

## FUNCTIONAL DESCRIPTION

The TriRate is a complete tri-axial angular rate sensor based on a surface-micromachining technology capable of sensing angular motion about three orthogonal axes. The TriRate provides analog outputs for angular rate and precision references about the X, Y, and Z axes. A temperature output is also provided allowing the implementation of compensation techniques. Two digital self-test inputs electromechanically excite each axis to test proper operation of both sensors and the signal conditioning circuits.

The TriRate is available in a custom SMT package measuring 0.70 in × 0.70 in × 0.40 in.

For pricing information contact Omni Instruments Ltd on +44 845 9000 601 or via email at [info@omni.uk.com](mailto:info@omni.uk.com)

## APPLICATIONS

- Antenna Stabilization
- Automotive Control
- Inertial Measurement Units
- Orientation Sensing
- 3D Simulators
- Industrial Automation
- Gaming Devices
- Industrial Automation



Figure 1 - TriRate

## FEATURES

- Triaxial Angular Rate Sensing
- Solid State MEMS Reliability
- Low Noise
- Low Power
- SMT Miniature Package
- 5 V Single Supply Operation

## ORDERING INFORMATION

Table 1 - Ordering Information

Part Number	Rate (°/s)	Bandwidth (Hz.)
TR0150S050	±150	50
TR0300S050	±300	50
Contact <a href="mailto:info@omni.uk.com">info@omni.uk.com</a>	Custom	Custom

- 1.) Commercial Temperature Range of 0°C to 70°C append a "C" to the Part Number.
- 2.) Military Temperature Range of -40°C to 85°C append an "M" to the Part Number.

