

Combined inertial sensor for automotive applications

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Bosch SMI130 sensor measures acceleration and yaw rate in three dimensions

Simple to calibrate, flexible design

- ▶ Acceleration and yaw rate sensor with six sensing axes
- ▶ AEC-Q100 qualified for automotive applications
- ▶ Wide range of setting options in an ultra-compact package

Bosch has announced the launch of a new sensor which offers six degrees of freedom (6DoF) by measuring acceleration in all three spatial dimensions and yaw rates around all axes. The SMI130 is designed for non-safety-critical applications in the automotive industry, including in-dash navigation and telematics systems such as toll, eCall, and alarm systems.

For users of navigation devices, the new Bosch combined inertial sensor offers two different benefits. First, it assists in situations where no GPS signal is available, such as tunnels, deep urban canyons, and off-road terrain. In combination with the vehicle's indicated speed, the sensor's yaw rate signal provides the data required to determine the exact position of the vehicle according to the principle of dead reckoning. Second, navigation systems can use the acceleration signal to determine whether the vehicle is moving up or down and can use this information to derive its vertical position. This enables the system to identify the correct level in places where multiple roads are overlapping.

One type of sensor for all types of applications

For manufacturers of navigation systems, the 2 x 3 sensing axes provided in the SMI130 offer a crucial advantage, enabling correction of the GPS signal regardless of where the navigation device is installed. This innovative solution means that only one type of sensor is required for all applications, instead of multiple single-axis yaw rate sensors aligned differently according to the orientation and position of the navigation device. Other

applications that use information on vehicle movement can also benefit from the 6DoF sensor. The SMI130 also makes it possible to identify the vehicle's location more accurately in telematics and toll systems, regardless of where it is installed.

Technical features of the SMI130

Where required, the measurement range of the yaw rate sensor can be adjusted in up to five steps between $\pm 125^\circ/\text{s}$ and $\pm 2000^\circ/\text{s}$; the acceleration sensor offers four different measurement ranges between $\pm 2\text{g}$ and $\pm 16\text{g}$. The yaw rate signal offers a resolution of 16 bit and the acceleration signal has a resolution of 12 bit. A temperature signal is also available. Further features include adjustable filter bandwidths and built-in self-testing capabilities. Taken together, these features offer a significant degree of design flexibility. The SMI130 is supplied in a compact LGA housing that measures just 3.0 x 4.5 x 0.95 mm, and is AEC-Q100 qualified for automotive applications.

Samples of the new SMI130 are already available.

Background to MEMS technology

Bosch has been at the forefront of MEMS (microelectromechanical systems) technology since the very beginning. Since the start of production in 1995, the company has manufactured well in excess of three billion MEMS sensors, with production volumes hitting new highs year after year. In 2012, some 600 million sensors rolled off the production lines at the company's high-tech wafer fab in Reutlingen – or 2.4 million each working day. Bosch supplies sensors for a wide range of applications in the consumer electronics and automotive industries. These sensors measure pressure, acceleration, rotary motion, mass flow, and the earth's magnetic field. More information on Bosch sensors for automotive applications is available online at www.bosch-sensors.com.

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