

High-voltage and high-sensitivity unipolar Hall switch

1. Introduction

SL44E unipolar Hall effect switch, designed with bipolar semiconductor process, includes Hall voltage generator, voltage regulator that can operate at power supply voltage of 3.8 to 40V, temperature compensation circuit, small signal amplifier, Schmitt trigger and open collector output.

This sensor is designed for south pole response. When the magnetic flux density (B) is greater than the operating point B_{op} , the output is low level, and the output remains unchanged until the magnetic flux (B) is less than the release point B_{rp} , the output is high level. SL44E provides a variety of packages, including TO92 S, SOT23 -3L, and the packaging is RoHS compliant.

2. Feature

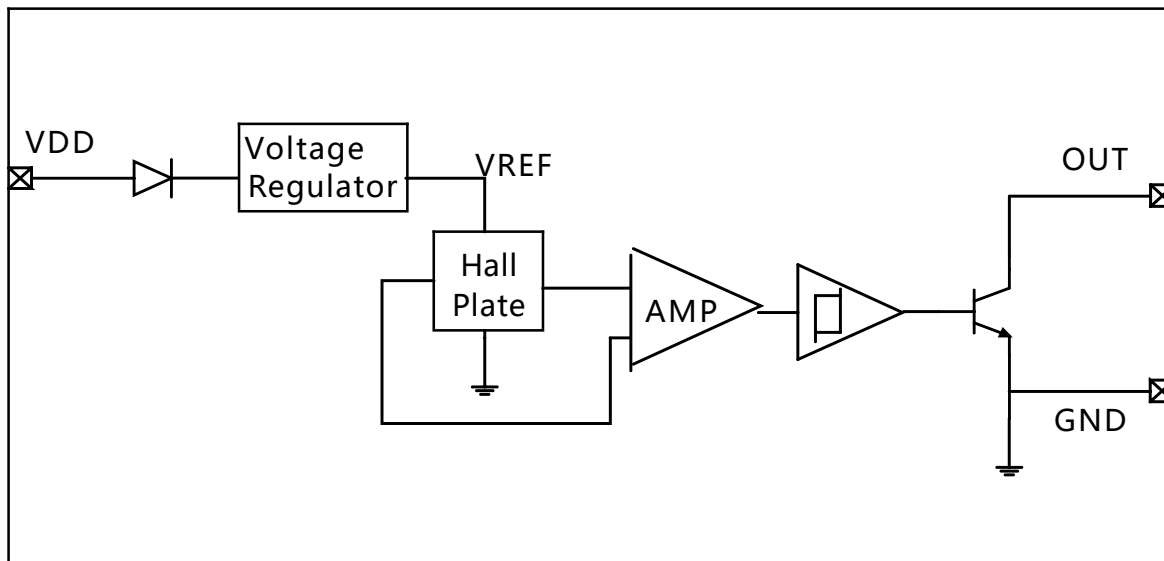
- Micro structure
- High sensitivity: 75/55Gauss (Typical Value)
- Wide voltage range: 3.8 V to 40 V
- ESD Performance can reach ± 4 kV
- Operating temperature range from -40°C to 125°C
- Open collector output

3. Typical Applications

- Brushless motor commutation
- Flow Sensors
- Position Sensors
- Speed Sensors
- Distance Sensors

