Catalogue

Hall Effect Sensor ICs and Elements

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Contents

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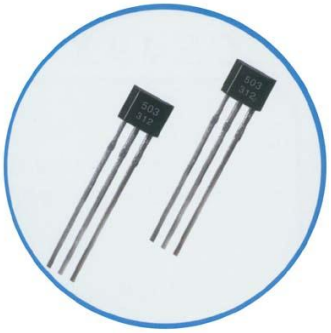
Linear Hall Effect Sensor ICs

CYL3503 Linear Hall Effect Sensor IC

CYL3503 linear Hall-effect integrated circuit includes a voltage regulator, Hall-voltage generator, linear amplifier, and emitter-follower output stage. The output of the ICs changes linearly with the magnetic flux density of the input.

FEATURES

- Small Size
- High Accuracy
- High Sensitivity
- Excellent Reliability
- High Linearity



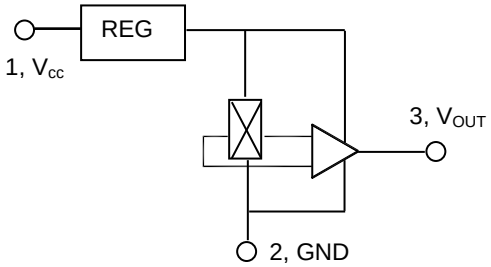
TYPICAL APPLICATION

- Motion Detector
- Gear Tooth Sensors
- Proximity Detector
- Current Detecting Sensor
- Velocity Detecting of Motor Bicycle

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	2.7-8.0	V
Operating Temperature Range	T_A	-20~+85	°C
Storage Temperature Range	T_S	-65~+150	°C

FUNCTIONAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (T_A=25°C, Vcc=5.0V)

TYPE	Supply current Icc (mA)			Quiescent Output Voltage Vo(V)			Sensitivity S (mV/mT)			Output upper Limit Voltage V_T(V)B≥200mT			Output Lower Limit Voltage V_L(V)B≤-200mT		
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
CYL3503	-	9.0	14.0	2.25	2.50	2.75	7.5	-	25.0	4.20	4.25	4.30	0.75	1.00	1.20

Package Outline Drawing (Unit: mm)

- TO-92UA Package and Position of Sensitive Area
- TO-92T Package and Position of Sensitive Area
- TO-92U Package and Position of Sensitive Area

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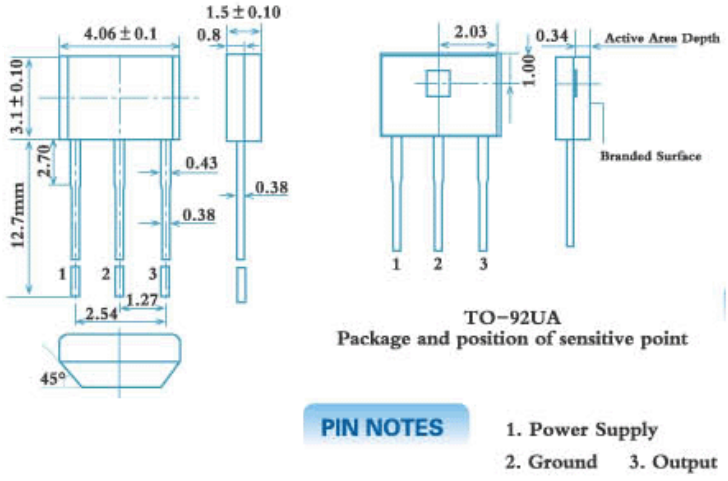
Pin Notes: (TO-92UA, TO-92T, TO-92U Package)

1. Power Supply
2. Ground
3. Output



TO-92UA
Package and position of sensitive point

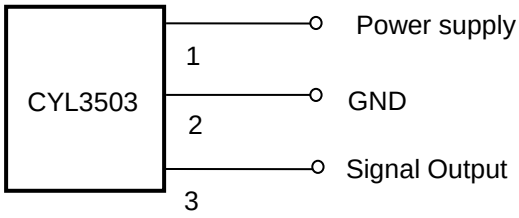
PIN NOTES

1. Power Supply
2. Ground 3. Output

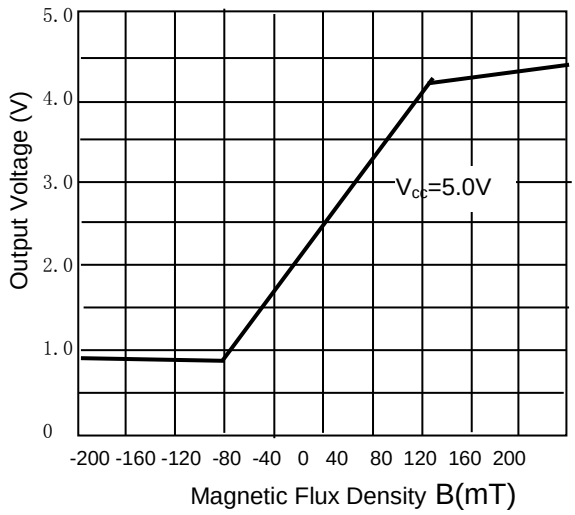
CAUTIONS

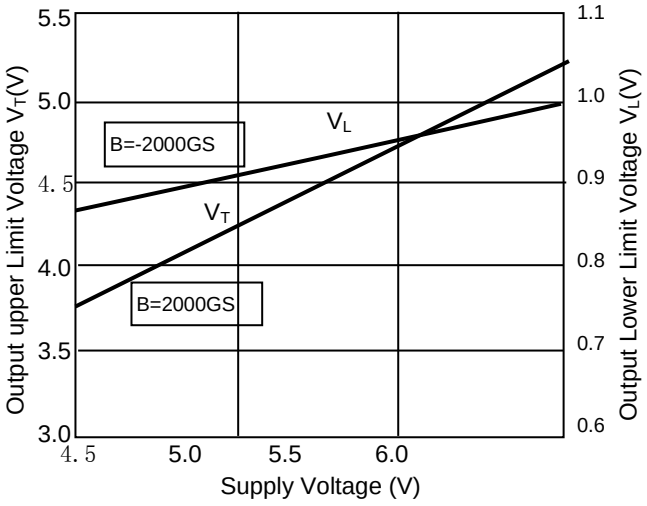
- It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuits, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
- Pay attention to the soldering temperature at the leads , keep it lower in a short time to guarantee good soldering quality .

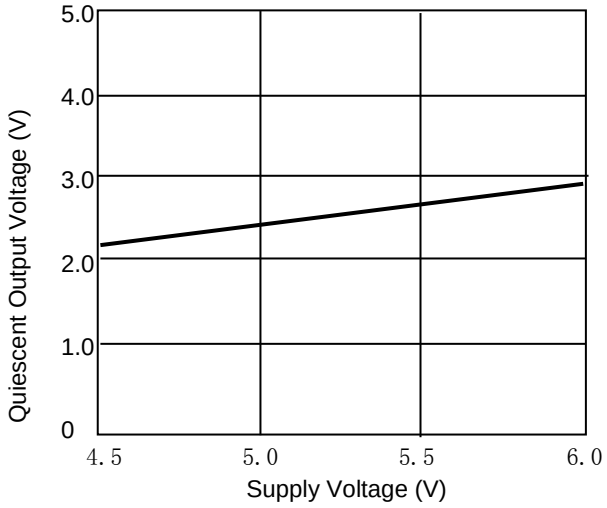
Connection

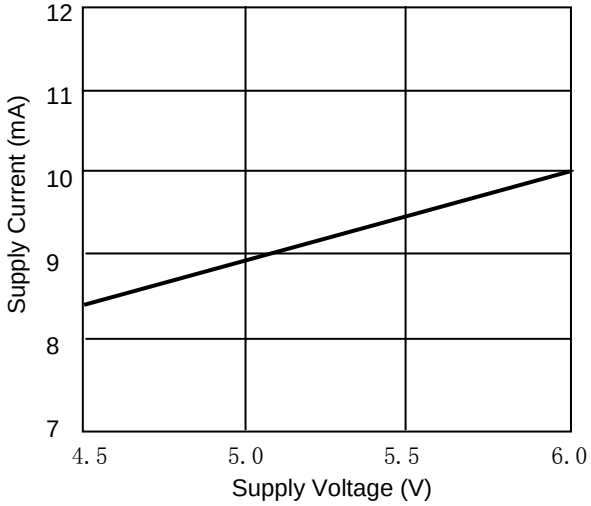


Characteristic Curves







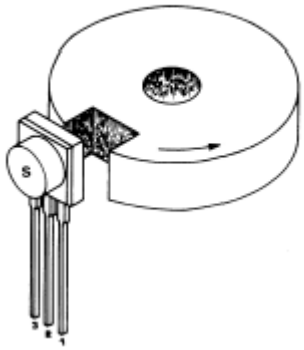


Principles

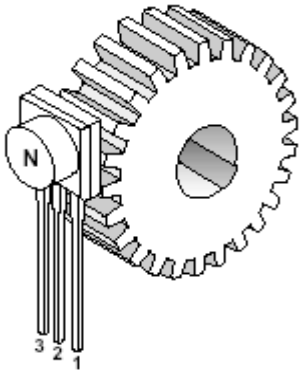
The quiescent output voltage (B=0mT) is nominally one-half the supply voltage. When a south magnetic pole presented to the branded face of the Hall-effect IC, it will drive the output higher than the quiescent voltage. A north magnetic pole will drive the output below the quiescent output voltage. In operation, instantaneous and proportional output voltage levels are dependent on magnetic flux density at the most sensitive area of the device. Greatest sensitivity is obtained with a supply voltage of 6V, but at the cost of increased supply current and a slight loss of output symmetry. The IC' output is usually capacitively coupled to an amplifier that boosts the output above the millivolt level.

Applications

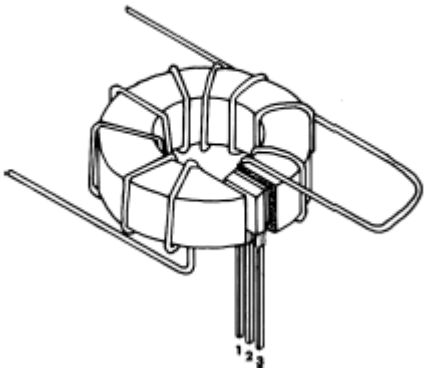
NOTCH SENSOR



GEAR TOOTH SENSOR



CURRENT MONITOR



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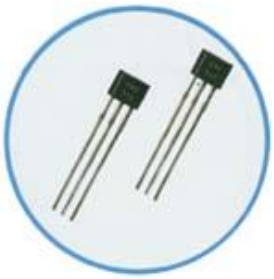
Note:

Mechanical stress should be lessened as far as possible in the process of assembly.
The soldering temperature at the leads should be less than 260°C with 5 seconds. If N pole is approaching Hall-effect ICs from the back side of the package, output voltage will increase, S pole is approaching ICs from the back side, output voltage will reduce; and if from the branded side of the package, the output situation is just to the contrary.

CYL49E Linear Hall Effect Sensor IC



CYL49E linear Hall-effect integrated circuit based on Hall-effect principle, includes a voltage regulator, Hall-voltage generator, linear amplifier, and emitter-follower output stage. The output of the ICs changes linearly with the magnetic flux density of the input.

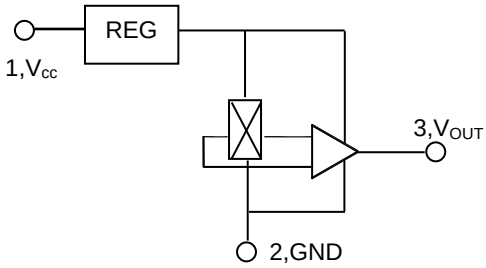
FEATURES

- Small Size
- High Accuracy
- High Sensitivity
- Excellent Reliability
- Low Power

TYPICAL APPLICATION

- Motion Detector
- Gear Tooth Sensors
- Proximity Detector
- Speed Regulator for Sports Appliance
- Current Detecting Sensor

FUNCTIONAL BLOCK DIAGRAM



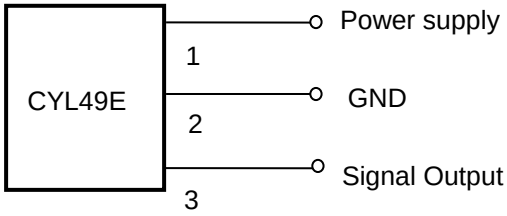
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	2.7 -9.0	V
Operating Temperature Range	T_A	-40 ~ 85	°C
Storage Temperature Range	T_S	-50 ~150	°C

ELECTRICAL & MAGNETIC CHARACTERISTICS (T_A=25°C, Vcc=5.0V)

Supply current Icc(mA)	Output upper Limit Voltage V_T (V) B≥90mT	Output Lower Limit Voltage V_L (V) B≤-90mT	Quiescent Output Voltage Vo(V) B=0mT	Sensitivity S (mV/mT)	Operating Temperature Range (°C)	Output Function
≤8mA	≥4.20	≤1	2.5±0.1	14~18	-40~+85	Linear

Connection



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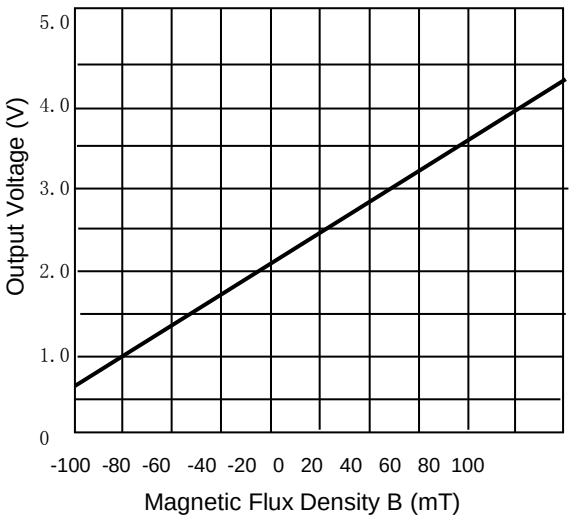
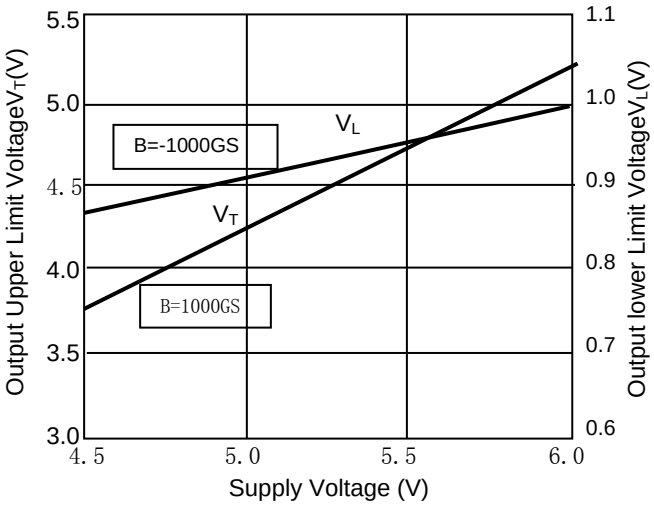
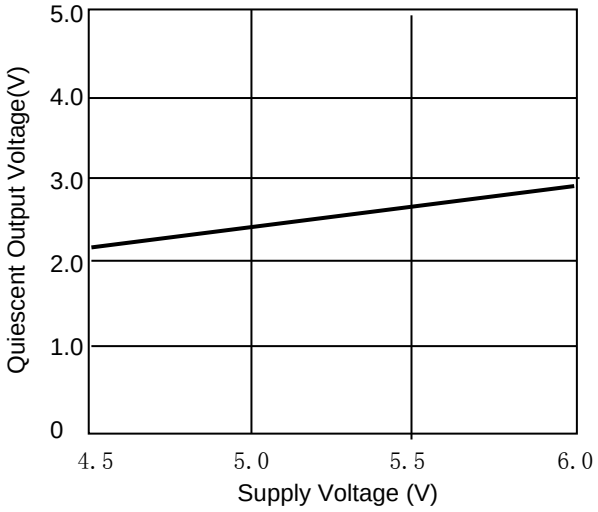
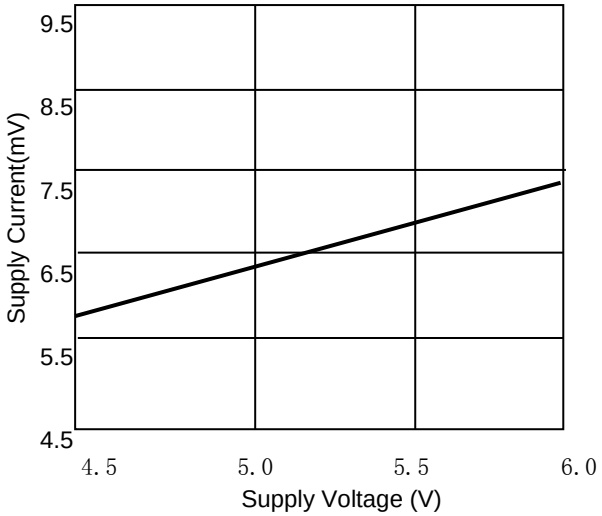




