

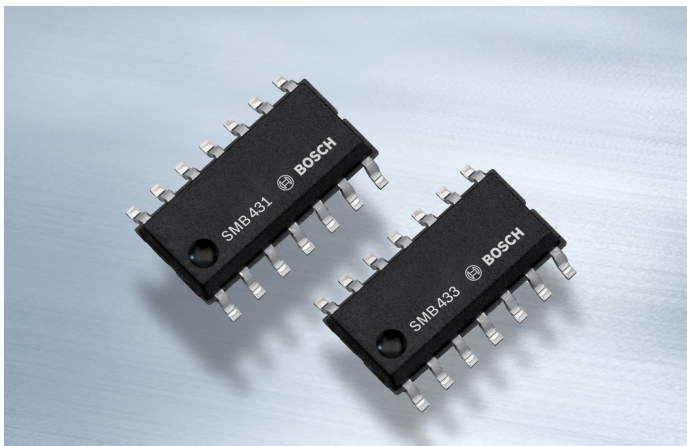
# Automotive Electronics

## Low-g accelerometers for active suspension

### SMB431, SMB433, SMB437



**BOSCH**  
Invented for life



Accelerometers SMB43x for active suspension systems

#### Customer benefit / features:

- ▶ SMB431: 1.6 g  $a_y$  gravity compensated low-g sensor with PSI5 interface
- SMB433: 16 g  $a_x$  low-g sensor with PSI5 interface
- SMB437: 1.6 g  $a_y$  low-g sensor with PSI5 interface
- ▶ Excellent signal performance and robust communication through digital sensor interface PSI5
- ▶ Cost-efficient system architecture
- ▶ 2-wire interface – reduction in harness costs
- ▶ Small size, only few passive elements necessary
- ▶ Identical package and programming as airbag sensors

#### Overview

The SMB43x accelerometers are designed for vibration control. They are particularly suitable for usage in second level housings as a peripheral sensor. The main applications are active suspension systems, in which the SMB43x sense accelerations of the chassis or wheel. Depending on the road conditions, active damping systems adjust damping forces to a comfortable but also safe level. Both sensors consist of a micromechanical (MEMS) sensor element and a signal processing ASIC mounted in a molded plastic housing for PCB mounting.

#### Product description

The SMB431/433 are linear, single-axis ( $a_y/a_x$ ) low-g sensors with a measurement range of  $\pm 1.6$  g or  $\pm 16$  g. Both sensors allow for the measurement of static as well as dynamic accelerations.

A fully digital signal and filtering path provides an excellent signal performance with small tolerances. In combination with the digital PSI5 interface (Peripheral Sensor Interface) signal degradation between sensor and control is effectively impeded.

The SMB43x allows the construction of cost-efficient systems. The 2-wire PSI5 interface reduces the harness costs, while the small size of the sensor and the need of only few passive elements leads to reduced housing/PCB costs. Further synergies are possible due to identical package and programming interface as our 4th generation airbag sensors.

Both sensors are applicable in the temperature range from  $-40$  °C to  $+125$  °C and can be operated with a power supply between 5 V and 11 V.

**Products**

| Type   | Range  | Sens. axes | Sensitivity |
|--------|--------|------------|-------------|
| SMB431 | ±1.6 g | Y          | 300 LSB/g   |
| SMB433 | ±16 g  | X          | 30 LSB/g    |
| SMB437 | ±1.6 g | Y          | 300 LSB/g   |

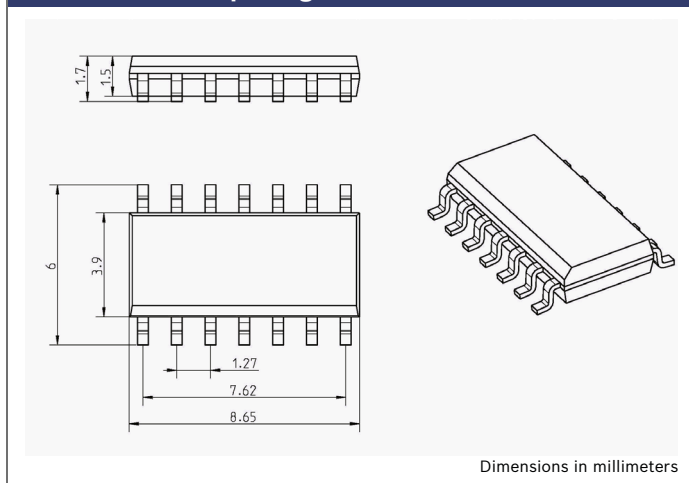
**Parameters SMB43x****Measurement and functional characteristics**

|                                       |                                    |
|---------------------------------------|------------------------------------|
| Sensitivity tolerance                 | ±5 % (SMB431/437)<br>±6 % (SMB433) |
| Nonlinearity of sensitivity           | ±2 %                               |
| Cut-off frequency (-3dB) <sup>2</sup> | 30 Hz, 60 Hz, 120 Hz, 240          |
| Acceleration data resolution          | 10 bit                             |
| Cross axis sensitivity <sup>1</sup>   | < ±3.5 %                           |

**Operating conditions**

|                          |                    |
|--------------------------|--------------------|
| Supply voltage           | 5 - 11 V           |
| Quiescent supply current | < 8 mA             |
| Temperature range        | -40 °C ... +125 °C |

- 1) Output signal due to acceleration in any axis perpendicular to the sensing axis.
- 2) Nominal values

**Outline SOIC14n package****Working principle**

The acceleration sensors SMB43x are manufactured by using surface micromachining technology. The acceleration sensors feature suspended free moving comb-like seismic mass elements 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 system capacitance. These changes are detected using a differential measurement principle.

**Interface**

The SMB43x sensors communicate via a digital (Peripheral Sensor Interface) PSI5 interface. For further information, please visit: [www.spi5.org](http://www.spi5.org).

**Package**

The sensors are RoHS compliant and packaged in SOIC14n housings (processability according to Jedec Level 1).

**Portfolio**

The SMB43x sensors are 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).

**Regional sales contacts**

Europe/Japan [bosch.semiconductors@de.bosch.com](mailto:bosch.semiconductors@de.bosch.com)  
 USA/Canada [bosch.semiconductors@us.bosch.com](mailto:bosch.semiconductors@us.bosch.com)  
 China [bosch.semiconductors@cn.bosch.com](mailto:bosch.semiconductors@cn.bosch.com)  
 Korea [bosch.semiconductors@kr.bosch.com](mailto:bosch.semiconductors@kr.bosch.com)

[www.bosch-semiconductors.com](http://www.bosch-semiconductors.com)  
[www.bosch-sensors.com](http://www.bosch-sensors.com)

**Robert Bosch GmbH**  
 Automotive Electronics  
 AE/SCS  
 Postfach 13 42  
 72703 Reutlingen  
 Germany

[www.bosch.de](http://www.bosch.de)