Overview

The SMA66x, SMA68x and SMA69x sensors are versatile accelerometers for automotive passive safety systems. SMA66x accelerometers are typically used as central sensors in the airbag electronic control unit (ECU), SMA68x/69x devices are typically used for satellite sensors for front and side crash sensing.

In order to design a complete airbag system, SMA6xy sensors can be combined perfectly with Bosch airbag system ICs, safety controllers, firing loop drivers and communication ICs. The SMA6xy family is based upon one common package, one common ASIC and several MEMS elements, designed for superior overload and crash performance. This unified approach can be used to reduce the cost of application and release on system level.

Product description

SMA6xy sensors are linear in-plane and out-of-plane accelerometers with available measurement ranges of ±120 g for SMA66x and ±120 g, ±240 g and ±480 g for the SMA68x/69x.

We offer SMA6xy in several variants of one-channel ($a_x, a_y$) and dual-channel ($a_y, a_z$) devices – enabling to design systems with higher flexibility with respect to the mounting orientation of satellites or ECUs. Fully digital signal processing and signal output either via SPI interface or via PSI5 interface ensure high signal quality. Combined with an automatic offset correction and embedded self test features both sensors are dedicated for safety critical applications.

For this reason, SMA6xy sensors are developed according to ISO26262 for use in ASIL D systems. The sensors are applicable in a broad temperature range from -40 °C up to +105 °C (SMA66x) or up to +125 °C (SMA68x/69x).
### Products

<table>
<thead>
<tr>
<th>Type</th>
<th>Application</th>
<th>Interface</th>
<th>Range</th>
<th>Sens. axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMA660</td>
<td>ECU</td>
<td>SPI</td>
<td>±120 g</td>
<td>X, Y</td>
</tr>
<tr>
<td>SMA665</td>
<td>ECU</td>
<td>SPI</td>
<td>±120 g</td>
<td>X, Z</td>
</tr>
<tr>
<td>SMA682</td>
<td>PAS</td>
<td>PSI5</td>
<td>±120/240/480 g</td>
<td>Y</td>
</tr>
<tr>
<td>SMA684</td>
<td>PAS</td>
<td>PSI5</td>
<td>±120/240 g</td>
<td>Z</td>
</tr>
<tr>
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<td>PSI5</td>
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<tr>
<td>SMA694</td>
<td>PAS</td>
<td>PSI5</td>
<td>±480 g</td>
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</tr>
<tr>
<td>SMA696</td>
<td>PAS</td>
<td>PSI5</td>
<td>±480 g</td>
<td>X, Z</td>
</tr>
</tbody>
</table>

### Parameters

#### SMA66x

- Tolerance of sensitivity: ±5 %
- -3dB corner frequency: 400 - 426 Hz
- Acceleration data resolution: 12 bit

#### SMA68x/69x

- Tolerance of sensitivity: ±7 %
- -3dB corner frequency: 400 - 426 Hz
- Acceleration data resolution: 10 bit

### Operating conditions

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>3.3 V, 5.0 V, 6.7 V</th>
<th>4.5 - 11 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply current</td>
<td>&lt; 6 mA (sink current 26 mA)</td>
<td>&lt; 6 mA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 °C...+105 °C</td>
<td>-40 °C...+125 °C</td>
</tr>
</tbody>
</table>

(1) Corner frequency depends on type and channel

### Interface

The SMA66x sensors communicate via a bidirectional digital 32-bit serial peripheral interface (SPI). Both sensors allow Bosch SPI or open SPI standard with 12-bit resolution of acceleration data.

The SMA68x/69x sensors communicate via a bidirectional PSI5 v1.3 interface.

Please visit [www.psi5.org](http://www.psi5.org) for further information.

### Package

The SMA66x/68x/69x is packaged in a lead-free SOIC8n housing. All parts are RoHS compliant.

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**Working principle**

The acceleration sensors SMA6xy 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.

**Portfolio**

The SMA66x/68x/69x sensors are 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 it first emerged in the 1980s. Today, 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 billion sensors are shipped each year from its state-of-the-art wafer fab in Reutlingen – or around 4 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).

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