

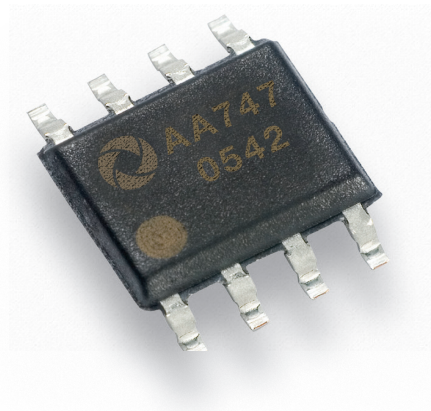
AA747

MagnetoResistive Angle Sensor

The AA747 is an angular sensor based on the AnisotropicMagnetoResistive (AMR) effect. The Sensor contains two galvanically separated Wheatstone bridges, at a relative angle of 45° to one another.

A rotating magnetic field in the sensor plane delivers two sinusoidal output signals with the double frequency of the angle α between sensor and magnetic field direction shown in Fig.1. The function of these signals is $+\sin(2\alpha)$ and $+\cos(2\alpha)$.

The AA747 is available as a SO8 package for SMD assembly.



Product Overview

Article description	Package	Delivery Type
AA747AHA-LB	SO8	Tape On Reel

Quick Reference Guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
Per bridge					
V_{CC}	Supply voltage	-	5	9	V
S	Sensitivity ($\alpha_1 = 0^\circ$; $\alpha_2 = 135^\circ$)	2.1	2.35	2.6	mV/deg
V_{off}	Offset voltage per V_{CC}	-2	-	+2	mV/V
V_{peak}	Signal amplitude per V_{CC}	12	13	14	mV/V
R_B	Bridge resistance	2.7	3.2	3.7	k Ω

Absolute Maximum Ratings

In accordance with the absolute maximum rating system (IEC60134).

Symbol	Parameter	Min.	Max.	Unit
V_{CC1}	Supply voltage of bridge 1	-9	+9	V
V_{CC2}	Supply voltage of bridge 2	-9	+9	V
T_{amb}	Ambient temperature	-40	+150	°C
t_{FL}	Floor life ($\leq 30^\circ\text{C} / 60\% \text{RH}$)	-	1	years
MSL	Moisture sensitivity level			2

Stresses beyond those listed under "Absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Features

- Based on the AnisotropicMagnetoResistive (AMR) effect
- Contains two independent Wheatstone bridges
- Sine and cosine output
- Temperature range from -40°C to $+150^\circ\text{C}$

Advantages

- Non-contacting angle measurement
- Large air gap
- Excellent accuracy, even for weak magnetic field strength
- Position tolerant
- Minimal offset voltage
- Negligible hysteresis

Applications

- Incremental or absolute position measurement (linear and rotary motion)
- Motor commutation
- Rotational speed measurement
- Angle measurement (180° absolute on shaft end)



Magnetic Data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
H_{ext}	Magnetic field strength ¹⁾		-	25	-	kA/m

¹⁾ The stimulating magnetic field in the sensor plane necessary to ensure the minimum error as specified in note 9.

Electrical Data

$T_{\text{amb}} = 25\text{ °C}$; $H_{\text{ext}} = 25\text{ kA/m}$; $V_{\text{CC1}} = 5\text{ V}$; $V_{\text{CC2}} = 5\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Per bridge						
V_{CC}	Supply voltage		-	5	9	V
S	Sensitivity ²⁾	$\alpha_1 = 0^\circ$; $\alpha_2 = 135^\circ$	2.1	2.35	2.6	mV/deg
TC_S	Temperature coefficient of sensitivity ³⁾	$T_{\text{amb}} = (-40\dots+150)\text{ °C}$	-0.31	-0.35	-0.39	%/K
V_{off}	Offset voltage per V_{CC}	See Fig.1	-2	-	+2	mV/V
TCV_{off}	Temperature coefficient of V_{off} ⁴⁾	$T_{\text{amb}} = (-40\dots+150)\text{ °C}$	-2	-	+2	($\mu\text{V/V}$)/K
V_{peak}	Signal amplitude per V_{CC} ⁵⁾	See Fig.1	12	13	14	mV/V
TCV_{peak}	Temperature coefficient of V_{peak} ⁶⁾	$T_{\text{amb}} = (-40\dots+150)\text{ °C}$	-0.31	-0.35	-0.39	%/K
R_B	Bridge resistance ⁷⁾		2.7	3.2	3.7	ΩW
TC_{R_B}	Temperature coefficient of R_B ⁸⁾	$T_{\text{amb}} = (-40\dots+150)\text{ °C}$	0.38	0.42	0.46	%/K

²⁾ Sensitivity changes with angle due to sinusoidal output.

