

## Linear Hall Effect Sensor CYSJ3A

CYSJ3A Hall Effect Sensor is outstanding for its Ultra-High sensitivity and its low temperature coefficients. This sensor is made by using the technique of Molecular Beam Epitaxy (MBE), which provides excellent uniformity and reproducibility.

### Features:

- Ultra-High Sensitivity (320V/AT)
- Low current requirement
- Very low power consumption
- Extended operating temperature range
- Small linearity error of the Hall voltage
- Plastic miniature package SOT-143 for surface mounting or SIP (Through Slot)
- Wide measuring range (0.1 $\mu$ T-3T)



### Applications:

- Magnetic field measurement
- Low temperature applications
- Current and power measurement
- Control of brushless DC motors
- Microswitches
- Position sensors
- Speed and RPM sensing



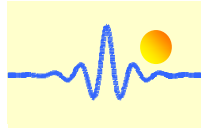
### 1. Model

CYSJ3A Hall Sensor is fabricated from AlGaAs/InGaAs/GaAs-2DEG (two-dimensional electron gas) heterojunction semiconductor.

### 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Control Voltage	$V_c$	5	V
Control Current	$I_c$	4	mA
Power Dissipation	$P_D$	20	mW
Operating Temperature	$T_{op}$	-100 ~ +200	$^{\circ}$ C
Storage Temperature	$T_s$	-100 ~ +200	$^{\circ}$ C
Soldering Temperature <sup>#</sup>	$T_{sol}$	260	$^{\circ}$ C

<sup>#</sup>Soldering time: 10 seconds



### 3. Electrical Characteristics

Parameter	Symbol	Test Condition	MIN	TYP	MAX	Unit
Output Hall Voltage	$V_H$	$I_c=1\text{mA}$ , $B=100\text{mT}$	24	28	36	mV
Residual Ratio* <sup>1</sup>	$V_{HO}/V_H$	$I_c=1\text{mA}$	-10	-	+10	%
Residual Ratio* <sup>1</sup>	$V_{HO}/V_H$	$I_c=0.5\text{mA}$	-4	-	+4	%
Input Resistance	$R_{IN}$	$I_c=1\text{mA}$ , $B=0\text{mT}$	1.1	1.25	1.45	k $\Omega$
Output Resistance	$R_{OUT}$	$I_c=1\text{mA}$ , $B=0\text{mT}$	1.1	1.25	1.45	k $\Omega$
Temperature Coefficient of Hall Voltage* <sup>2</sup>	$\alpha$	$I_c=1\text{mA}$ , $B=100\text{mT}$ ( $T_1= -100\text{ }^\circ\text{C}$ , $T_2=150\text{ }^\circ\text{C}$ )	-0.05	-0.08	-0.1	%/ $^\circ\text{C}$
Temperature Coefficient of Input Resistance* <sup>3</sup>	$\beta$	$I_c=1\text{mA}$ , $B=0\text{mT}$ ( $T_1= -100\text{ }^\circ\text{C}$ , $T_2=150\text{ }^\circ\text{C}$ )	-	0.3	0.4	%/ $^\circ\text{C}$
Linearity of Hall Voltage* <sup>4</sup>	$\gamma$	$I_c= 1\text{mA}$ , $B_1=60\text{mT}$ , $B_2=500\text{mT}$	-	1	1.5	%

$$* 1 \quad \text{Residual Ratio} = \frac{V_{HO}(B=0\text{mT})}{V_H(B=100\text{mT})}$$

$$* 2 \quad \alpha = \frac{I}{V_H(T_1)} \times \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} \times 100$$

$$* 3 \quad \beta = \frac{1}{R_{IN}(T_1)} \times \frac{R_{IN}(T_2) - R_{IN}(T_1)}{T_2 - T_1} \times 100$$

$$* 4 \quad \gamma = \frac{K_H(B_2) - K_H(B_1)}{K_H(B_2) + K_H(B_1)} \times 200$$

