm

# reliable operation

due to excellent vibration resistance

## TASK

The SMI860 is especially designed to support safety and ADAS functions with ASIL rating: ESP®, roll-over sensing, adaptive cruise control, hill-hold control, and short-term localization for ADAS functions. The SMI860 is a five axis sensor measuring yaw rate ( $\Omega_z$ ), roll rate ( $\Omega_x$ ) and acceleration ( $a_{xyz}$ ). It provides all relevant inertial signals in just one sensor. Subsequent system algorithms will use these sensor signals to compute the dynamical driving state of a vehicle or its position.

## FUNCTION

The SMI860 sensor is based on MEMS technology combining gyroscope and low-g acceleration sensors.

Its gyros can measure whether a vehicle is rotated around its vertical or lateral axis, the low-g channels will detect whether an acceleration is exerted to the vehicle.

Rotations will deflect a micro machined seismic mass of a MEMS gyro chip, accelerations deflect a MEMS accelerometer chip. 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. These movements are detected by a signal conditioning ASIC. Subsequent processing consists of low-pass filtering the signals and translating them into a SafeSPI communication protocol. The sensor is developed according to ISO26262 for use in systems up to ASIL D.

# safe and economical

integrated sensor solution, applicable in systems up to ASIL D requirements

## MEASUREMENT CHARACTERISTICS

Measurement axis	$\Omega_x$	$\Omega_z$	$a_{xy}$	$a_z$
Range	$\pm 300^\circ/\text{s}$		6 g	
Digital resolution	16-bit		16-bit	
Sensitivity (nominal)	100 LSB per $^\circ/\text{s}$		5000 LSB per g	
Sensitivity variation <sup>1</sup>	$\pm 3\%$		$\pm 3\%$	
Offset variation <sup>1</sup>	$\pm 2^\circ/\text{s}$	$\pm 3^\circ/\text{s}$	50 mg	55 mg
Noise (rms)	$\pm 0.1^\circ/\text{s}$		4 mg	6 mg

## TECHNICAL CHARACTERISTICS

Communication	SafeSPI
Low pass filter settings: $f_{-3\text{dB}}$ <sup>2</sup>	10, 20 or 80 Hz
Start-up time <sup>3</sup>	max. 400 ms

## OPERATING CONDITIONS

Supply voltage	3.3 V, 5 V or 6.7 V
Supply current	< 28 mA
Operating temperature	-40 °C to +125 °C

<sup>1</sup> over lifetime and temperature

<sup>2</sup> nominal corner frequency corresponding to programmable filter settings

<sup>3</sup> depends on filter settings. Here: incl. up to 3 self-tests for 80 Hz setting