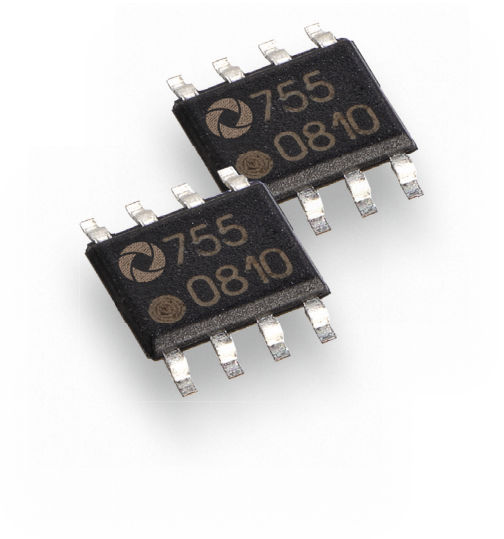
SENSITEC
MAGNETORESISTIVE SENSORS

DATA SHEET

AFF755B

MagnetoResistive Field Sensor



The AFF755B is a low noise magnetic field sensor based on the Anisotropic MagnetoResistive (AMR) effect.

The sensor contains a Wheatstone bridge including a flip coil for offset correction. This measurement principle also reduces the temperature coefficient of the offset by a factor of 100.

This sensor is ideally suited for the detection of weak magnetic fields (< 20 µG resp. < 2 nT) including the earth magnetic field.

The voltage necessary for driving the required flip-current of 150 mA is smaller than 0.5 V. This allows the serial connection of 3 sensors for a 3-axis measurement with typical supply voltages available in battery powered devices.

The AFF755B is available as a SO8 package (RoHS-conform) for SMD assembly.

Product Overview

Article description	Package	Delivery Type
AFF755BHA-AD	SO8	Tape on reel (4000)
AFF755BMA-AD	LGA	Tape on reel (5000)

Quick Reference Guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	1.2	5.0	9.0	V
R_B	Bridge resistance	2.2	2.5	2.8	kΩ
S	Sensitivity (in range ±160 A/m)	13.0	15.0	17.0	mV/V kA/m
I_F	Flip current (required)	±150	-	-	mA
R_F	Flip coil resistance	-	1.5	2.0	Ω

Absolute Maximum Ratings

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

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-20.0	+20.0	V
I_{Fmax}	Maximum flip current [1]	-1.0	+1.0	A
P_F	Maximum flip power dissipation	-	50	mW
T_{amb}	Ambient temperature	-40	+125	°C
T_{stg}	Storage temperature	-40	+150	°C
$V_{isolation}$	Voltage between bridge and flip coil	-250	+250	V
MSL	Moisture sensitivity level	-	2	-

[1] 10 µs pulse, 400 µs pause.

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 one Wheatstone Bridge
- Integrated flip coil
- Temperature range from -40 °C to +125 °C

Advantages

- Extreme sensitivity
- Wide range of magnetic field strength
- Low power consumption
- Low flip coil resistance
- Very good signal to noise ratio

Applications

- Compass
- Electronic navigation systems
- Battery powered applications
- Magnetometry
- Measurement of terrestrial magnetic field
- Traffic detection

ESD

RoHS-Compliant www.sensitec.com

Magnetic Data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
H_{ext}	Operating magnetic field range		-400	-	+400	A/m
B_{RES}	Resolution	V_{CC} = 5 V; BW = 50 Hz	-	2.0	-	nT

