Magnetic Sensors

**TDK offers new stray-field compensated 3D HAL® sensors with redundancy function and digital output interfaces**

* New dual-die 3D position sensor family HAR® 39xy (HAR 3900 and HAR 3930) based on Hall-effect allows active stray-field compensation
* Fully redundant devices in SSOP16 package
* Highly flexible device architecture supports various digital interfaces (SPI, PWM output and SENT according to SAE J2716)

September 9, 2021

TDK Corporation (TSE:6762) expands its Micronas 3D HAL® sensor portfolio with the Hall-sensors HAR 3900 and HAR 3930\*. The products enable stray-field compensated position detection in automotive and industrial applications while addressing the need for ISO 26262 compliant developments. Samples are available on request. The start of production begins in the second quarter of 2022.

According to ISO 26262, the sensors are SEooC and ASIL B ready, enabling ASIL D developments on system level. They feature 3D magnetic-field measurement capability, 2D stray-field robust position detection; HAR 3930 has PWM and SENT (SAE J2716 rev. 4) output, additional switch output and HAR 3900 offers measurement data available via a high-speed SPI interface. Both sensors are the dual-die SMD package versions of HAL 3900 and HAL 3930, and suit a wide range of applications, including steering-angle position detection, transmission position detection, shifter position detection, accelerator and brake-pedal position detection.\*\*

HAR 39xy sensors enable angular measurements up to 360° with ferrite 2-pole magnets in addition to linear measurements up to 35 mm by using two-pole bar magnets. The stray-field robust position detection can take both measurement types, with additional 3D measurements resulting in two independent angles for each die. HAR 3900 provides temperature-compensated raw values of the magnetic field in X, Y, and Z direction via the SPI interface while offering various low-power modes. Patented 3D HAL pixel-cell technology which accurately measures magnetic fields is the core of the HAR 39xy sensors.

With its flexible architecture, HAR 39xy offers a wide range of configuration possibilities and helps design engineers select the best operation mode for any given task. It features a powerful DSP responsible for fast signal processing, and an embedded microcontroller that performs the interface configuration and supervision of the Functional Safety related tasks.

Each HAR 39xy sensor contains two independent dies placed upon each other that are mechanically separated and electrically insulated. The two dies measure almost the same magnetic field, therefore ensuring synchronous output signals. Redundant sensor solutions in a single package reduce system costs while at the same time increasing the reliability of the system due to smaller PCBs and less solder joints. The HAR 3900 and HAR 3930 are available in a small SSOP16 package.

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**Glossary**

* 3D HAL® pixel cell: Enables the direct measurement of magnetic fields in three directions X, Y, Z.
* Stray-field compensation: Modern Hall-effect sensors must be insensitive against disturbing fields generated by e-motors or power lines in hybrid or electrical vehicles (xHEV)
* masterHAL®: Registered trademark which stands for a unique feature set, including stray-field compensation capability built on the highly flexible architecture for multidimensional magnetic-field measurements

**Main applications\*\***

* Steering angle position detection
* Gear shifters
* Brake stroke position sensors
* Position detection in transmission systems
* Accelerator pedal position detection

**Main features and benefits\*\*\***

* Stray-field robust position detection (linear and rotary up to 360°) covering ISO 11452-8 requirements
* Compensation of stray-fields with gradients for applications with 180° rotation
* Real 3D magnetic field measurement of BX, BY and BZ
* Transmission of position information, up to two calculated angles, magnetic-field amplitude and/or chip temperature
* Transmission of temperature-compensated raw magnetic-field values (BX, BY and BZ) and low-power modes in case of HAR 3900.
* SEooC according to ISO 26262 to support Functional Safety applications
* Wide supply voltage range: 3.0 V to 5.5 V (HAR 3900), 3.0 V to 18 V (HAR 3930)
* Suitable for automotive applications due to a wide ambient temperature range  
  from -40 °C to 160 °C
* Dual-die SSOP16 SMD package

**Key data**

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| Types | HAR 3900, HAR 3930 |
| Packages | SSOP16 |
| Digital output formats | HAR 3900: SPI, HAR 3930: PWM, SENT, and Switch Output |
| Accuracy | ±0.5° @ 10 mT for rotary setups |
| Flux density amplitude range | 10 mT… 130 mT. Down to 5 mT with reduced accuracy |
| Functional Safety | ASIL B ready development according to ISO 26262 |

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| \* | HAR 39xy uses licenses of Fraunhofer Institute for Integrated Circuits (IlS) |
| \*\* | 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. |

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**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 2021, TDK posted total sales of USD 13.3 billion and employed about 129,000 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 has been the first company to integrate a Hall-effect based sensor into CMOS technology in 1993. Since then, TDK-Micronas has shipped over five 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.

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You can download this text and associated images from

<https://www.micronas.tdk.com/en/tradenews/pr2105>.

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

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