Product News

Bosch's SMI340 MEMS sensor combines vehicle safety and ADAS
A new benchmark for vehicle motion sensing

- Bosch's SMI340 MEMS inertial sensor combines ADAS and safety applications up to ASIL D in a single sensor platform
- The SMI340 offers high measurement performance and robustness in a compact package
- OEMs benefit from a future-ready sensor platform designed to meet the demands of next-generation vehicle architectures

Safety and advanced driver assistance systems (ADAS) in modern vehicles increasingly depend on MEMS (micro-electromechanical systems) sensors to precisely capture vehicle motion. These sensors must maintain their performance under changing temperatures and strong vibrations. At the same time, increasingly complex vehicle architectures leave little room for multiple sensors. The new SMI340 MEMS sensor draws on Bosch's long-standing expertise to meet these demands and bring the best of both worlds – ADAS and safety applications – together in one compact sensor platform.

One platform, multiple applications

The Bosch SMI340 is a 6 DoF (six-degrees-of-freedom) inertial measurement unit that measures acceleration and rotation rate along three spatial axes. By providing precise information about how a vehicle is moving, the SMI340 is a key enabler for functions ranging from vehicle stabilization to increasingly advanced driver assistance.

As successor to SMI240 and SMI270, the new SMI340 adds ESP functionality and brings previously separate sensor functions together on one standardized platform. Rather than using separate inertial sensors for different application areas, vehicle manufacturers can now rely on one common solution for a broader range of functions. For OEMs, this can simplify sensor integration, reduce the number of sensor variants, and streamline development across multiple vehicle platforms.

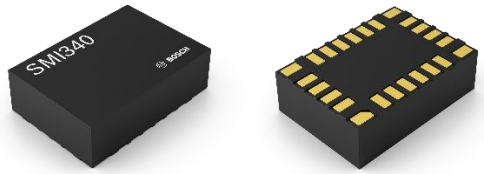


Image: The SMI340 supports both ESP and ADAS applications.

Compact design without compromising performance

The SMI340 is designed for demanding automotive applications where precise motion sensing, robustness, and compact dimensions must go hand in hand. These requirements become increasingly important as OEMs aim to integrate more safety and advanced driver assistance functions into vehicle architectures without additional installation space.

For safety-critical applications, the SMI340 comes in a small package, measuring just 3.1 x 4.4 mm^2. Despite its reduced footprint, it delivers the same excellent technical performance while supporting functional-safety applications up to ASIL D (automotive safety integrity level D). OEMs therefore gain greater design flexibility without a trade-off in measurement performance. In active-safety applications such as ESP, the SMI340 supplies precise acceleration and rotation-rate data, allowing the vehicle control system to detect critical vehicle movements and initiate appropriate stabilization measures. The same data can contribute to passive-safety applications such as rollover sensing.

For L2+ ADAS applications, the SMI340 builds on its predecessor SMI240 with improved temperature stability from -40 up to 125 °C and increased vibration robustness. This helps ensure reliable vehicle-motion information even under demanding operating conditions. For functions such as semi-autonomous and hands-free driving, the SMI340 continuously measures acceleration and rotation, providing an independent source of motion data that can complement information from other vehicle sensors. ADAS systems thus gain an additional reliable input to understand how the vehicle is moving.

"At Bosch, we develop solutions that combine rather than compromise. By consolidating the strengths of our previous sensors in one platform, we are bringing the best of two worlds together: performance required for safety-critical applications and precision needed for advanced driver assistance."

Kai Dolde, Product Manager MEMS Inertial Sensors

Efficient motion data handling

Apart from motion sensing, the SMI340 is designed for efficient data handling. At a 16-bit data resolution, its integrated FIFO (First in, First out) can be used to temporarily buffer consecutive sensor measurements before transferring them to the control unit. Interrupt functions notify the control unit when new data is available and ready to be retrieved. Together, these functions enable more flexible data transfer between the sensor and the control unit without requiring every individual measurement to be retrieved immediately.

This process can best be seen in practice in ADAS functions such as assisted lane driving. While the front camera detects the lane markings, the SMI340 continuously measures acceleration and rotation rate to track the vehicle's motion for sensor fusion and vehicle-state estimation. Rather than transmitting individual measurements to the control unit as soon as they are generated, the FIFO temporarily stores them until they are transferred. This allows the control unit to retrieve multiple time-ordered measurements together, efficiently providing input for the ADAS function. As a result, developers gain greater flexibility in handling and transferring measurement data within the system.

"Vehicle architectures are evolving quickly, and OEMs need sensor solutions that evolve with them. The SMI340 helps simplify sensor strategies while giving manufacturers flexibility to integrate new functions in future vehicle projects."

Peter Spoden, Senior Manager and Expert Product Management Inertial

Ready for the road ahead

The ability to meet evolving vehicle requirements does not start with a single product generation. It builds on continuous advances in inertial sensing and an understanding of how automotive applications and OEM requirements are changing. Building on more than 30 years of expertise in automotive inertial sensing and MEMS technology, Bosch has brought capabilities previously covered by several sensors together in the SMI340, laying the foundation for reliable vehicle-motion sensing in the next generation of vehicles.

For more information, please visit www.bosch-semiconductors.com