

Installation Instructions for the APS00B High Resolution Magnetic Angular Position Sensor IC

ISSUE 2
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GENERAL INFORMATION

The APS00B is an analog angular position sensor IC containing two saturated mode MR (magnetoresistive) bridges generating quadrature sine and cosine output signals which are a function of the angle of the magnetic flux. It can measure up to 180° (±90°) of rotation.

CAUTION

ELECTROSTATIC DISCHARGE DAMAGE

This component is sensitive to electrostatic discharge (ESD). Take normal ESD precautions in handling this product to prevent ESD-induced damage and/or degradation.

Failure to comply with these instructions may result in product damage.



SOLDERING/ASSEMBLY

CAUTION

IMPROPER SOLDERING

- Ensure leads are adequately supported during any forming/shearing operation so that they are not stressed inside the plastic case. □
- Limit exposure to high temperatures.
- Do not wave solder the APS00B.

Failure to comply with these instructions may result in product damage.

Recommended process: Use an infrared reflow process with temperatures of 245 °C [473 °F] peak for 10 s max.

Figure 3. APS00B Typical Bridge Outputs vs Rotation Angle

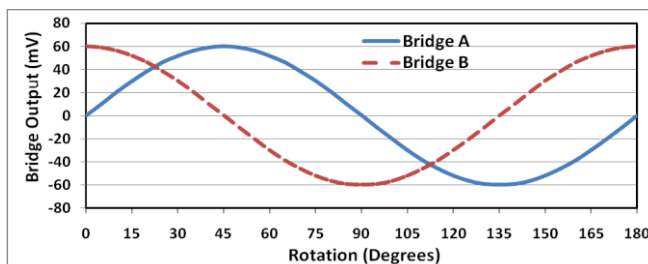
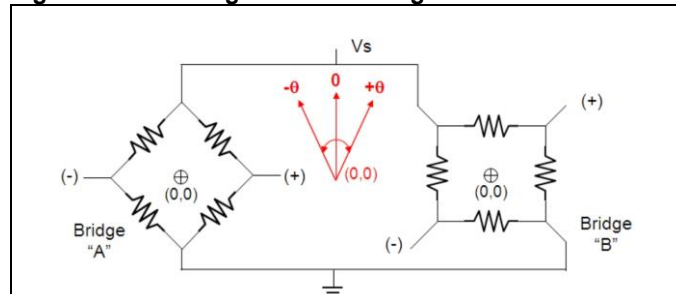


Figure 1. Dual Bridge Electrical Diagram



Bridge "A" output: $V_{outA} = V_s * S * \sin(2\theta) + V_{osA}$

Where,
S = 11.5 mV/V nominal; V_{osA} = Bridge A Offset (nominal = 0 V)

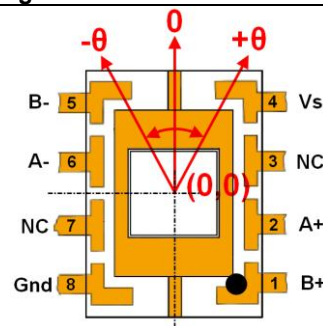
Bridge "B" output: $V_{outB} = V_s * S * \cos(2\theta) + V_{osB}$

Where,
S = 11.5 mV/V nominal; V_{osA} = Bridge A Offset (nominal = 0 V)

Bridge A is centroidally co-located with Bridge B, and Bridge A elements are rotated by 45° relative to Bridge B elements as shown

Figure 2. Pinout and Sensing Element Location

The APS00B has two sensor bridges optimized for rotary sensing applications. Thus the die is centered in all three dimensions within the SOIC-8 package.



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Table 1. Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
Supply voltage	-12	+12	V
Power dissipation	–	200	mW
Operating temperature	-55	150	°C
Magnetic flux	–	no limit	Gauss

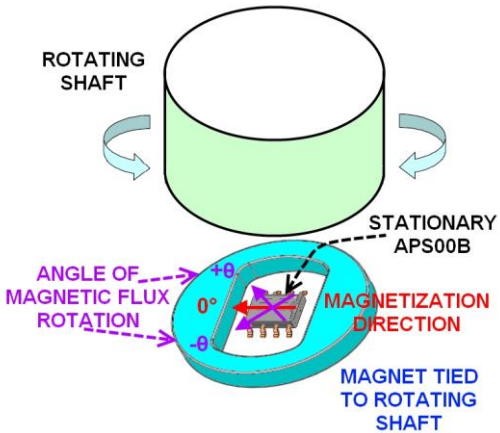
NOTICE

Absolute maximum ratings are the extreme limits that the device will withstand without damage to the device. However, the electrical and mechanical characteristics are not guaranteed as the maximum limits (above recommended operating conditions) are approached, nor will the device necessarily operate at absolute maximum ratings.