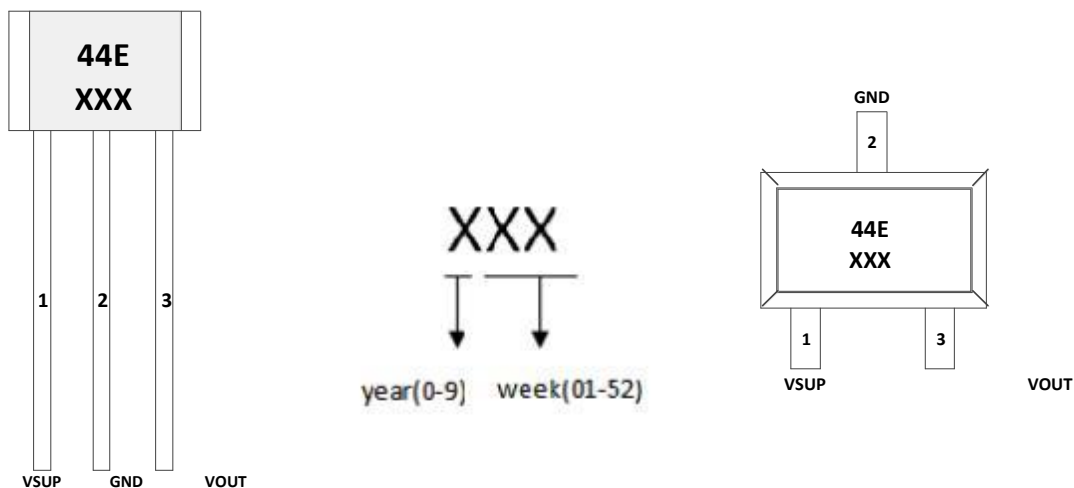
4. Functional Block Diagram

The SL44E is designed using bipolar technology and includes an on-chip Hall element voltage generator, a voltage regulator that can operate at a supply voltage from 3.8 to 40V, a temperature compensation circuit, a small signal amplifier, a Schmitt trigger, and an open collector output.



SL44E Functional Block Diagram

5. Pin Description



**TO92S
SOT23-3L**

6. Ordering Information

Serial number	Package	Boxing	Work Environment, TA
SL44E-9	TO92S	1000 /Bag	-40°C to 125°C
SL44E-3	SOT23-3L	3000 /Roll	-40°C to 125°C

7. Pin information

SOT23-3L Pin number	TO92S Pin number	Name	Function
1	1	V _{SUP}	Power
2	2	G _{ND}	Ground
3	3	V _{OUT}	Open collector output, need to connect pull-up resistor

8. Absolute Maximum Ratings

The absolute maximum ratings are the extreme values that the chip can withstand. If the value is exceeded, the chip may be permanently damaged.

Parameter	Symbol	Min	Max	Unit
Supply voltage	V _{DD}	-0.3	60	V
Output Current	I _{sink}	0	40	mA
Output voltage	V _{out}	-0.5	60	V
Operating temperature range	T _a	-40	125	°C
Storage temperature range	T _s	-50	165	°C

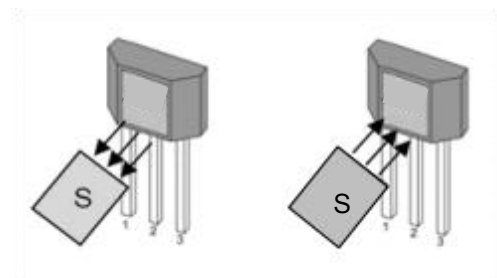
9. Electromagnetic properties(Ta=25°C, VSUP=5V)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
Electrical properties						
V _{SUP}	Supply voltage		3.8		40	V
I _{SUP}	Working current	V _{SUP} =5V		6	9	mA
I _{le}	Output leakage current				10	uA
V _{sat}	Output saturation voltage	I _{out} =20mA, On state			0.4	V
I _{sink}	Output current sink				30	mA
T _r	Output rise time	CL=20pF			1	us
T _f	Output Fall Time	CL=20pF			1.5	us
Magnetic properties						
B _{op}	Working point	CL=20pF	60	75	90	Gauss
B _{rp}	Release Point		40	55	70	Gauss
B _{hys}	Hysteresis		10	20	40	Gauss

10. Magnetoelectric conversion characteristics

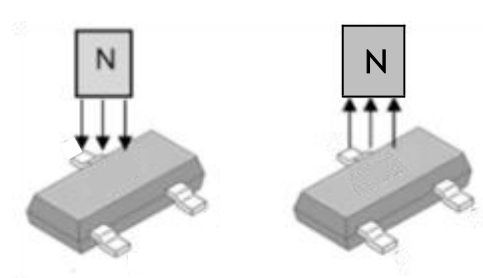
TO92S Package, When the south pole is close to the marked side, the output is low level, and when it is far away, the output is high level;

SOT23-3L Package, When the north pole is close to the marked side, the output is low level, and when it is far away, the output is high level.



