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Installation Instructions for the **AMR 4-Pin Quadrature Sensor Integrated Circuit:** VM821Q1

32326295

Issue B

GENERAL INFORMATION

Honeywell's Anisotropic Magnetoresistive (AMR) 4-Pin Quadrature Sensor Integrated Circuit (IC) is designed to detect the speed and direction and position of a ring magnet encoder target using a unique* bridge design. The frequency of the output is proportional to the rotational speed of the target, and the rotational direction is encoded by the phase between the outputs. The sensor IC works over a wide range of speeds, temperatures and air gaps.

**Patent Pending*

CAUTION

ELECTROSTATIC DISCHARGE DAMAGE

Ensure proper ESD precautions are followed when handling this product.

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

SOLDERING AND 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.

Failure to comply with these instructions may result in product damage

Wave solder at 250°C to 260°C [482°F to 500°F] for a maximum of three seconds. Burrs are allowed only if full lead length will pass through a 0,68 mm [0.027 in] dia. hole.

CLEANING

CAUTION

IMPROPER CLEANING

Do not use pressure wash. High-pressure stream could force contaminants into the package.

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

Use agitated rinse to clean the sensor.

Table 1. Operating Characteristics (At 4.0 V ≤ V_S ≤ 24 V, -40°C ≤ T_A ≤ 150°C, unless otherwise specified.)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_S	—	4.0	—	24	V
Supply current	I_{CC}	—	—	—	20	mA
Output low	V_{sat}	V_S = 5 V, I_{ol} = 5 mA	—	—	400	mV
Output leakage	I_{oh}	V_{oh} = 24 V	—	—	10	µA
Output current	I_{ol}	—	—	—	20	mA
Duty cycle	—	2 mm pole width	40	50	60	%
Phase	—	2 mm pole width	70	90	110	°
Output switching time: rise time fall time	 t_r t_f	 Vs = 5 V, R_L = 1 kOhm to 5 V, C_L = 20 pF Vs = 5 V, R_L = 1 kOhm to 5 V, C_L = 20 pF	 — —	 — —	 1.5 1.5	µs
Switching frequency	f	—	—	35	—	kHz

Table 2. Output Configuration

Characteristic	Condition	Configuration
Number of pulses per pole	—	1
Phase polarity	rotation from pin 4 to pin 1 as shown in Figure 4.	output A leads B

Table 3. Application Requirements (At 4.0 V ≤ V_S ≤ 24 V, –40°C ≤ T_A ≤ 150°C.)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Magnetic flux	B	D_{max}, max. air gap, max. temp	±30	—	—	Gauss
Magnetic flux with valid direction indication, increased jitter	B	D_{max}, max. air gap, max. temp	±10	—	—	Gauss
Metering resistor	R	—	50	160	—	Ohm

Table 4. Absolute Maximum Ratings

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating temperature	T_a	—	-40 [-40]	—	150 [302]	°C [°F]
Junction temperature	T_J	—	-40 [-40]	—	165 [329]	°C [°F]
Storage temperature	T_s	—	-40 [-40]	—	150 [302]	°C [°F]
Thermal resistance	$R_{\theta JA}$	—	—	—	—	°C/W
Supply voltage	V_S	—	-26.5	—	26.5	V
Soldering temperature	—	3 s max.	—	—	260 [500]	°C [°F]
ESD (HBM)	V_{ESD}	JEDEC JS-002-2014	—	—	±6	kV
Output short circuit	—	with no current limiting resistor	—	—	24	V

NOTICE

Absolute maximum ratings are the extreme limits the device will momentarily withstand without damage to the device. Electrical and mechanical characteristics are not guaranteed if the rated voltage and/or currents are exceeded, nor will the device necessarily operate at absolute maximum ratings.

