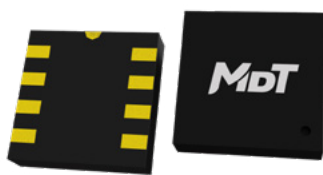


TMR3005

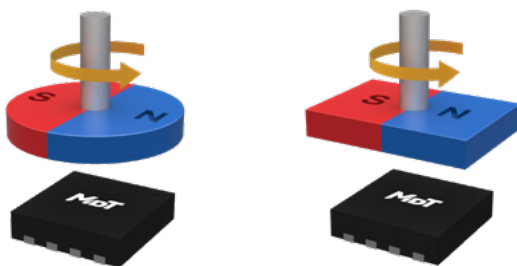
Dual-axis TMR Angle Sensor

Description

TMR3005 angle sensor adopts two orthogonal push-pull Wheatstone bridge design, and each bridge contains four high-sensitivity TMR sensing elements to produce a best-in-class peak-to-peak output signal as large as 65% of the supply voltage, thereby eliminating many external signal amplifying and processing circuit needed in the applications. The voltage signal output by the two axes of the chip has a sine and cosine relationship with the angle of the magnetic field, when a magnet is placed above the TMR3005 chip to provide an operating magnetic field parallel to the surface of the chip in general angle sensor application. Additionally, the TMR full bridge technology accurately compensates the output against changes in ambient temperature. This high performance TMR3005 angle sensor is available in packaging form factors of compact LGA8L (3 mm × 3 mm × 0.75 mm).



LGA8L

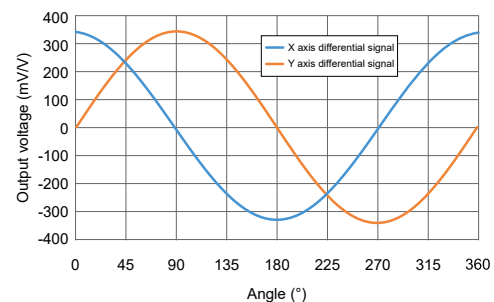


Features and Benefits

- Tunneling magnetoresistance (TMR) technology
- Large output signal without amplification
- Dual-axis 0~360° angle measurement
- Compatible with a wide range of supply voltages
- Low power consumption
- Large air gap tolerance
- Compact LGA package
- Excellent thermal stability
- RoHS & REACH compliant

Applications

- Rotary position sensors
- Rotary encoders
- Contactless potentiometers
- Valve position sensors
- Knob position sensors



Selection Guide

Part Number	Angle range	Bridge resistance	Peak voltage	Angular error	Package	Packing Form
TMR3005SG	0~360°	6 kΩ	340 mV/V	0.6°	LGA8L	Tape & Reel
TMR3005G	0~360°	140 kΩ	340 mV/V	0.6°	LGA8L	Tape & Reel
TMR3005BG	0~360°	1900 kΩ	340 mV/V	0.6°	LGA8L	Tape & Reel

Catalogue

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1. Functional Block Diagram

The TMR3005 angle sensors use dual Wheatstone bridges of high sensitivity TMR sensing elements to increase the sensors' output signal amplitude with enhanced temperature characteristic and anti-interference performance as shown in Figure 1.

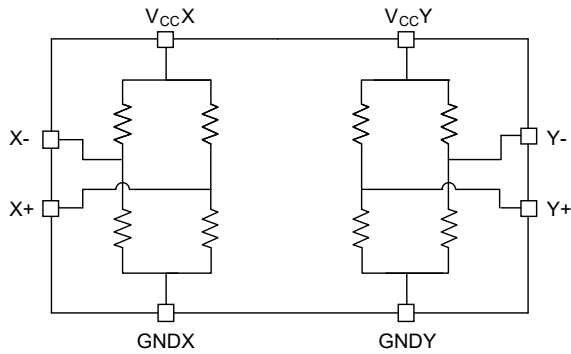


Figure 1. Block diagram

2. Operating Principle

The resistance value of the sensing elements changes with the target magnetic field, and the sensing direction is parallel to the chip surface as shown in Figure 2.

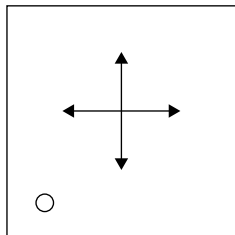


Figure 2. Sensing direction

A small dipole magnet, placed above the TMR3005, can provide a magnetic field in any desired orientation parallel to the plane of the TMR3005 package. When the Angle of the applied magnetic field changes, the output voltage waveform of the sensor is a cosine curve as shown in Figure 3.

