TDK Technologies & Products Press Conference 2018

3D Hall-effect position sensor with stray field compensation

Jens Schubert
Product Line Manager 3D Position Sensors
TDK-Micronas, a TDK Group Company

The demands on magnetic field sensors are rising steadily. In particular, the increasing requirements for stray field compensation are creating new challenges for the design of magnetic sensors. At the same time, autonomous driving functions, increased functional safety requirements, and the growing need for digital interfaces demand a new kind of sensor that offers greater functionality and flexibility. TDK now introduces a unique 3D Hall-effect position sensor with stray field compensation and a highly flexible architecture.

Magnetic field sensors, and especially Hall-effect sensors, are widely used in industrial and automotive electronics applications. The main reason is that they enable the cost-efficient integration of many additional functions. Besides Hall-effect switches and 1D sensors, recent years have seen more and more 2D/3D magnetic field sensors being designed into advanced automotive applications. These sensors must fulfill ever rising demands. For example, autonomous driving applications are accompanied by rising safety requirements as per ISO 26262. In addition, modern cars feature more and more actuators that must be controlled with high precision, and the sensors must offer digital interfaces (e.g. SENT, SPI, PSI5), low power modes and 3D capability.

***Figure 1**: The new Micronas HAL® 39xy Hall-effect position sensor family offers multiple measure modes with active stray field compensation.*

The growing challenge of stray fields

Especially the stray field requirement is a big challenge for magnetic field sensors. The motors and power lines in hybrid electric vehicles (HEVs) and battery electric vehicles (BEVs) carry high currents and can generate magnetic fields that interfere with magnetic field sensors. A modern Hall-effect sensor must now offer robust stray field immunity conforming to the latest ISO 11452-8 standard and related OEM requirements. In the past, it was

sufficient to balance the strength of the magnet used in the application in relation to the disturbing field. Cost considerations have led to the use of ever smaller magnets, making active stray field compensation mandatory for magnetic field sensors.

HAL® 39xy position sensor family with a unique stray field concept

The new Micronas HAL® 39xy position sensor family addresses all those challenging targets. The Hall sensors not only measure magnetic fields very accurately, but they are also insensitive to disturbing magnetic fields. Their unique stray field concept is based on an array of vertical and horizontal Hall plates. The heart of the sensor is the patented 3D Hall pixel cell. The highly flexible sensor array enables design engineers to select the best stray field concept for any given measurement task.

The HAL 39xy family offers four different measurement modes:

- Linear position detection with stray field compensation
- Rotary 360° angle detection with stray field compensation
- Rotary 180° angle detection with stray field compensation, including gradient fields
- Real 3D magnetic field measurement (B_X, B_Y, B_Z)

Each mode uses a different combination of Hall plates to enable the best performance in each mode. The HAL39xy is the only solution available on the market that integrates all four modes in a single device. This offers a clear benefit to customers: They only have to qualify one device instead of various different hardware versions.

Flexible architecture for customized applications and fast prototyping

Thanks to its flexible architecture the HAL 39xy family offers a wide range of configuration possibilities. It features a powerful DSP and an embedded microcontroller. The DSP is mainly responsible for the fast signal processing (angle calculation, compensation, etc.), while the microcontroller performs overall scheduling, interface configuration and supervision of the functional safety related tasks. Customized firmware can be developed for both blocks. Together with the flexible Hall frontend, this enables customers to realize new kinds of applications. For example, this can involve customized signal processing or support for new interface standards. The innovative architecture of the HAL 39xy 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.

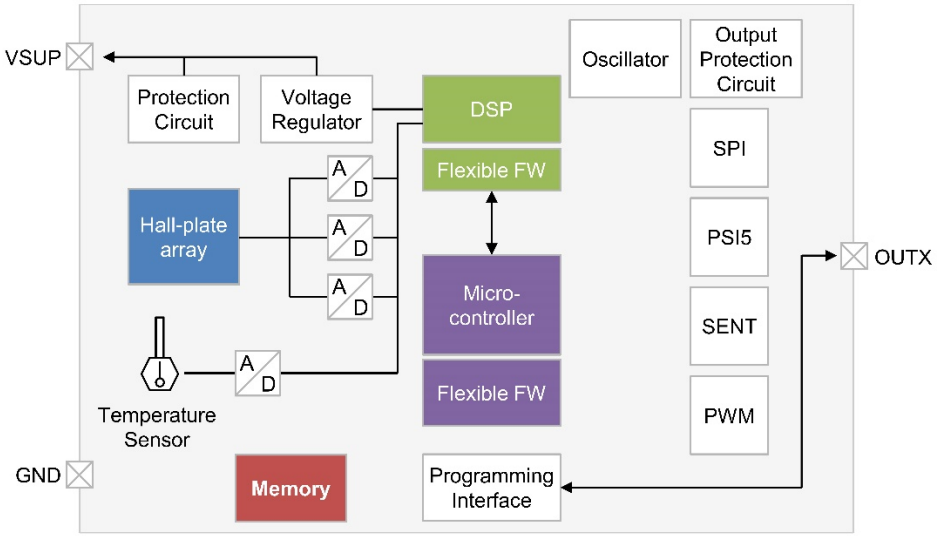

***Figure 2**: In addition to the patented Hall plate array, the Micronas HAL® 39xy Hall-effect position sensor family features a powerful DSP and an embedded microcontroller, both with configurable firmware.*

Unique solution for a wide range of automotive and industrial applications

With the new Micronas HAL 39xy family TDK provides a unique solution that fulfills the latest requirements on magnetic field position sensors. These sensors are ideal for a wide range of automotive and industrial applications, including:

- All kind of valves and actuators (e.g. cooling valves, EGR, turbocharger actuators)
- Selectors and gear shifters
- Pedal position detection
- Position detection in transmission systems
- Steering angle detection
- Chassis position detection

Initially, TDK will release the HAL 3900 (SPI), HAL 3930 (SENT/PWM) and HAL 3980 (PSI5) sensors in an SOIC8 package. Engineering samples will be available in early 2019. Looking ahead, further package types and additional interfaces will follow.

You can download this text and associated images from www.tdk-electronics.tdk.com/tpc18.
Further information contact our Sales department at www.tdk-electronics.tdk.com/inquiry.
Please forward reader inquiries to marketing.communications@tdk-electronics.tdk.com.

Contact for the media

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