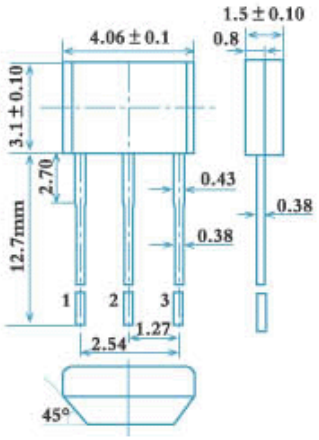


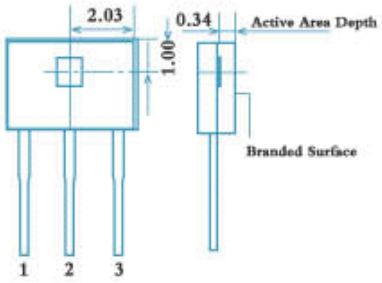


Principles

The quiescent output voltage (B=0mT) is nominally one-half the supply voltage. When a south magnetic pole presented to the branded face of the Hall-effect IC, it will drive the output higher than the quiescent voltage. A north magnetic pole will drive the output below the quiescent output voltage. In operation, instantaneous and proportional output voltage levels are dependent on magnetic flux density at the most sensitive area of the device. Improve the supply voltage can increase its sensitivity.

Package (Unit: mm)





TO−92UA
Package and position of sensitive point

PIN NOTES

1. Power Supply
2. Ground 3. Output

CAUTIONS

◆ It is possible that outside mechanical stress affects the operating point and the release point of Hall−effect circuits, therefore, mechanical stress should be lessened as far as possible in the process of assembly;

◆ Pay attention to the soldering temperature at the leads , keep it lower in a short time to guarantee good soldering quality .

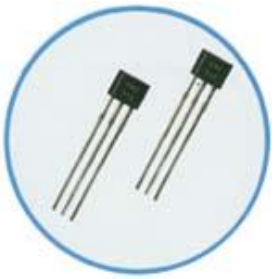
Note:

- ◆ Mechanical Stress Should be lessened as far as possible in the process of assembly
- ◆ The soldering temperature at the leads should be less than 260°C with 5 seconds.
- ◆ If N pole is approaching hall-effect ICs from the back side of the package, output voltage will increase, S pole is approaching ICs from the back side, output voltage will reduce; and if from the branded side of the package, the output situation is just to the contrary.

CYL49F Linear Hall Effect Sensor IC

General Description

The CYL49F is a small, versatile linear Hall-effect device that is operated by the magnetic field from a permanent magnet or an electromagnet. The output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field. The integrated circuitry features low noise output, which makes it unnecessary to use external filtering. It also includes precision resistors to provide increased temperature stability and accuracy. The operating temperature range of this linear Hall sensor is -40°C to105°C, appropriate for commercial, consumer and industrial applications.



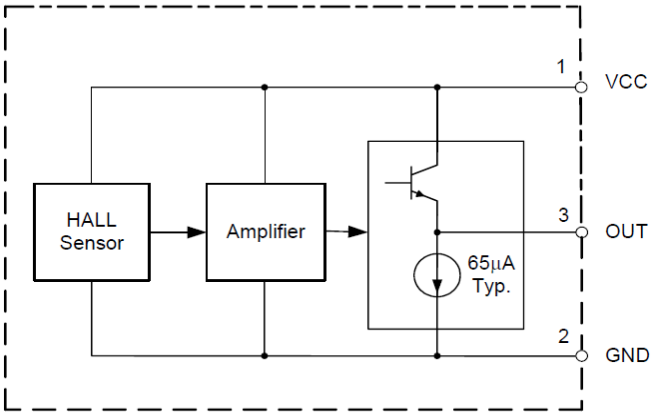
Features

- Miniature Construction
- Power Consumption of 3mA at Vcc=5V for Energy Efficiency
- Single Current Sourcing Output
- Linear Output for Circuit Design Flexibility
- Low Noise Output Virtually Eliminates the Need for Filtering
- A Stable and Accurate Output
- Temperature Range of -40℃ to 105℃
- Responds to Either Positive or Negative Magnetic Field
- The Maximum Instantaneous Supply Voltage up to 50V
- High ESD Rating: Human Body Model: 6000V, Machine Model: 600V

Typical applications

- Current Sensing
- Motor Control
- Position Sensing
- Magnetic Code Reading
- Ferrous Metal Detector
- Vibration Sensing
- Liquid Level Sensing
- Weight Sensing
- Pole Detection

Functional Block Diagram



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	2.7-10	V
Operating Temperature Range	T_A	-40 ~ 125	°C
Storage Temperature Range	T_S	-50 ~ 150	°C
ESD (Human Body Model)		6000	V
ESD (Machine Model)		600	V

Note: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

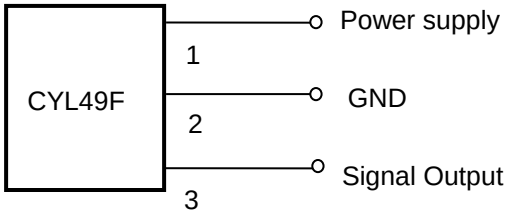
Supply Voltage $V_{CC:}$ 3~8V

Operating Temperature Range $T_{A:}$ -40~105°C

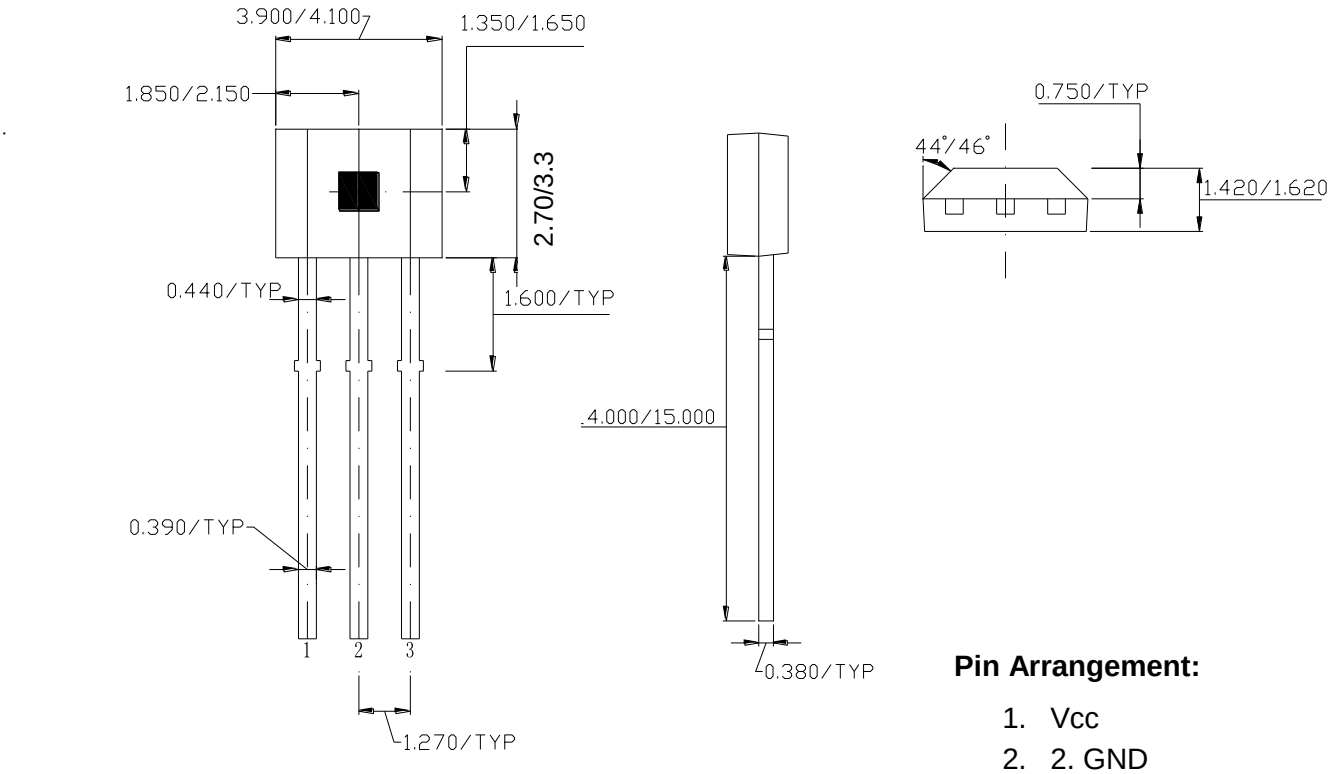
Electrical & Magnetic Characteristics (T_A=25°C, Vcc=5.0V)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Current	Icc		2	3	4	mA
Quiescent Output Voltage	Vo	@ B=0GS	2.25	2.5	2.75	V
Output Voltage Sensitivity	S	B=0 to ±600GS	1.7	2.0	2.4	mV/GS
Output Voltage Span	VOS		1.0 to (VCC-1.0)	0.8 to (VCC-0.8)		V
Output Resistor	Ro			60	120	Ω
Magnetic Field Range	B		±500	±800		GS
Linearity of Span				0.7		%
Output Noise		BW=10Hz to 10kHz		90		μV

Connection



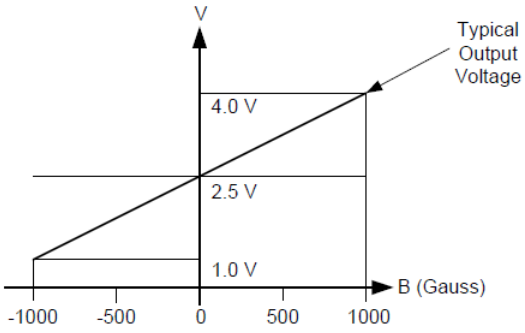
Package TO-92S (unit :mm)



Pin Arrangement:

1. Vcc
2. 2. GND
3. 3. OUTPUT

Transfer Characteristics (VCC=5V)



When there is no outside magnetic field (B=0GS), the quiescent output voltage is one-half of the supply voltage in general. If a south magnetic pole approaches to the front face (the side with marking ID) of the Hall Effect sensor, the circuit will drive the output voltage higher. Contrary, a north magnetic pole will drive the output voltage lower. The variations of voltage level up or down are symmetrical. Greatest magnetic sensitivity is obtained with a supply voltage of 6V, but at the cost of increased supply current and a slight loss of output symmetry. So, it is not recommended to work in such condition unless the output voltage magnitude is a main issue. The output signal can be capacitively coupled to an amplifier for boosting further if the changing frequency of the magnetic field is high.

Note:

- Mechanical Stress Should be lessened as far as possible in the process of assembly
- The soldering temperature at the leads should be less than 260°C with 5 seconds.
- If N pole is approaching hall-effect ICs from the back side of the package, output voltage will increase, S pole is approaching ICs from the back side, output voltage will reduce; and if from the branded side of the package, the output situation is just to the contrary.

CYLF50 Linear Hall Effect Sensor IC

The CYLF50 Hall-effect sensors accurately track extremely small changes in magnetic flux density-changes generally too small to operate Hall-effect switches.
As motion detectors, gear tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.
Each Hall-effect integrated circuit includes a Hall sensing element, linear amplifier, and emitter-follower output stage. Problems associated with handling tiny analog signals are minimized by having the Hall cell and amplifier on a single chip.

Features

Very high sensitive	2.7V to 7V power supply
Flat response to 23 kHz	Package : SIP-3L
Lower low-noise output	

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Block Diagram

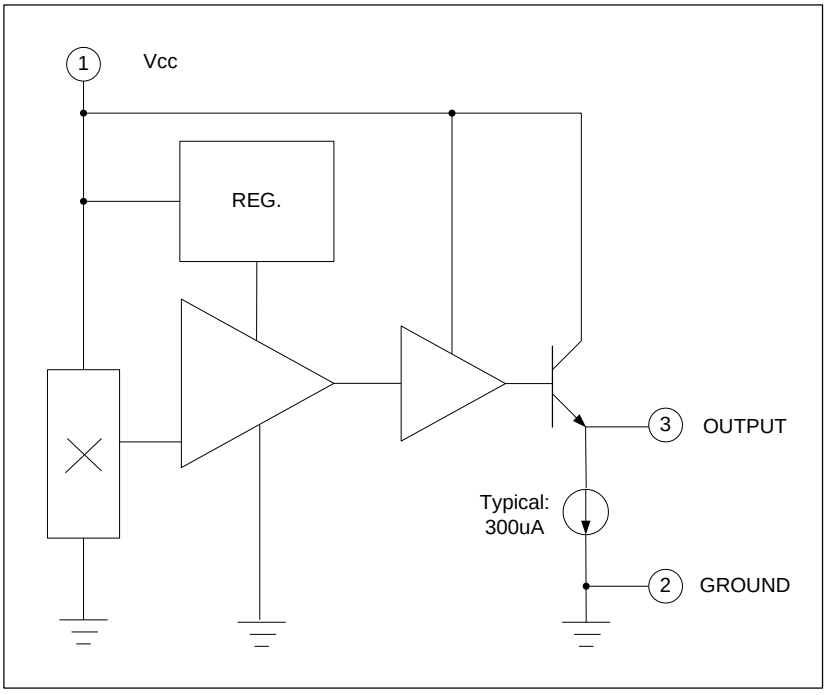


Figure.1

Recommended Operating Conditions

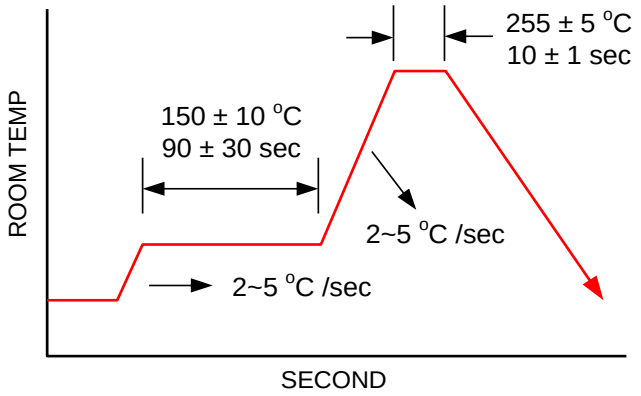
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}	-	2.7		7.0	V
Operating Temperature Range	T_A	-	-20		85	℃

