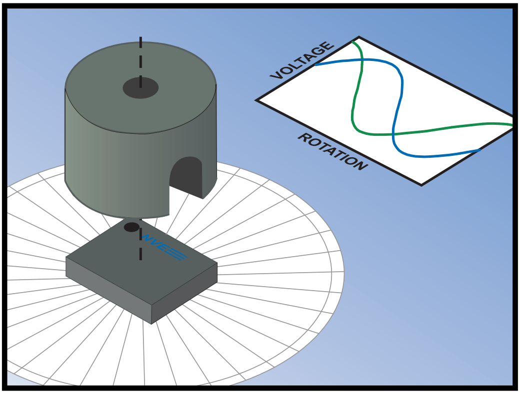
AG930-07E
Angle Sensor Evaluation Kit



SN12425A

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Kit Overview

Evaluation Kit Features

- AAT001-10E Angle Sensor
- Part # 12426 Split-Pole Alnico 5 Round Horseshoe Magnet
- Unity-Gain Buffer Amplifier
- Uses 1.5 V to 5.5 V Power Supply
- Plastic Magnet Locating Fixture

AAT001-10E Features

- Tunneling Magnetoresistance (TMR) Technology
- Very High Output Signal Without Amplification
- Wide Airgap Tolerance
- Very High Resistance for Extremely Low Power
- Sine and Cosine Outputs for Direction Detection
- Ultraminiature TDFN6 Package

AAT001-10E Applications

- Rotary Encoders
- Battery-Powered Rotary Position Sensors
- Motor Shaft Position Sensors

AAT001-10E Angle Sensor Description

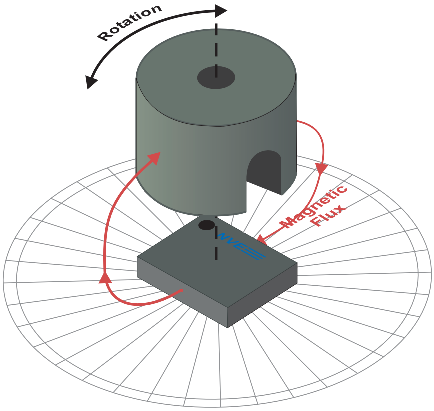
The AAT001-10E angle sensor is a low power, high output magnetic sensor element able to provide rotational position measurements when a rotating magnetic field is applied to the sensor. Sine and cosine signals are available for a quadrature output.

The sensor element has a resistance of approximately 1.25 MΩ and can be operated at typical battery voltages to conserve power. Outputs are proportional to the supply voltage and peak-to-peak output voltages are much larger than other sensor technologies.

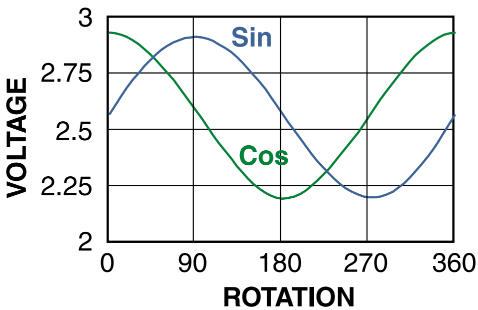
The part is packaged in NVE’s 2.5 mm x 2.5 mm x 0.8 mm TDFN6 surface-mount package.

Quick Start

⇒ Connect V_{CC1} and V_{CC2} to a 5 V power supply.
⇒ Connect the “SIN” and “COS” screw terminals to an oscilloscope or to meters.
⇒ Place the split-pole magnet in the Plexiglas pocket SLOT DOWN.
⇒ Rotate the magnet.