$$\supset TC_S = 100 \cdot \frac{S_{(T_2)} - S_{(T_1)}}{S_{(T_1)} \cdot (T_2 - T_1)} \text{ with } T_1 = -40\text{ °C}; T_2 = +150\text{ °C}.$$

$$\supset TC_{V_{\text{off}}} = \frac{V_{\text{off}(T_2)} - V_{\text{off}(T_1)}}{(T_2 - T_1)} \text{ with } T_1 = -40\text{ °C}; T_2 = +150\text{ °C}.$$

⁵⁾ Maximal output voltage without offset influences. Periodicity of V_{peak} is $\sin(2\alpha)$ and $\cos(2\alpha)$.

$$\supset TC_{V_{\text{peak}}} = 100 \cdot \frac{V_{\text{peak}(T_2)} - V_{\text{peak}(T_1)}}{V_{\text{peak}(T_1)} \cdot (T_2 - T_1)} \text{ with } T_1 = -40\text{ °C}; T_2 = +150\text{ °C}.$$

⁷⁾ Bridge resistance between pins 8 and 4, 7 and 3, 5 and 1, and 6 and 2.

$$\supset TC_{R_B} = 100 \cdot \frac{R_{B(T_2)} - R_{B(T_1)}}{R_{B(T_1)} \cdot (T_2 - T_1)} \text{ with } T_1 = -40\text{ °C}; T_2 = +150\text{ °C}.$$

Accuracy

$T_{\text{amb}} = 25\text{ °C}$; $H_{\text{ext}} = 25\text{ kA/m}$; $V_{\text{CC1}} = 5\text{ V}$; $V_{\text{CC2}} = 5\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$\Delta\alpha$	Angular error ⁹⁾		0	0.05	0.1	deg
k	Amplitude synchronism ¹⁰⁾		-0.5	0	+0.5	% of V_{peak}

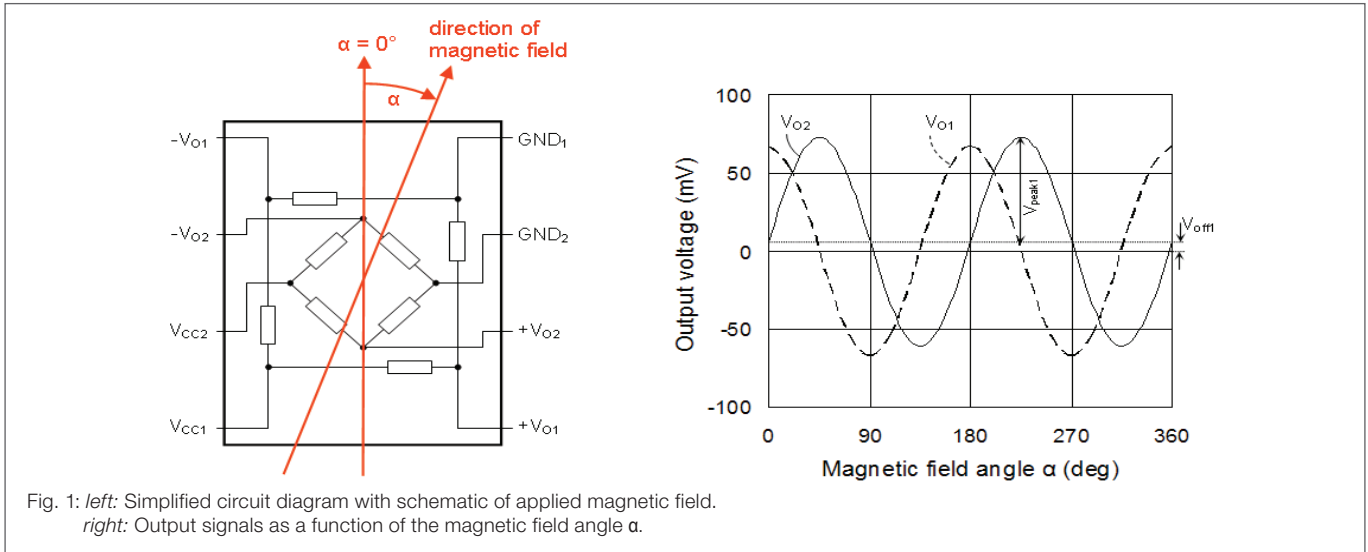
⁹⁾ $\Delta X = |x_{\text{real}} - x_{\text{measured}}|$ without offset influences due to deviations from ideal sinusoidal characteristics.

$$\supset k = 100 - 100 \cdot \frac{V_{\text{peak1}}}{V_{\text{peak2}}}$$

Dynamic Data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
ω	Angular velocity of the magnetic field		0	-	1	MHz