Electrical Data of MR-Bridge

T_{amb} = 25 °C; V_{CC} = 5 V; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		1.2	5.0	9.0	V
S	Sensitivity	In the operating range of ±160 A/m	13.0	15.0	17.0	$\frac{mV/V}{kA/m}$
TC_S	Temperature coefficient of Sensitivity [1]	See Fig. 3	-0.32	-0.36	-0.40	%/K
R_B	Bridge resistance [2]		2.2	2.5	2.8	kΩ
TC_{RB}	Temperature coefficient of R_B [3]		0.22	0.26	0.30	%/K
V_{off}	Offset voltage per V_{CC}		-0.5	-	+0.5	mV/V
TC_{Voff}	Temperature coefficient of V_{off} [4]		-1.0	-	+1.0	µV/V/K
H_{off}	Magnetic offset per V_{CC}		-	0.15	-	A/m/V
N	Noise level	f > 100 Hz	-	10	20	nV/√Hz
$\varepsilon_{Lin,80}$	Linearity error @ ±80 A/m	$-80 \le H_{ext} \le +80$ A/m	-	0.15	0.25	% of FS
$\varepsilon_{Lin,240}$	Linearity error @ ±240 A/m	$-240 \le H_{ext} \le +240$ A/m	-	0.80	0.90	% of FS
$\varepsilon_{Lin,400}$	Linearity error @ ±400 A/m	$-400 \le H_{ext} \le +400$ A/m	-	2.30	2.70	% of FS

[1] $TCS = 100 \cdot \frac{S_{(T2)} - S_{(T1)}}{S_{(T1)} \cdot (T_2 - T_1)}$ with T_1 = 25 °C; T_2 = 125 °C.

[2] Bridge resistance between pins 2 and 5, 4 and 6.

[3] $TC_{RB} = 100 \cdot \frac{R_{B(T2)} - R_{B(T1)}}{R_{B(T1)} \cdot (T_2 - T_1)}$ with T_1 = 25 °C; T_2 = 125 °C.

[4] $TC_{Voff} = \frac{V_{off(T2)} - V_{off(T1)}}{T_2 - T_1}$ with T_1 = 25 °C; T_2 = 125 °C.

Electrical Data of Flip Coil and Test Connectors

T_{amb} = 25 °C; V_{CC} = 5 V; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_F	Flip current (required)	1 µs on, 1 ms off	±150	-	-	mA
t_{IF}	Flip pulse duration		-	1.0	2.0	µs
I_{Fmax}	Flip current (maximum)	10 µs on, 400 µs off	-	-	±1.0	A
R_F	Flip coil resistance		-	1.5	2.0	Ω
TC_{RF}	Temperature coefficient of RF [5]		0.30	0.35	0.40	%/K
I_{test}	Test current		-	-	200	mA
H_{test}	Magnetic field strength per test current		0.25	0.35	0.45	A/m/mA

[5] $TC_{RF} = 100 \cdot \frac{R_{F(T2)} - R_{F(T1)}}{R_{F(T1)} \cdot (T_2 - T_1)}$ with T_1 = 25 °C; T_2 = 125 °C.

Dynamic Data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
f	Frequency range		1	-	-	MHz

Typical Performance Graphs

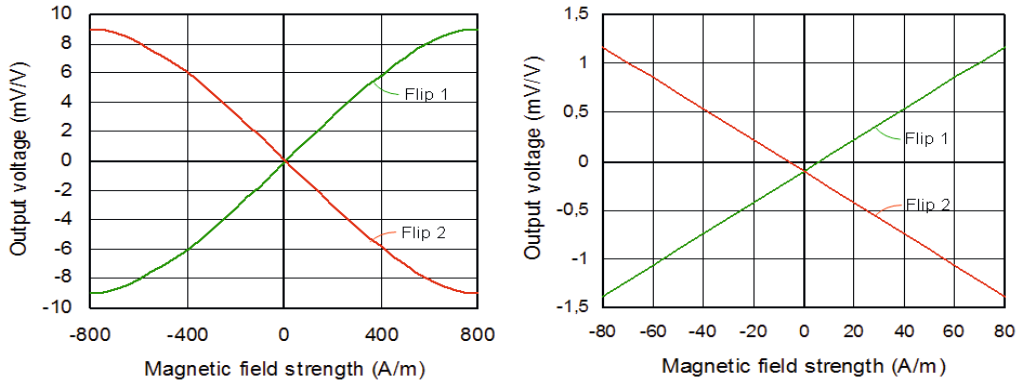


Fig. 1: Output voltage as a function of the magnetic field strength (α = 0°).

