AH82X

Multi purpose programmable linear Hall effect sensor

1. Product Introduction

AH82X is a programmable linear Hall sensor series developed by Alfa. This series consists of two members: AH820 with analog output format, and AH821 with PWM digital output format.

AH82X is a universal magnetic field sensor based on Hall effect linear output. When combined with rotating or moving magnets, integrated circuits can be used for angle or distance measurement of magnetic field range, sensitivity, output static voltage (B=0mT output voltage), and output voltage range. Programmable sensors in EEPROM have proportional output characteristics, which means that the output voltage is proportional to the magnetic flux and power supply voltage. Multiple chips connected to the same power supply and ground wire can be programmed simultaneously.

The AH82X features chopper zero stabilization technology to eliminate the impact of Hall chip offset, while also utilizing A/D converters, digital signal processing, D/A converters with output drivers, EEPROM memory with calibration data locking function, serial interfaces for programming EEPROM, and protective devices on all pins.

AH82X can be programmed through the chip power pin without the need for additional programming pins, making it easy to program. During the customer's manufacturing process, each sensor can be individually programmed, and through this calibration program, the tolerances of sensors, magnets, and mechanical positioning can be compensated for in the final assembly.

In addition, the temperature compensation of Hall ICs can be adapted to common magnetic materials by programming the first-order and second-order temperature coefficients of Hall sensor sensitivity. This enables high-precision operation throughout the entire temperature range.

The calculation of individual sensor characteristics and programming of EEPROM memory can be completed through PC and Alfa programming boards.

This sensor is designed for industrial and automotive applications in the environment

The working temperature range is -40 ℃ to 150 ℃. Encapsulate TO92S, TO94-3, or SOP8 and obtain AEC-Q100 certification.

2. Product Features

- 12 bit analog output and digital signal processing
- Non volatile memory (EEPROM) with locking function
- Open circuit detection, overvoltage detection, undervoltage detection
- Multi channel parallel optional single channel sensor programming (controlled by output pins)
- The temperature characteristics are programmable and can be matched with common magnetic materials;
- Programmable clamp function;
- Power supply voltage modulation programming;
- Overvoltage protection, short circuit protection, reverse voltage protection;
- High resistance to mechanical stress
- High performance EMC and ESD；
- Multiple programmable and controllable low temperature drift characteristics

3. Application

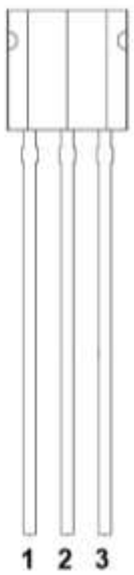
- Accelerator pedal
- Turbocharging
- EGR system
- Distance detection

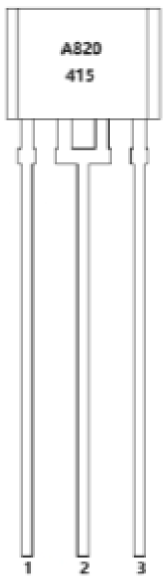
目 录

4. Product packaging

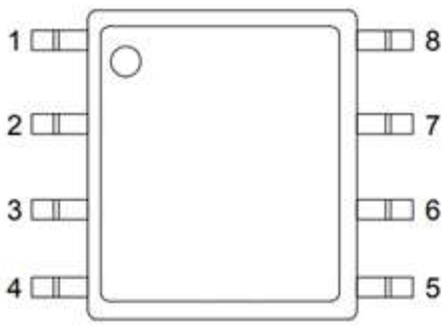
Part No.	operation temperature	Packages	Packing
AH820UA	-40℃～150℃	TO92S	1000PCS/ bag
AH820UR	-40℃～150℃	TO94-3L	1000PCS/ bag
AH820SO	-40℃～150℃	SOP8	100PCS/tube
AH821UA	-40℃～150℃	TO92S	1000PCS/ bag
AH821UR	-40℃～150℃	TO94-3L	1000PCS/ bag
AH821SO	-40℃～150℃	SOP8	100PCS/ tube

