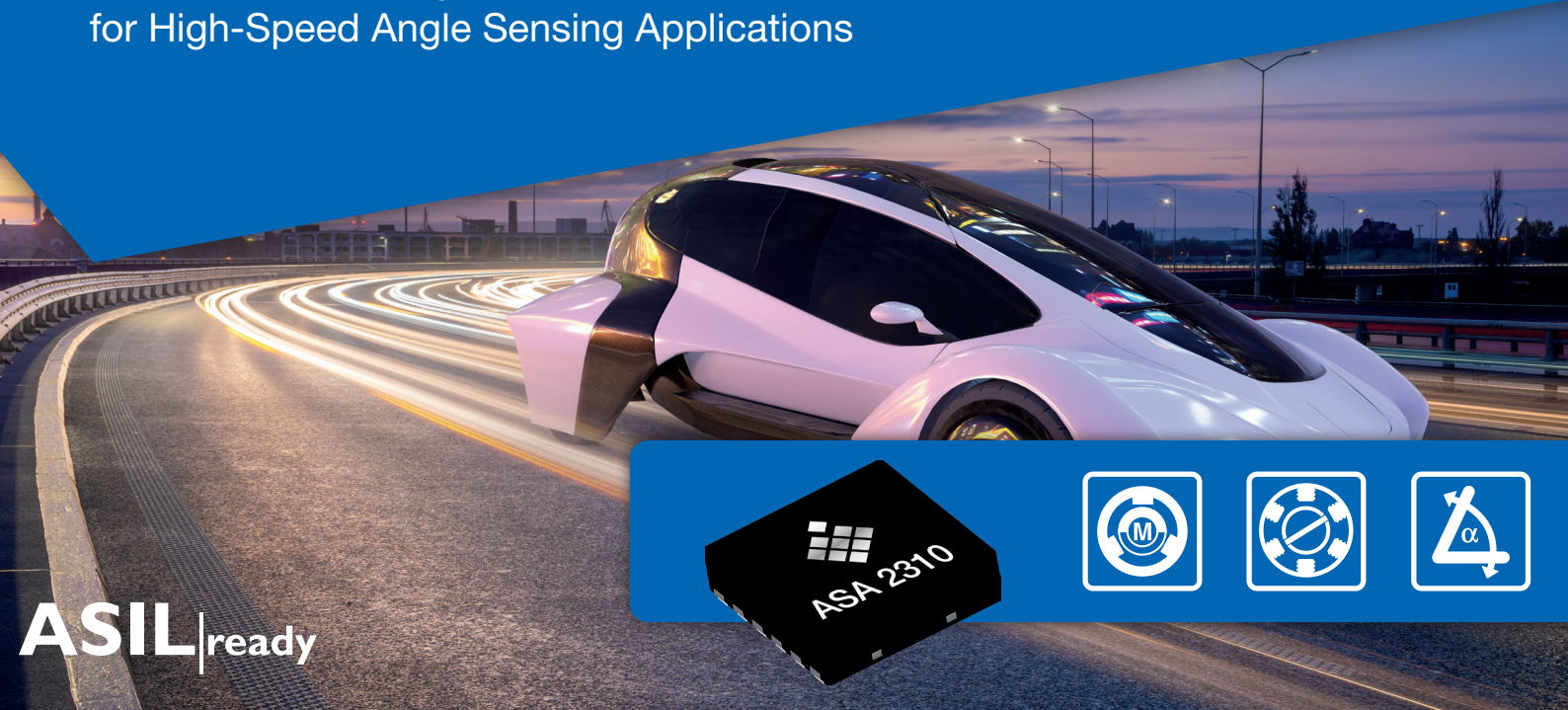


ASA 2310

Flexible TMR Analog Front-End IC for High-Speed Angle Sensing Applications



ASIL ready

ASA 2310 is a high-performance TMR analog front-end IC for high-speed angle sensing applications with rotation speeds of up to 650,000 rpm.

