

# AMR2501

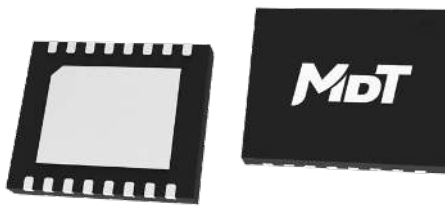
## High Accuracy, Low Noise Linear Magnetic Sensor

### Description

The AMR2501 linear sensor utilizes a push-pull Wheatstone bridge composed of four highly sensitive AMR sensor elements. The Wheatstone bridge effectively compensates the sensor's temperature drift to achieve outstanding temperature stability with minimal noise. AMR2501 is available in the DFN16L package.

### Features and Benefits

- Anisotropic magnetoresistance (AMR) technology
- Low noise density: 100 pT/ $\sqrt{\text{Hz}}$ @1 Hz
- Wide range supply voltages
- Low saturation field
- Excellent temperature stability
- Low hysteresis



DFN16L (5 mm × 6 mm × 0.75 mm)

### 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
AMR2501D-A	±1 Gs	2.5 mV/V/Gs	2 Ω	3 Ω	100 pT/ $\sqrt{\text{Hz}}$	DFN16L	Tape & Reel
AMR2501D-B	±1 Gs	2.5 mV/V/Gs	2 Ω	40 Ω	100 pT/ $\sqrt{\text{Hz}}$	DFN16L	Tape & Reel

## Catalogue

1. Functional Block Diagram.....	03
2. Sensing Direction .....	03
3. Pin Configuration .....	03
4. Absolute Maximum Ratings .....	04
5. Electrical Specifications.....	04
6. Typical Output Characteristics.....	05
7. Application Information .....	06
8. Dimensions.....	07

### 1. Functional Block Diagram

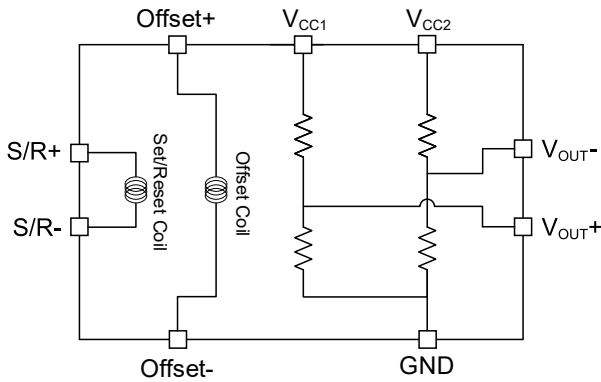


Figure 1. Block Diagram

### 2. Sensing Direction

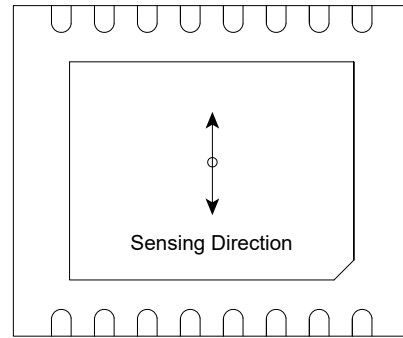


Figure 2. Sensing Direction (DFN16L)

### 3. Pin Configuration

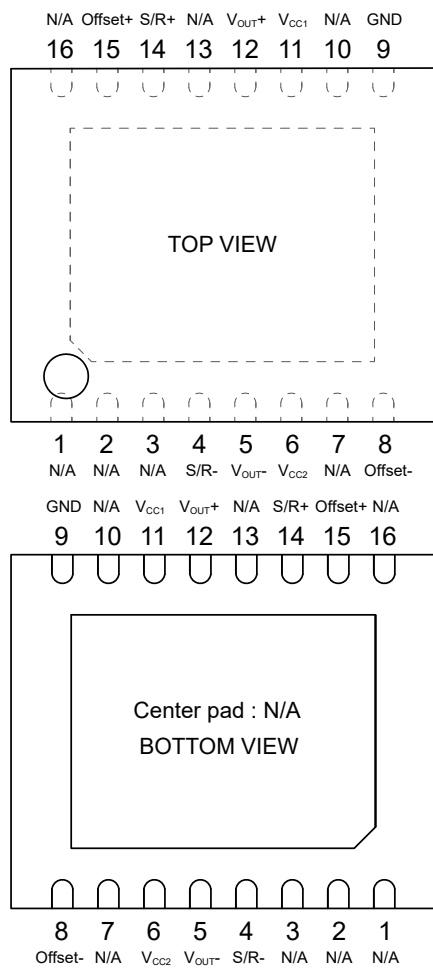


Figure 3. Pin Configuration (DFN16L)

