

CUR 423x

June/2019



CUR 423x TMR-Based Closed-Loop Sensor for High-Current Coreless Applications

The CUR 423x is a single-axis contactless magnetic-field sensor for galvanically isolated DC and AC current measurements. The Tunnel Magneto Resistance (TMR) sensing technology enables current measurements with high sensitivity and high accuracy in high-power applications. The galvanically isolated power and sensing circuits are of particular benefit in high-voltage battery monitoring systems of hybrid and electric vehicles (xEV). A very good signal-to-noise ratio and a total error below 1% (full scale) over temperature allow precise current measurements in applications with a signal bandwidth of up to 5 kHz.

All the necessary components for a closed-loop circuit, such as compensation coil, R_{SHUNT} , and TMR sensor bridge, are integrated into a small 1 mm thin industry standard TSSOP16 SMD package. By avoiding the need for a large magnetic-field concentrator core, space and costs can be saved. Digital offset and gain temperature compensation, low-pass filter, and clamping can easily be programmed by using TDK-Micronas' programming toolchain.

Two variants are available that offer magnetic-flux density ranges of either ± 7 mT or ± 40 mT. A programmable fine adjustment of the field ranges allows an adaptation to different application current ranges.

Current sensing modules equipped with the CUR 423x can be programmed via the output pin during the manufacturing process. Customer-selectable output interfaces, like SENT acc. to SAEJ2716 Rev.4, SPI or full ratiometric analog, allow a flexible adaptation to application requirements.

The CUR 423x is developed according to ISO26262 ASIL-B ready. The device is qualified according to AEC-Q100-Rev-H and is designed for automotive applications with temperatures ranging from -40 °C to $+170$ °C (T_J).

Features

- ◆ High-precision, linear closed-loop TMR technology
- ◆ Non-intrusive, galvanically isolated contactless and coreless current sensing
- ◆ Total error <1% over temperature
- ◆ Programmable non-linearity compensation
- ◆ Programmable adjustment and temperature compensation for gain and offset
- ◆ Selectable current-limiting function of the compensation loop feedback current
- ◆ Programmable quiescent output level
- ◆ Programmable magnetic-field ranges
- ◆ Programmable clamping threshold
- ◆ Digital 12/16-bit SENT and 13-bit analog output with programmable digital low-pass filter for 100 Hz to 5 kHz bandwidth
- ◆ SENT according to SAE J2716 Rev. 4
- ◆ Ratiometric analog output with selectable output inversion
- ◆ SPI interface for test, debugging and direct microcontroller connection
- ◆ Digital readout of temperature and magnetic-field information via digital interface
- ◆ Biphase interface on OUT pin for programming and calibration
- ◆ Operates from -40 °C up to 170 °C (T_J)
- ◆ Operates from 4.5 V up to 5.5 V
- ◆ Over-/undervoltage detection on VSUP
- ◆ Overtemperature detection
- ◆ Wire-break detection on VSUP and GND
- ◆ Reverse-/overvoltage protection at VSUP
- ◆ Magnetic-field-out-of-range detection
- ◆ Short-current detection on OUT
- ◆ On-chip stimulation capability (coil)
- ◆ ISO26262 ASIL-B ready
- ◆ Qualified according to AEC-Q100-Rev-H

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Application Examples

- ◆ xEV battery monitoring
- ◆ Stationary battery management

Development Tools

The CUR 423x can be programmed and calibrated during the final manufacturing process with the Magnetic Sensor Programmer MSP V1.0 via the Biphasse communication interface or SPI.

TDK-Micronas offers an easy-to-use evaluation kit for engineering.

- ◆ Magnetic Sensor Programmer MSP V1.0
- ◆ LabVIEW™ programming software for Windows® including Sub VIs

CUR 423x Versions

Type	Magnetic Flux Range
CUR 4235GWDA	±7 mT
CUR 4235GWBA	±40 mT

Sensor Busbar Setup

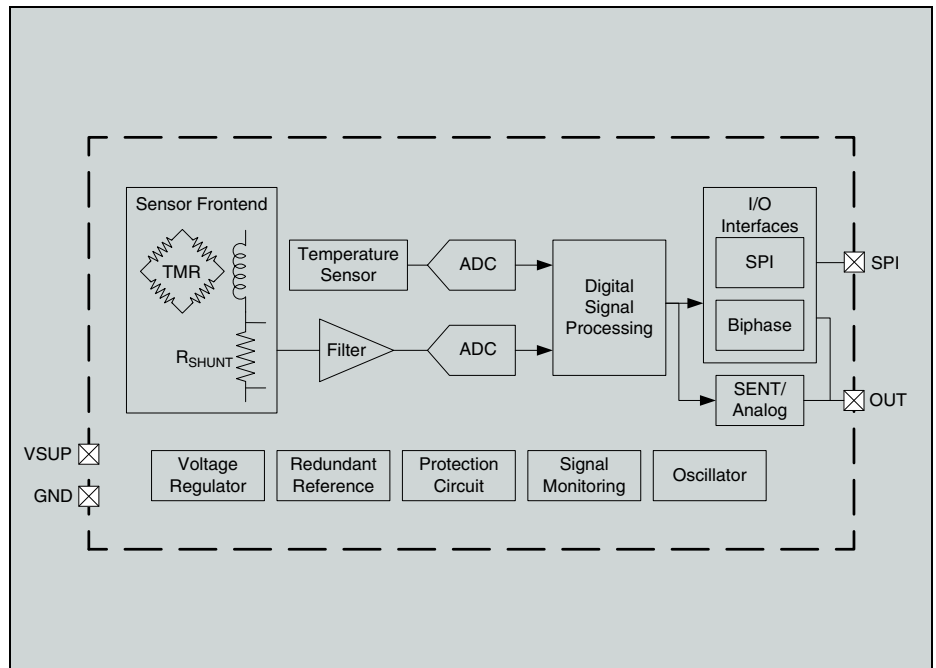
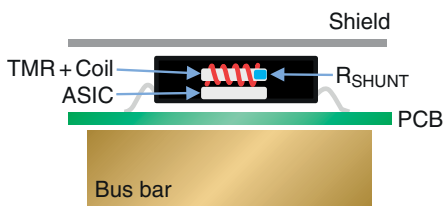


Fig. 1: Block diagram of the CUR 423x

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