

# Automotive Electronics

## Angular rate sensor for vehicle dynamics control SMG550



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Angular rate sensor SMG550 for VDC

### Customer benefit / features:

- ▶ 240 °/s high precision  $\Omega_x$  angular rate sensor with SPI interface
- ▶ Fully digital signal processing
- ▶ 16 bit digital output via Serial Peripheral Interface (SPI)
- ▶ Bosch SPI and open SPI available
- ▶ Excellent stability over temperature and lifetime
- ▶ Broad temperature range (-40 °C...+105 °C)
- ▶ On-chip self monitoring based on Bosch VDC component experience
- ▶ Temperature sensor output
- ▶ RoHS compliant

### Overview

The SMG550 is a compact angular rate sensor with high accuracy and reliability, specially designed for challenging and safety relevant automotive applications like vehicle dynamics control (VDC) systems.

The sensor consists of a micro-machined sensor element and a signal conditioning ASIC mounted in a SMD plastic package for ease of mounting.

### Product description

The SMG550 sensor is an  $\Omega_x$  angular rate sensor. The fully digital signal path features a front-end operated in closed-loop mode and a digital output via Serial Peripheral Interface (SPI). The sensor is designed for excellent robustness with respect to mechanical and electrical interference (vibration, EMI).

The SMG550 allows for a multitude of customer specific signal monitoring via the SPI interface making it suitable for safety relevant applications. In addition, the sensor carries out its own internal parametric monitoring of the measuring element and the ASIC.

The SMG550 works with a 5 V supply, the SPI interface can be operated with 3.3V or 5V. The sensor can be operated in a broad temperature range between -40 °C and +105 °C.

The sensor is RoHS compliant and automotive qualified.

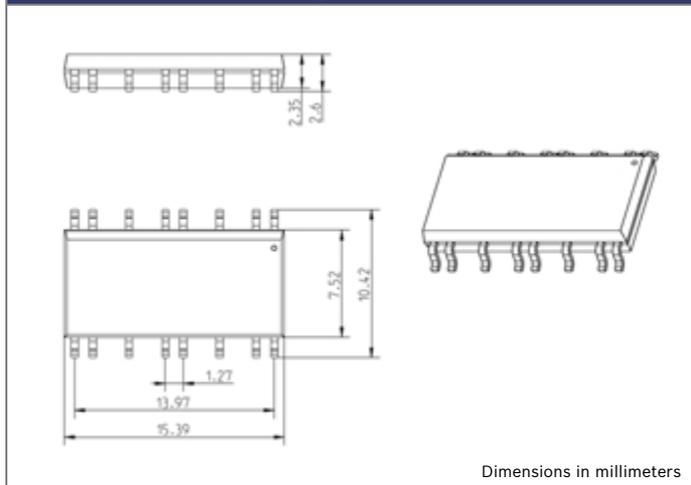
**Parameters SMG550****Measurement and functional characteristics**

Measurement range	$\pm 240$ °/s
Sensitivity (nominal)	$\pm 100$ LSB/°/s
Sensitivity variation <sup>1)</sup>	$\pm 4\%$
Non-linearity <sup>1</sup>	$\pm 1.5$ °/s for $\pm 240$ °/s $\pm 0.75$ °/s for $\pm 100$ °/s
Offset variation <sup>1)</sup>	$\pm 3$ °/s
Noise	$< 0.4$ °/s rms
Start up time	350 ms
Bandwidth (-3dB)	57 Hz

**Operating conditions**

Supply voltage	5 V
SPI voltage	3.3 V/5 V
Supply current	20 mA (typical)
Operating temperature	-40 °C...+105 °C

<sup>1)</sup> Over lifetime and temperature

**Outline SOIC24-8 package****Package**

The sensor is available in a SOIC24-8 package for surface mounting.

**Working principle**

The sensor element of the SMG550 is designed for roll rate measurement and is manufactured using state of the art Bosch surface micro-machining technology. It is based on the coriolis vibratory gyroscope principle: High frequency electrostatic forces generate a 15 kHz out-of-phase oscillation of two seismic masses controlled by a closed loop drive.

A rotation around the sensitive  $\Omega_x$  axis leads to a coriolis force acting on the oscillators which can be measured by capacity changes in the detection system. To guarantee the highest performance the detection circuit also makes use of the closed loop principle.

Synchronous demodulation of the high frequency signal generates a signal which is proportional to the angular rate.

**Interface**

The SMG550 communicates via a 16 bit digital Serial Peripheral Interface (SPI).

**Portfolio**

The SMG550 s sensor is part of a larger sensor portfolio. The portfolio consists of acceleration sensors, angular rate sensors, pressure sensors, and combined inertial sensors for occupant safety systems, vehicle dynamics control VDC, active suspension systems, motor management, transmission control systems, and navigation.

Bosch has been active in the field of micro-electro-mechanical systems (MEMS) for more than 20 years, and is established as one of the pioneers of this technology. With more than 1000 MEMS patents, hundreds of engineers in this field, and more than 3 billion MEMS sensors shipped to date, Bosch is the global market leader for MEMS sensors.

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

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