AMR2302

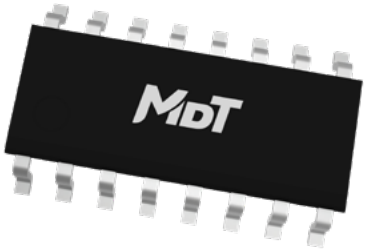
High Accuracy, Low Noise Dual Axis Linear Magnetic Sensor

Description

The AMR2302 linear sensor utilizes two push-pull Wheatstone bridges each composed of four highly sensitive AMR sensor elements. These Wheatstone bridges effectively compensate the sensor's temperature drift to achieve outstanding temperature stability with minimal noise. AMR2302 is available in the SOP16 package.

Features and Benefits

- Anisotropic magnetoresistance (AMR) technology
- Low noise density: 300 pT/√Hz@1 Hz
- Wide range supply voltages
- Low saturation field
- Excellent temperature stability
- Low hysteresis
- RoHS & REACH compliant



SOP16

Applications

- Weak magnetic field sensing
- Current sensor
- Position sensor
- Magnetometer

Selection Guide

Part Number	Linear Range	Sensitivity	Set/reset Coil Resistance	Offset Coil Resistance	Noise Density	Package	Packing Form
AMR2302P	±3 Gs	0.9 mV/V/Gs	5 Ω	45 Ω	300 pT/√Hz	SOP16	Tape & Reel

Catalogue

1. Functional Block Diagram

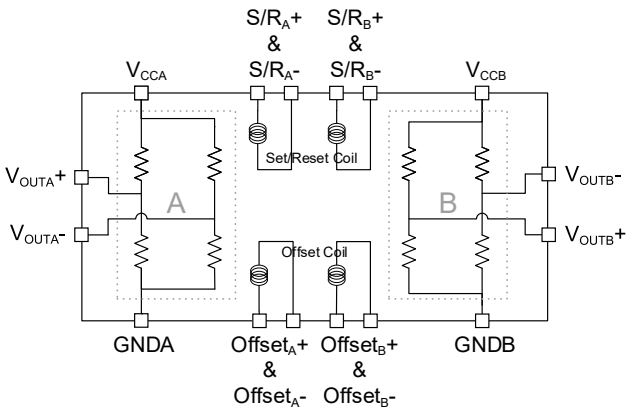


Figure 1. Block Diagram

2. Sensing Direction

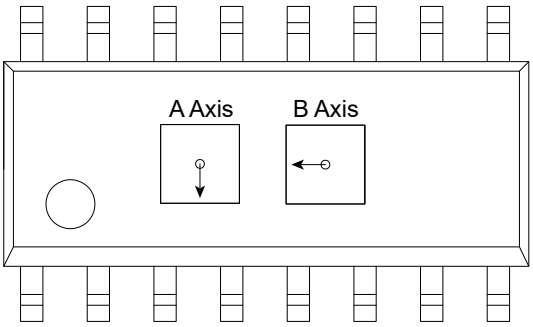


Figure 2. Sensing Direction (SOP16)

3. Pin Configuration

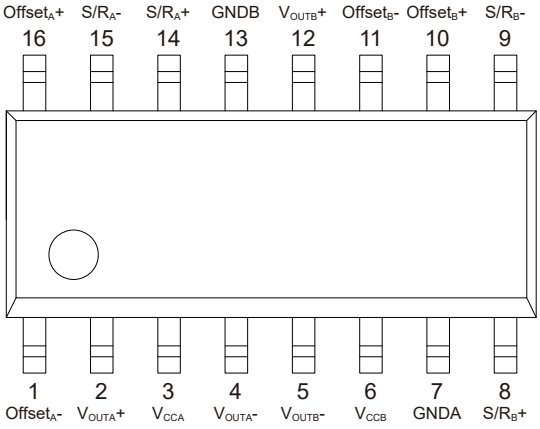


Figure 3. Pin Configuration (SOP16)

Pin Number	Name	Function
1	$Offset_A$-	A axis offset voltage -
2	V_{OUTA}+	A axis output +
3	V_{CCA}	A axis supply voltage
4	V_{OUTA}-	A axis output -
5	V_{OUTB}-	B axis output -
6	V_{CCB}	B axis supply voltage
7	GNDA	A axis ground
8	S/R_B+	B axis set/reset input+
9	S/R_B-	B axis set/reset input -
10	$Offset_B$+	B axis offset voltage +
11	$Offset_B$-	B axis offset voltage -
12	V_{OUTB}+	B axis output +
13	GNDB	B axis ground
14	S/R_A+	A axis set/reset input +
15	S/R_A-	A axis set/reset input -
16	$Offset_A$+	A axis offset +

4. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Supply Voltage	V_{CC}	-	12	V
ESD Performance (HBM)	V_{ESD}	-	4	kV
Operating Ambient Temperature	T_A	-55	150	°C
Storage Ambient Temperature	T_{STG}	-55	175	°C
Soldering Temperature	T_i	-	260	°C
Magnetic Field	B	-	10000	Gs

5. Electrical Specifications

V_{CC} = 5.0 V, T_A = 25 °C, $I_{S/R}$ = 1.5 A, dual differential output unless otherwise specified

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	Bridge voltage, referenced to ground	1.8	5	12	V
Bridge Resistance	R_B	I = 5 mA	600	650	1100	Ω
Field Range	B_{SAT}	Full scale (FS)	-6	-	6	Gs
Linearity Error	NONL	Fit in: ±1 Gs	-	0.05	-	%FS
		Fit in: ±3 Gs	-	0.15	-	
		Fit in: ±6 Gs	-	1.0	1.6	
Hysteresis Error	HYS	2 sweeps, across ±6 Gs	-	0.05	-	%FS
Repeatability Error	B_{repeat}	2 sweeps, across ±6 Gs	-	0.08	-	%FS
Bridge Offset	V_{OFFSET}	V_{OFFSET} = (V_{OUT}+) - (V_{OUT}-), B = 0 Gs, after set pulse	-10	±2	+10	mV/V
Sensitivity	SEN	-	0.6	0.9	1.1	mV/V/Gs
Voltage Noise Density	V_{noise}	At 1 Hz	-	25	-	nV/√Hz
Magnetic Noise Density	B_{noise}	At 1 Hz	-	300	-	pT/√Hz
Resolution	RES	Bandwidth = 10 Hz	-	40	-	μGs
Bandwidth	BW	Magnetic signal (lower limit = DC)	-	5	-	MHz
Offset Coil Resistance	$R_{OFFCOIL}$	Measured from OFFSET+ to OFFSET-	35	45	55	Ω
Offset Field	$B_{OFFCOIL}$	Field applied in sensitive direction	4.0	5.0	7.0	mA/Gs
Set/Reset Coil Resistance	$R_{S/R}$	Measured between S/R+ and S/R-	3	5	7	Ω
Set/Reset Current	$I_{S/R}$	2 μs current pulse	1	1.5	5	A
Disturbing Field	$B_{disturb}$	Sensitivity starts to degrade, restore by S/R pulse	-	20	-	Gs
Sensitivity Temperature Coefficient	TCS	T_A = -40 °C to 125 °C	-	-3800	-	PPM/°C
Bridge Offset Temperature Coefficient	TCO	T_A = -40 °C to 125 °C, w/o set/reset	-	500	-	PPM/°C
		T_A = -40 °C to 125 °C, w/ set/reset	-	10	-	
Resistance Temperature Coefficient	TCR_B	T_A = -40 °C to 125 °C	-	2700	-	PPM/°C
Cross-Axis Effect	X_B	Cross field = 1 Gs	-	±0.5	-	%FS

6. Typical Output Characteristics

Figure 4 shows the response of the AMR2302 to an applied magnetic field. (Applied field = ±20 Gs, analysis field = ±6 Gs, and V_{CC} = 5 V).