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operating Temperature	T_{OP}	-	-20		85	℃
Storage Temperature	T_{ST}	-	-55		165	℃
DC Supply Voltage	V_{DD}	-	2.7		7	V
Supply Current	I_{DD}	-			10	mA
Magnetic Flux Density	B	-			Unlimited	G
Junction temperature	T_J				160	℃
Lead Temperature		10sec			260	℃

Electrical Characteristics V_{DD}=5.0V, T_A=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Average Supply Current(no load)	I_{DD}	-		6.0	10	mA
Quiescent Output Voltage	V_{OUT}	B=0G	2.35	2.50	2.65	V
Sensitivity	ΔV_{OUT}	B=0 G to ±900G	1.00	1.20	1.40	mV/G
Linearity (% of Span)				<0.7		%



Soldering Condition

Figure 2

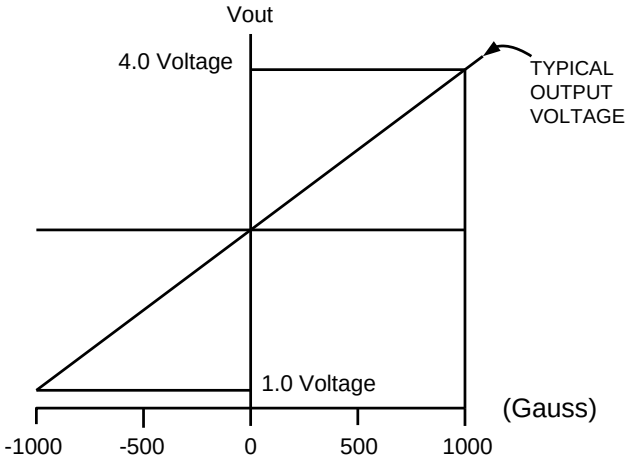


Figure 3 Transfer Characteristics (V_{DD}=5.0V)

Pin Connection

[Top View]

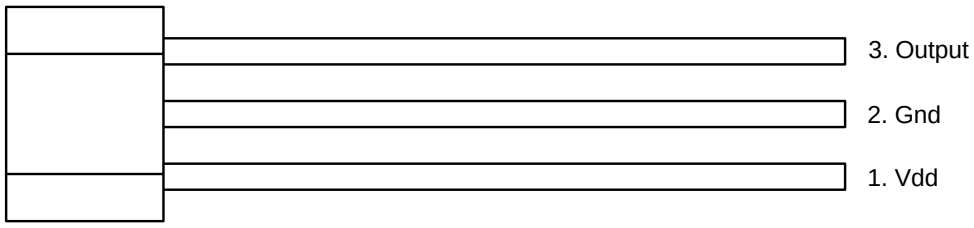


Figure 4

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Pin Descriptions

Name	I/O	Pin No.	Description
Vdd	P	1	**Positive power supply**
Gnd	G	2	**Ground**
Output	O	3	**Driver output**

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

Marking Information

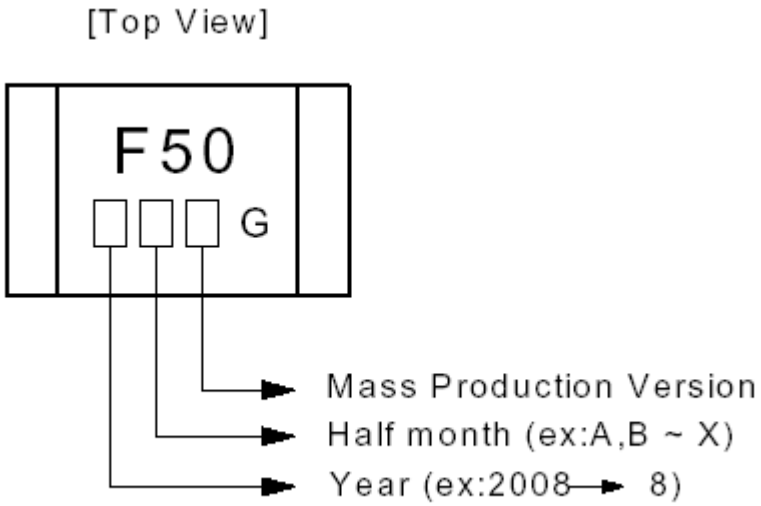


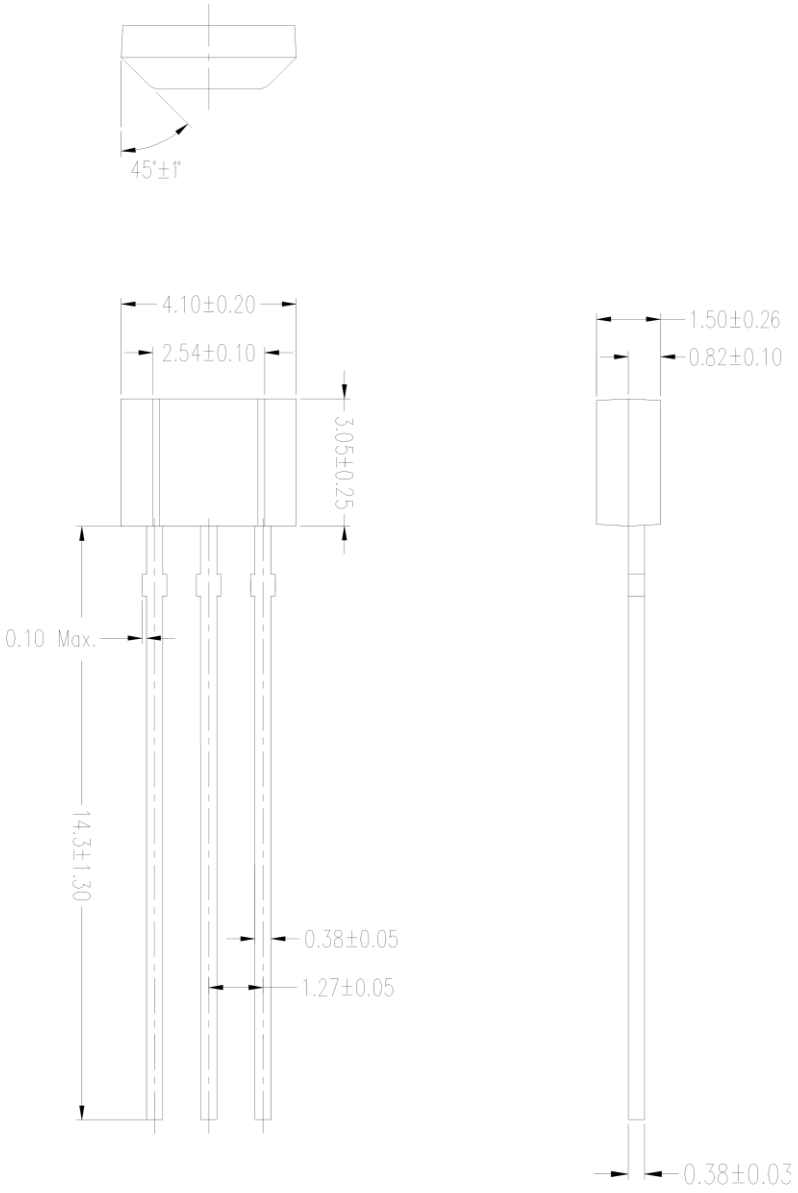
Figure 5

Order Information

Part Number	Operating Temperature	Package	MOQ
CYLF50	-20 ℃ to +85 ℃	SIP-3L	1000ea

Package Dimension (Unit: mm)

SIP-3L(Pb Free)



Linear Hall Effect Sensors (Elements)

CYSJ106C and CYSJ166A GaAs HALL-EFFECT ELEMENTS

CYSJ106C and CYSJ166A series Hall-effect element is an ion-implanted magnetic field sensor made of mono-crystal gallium arsenide (GaAs) semiconductor material group III-V using ion-implanted technology. It can convert a magnetic flux density signal linearly into voltage output.

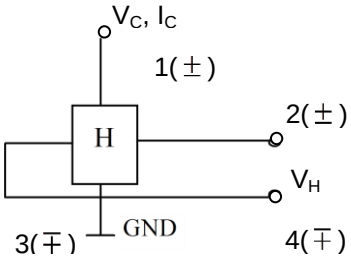
FEATURES

- High Linearity
- Superior Temperature Stability
- Miniature Package
- Wide measuring range 0-3T

TYPICAL APPLICATION

- Magnetic Field Measurement
- DC Brushless Motor
- Current Sensor
- Non-contact Switch
- Position Control
- Detection Of Revolution

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Parameter	Symbol	Value		Unit
		CYSJ106C	CYSJ166A	
Max. Input Current/Voltage	I_C/V_C	13mA / 10V	- / 12V	mA/V
Max. Input Power	P_D	150	150	mW
Operating temperature range	T_A	-40~125	-40~125	°C
Storage temperature range	T_S	-55~150	-55~150	°C

ELECTRICAL CHARACTERISTICS（T_A=25°C）

Parameter	Symbol	Test conditions	Value		Unit
			CYSJ106C	CYSJ166A	
Hall output voltage	V_H	B=100mT, I_C=8mA/V_C=6V	110～150	156～204	mV
Offset voltage	Vos(Vu)	V_C=6V, B=0mT	±11	±8	mV
Input resistance	R_{in}	B=0mT, I_C=0.1mA	650～850	1000～1500	Ω
Output resistance	R_{out}	B=0mT, I_C=0.1mA	650～850	1800～3000	Ω
Temperature coefficient of Hall output voltage	αV_H	I_C=5mA , B=100mT	-0.06	-0.06	%/°C
Temperature coefficient of input and output resistance	αR_{in} αR_{out}	I_C=0.1mA , B=0mT (Ta=25°C ~ 125°C)	0.3	0.3	%/°C
Linearity	ΔK_H	I_C=5mA B=0.1/0.5T	2	2	%

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Notes:

$$\alpha V_H = \frac{1}{V_H(T_1)} x \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} x100,$$

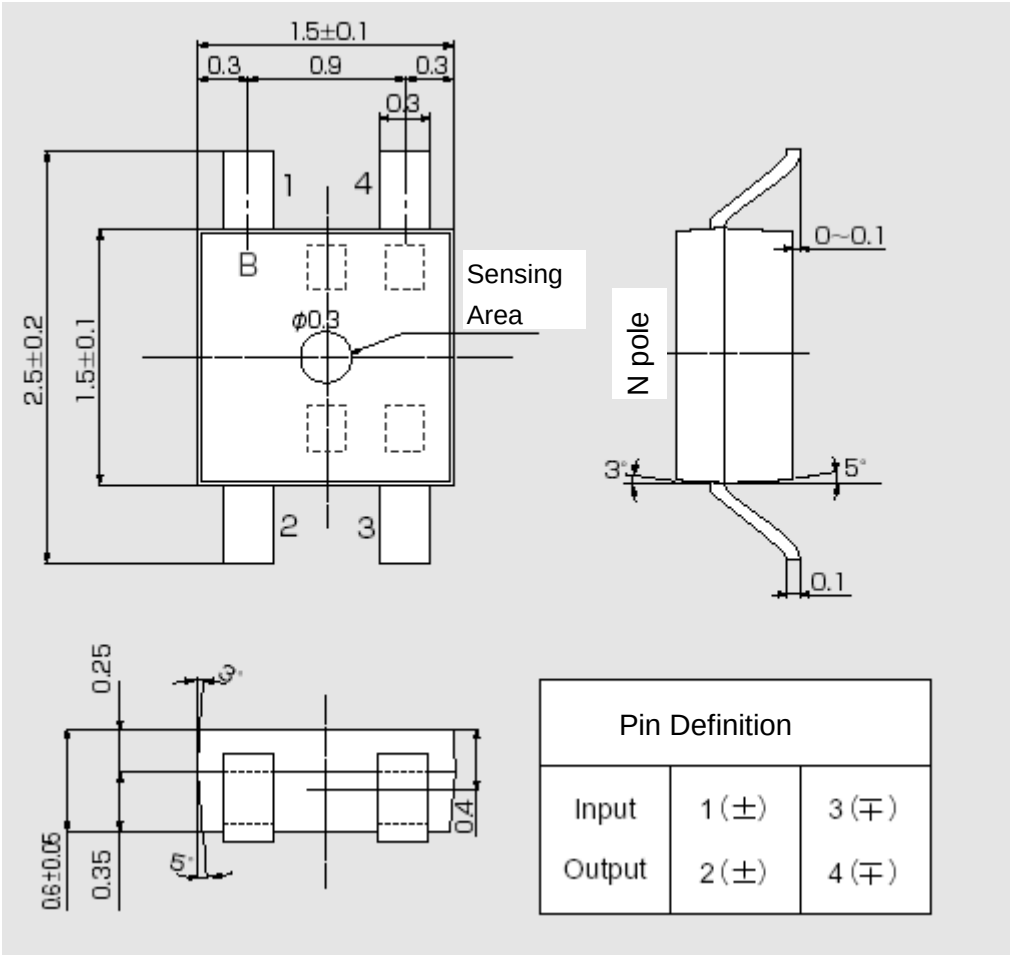
$$\alpha R_{in} = \frac{1}{R_{in}(T_1)} x \frac{R_{in}(T_2) - R_{in}(T_1)}{T_2 - T_1} x100$$

$$\Delta K_H = \frac{K(B_1) - K(B_2)}{[K(B_1) + K(B_2)]} x200$$

$$K_H = \frac{V_H}{I_C B}$$

T_1=25°C, T_2=125°C, B_1=0.5T, B_2=0.1T

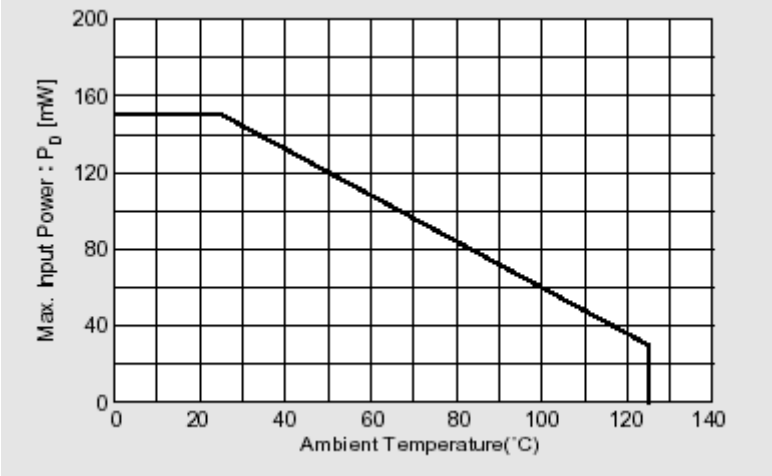
Package Outline Drawing (Unit: mm)