Table 2. Specifications (At $V_s = 5.0$ V and $T_a = 25$ °C [77 °F] unless otherwise noted.)

Parameter	Condition	Min.	Typ.	Max.	Unit
Supply voltage	–	–	5	12	V
Operating temperature	–	-40 [-40]	–	150 [302]	°C [°F]
Bridge resistance	bridges are connected in parallel	0.9	1.25	1.6	kOhm
Supply current	–	–	4.0	7.0	mA
Sensitivity	around zero crossing	–	2.1	2.3	mV/°
Angle range	B > saturation field	-90	–	+90	°
Resolution	–	–	0.05	–	°
Max output amplitude	–	47.5	57.5	67.5	mV
Min output amplitude	–	-47.5	-57.5	-67.5	mV
Output amplitude (peak to peak)	–	95	115	135	mV
Offset voltage	–	-1	–	1	mV
Amplitude change	at 140 °C [284 °F]	-34	–	-43	%
Amplitude change	at -40 °C [-40 °F]	24	–	31	%
Offset shift	–	-2	–	2	mV
Synchronism	(Amp A/Amp B) * 100	97	–	103	%
Synchronism shift	–	-1	–	1	%
Saturation level	<10 μ V/Gauss amplitude change	60	190	–	Gauss
Bandwidth	–	0 to 5.0			MHz

Figure 4. Basic Angular Displacement Sensing



The diagram illustrates the basic angular displacement sensing mechanism. A rotating shaft (green) has a magnet (blue) attached to it. The magnet's rotation angle is labeled as θ . The magnetization direction is shown as a red arrow. The sensor chip (blue) is stationary and labeled 'STATIONARY APS00B'. The angle of magnetic flux rotation is also indicated as θ .

The APS00B sensor can be used to detect the relative motion of a magnet in angular displacement.

Given a typical supply voltage of 5 V, each bridge will provide about 115 mV of swing (± 57.5 mV) on top of 2.5 V bias voltage. With +5 V applied to it, the bridge performs a rail splitter function to create two near +2.5 V sources driven apart by ΔV as created by the magnetic field and the offset error voltage.

The bridge differential output voltages (ΔV) for the APS00B are:
 $\Delta V_A = V_s S \sin(2\theta)$ and $\Delta V_B = V_s S \cos(2\theta)$

Where:
 V_s = Supply Voltage (V)
 S = Material Constant = $(\Delta R/R_{max}) * (1/2) = 11.5$ mV/V nominal
 θ = Reference to Magnetic Field Angle (°)

Please refer to Application Sheet [“How to Apply Honeywell APS00B Angular Position Sensor ICs”](#) for additional details.

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Figure 5. Common Wiring Diagrams

