

High voltage bipolar latch Hall chip

1. Product Introduction

HK402F is a high-voltage bipolar Hall switch chip manufactured using a high-voltage bipolar process. The chip is composed of voltage stabilizing unit, Hall voltage generator, differential amplifier circuit, temperature compensation circuit and Open collector output circuit. Working mode: input Magnetic flux density and output digital voltage signal. The chip has the ability to withstand high voltage surges and has strong noise resistance; Suitable for various fields such as electronic consumption, automotive, and industrial control. Provide TO92S inline packaging, SMT SOT23-3L packaging, and all packaging meets RoHS standards.



4. Product packaging

Part No.	Packages	Temperature range	Packing
HK402FUA	TO92S	-40°C~150°C	1000/bag
HK402FSU	SOT23-3L	-40°C~150°C	3000/ reel

2. Function

- Open collector output
- ESD: $\pm 4kV$
- Operating voltage: 3.0V~60V
- Overvoltage protection capability: 80V
- Maximum driving current :30mA
- Output built-in 10k Ω Pull-up resistor
- Operating temperature range: -40°C~150°C
- Power pin reverse voltage protection

3. Application

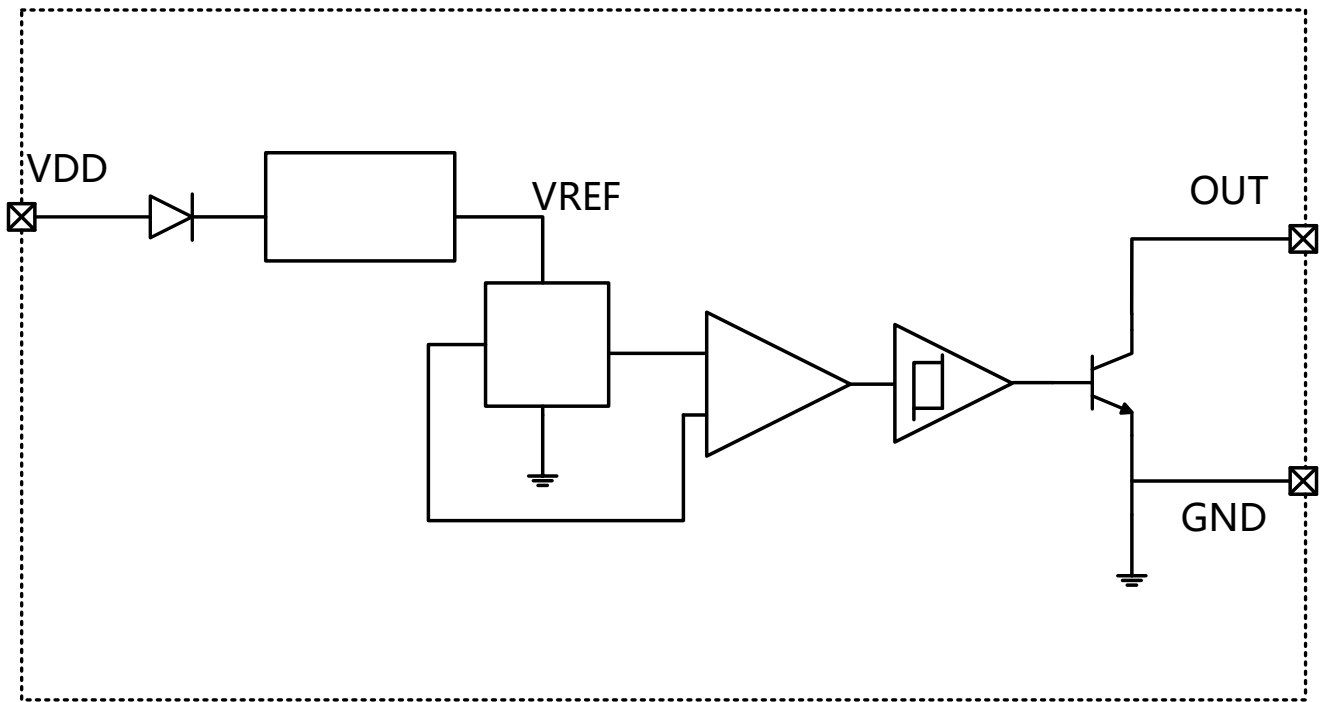
- Brushless DC motor commutation
- Speed measurement
- Count
- Corner position detection
- Proximity detection
- Suitable for automobiles and extreme industrial environments