Pin Definition		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

Characteristic Curves

CYSJ106C: Allowable Package Power Dissipation



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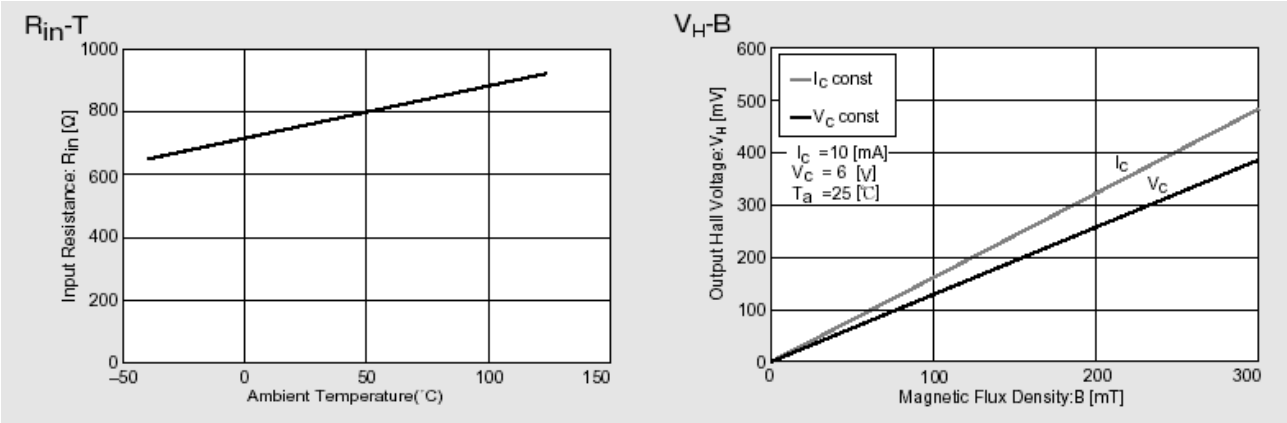
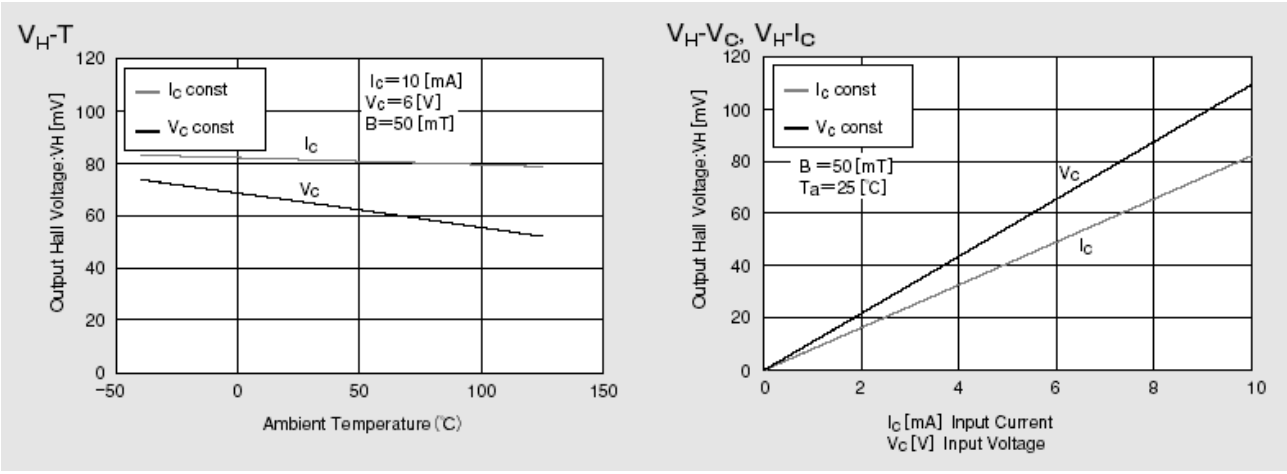
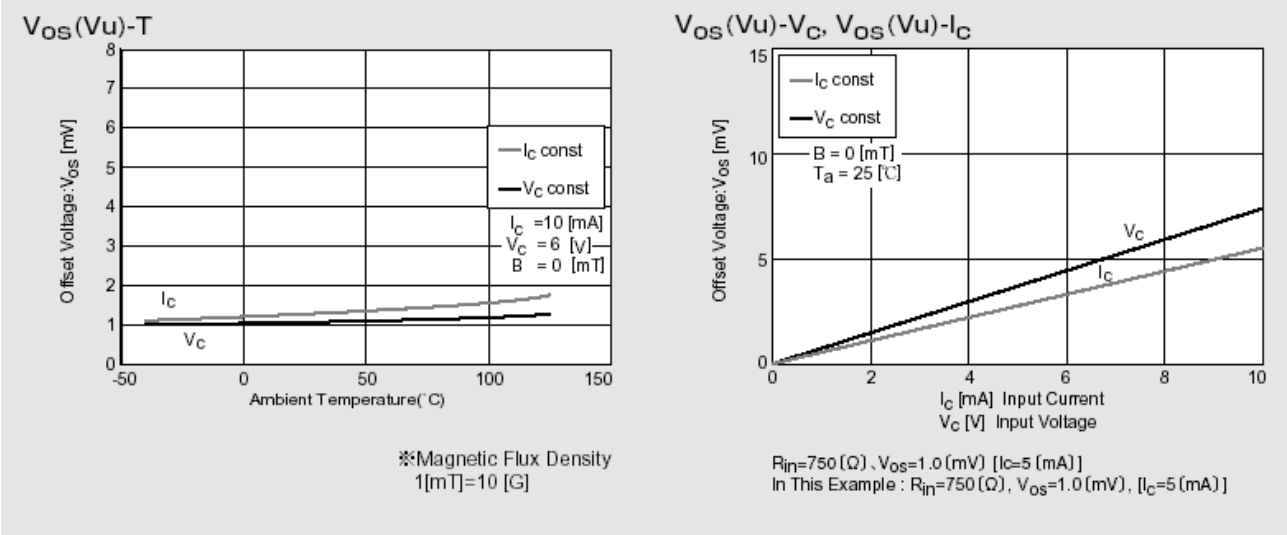
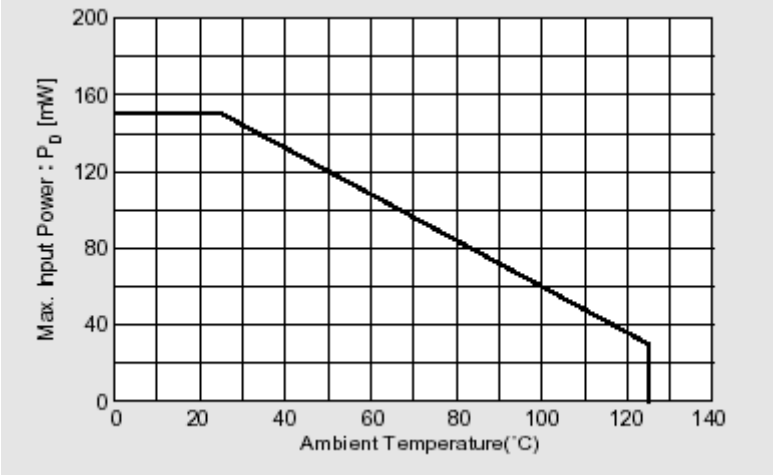
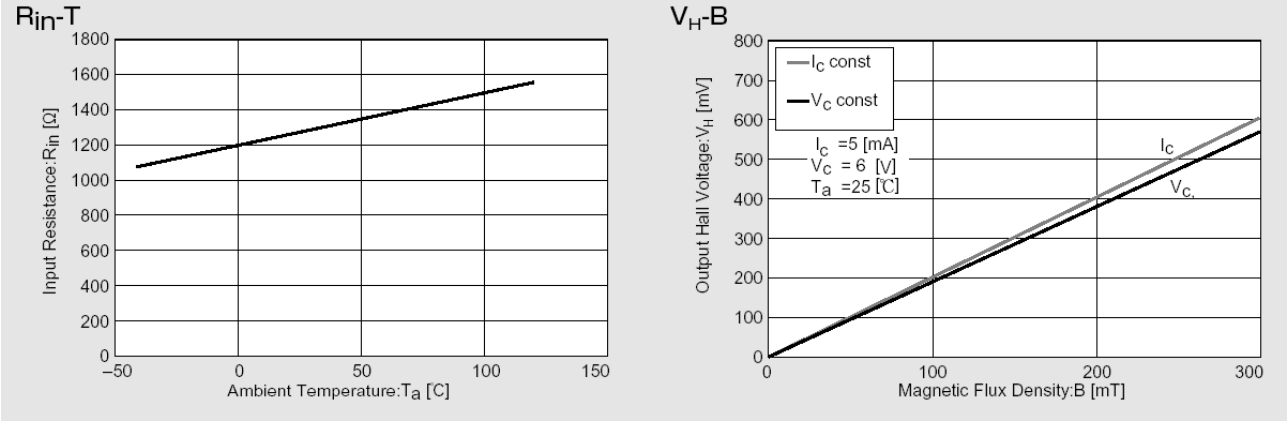


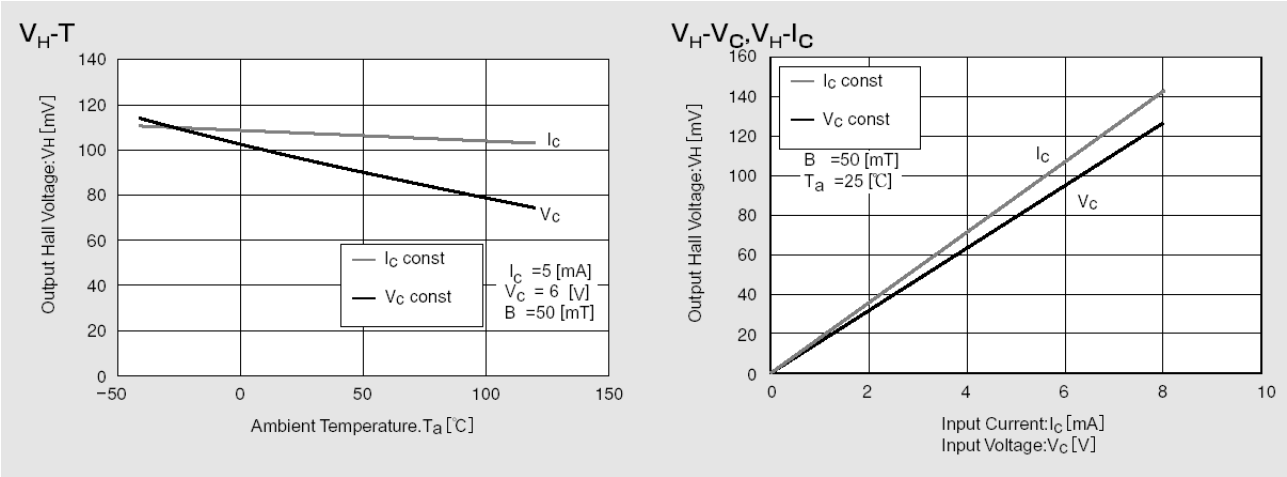


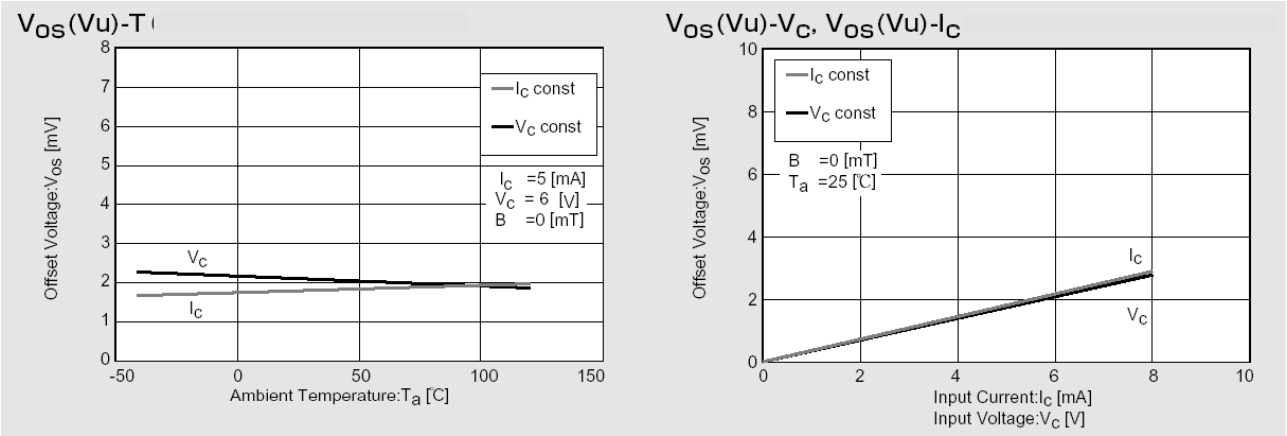


CYSJ166A: Allowable Package Power Dissipation



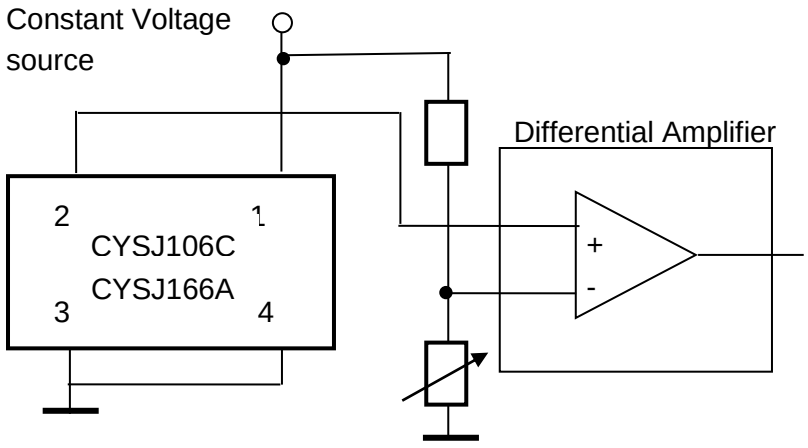






Connection

Circuit 1



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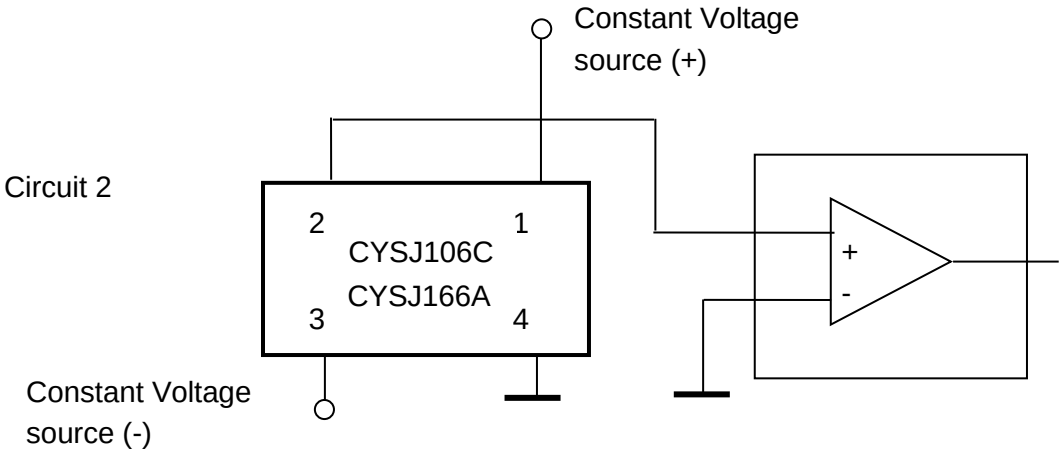


Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit 1):

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.

The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):

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

In this case the output voltage is equal to the Hall Voltage.

CYSJ362A GaAs HALL-EFFECT ELEMENTS

CYSJ362A series Hall-effect element is a ion-implanted magnetic field sensor made of mono-crystal gallium arsenide (GaAs) semiconductor material group III-V using ion-implanted technology. It can convert a magnetic flux density signal linearly into voltage output.