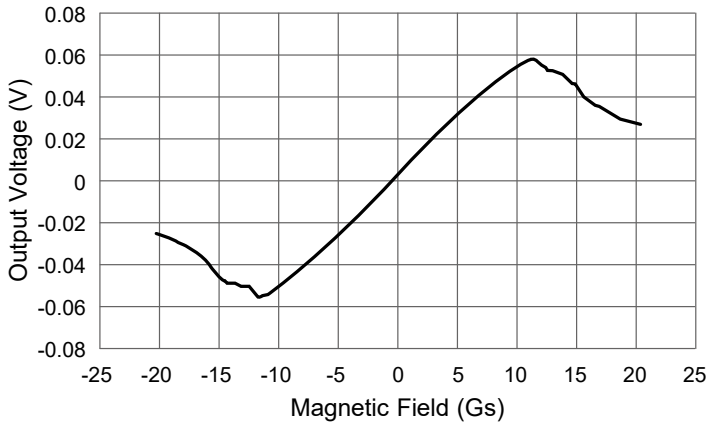


Figure 4. AMR2302 output vs. applied field

Typical voltage noise density

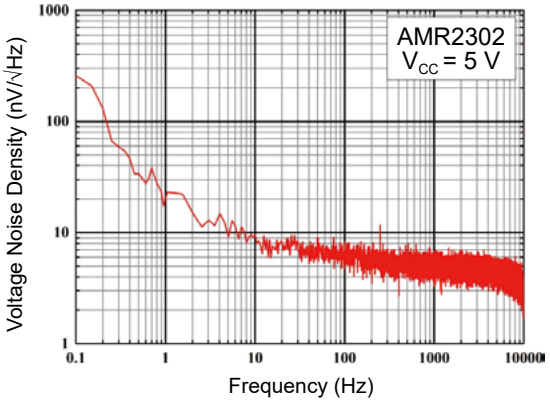


Figure 5. AMR2302 voltage noise density vs. frequency

Typical magnetic noise density

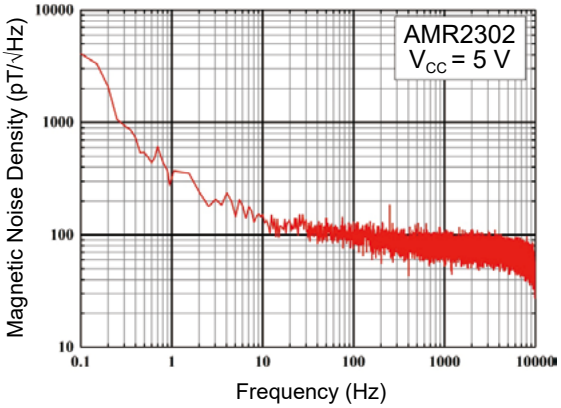


Figure 6. AMR2302 magnetic noise density vs. frequency

7. Application Information

A voltage pulse of 5 V for 2 μs in 10 kHz can be select as the set/reset signal. The pulse voltage, pulse width and duty cycle can be adjusted in a certain range. A typical drive circuit is shown in Figure 7.

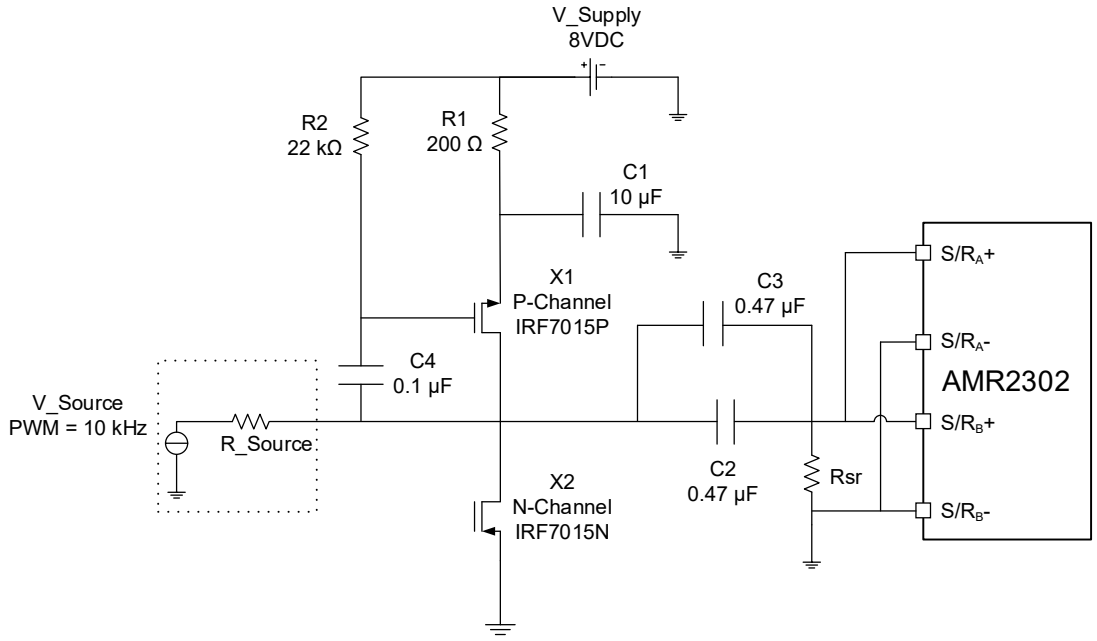


Figure 7. Set/reset drive circuit of AMR2302

The circuit will generate 5 V set/reset pulses, as illustrated in figure 8.