5.Pin information





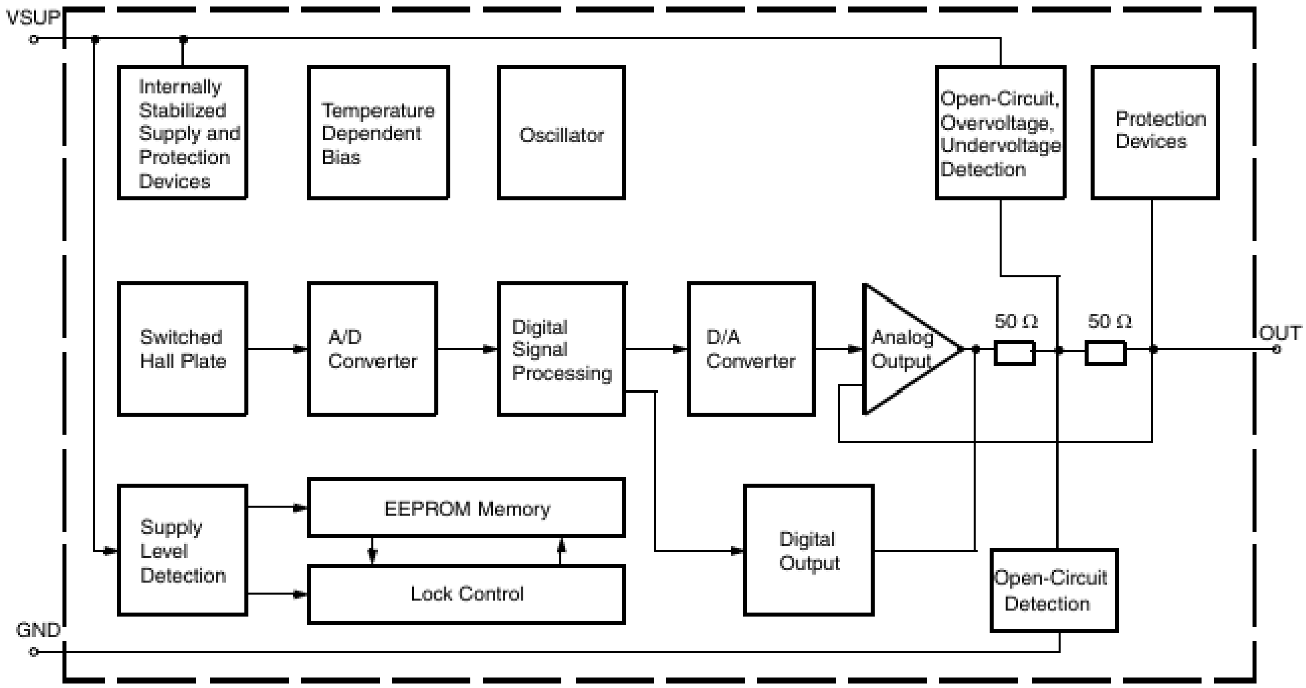
No.	Name	Type	Functions
1	VSUP	SUPPLY	Power/programming pins
2	GND	GND	Grounding/programming pins
3	OUT	I/O	Push pull output and selection pin



No.	Name	Type	Functions
1	VSUP	SUPPLY	Power/programming pins
2	GND	GND	Grounding/programming pins
3	NC	-	-
4	OUT	I/O	Push pull output and selection pin
5	NC	-	-
6	NC	-	-
7	NC	-	-
8	NC	-	-

6. Functional Block Diagram

6.1. Functional Block Diagram



AH82X is a linear programmable Hall sensor that provides an output signal proportional to the measured magnetic field strength passing through the Hall sensor. In voltage output mode (AH820), the sensor's output voltage is proportional to the sensor's supply voltage (output proportionally with the supply voltage). In the PWM output mode (AH821), the output of the PWM signal is not proportional to the supply voltage.

The external magnetic field perpendicular to the packaging screen printing surface will generate a Hall voltage, which is sensitive to both the magnetic north and south poles of the Hall IC. The Hall voltage signal is set through EEPROM, converted from analog to digital, processed by a digital signal processing unit (DSP), and then converted into an output signal.

The setting of the LOCK address bit locks the further programming capability of the EEPROM, which also makes it impossible to read the contents of the EEPROM and reset the LOCK address bit. As long as the LOCK register is not set, the output characteristics can be adjusted by programming the EEPROM code. In the process of programming communication, the output switches from analog to digital, and multiple sensors can be individually programmed in parallel with the same power and ground lines.

The selection of each sensor is completed through its output pin.

If the VSUP or GND line is disconnected, the open circuit detection function will provide a defined output voltage for the analog output. The internal temperature compensation circuit and chopper stabilized zero compensation can operate throughout the entire temperature range, minimizing changes in sensor accuracy, ensuring high offset stability, and reducing offset caused by mechanical stress in the packaging. EEPROM is used to store production information for tracking within sensors. In addition, the sensor IC is equipped with overvoltage and reverse voltage protection devices on all pins.

6.2. A/D converter

The ADC used in the AH82X sensor has a "∑ - Δ" architecture, which provides an oversampled multi bit stream with high-frequency shaping quantization noise. After low-pass filtering and accumulation, the signal is averaged. As the accumulation time increases, the resolution of the data converter also improves.

6.3. Digital Signal Processing and EEPROM

The DSP digital signal processing unit performs signal conditioning and allows sensors to meet customer applications. The parameters of the DSP digital signal processing unit are stored in EEPROM registers.

EEPROM registers consist of four groups:

The first group contains registers used to match the magnetic characteristics of the sensor: MODE is used to select the magnetic field range and filter frequency, TC, TCSQ, and TC range are used for the temperature characteristics of magnetic sensitivity.

The second group contains registers used to define output characteristics: sensitivity, VOQ, CLAMP-LOW (clamp low), CLAMP-HIGH (clamp high), and output mode. The output characteristics of sensors are defined by these parameters.

–The parameter VOQ (output static voltage) corresponds to the output signal when B=0mT.

–The parameter Sensitivity defines magnetic sensitivity:

$$\text{Sensitivity} = \frac{\Delta V_{OUT}}{\Delta B}$$

－The output voltage can be calculated as：

$$VOUT = Sensitivity \times B + VOQ$$

By setting the registers CLAMP-LOW and CLAMP-HIGH, the output voltage range can be clamped to achieve fault detection (such as open circuit of VSUP or GND).