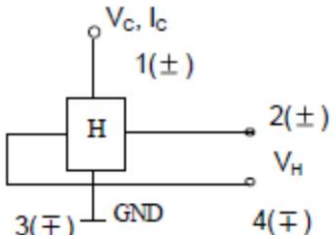
FEATURES

- High Linearity
- Superior Temperature Stability
- Miniature Package
- Replacements of **THS119**, **KSY14** and **KSY44** etc.

TYPICAL APPLICATION

- Magnetic Field Measurement
- DC Brushless Motor
- Current Sensor
- Non-contact Switch
- Position Control
- Detection of Revolution

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Parameter	Symbol	Value	Unit
Max. Input Voltage	V_C	12V	mA/V
Max. Input Power	P_D	150	mW
Operating temperature range	T_A	-40~125	°C
Storage temperature range	T_S	-55~150	°C
MTBF (Mean Time Before Failure)		>100k	hour

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Parameter	Symbol	Test conditions	Value	Unit
Hall output voltage	V_H	B=100mT, V_C=6V	156~204	mV
Offset voltage	Vos(Vu)	IV_C=6V, B=0	±8	mV
Input resistance	R_{in}	B=0mT, I_C=0.1mA	1000~1500	Ω
Output resistance	R_{out}	B=0mT, I_C=0.1mA	1800~3000	Ω
Temperature coefficient of Hall output voltage	αV_H	I_C=1mA , B=100mT (Ta=25°C ~ 125°C)	-0.06	%/°C
Temperature coefficient of input resistance	αR_{in}	I_C=0.1mA , B=0mT (Ta=25°C ~ 125°C)	0.3	%/°C
Linearity	ΔK_H	I_C=1mA B=0.1/0.5T	2	%

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Notes: V_H=VHM-V_{OS}(V_u) (VHM: meter indication)

$$\alpha V_H = \frac{1}{V_H(T_1)} x \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} x100,$$

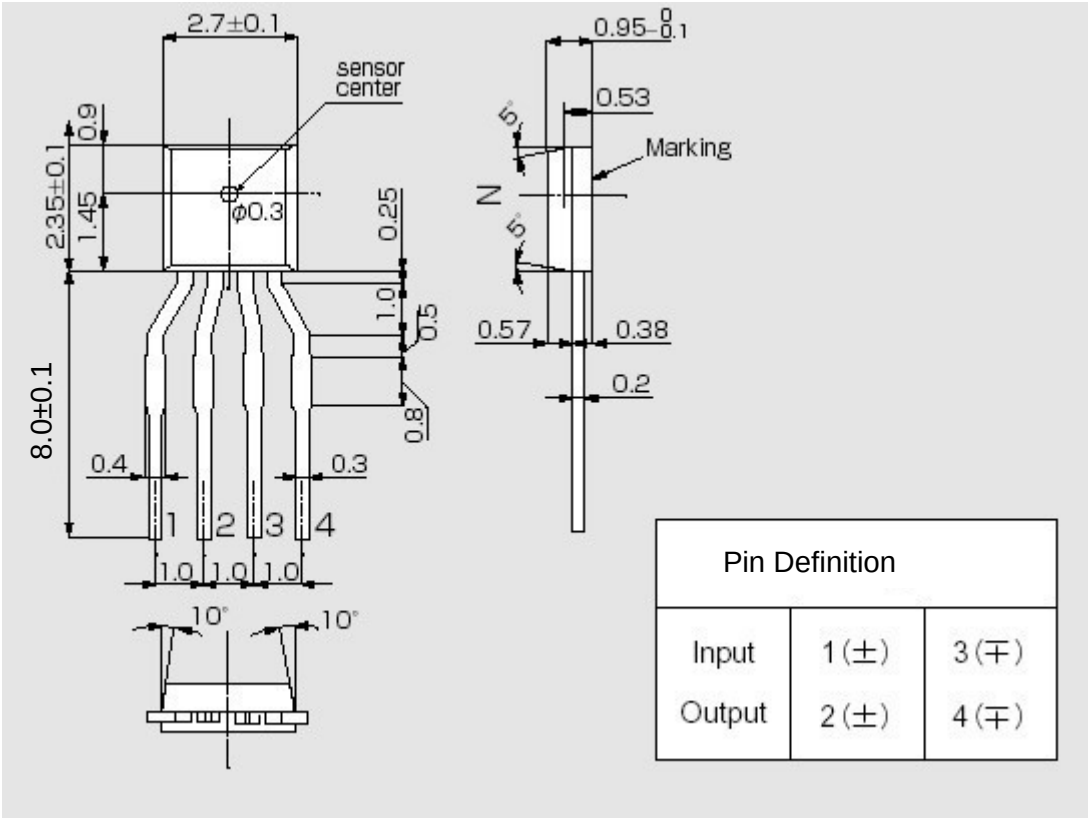
$$\alpha R_{in} = \frac{1}{R_{in}(T_1)} x \frac{R_{in}(T_2) - R_{in}(T_1)}{T_2 - T_1} x100$$

$$\Delta K_H = \frac{K(B_1) - K(B_2)}{[K(B_1) + K(B_2)]} x200$$

$$K_H = \frac{V_H}{I_C B}$$

T_1=25°C, T_2=125°C, B_1=0.5T, B_2=0.1T

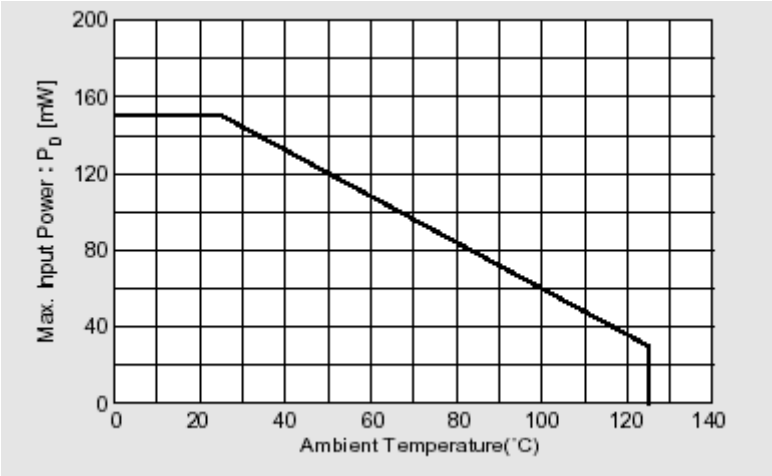
Package Outline Drawing (Unit: mm)



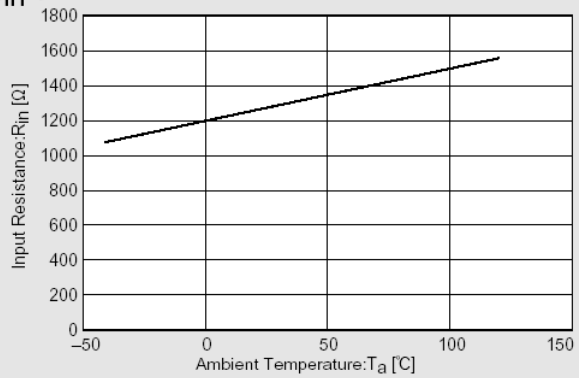
Pin Definition		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

Characteristic Curves

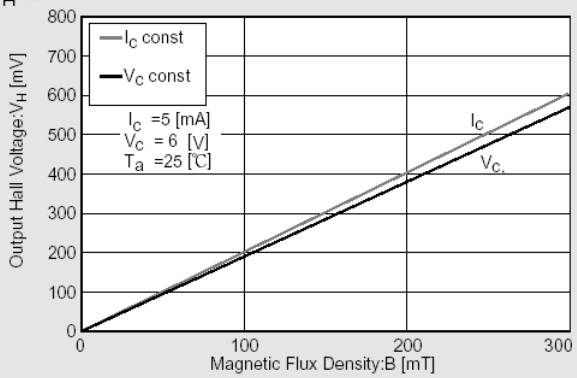
Allowable Package Power Dissipation



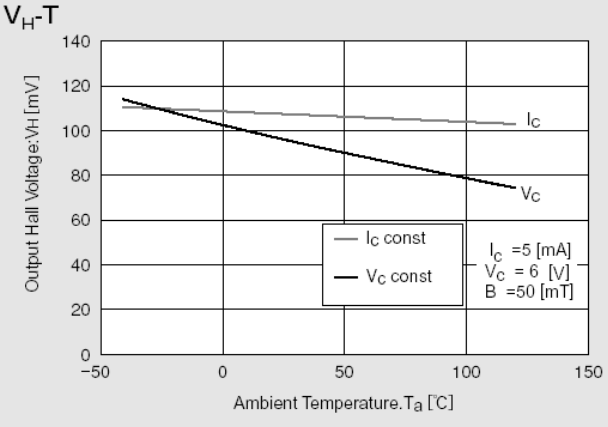
R_{in}-T



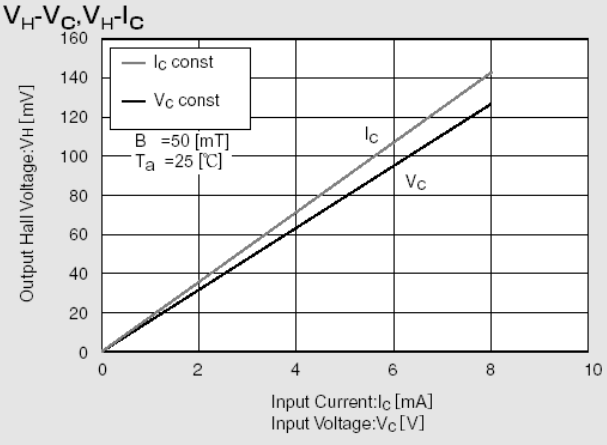
V_H-B

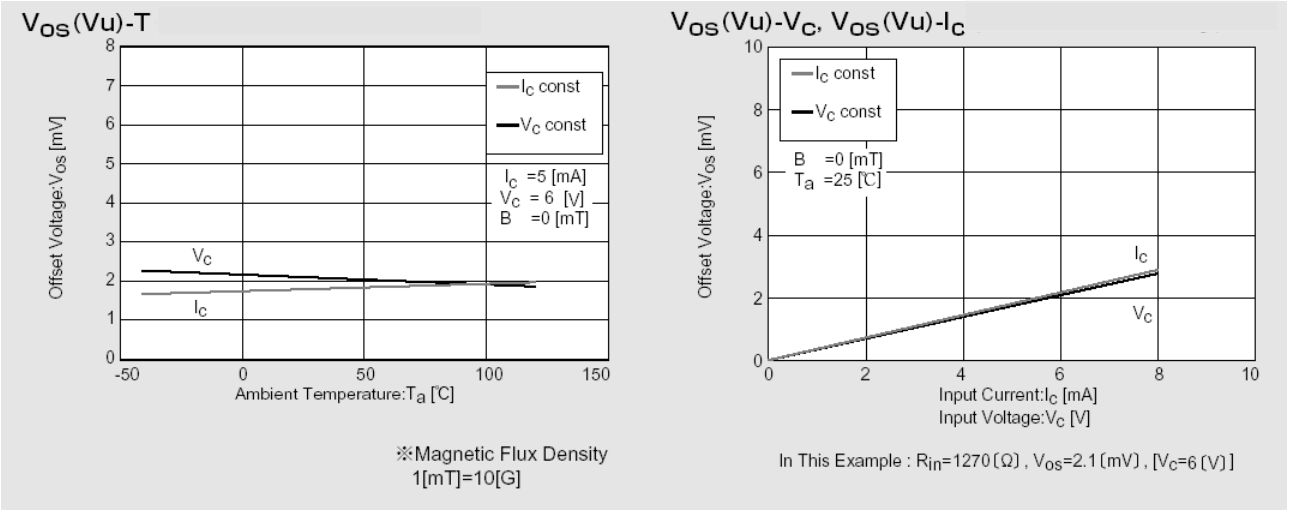


V_H-T

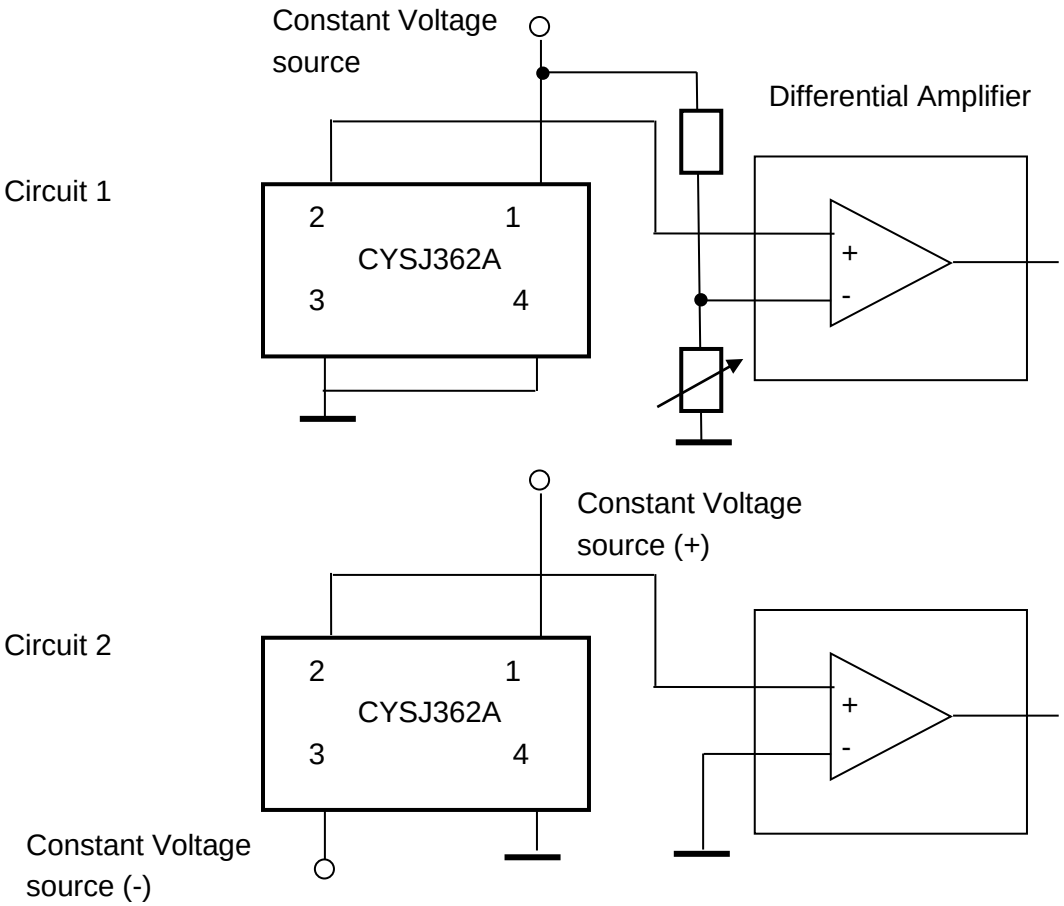


V_H-V_C,V_H-I_C




Vos(Vu)-T
Offset Voltage:Vos [mV]
Ambient Temperature:Ta [℃]
Ic const
Vc const
Ic =5 [mA]
Vc = 6 [V]
B =0 [mT]
※Magnetic Flux Density
1[mT]=10[G]
Vos(Vu)-Vc, Vos(Vu)-Ic
Input Current:Ic [mA]
Input Voltage:Vc [V]
B =0 [mT]
Ta =25 [℃]
In This Example : Rin=1270〔Ω〕, Vos=2.1〔mV〕, 〔Vc=6〔V〕〕

Connection


Constant Voltage source
Differential Amplifier
Circuit 1
CYSJ362A
Constant Voltage source (+)
Circuit 2
CYSJ362A
Constant Voltage source (-)

Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit 1):

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.

