

## Low Power Hall Switch YH13s

### GENERAL DESCRIPTION

The YH13s omnipolar Hall effect sensor IC is fabricated from mixed signal CMOS technology. It incorporates advanced chopper-stabilization techniques to provide accurate and stable magnetic switch points.

The circuit design provides an internally controlled clocking mechanism to cycle power to the Hall element and analog signal processing circuits. This serves to place the high current-consuming portions of the circuit into a “Sleep” mode. Periodically the device is “Awakened” by this internal logic and the magnetic flux from the Hall element is evaluated against the predefined thresholds. If the flux density is above or below the Bop/Brp thresholds then the output transistor is driven to change states accordingly. While in the “Sleep” cycle the output transistor is latched in its previous state. The design has been optimized for service in applications requiring extended operating

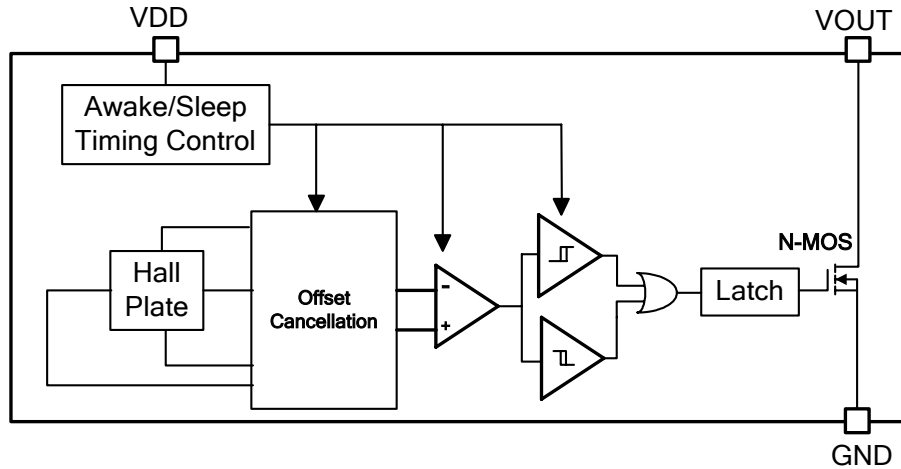
The output transistor of the YH13s will be latched on (Bop) in the presence of a sufficiently strong South or North magnetic field facing the marked side of the package. The output will be latched off (Brp) in the absence of a magnetic field.

### Features

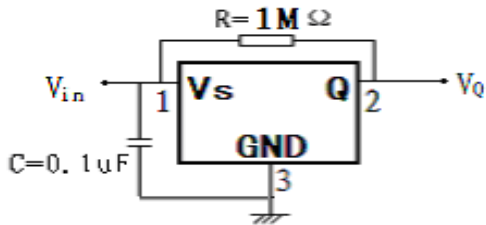
- 2.4V-5.5V battery operation
- High sensitivity and high stability of the magnetic switching
- High resistance to mechanical stress
- Digital output signal
- Switching for both poles of a magnet (omnipolar)



### Block Diagram



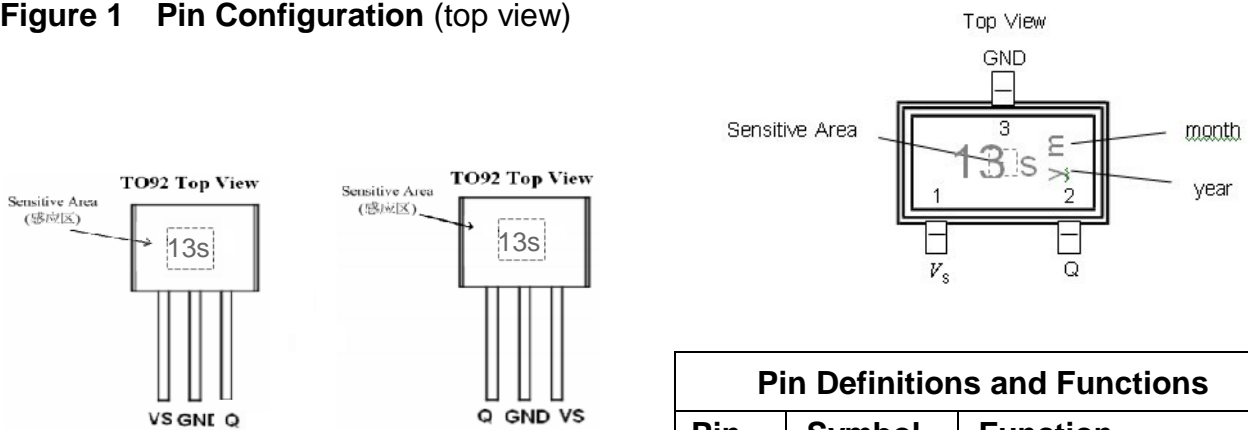
### Application circuit YH13s



notes:

- 1、 the pull up resistor: 20K ~ 1M
- 2、 supply voltage  $V_{in}$ : 2.4V ~ 5.5

Figure 1 Pin Configuration (top view)



Pin Definitions and Functions		
Pin	Symbol	Function
1	$V_s$	Supply Voltage
2	$Q$	Open Drain Input
3	$Gnd$	Ground





**Absolute Maximum Ratings** (at  $T_A=25^{\circ}\text{C}$ )

Characteristics	Symbol	Rating	Unit
VDD Pin Voltage	$V_{DD}$	- 0.3 to 6V	V
Output Pin Voltage	$V_{OUT}$	- 0.3 to 6V	V
Output Current	$I_{OUT}$	2	mA
Storage Temperature Range	$T_{ST}$	-65 to +150	$^{\circ}\text{C}$
Junction Temperature	$T_J$	+125	$^{\circ}\text{C}$
Operating Temperature Range	$T_{OP}$	-40 to +85	$^{\circ}\text{C}$
Thermal Resistance from Junction to ambient	$\theta_{JA}$	550	$^{\circ}\text{C}/\text{W}$
Power Dissipation[ $PD=(T_J-T_A) / \theta_{JA}$ ]	PD	230	mW

Note :  $\theta_{JA}$  is measured with the PCB copper area of approximately 1 in<sup>2</sup>(Multi-layer).

**Electrical Characteristics** ( $V_{DD} = 2.75\text{V}$ ,  $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	$V_{DD}$		2.4	-	5.5	V
Supply Current	$I_{DD}$	Awake state	-	2	4	mA
		Sleep state	-	4	10	$\mu\text{A}$
		Average	-	9	16	$\mu\text{A}$
Output Saturation Voltage	$V_{OSAT}$	$I_O=1\text{mA}$	-	0.1	0.3	V
Output Leakage Current	$I_{O-LEAK}$	$V_{OUT}=5.5\text{V}$ , $B < B_{rp}$	-	0.01	1	$\mu\text{A}$
Output Wake-Up Time	$T_{wake-up}$		-	70	120	$\mu\text{s}$
Period	$T_{Period}$		-	70	120	ms
Duty Cycle	D.C		-	0.1	-	%

**Magnetic Characteristics** ( $V_{DD} = 2.75\text{V}$ ,  $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Operating Points	$B_{OPS}$		-	35	55	Gauss
	$B_{OPN}$		-55	-35	-	
Release Points	$B_{RPS}$		10	25	-	
	$B_{RPN}$			-25	-10	
Hysteresis	$B_{Hys}$		-	10	-	

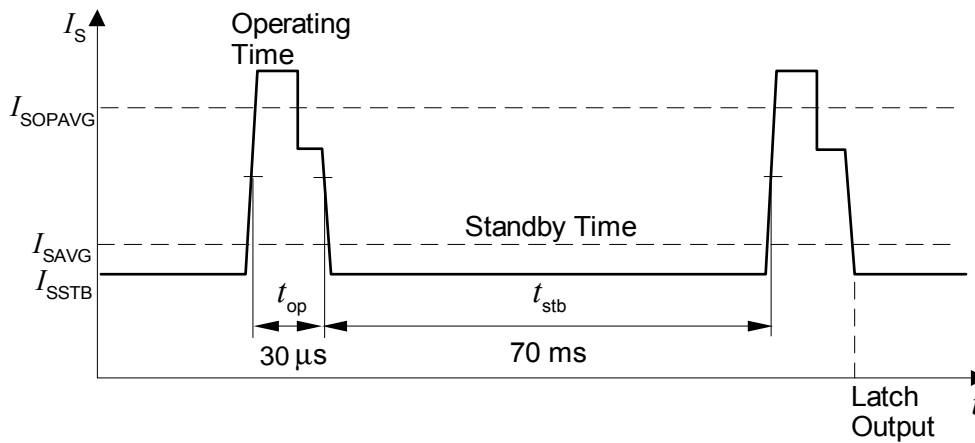


### ESD Protection

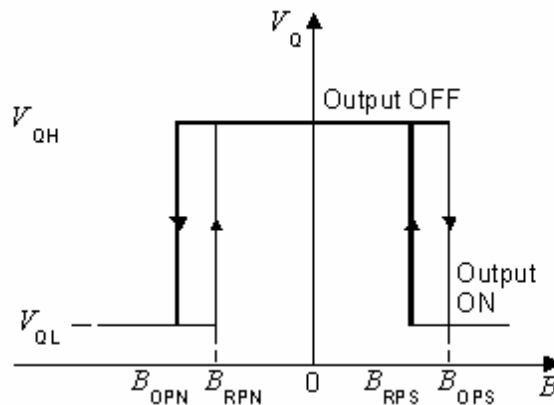
Human Body Model (HBM) tests according to: Mil. Std. 883F method 3015.7

