

## General Description

The TMR9002 linear sensor utilizes a unique push-pull Wheatstone bridge composed of four TMR sensor elements. The TMR9002 is assembled in a 6mm × 5mm × 1.5mm SOP8 package.

## Features and Benefits

- Tunneling Magnetoresistance (TMR) Technology
- Ultra High Sensitivity (~100mV/V/Oe)
- Ultra Low Noise Spectral Density (150pT/√Hz@1Hz)
- Very Low Power Consumption
- Excellent Thermal Stability
- Low Hysteresis
- Compatible with Wide Range of Supply Voltages
- No need for set/reset calibration

## Applications

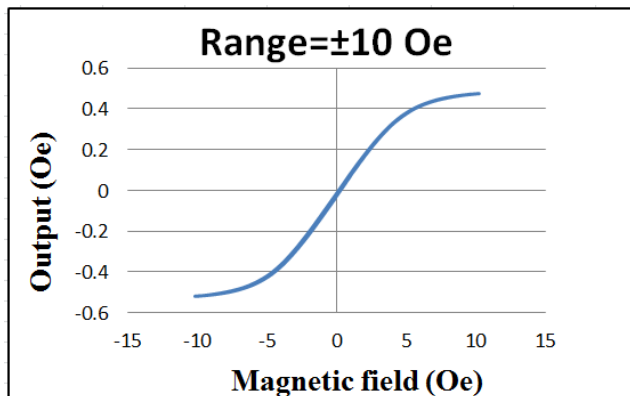
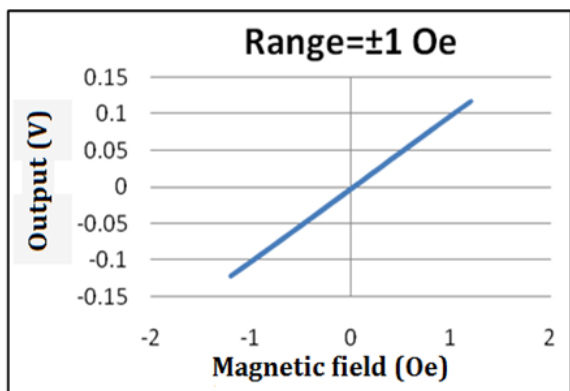
- Weak Magnetic Field Sensing
- Current Sensors
- Position and Displacement Sensing
- Bio-medical Sensing
- Magnetic Communication