Contents

1. Product Introduction	1
2. Function	1
3. Application.....	1
4. Product packaging.....	1
5. Functional Block Diagram.....	3
6. Pin information	3
7. Magnetolectric conversion characteristics	3
8. Limit parameter.....	4
9. Electromagnetic characteristics	4
10. Temperature Performance	5
11. Application Circuit.....	5
12. Package Material Information.....	6
13. Historic version.....	8
14. Notes	8

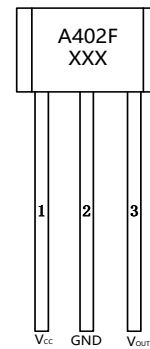
High voltage bipolar latch Hall chip

5. Functional Block Diagram

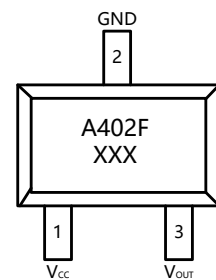


6. Pin information

No.	Name	Functions
1	V _{CC}	Power supply
2	GND	Ground
3	V _{OUT}	Output

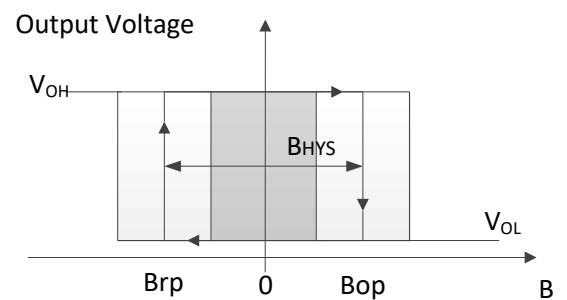
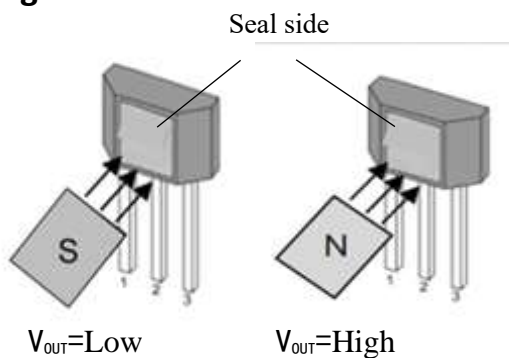


TO92S



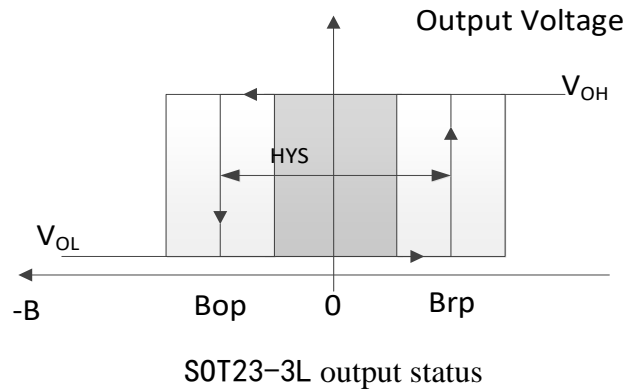
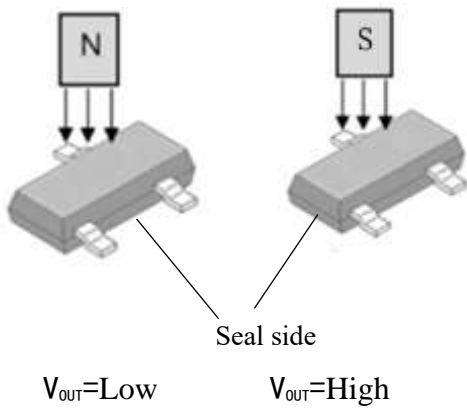
SOT23-3L

7. Magnetolectric conversion characteristics



TO92S output status

High voltage bipolar latch Hall chip



8. Limit parameter

Parameters	Symbols	Min	Max	Units
Power supply voltage	V_{CC}	-60	80	V
Output voltage	V_{OUT}	-0.5	80	V
Output current	I_{OUT}	0	40	mA
Operating temperature	T_J	-40	150	°C
storage temperature	T_{STG}	-50	165	°C

The absolute maximum rating is the limit value that a chip can withstand, and exceeding this value may cause permanent damage to the chip.