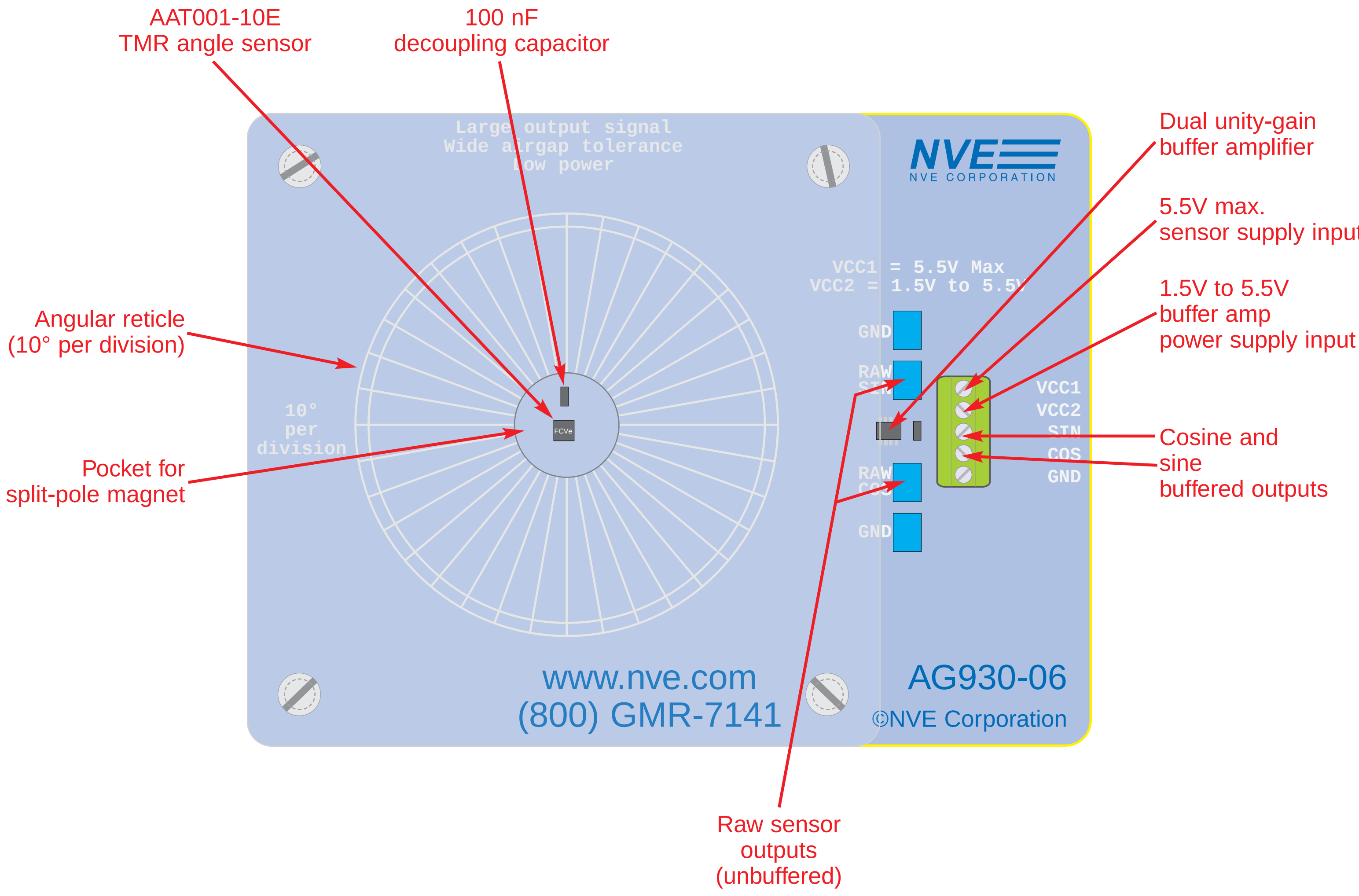


⇒ The outputs should be similar to the following graph:



The output is insensitive to magnet spacing over a wide range. Signal is lost if the magnet is too far away; if the magnet is too close the outputs will be non-sinusoidal. A relatively large magnet-sensor airgap is possible with the magnet provided with the kit, although smaller magnets will require a smaller gap.