Vout=High level

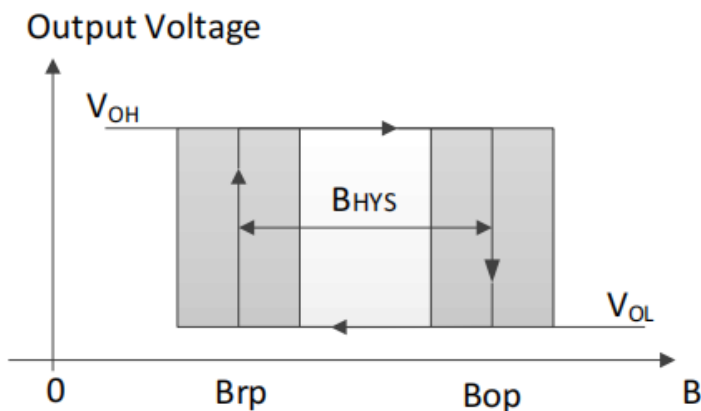
Vout=Low level



Vout=Low level

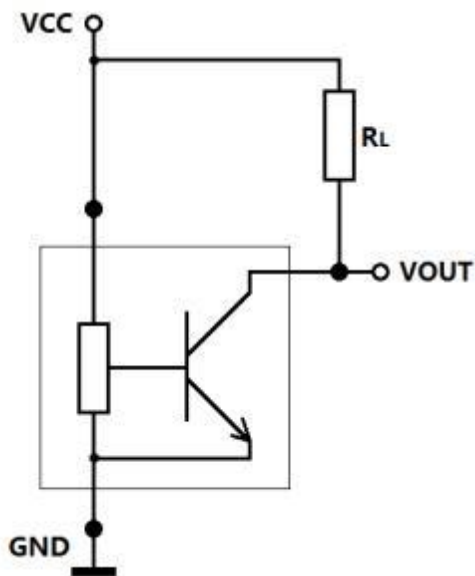
Vout=Low level

11. Output Status

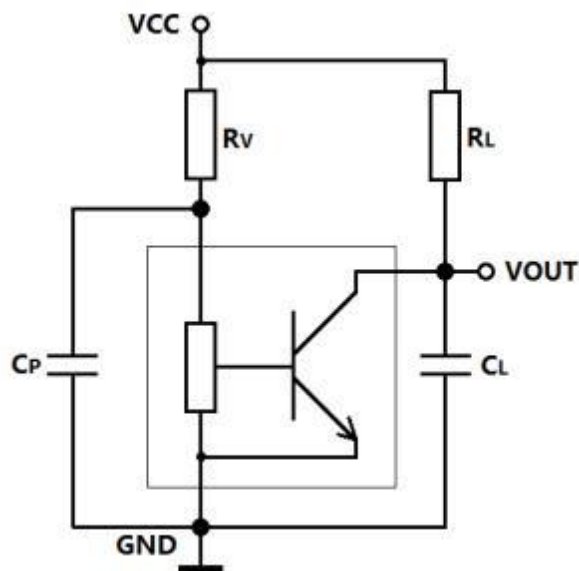


12. Application Circuit

The typical application circuit is shown in the following figure, Application Circuit 1, where $R_L = 4.7K\Omega$. For applications with interference or radiated interference on the power supply line, it is recommended to place the series resistor R_V and the two capacitors C_P and C_L as close to the sensor as possible, as shown in the following figure, Application Circuit 2, among $R_V = 100 \Omega$, $C_P = 4.7nF$, $R_L = 4.7K\Omega$, $C_L = 1nF$.