$$K_H = \frac{V_H}{IB}$$

$V_{HO}$ : Offset Voltage

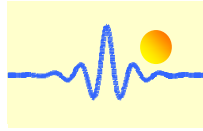
$B$ : Magnetic Flux Density

$T_1, T_2$ : Ambient Temperature

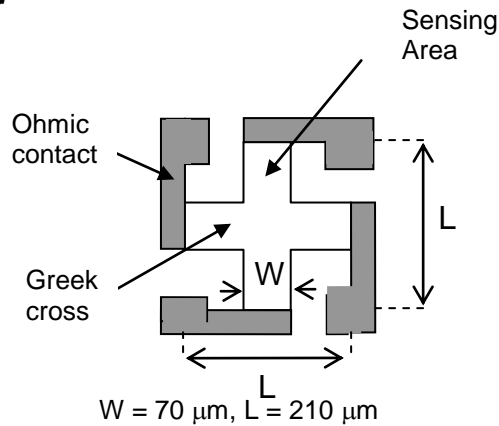
$K_H$ : Current Sensitivity

### 4. Part Numbers and Ordering Information

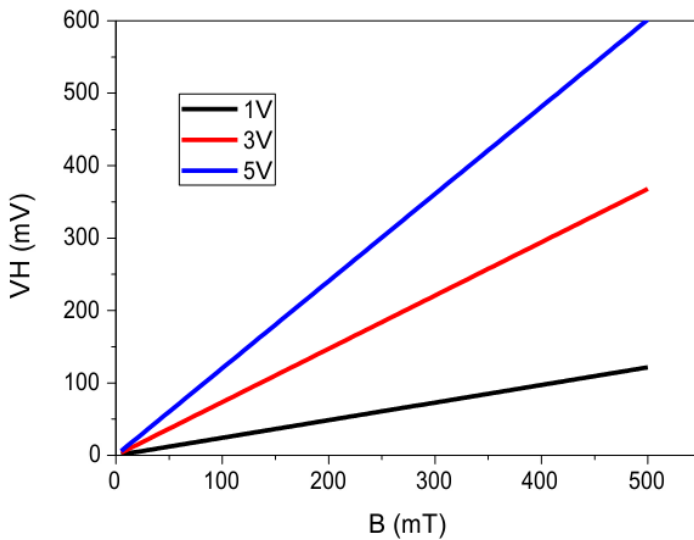
Package	P/N	Mark	Packing	Temperature range
SOT-143	CYSJ3A-S	P3A	3000 units/reel	-100 $^\circ\text{C}$ ~ +200 $^\circ\text{C}$
SIP/2.8x3.1x0.90mm	CYSJ3A-T	P3A	500 units/pack	-100 $^\circ\text{C}$ ~ +200 $^\circ\text{C}$



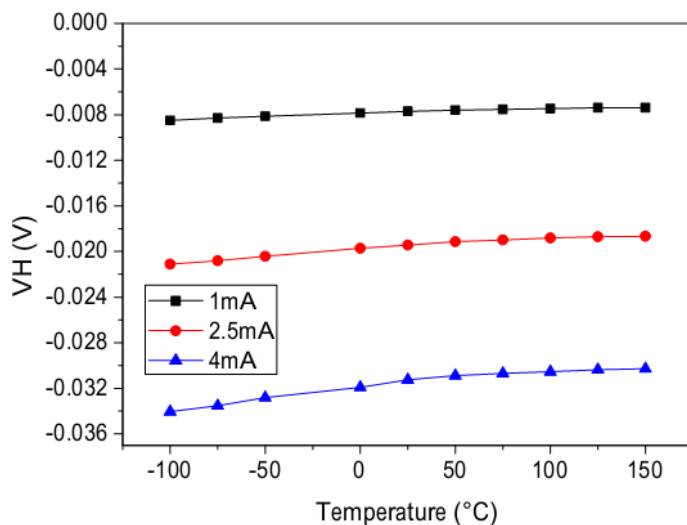
## 5. Shape of the Hall sensor



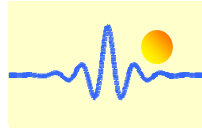
## 6. Typical Characteristics



Output Hall Voltage versus magnetic field under supplying 1V, 3V and 5V across the inputs of Hall Sensor