General Data

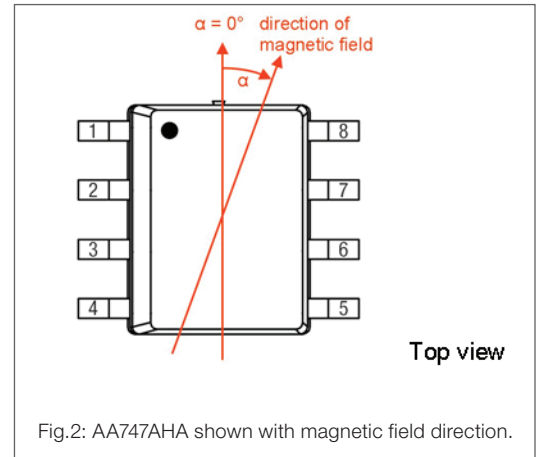


AA747 in SO8-housing

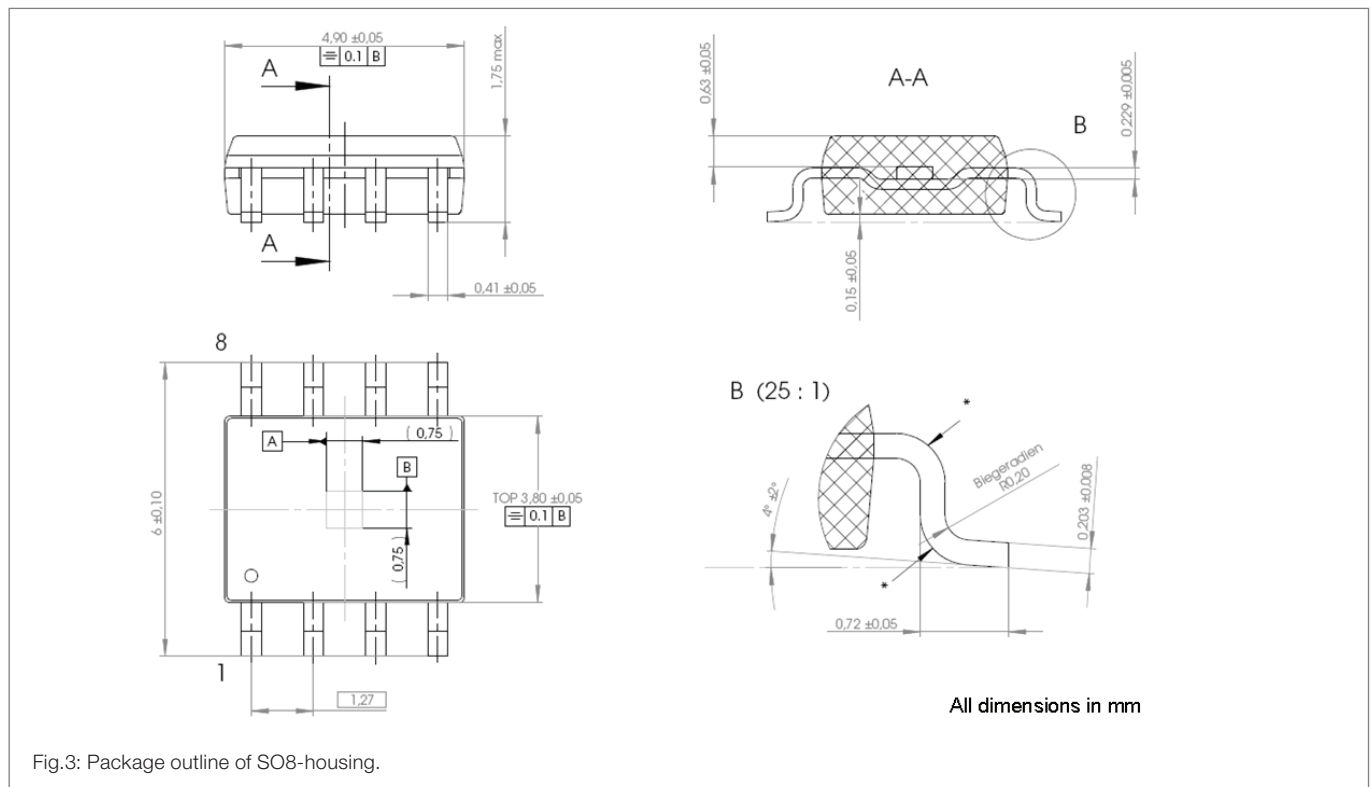
Pinning

Symbol	Parameter	Conditions
1	$-V_{O1}$	Output voltage bridge 1
2	$-V_{O2}$	Output voltage bridge 2
3	V_{CC2}	Supply voltage bridge 2
4	V_{CC1}	Supply voltage bridge 1
5	$+V_{O1}$	Output voltage bridge 1
6	$+V_{O2}$	Output voltage bridge 2
7	GND_2	Ground 2
8	GND_1	Ground 1

Pin 1 is marked by a point on housing.



Dimensions



The moisture sensitivity level of the package is MSL2 according to JEDEC standard J-STD-020D.

The allowable time period (floor life) after removal from a moisture barrier bag, dry storage or dry bake and before the solder reflow process is 1 year ($\leq 30\text{ °C} / 60\% \text{ RH}$).

General Information

Product Status

Article	Status
AA747AHA-LB	The product is in series production.
Note	The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com .

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