9. Electromagnetic characteristics

Test conditions: $T_J = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$, $V_{CC} = 3.0\text{V} \sim 60\text{V}$; Typical value test conditions: $T_J = 25^{\circ}\text{C}$, $V_{CC} = 5\text{V}$.

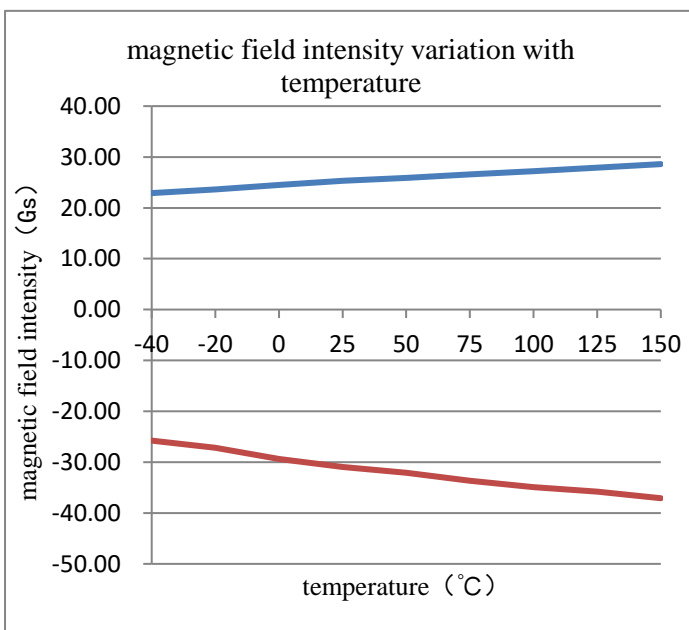
Parameters	Symbols	Test conditions	Min	Typ	Max	Units
Electrical performance						
Power supply voltage	V_{CC}		3.0		60	V
Power supply current	I_{CC}			4.8	8	mA
Output leakage current	I_{OLEAK}				10	uA
Output voltage	V_{SAT}	$I_{OUT} = 20\text{mA}$			0.4	V
Output current	I_{OUT}				30	mA
Output Rise Time	T_R	$C_L = 20\text{pF}$			1.0	us
Output Fall Time	T_F	$C_L = 20\text{pF}$			1.5	us

High voltage bipolar latch Hall chip

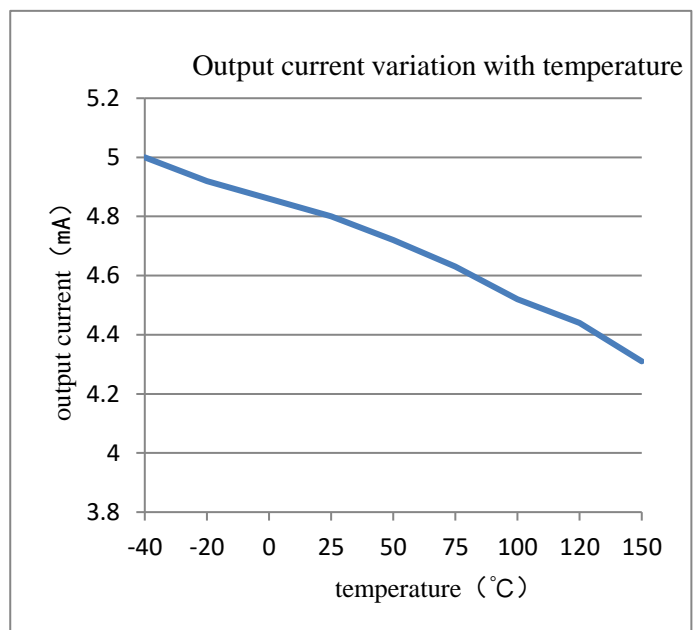
Magnetic performance						
operating point	Bop	$C_L=20\mu\text{F}$	10	25	40	Gs
release point	Brp	$C_L=20\mu\text{F}$	-40	-25	-10	Gs
return difference	B_{HYS}	$ B_{op}-B_{rp} $		50		Gs

10. Temperature Performance

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



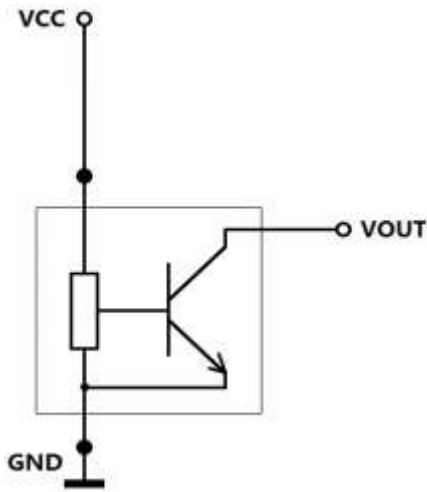
$V_{CC}=5V$, operating current Characteristic Performance



