AH507

High sensitivity Single Hall switch sensor

Alfa Electronics Co.,Ltd

1.Product Introduction

AH507 is a highly sensitive unipolar Hall switch chip designed based on BCDMOS technology. The chip includes temperature compensation, comparator, and output driver. In addition, mechanical stress has little effect on the magnetic parameters of the chip.

The series of chip sensors is suitable for industrial and automotive applications, with an ambient temperature range of -40 ℃ to 150 ℃ and supply voltage range of 2.7V to 30V. AH507 provides a variety of packages to customers:TO92S、SOT23（small）、SOT23. All packages are RoHs compliant. The product has passed AEC-Q100 certification.

3-pin SOT23

3-pin TO92S

2.Function

- AEC-Q100 Grade 0 Automotive Level Certification
- Operating Vcc Range:2.7V~30V
- ESD：±12kV
- High mechanical stress suppression ability
- Temperature range：−40℃～150℃
- The decrease of magnetic flux density caused by rising temperature is compensated by the built-in negative temperature coefficient
- Reverse-voltage protection at Vcc pin
- Suitable for automobiles and industries

3.Application

- Speed and RPM sensing
- Tachometer sensor、Flow-rate sensing
- DC motor, motor and fan control, robotics control
- Proximity sensor、Position sensor
- Seat belt buckles、hood/trunk/door latches
- Sunroof/convertible top/tailgate
- Liftgate activation
- Brake/clutch pedals
- Electric power steering(EPS)
- Transmission shifting
- Wiper motor

4.Products packaging

Part No.	Packages	temperature range	Packing
AH507UA	TO92S	-40℃～150℃	1000pcs/bag
AH507SU	SOT23-3L	-40℃～150℃	3000pcs/reel
AH507SS	SOT23（small）	-40℃～150℃	3000pcs/reel

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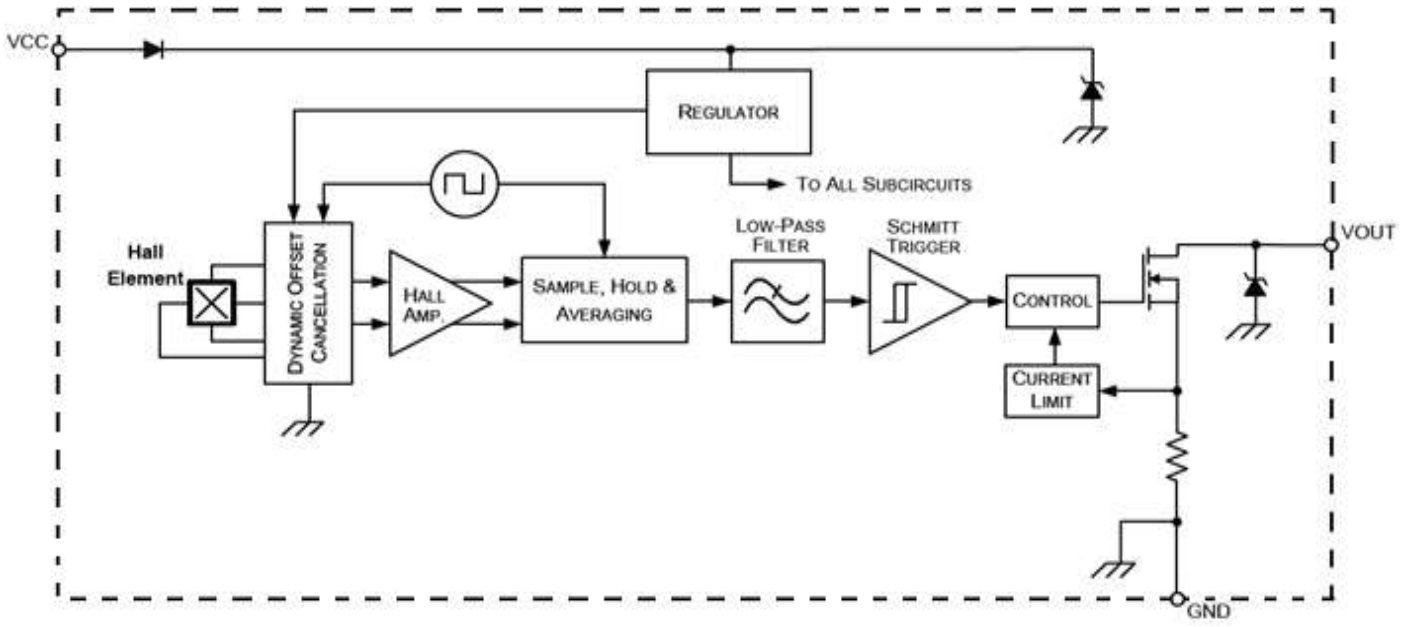
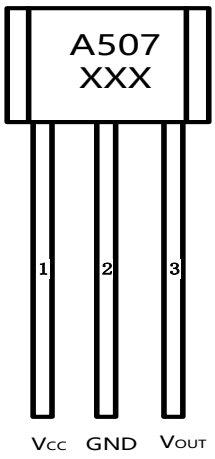
5.Functional Block Diagram