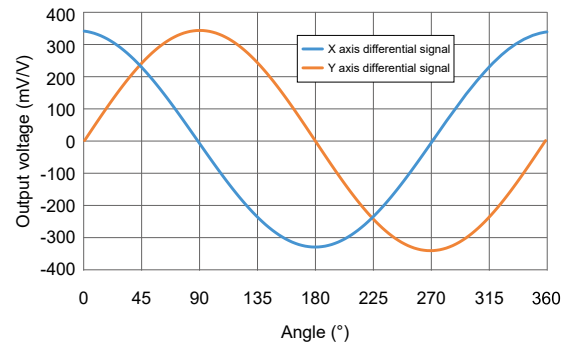


Figure 3. Typical output curve

3. Pin Configuration

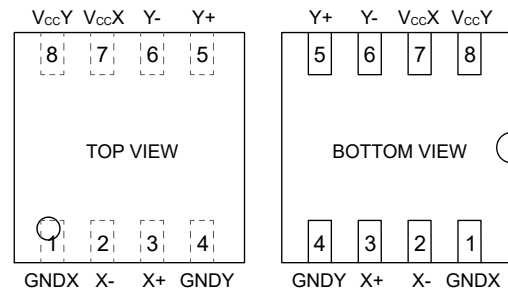


Figure 4. Pin configuration (LGA8L)

Number	Name	Function
1	GNDX	Ground (X axis)
2	X-	Analog Differential Output 2 (X axis)
3	X+	Analog Differential Output 1 (X axis)
4	GNDY	Ground (Y axis)
5	Y+	Analog Differential Output1 (Y axis)
6	Y-	Analog Differential Output2 (Y axis)
7	V _{cc} X	Supply Voltage (X axis)
8	V _{cc} Y	Supply Voltage (Y axis)

4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	-	19	V
Magnetic flux density	B	-	3000	Gs
ESD performance (HBM)	V_{ESD}	-	4000	V
Operating ambient temperature	T_A	-40	85	°C
Storage ambient temperature	T_{STG}	-40	150	°C

5. Electrical Specifications

$V_{CC} = 5\text{ V}$, $T_A = 25\text{ °C}$, a $0.1\text{ }\mu\text{F}$ capacitor is connected between V_{CC} and GND

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable Part Number
Supply voltage	V_{CC}	operating	-	1	7	V	All parts
Bridge resistance	R_B	operating	2	6 ¹⁾	9	k Ω	TMR3005SG
			100	140	190	k Ω	TMR3005G
			1400	1900	2800	k Ω	TMR3005BG
Peak voltage	V_{PEAK}	operating	-	340 ²⁾	-	mV/V	All parts
Offset voltage	V_{OFFSET}	operating	-20	-	20	mV/V	All parts
Magnetic field	H_{ext}	operating	200	-	800	Gs	All parts
Angular error	$\Delta\theta$	operating	-	0.6 ³⁾	-	°	All parts
Operation coefficient of peak voltage	TCV_{PEAK}	$T_A = -40\text{ °C to }85\text{ °C}$	-	-970	-	PPM/°C	All parts

Notes:

- 1) V_{CC} - GND resistance of single axis, customizable upon request.
- 2) V_{PEAK} is the amplitude of the output sinusoidal voltage, which equals to half of the peak-to-peak value (V_{P-P}).
- 3) Angle error is defined by zero-to-peak.

6. Applications

When the sensor is in an appropriate magnetic field, the resistance value of each TMR element of the sensor changes due to the difference between the sensitive direction of each TMR element and the direction of the magnetic field, resulting in a corresponding change in the output voltage.