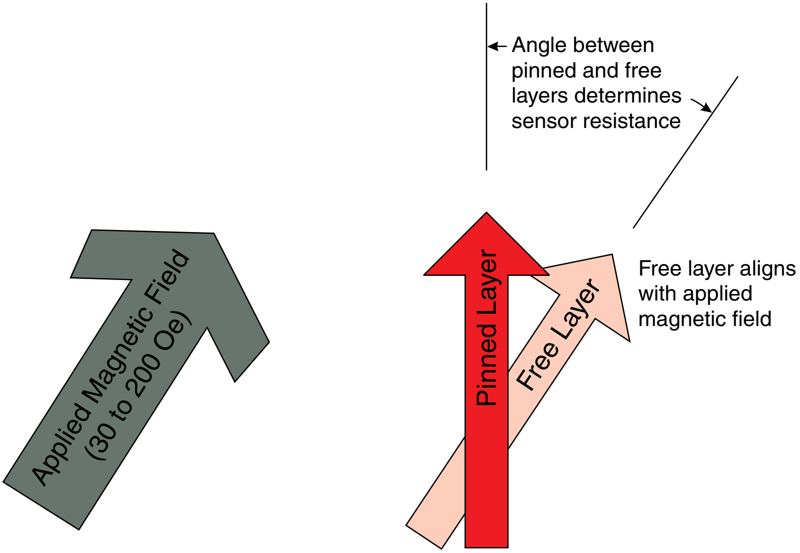
Evaluation Board Layout



Principles of Operation

Each of the four sensor elements contains two magnetic layers: a “pinned,” or fixed direction layer; and a movable-direction, or “free” layer. Internal sensor pairs are 90° out of phase to provide quadrature outputs.

The diagram below illustrates the configuration, using arrows to represent the magnetic orientation of the layers:



The sensor element free layers will align with the external field. As the applied field changes direction, the angle between the free layer and the pinned layer changes, changing the resistance of spintronic Tunneling Magnetoresistance (TMR) elements, which changes the device output voltages.

In the typical configuration, an external magnet provides a saturating magnetic field (30 to 200 Oe) in the plane of the sensor, as demonstrated in this kit.

Depending on the application, a bar magnet can also be used instead of a split-pole magnet.

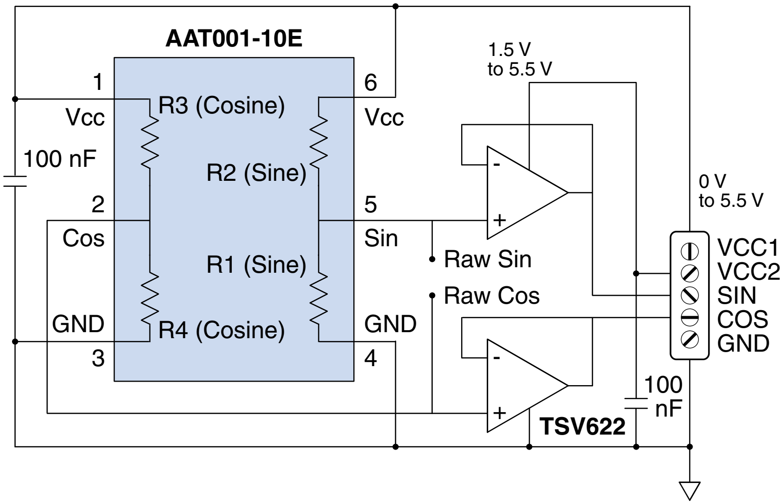
PCB Assembly

The PCB assembly includes a unity-gain buffer with low-impedance outputs for use with ordinary multimeters, comparators, or other circuitry. These are often not suitable for direct connection to the AAT001 sensors because the resistance of the part is comparable to the internal resistance of the test instrument. The buffer amplifier outputs allow normal test instruments to be used to evaluate the part.

Raw output signals from the AAT001 are also available as test points on the board. Instruments with at least 300 MΩ internal resistance should be used for accurate raw output measurements.

In the application, connecting the sensor outputs to a high impedance input (*e.g.*, analog microcontroller inputs) eliminates the need for a buffer amplifier.

Separate power supply connections for the sensor and op amp (V_{CC1} and V_{CC2}) allow monitoring the current requirements of the sensor only. The minimum op amp supply voltage is 1.5 V, while the AAT001 sensor has no minimum. Sensitivity increases proportionately to the sensor supply voltage, as does current consumption. V_{CC1} and V_{CC2} can be connected together if desired.



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Manual No.: SN12425A