The ASA 2310 is designed to interface the high-precision analog TMR sensors of the TAS family. The sensor interface provides two differential inputs for sine and cosine TMR resistive bridges, respectively. The integrated sine and cosine channels of ASA 2310 have their own programmable gain amplifier (PGA), which are used as a low-noise instrumentation amplifier for the TMR sensor signals. Several coarse gain settings ensure that the device can support various TMR full- and half-bridges from TDK. The output buffer amplifies the signal even further and acts as buffer for the external load.

The ASA 2310 offers an intrinsic signal conditioning with on-chip calibration, which reduces effort on ECU side. The device can compensate for the main sensor and magnetic system non-idealities, like offset error, amplitude mismatch and orthogonality error. In addition, it is possible to define the angular reference position (0-angle) for the sine and cosine output signals. This allows the compensation of mechanical twist between magnet and sensor at module level. The conditioned signals can be output as differential or single-ended analog sine and cosine output signals. These signals allow the user to calculate the angle with very high accuracy by an external A/D-converter and a microcontroller/ECU.

The ASA 2310 is programmable by modulation of the output voltage. No additional programming pin is needed and fast end-of-line programming is enabled.

This product is defined as SEooC (Safety Element out of Context) ASIL B ready according to ISO 26262:2018 (Metrics (PMHF, SPFM, LFM) according to ASIL C). ASA 2310 contains integrated safety monitorings, such as overvoltage and undervoltage detection as well as wire-break monitoring during normal operation.

The signal-conditioning IC is available in a very compact 3 × 3 mm² DFN12 SMD package.

Main Features and Benefits

- ◆ Support of various TMR full- and half-bridges from TDK
- ◆ Optimized signal conditioning for TMR signals, like output gain, offset, 0-angle and orthogonality correction
- ◆ Easy-to-use differential or single-ended SIN/COS outputs for remote sensing applications with best-in-class EMC performance
- ◆ Fast response time of max. 3 μs and high output bandwidth for applications up to 650,000 rpm
- ◆ Various analog output configurations
 - Differential or single-ended SIN/COS analog output signals
 - Non-ratiometric or ratiometric analog outputs related to the supply voltage

- ◆ SEooC ASIL B ready according to ISO 26262:2018 to support Functional Safety applications (Metrics (PMHF, SPFM, LFM) according to ASIL C)
- ◆ Intrinsic signal conditioning with on-chip calibration and integrated safety monitoring reduce effort on ECU side
- ◆ Flux-less self-test
- ◆ Operates from 3.0 V up to 5.5 V supply voltage
- ◆ Low current consumption of typ. 5.5 mA
- ◆ Operates from –40 °C up to 170 °C junction temperature (Max. Ambient Temperature: T_{A,absmax} = 160 °C)
- ◆ Programming via the IC's output pin. No additional programming pin required
- ◆ Overvoltage and reverse-voltage protection
- ◆ Under- and overvoltage detection of V_{SUP}
- ◆ Passive wire-break detection working with external pull-up or pull-down resistors
- ◆ On-chip temperature sensor for overtemperature supervision
- ◆ Integrated, protected supply for the external TMR bridges
- ◆ Various integrated supervision features of the external TMR bridges
- ◆ Small 3 × 3 mm² DFN12 SMD package
- ◆ AEC-Q100 qualification

ASA 2310

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Major Applications

Thanks to its capability to operate several sensors at the same time and its fast analog signal path, the ASA 2310 is a potential solution for the following application examples:

- ◆ Brushless DC (BLDC) and permanent-magnet synchronous motor (PMSM) commutation in a safety-relevant environment with long wire-harness between sensor and ECU
- ◆ Traction motor rotor position for electric vehicles (BLDC, PMSM, PMSR,...)
- ◆ Electric power steering motor
- ◆ Replacement of resolvers
- ◆ Brake booster
- ◆ LIDAR mirror

