Overview
The inertial sensor SMI700 is especially designed for ESP® and premium VDC functions such as hill-hold control, active front steering, or adaptive cruise control.

The sensor consists of two micro-machined sensor elements and a signal processing ASIC mounted in a molded BGA housing (7 x 7 x 1.5 mm³).

The concept of combining an acceleration sensor and an angular rate sensor in one package aims to provide a cost-efficient one-chip solution for VDC applications without compromising on quality and standard system performance.

Product description
The SMI700 sensor contains a $\Omega$-axy combined rotation and acceleration inertial sensor.

- Designed for ESP® and premium VDC functions
- Three communication interfaces available: SPI, PSI5, and CAN
- Excellent stability over temperature and lifetime
- Standard SMD package: BGA 7 x 7 x 1.5 mm³
- RoHS compliant
- Superior signal performance and implemented self-tests
- Applicable in systems up to ASIL D requirements
- Fully digital signal processing
- On-chip self-monitoring based on Bosch VDC component experience
- 16-bit digital output via serial peripheral interface (SPI)
- Two SPI versions with in-frame or out-of frame communication selectable

Customer benefit / features:
- Three-axis $\Omega$-axy combined rotation and acceleration inertial sensor
- Designed for ESP® and premium VDC functions
- Three communication interfaces available: SPI, PSI5, and CAN
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In combination with a multitude of customer specific signal monitoring options and an integrated safety controller, the sensor is particularly suitable for safety relevant applications – applicable in systems with safety requirements according to ISO26262 up to ASIL D depending on the target application.

The sensor accepts 3.3 V or 5 V supply voltage and can be operated in a broad temperature range from -40 °C up to +125 °C. The sensor is RoHS compliant and qualified according to AEC-Q100.
### Parameters

**Measurement and functional characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement axis</td>
<td>Ωz, a_y</td>
</tr>
<tr>
<td>Measurement range</td>
<td>±300 °/s, ±5.0 g</td>
</tr>
<tr>
<td>Sensitivity (nominal)</td>
<td>100 LSB/°/s, 5000 LSB/g</td>
</tr>
<tr>
<td>Sensitivity variation 1)</td>
<td>±3 %, ±3 %</td>
</tr>
<tr>
<td>Offset variation 1)</td>
<td>±3 °/s, ±50 mg</td>
</tr>
<tr>
<td>Noise (rms @ 77 Hz)</td>
<td>0.1 °/s, 6 mg</td>
</tr>
</tbody>
</table>

**Functional characteristics**

- **Communication**: SPI, PSI5, CAN
- **Corner frequency 2)**: 11 or 18 or 21 or 77 Hz
- **Start-up time 3)**: max. 400 ms

**Operating conditions**

- **Supply voltage (digital)**: 3.3 V / 5 V
- **Supply current (SPI, PSI5)**: < 29 mA
- **Operating temperature**: -40 °C ... +125 °C

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1) Over lifetime and temperature
2) Nominal f-3dB for the rate channel corresponding to programmable filter settings
3) Depends in filter setting and interface – here: incl. up to 3 self-tests for 77 Hz setting

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### Working principle

The sensor elements are manufactured utilizing state-of-the-art Bosch surface micro-machining technology. 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 free 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.

The MEMS elements of the SMI700 have been optimized for vibration robustness. In addition, the sensor is manufactured to guarantee an ultra-robust stability over temperature and lifetime.

### Portfolio

The SMI700 sensor is part of a broad sensor portfolio, which consists of acceleration sensors, angular rate sensors, combined inertial sensors, pressure sensors, and media sensors. Related applications range from occupant safety systems, vehicle dynamics control, motor management, transmission control systems, A/C systems and navigation.

Bosch has been at the forefront of micro-electro-mechanical systems (MEMS) technology since more than 20 years. Bosch is the world’s leading supplier for MEMS sensors and holds more than 1,000 patents and patent applications related to the MEMS technology. More than 1.4 billion sensors are shipped each year from its state-of-the-art wafer fab in Reutlingen – or around 3 million each day. Bosch provides sensors for a wide range of uses in the automotive and consumer electronics.

For more information about automotive MEMS sensors, visit [www.bosch-sensors.com](http://www.bosch-sensors.com).