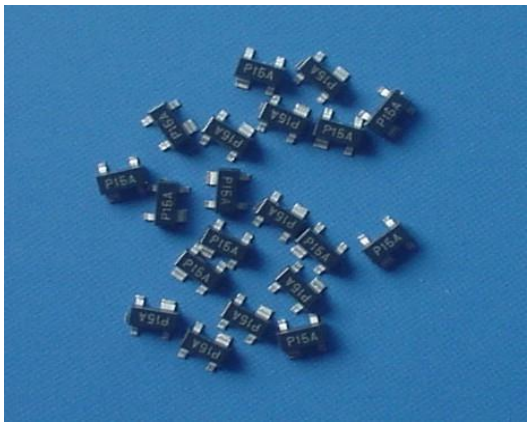
The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):

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

In this case the output voltage is equal to the Hall Voltage.

CY-P15A Hall Effect Sensor

CY-P15A 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 (1000V/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
- Wide measuring range (0.1μT-2T)

Applications:

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

1. Model

CY-P15A 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	6	V
Control Current	I_c	1.5	mA
Power Dissipation	P_D	9	mW
Operating Temperature	T_{op}	-100 ~ +180	^oC
Storage Temperature	T_s	-100 ~ +180	^oC
Soldering Temperature[#]	T_{sol}	260	^oC

[#]Soldering time: 10 seconds

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3. Electrical Characteristics

Parameter	Symbol	Test Condition	MIN	TYP	MAX	Unit
Output Hall Voltage	V_H	Ic=1mA, B=100mT	-	100	-	mV
Residual Ratio*[1]	V_{HO}/V_H	Ic=1mA	-10	-	+10	%
Residual Ratio*[1]	V_{HO}/V_H	Ic=0.5mA	-4	-	+4	%
Input Resistance	R_{IN}	Ic=0.1mA, B=0 mT	3.9	4	4.4	kΩ
Output Resistance	R_{OUT}	Ic=0.1mA, B=0 mT	3.9	4	4.4	kΩ
Temperature Coefficient of Hall Voltage*[2]	α	Ic=1mA, B=100mT (T_1= -100 °C,T_2=180 °C)	-0.05	-0.1	-0.13	%/ °C
Temperature Coefficient of Input Resistance*[3]	β	Ic=1mA, B=0 mT (T_1= -100 °C,T_2=180 °C)	-	0.3	0.4	%/ °C
Linearity of Hall Voltage*[4]	γ	Ic= 1mA, B_1=60mT,B_2=500mT	-	1	1.5	%

*1 $$Residual\,Ratio = \frac{V_{Ho}(B = 0mT)}{V_H(B = 100mT)}$$

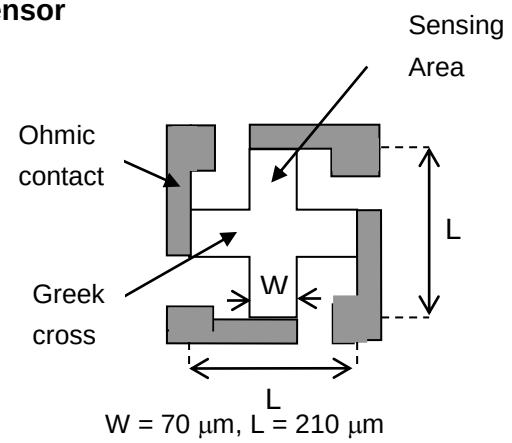
*2 $$\alpha = \frac{1}{V_H(T_1)} \times \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} \times 100$$

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

*4 $$\gamma = \frac{K_H(B_2) - K_H(B_1)}{\frac{1}{2}[K_H(B_2) + K_H(B_1)]} \times 100 \qquad K_H = \frac{V_H}{IB}$$

V_{Ho}: Offset Voltage
B: Magnetic Flux Density
T_1, T_2: Ambient Temperature
K_H: Current Sensitivity

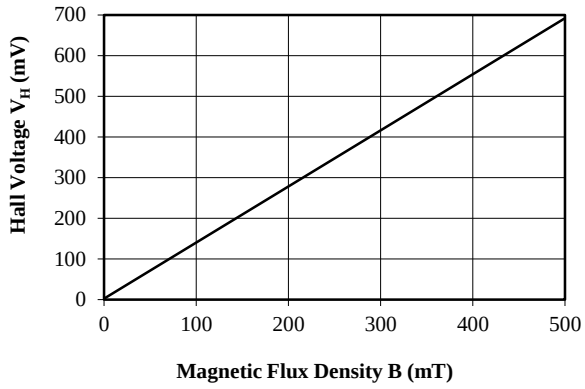
4. Shape of the 2DEG Hall sensor



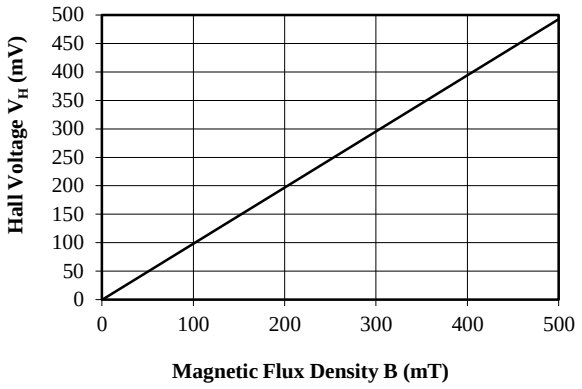
W = 70 µm, L = 210 µm

5. Typical Characteristics

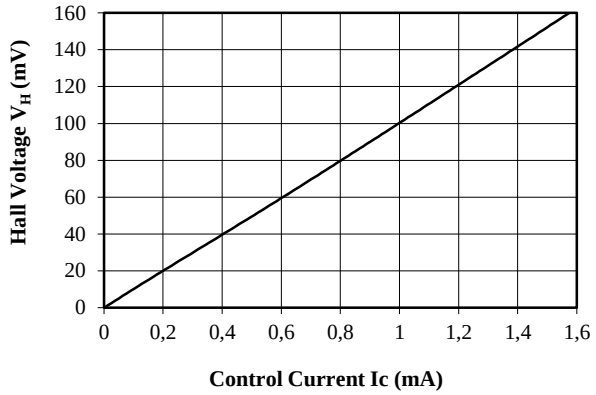
Hall Voltage vs.Magnetic Flux Density
Vc= 6V



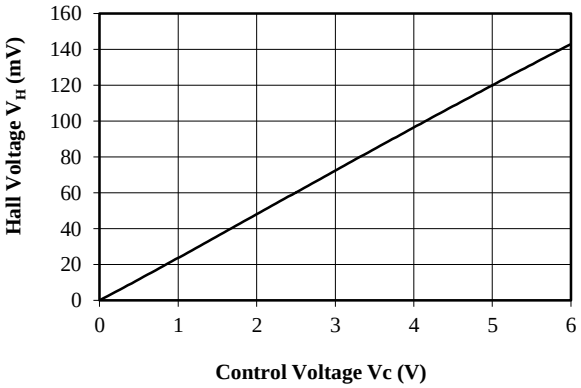
Hall Voltage vs.Magnetic Flux Density
Ic=1 mA



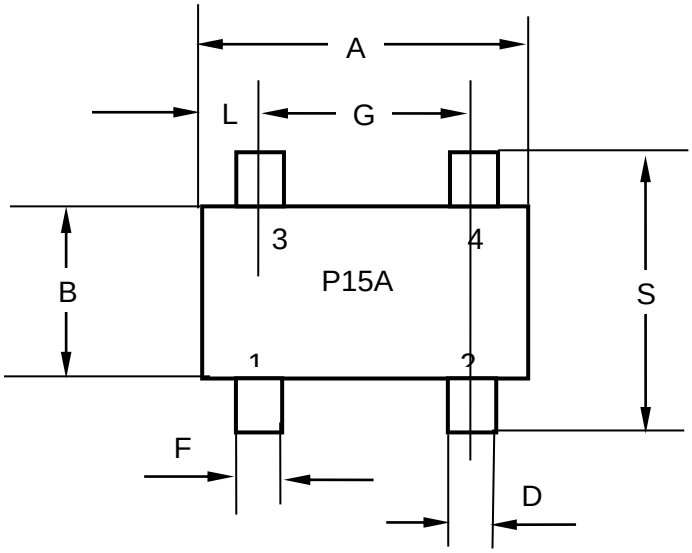
Hall Voltage vs.Control Current
B=100 mT



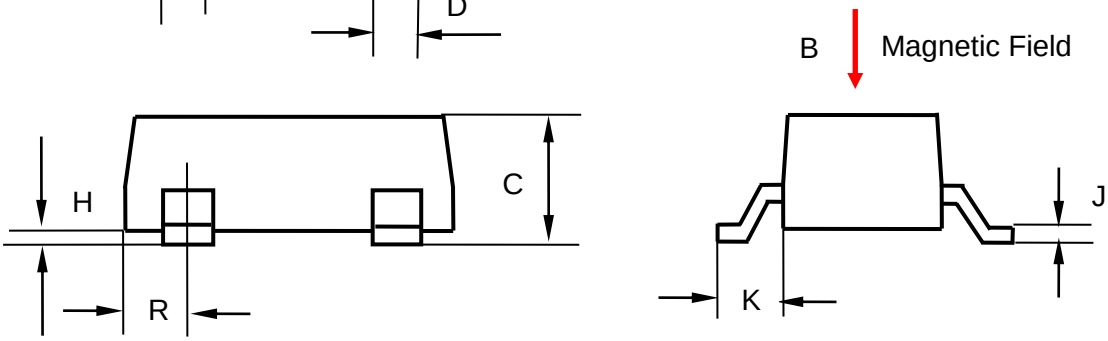
Hall Voltage vs.Control Voltage
B=100 mT



6. Outline drawings (unit: mm)



SOT 143 packaged Hall Sensor



Terminal Connection

Terminal No.		Polarity
1	Input	(+)
2	Output	(-)
3	Output	(+)
4	Input	(-)

SOT 143 Package Dimensions

	Min (mm)	Max (mm)
A	2.8	3.04
B	1.2	1.39
C	0.89	1.14
D	0.39	0.5
F	0.39	0.5
G	1.78	2.03
H	0.013	0.1
J	0.08	0.15
K	0.46	0.6
L	0.45	0.6
R	0.45	0.6
S	2.11	2.48

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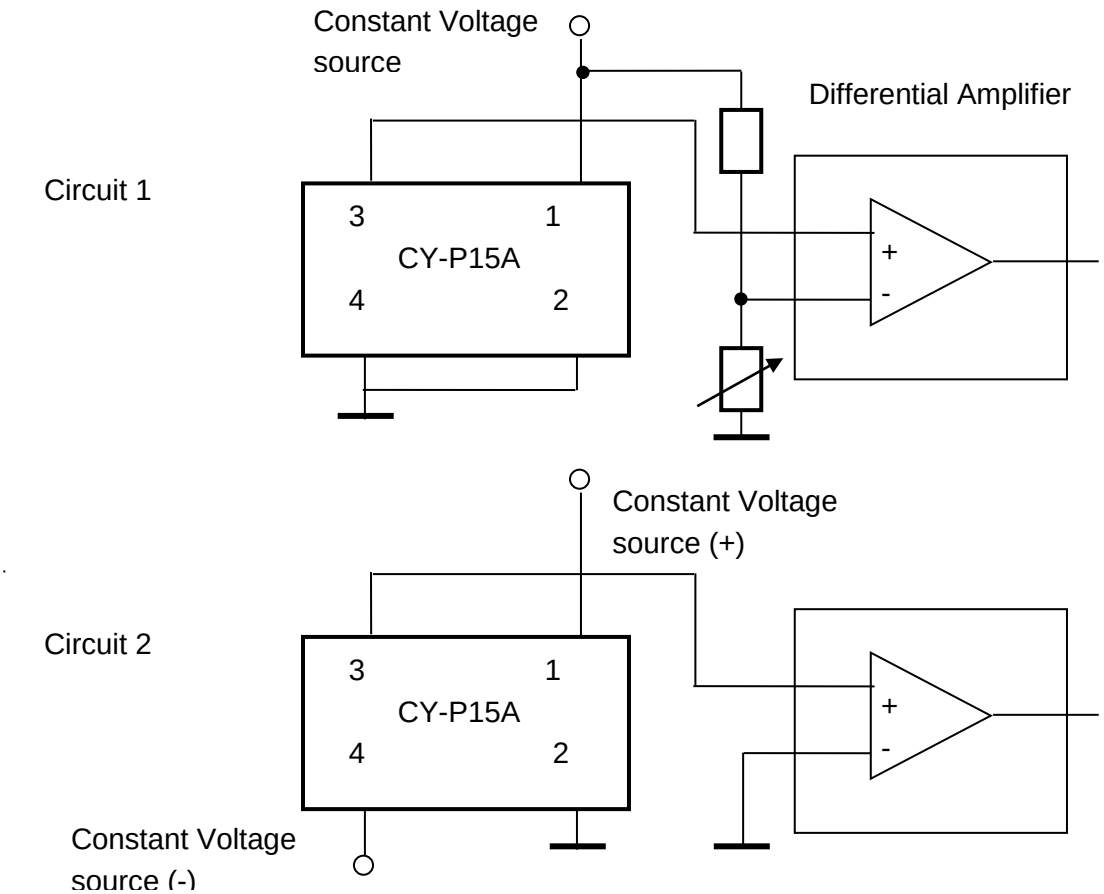
7. Connection



8. Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit 1):

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

One can only measure the positive voltage at the pin 3. 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.

The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):

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

In this case the output voltage is equal to the Hall Voltage.

CYTHS124 GaAs HALL-EFFECT ELEMENTS

CYTHS124 Hall-effect element is a ion-implanted magnetic field sensor made of mono-crystal gallium arsenide (GaAs) semiconductor material group III-V using ion-implanted technology. It can convert a magnetic flux density signal linearly into voltage output.

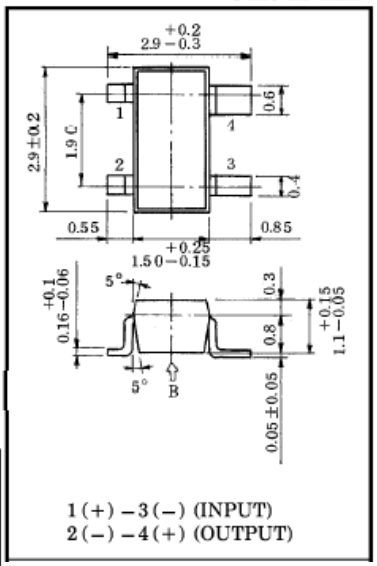
HIGH STABILITY MOTOR CONTROL.

DIGITAL TACHOMETER.

CRANK SHAFT POSITION SENSOR.

- Excellent Temperature Characteristics.
- Wide Operating Temperature Range. (; −55~125°C)
- Excellent Output Voltage Linearity.
- High Internal Resistance. : R_d=1000Ω (Min.)
- Low Residual Voltage Ratio. : V_{HO}/V_H=±5% (Max.)