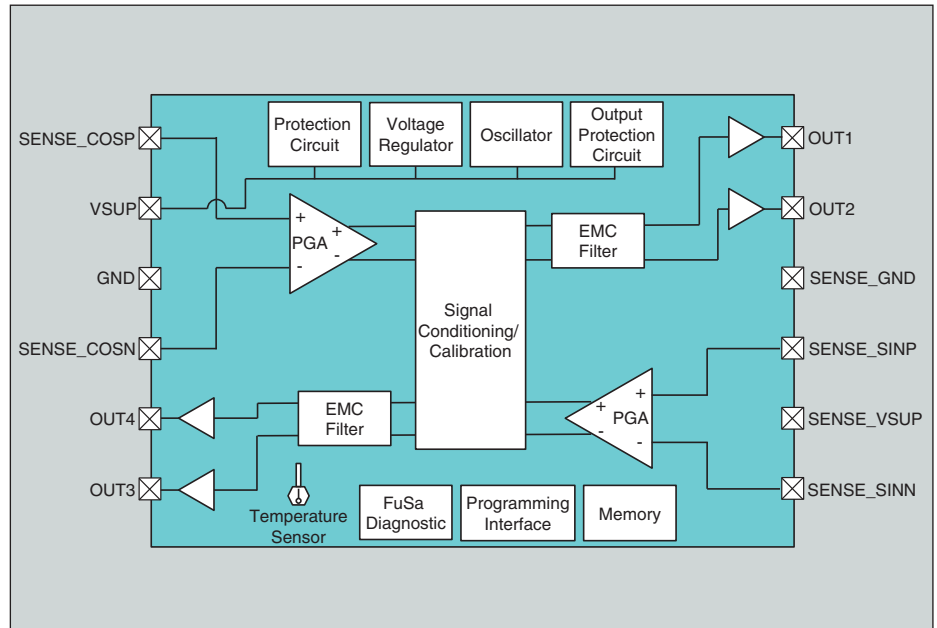


Fig. 1: Block diagram of ASA 2310

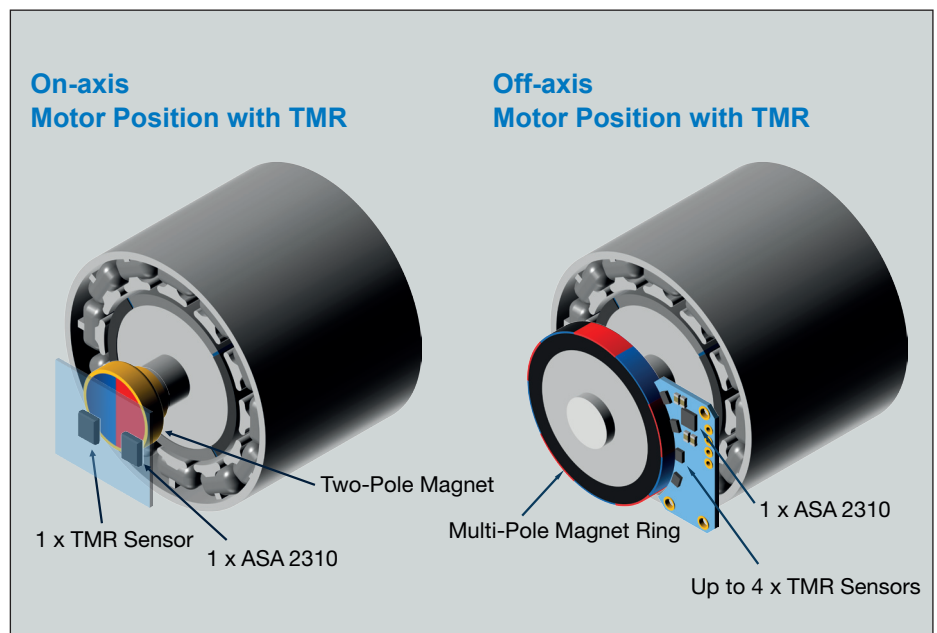


Fig. 2: Sensor application setup

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