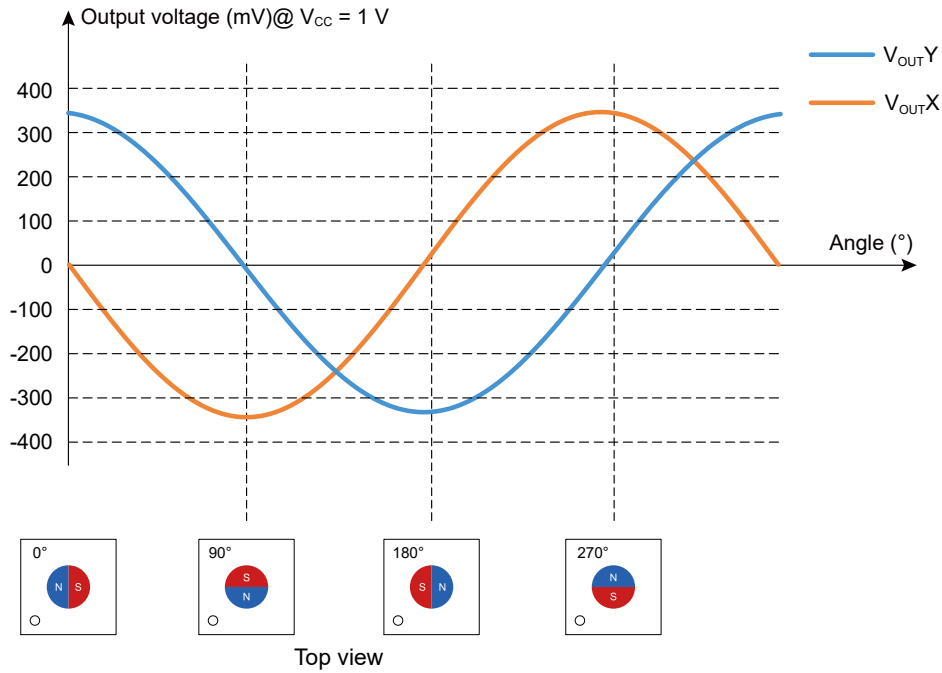


Figure 5. Single-ended output of TMR3005 in one period @ $V_{CC} = 1\text{ V}$

7. Dimensions

LGA8L Package

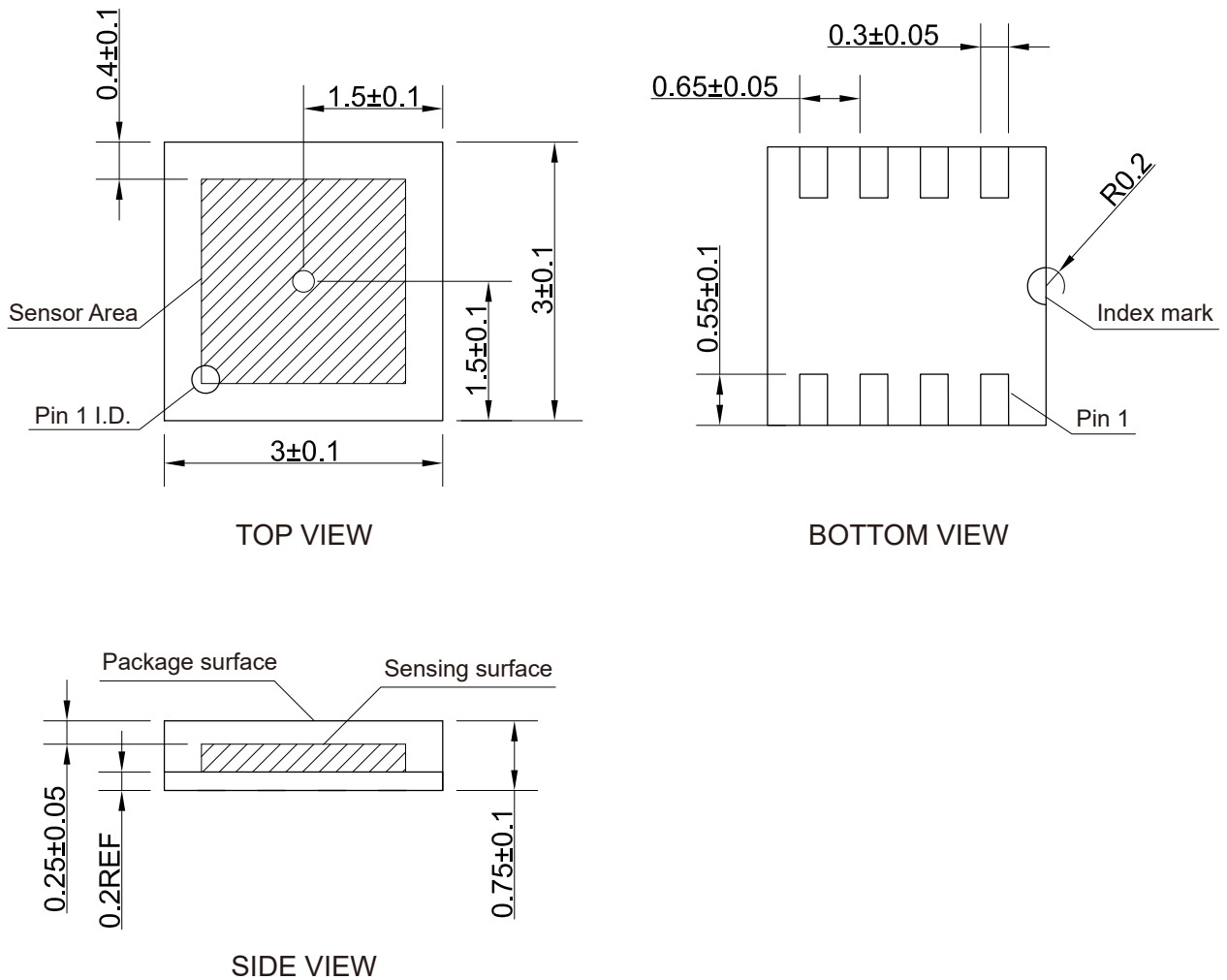


Figure 6. Package outline of LGA8L (unit: mm)

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