The third group contains the general register GP. The GP register can be used to store customer information.

The fourth group includes the alpha register and the LOCK used to lock all registers. Alpha registers are programmed and locked during the production process.

The external magnetic field generates Hall voltage on the Hall plate. The ADC converts the amplified Hall voltage (operating on the silk screen side of the package with magnetic north and south poles) into a digital value, which can be read by the A/D READOUT register. The digital signal is filtered in an internal low-pass filter and operated according to the settings stored in EEPROM. The processed digital values can be read from the D/A READOUT register. According to the programmable magnetic range of Hall IC, the working range of A/D converter is -30mT to+30mT or -150mT to+150mT.

In the further processing, the digital signal is multiplied by the sensitivity factor, added with a static output voltage, and limited according to the clamp voltage level. The digital signal result is converted into an analog signal and stabilized by a push-pull output stage. The D/A reading at any given magnetic field depends on the programmed magnetic field range, low-pass filter, sensitivity, VOQ, TC value, as well as CLAMP low and CLAMP-HIGH. The minimum reading range of D/A is 0 and the maximum is 16383.

MODE register

The MODE register contains all the bits used to configure the A/D converter and different output modes.。

MODE										
Bit Number	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Parameter	RANGE	Reserved	OUTPUT-MODE			FILTER		RANGE (together with bit 9)		Reserved

Table 6-1: MODE Register

Magnetic Range

The RANGE bit defines the magnetic field range of the A/D converter. Table 6-2 defines the magnetic range

Magnetic Range	RANGE	
MODE	**MODE [9]**	**MODE [2:1]**
±30mT	0	00
±60mT	0	01
±80mT	0	10
±100mT	0	11
±150mT	1	11

Table 6-2: Magnetic Range

Filter

The Filter bit defines the -3 dB frequency point of the digital low-pass filter.

-3 dB Frequency	MODE [4:3]
500 Hz	10
1 kHz	11

Table 6-3: Filter bit

Output

The OUTPUT MODE bit defines the different output modes of AH82X

Output Format	MODE [7:5]
Analog Output (12 bit)	000
PWM	110

Table 6-3： OUTPUT MODE

In analog output mode, the sensor provides a 12 bit analog output voltage with a ratio between 0V and 5V.

In PWM mode, the sensor provides an 11 bit PWM output with a PWM cycle of 8ms, and the output signal will vary between 0V and 5V power supply voltage. The magnetic field information is encoded with the duty cycle of the PWM signal.

TC register

The temperature dependence of magnetic sensitivity can be adapted to different magnetic materials to compensate for changes in magnetic field strength with temperature. By programming the TC (temperature coefficient) register and TCSQ register (secondary temperature coefficient) to achieve compensation effects, the slope and curvature of the temperature dependence of magnetic sensitivity can be matched with the magnet and sensor components. The output voltage characteristics can be fixed throughout the entire temperature range. The sensor can compensate for linear temperature coefficients ranging from approximately -3100ppm/K to 1000ppm/K, and secondary temperature coefficients ranging from approximately -7ppm/K ^{2} to 2ppm/K ^{2}. The entire TC range is divided into the following four TC range groups:：

TC-Range [ppm/k]	TC-Range Group
-3100 ～ -2000	0
-1950 ～ -550	2
-500 ～ +450	1
+450 ～ +1000	3

Table 6-5: TC-Range Groups

TC (5-digit) and TCSQ (3-digit) must be selected separately in each of the four ranges. For example, 0ppm/k requires TC range=1, TC=15, and TCSQ=1.

Sensitivity

SENSITY register contains the parameters of the multiplier in the DSP. Sensitivity can be programmed between -4 and 4. For VSUP=5V, the register can be changed starting from 0.00049. For all calculations, use the digital values of the magnetic field from the D/A converter. This digital information can be read from the D/A readout register.

$$\text{SENSITIVITY} = \frac{\Delta V_{out} \times 16384}{2 \cdot \Delta\text{DA-Readout} \cdot V_{DD}}$$

VOQ

The VOQ register contains the parameters of the adder in the DSP. VOQ is an output signal without an external magnetic field (B=0 mT), and for VSUP=5 V, the register can be changed in steps of 4.9 mV.

Clamping

The output signal range can be clamped to detect faults such as VSUP or GND short circuits or open circuits。

The CLAMP-LOW register contains a lower limit parameter. The lower limit of the clamp can be programmed at 0 V (minimum duty cycle) and VSUP/2 (50% duty cycle). For VSUP=5 V, the register can be adjusted according to a step size of 9.77 mV (0.195% duty cycle).

The CLAMP-HIGH register contains an upper limit parameter. The upper clamp voltage can be at VSUP/2 (50% duty cycle) and VSUP (maximum duty cycle). When VSUP=5 V, the register can be adjusted according to a step pitch of 9.77 mV (0.195% duty cycle).

GP register

The registers GP0 to GP3 can be used to store important information such as production dates or customer serial numbers.

Lock register

By setting a 1-bit register, all registers will be locked and the sensor will no longer respond to any power supply voltage modulation. This position is active after the first power-off and power on sequence after setting the LOCK position.