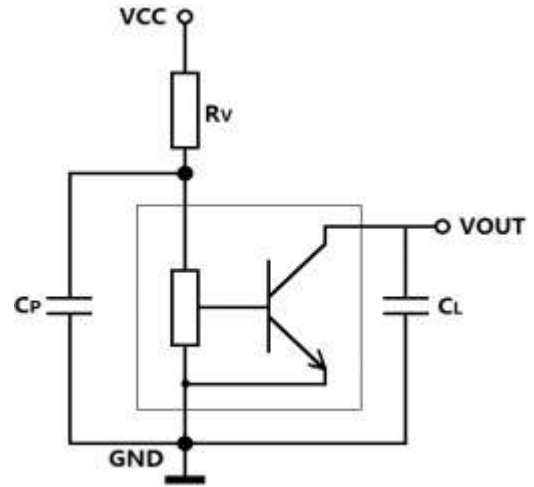
11. Application Circuit

The typical application circuit is shown in the following figure: Application Circuit 1, which can be applied to most circuits. Application circuit 2, where $R_V=100\ \Omega$, $C_P=4.7nF$, $C_L=1nF$, is suitable for circuits with interference or radiation interference on power supply lines. It is recommended to connect the resistor R_V and two capacitors C_P and C_L in series in the circuit, and place the resistor and capacitor components as close to the chip as possible.