Parameter	Symbol	Limit Values		Unit	Notes
		Min	Max		
ESD Voltage	$V_{ESD}$	-	$\pm 4$	kV	R=1.5K $\Omega$ C=100PF T=25 $^{\circ}$ C

### Timing Diagram



### Output – Signal YH13s

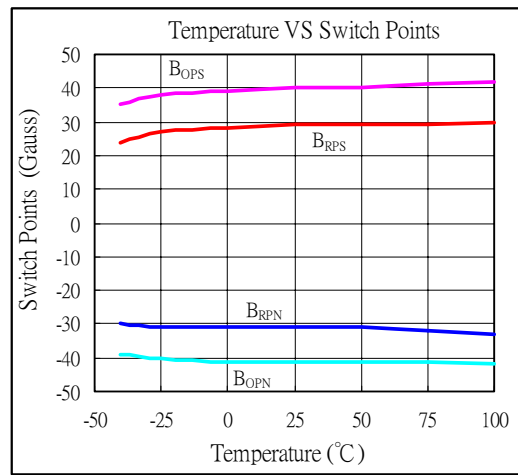
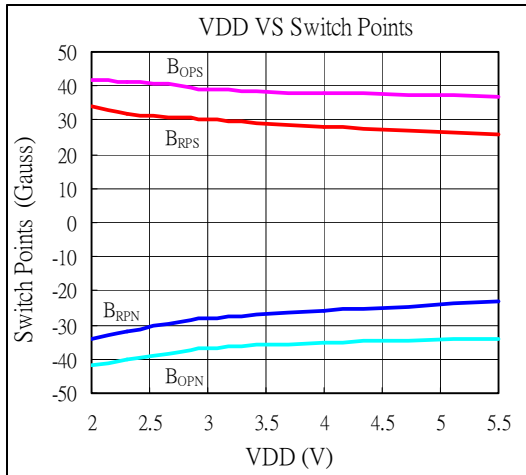
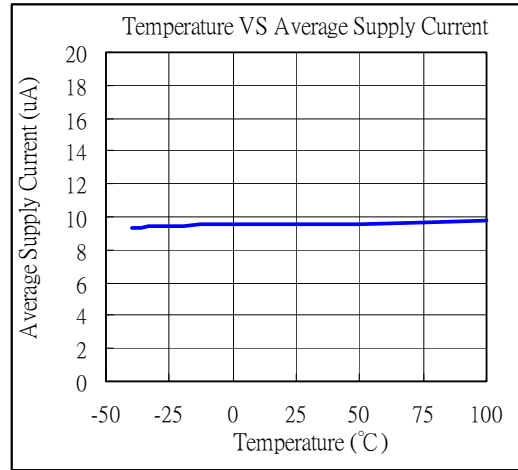
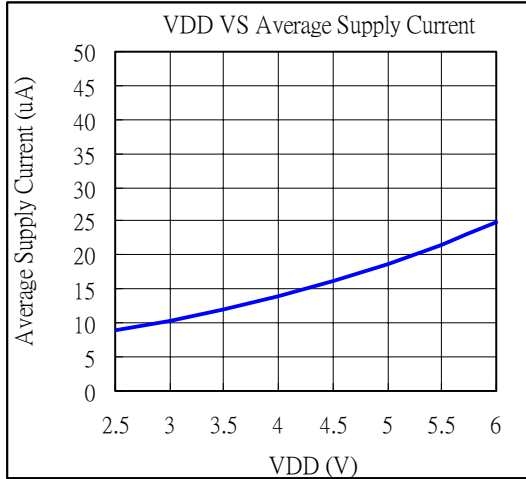