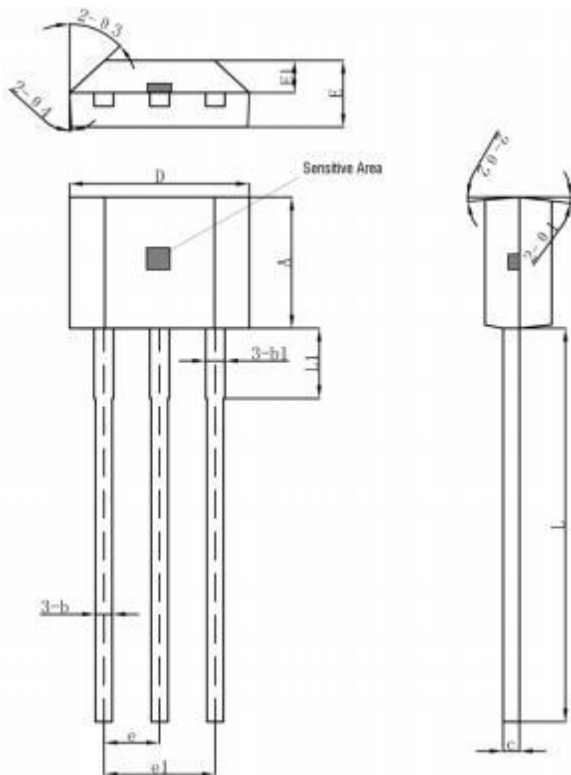
Application Circuit 1



Application Circuit 2

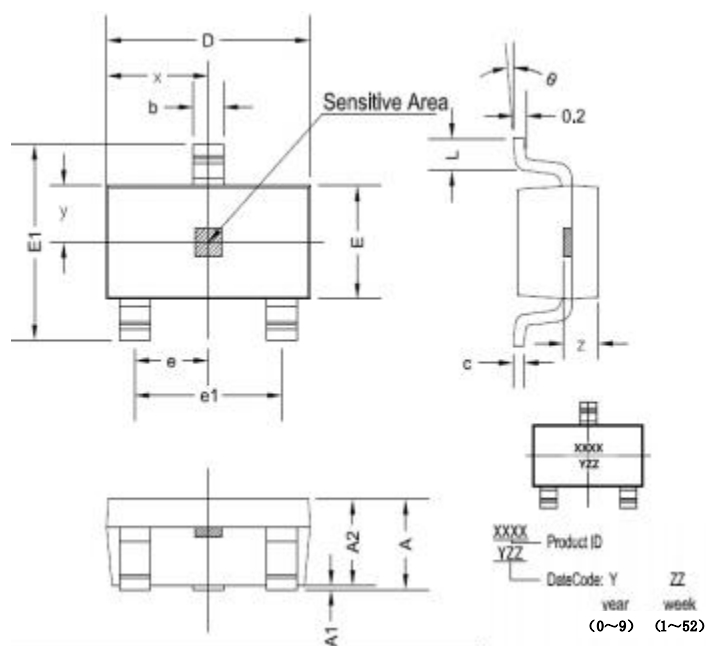
13. Dimensions

TO92S Package size



Symbol	Dimensions/mm		
	Min	Typ	Max
A	2.9	3	3.1
b	0.35	0.39	0.4
b1		0.44	
c	0.36	0.38	0.4
D	4	4.1	4.2
E	1.42	1.52	1.62
E1		0.75	
e		1.27	
e1		1.27	
L		2.54	
L1	13.5	14.5	15.5
θ_1		6°	
θ_2		3°	
θ_3		45°	
θ_4		3°	
h		3.6	

SOT23-3L Package size



Symbol	Size (MM)		Size (Inch)	
	Min	Max	Min	Max
A	1.05	1.25	0.041	0.049
A1	0	0.1	0	0.004
A2	1.05	1.15	0.041	0.045
b	0.3	0.5	0.012	0.02
c	0.100	0.2	0.004	0.008
D	2.82	3.02	0.111	0.119
E	1.5	1.7	0.059	0.067
E1	2.65	2.95	0.104	0.116
e	0.950 TYP		0.037 TYP	
e1	1.8	2	0.071	0.079
L	0.3	0.6	0.012	0.024
x	1.460 TYP		0.057 TYP	
y	0.800 TYP		0.032 TYP	
z	0.600 TYP		0.024 TYP	
θ	0°	8°	0°	8°

Precautions

1. Hall sensors are sensitive devices. Electrostatic protection measures should be taken during use and storage.
- 2 Mechanical stress applied to the device housing and leads should be minimized during installation and use.
3. It is recommended that the welding temperature should not exceed 350°C and the duration should not exceed in 5 seconds.
4. In order to ensure the safety and stability of the Hall chip, it is not recommended to use it for a long time beyond the parameters.