## ORIENTATION DIAGRAM

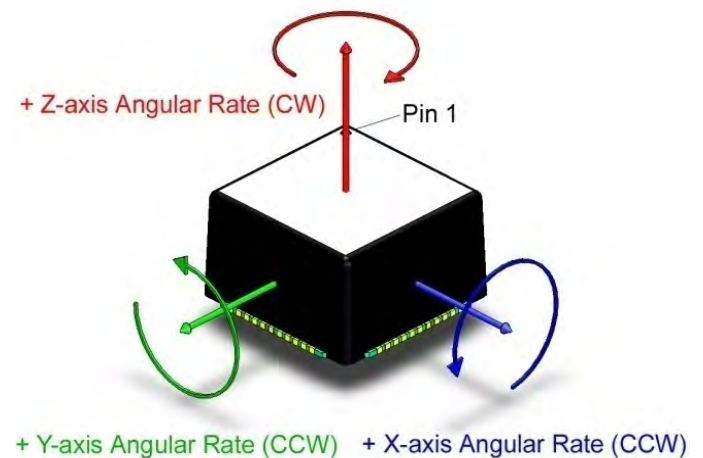


Figure 2 - TriRate Orientation Diagram

## SPECIFICATIONS

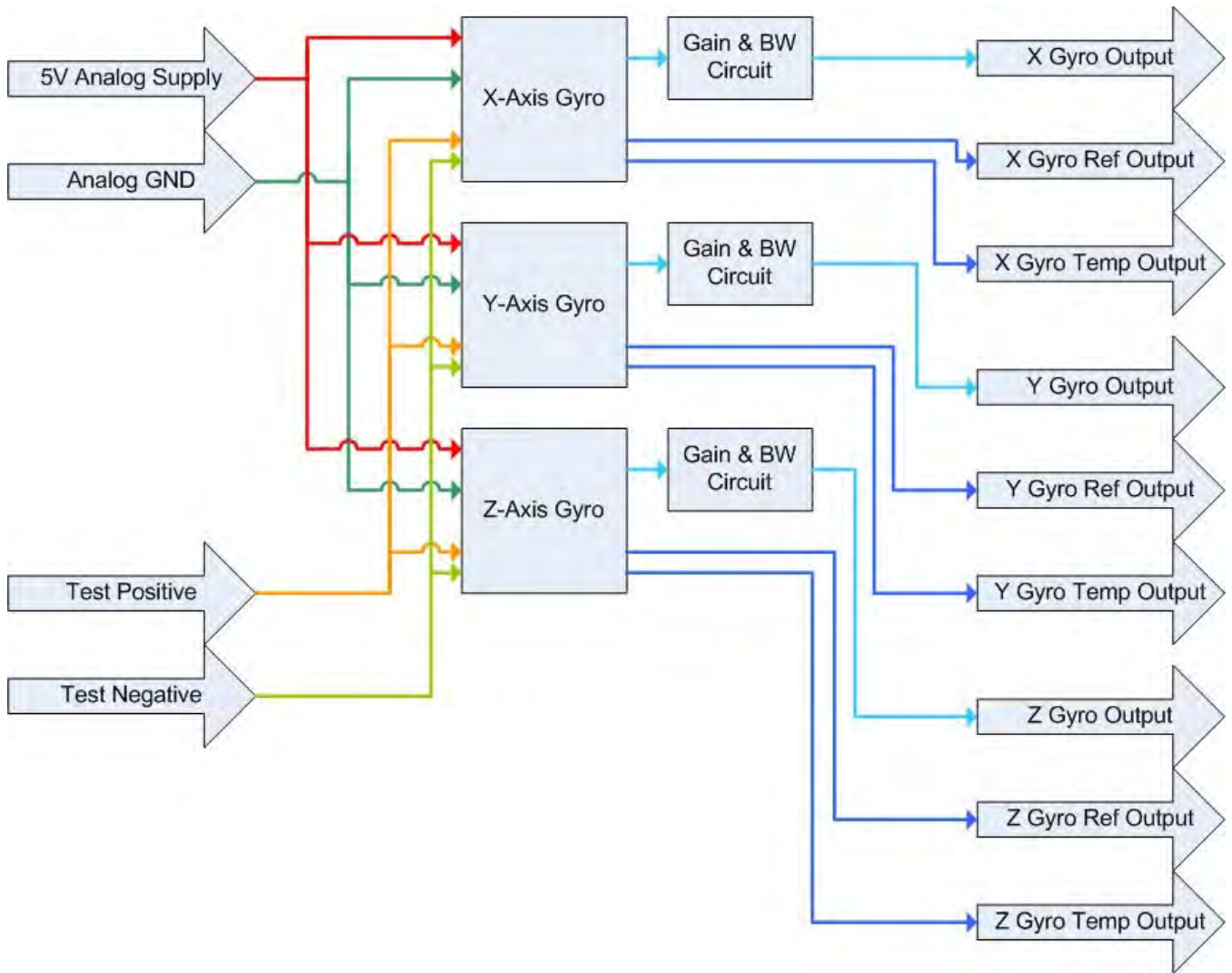
**Table 2 - Specifications**

PARAMETER	SPECIFICATION		UNITS	CONDITIONS
<b>Sensor</b>				
Supply Voltage	4.75 to 5.25		V	Note 2
Supply Current	18, (24)		mA	Typical, (Maximum)
Mass	5		Grams	Maximum
<b>Commercial Temp Range</b>	0 to +70		°C	Temperature for max and min specs.
<b>Military Temp Range</b>	-40 to +85		°C	See Table 1 for part numbering.
<b>Rate Output</b>	<b>0150S050</b>	<b>0300S050</b>		
Dynamic Range	±150	± 300	°/s	Full scale range over specified temperature
Sensitivity	12.5	5.0	mV/°/s	Note 2
Nonlinearity	0.1	0.1	% of FS	Best fit straight line
Zero Rate	2.50	2.50	V	
Turn On Time	50	50	ms	Power on to ± ½ °/s of Final
Rate Noise Density	0.04	0.05	°/s/Hz <sup>1/2</sup>	Maximum
Bandwidth <sup>1</sup>	50	50	Hz	Factory set 3dB point
Cross Axis Sensitivity	4.0	4.0	%	
<b>Rate Reference Output</b>				
Voltage Value	2.5		V	
Temperature Drift	±5.0		mV	Deviation from 25°C
<b>Temperature Output</b>				
Voltage at 25 °C	2.50		V	
Scale Factor	9.0		mV/°C	0150/0300
<b>Absolute Max Ratings</b>				
Acceleration Powered	2000 max		g	Any axis 0.5ms
Vdd	-0.3, +6.0		V	Minimum, Maximum
Operating Temperature	-40 to +85		°C	
Storage Temperature	-65 to +150		°C	

