Magnetic Sensors

**TDK provides its stray-field robust 3D HAL® position sensors now with integrated decoupling capacitors**

* New 3D sensors based on Hall-effect allow active stray-field compensation of homogenous and gradient fields
* Single-mold three-pin TO92UF leaded package with integrated capacitors
* Highly flexible device architecture supports various digital interfaces (2-wire and 3-wire PWM output, SENT according to SAE J2716 rev. 2016 and PSI5 rev. 2.x)

June 17, 2021

TDK Corporation (TSE:6762) expands its Micronas 3D HAL® sensor portfolio with the Hall-sensor family HAC® 39xy\*, which features integrated capacitors for stray-field robust position detection in automotive and industrial applications. The TO92UF package was designed explicitly for PCB-less applications, combining both a chip from the HAL® 39xy\* family featuring stray-field compensation capability, and up to two capacitors with up to 330 nF. The new sensors suit a wide range of applications, including valves and actuators, gear shifters, transmission systems, or brake stroke position detection. The PSI5 interface supports the latest requirements of chassis-position detection sensors.\*\*

HAC 39xy sensors enable angular measurements up to 360° with ferrite 2-pole magnets and 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. The SENT interface transmits data from both angles while the sensors achieve a high ESD immunity and meet all of the stringent EMC requirements. Samples are available now; mass production will start by the end of 2021.

The patented 3D HAL pixel-cell technology is the core of the HAC 39xy sensors, and accurately measures magnetic fields while being insensitive to stray fields. The unique concept of the masterHAL® sensor line is based on an array of Hall plates. The highly flexible sensor array helps design engineers select the best operation mode for any given measurement task.

With its flexible architecture, HAC 39xy offers a wide range of configuration possibilities. It features a powerful DSP, which is responsible for fast signal processing, and an embedded microcontroller that performs the interface configuration and supervision of the Functional Safety related tasks. The innovative architecture of the HAC 39xy sensors makes it easy for customers to develop new solutions using fast prototyping techniques. It also enables quick and easy adaptation to changes in interface standards such as SENT and PSI5.

The pins of the TO92UF package can be welded or soldered directly to a lead frame, eliminating the need for a printed circuit board (PCB), thus reducing the total system size and cost. Furthermore, the overall system long-term reliability is significantly improved.

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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\*\***

* All kind of valves and actuators (e.g. cooling valves, EGR, turbocharger actuators)
* Gear shifters
* Brake stroke position sensors
* Position detection in transmission systems
* Chassis position detection
* Position detection in charging connector lock actuators

**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, angle velocity, magnetic-field amplitude and/or chip temperature
* SEooC according to ISO 26262 to support Functional Safety applications
* Wide supply voltage range: 3.0 V to 18 V
* Suitable for automotive applications, due to a wide ambient temperature range from -40 °C to 160 °C
* Leaded 3-pin TO92UF transistor package with integrated decoupling capacitors

**Key data**

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| Types | HAC 3930, HAC 3960, HAC 3980 |
| Packages | TO92UF |
| Digital output formats | PWM (2-/3-wire) & SENT SAE J2716 rev. 2016, PSI5 2.x |
| Accuracy | ±0.5° @ 10 mT for rotary setups |
| Flux density amplitude range | 10 mT to 130 mT. Down to 5 mT with reduced accuracy |
| Functional Safety | ASIL-B ready development according to ISO 26262 |

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| \* | HAL 39xy and HAC 39xy use 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/pr2104>.

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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**Contacts for regional media**

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| --- | --- | --- | --- | --- |
| **Region** | **Contact** |  | **Phone** | **Mail** |
| **Global** | Mrs. Julia ANDRIS | TDK-Micronas  Freiburg, Germany | +49 761 517 2531 | [media@micronas.com](mailto:media@micronas.com) |