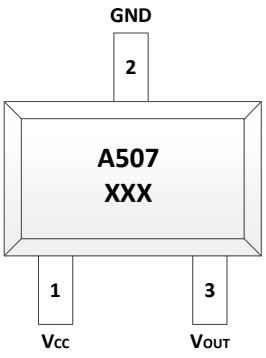


6. Pin information

No.	Name	Functions
1	V_{CC}	Power supply voltage 2.7V~30V
2	GND	Ground wire
3	V_{OUT}	output



TO92S



SOT23(small)/SOT23-3L

7.Absolute Maximum Ratings

Absolute maximum ratings are limited values to be applied chips, and beyond which the absolute maximum rating may be damage chips. Although the functionality is not necessarily damaged, exposure to absolute maximum rating conditions for an extended period of time may affect device reliability

Symbol	Parameters	Pins	Min	Max	Unit	Test condition
V_{CC}	supply voltage	1	-20	30	V	t<1000h[1)]
			–	34	V	t<96h[1)]
			–	36	V	t<5min[1)]
V_{OUT}	Output voltage	3	-0.5	30	V	t<1000h[1)]
			–	34	V	t<96h[1)]
			–	36	V	t<5min[1)]
I_O	Output current	3	–	65	mA	–
I_{OR}	Reverse output current	3	50	–	mA	–
T_A	operating ambient temperature	–	-40	170	℃	t<96h[1)]
[1)] No accumulated stress						

8.Recommended operating conditions

When the operation of the chip exceeds the range described in the recommended operating conditions, it may lead to abnormal chip operation and may reduce reliability and service life

Symbol	Parameters	Pins	Min	Typ	Max	Unit
V_{CC}	supply voltage	1	2.7	–	30	V
T_A	operating ambient temperature	–	-40	–	150	℃
V_{OUT}	Output voltage	3	–	–	30	V
I_{OUT}	Output current	3	–	–	25	mA

ESD ratings

Symbol	Describe	Executive standards	Max	Unit
V_{ESD}	HBM	JEDEC JS-001-2017	12	kV

9.Electrical Parameters

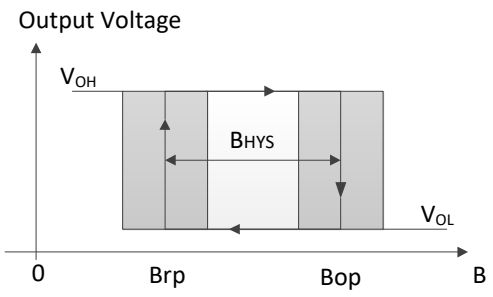
Test conditions: V_{CC}=2.7V～30V, T_A=-40℃～150℃

