TMR3017

High Accuracy Analog TMR Angle Sensor

Description

TMR3017 contains a push-pull Wheatstone bridge, which is composed of four high-sensitivity tunneling magnetoresistance (TMR) elements. The sensor outputs a sinusoidal signal, and the period of the signal is that the di rection of the magnetic field rotates 360° in the sensing plane.

TMR3017 uses a compact DFN4L (0.8 mm × 0.4 mm × 0.23 mm) package for easy assembly in small spaces.

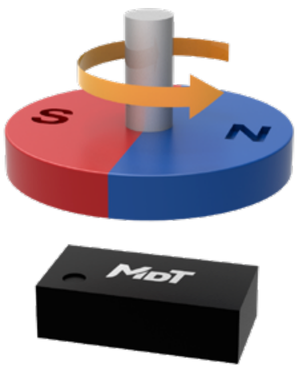
Features and Benefits

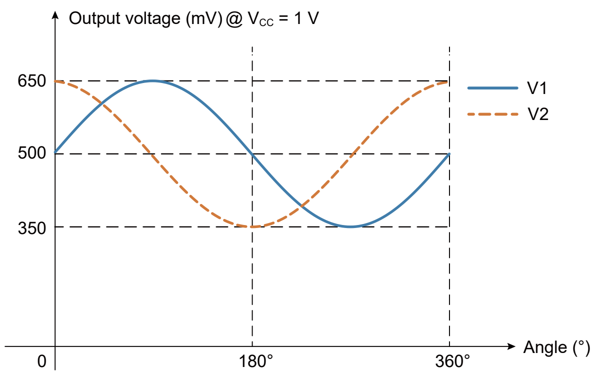
- Tunneling magnetoresistance (TMR) technology
- Wide range supply voltage
- Analog differential output
- Excellent temperature stability
- Adapt to large air gap
- Compact DFN package
- RoHS and REACH compliant

DFN4L

Applications

- Angular position sensing
- Linear position sensing





Selection Guide

Part Number	Output	Supply Voltage	Operating Temperature	Package	Packing Form
TMR3017D	Analog	≤ 5.5 V	-30 °C to 85°C	DFN4L	Tape & Reel

Catalogue

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1. Functional Block Diagram

TMR3017 TMR angle sensor integrates a Wheatstone bridge using TMR elements to increase the output amplitude and improve the temperature characteristics.

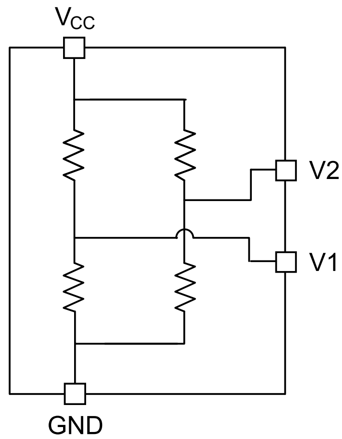


Figure 1. Block diagram

2. Pin Configuration

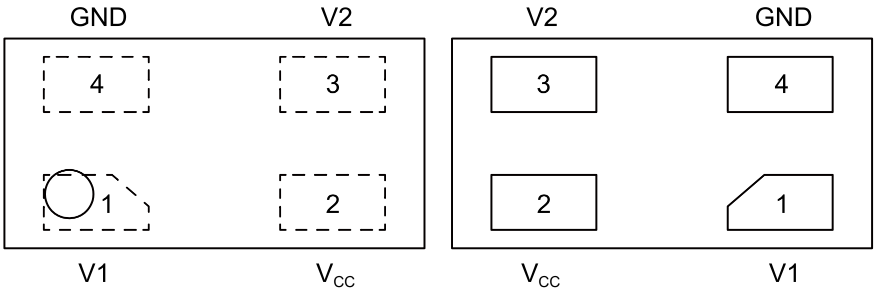


Figure 2. Pin configuration (DFN4L)

Number	Name	Function
1	V1	Output signal 1
2	V_{CC}	Power supply
3	V2	Output signal 2
4	GND	GND

3. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	-	6	V
Magnetic flux density	B	-	3000	Gs
ESD performance (HBM)	$V_{ESD(HBM)}$	-	3000	V
ESD performance (CDM)	$V_{ESD(CDM)}$	-	2000	V
Operating ambient temperature	T_A	-30	85	°C
Storage ambient temperature	T_{STG}	-40	125	°C

Note: The absolute maximum rating only lists the conditions under which the sensors are not permanently damaged. For normal operations please refer to Specifications.