TMR9002

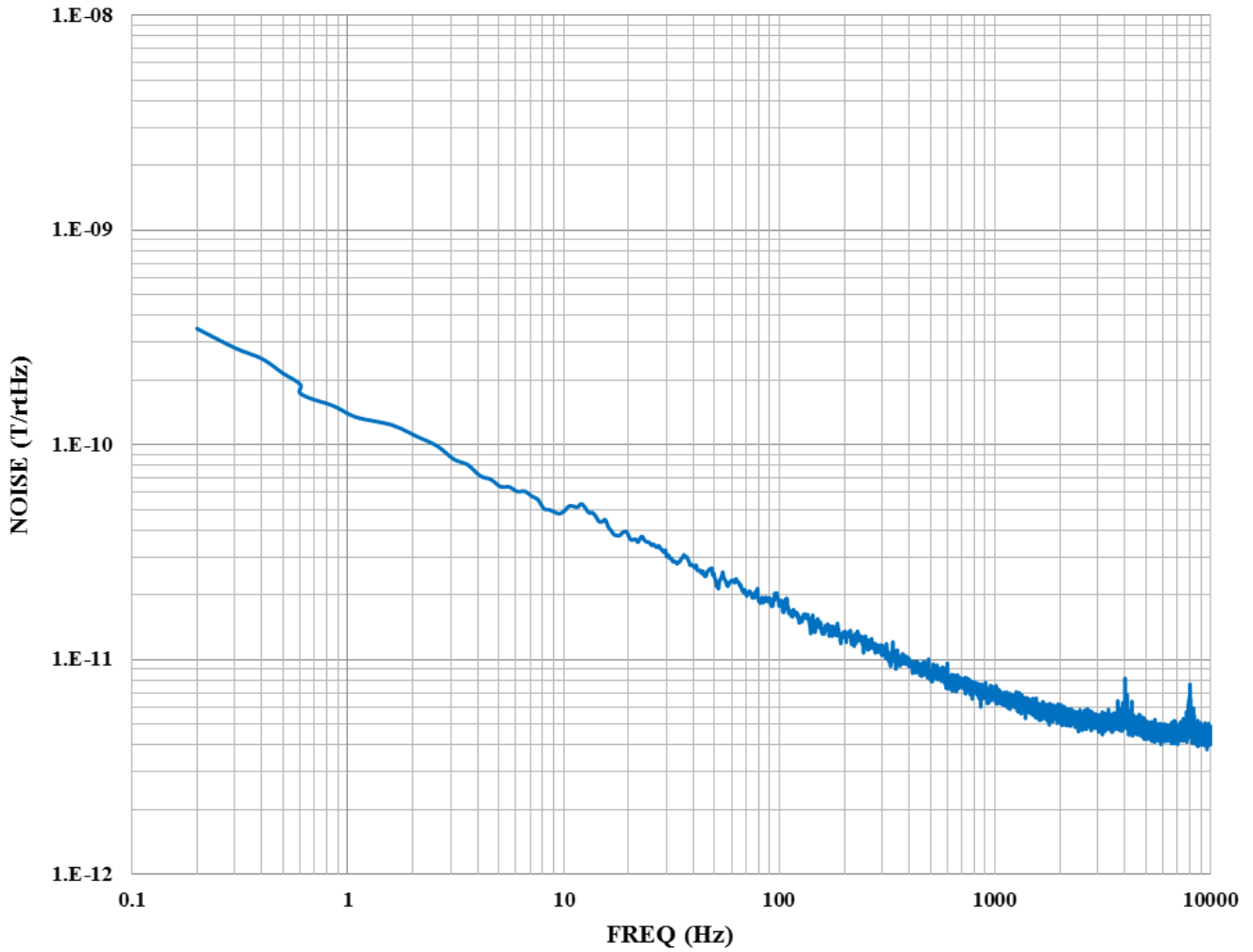
## Transfer Curve

The following figure shows the response of the TMR9002 to an applied magnetic field in the range of ±1 Oe and ±10 Oe when the TMR9002 is biased at 1 V. The following specifications are calculated over an analysis range of ±1 Oe .



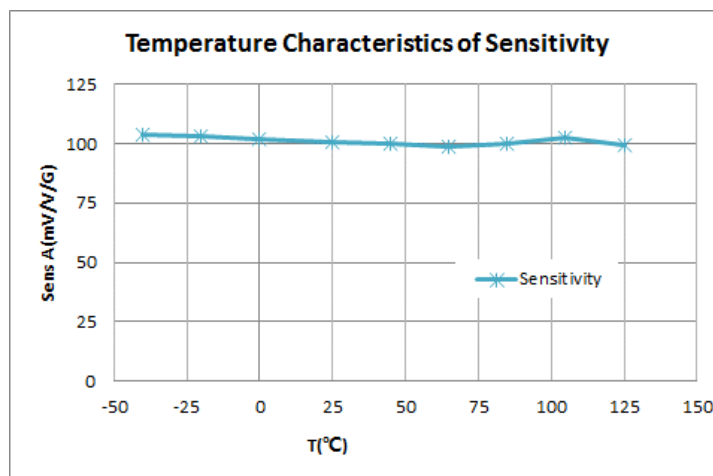
## Sensor Noise

The following figure illustrates the Power SpectralDensity (PSD) of the TMR9002 self noise (M). The  $1/f$  noise is approximately  $150 \text{ pT}/\sqrt{\text{Hz}}$  @ 1Hz, and the white noise is approximately  $4.5 \text{ pT}/\sqrt{\text{Hz}}$  @ 10kHz.