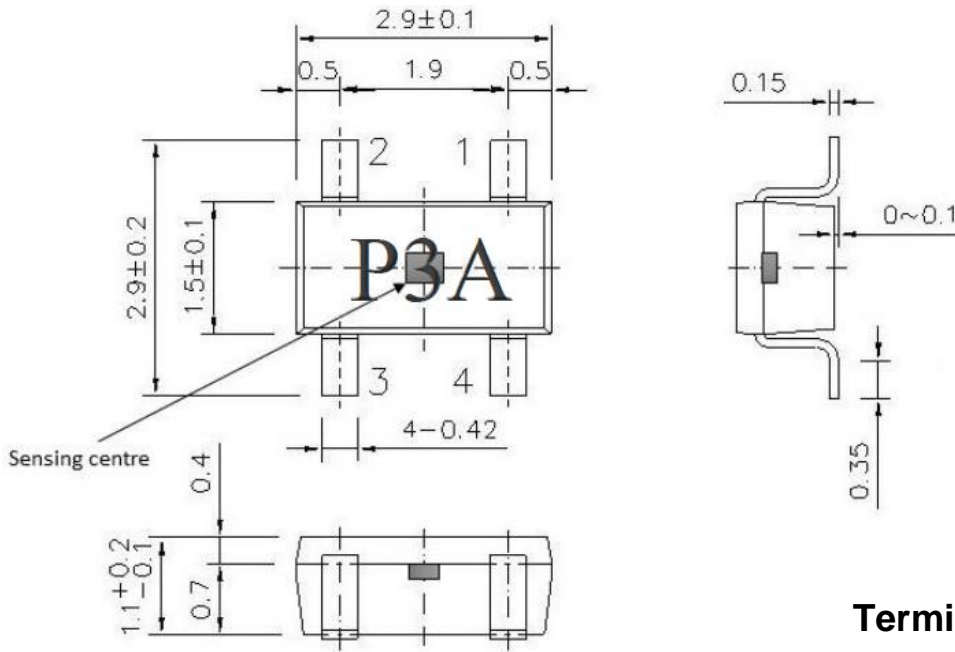


Output Hall Voltage versus temperature under supplying bias currents of 1mA, 2.5mA and 4mA across the inputs of Hall Sensor and at 30mT magnetic field



## 7. Outline drawings (unit: mm)

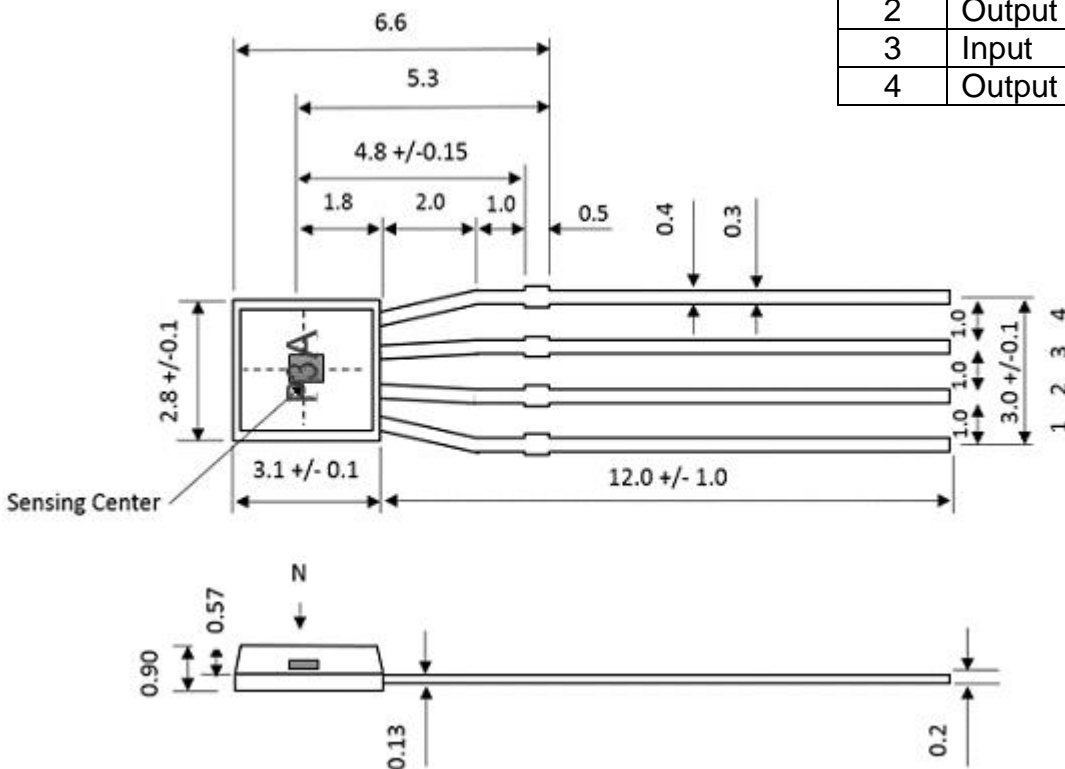
### 7.1. Package SOT 143 (Surface Mount)