Symbol	Parameters	Pins	Min	Typ	Max	Unit	Test condition
power supply V_{CC}=12V							
I_{CC}	Power supply current	1	-	2.5	3.2	mA	3-wire
I_{CCR}	reverse current	-	-	-	1	mA	V_{CC}=-18V
Output							
V_{OL}	Low output voltage	3	-	0.13	0.4	V	I_O=20mA
			-	-	0.5	V	I_O=25mA
T_F	Output Fall Time	-	-	-	1	μs	R_L=82Ω C_L=20pF
T_R	Output Rise Time	-	-	-	1	μs	
B_{NOISE}	Effective noise of magnetic switching points	-	-	1	-	Gs	Suitable for square wave signals of 1kHz
T_J	Output Jitter	-	-	-	0.5	μs	Suitable for square wave signals of 1kHz
T_D	delay time	-	-	16		μs	-
T_{SAMP}	Output	-	1.6	2	2.66	μs	-

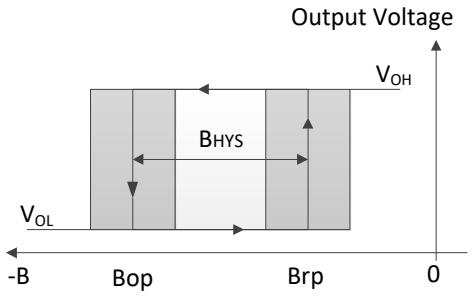
10.Magnetic Parameters

Part No.	Switch Type	TC(ppm/K)	Bop(Gs)			Brp(Gs)			B_{HYS}(Gs)		
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
AH507	unipolar	0	-	283	-	-	239	-	-	44	-

11.Magnetic Characteristics

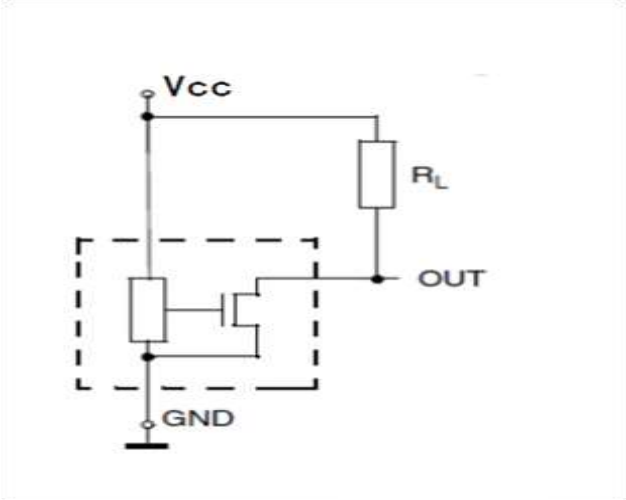


TO92S/SOT23(small)



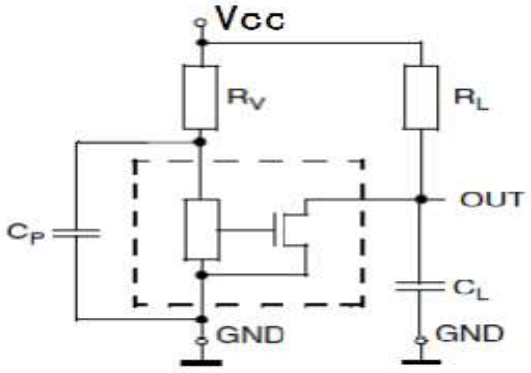
SOT23-3L

12.Typical Application Circuit



Typical Application Circuit 1

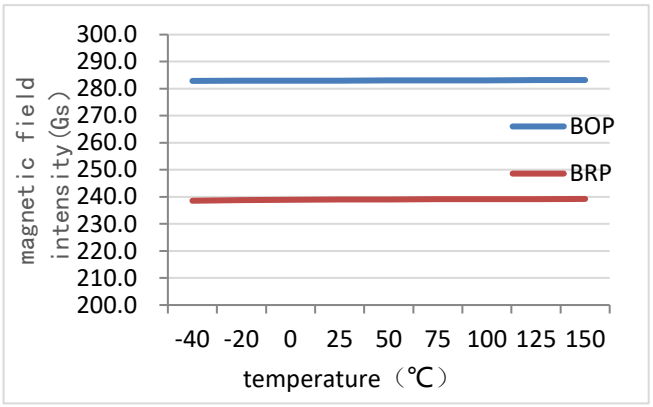
For applications with interference or radiation interference on the supply line, a series resistor R_V and two capacitors C_P and C_L are placed near the sensor (typical application circuit 2).For example：R_V=100Ω, C_P =10nF and C_L=4.7nF。R_L is an open drain pull-up resistor, which must be placed near the input end of the host controller to enable wire break detection.