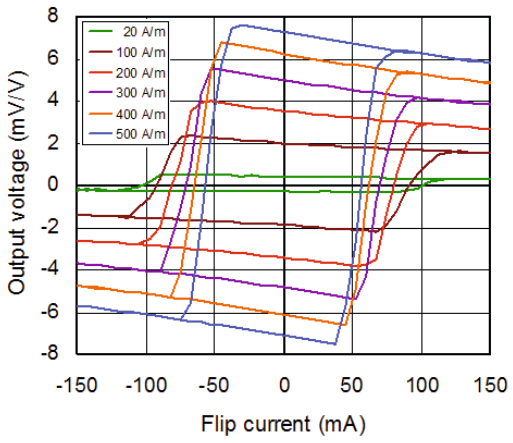


Fig. 2: Output voltage vs. flip current at different H_{ext}.

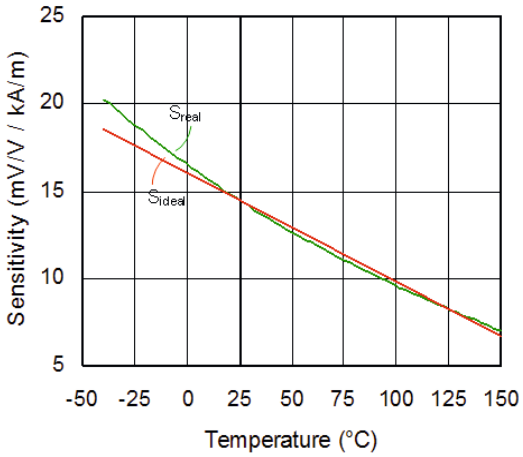


Fig. 3: Sensitivity vs. ambient temperature.

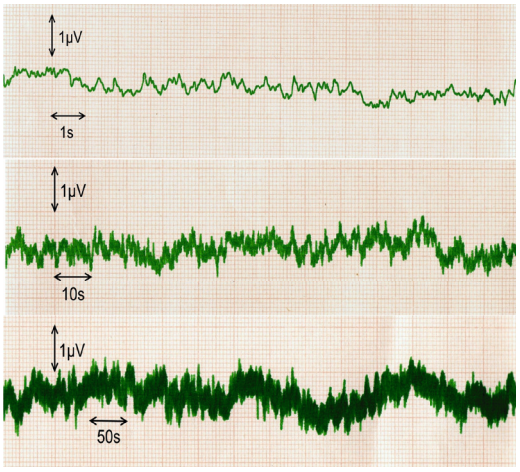


Fig. 4: Noise level for frequencies below 1 Hz (V_{CC}=5 V).

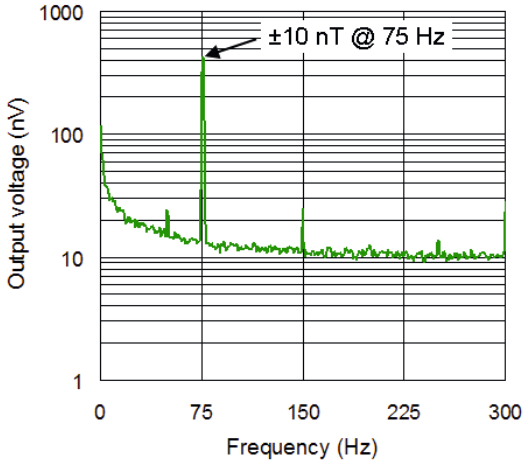


Fig. 5: Noise level for frequencies below 1 Hz (V_{CC}=5 V)

Typical Performance Graphs

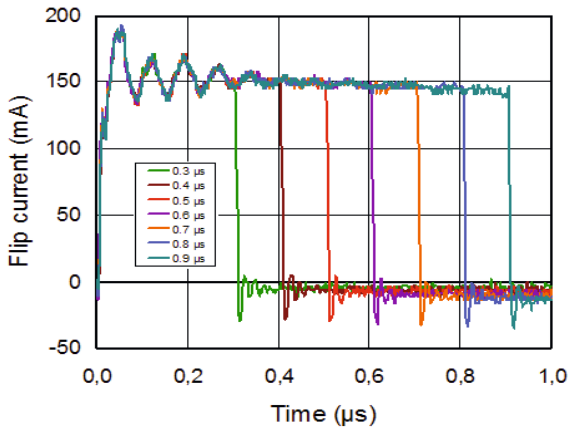


Fig. 6: Typically used flip pulses at different pulse durations (measured with Tektronix CT-1 Current Transducer).

