

## 1 General Description

The AS5030 is a contactless magnetic rotary encoder for accurate angular measurement over a full turn of 360°. It is a system-on-chip, combining integrated Hall elements, analog front end and digital signal processing in a single device.

To measure the angle, only a simple two-pole magnet, rotating over the center of the chip is required.

The absolute angle measurement provides instant indication of the magnet's angular position with a resolution of 8 bit = 256 positions per revolution. This digital data is available as a serial bit stream and as a PWM signal.

In addition to the angle information, the strength of the magnetic field is also available as a 6-bit code.

Data transmission can be configured for 1-wire (PWM), 2-wires (CLK, DIO) or 3-wires (CLK, DIO, CS).

A software programmable (OTP) zero position simplifies assembly as the zero position of the magnet does not need to be mechanically aligned.

A power down mode together with fast startup- and measurement cycles allows for very low average power consumption and makes the AS5030 also suitable for battery operated equipment.

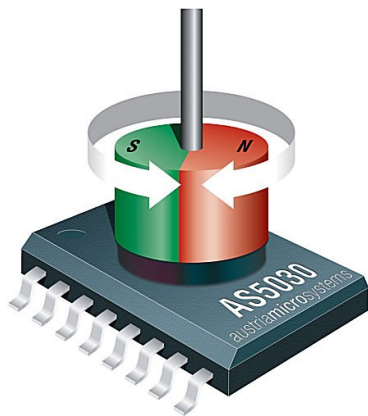


Figure 1: Typical arrangement of AS5030 and magnet

### 1.1 Benefits

- Complete system-on-chip, no calibration required
- Flexible system solution provides absolute output, with serial data and PWM output
- Ideal for applications in harsh environments due to magnetic sensing principle
- High reliability due to non-contact sensing
- Robust system, tolerant to horizontal misalignment, airgap variations, temperature variations and external magnetic fields

## 2 Key Features

- 360° contactless angular position encoding
- Two digital 8-bit absolute outputs:
  - Serial interface and
  - Pulse width modulated (PWM) output
- User programmable zero position
- High speed: up to 30.000 rpm
- Direct measurement of magnetic field strength allows exact determination of vertical magnet distance
- Serial read-out of multiple interconnected AS5030 devices using daisy chain mode
- Wide magnetic field input range: 20 – 80mT
- Wide temperature range: - 40°C to + 125°C
- Small Pb-free packages: TSSOP 16

## 3 Applications

- Industrial applications:
  - Contactless rotary position sensing
  - Rotary switches (human machine interface)
  - AC/DC motor position control
  - Robotics
- Encoder for battery operated equipment
- Automotive applications:
  - Steering wheel position sensing
  - Dashboard rotary switches
  - Headlight position control

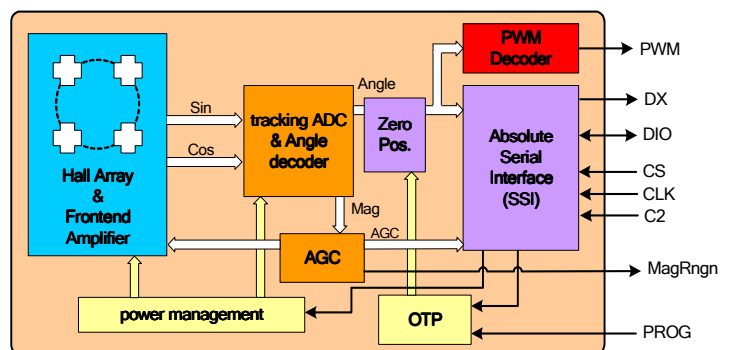


Figure 2: AS5030 block diagram

## 4 Package and Pinout

The AS5030 is available in a TSSOP16 package

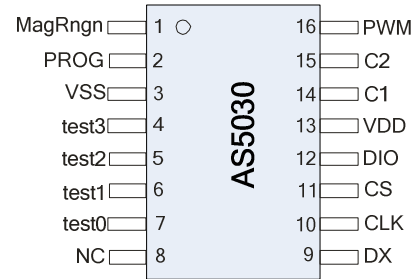


Figure 3: TSSOP-16 package and pin-out

Pin# TSSOP	Symbol	Type	Description
1	MagRngn	DO_T	Push-Pull output. Will be low when magnetic field strength is too weak, e.g. due to missing magnet
2	Prog_DI	S	OTP <b>Programming</b> voltage supply pin
3	VSS	S	Supply ground
4	Test3	-	This pin is used for factory testing. For normal operation it must be left unconnected
5	Test2	-	This pin is used for factory testing. For normal operation it must be left unconnected
6	Test1	-	This pin is used for factory testing. For normal operation it must be left unconnected
7	Test0	-	This pin is used for factory testing. For normal operation it must be left unconnected
8	NC	-	must be left unconnected
9	DX	DO	Digital output for 2-wire operation and Daisy Chain mode
10	CLK	DI_ST	Clock Input of Synchronous Serial Interface; Schmitt-Trigger input
11	CS	DI_ST	Chip Select for serial data transmission, active high; Schmitt-Trigger input, external pull-down resistor (~50kΩ) required in read-only mode
12	DIO	DIO	Data output / command input for digital serial interface
13	VDD	S	Positive supply voltage, 4.5 to 5.5 V
14	C1	DI	Configuration input: connect to VSS for normal operation
15	C2	DI	Configuration input: connect to VSS for 3-wire operation, connect to VDD for 2-wire operation
16	PWM	DO	Pulse Width Modulation output, 2μs pulse width per step (2μs...512μs)

Table 1: Pin description

Pin types: S: supply pin  
 DI\_ST: digital input / Schmitt-Trigger  
 DIO: bi-directional digital pin  
 DO: digital output  
 DO\_T: digital output / tri-state  
 DI: digital input

## Contact

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