

## TAD 2140, TAD 2141

June/2018



## TAD 2140, TAD 2141

### High-Precision TMR Angle Sensors with Digital Output

TAD 2140 and TAD 2141 are TMR angle sensors which allow absolute angle measurement of up to 360°. Based on the Tunnel Magneto-Resistance (TMR) effect, they offer high sensitivity and best angle accuracy needed for demanding automotive applications. The internal digital signal processing allows outstanding angular measurement performance. Stability in a wide range of temperature, and magnetic field variations is also achieved.

The sensors are pre-calibrated at manufacturing and additionally offer in-application calibration modes. The "Static compensation" targets the elimination of angle errors caused by mechanical misalignment between magnet and sensor. These correction parameters are programmed at EOL. In 360° multi-turn operation, TAD 2140 and TAD 2141 achieve excellent angle accuracy by using the "Dynamic compensation" mechanism, which eliminates magnetic, temperature, and life-time effects.

TAD 2140 and TAD 2141 support various output interfaces such as UVW (Hall Switch Emulation Mode), PWM, ENC (Encoder Mode), SPI or SENT. To reduce system costs, TAD 2140 integrates six capacitors and one resistor. They act as filter components and provide increased durability and automotive system level EMC/ESD protection.

#### Features

- ◆ Two TMR bridges including signal processor unit in one TO6 or TSSOP16 package
- ◆ Various and configurable digital outputs:
  - UVW (Hall Switch Emulation Mode)
  - PWM
  - ENC (Encoder Mode)
  - SENT SAE J2716 JAN2010 revision 3 (TAD 2140)
  - SPI (TAD 2141)
- ◆ High EMC/ESD performance for automotive system level EMC (TAD 2140)
- ◆ AEC-Q100 qualified
- ◆ ASIL-B ready device with several diagnostic functions and status reporting (TAD 2140)
- ◆ Internal diagnostic capability including direct monitoring of the sensor elements
- ◆ Continuous in operation self-tests:
  - Magnet loss detection
  - Maximum rotation speed detection
  - Over/undervoltage detection
  - Internal sensor fails
  - Signal processing supervision
  - Register CRC

#### Physical Characteristics

- ◆ Performance-dependent current consumption down to 12.5 mA
- ◆ Wide operating temperature range:  $T_J = -40\text{ °C}$  to  $175\text{ °C}$
- ◆ Wide magnetic field range:
  - 20 mT to 80 mT (standard range)
  - 80 mT to 130 mT (extended range) with lower accuracy
- ◆ Lowest deviation of angle error of just  $\pm 0.05^\circ$
- ◆ Guaranteed angle accuracy of  $\pm 0.2^\circ$  (in multi-turn application)

#### Typical Applications

- ◆ BLDC motor commutation e.g. for EPS
- ◆ Absolute angle sensor
- ◆ Resolver replacement

#### Benefits

- ◆ Fast response, high angular accuracy, and advanced compensation algorithms
- ◆ Compliant to ISO 26262: supports ASIL B on system level (TAD 2140)
- ◆ No PCB required (TAD 2140)

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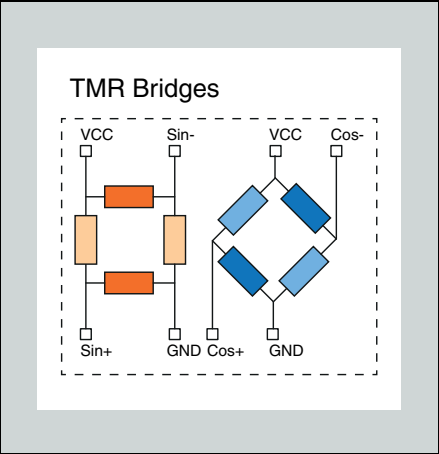


