

Magnetic Sensors

TMR-based closed-loop sensor for high-current coreless applications

- First Micronas' brand TMR-based current sensor
- Non-intrusive, galvanically isolated contactless current measurement based on closed-loop TMR technology
- Smallest module integration since no magnetic-field core concentrator is required
- ISO26262 ASIL-B ready and AEC-Q100 qualified

June 18, 2019

TDK Corporation (TSE 6762) is expanding its Micronas magnetic sensor portfolio with the CUR 423x sensors developed for current measurements in automotive and industrial applications. The new sensors, marketed under the trademark curSENS, are the first Micronas branded products based on the TDK TMR technology. This technology has already been proven in existing TDK automotive sensor products and is now paving the way for innovative coreless current-sensing applications. The new sensors highlight the synergies created in TDK's magnetic sensor business, following the acquisition of Micronas in 2016. The CUR 423x sensors are the first family members, suited for DC and AC measurements in high-power applications and is able to measure currents above 1200 A. 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 for precise current measurements in applications with a signal bandwidth of up to 5 kHz. Samples will be available from the fourth quarter of 2019.

All the necessary components for a closed-loop circuit, such as compensation coil, Rshunt, 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 fine adjustment of the field ranges allows for adaptation to different application current ranges. Current sensing modules equipped with 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 for flexible adaptation to application requirements.

The CUR 423x is developed according to ISO26262. ASIL-B ready Functional Safety level is achieved due to various integrated diagnostic functions. The CUR 423x is qualified according to AEC-Q100 and is designed for automotive applications with temperatures ranging from -40 °C to $+170$ °C (T_J).

TDK will present its Micronas CUR 423x sensors simultaneously from June 25 to 27, 2019 at the Sensor+Test fair in Nuremberg, Germany, at booth 204 in hall 1 and at the Sensors Expo in San Jose, California, at booth 416.

Glossary

- TMR = Tunnel Magneto Resistance
- SENT = Single-Edge Nibble Transmission
- xEV = Vehicles including an electric traction motor
- SPI = Serial Peripherals Interface
- TSSOP = Thin Shrink Small Outline Package

Main applications

- xEV Battery Monitoring
- Stationary Battery Management

Main features and benefits

- High-precision closed-loop and coreless TMR sensor technology (reduced system size and weight)
- Contactless current sensing (non-intrusive)
- Functional Safety diagnostic (ISO26262 ASIL-B ready)
- Various programmable magnetic field ranges
- Supply voltage protection up to 18 V
- Automotive temperature grade ($T_{Jmax} = 170\text{ °C}$)
- Various output interfaces (SENT acc. to SAEJ2716 Rev.4, full ratiometric Analog or SPI)

Key data

Type	CUR 423x
Package	TSSOP16
Output formats	SENT acc. to SAEJ2716 rev.4 (including fast 16 bit data channel), SPI, full ratiometric analog (13 bit DAC)
Overall accuracy	Measurement error <1% of full-scale range
Flux density amplitude range	$\pm 7\text{ mT}$, $\pm 40\text{ mT}$
Functional Safety	ASIL-B ready (digital interface)
Temperature Range	$T_J = -40\text{ °C}$ to 170 °C
Sample availability	Q4/2019

About TDK Corporation

TDK Corporation is a leading electronics company based in Tokyo, Japan. It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK's comprehensive portfolio features passive components such as ceramic, aluminum electrolytic and film capacitors, as well as magnetics, high-frequency, and piezo and protection devices. The product spectrum also includes sensors and sensor systems such as temperature and pressure, magnetic, and MEMS sensors. In addition, TDK provides power supplies and energy devices, magnetic heads and more. These products are marketed under the product brands TDK, EPCOS, InvenSense, Micronas, Tronics and TDK-Lambda. TDK focuses on demanding markets in the areas of information and communication technology automotive, industrial, and consumer electronics. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2019, TDK posted total sales of USD 12.5 billion and employed about 105,000 people worldwide.

About TDK-Micronas

TDK-Micronas is the most preferred partner for sensing and control. TDK-Micronas serves all major automotive electronics customers worldwide, many of them in long-term partnerships for lasting success. Operational headquarters are based in Freiburg im Breisgau (Germany). Currently, TDK-Micronas employs around 1,000 persons. For more information about TDK-Micronas and its products, please visit www.micronas.com.

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Further information on the products can be found under www.micronas.com.

Contacts for regional media

Region	Contact	Phone	Mail
Global	Ms. Julia ANDRIS TDK-Micronas Freiburg, Germany	+49 761 517 2531	media@micronas.com