Pin Number	Name	Function
1	N/A	Not connected
2	N/A	Not connected
3	N/A	Not connected
4	S/R-	Set/reset input -
5	V <sub>OUT-</sub>	Output -
6	V <sub>CC2</sub>	Supply voltage
7	N/A	Not connected
8	Offset-	Offset voltage -
9	GND	Ground
10	N/A	Not connected
11	V <sub>CC1</sub>	Supply voltage
12	V <sub>OUT+</sub>	Output +
13	N/A	Not connected
14	S/R+	Set/reset input +
15	Offset+	Offset voltage +
16	N/A	Not connected

## 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,  $I_{S/R} = 2.5$  A, 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	$R_B$	$I = 10$ mA	500	700	1100	$\Omega$	
Field Range	$B_{SAT}$	Full scale (FS)	-2	-	2	Gs	
Linearity Error	NONL	Fit in: $\pm 1$ Gs	-	0.2	0.5	%FS	
		Fit in: $\pm 2$ Gs	-	1.2	2		
Hysteresis Error	HYS	2 sweeps, across $\pm 2$ Gs	-	0.02	0.1	%FS	
Repeatability Error	$B_{repeat}$	2 sweeps, across $\pm 2$ Gs	-	0.05	0.1	%FS	
Bridge Offset	$V_{OFFSET}$	$V_{OFFSET} = (V_{OUT+}) - (V_{OUT-})$ , B = 0 Gs, after set pulse	-10	$\pm 2$	+10	mV/V	
Sensitivity	SEN	-	1.8	2.5	3.5	mV/V/Gs	
Voltage Noise Density	$V_{noise}$	At 1 Hz	-	20	-	nV/ $\sqrt{Hz}$	
Magnetic Noise Density	$B_{noise}$	At 1 Hz	-	100	-	pT/ $\sqrt{Hz}$	
Resolution	RES	Bandwidth = 10 Hz	-	20	-	$\mu$ Gs	
Bandwidth	BW	Magnetic signal (lower limit = DC)	-	5	-	MHz	
Offset Coil Resistance	$R_{OFFCOIL}$	Measured from OFFSET+ to OFFSET-	AMR2501D-A	-	3	-	$\Omega$
			AMR2501D-B	-	40	-	
Offset Field	$B_{OFFCOIL}$	Field applied in sensitive direction	AMR2501D-A	45	51	60	mA/Gs
			AMR2501D-B	9	10	12	
Set/Reset Coil Resistance	$R_{S/R}$	Measured between S/R+ and S/R-	1.5	2	2.5	$\Omega$	
Set/Reset Current	$I_{S/R}$	2 $\mu$ s current pulse	1	2.5	3.5	A	
Disturbing Field	$B_{disturb}$	Sensitivity starts to degrade, restore by S/R pulse	-	3	-	Gs	
Sensitivity Temperature Coefficient	TCS	$T_A = -40$ °C to 125 °C	-	-3000	-	PPM/°C	
Bridge Offset Temperature Coefficient	TCO	$T_A = -40$ °C to 125 °C, w/o set/reset	-	300	-	PPM/°C	
		$T_A = -40$ °C to 125 °C, w/ set/reset	-	10	-		
Resistance Temperature Coefficient	TCR	$T_A = -40$ °C to 125 °C	-	2500	-	PPM/°C	
Cross-Axis Effect	$X_B$	Cross field = 1 Gs	-	$\pm 0.5$	-	%FS	

## 6. Typical Output Characteristics

Figure 4 shows the response of the AMR2501 to an applied magnetic field. (Applied field =  $\pm 6$  Gs, analysis field =  $\pm 2$  Gs, and  $V_{CC} = 5$  V).