Fig. 1: TMR bridges of TAD 2140/2141

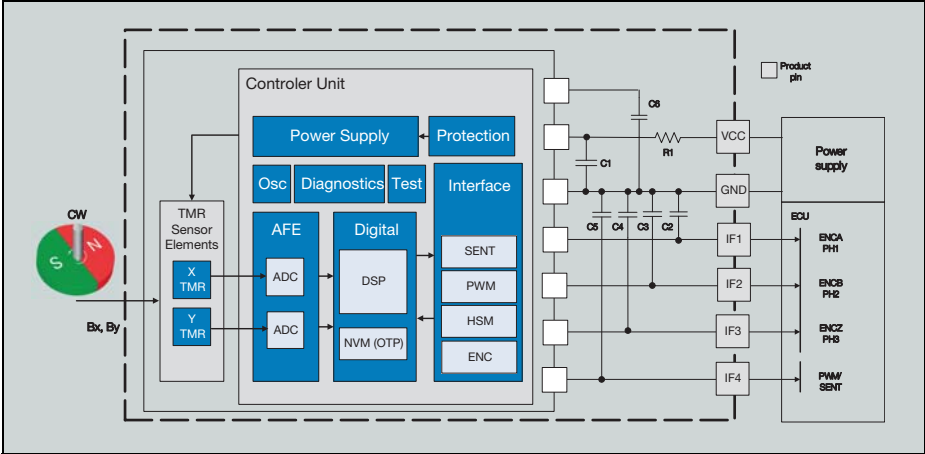


Fig. 2: Block diagram of TAD 2140

## Selection Guide

Type	Output Formats	Package
TAD 2140	UVW, PWM, ENC, SENT	TO6 including integrated caps
TAD 2141	UVW, PWM, ENC, SPI	TSSOP16

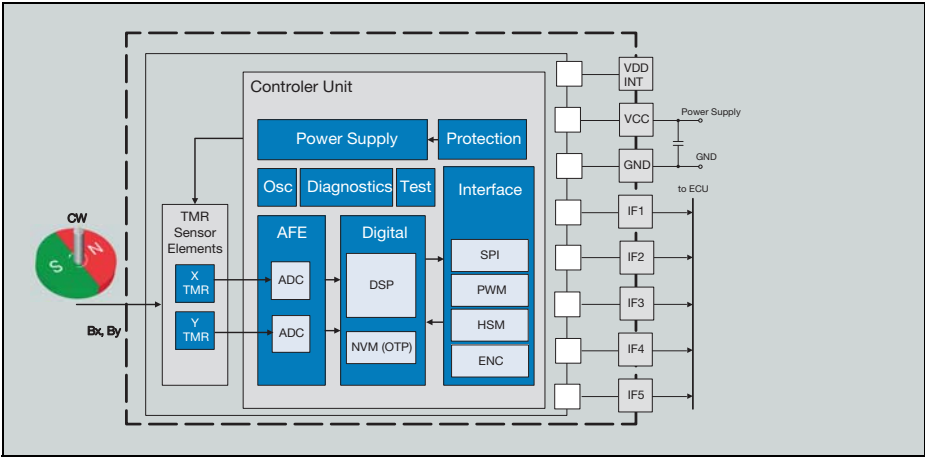


Fig. 3: Block diagram of TAD 2141

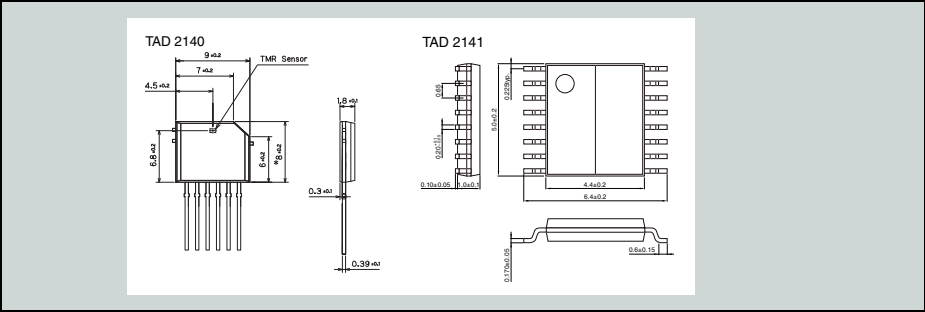


Fig. 4: Packages of TAD 2140 and TAD 2141

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