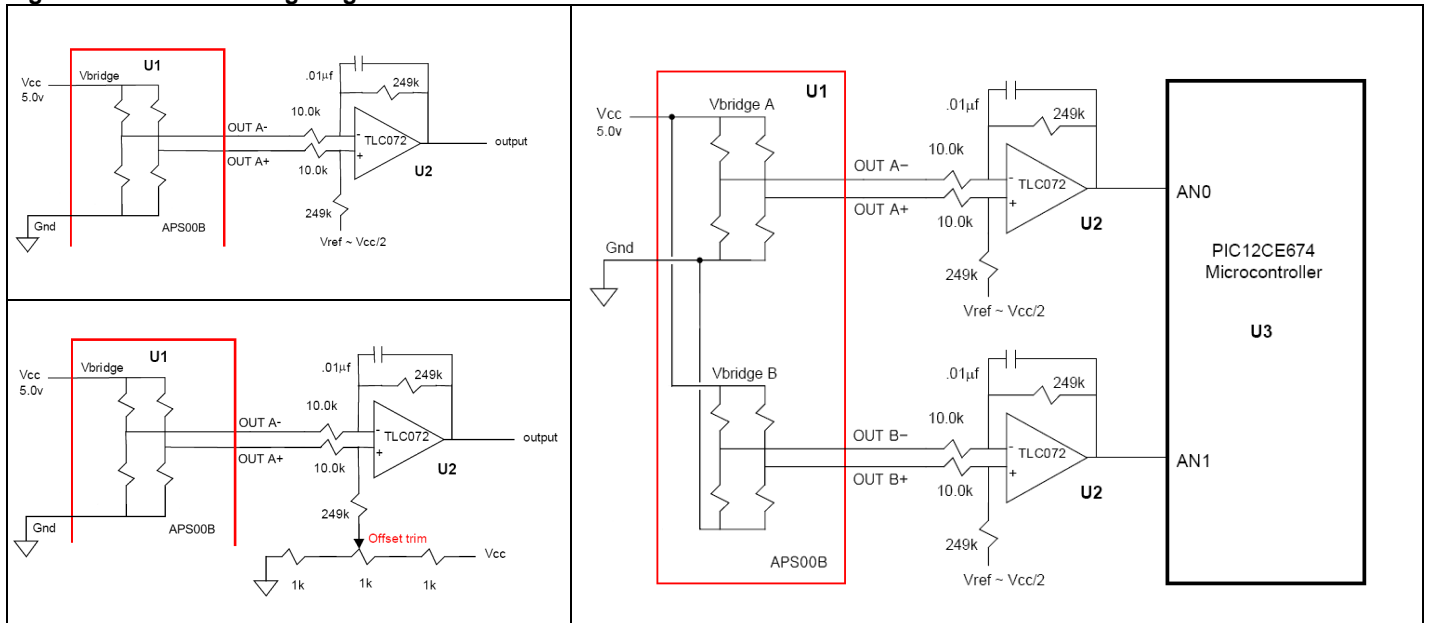
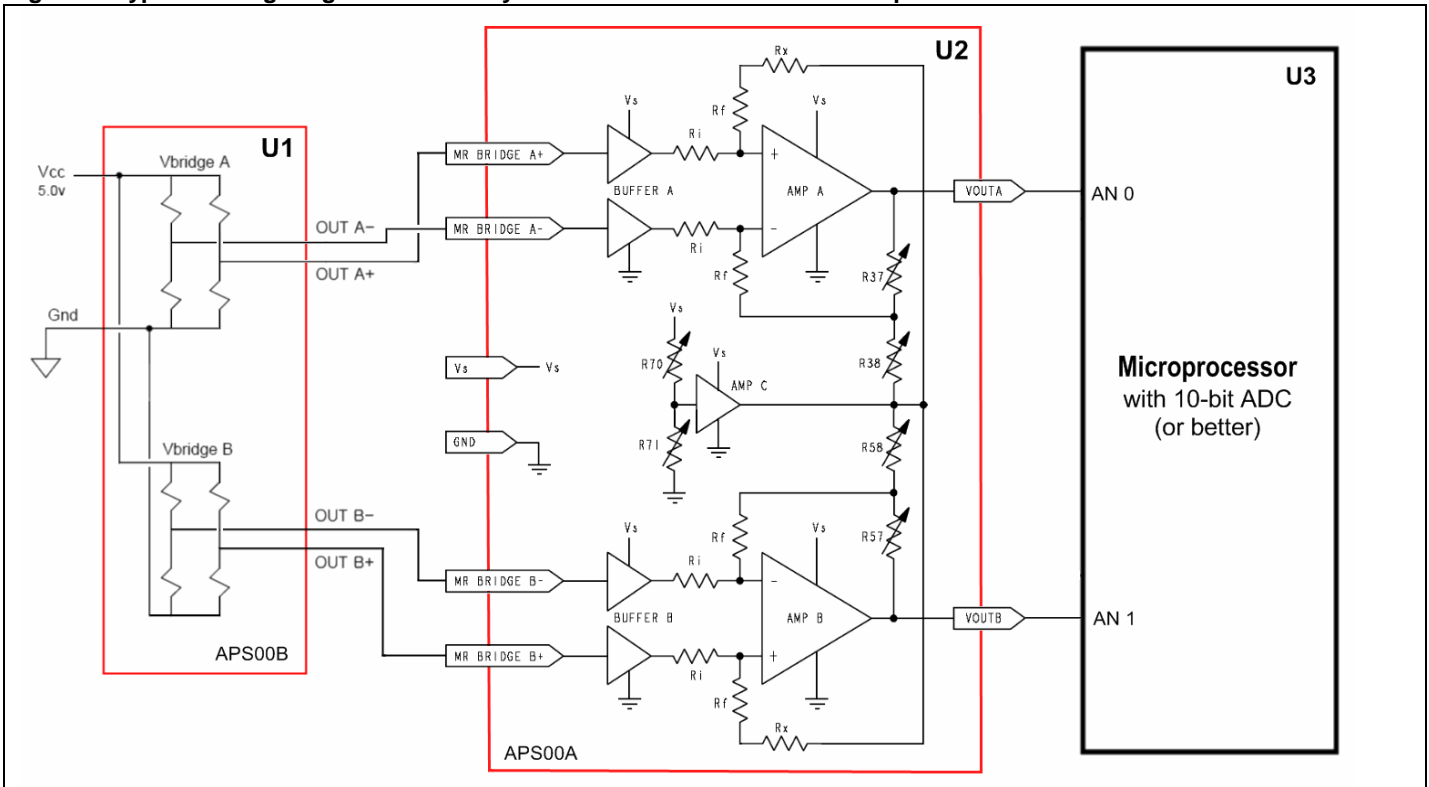