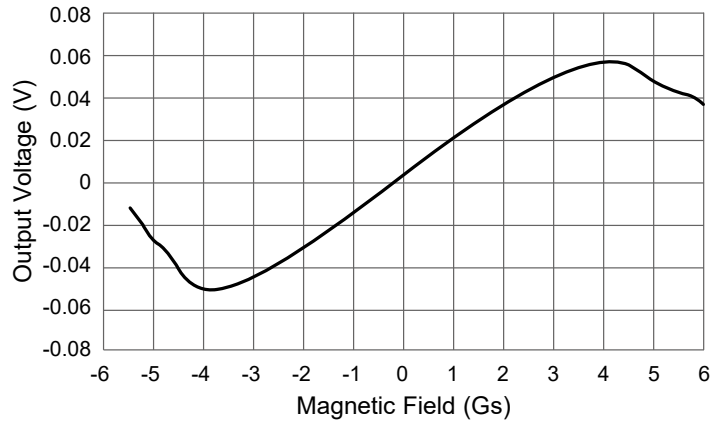


Figure 4. AMR2501 output vs. applied field

Typical voltage noise density

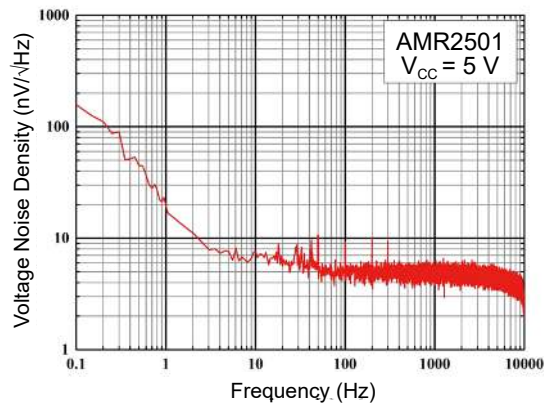


Figure 5. AMR2501 voltage noise density vs. frequency

Typical magnetic noise density

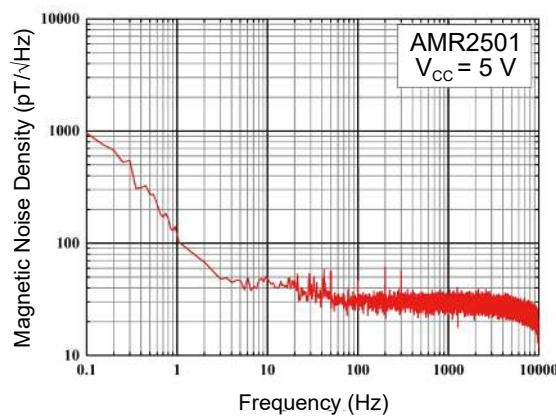


Figure 6. AMR2501 magnetic noise density vs. frequency

## 7. Application Information

A voltage pulse of 5 V for 2  $\mu$ s 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.