$V_Q$  as function of the applied B-Field



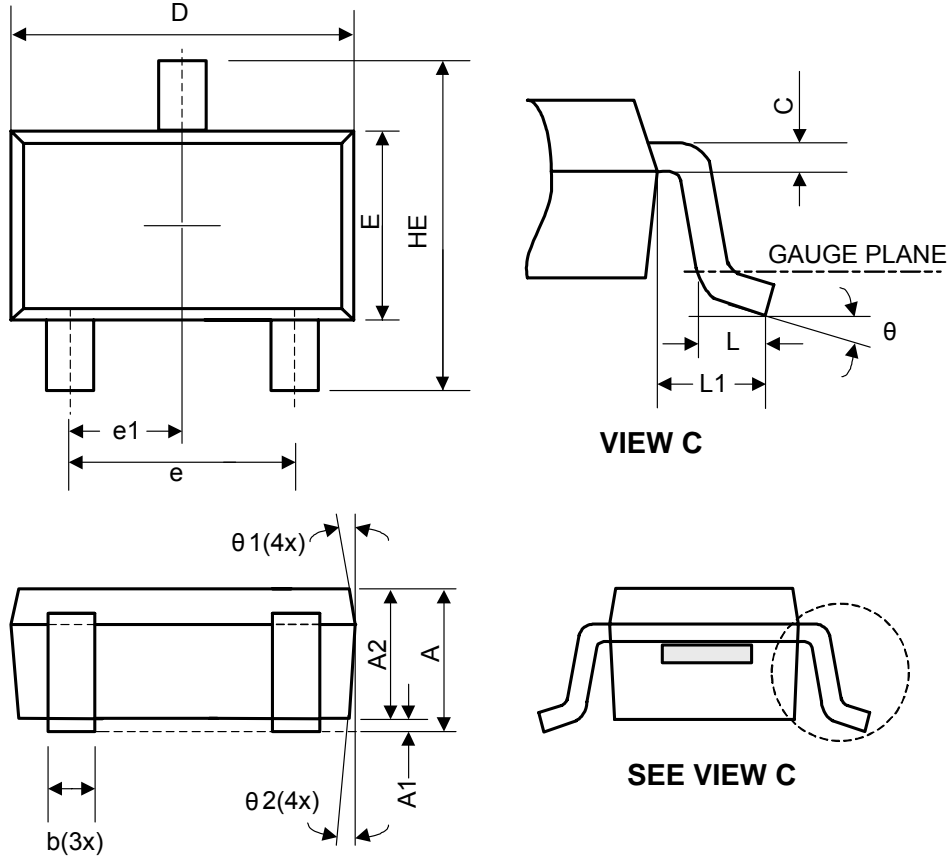


### Typical Characteristics



## Package Outlines

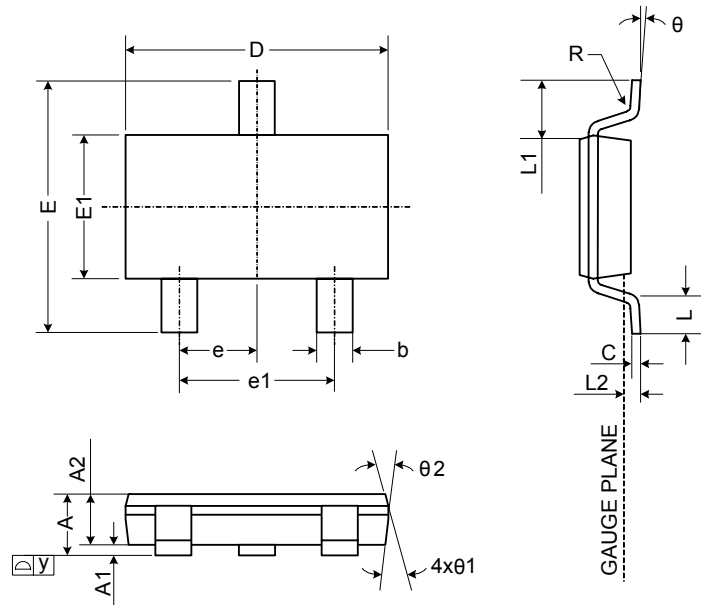
### (1) SOT23-3L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.		Min.	Nom.	
A	1.05	-	A	1.05	-	A
A1	0.05	-	A1	0.05	-	A1
A2	1.00	1.10	A2	1.00	1.10	A2
b	0.25	-	b	0.25	-	b
C	0.08	-	C	0.08	-	C
D	2.70	2.90	D	2.70	2.90	D
E	1.50	1.60	E	1.50	1.60	E
HE	2.60	2.80	HE	2.60	2.80	HE
L	0.30	-	L	0.30	-	L
L1	0.50	0.60	L1	0.50	0.60	L1
e	1.80	1.90	e	1.80	1.90	e
e1	0.85	0.95	e1	0.85	0.95	e1
theta	0°	5°	theta	0°	5°	theta
theta1	3°	5°	theta1	3°	5°	theta1
theta2	6°	8°	theta2	6°	8°	theta2