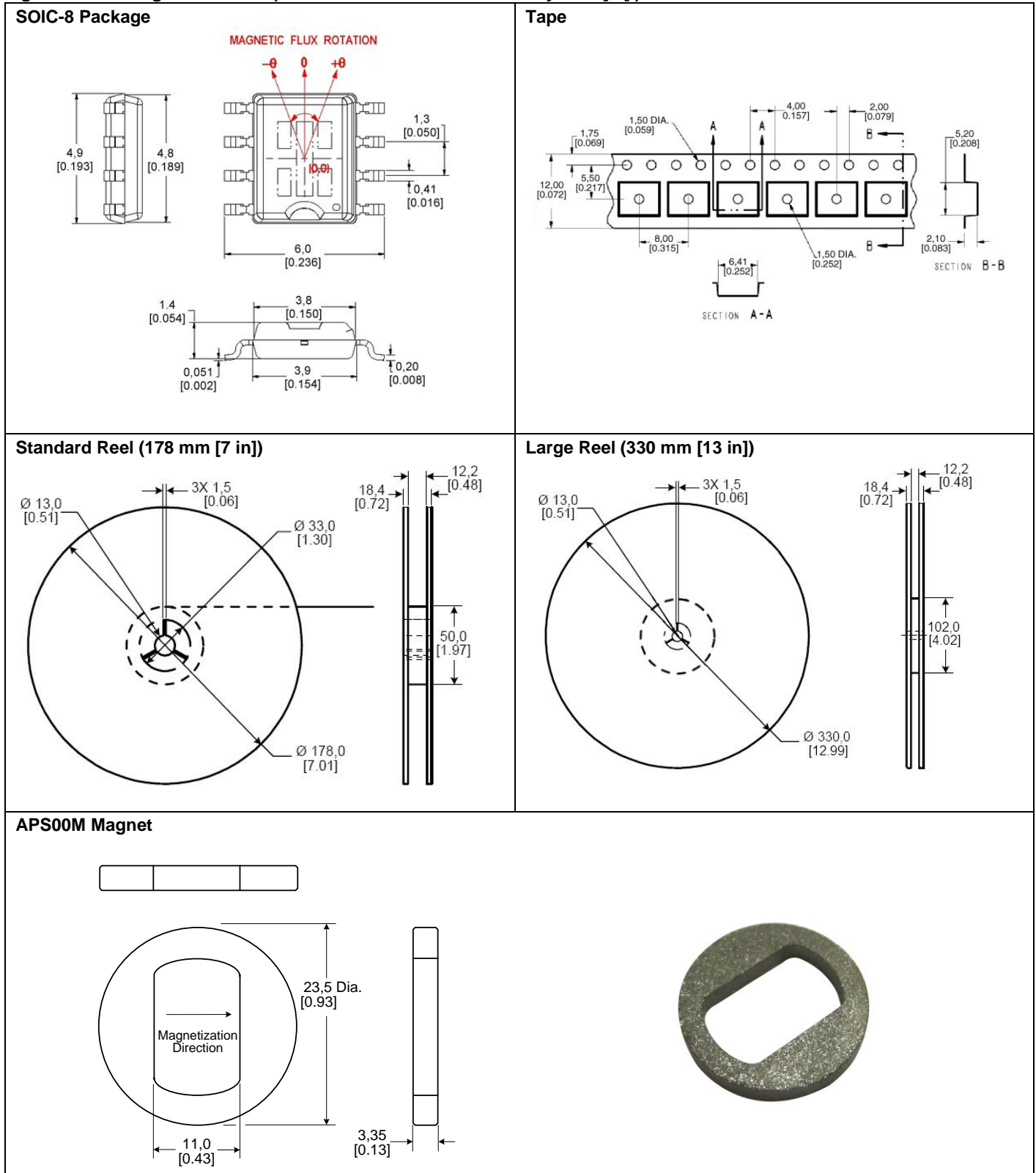
Figure 6. Typical Wiring Diagram with Honeywell APS00A Instrumentation Amplifier



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Figure 7. Mounting Dimensions (All dimensions for reference only: mm/[in].)



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WARNING

PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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