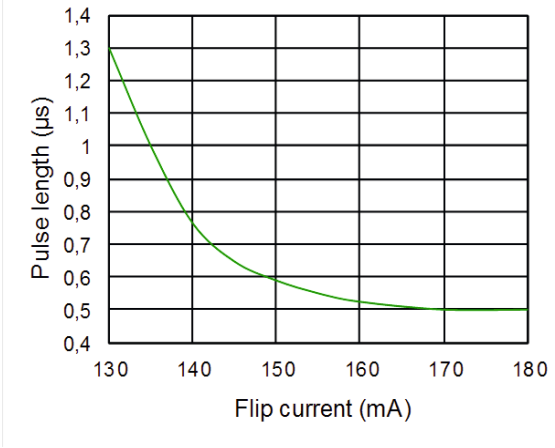


Fig. 7: Flip pulse length vs. flip current magnitude to achieve maximum resolution (see Fig. 10).

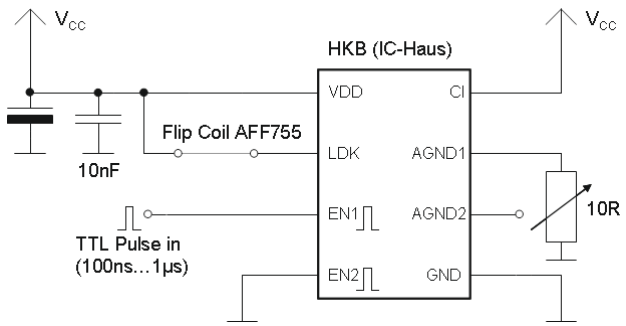


Fig. 8: Used laser diode driver circuit for generating short flip current pulses.

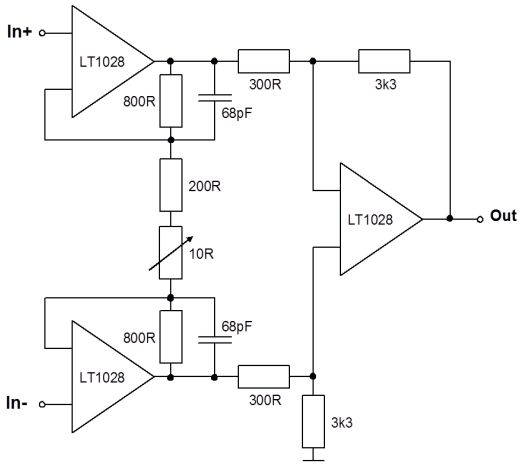


Fig. 9: Used instrumentation amplifier (Gain 100) for pre-amplifying sensor output signals.

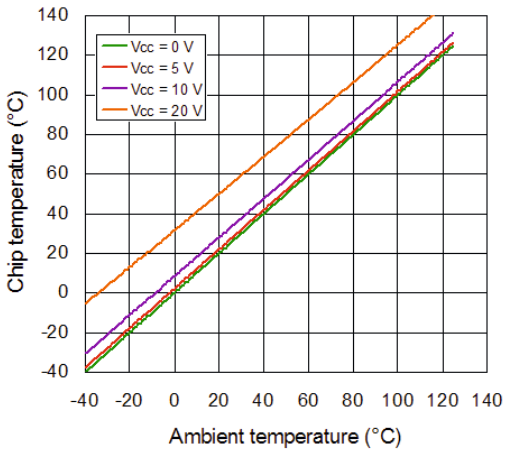


Fig. 10: Chip temperature vs. ambient temperature at different supply voltages.

AFF755B in SO8-Housing

Pinning

Pin	Symbol	Parameter
1	$+I_F$	Flip coil
2	$-V_{out}$	Negative output voltage
3	I_{test}	Test connector
4	GND	Ground
5	$+V_{out}$	Positive output voltage
6	V_{CC}	Supply voltage
7	I_{test}	Test connector
8	$-I_F$	Flip coil

Pin 1 is marked by a point on housing.