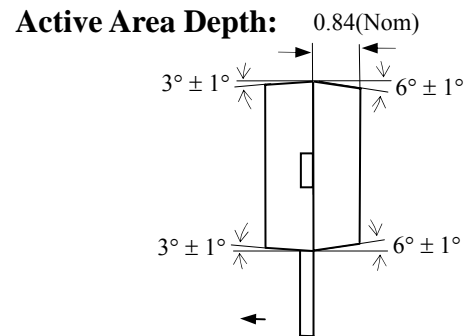
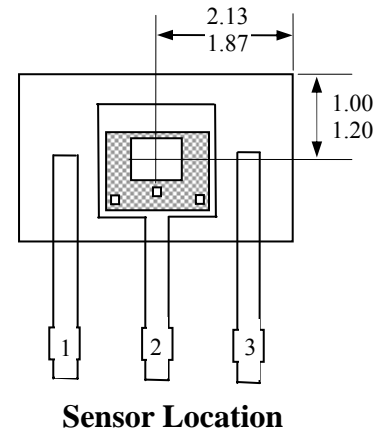
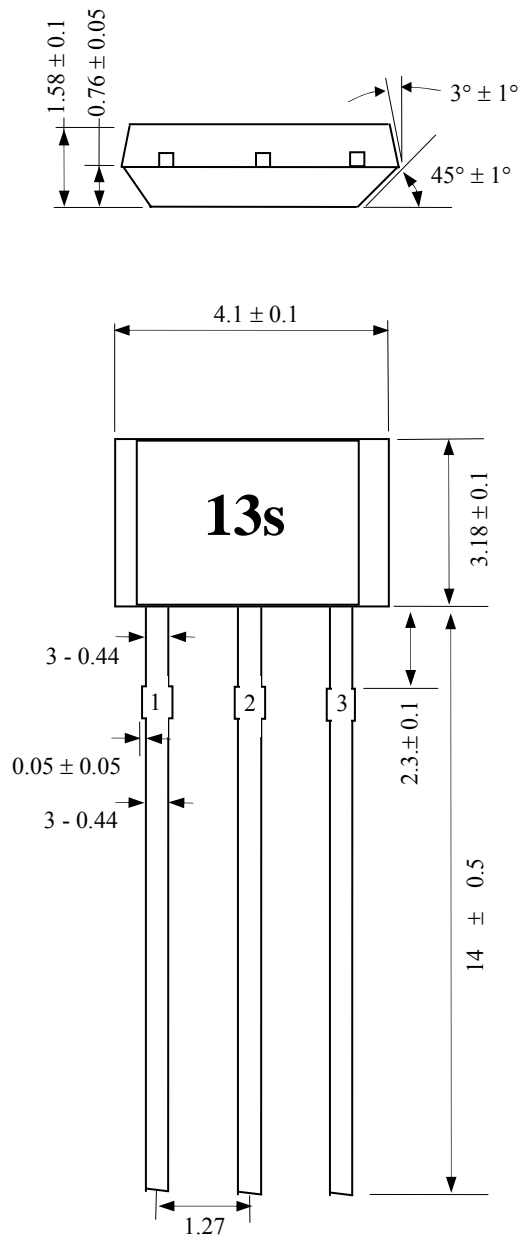
(2) TSOT23-3L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.75	-	0.90	0.030	-	0.035
A1	0.00	-	0.10	0.000	-	0.004
A2	0.70	0.75	0.80	0.028	0.030	0.031
b	0.35	-	0.51	0.014	-	0.020
C	0.10	-	0.25	0.004	-	0.010
D	2.80	2.90	3.00	0.110	0.114	0.118
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
e	0.95 BSC.			0.037		
e1	1.90 BSC.			0.075		
L	0.37	-	-	0.015	-	-
L1	0.60 REF.			0.024		
L2	0.25 BSC.			0.010		
y	-	-	0.10	-	-	0.004
R	0.10	-	-	0.004	-	-
theta	0°	-	8°	0°	-	8°
theta1	7° NOM.			7° NOM.		
theta2	5° NOM.			5° NOM.		



### 15.3 TO-92 Package Physical Characteristics



**Notes:**

- 1). Controlling dimension : mm ;
- 2). Lesds must be free of flash and plating voids ;
- 3). Do not bend leads within 1 mm of lead to package interface ;
- 4). PINOUT: Pin 1 VDD  
Pin 2 GND  
Pin 3 Output

### 16. Ordering Information

Part No.	Temperature	Suffix	Package Code
YH	0°C to 85°C)		UA( TO-92S) SO(SOT-23) ST(TSOT-23)