D/A reading

This 14 bit register transmits the actual digital value of the applied magnetic field after signal processing. This register can be read and is the foundation of the sensor calibration process in the system environment.

7. Calibration process

For calibration in the system environment, it is recommended to use Alpha's programming kit, which includes a programming board and upper computer software. For individual calibration of each sensor in customer applications, it is recommended to make two-point adjustments. Calibration should be carried out in the following manner：

Step 1: Enter registers that do not require separate adjustment

The magnetic circuit of the application, magnetic materials with temperature characteristics, filter frequency, output mode, and GP register values are provided. Therefore, for all sensors specific to customer applications, the values of the following registers should be the same.

–Filter：According to the maximum signal frequency

–Range：According to the maximum magnetic field at the sensor location

–output mode

–TC、TCSQ和TC-RANGE：Depending on the magnet material and other temperatures of the application

–GP

–Clamping

The above settings need to be written into the AH82X register.

Step 2: Initialize DSP

Since the values of the D/A readout registers depend on the sensitivity, VOQ, and CLAMP-LOW/HIGH settings, these registers must be initialized with defined values. First:

–Initial VOQ value =2.5 V

–Clamping-low=0 V

–Clamping-high =4.999 V

3dB Filter frequency	Sens INITIAL
500 Hz	0.3
1 kHz	0.321

Table 6-6: Sens Initialization

Step 3: Define calibration points

Calibration points 1 and 2 can be set within a specified range. The corresponding values of VOUT1 and VOUT2 are determined by the application requirements.

Low Clamping Voltage ≤ VOUT1,2 ≤ High Clamping Voltage

To achieve the highest accuracy of the sensor, it is recommended to set calibration points near the minimum and maximum input signals. The output voltage difference between calibration point 1 and calibration point 2 should be greater than 3.5V.

Step 4: Calculate VOQ and Sensitivity

Set the system to calibration point 1 and read the register D/A READOUT. The result is the D/A-READOUT1 value. Now, set the system to calibration point 2, read the register D/A-READOUT again, and obtain the value D/A-READOUT2. Based on these values and the target values VOUT1 and VOUT2, the sensitivity and VOQ values for calibration points 1 and 2 are calculated as follows:

$$Sensitivity = \frac{1}{2} \times \frac{(Vout2 - Vout1)}{(\text{D/A-Readout2} - \text{D/A-Readout1})} \times \frac{16384}{5}$$

$$\text{Voq} = \text{Vout2} - \left[\left(\frac{5 \times \text{D/A-Readout2}}{16383} - \text{Voq}_{\text{INITIAL}}\right) \times \frac{\text{Sensitivity}}{\text{Sensitivity}_{\text{INITIAL}}}\right]$$

This calculation values of sensitivity and VOQ must be written into the IC to adjust the sensor. Specific application values for clamping low and clamping high can also be stored in the sensor EEPROM.

At this point, the sensor has been calibrated for the customer's application. However, if necessary, programming can be changed over and over again. must be performed separately for each sensor, and the calculated

Step 5: Lock the sensor

The final step is to activate the LOCK function by programming the LOCK bit. Please note that the LOCK function takes effect after the Hall IC is powered off and on. The sensor is now locked and is not responding to any programming or reading commands.

8. Electromagnetic characteristics

8.1 limit parameter

Exceeding the limit parameters may cause permanent damage to the IC, and under such conditions, the IC may no longer function as it should. At the same time, prolonged exposure to the limit parameter environment can affect the reliability of the IC. The device includes circuits that protect the input and output from high static voltage or electric field damage; However, it is recommended to take normal precautions to avoid applying any voltage higher than the absolute maximum rated voltage to the circuit.

All listed voltages are referenced to ground (GND)

Symbol	Symbol	Min	Max	Unit	Condition
V_{SUP}	supply voltage	-20	20	V	t<1h
V_{OUT}	Output voltage	-5	20	V	
V_{OUT}-V_{SUP}	Output voltage - power supply voltage	-	2	V	
I_{OUT}	Output current source	-10	10	mA	
t_{Sh}	Output short-circuit time	-	10	mA	
V_{ESD}	HBM	-6	6	kV	
T_S	storage temperature	-55	150	℃	
T_J	Junction temperature under bias $^{2)}$	-50	170	℃	
$T_{Endurance}$	EEPROM		25	Years	T_A=85℃

Table 8-1: Limit Parameters

8.2 Recommended operating conditions

The operating environment of the sensor exceeds the range shown in the "Recommended Operating

Conditions/Characteristics", which may lead to unpredictable risks and reduce the reliability and lifespan of the sensor.

Symbol	Parameter	Min	Typ	Max	Unit	Condition
V_{SUP}	Power supply Voltage	4.5	5	5.5	V	working voltage
		8	8.5	9	V	programming voltage
I_{OUT}	output current	-1.2	-	1.2	mA	
R_L	load resistance	4.5	10	-	KΩ	Pull up or pull down resistor
C_L	Load Capacitance	0	100	1000	nF	Only suitable for analog output
C_P	Protective capacitor	0.33	100	2700	nF	
NPRG	Number of EEPROM programming cycles	-	-	100	cycles	0°C < Tamb < 55°C
T_J	Range of junction temperature [1)]	-40	-	125	°C	8000h[2)]
		-40	-	150	°C	2000h[2)]
		-40	-	170	°C	1000h[2)]
1) Temperature distribution dependent on the application; 2) Time is not calculated cumulatively.						