## Sensitivity temperature characteristic curve.

The figure below shows the temperature characteristic curve of the TMR9002 sensor (test temperature range: -40, c ~125)



## Pin Configuration

(Arrow indicates direction of applied field that generates a positive output voltage.)

The diagram shows a top view of a square sensor package with a circular sensing area. The pins are arranged as follows: Pin 8 (GND) at the top-left, Pin 7 (V-) at the top-center, Pin 6 (V+) at the top-right, and Pin 5 (VCC) at the top-right. On the bottom edge, pins 1, 2, 3, and 4 are labeled as N/A. A red arrow points from the right towards the center of the sensor, indicating the direction of the applied field.

Pin No.	Pin Name	Pin Function
5	V <sub>CC</sub>	Supply voltage
6	V+	Analog Differential Output 1
7	V-	Analog Differential Output 2
8	GND	Ground
1, 2, 3, 4	N/A	Not connected

(Top View)

## Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Supply Voltage	V <sub>CC</sub>	3	V
Reverse Supply Voltage	V <sub>RCC</sub>	3	V
Max Exposed Field	H <sub>E</sub>	4000	Oe <sup>(1)</sup>
ESD Voltage	V <sub>ESD</sub>	4000	V
Operating Temperature	T <sub>A</sub>	-40~125	°C
Storage Temperature	T <sub>stg</sub>	-50 ~150	°C

## Specification (V<sub>CC</sub>=1.0V, T<sub>A</sub>=25°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V <sub>CC</sub>	Normal Operating		1	3	V
Supply Current	I <sub>CC</sub>	Output Open		20 <sup>(2)</sup>		μA
Resistance	R			50		kOhm
Sensitivity	SEN	Fit ±1Oe		100		mV/V/Oe
Saturation Field	H <sub>sat</sub>			±8		Oe
Non -Linearity	NONL	Fit ±1Oe		0.5		%FS
Offset Voltage	V <sub>offset</sub>			15		mV/V
Hysteresis	Hys	Fit ±1Oe		0.02		Oe
Resistance temperature coefficient	TCR	-40 °C ~125 °C		-541		PPM/°C
Sensitivity temperature coefficient.	TCS	-40 °C ~125 °C		-287		PPM/°C
Self Noise	N <sub>i</sub>	@1Hz		150		pT/√Hz

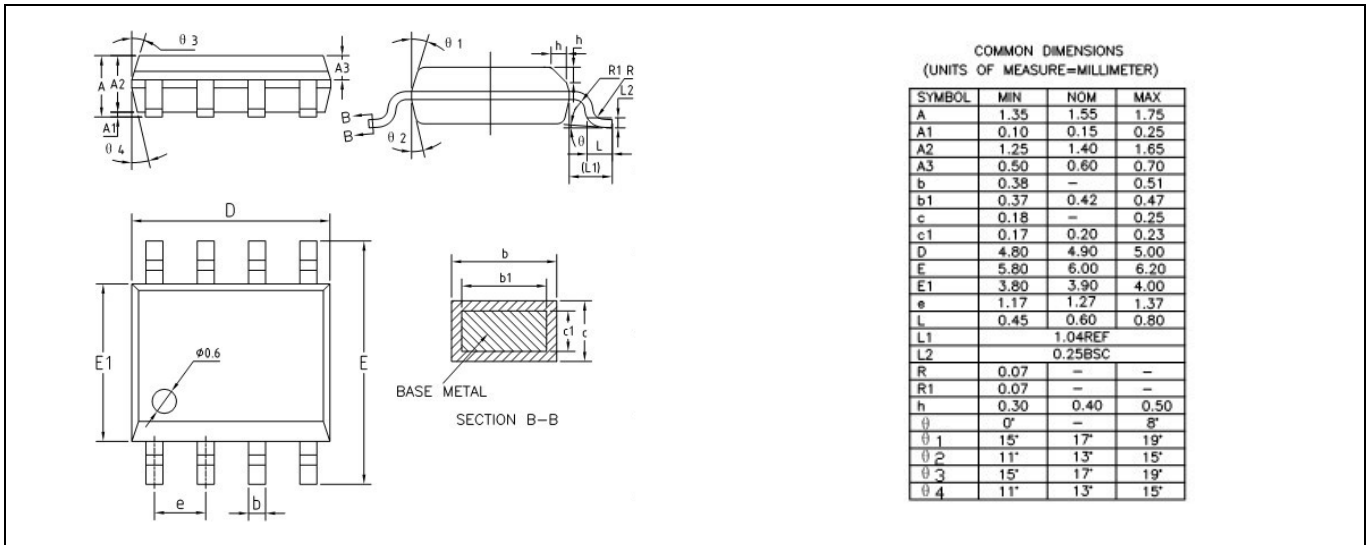
Note:

(1) 1 Oe (Oersted) = 1 Gauss in air = 0.1 millitesla = 79.8 A/m.

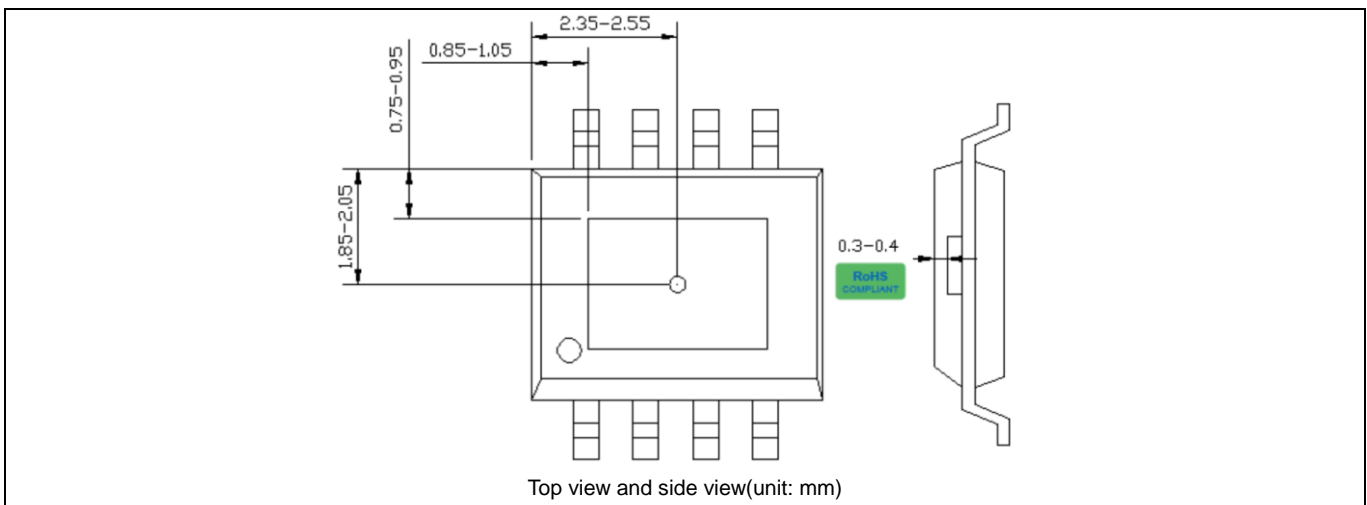
(2) I<sub>CC</sub> = V<sub>CC</sub>/R, I<sub>CC</sub> will vary under different R in practice and it can be customized accordingly.

## Package Information

SOP8 package drawing



## TMR Sensor Position





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