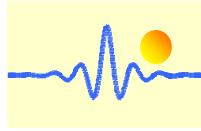


### Terminal Connection

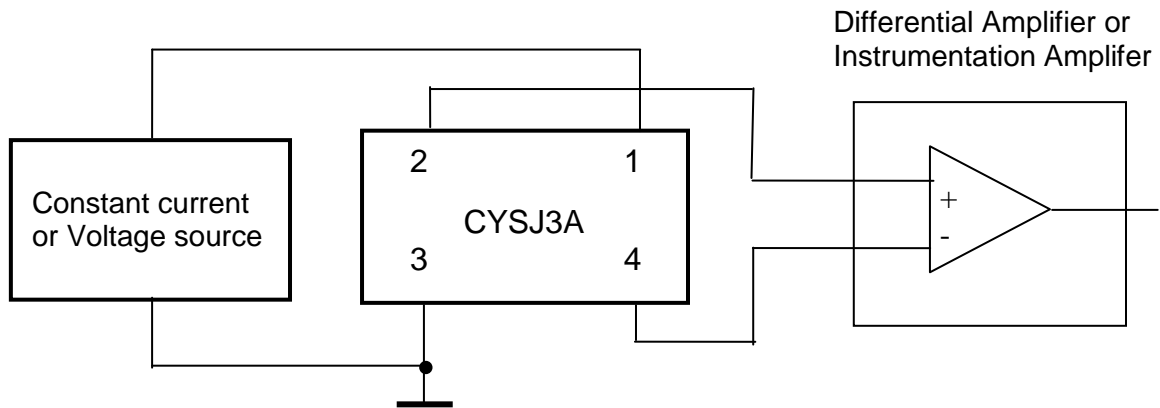
No.	Terminal	Polarity
1	Input	(±)
2	Output	(±)
3	Input	(∓)
4	Output	(∓)

### 7.2. Package SIP (Through Slot)



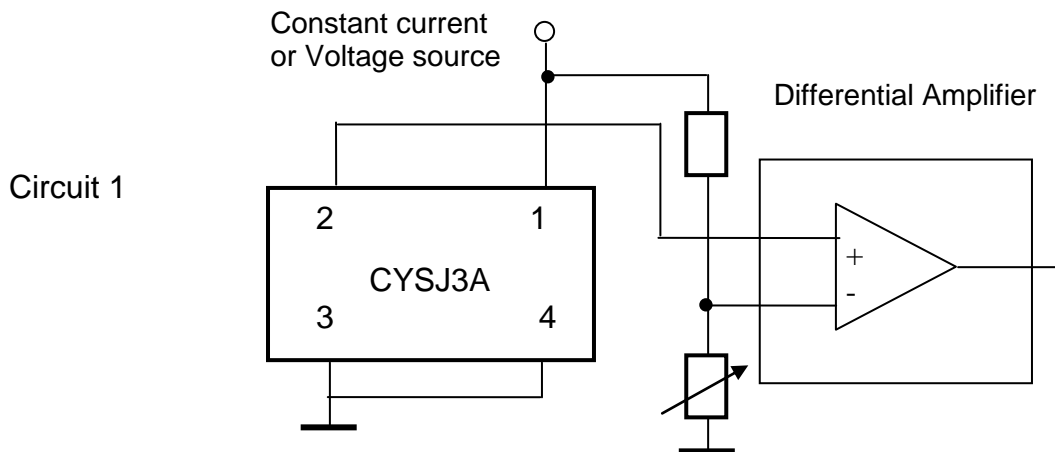


## 8. Connection



## 9. Application Notes

The Hall voltage  $V_H$  can be positive and negative. But if one connects the sensor as follows:



- Pin 1: positive input voltage  $V+$ , for instance +5VDC.
- Pin 3: GND
- Pin 2: OUTPUT
- Pin 4: GND

One can only measure the positive voltage at the pin 2. This means that the output voltage at zero magnetic field is not zero. This voltage is called as offset voltage. The output voltage in this case is not equal to the Hall voltage. The output voltage is equal to the sum of offset voltage and Hall voltage.