Magnetic Sensors

TDK introduces 3D HAL® technology-based position sensor with analog output and SENT interface

- The new Hall-effect sensor, HAL 3927, offers ratiometric analog output and digital SENT protocol according to SAE J2716 rev. 4
- Superior angular measurement and ISO 26262 compliant development to support safety-critical automotive and industrial applications in a small SOIC8 SMD package

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TDK Corporation (TSE:6762) announces the portfolio expansion of its Micronas direct-angle Hall-effect sensor family with the new HAL® 3927* sensor for automotive and industrial applications. HAL 3927 features a linear, ratiometric analog output with integrated wire-break detection as well as an SAE J2716 compliant SENT interface according to rev. 4. Samples are already available. The start of production is planned for the first quarter of 2024.

The new device is a high-resolution position sensor for highly accurate position measurements. Thanks to the sensor's versatile programming characteristics and its high accuracy, the HAL 3927 is a potential solution for linear movement measurements in transmissions, in clutch pedals, as an engine stroke sensor, for liquid level sensing, and for cylinder and valve position measurements. Furthermore, HAL 3927 is well suited for rotary position measurement in gear selectors, as a rotary selector with push function or in rear-axis, etc.** Its accurate integrated temperature sensor allows customers to replace other external temperature sensors if the application is using the SENT interface.

The HAL 3927 is based on Hall technology and can measure horizontal and vertical magnetic-field components B_X, B_Y and B_Z. Based on the signals of two out of three magnetic-field components, the device can measure 360° angular range and linear movements. On-chip signal processing calculates one angle out of two orthogonal magnetic-field components and converts this value into an output signal. In addition to the built-in signal processing, the sensor features an arbitrary programmable output characteristic, e.g. for linearization of the output signal via up to 33 setpoints (17 variable- or 33 fixed). Major characteristics like gain and offset, reference position, etc. can be adjusted to the magnetic circuitry by programming the non-volatile memory. This product is defined as ASIL B ready SEooC (Safety Element out of Context) according to ISO 26262. The sensor is available in the eight-pin SOIC8 SMD package.

Glossary

- 3D HAL® pixel cell: Enables the direct measurement of magnetic fields in three directions X, Y, Z.

Main applications

- Detection of angle of rotation in automotive applications, rotary shifters (with push-function), liquid-level measurement, as well as rear-axis steering systems
- Detection of linear position in applications like clutch or brake pedal stroke, transmission system, cylinder and valve position sensing

Main features and benefits

- Very low angular error of ±1.0° @ 30 mT amplitude
- End-of-shaft and off-axis 360° angular measurement
- Direct measurement of magnetic-field amplitude (B_X, B_Y, B_Z)
- Customer-selectable analog or SENT output
- Very accurate internal temperature sensor and temperature information transmission via SENT
- ASIL B ready SEooC according to ISO 26262 to support functional-safety applications
- Suitable for automotive applications, due to a wide ambient temperature range from -40 °C to 160 °C

Key data***	
Type	HAL 3927
Package	SOIC8
Output formats	Analog, SENT SAE J2716 rev. 4
Angular error	±1° @ ±30 mT for rotary end-of-shaft setups
Magnetic-field amplitude range	±20 to ±130 mT. Down to 5 mT with reduced accuracy.
Safety	ASIL B ready, developed according to ISO 26262

* HAL/HAR 39xy uses licenses of Fraunhofer Institute for Integrated Circuits (IIS).
** Any mention of target applications for our products are made without a claim for fit for purpose as this has to be checked at system level.
*** All operating parameters must be validated for each customer application by customers' technical experts.

About TDK Corporation

TDK Corporation is a world leader in electronic solutions for the smart society based in Tokyo, Japan. Built on a foundation of material sciences mastery, TDK welcomes societal transformation by resolutely remaining at the forefront of technological evolution and deliberately "Attracting Tomorrow." It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK's comprehensive, innovation-driven 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 automotive, industrial and consumer electronics, and information and communication technology. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2023, TDK posted total sales of USD 16.1 billion and employed about 103,000 people worldwide.

About TDK-Micronas

TDK-Micronas is the center of competence for magnetic-field sensors and CMOS integration within the TDK group. TDK-Micronas has gained operational excellence for sensors and actuators production in over 25 years of in-house manufacturing. It was the first company to integrate a Hall-effect based sensor into CMOS technology in 1993. Since then, TDK-Micronas has shipped over six billion Hall sensors to the automotive and industrial market. The operational headquarters are located in Freiburg im Breisgau (Germany). Currently, TDK-Micronas employs around 1,000 people.

You can download this text and associated images from https://www.micronas.tdk.com/en/tradenews/pr2305.

Further information on the products can be found https://www.micronas.tdk.com/en/products/direct-angle-sensors/hal-39xy.

Contacts for regional media

Region	Contact		Phone	Mail
Global	Ms. J. ANDRIS	TDK-Micronas GmbH, Freiburg, Germany	+49 761 517 2531	mic-media@tdk.com