4. Electrical Specifications

V_{CC} = 1.0 V, T_A = 25 °C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	-	-	5.5	V
Bridge resistance	R_B	B = 300 Gs	100	200	300	kΩ
Peak voltage	V_{PEAK}	B = 300 Gs	100	150	200	mV/V
Midpoint voltage	V_{Mid}	B = 300 Gs	450	500	550	mV/V
Offset voltage	V_{OFFSET}	B = 300 Gs	-15	0	15	mV/V
Temperature coefficient of bridge resistance	TCR_B	-	-	-0.05	-	%/°C
Temperature coefficient of amplitude	TCV_{PEAK}	-	-	-0.09	-	%/°C

5. Magnetic Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Magnetic flux density	B	-	200	-	800	Gs

Note: 1 Gauss in air = 0.1 millitesla = 79.8 A/m

6. Specification Definitions

6.1 Bridge resistance R_B

Resistance between pin V_{CC} and GND

6.2 Output amplitude V_{PEAK}

$$V_{PEAK}1 = \frac{V_{MAX}1 - V_{MIN}1}{2} \qquad V_{PP}1 = V_{MAX}1 - V_{MIN}1$$

$$V_{PEAK}2 = \frac{V_{MAX}2 - V_{MIN}2}{2} \qquad V_{PP}2 = V_{MAX}2 - V_{MIN}2$$

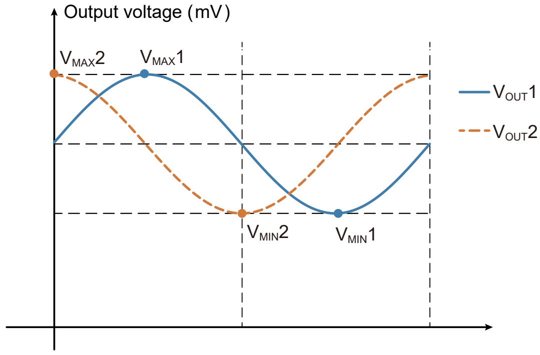


Figure 3. Definition of V_{MIN} and V_{MAX} in output signal

6.3 Midpoint voltage V_{Mid}

$$V_{Mid}1 = \frac{V_{MAX}1 + V_{MIN}1}{2}$$

$$V_{Mid}2 = \frac{V_{MAX}2 + V_{MIN}2}{2}$$

6.4 Offset V_{OFFSET}

$$V_{OFFSET} = V_{Mid}1 - V_{Mid}2$$

6.5 Temperature coefficient of bridge resistance TCR_B

R_H: High temperature resistance R_L: Low temperature resistance R_N: Resistance at 25°C

T_H: High temperature T_L: Low temperature T_N: 25°C

$$TCR_B = \frac{R_H - R_L}{R_N (T_H - T_L)} \times 100\%$$

6.6 Temperature coefficient of amplitude TCV_{PEAK}

$V_{PEAKH}1$: $V_{OUT}1$ in high temp $V_{PEAKL}1$: $V_{OUT}1$ in low temp $V_{PEAKN}1$: $V_{OUT}1$ at 25°C

$V_{PEAKH}2$: $V_{OUT}2$ in high temp $V_{PEAKL}2$: $V_{OUT}2$ in low temp $V_{PEAKN}2$: $V_{OUT}2$ at 25°C

T_H: High temperature T_L: Low temperature T_N: 25°C

$$TCV_{PEAK}1 = \frac{V_{PEAKH}1 - V_{PEAKL}1}{V_{PEAKN}1 (T_H - T_L)} \times 100\% \qquad TCV_{PEAK}2 = \frac{V_{PEAKH}2 - V_{PEAKL}2}{V_{PEAKN}2 (T_H - T_L)} \times 100\%$$

7. Applications

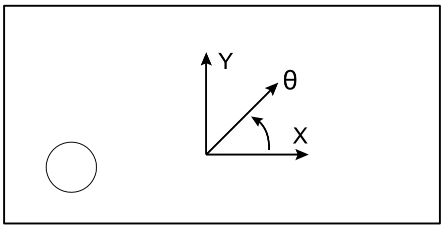


Figure 4. Sensing direction of TMR3017

The sensing direction is parallel to the X-Y plane where package laser mark is located as shown in Figure 4. 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.