Table 8-2: Recommended operating conditions

8.3 Characteristic indicators

After programming and locking, T_J=-40 °C to 170 °C, V_{SUP}=4.5V～5.5V, GND=0V, Under recommended operating conditions, unless otherwise specified in the "Conditions" column. Typical characteristics of T_J=25 °C and V_{SUP}=5V.

Symbol	Parameter	Min	Typ	Max	Unit	Condition
General parameters						
I_{SUP}	Supply current (full temperature)	5	7	10	mA	
V_{DDZ}	Power overvoltage protection		17.5	20	V	I_{DD}=25mA, T_J=25°C, t=20ms
V_{OZ}	Output overvoltage protection		17.5	20	V	I_O=10mA, T_J=25°C, t=20ms
R_{OUT}	output resistance	-	1	10	Ω	$V_{OUTLmax} \leq V_{OUT} \leq V_{OUTHmin}$
F_{OSC}	Frequency	110	128	150	kHz	512kHz test
BW	Small Signal Bandwidth	-	1	-	kHz	B_{AC}<10mT; 3dB Filter frequency=1kHz
Basic parameters						
VOQ	Static output voltage	2.46	2.48	2.5	V	B=0mT, I_{OUT}=0mA, T_J=25°C, f3dB=1000Hz, B Range=30mT, V_{oq}=2.5V, sensitivity =0.6
Sensitivity	sensitivity	80	90	100	mV/mT	sensitivity =1,V_{oq}=2.5V, Magnetic range =±60mT 3dB Filter frequency =500Hz, T_C=15, T_{CSQ}=1, -500 ppm/K <T_C-Range<+450 ppm/K
Overall performance						
INL	Linearity of output across all temperature ranges	-0.5	0	0.5	%	Power supply voltage percentage 1), for V_{OUT}=0.35V~4.65V; V_{SUP}=5V, sensitivity≤0.95
Dev-V_{OUT}	Output voltage offset in the full temperature range	-30	0	30	mV	
V_{OUTn}	Effective value of noise output voltage	-	0.6	1.4	mV	Magnetic range =60mT, 3dB Frequency filter=500Hz,

						sensitivity≤0.7;C=4.7nF (V_{SUP} & V_{OUT} to GND)
E_R	Ratio error of output voltage in the full temperature range	-0.25	0	0.25	%	$\lvert V_{OUT1}-V_{OUT2}\rvert$>2V During the calibration process
Digital to analog converter						
RES	resolution	-	12	-	bit	Ratio to VSUP [2)]
DNL	Differential Nonlinear D/A Converter [3)]	-1.5	0	1.5	LSB	The ambient temperature is only 25°C
ES	Magnetic sensitivity error within temperature range [4)]	-2	0	2	%	V_{SUP}=5V;60mT range, 3dBFrequency filter=500Hz,
V_{Offset}	Zero temperature drift in the full temperature range	-0.6	0.25	0.6	% V_{SUP}	V_{SUP}=5V;60mT range, 3dBFrequency filter=500Hz, T_C=15,T_{CSQ}=1,T_C-Range =1-0.65< sensitivity <0.65
OTHERS						
t_r(O)	Output response time [1)]	-	1.5	1.75	ms	3dB Frequency filter=500Hz； C_L=10nF, Time up to 90%, signal B step size from 0mT to Bmax
			1.1	1.3	ms	3dB Frequency filter=1kHz； C_L=10nF, Time up to 90%, signal B step size from 0mT to Bmax
t_{POD}	Power on time (output voltage stabilization time)	1.5	1.7	1.9	ms	C_L=10nF, V_{OUT} 的 90%
POR_{UP}	Power on reset voltage (rising)	3.4	-	V		
POR_{DOWN}	Power on reset voltage (decrease)	3.0	-	V		
ΔV_{OUTCL}	Output voltage accuracy (clamp low voltage across all temperature ranges)	-15	0	15	mV	R_L=5kΩ,V_{SUP}=5V
ΔV_{OUTCH}	Output voltage accuracy (clamp high voltage across all temperature ranges)	-15	0	15	mV	
V_{OUTH}	Output signal upper limit	4.65	4.8	-	V	V_{SUP}=5V, -1mA≤I_{OUT}≤1mA

V_{OUTL}	Lower limit of output signal	-	0.2	0.35	V	V_{SUP}=5V, -1mA≤I_{OUT}≤1mA
DACGE	D/A output ripple	-	40	-	nV	

1) If using more than 50% of the selected magnetic field range (sensitivity ≤ 0.5), and temperature compensation is appropriate. INL=VOUT-V OUTLSF=least squares fitting line voltage.

2) Output DAC full-scale=5V ratio, output DAC offset=0V, output DAC LSB=VSUP/4096.

3) Testing is only conducted at 25 ℃.

4) The specified value is only for testing purposes.

