Active safety systems

SMI710 combined inertial sensor for vehicle dynamics control

BOSCH
Invented for life

PRODUCT BENEFITS

- Target applications
  – Roll-stability control
  – Active damping systems
  – Rollover sensing
- Excellent vibration resistance and offset stability over temperature and lifetime
- Wide range of customized signal monitoring options
- Various communication interfaces available (SPI, PSI5 and CAN)
- RoHS compliant

1 Ball grid array package (BGA), 7 mm × 7 mm × 1.5 mm

reliable operation

due to excellent vibration resistance

safe and economical

integrated sensor solution, applicable in systems up to ASIL D requirements.

TASK

The inertial sensor SMI710 is especially designed for premium vehicle dynamics control (VDC) functions, roll-stability control (RSC) and active damping systems (AD) but also for roll-over sensing (RoSe) functions.
Thanks to three chips in one housing, the SMI710 is able to measure data regarding the vehicle's rotation around its roll axis. In addition, it delivers data about the longitudinal and vertical acceleration, which is important to determine the dynamic state of the vehicle and to check the plausibility of the rotation rate signal.

FUNCTION

The MEMS elements of the SMI710 have been optimized for vibration resistance and ultra-robust offset stability.
The angular rate sensor is based on the Coriolis vibratory gyroscope principle: High-frequency electrostatic forces generate an oscillation of two seismic masses controlled by a closed loop drive system. When rotating around the nominal axis, the Coriolis forces acting on the oscillators can be measured by capacity changes in the detection system.
The acceleration sensor consists of movable comb-like seismic masses suspended from silicon spring bars 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 the capacity of the system.

VARIANTS

The SMI715 combined inertial sensor contains the angular rate sensor (Ω_x) from the SMI710 and the acceleration sensor (a_{xy}) from the SMI700.

MEASUREMENT CHARACTERISTICS

Measurement axis	a_{xy}	Ω_z
Measurement range	±5.0 g	±300 °/s
Sensitivity (nominal)	5,000 LSB/g	100 LSB/°/s
Sensitivity variation [1]	±3 %	±3 %
Offset variation [1]	±50 mg (a_y); ±70 mg (a_z)	±3 °/s
Noise (rms) [2]	6 mg (a_y); 7 mg (a_z)	0.15 °/s

TECHNICAL CHARACTERISTICS

Communication	SPI, PSI5, CAN
–3dB corner frequency [3]	either 11, 18, 21 or 77 Hz
Start-up time [4]	max. 400 ms

OPERATING CONDITIONS

Supply voltage (digital)	3.3 V / 5 V
Supply current [5]	< 29 mA
Operating temperature	–40 °C to +125 °C

[1] Over lifetime and temperature
[2] Depends on filter setting and interface – here: 77 Hz
[3] Nominal f–3dB for the rate channel corresponding to programmable filter settings
[4] Incl. up to 3 self-tests for 77.5 Hz setting
[5] SPI, PSI5

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