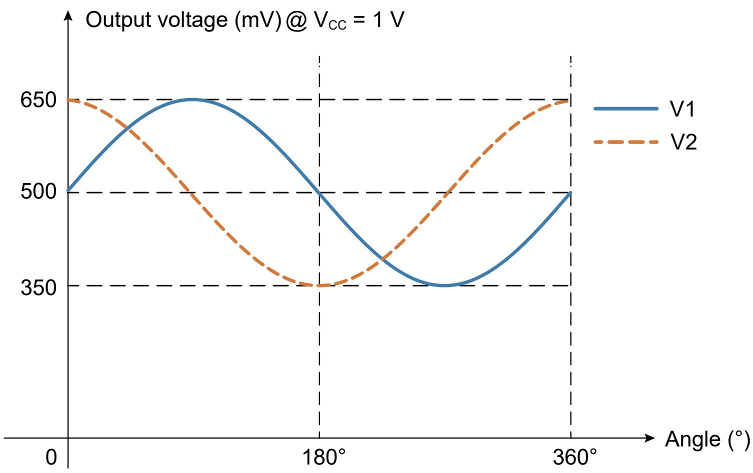


Figure 5. Single-ended output of TMR3017 in one period @ V_{CC} = 1 V

8. Dimensions

DFN4L Package

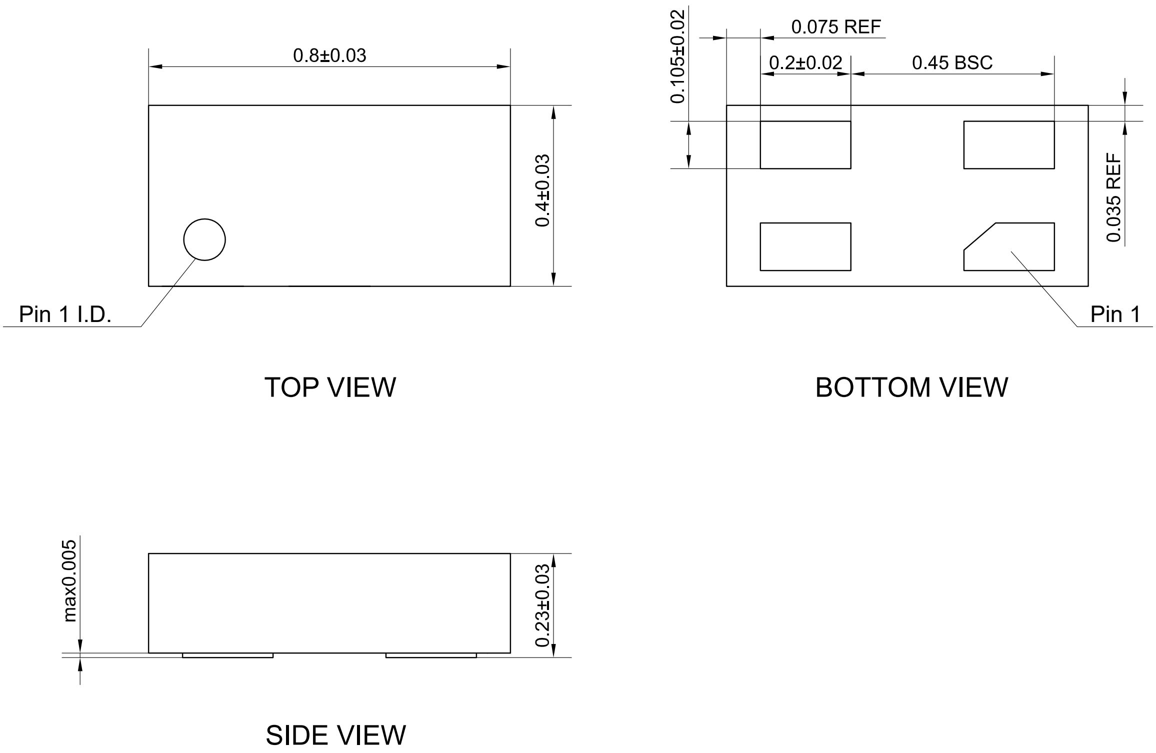


Figure 7. Package outline of DFN4L (unit: mm)

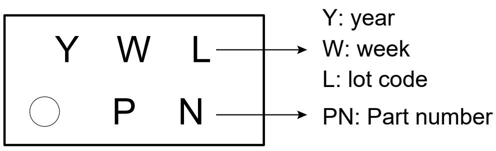
Product Marking Description

“Y” represents the year of material input, with one character for every half year, and 26 characters covering 13 years;

“W” represents the week of material input, with 26 letters representing 26 weeks;

“L” represents the batch of material input, with one character for each wafer per input;

“PN” represents the part number.



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Specifications may change without notice.

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