5) Excessive molding and packaging may affect the parameter environment at 150 ℃.

8.4. Security detection function

8.4.1. Overvoltage and undervoltage detection

Typical characteristics at TJ=-40 ℃ to 170 ℃, TJ=25 ℃, locked after programming.

Symbol	Parameter	Min	Typ	Max	Unit	Condition
VSUP,UV	Undervoltage detection	-	4.2	4.5	V	1)2)
VSUP,OV	Overvoltage detection	7.0	7.5	8	V	1)2)

Table 8-4: Overvoltage/Undervoltage Detection

1) If the power supply voltage drops below VSUP or UV or exceeds VSUP or OV, the output voltage switches to VSUP (VSUP ≥ 97% when RL=10k Ω to GND).

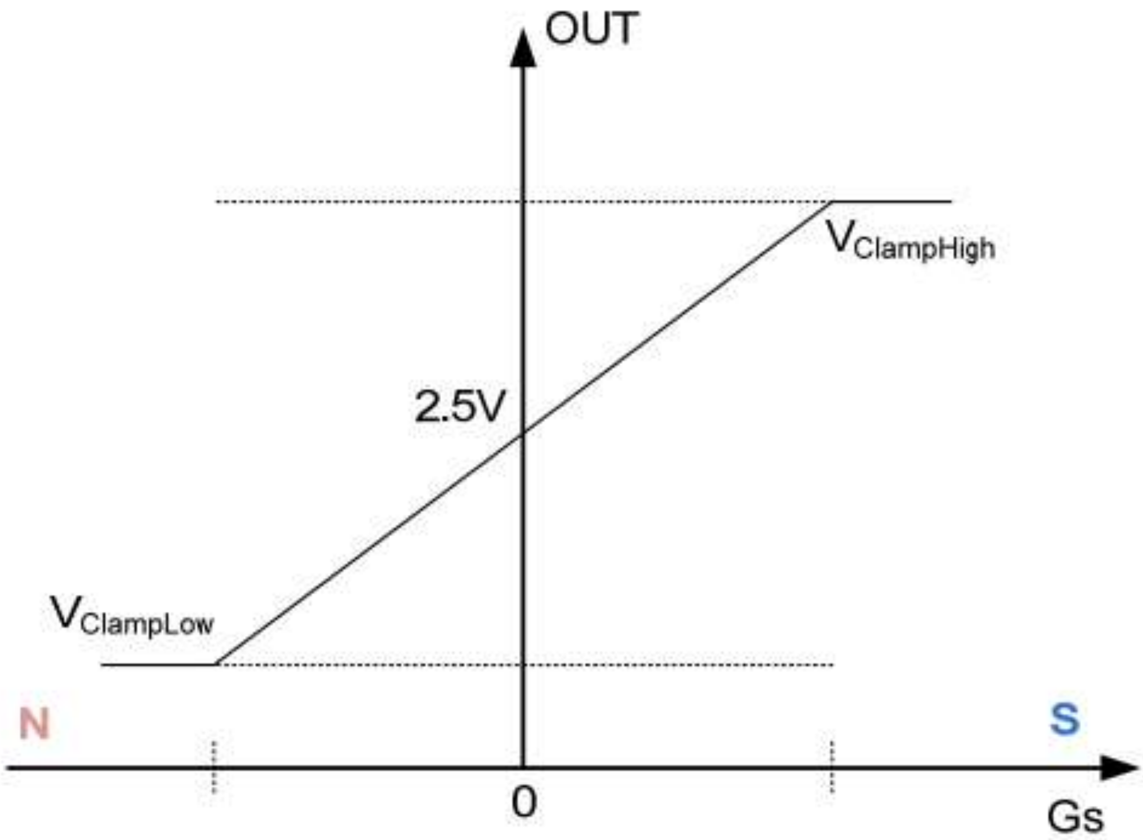
2) If the PWM output of AH821 is activated, the output signal will follow VSUP and the PWM signal will be turned off.

8.4.2. Open Circuit Test

Symbol	Parameter	Min	Typ	Max	Unit	Condition
V_{OUT}	Ground wire open circuit output voltage	0	0	0.15	V	VSUP =5V RL=10kΩ to 200kΩ
V_{OUT}	Open circuit output voltage of power cord	4.85	4.9	5.0	V	VSUP=5V RL=10kΩ to 200kΩ

Table 8-5: Open Circuit Test

9. Output characteristic curve



10. Definition of Characteristics

10.1 Clamp-low

- The register range is 0 to 255.
- Register value calculation formula:

$$\text{CLAMP-LOW} = \frac{\text{LowClampingVoltage} \times 2}{V_{SUP}} \times 255$$

10.2 Clamp-high

- The register range is 0 to 511.
- Register value calculation formula:

$$\text{CLAMP-HIGH} = \frac{\text{HighClampingVoltage}}{V_{SUP}} \times 511$$

10.3 VOQ

- The register range is -1024 to 1023.
- Register value calculation formula：

$$VOQ = \frac{V_{OQ}}{V_{SUP}} \times 1024$$

10.4 SENSITIVITY

- The register range is -8192 to 8191.
- Register value calculation formula：

$$SENSITIVITY = Sensitivity \times 2048$$

10.5 TC

- The range of TC register is from 0 to 1023.
- Register value calculation formula：

$$TC = GROUP \times 256 + TCValue \times 8 + TCSQ\ Value$$

10.6 MODE

–The register range is from 0 to 1023, including settings for Filter, RANGE, and OUTPUTMODE：

$$MODE\ \ RANGE = (Mode[9]) \times 512 + OUTPUTMODE \times 32 + FILTER \times 8 + RANGE(Mode[2:1]) \times 2$$

10.7 D/A-READOUT

–This register is read-only.

