

## Magnetic Sensors

### **TMR angle sensor in a TO-6 package for PCB-less applications**

- Reliable and cost-effective solution for PCB-less applications
- Fast response, high angular accuracy, and advanced compensation algorithms
- Presentation at the Sensor+Test exhibition in Nuremberg, Germany, and at the Sensors Expo in San Jose, California

June 12, 2018

TDK Corporation (TSE:6762) is expanding its portfolio of TMR angle sensors with the TAD2140 type in a TO-6 package for automotive and industrial applications. The new sensor provides an innovative system-in-package solution for PCB-less applications. It includes two full TMR bridges, a dedicated ASIC for signal conditioning and integrated passive components. Like all of TDK's TMR sensors, the TAD2140 features an angle accuracy of  $\pm 0.2^\circ$ , achieving the world's smallest angle error of only  $\pm 0.05^\circ$  at room temperature. The sensors are capable of contactless sensing from  $0^\circ$  to  $360^\circ$  over a temperature range of  $-40^\circ\text{C}$  to  $+150^\circ\text{C}$ . The sensor's fast response, high angular accuracy, and advanced compensation algorithms make it ideal for the optimization of motor control applications such as BLDC motor commutation. Moreover, thanks to its small package size, the sensor is perfectly suited for applications with limited available space, such as steering motor commutation. Samples will be available from the third quarter of 2018. Start of production is planned for the third quarter of 2019.

TDK will present the new TAD2140 sensor from June 26 to 28, 2018 at the Sensor+Test exhibition in Nuremberg, Germany, at booth 204 in hall 1 and at the same time at the Sensors Expo in San Jose, California, at booth 416.

The TAD2140 comes in a new TO-6 package that integrates six capacitors and one resistor. The sensor can be welded or soldered directly onto a package lead, a connector or a terminal, eliminating the need for a PCB, thus reducing total system size and cost. Furthermore, by using fewer external components and lowering the number of solder joints, thus improving the long-term reliability of the overall system.

The TAD2140 uses an embedded DSP from ICsense, an ASIC design specialist that TDK acquired in March 2017. Thanks to the integrated static and dynamic compensation functions of the ASIC, design-in effort is considerably reduced. The sensor can compensate any drifts of gain, offset or orthogonality as well as mechanical non-idealities like magnet tilt or displacement. In addition, the implemented algorithms allow higher assembly tolerances of mechanical components or increase of the system performance with existing solutions. The ASIC provides several digital outputs such as Hall emulation (UVW), encoder (ENC), pulse-width modulation (PWM), and SENT on two interfaces simultaneously. Furthermore, its various internal diagnostic features make it suitable for demanding automotive applications where functional safety is required (ASIL B rating).

### Glossary

- TMR: Tunnel Magneto Resistance. Of all magnetic field sensors, TMR offers the greatest sensitivity.

### Main applications

- Applications with limited available space, such as steering motor commutation

### Main features and benefits

- New TO-6 package integrates six capacitors and one resistor for PCB-less applications
- World's smallest angle error of just  $\pm 0.05^\circ$
- Angle accuracy of  $\pm 0.2^\circ$
- Digital output for all major interfaces, realized with an ASIC from ICsense
- Automatic correction function and compensation of system errors
- Contactless 360° angle measurement
- Suitable for automotive applications thanks to a wide temperature range from  $-40^\circ\text{C}$  to  $+150^\circ\text{C}$

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### Key data

TAD2140	
Package	TO-6
Digital outputs	UVW, ENC, PWM, SENT
Angle accuracy	$\pm 0.2^\circ$
Temperature range	$-40^\circ\text{C}$ to $150^\circ\text{C}$
Magnetic field measuring range	20 mT to 80 mT (typ.) 80 mT to 130 mT (extended)
Safety	Automatic correction function
Sample availability	Third quarter of 2018

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### 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 and 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 2018, TDK posted total sales of USD 12 billion and employed about 103,000 people worldwide.

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