Typical Values at 25 °C, Vdd = 5.0V, 0 °/s unless otherwise noted

1. Other rate bandwidth configurations are available upon request.
2. Rate output is ratiometric to Supply Voltage.

## FUNCTIONAL BLOCK DIAGRAM



**Figure 3 - Functional Block Diagram**



## PIN FUNCTION DESCRIPTIONS

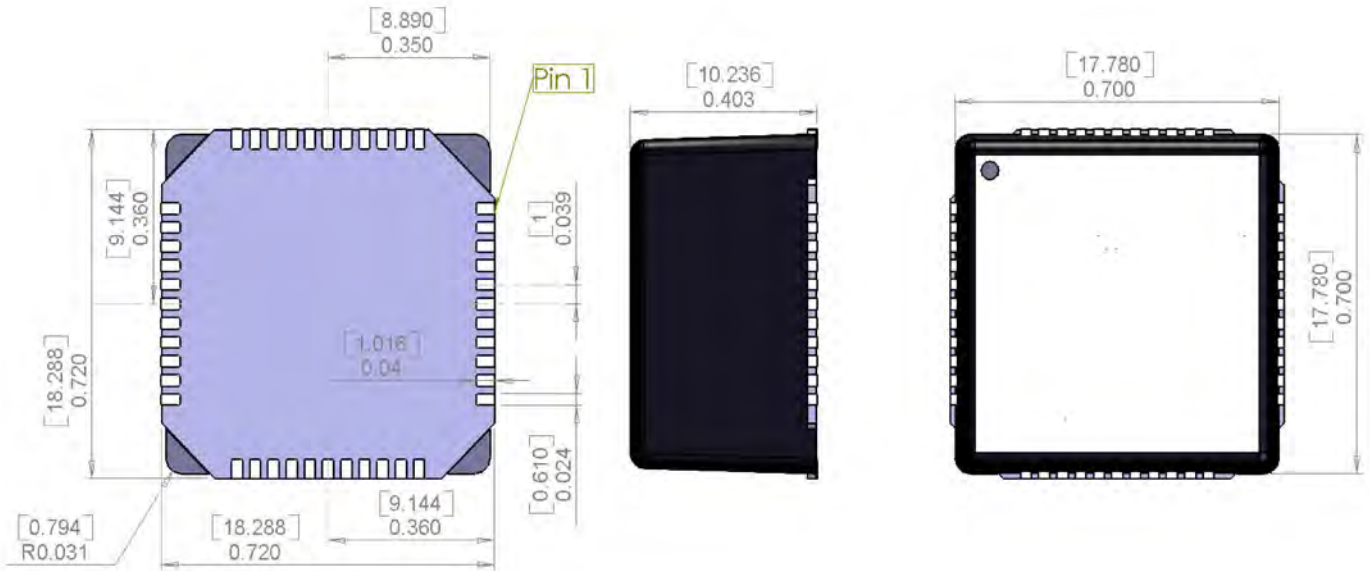
**Table 3 - Pin Function Description**

Pin No.	Name	Function
1	XREF	X axis analog precision reference output. <sup>3</sup>
2	XRATE	X axis analog rate signal output.
3	ZREF	Z axis analog precision reference output. <sup>3</sup>
4	ZRATE	Z axis analog rate signal output.
5	TEMPZ	Analog temperature voltage output, Z gyro.
6	AGND	Analog power supply return.
7	TEMPX	Analog temperature voltage output, X gyro.
8	TEMPY	Analog temperature voltage output, Y gyro.
9 - 35		No electrical connection required (open) <sup>1</sup>
36	AGND	Analog power supply return.
37	VDDA	Analog power supply.
38	TESTN	High-level activated digital input stimulating X, Y and Z rate to Ref – 1.9 V. <sup>2</sup>
39	TESTP	High-level activated digital input stimulating X, Y and Z rate to Ref +1.9 V. <sup>2</sup>
40 - 42		No electrical connection required (open) <sup>1</sup>
43	YREF	Y axis analog precision reference output. <sup>3</sup>
44	YRATE	Y axis analog rate signal output.