High voltage bipolar latch Hall chip



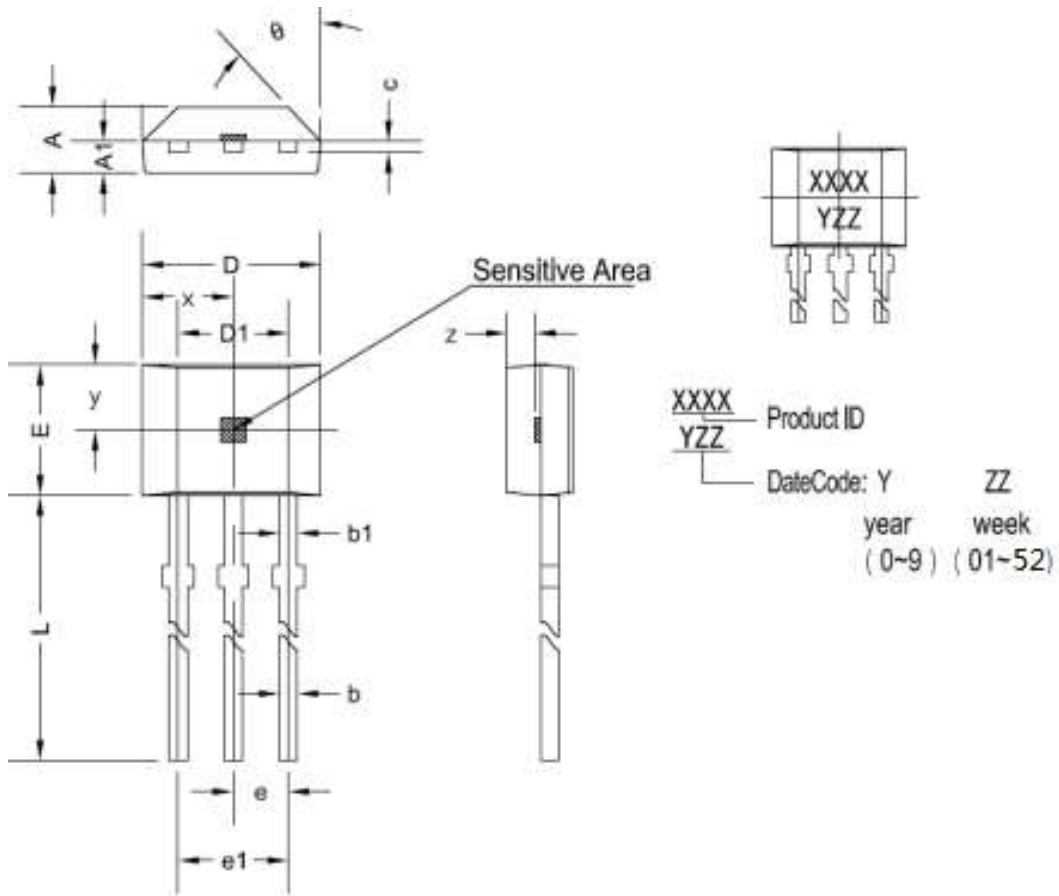
Typical Application Circuit 1



Typical Application Circuit 2

12.Package Material Information

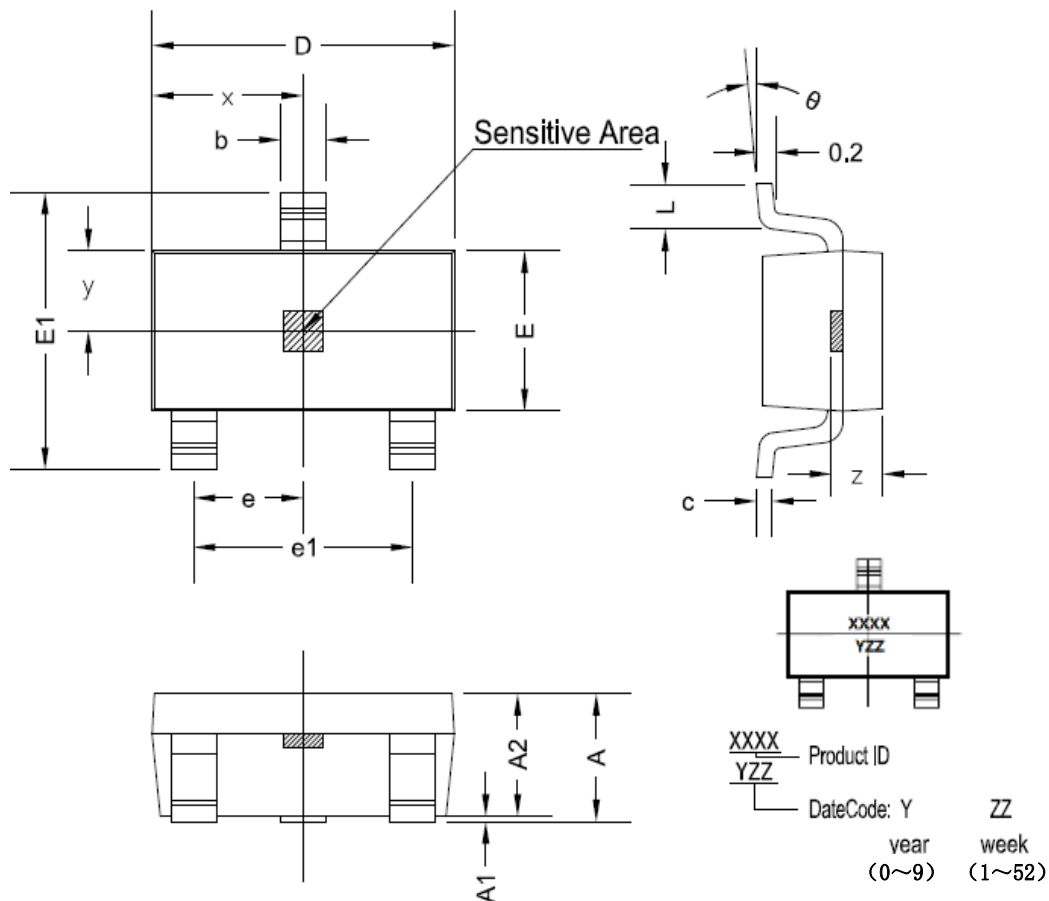
TO92S Package Size



High voltage bipolar latch Hall chip

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
b1	0.400	0.550	0.016	0.022
C	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.900	3.280	0.114	0.129
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	15.500	0.531	0.610
x	2.025TYP		0.080TYP	
y	1.545TYP		0.061TYP	
z	0.500TYP		0.020TYP	
θ	45°TYP		45°TYP	

SOT23-3L Package Size



High voltage bipolar latch Hall chip

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
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°

13.Historic version

Versions	Update date	modify
REV1.0	2020.07	
REV1.1	2022.07	Optimize the minimum working voltage to 3.0V and increase the temperature characteristic curve
REV1.2	2023.04	Layout and formatting

14.Notes

- 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 °C 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.