Unit in mm



Unit weight: 0.013g

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Control Voltage	V_C	12	V
Power Dissipation	P_D	150	mW
Operating Temperature Range	T_{opr}	−55~125	°C
Storage Temperature Range	T_{stg}	−55~150	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Internal Resistance (Input)	R_d	I_C=1mA	1000	1250	1500	Ω
Residual Voltage Ratio	V_{HO}/V_H	V_C=5V, B=0/B=0.1T	—	—	±5	%
Hall Voltage (Note 1)	V_H	V_C=5V, B=0.1T	130	150	170	mV
Temperature Coefficient (Note 2)	V_{HT}	I_C=5mA, B=0.1T T1=25°C, T2=125°C	—	—	−0.06	%/°C
Linearity (Note 3)	ΔK_H	V_C=5V, B1=0.05T, B2=0.1T	—	—	2	%
Specific Sensitivity (Note 4)	K*	V_C=5V, B=0.1T	—	30	—	$\times 10^{-2}$/T
Internal Resistance (Output)	R_{OUT}	I_C=1mA	1800	2375	3000	Ω

Note 1 : $V_H = V_{HM} - V_{HO}$ (V_{HM} is meter indication)

Note 2 : $V_{HT} = \frac{1}{V_{H(T1)}} \cdot \frac{V_{H(T2)} - V_{H(T1)}}{T2 - T1} \times 100\,(\%/°C)$ V_{HO} : Residual Voltage

Note 3 : $\Delta K_H = \frac{K_{H(B2)} - K_{H(B1)}}{1/2\{K_{H(B1)} + K_{H(B2)}\}} \times 100\,(\%)$, $K_H = \frac{V_H}{I_C \cdot B}$ K_H : Product Sensitivity

Note 4 : $K^* = V_H/(R_d \times I_C \times B) = K_H/R_d$

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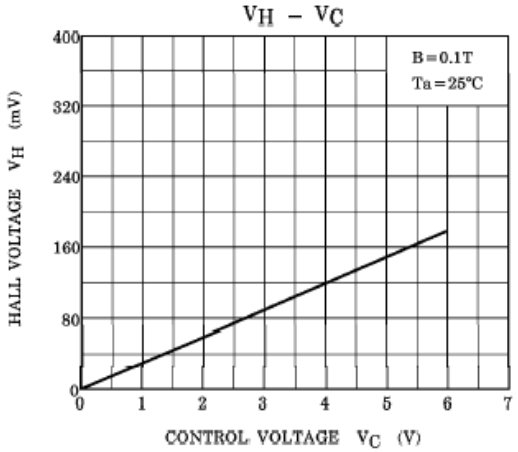
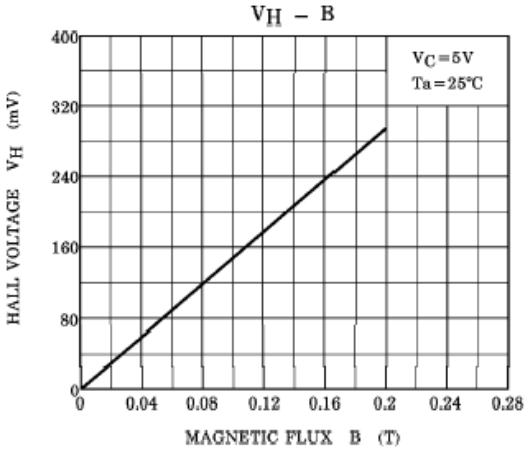
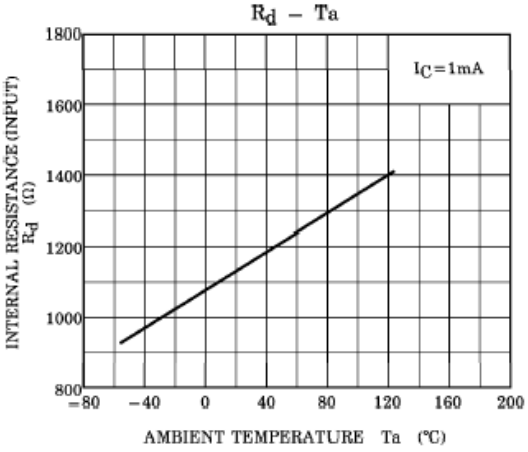
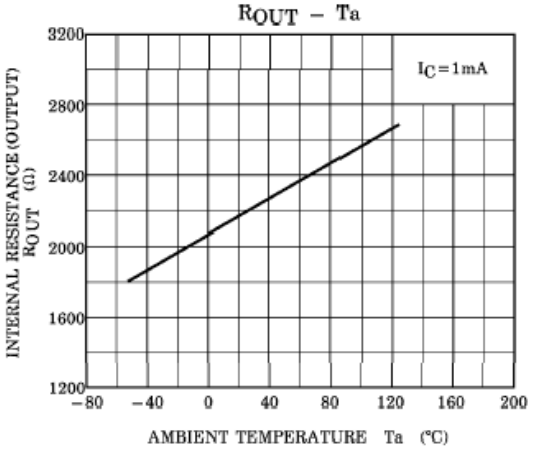
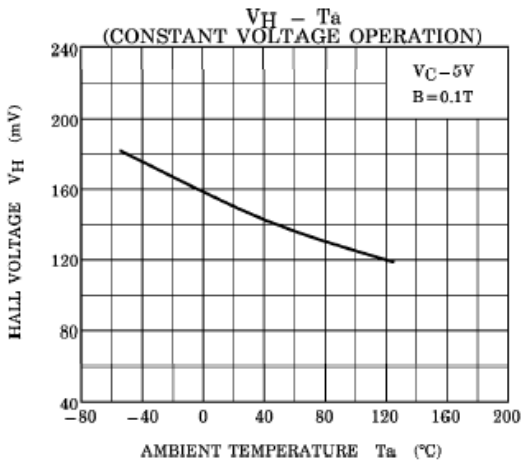
Characteristic Curves



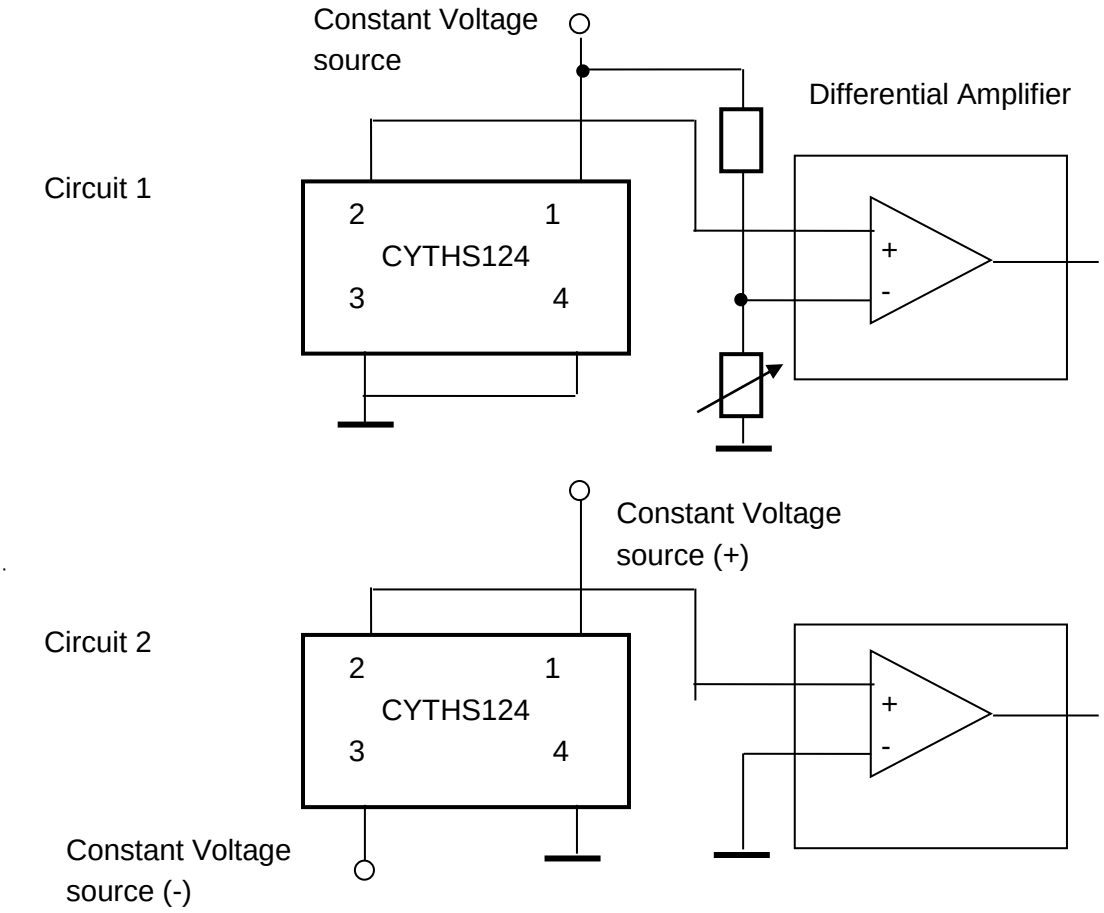








Connection



Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit 1):

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.

The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):

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

In this case the output voltage is equal to the Hall Voltage.

InSb Hall Effect Elements (Analog Output)

CYSH12AF, CYTY108A and CYTY302B (InSb) HALL-EFFECT ELEMENT

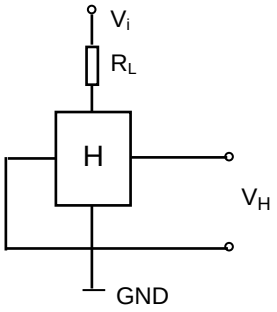
Hall-effect element CYSH12AF, CYTY108A and CYTY302B is made of compound semiconductor material indium stibnite (InSb), which utilizes the Hall-effect principle. It can convert a magnetic flux density signal linearly into voltage output. It is new generation of Hall Effect element CYTY101A.

FEATURES

- High Magnetic Sensitivity
- Low Offset Voltage
- Miniature Package

TYPICAL APPLICATION

- Magnetic Field Measurement
- Current Sensor
- Detection of Speed
- DC Brushless Motor
- Position Control



1. Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating			Unit
		CYSH12AF	CYTY108A	CYTY302B	
Maximum Input Current	Imax	20 (at 25°C)			mA
Maximum Power Dissipation	Pmax	150 (at 25°C)			mW
Operating Temperature Range	Top	− 40 ~ + 110			°C
Storage Temperature Range	Tst	− 40 ~ + 150	− 40 ~ + 125	− 40 ~ + 125	°C

2. Electrical Characteristics (Measured at 25°C)

CYSH12AF:

Parameter	Symbol	Measurement Conditions	Min	Max	Unit
Output Hall Voltage	VH	Vin = 1V, B = 50mT	196	415	mV
Input Resistance	Rin	I = 0.1mA	240	550	Ω
Output Resistance	Rout	I = 0.1mA	240	550	Ω
Offset Voltage	VO	Vin = 1V, B = 0G	− 7	+ 7	mV
Temp. Coeff. of VH	α	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Temp. Coeff. of Rin, Rout	β	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C

CYTY108A:

Parameter	Symbol	Measurement Conditions	Min	Max	Unit
Output Hall Voltage	VH	Vin = 1V, B = 50mT	196	415	mV
Input Resistance	Rin	I = 0.1mA	240	550	Ω
Output Resistance	Rout	I = 0.1mA	240	550	Ω

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Offset Voltage	VO	Vin = 1V, B = 0G	− 7	+ 7	mV
Temp. Coeff. of VH	α	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Temp. Coeff. of Rin, Rout	β	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Dielectric strength		100V DC	1.0		MΩ

CYTY302B:

Parameter	Symbol	Measurement Conditions	Min	Max	Unit
Output Hall Voltage	VH	Vin = 1V, B = 50mT	168	415	mV
Input Resistance	Rin	I = 0.1mA	240	550	Ω
Output Resistance	Rout	I = 0.1mA	240	550	Ω
Offset Voltage	VO	Vin = 1V, B = 0G	− 7	+ 7	mV
Temp. Coeff. of VH	α	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Temp. Coeff. of Rin, Rout	β	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Dielectric strength		100V DC	1.0		MΩ

$V_H = V_{HM} - V_O$ (V_{HM} : The output voltage measured at 500G.)

3. Rank Classification and Mark on Output Hall Voltage

CYSH12AF:

Output Hall Voltage,VH (mV)	Rank	Mark	Measurement Conditions
196 ~ 236	D	SSD	Vin=1V, B=50mT (Constant Voltage)
228 ~ 274	E	SSE	
266 ~ 320	F**	SSF	
310 ~ 370	G*	SSG	
360 ~ 415	H*	SSH	

CYTY108A:

Output Hall Voltage,VH (mV)	Rank	Measurement Conditions
196 ~ 236	D	Vin=1V, B=50mT (Constant Voltage)
228 ~ 274	E	
266 ~ 320	F	
310 ~ 370	G*	
360 ~ 415	H*	

CYTY302B:

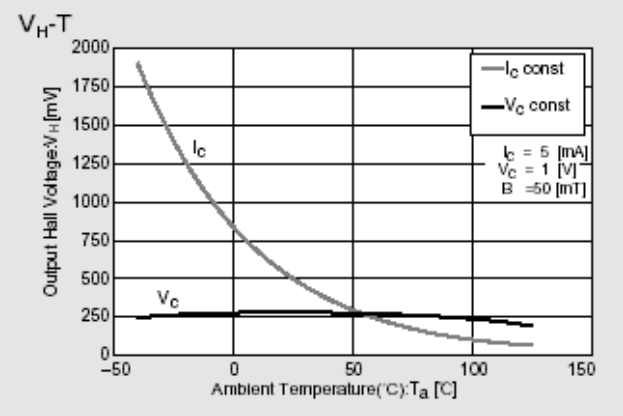
Output Hall Voltage,VH (mV)	Rank	Measurement Conditions
168 ~ 204	C	Vin=1V, B=50mT (Constant Voltage)
196 ~ 236	D	
228 ~ 274	E	
266 ~ 320	F	
310 ~ 370	G*	
360 ~ 415	H*	

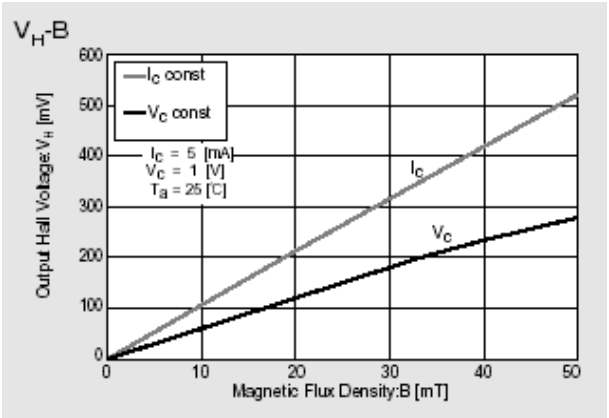
* Sensors with rank G and H are custom made sensors

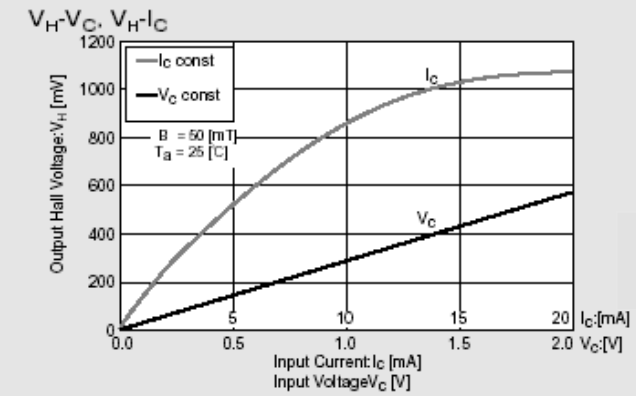
** As standard sensor we offer our customers rank F