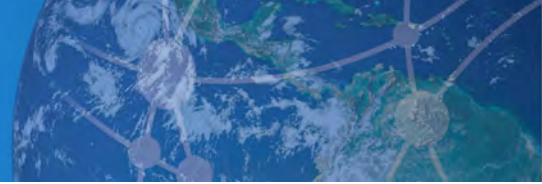
1. Physical solder connection recommended.
2. The 150°/s rate sensor will produce a 1.9 V output change while the 300°/s rate sensor will produce a 417 mV output change.
3. **Do Not Ground 2.5V Precision Reference Outputs, Damage to the Device May Occur (Recommend floating or the use of a 20k resistor or higher)**



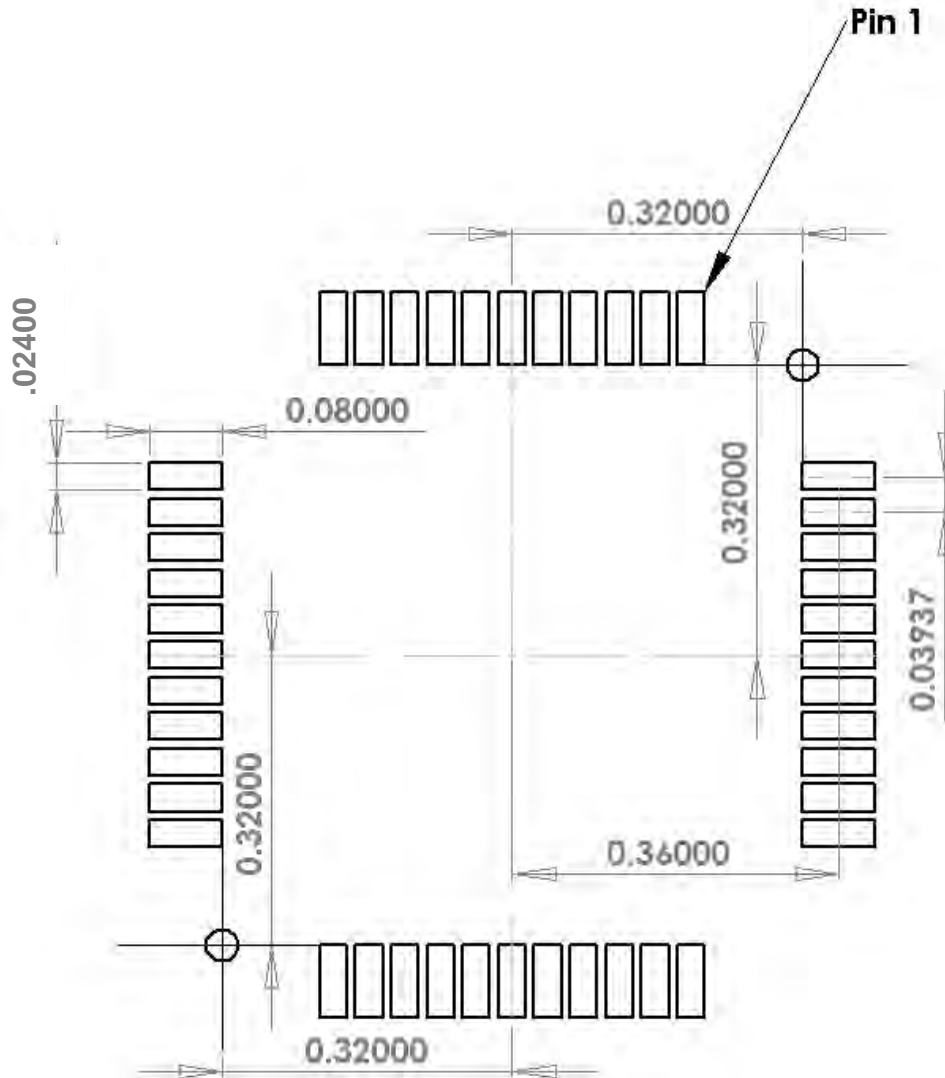
## PHYSICAL DIMENSIONS



All dimensions in [mm] inches - *Hand solder attachment recommended*  
**Figure 4 – Physical Dimensions**



## RECOMMENDED PCB LAND PATTERNS



**Dimensions in Inches**

**Figure 5 – Recommended PCB Pattern**





## Document Change History

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Rev	Status	Description	Date
J	Obsolete	New datasheet in Memsense document format.	1/29/2009
K	Obsolete	Added ratiometric note to spec table. Normalized overall formatting	12/03/2009
L	Released	Updated graphics and colors. Added temperature range to part numbering.	4/11/2013



For pricing or any further, information please contact us.  
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**[www.omniinstruments.co.uk](http://www.omniinstruments.co.uk)**