

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

# 32326295

Issue B

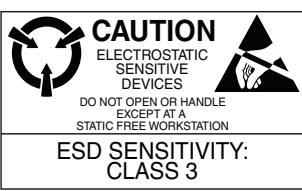
### GENERAL INFORMATION

Honeywell's Anisotropic Magnetostrictive (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.**



**CAUTION**  
ELECTROSTATIC SENSITIVE DEVICES  
DO NOT OPEN OR HANDLE EXCEPT AT A STATIC FREE WORKSTATION  
**ESD SENSITIVITY: CLASS 3**

### 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<sub>S</sub> ≤ 24 V, -40°C ≤ T<sub>A</sub> ≤ 150°C, unless otherwise specified.)**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V <sub>S</sub>	—	4.0	—	24	V
Supply current	I <sub>CC</sub>	—	—	—	20	mA
Output low	V <sub>sat</sub>	V <sub>S</sub> = 5 V, I <sub>ol</sub> = 5 mA	—	—	400	mV
Output leakage	I <sub>oh</sub>	V <sub>oh</sub> = 24 V	—	—	10	μA
Output current	I <sub>ol</sub>	—	—	—	20	mA
Duty cycle	—	2 mm pole width	40	50	60	%
Phase	—	2 mm pole width	70	90	110	°
Output switching time:						
rise time	t <sub>r</sub>	V <sub>S</sub> = 5 V, R <sub>L</sub> = 1 kOhm to 5 V, C <sub>L</sub> = 20 pF	—	—	1.5	μs
fall time	t <sub>f</sub>	V <sub>S</sub> = 5 V, R <sub>L</sub> = 1 kOhm to 5 V, C <sub>L</sub> = 20 pF	—	—	1.5	
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<sub>S</sub> ≤ 24 V, -40°C ≤ T<sub>A</sub> ≤ 150°C.)**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Magnetic flux	B	D <sub>max</sub> , max. air gap, max. temp	±30	—	—	Gauss
Magnetic flux with valid direction indication, increased jitter	B	D <sub>max</sub> , 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 <sub>a</sub>	—	-40 [-40]	—	150 [302]	°C [°F]
Junction temperature	T <sub>J</sub>	—	-40 [-40]	—	165 [329]	°C [°F]
Storage temperature	T <sub>s</sub>	—	-40 [-40]	—	150 [302]	°C [°F]
Thermal resistance	R <sub>θJA</sub>	—	—	—	—	°C/W
Supply voltage	V <sub>S</sub>	—	-26.5	—	26.5	V
Soldering temperature	—	3 s max.	—	—	260 [500]	°C [°F]
ESD (HBM)	V <sub>ESD</sub>	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

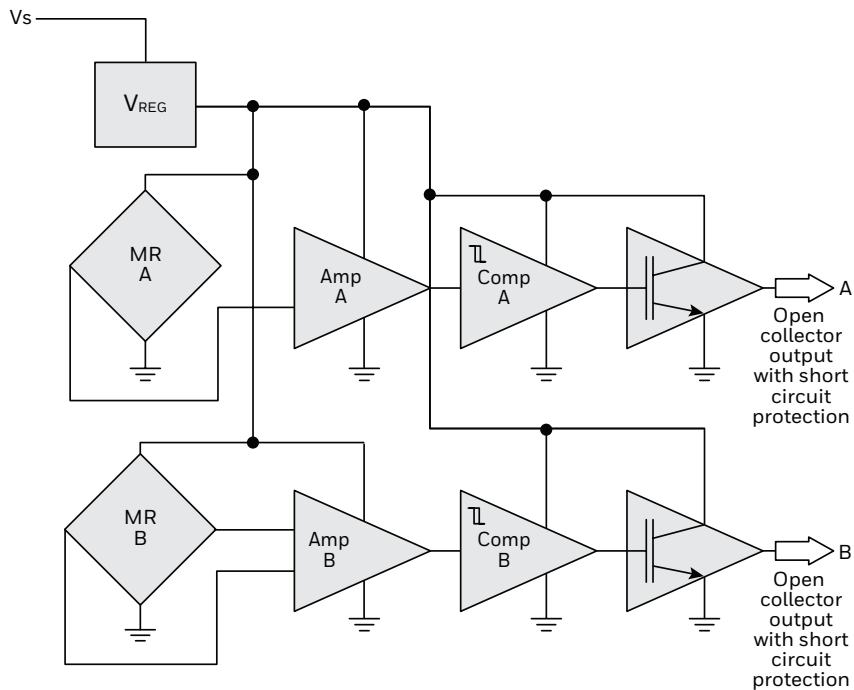


Figure 2. Basic Application Circuit

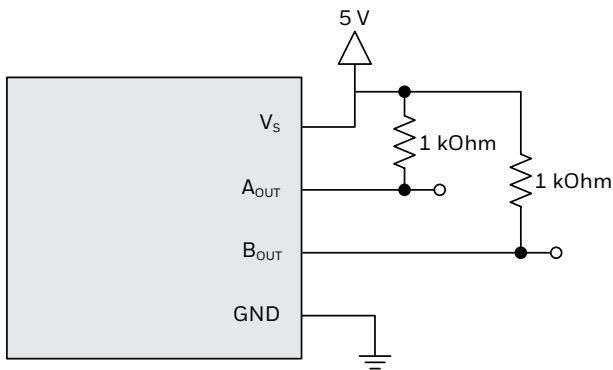
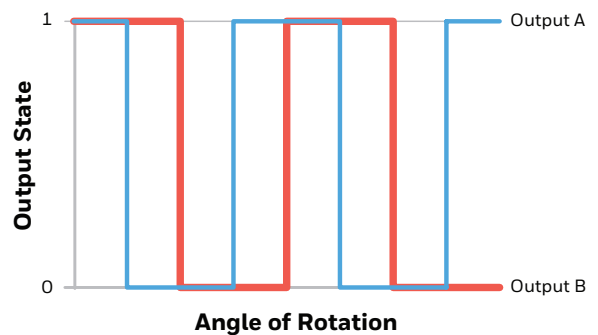