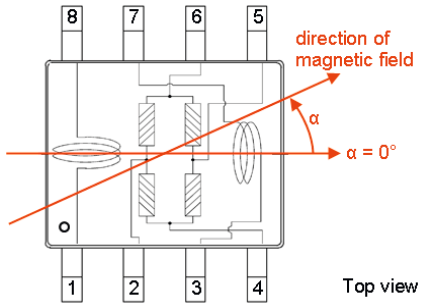


Fig. 11: AFF755B shown with magnetic field direction.

Dimensions

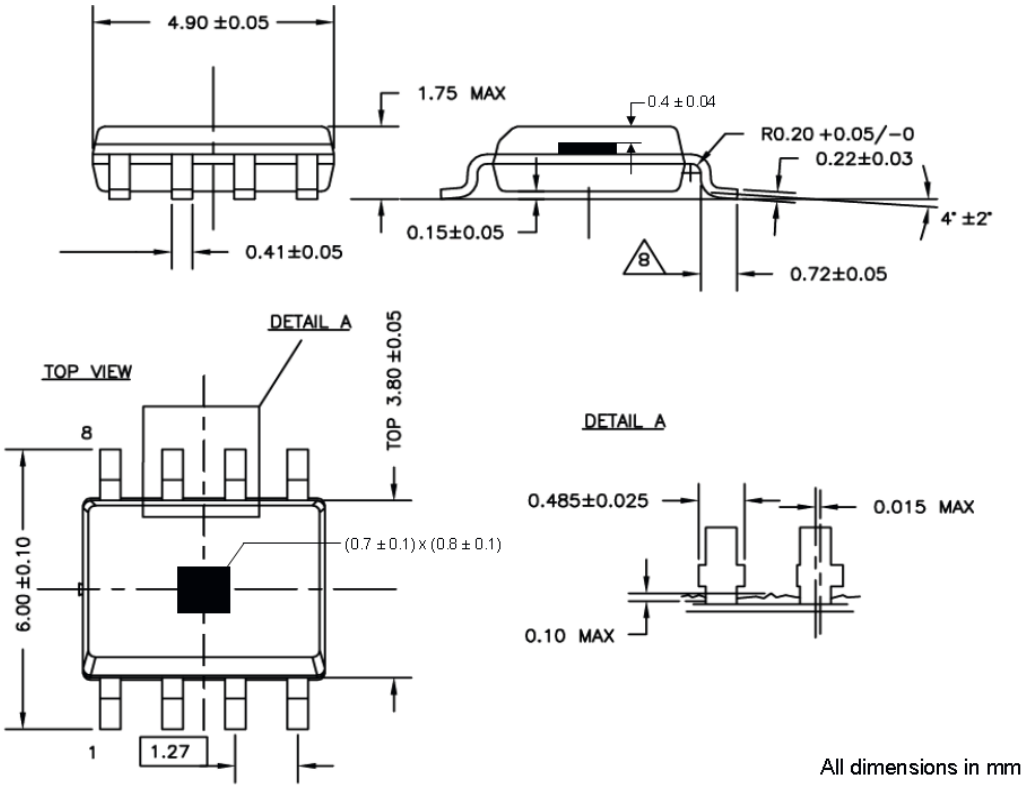


Fig. 12: Package outline of SO8-housing.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{th\,j\text{-}a}$	Thermal resistance from junction to ambient [1]	210	K/W

[1] $R_{th\,j\text{-}a}$ is specified for device in SO8 package, soldered to printed circuit board on worst case mounting conditions.

General Information

Product Status

Article	Status
AFF755B	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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These products are not qualified for use in life support appliances, aeronautical applications or devices or systems where malfunction of these products can reasonably be expected to result in personal injury.

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Changelist

Version	Description of the Change	Date
AFF755B.DSE.07	Logo updated (pp. 1-7)	03/2024
AFF755B.DSE.00	Original (pp. 1-7	01/2012

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