–The register range is from 0 to 16383.

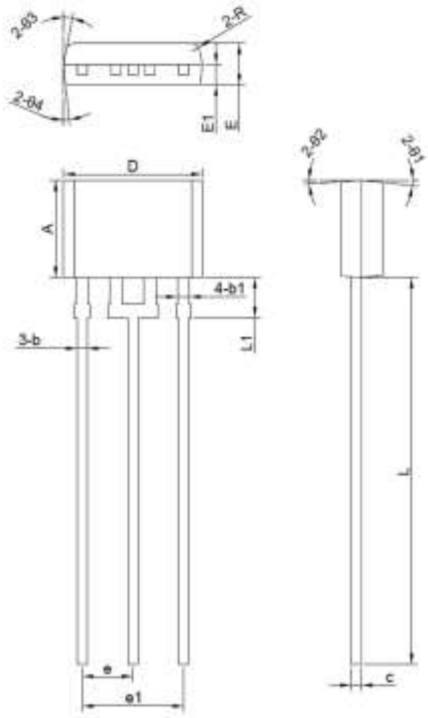
10.8 DEACTIVATE

–This registry can only be written to.

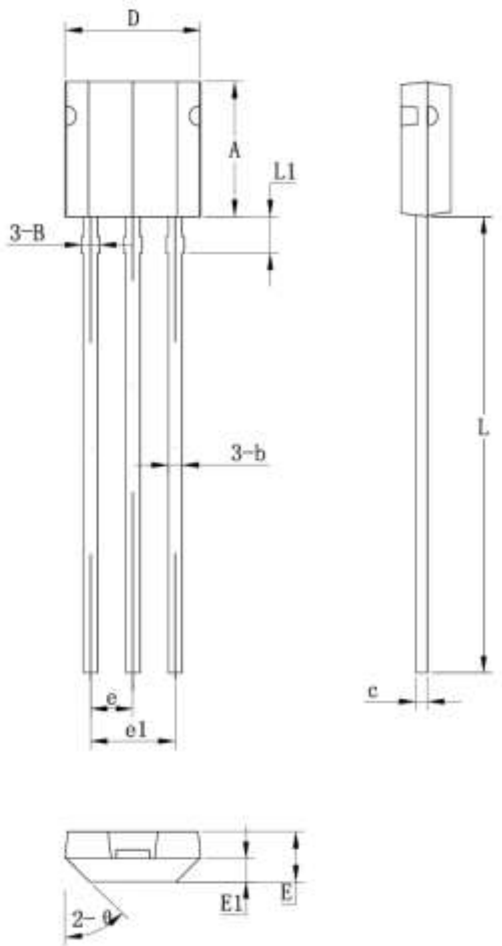
–The register must be written in 2063 decimal (80F hexadecimal) to be disabled.

–The sensor can be reset by an activation pulse on the output pin or by turning off and on the power supply voltage.