Figure 3. Transfer Characteristics



### Phase Calculation Definition

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

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

Where:

$A_{\text{rising}}$  = rising edge of output A

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

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

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

$T$  = period of one cycle

# VM821Q1

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Issue B

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Figure 4. Sensor IC Mounting Orientation

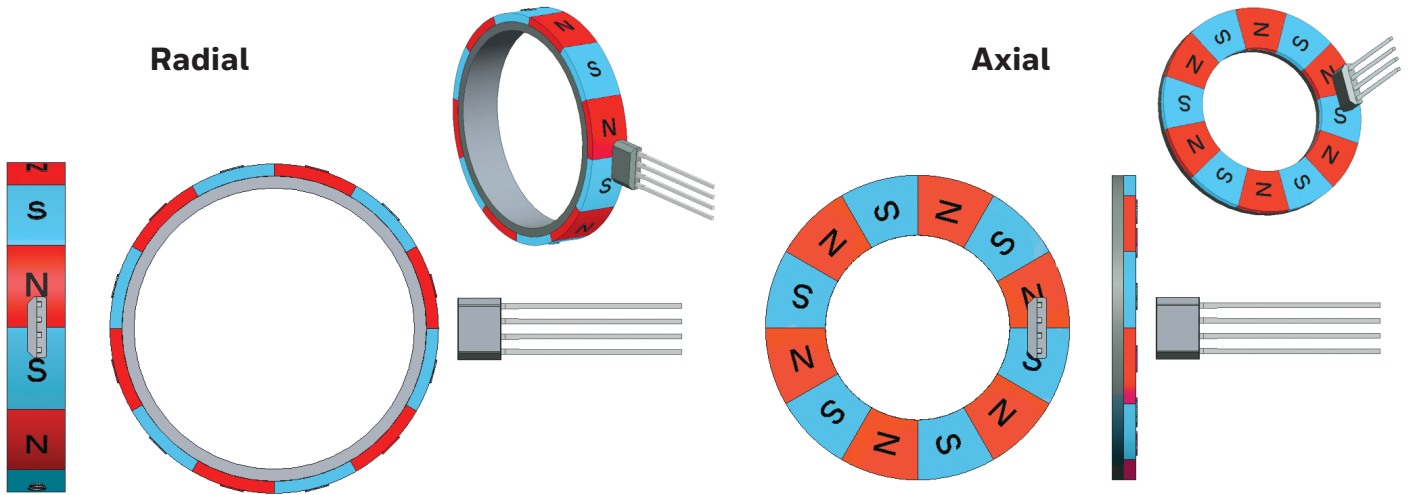
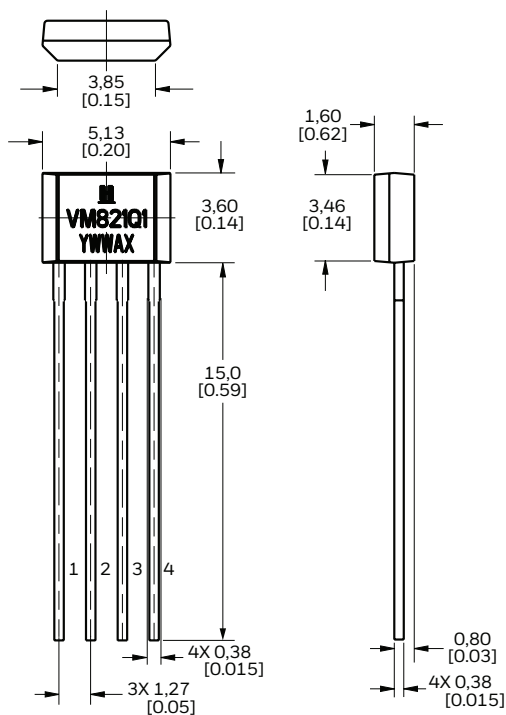
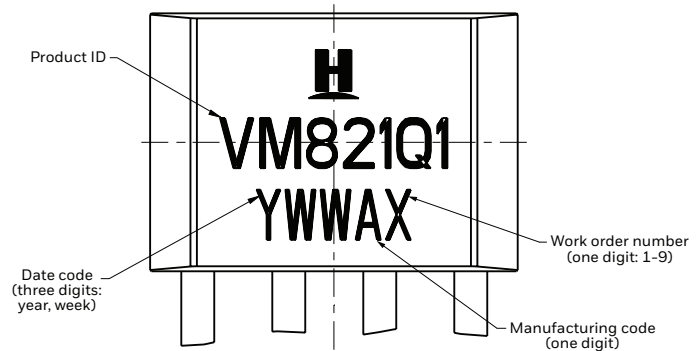


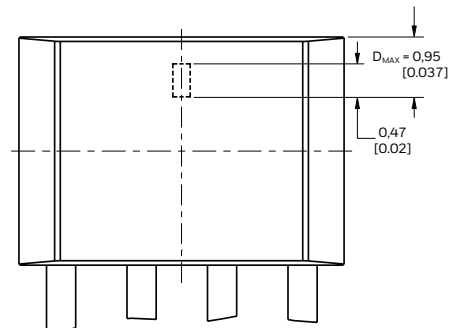
Figure 5. Dimensions and Product Marking (For reference only mm/[in])



### Product Marking



### Sensing Element Edge Distance



### Pinout

Pin Number	Symbol	Function
1	V <sub>S</sub>	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**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective.

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