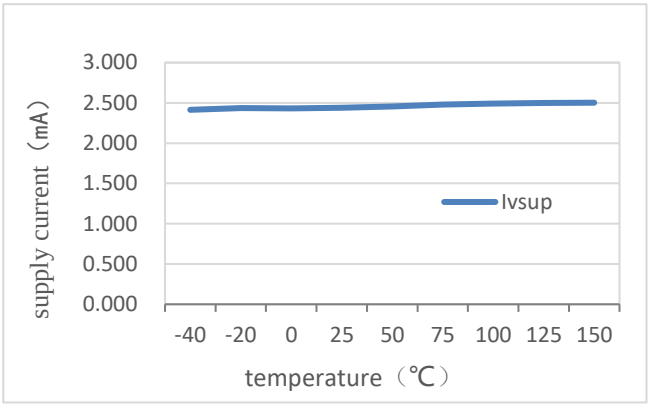
Typical Application Circuit 2

13.Characteristic Performance

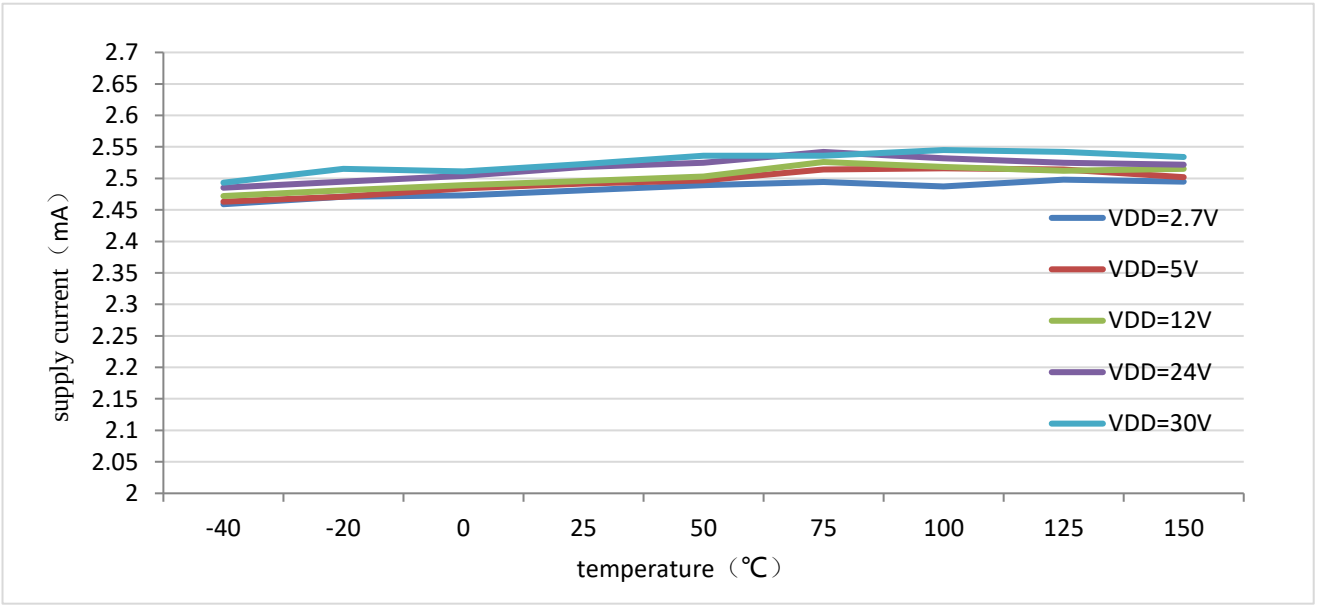
V_{CC}=5V, Bop and Brp Characteristic Performance