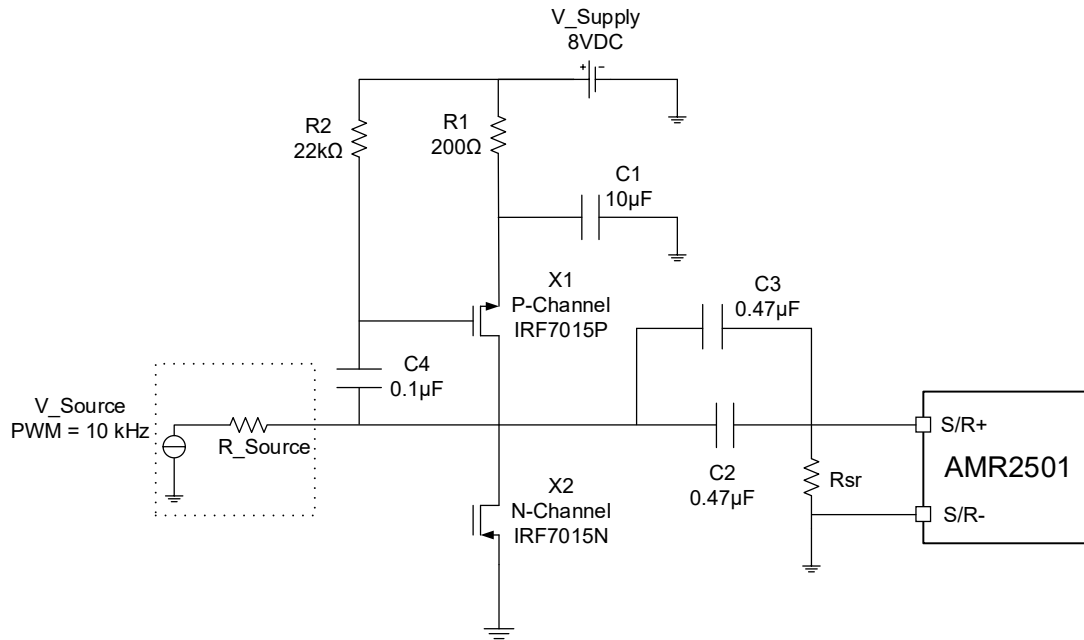


Figure 7. Set/reset drive circuit of AMR2501

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

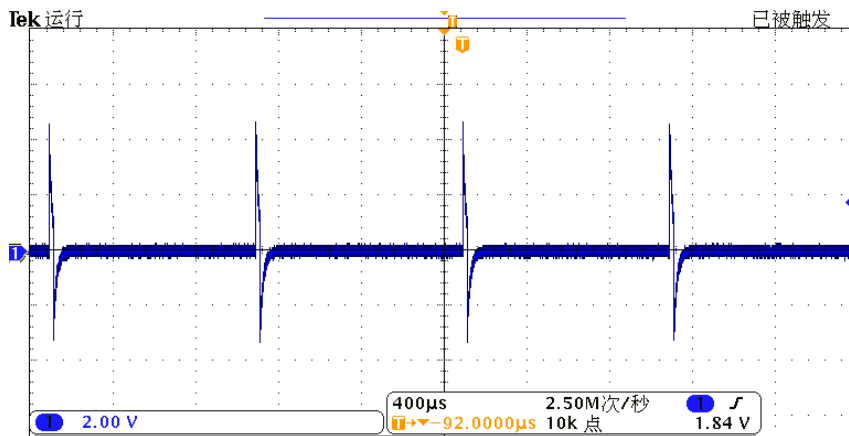


Figure 8. Set/reset voltage pulses waveform

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

## 8. Dimensions

### DFN16L Package

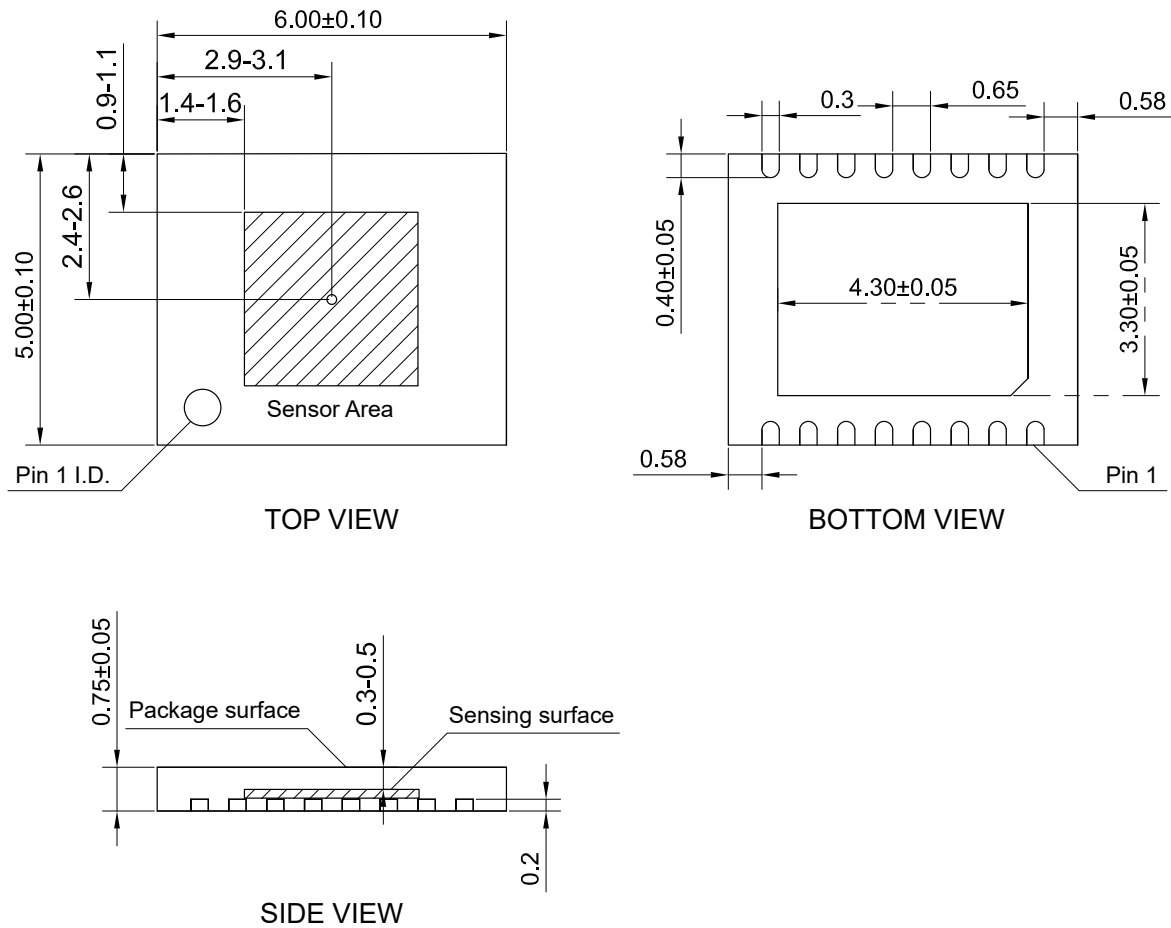


Figure 9. Package outline of DFN16L (unit: mm)

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