Figure 1. Block Diagram

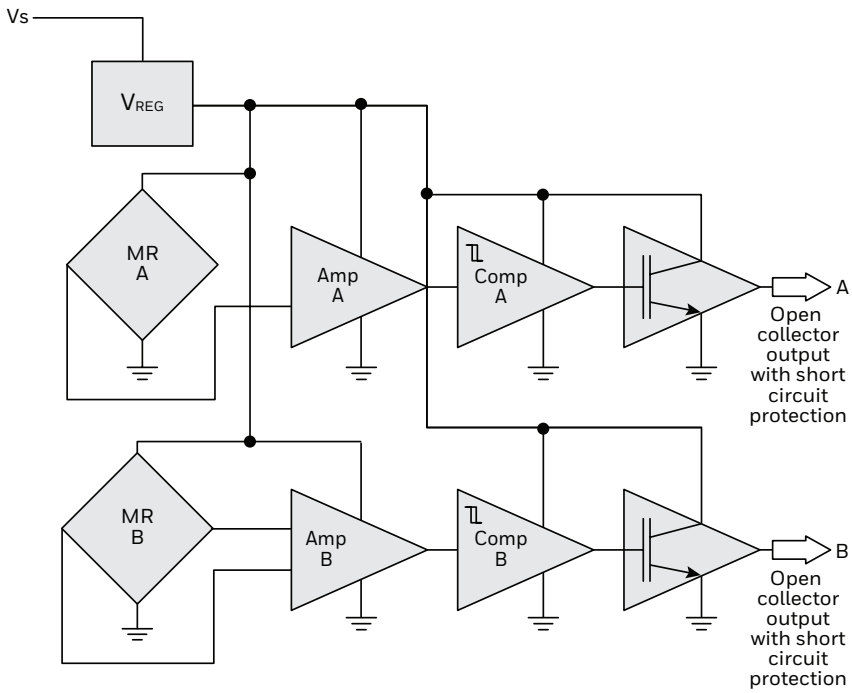


Figure 2. Basic Application Circuit

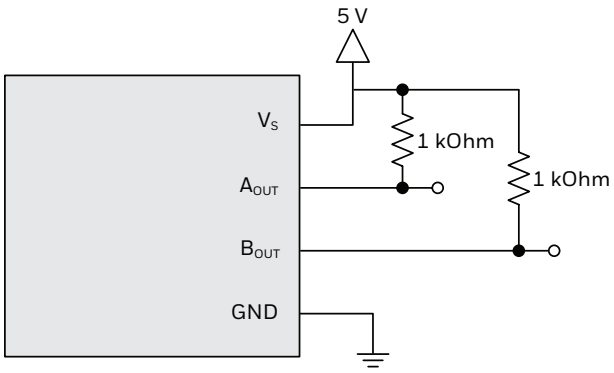
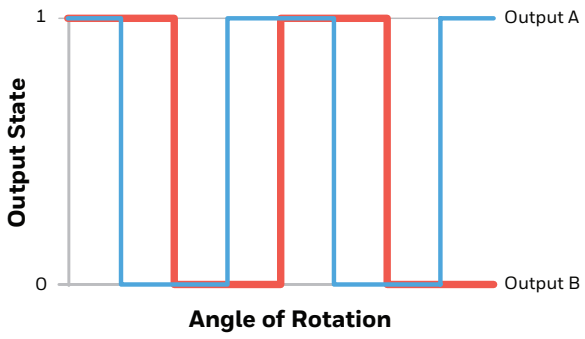


Figure 3. Transfer Characteristics



Phase Calculation Definition

This method isolates phase from duty cycle. It also best correlates to analysis of the fundamental frequency in the frequency domain.

$$\text{Phase } (^{\circ}) = \left(\frac{B_{rising} + B_{falling}}{2} - \frac{A_{rising} + A_{falling}}{2} \right) * \frac{360}{T}$$

Where:

A_{rising} = rising edge of output A

$A_{falling}$ = falling edge of output A

B_{rising} = nearest falling edge of output B to A_{rising}

$B_{falling}$ = next falling edge of output B

T = period of one cycle

Figure 4. Sensor IC Mounting Orientation

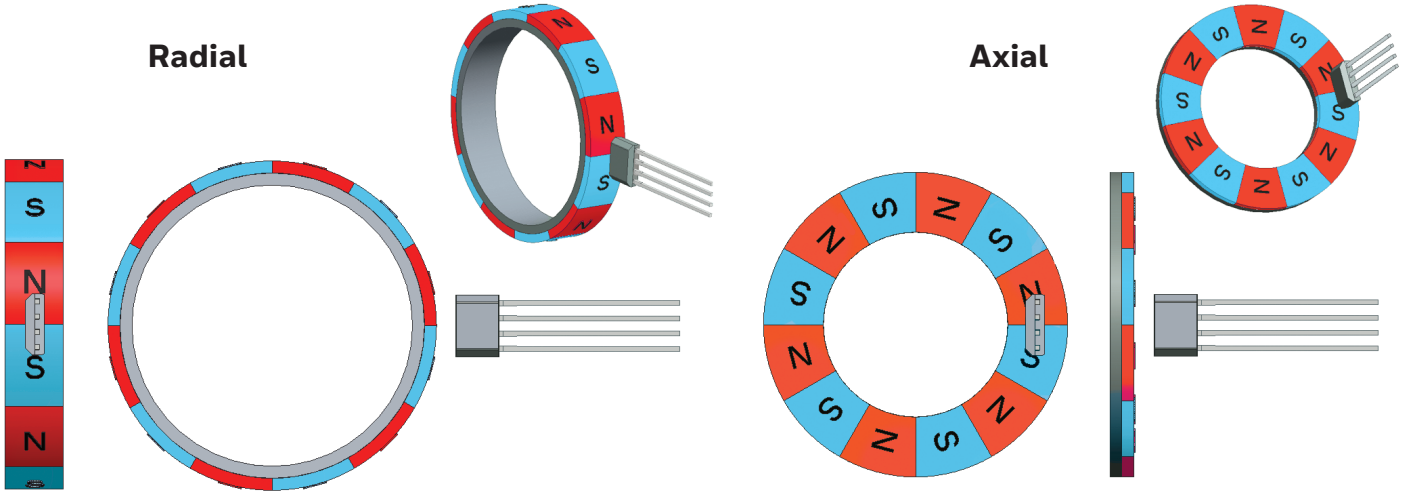
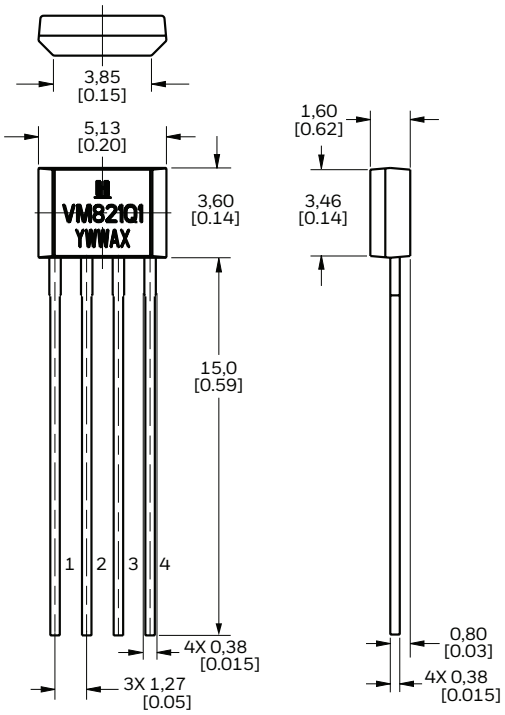
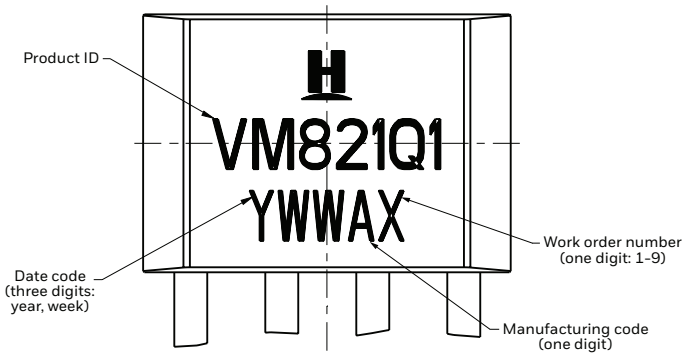


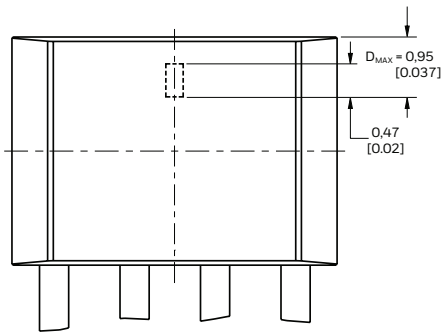
Figure 5. Dimensions and Product Marking (For reference only mm/[in])



Product Marking



Sensing Element Edge Distance



Pinout

Pin Number	Symbol	Function
1	V_S	supply voltage
2	A	output
3	B	output
4	GND	ground

⚠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.

Warranty/Remedy

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Asia Pacific	+65 6355-2828
Europe	+44 (0) 1698 481481
USA/Canada	+1-800-537-6945

Honeywell Sensing and Internet of Things
9680 Old Bailes Road
Fort Mill, SC 29707
www.honeywell.com

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