V_{CC}=5V, Supply current Characteristic Performance

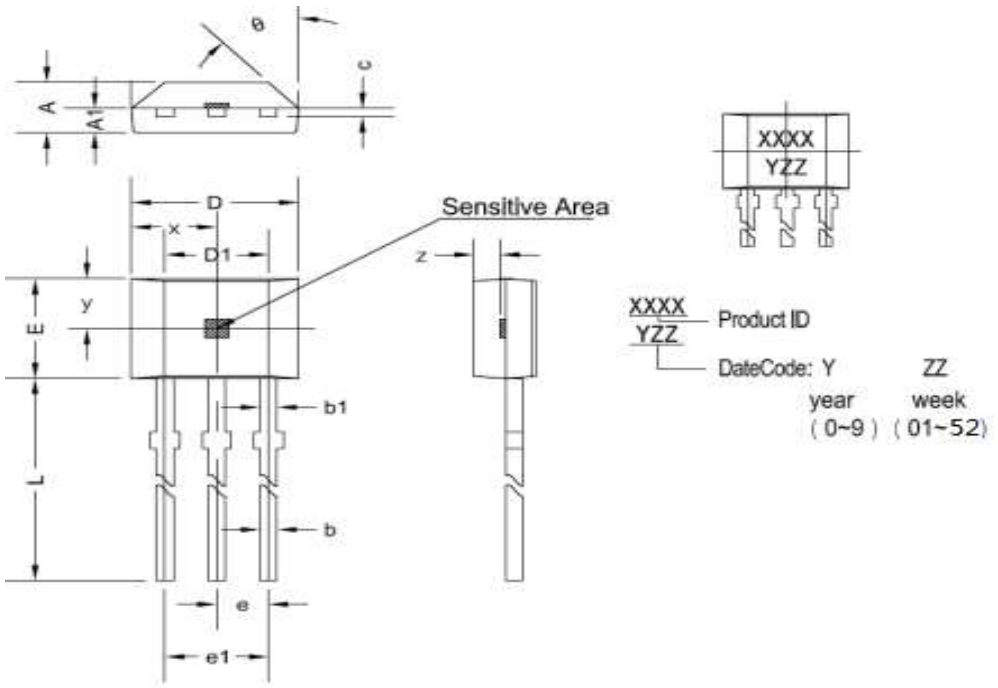


Different temperature and supply voltage, Supply current Characteristic Performance