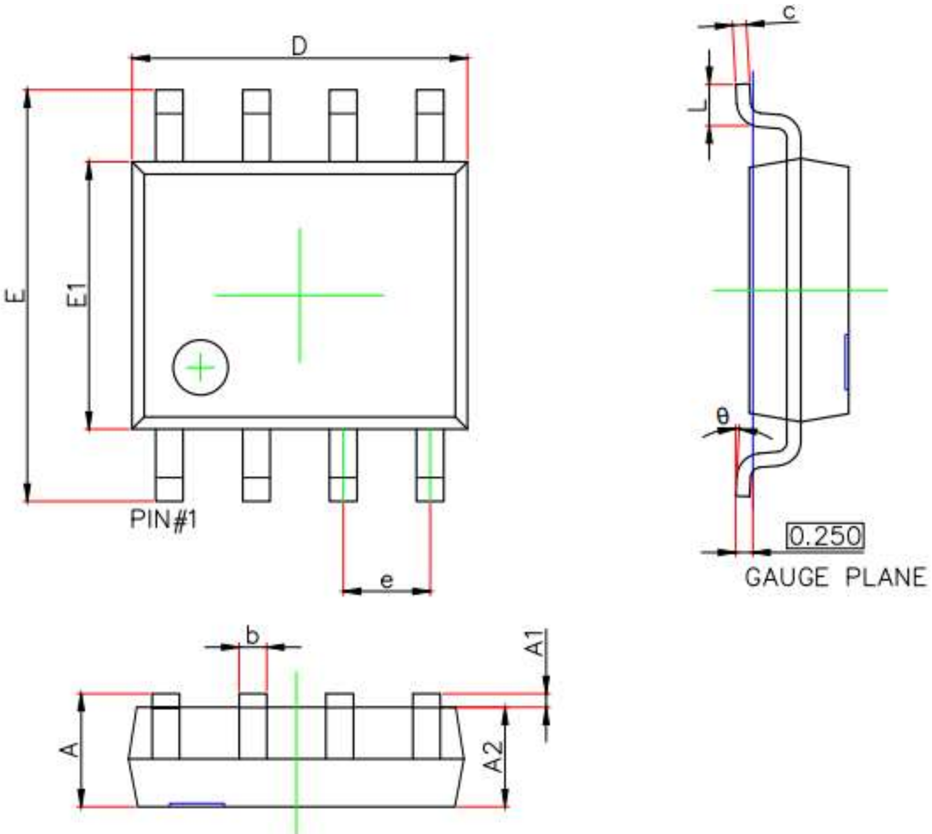
12. Package information



Symbol	dimensions（millimeter）		
	Min	Typ	Max
D	5.12	5.22	5.32
A	3.55	3.56	3.75
E	1.46	1.56	1.66
E1		0.76	
L	13.5	14.5	15.5
L1	1.2	1.45	1.7
b	0.35	0.39	0.50
b1		0.45	
c	0.36	0.38	0.45
R		0.3	
e		1.905	
e1		3.81	
θ1		6°	
θ2		4°	
θ3		11°	
θ4		6°	



Symbol	dimensions（millimeter）		
	Min	Typ	Min
A	4. 00	4. 05	4. 1
b	0. 35	0. 42	0. 52
B	0. 42	0. 52	0. 60
c	0. 35	0. 36	0. 42
D	4. 01	4. 06	4. 11
E	1. 45	1. 50	1. 55
E1		0. 70	
e		1. 27	
e1		2. 54	
L	13	13. 6	13. 9
L1	0. 9	1. 1	1. 3
θ		45°	



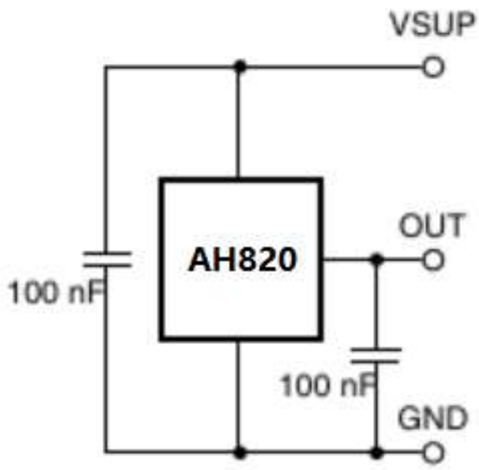
Symbol	dimensions（millimeter）		dimensions（Inches）	
	Min	Max	Min	Max
A	1.350	1.750	0.530	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270（BSC）		0.050（BSC）	
E	5.800	6.200	0.228	0.224
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

13. Typical application circuit

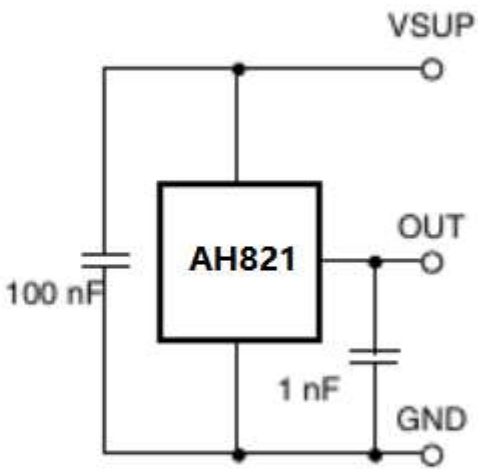
13.1. Application of a single AH82X

For EMC protection, it is recommended to connect a 100nF ceramic capacitor between ground and power supply voltage, and between the output voltage pins.

Please note that during the programming process, the sensor will repeatedly provide a programming voltage of 8V for 100ms. At this time, all components connected to the VSUP circuit must be able to withstand this voltage.



Recommended application circuit (analog output signal）



Recommended application circuit (PWM output signal）

13.2. 2 AH82X parallel applications (only for AH820 analog output mode)

Two different AH820 sensors can be programmed separately and operate in parallel with the same power and ground lines. In order to select the IC to be programmed, two Hall ICs are disabled by the "disable" command on the common power line. Then, the corresponding IC is activated by the "activate" pulse on its output. Only activated sensors will respond to all read, write, and program commands listed below. If it is necessary to program the second IC, the 'disable' command will be sent again, and then the second integrated circuit can be selected.

14. Note

- Hall chips are sensitive devices, and electrostatic protection measures should be taken during use, installation, and storage.
- During installation and use, mechanical stress applied to the device casing and leads should be minimized as much as possible.
- It is recommended that the welding temperature should not exceed 350 ℃ and the duration should not exceed 5 seconds.
- To ensure the safety and stability of Hall chips, it is not recommended to use them beyond the parameter range for a long time.

15. Historical Version

No.	Time	Describe
1	January， 2024	Compile and publish
2	May， 2024	Update some ambiguous text descriptions
3	July,2024	Add TO94-3L packaging
4	October,2024	Add SOP8 packaging