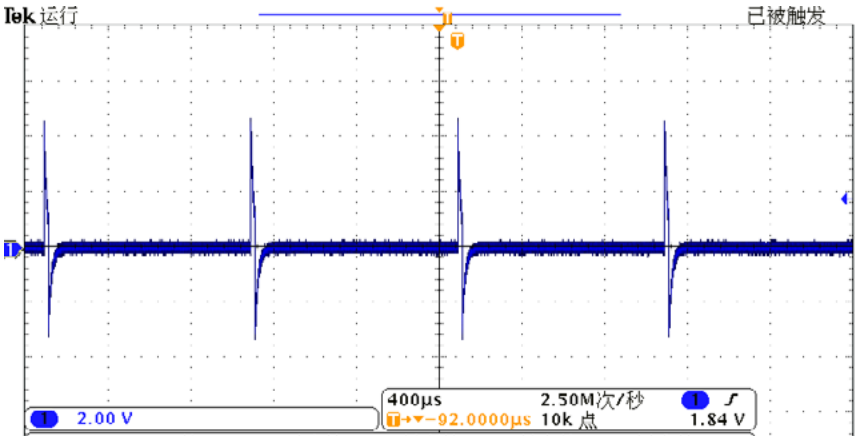


Figure 8. Set/reset voltage pulses waveform

When set-only or reset-only pulse is applied, the set- and reset- pulse is switchable by reversing the set/reset input.

8. Dimensions

SOP16 Package

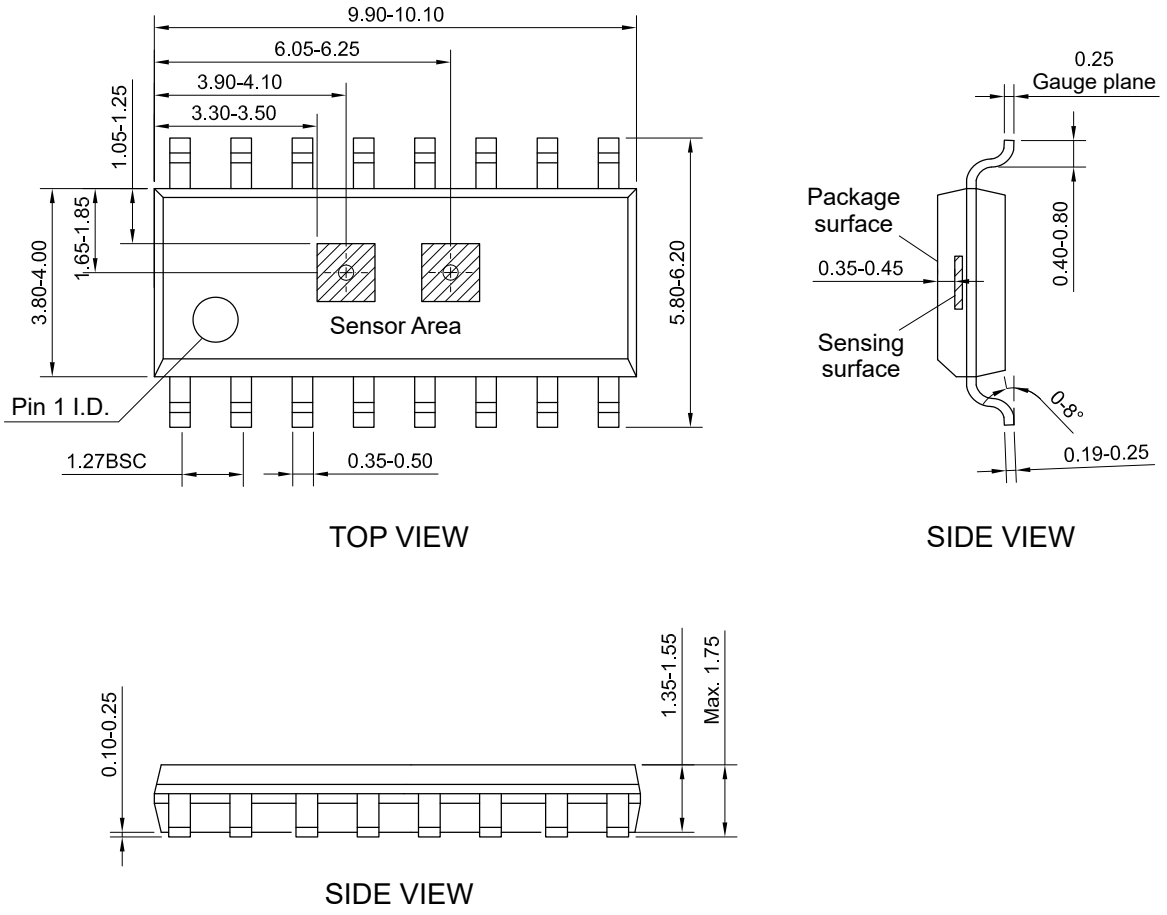


Figure 9. Package outline of SOP16 (unit: mm)

Recycling

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

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