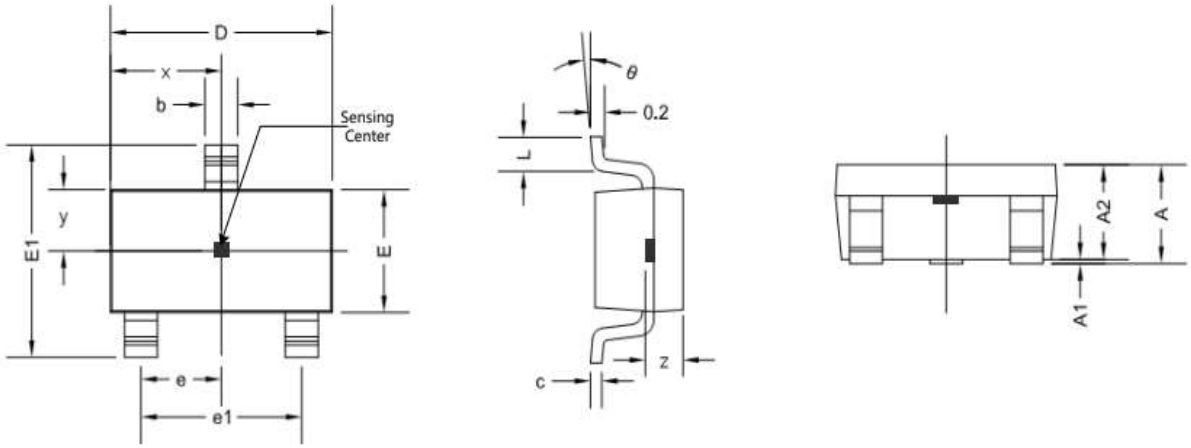
14.Package Material Information

TO92S Package Size



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1. 420	1. 620	0. 056	0. 064
A1	0. 660	0. 860	0. 026	0. 034
b	0. 350	0. 560	0. 014	0. 022
b1	0. 420TYP		0. 016TYP	
C	0. 360	0. 510	0. 014	0. 020
D	3. 900	4. 100	0. 154	0. 162
D1	2. 970	3. 270	0. 117	0. 129
E	2. 900	3. 100	0. 114	0. 122
e	1. 270TYP		0. 050TYP	
e1	2. 540TYP		0. 100TYP	
L	15. 500	16. 200	0. 610	0. 638
x	2. 025TYP		0. 080TYP	
y	1. 545TYP		0. 061TYP	
z	0. 500TYP		0. 020TYP	
θ	45°TYP		45°TYP	

SOT23-3LPackage Size



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.300	0.041	0.051
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.300	0.500	0.012	0.020
c	0.080	0.220	0.003	0.009
D	2.800	3.020	0.110	0.119
E	1.500	1.700	0.059	0.067
E1	2.600	3.000	0.102	0.118
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
x	1.460TYP		0.057TYP	
y	0.800TYP		0.032TYP	
z	0.600TYP		0.024TYP	
θ	0°	8°	0°	8°

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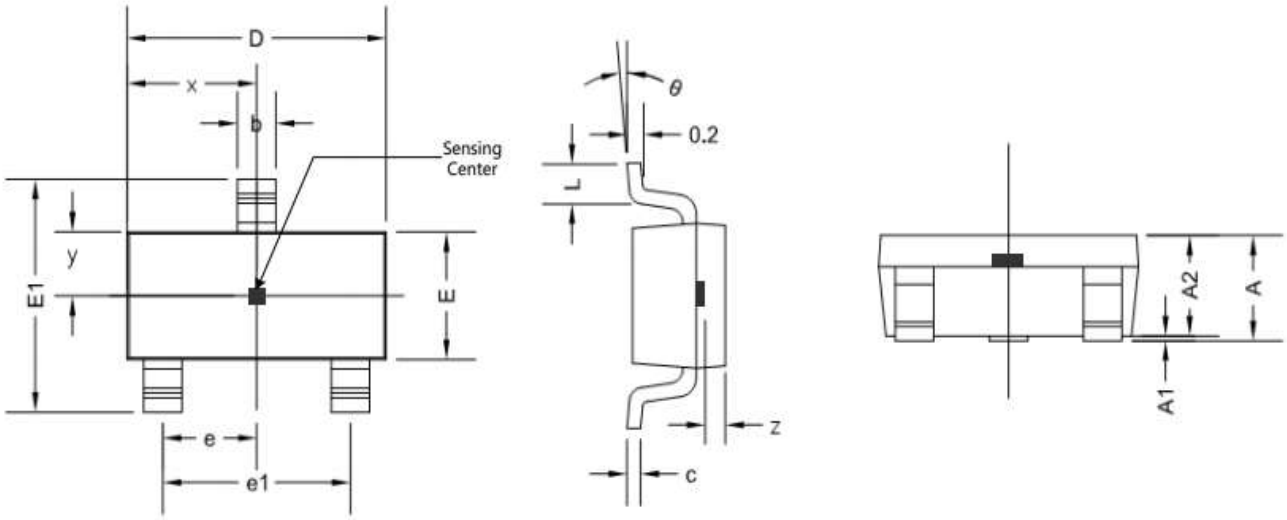
SOT23（small）Package Size



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.132	0.202	0.005	0.008
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
x	1.460TYP		0.057TYP	
y	0.650TYP		0.026TYP	
z	0.500TYP		0.020TYP	
θ	0°	8°	0°	8°

15.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.

16. Historical Version

No.	Time	Describe
1	September 6th, 2022	Update Characteristic Performance。
2	December 22th, 2022	Update static voltage output error range
3	February 9th, 2023	Update IC limit of operate temperature and storage temperature
4	April 19th, 2023	Version update to V1.2