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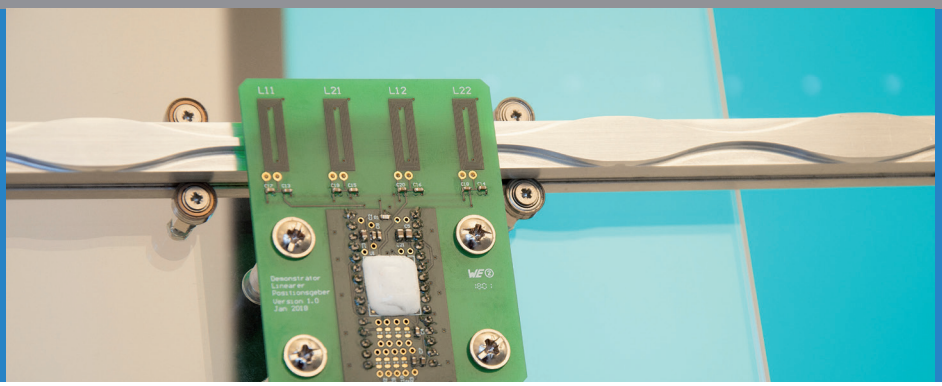

1 *Linear position sensor demonstrator*

INDUCTIVE POSITION SENSOR ASIC

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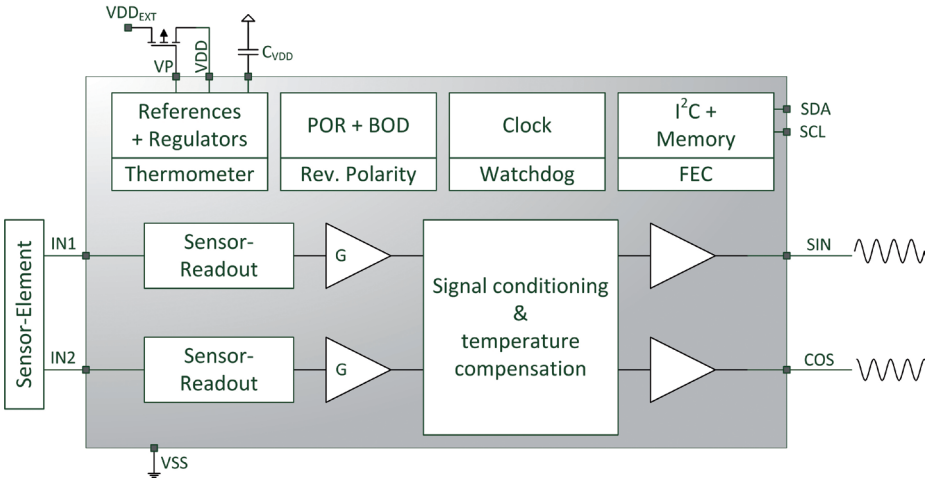
Description

The basic function of a position sensor lies in acquiring and processing measurement data based on the position of a moving object. Position sensors basing on a magnet measure angular positions by using variations of magnetic field amplitudes. These amplitudes are induced by the displacement or the rotation of the moving of the magnet. Disadvantages of this traditional solution are the costs of the magnet, operating temperature limitations, and the sensitivity towards magnetic stray fields.

The ASIC developed by Fraunhofer IMS can be used in magnet-free, contactless, inductive position sensors. These sensors use the physical principles of induction in a wire loop and eddy currents to detect the position of an electrically conducting target that is sliding or rotating above a set of receiver coils. The sensor itself consists of an arrangement of PCB-based coils and a target with a shaped layer of conductive material. Each coil is part of a resonant circuit and emits a high frequency field. The magnetic field induces eddy current in the target and the accordingly resulting opposed field reduces the inductance of the coil. Accordingly, the frequency of the resonant circuit changes as well as the phase. Depending on the area of conductive material which actually affects the coil the described effect varies and the output of the ASIC shows a signal which is proportional to the area of the conductive material. One sensor element basically consists of two coils which each are part of a resonant circuit. Therefore, a phase difference between the two resonant signals can be measured by the ASIC when the coils get asymmetrically affected by the conductive material of the target. The measured phase difference - and thus the resulting output signal - is insensitive to magnetic and electrical influences. The ASIC can be used for linear motion or absolute rotary sensing in automotive, industrial, medical, and consumer applications.



Features

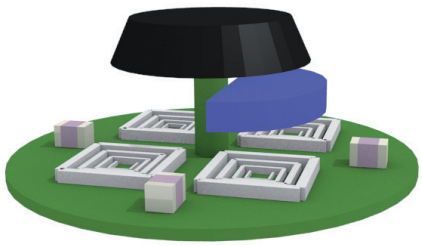
- Contactless absolute or relative position measurement
- Widely user programmable
- EEPROM for user calibration data and ID integrated
- On board sinus generation (programmable output frequency)
- ISO 26262 / ISO 61508 specific diagnosis and redundancy features can be implemented

Benefits

- High reliability and durability in harsh environments
- Wide operating temperature
- No magnets required
- Immunity to magnetic stray fields
- Low-cost PCB-based coils and metallic target sufficient
- Analog single-ended or differential sine / cosine output

Parameter	Value
Temperature range [°C]	-40 to +150
Output [V]	0 to 5
Accuracy [%]	1 (1)
Supply voltage [V]	4.5 to 5.5
Supply current [mA]	35 to 90 (2)
Air gap between coils and target [mm]	0.5 to 2.0
Over-voltage protection	yes
Ground-loss detection	yes
Under- and over-voltage detection	yes
Programming / diagnostic interfaces	Two-Wire, SPI

(1) typical value; the achievable resolution depends on geometry of the application (of the metallic target, coils, etc.)
(2) depending on frequency and amplitude of the integrated sine oscillator, output load and activated additional functions



2 *Block diagram*

3 *Rotation sensing of a control element (blue metallic target over four PCB-based coils)*