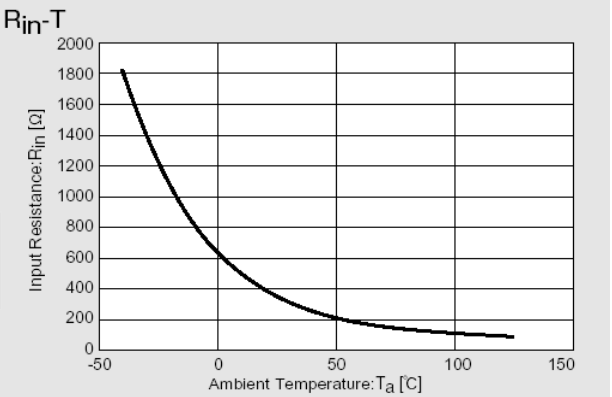
4. CHARACTERISTIC CURVES (only for references)

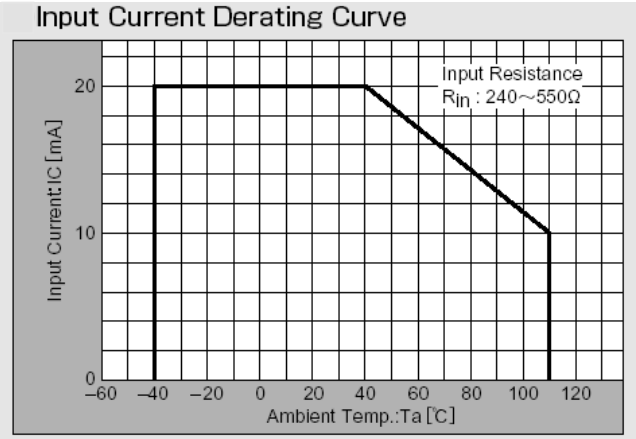
CYSH12AF:

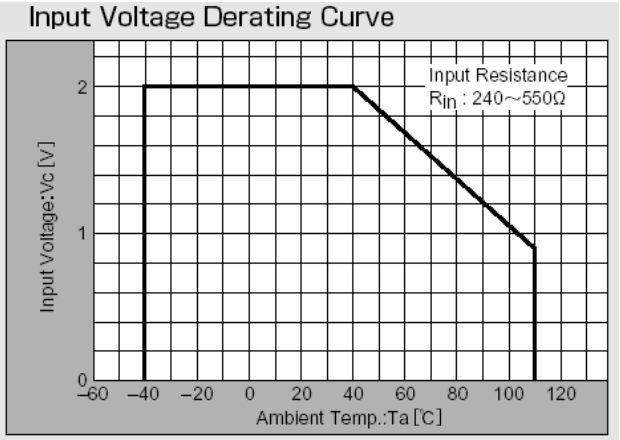




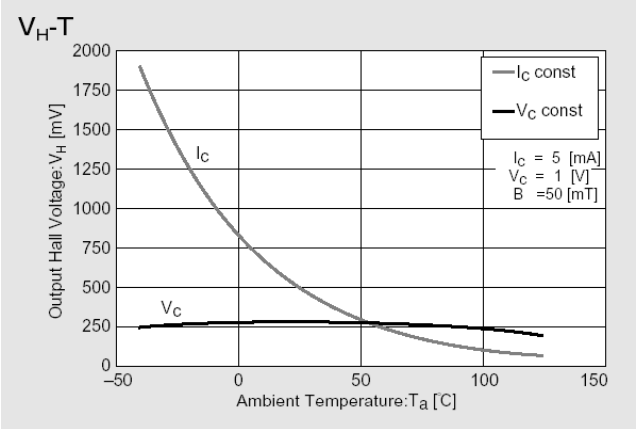


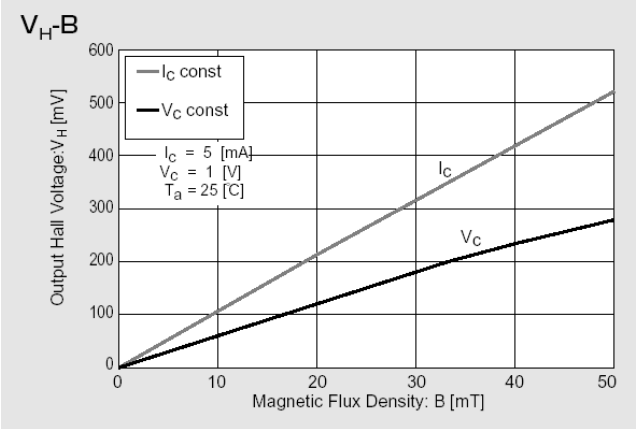


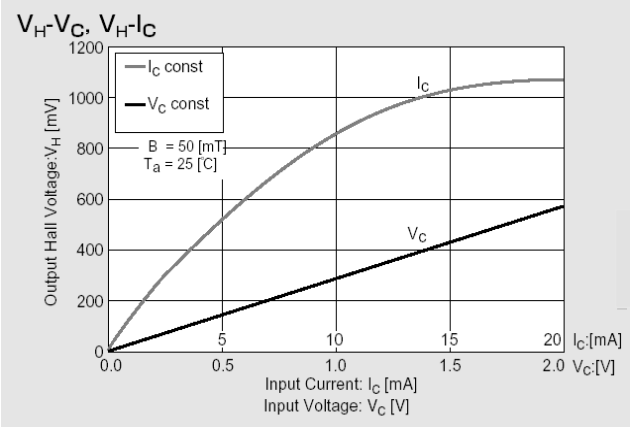


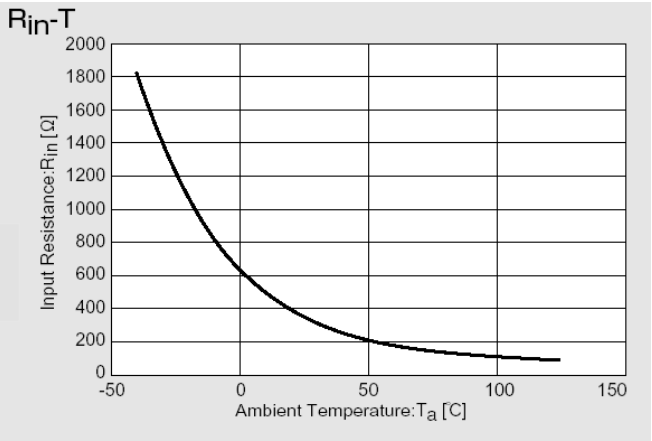


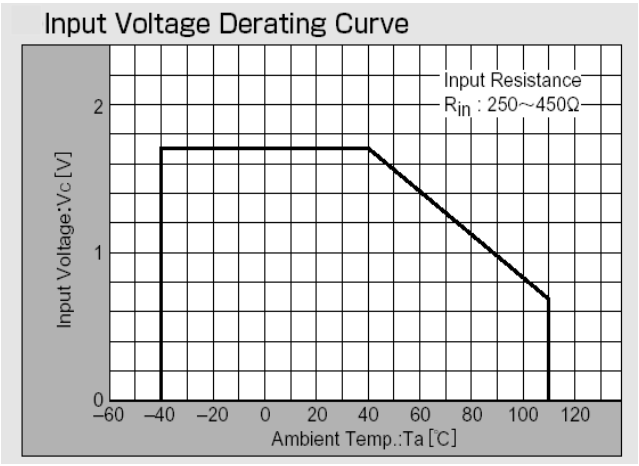
CYTY108A:

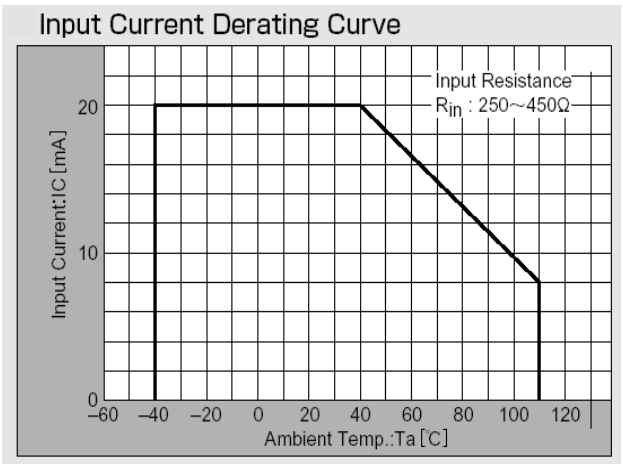

V_H-T
Output Hall Voltage:V_H [mV]
Ambient Temperature:T_a [C]
I_C const
V_C const
I_C = 5 [mA]
V_C = 1 [V]
B =50 [mT]


V_H-B
Output Hall Voltage:V_H [mV]
Magnetic Flux Density: B [mT]
I_C const
V_C const
I_C = 5 [mA]
V_C = 1 [V]
T_a = 25 [C]

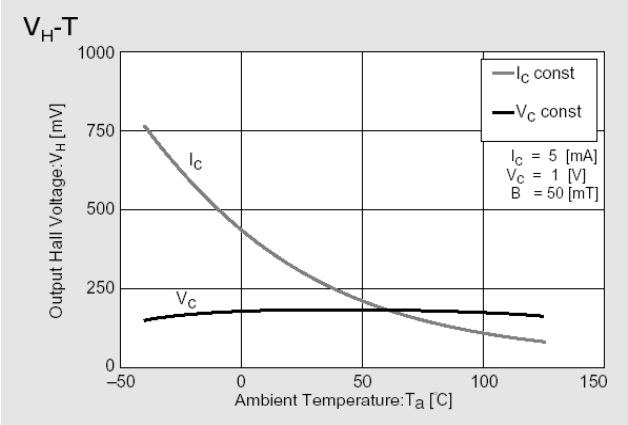

V_H-V_C, V_H-I_C
Output Hall Voltage:V_H [mV]
Input Current: I_C [mA]
Input Voltage: V_C [V]
I_C const
V_C const
B = 50 [mT]
T_a = 25 [C]

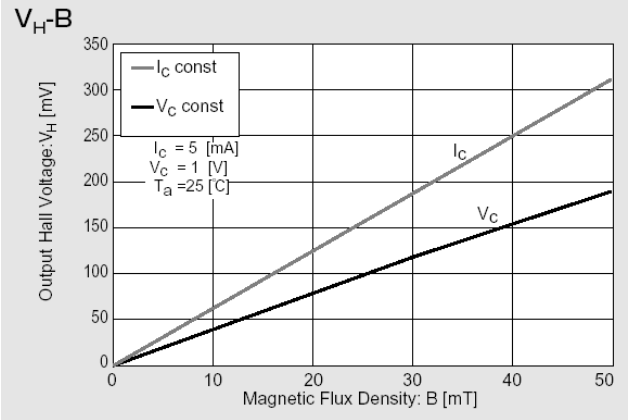

R_{in}-T
Input Resistance:R_{in} [Ω]
Ambient Temperature:T_a [C]

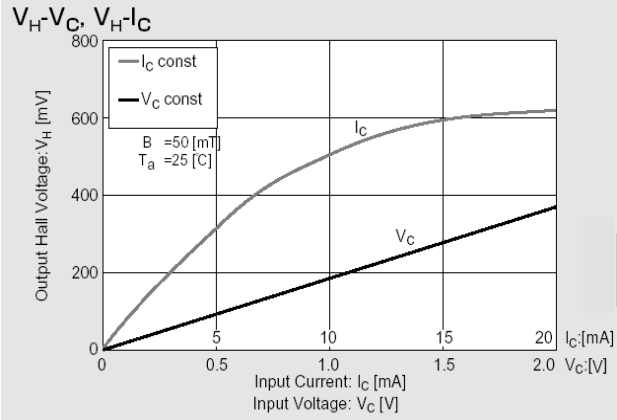

Input Voltage Derating Curve
Input Voltage:V_C [V]
Ambient Temp.:Ta [C]
Input Resistance
R_{in} : 250~450Ω

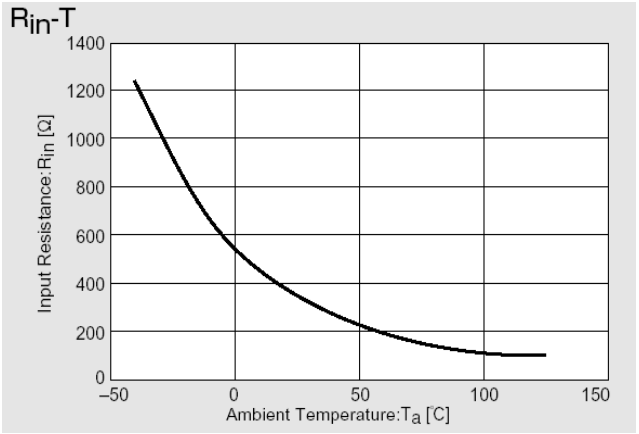

Input Current Derating Curve
Input Current:IC [mA]
Ambient Temp.:Ta [C]
Input Resistance
R_{in} : 250~450Ω

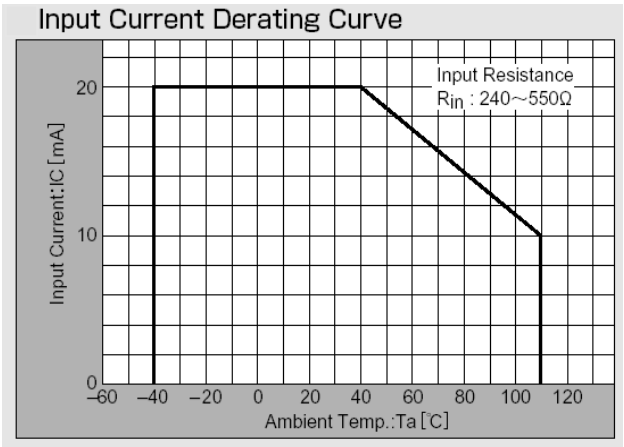
CYTY302B:

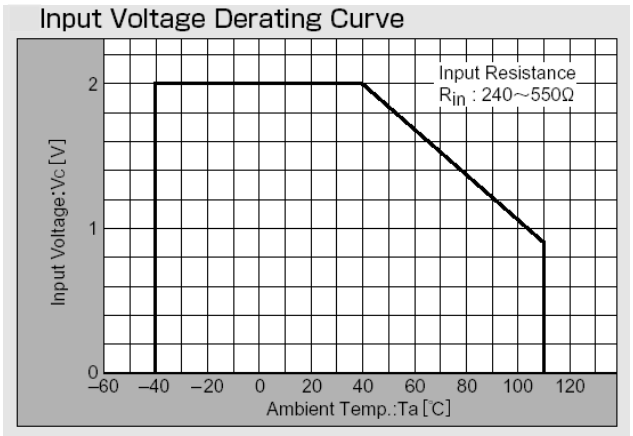

V_H-T
Output Hall Voltage:V_H [mV]
1000
750
500
250
0
−50
0
50
100
150
Ambient Temperature:T_a [℃]
I_C const
V_C const
I_C = 5 [mA]
V_C = 1 [V]
B = 50 [mT]
I_C
V_C


V_H-B
Output Hall Voltage:V_H [mV]
350
300
250
200
150
100
50
0
0
10
20
30
40
50
Magnetic Flux Density: B [mT]
I_C const
V_C const
I_C = 5 [mA]
V_C = 1 [V]
T_a =25 [℃]
I_C
V_C


V_H-V_C, V_H-I_C
Output Hall Voltage:V_H [mV]
800
600
400
200
0
0
0.5
1.0
1.5
2.0
V_C:[V]
5
10
15
20
I_C:[mA]
Input Current: I_C [mA]
Input Voltage: V_C [V]
I_C const
V_C const
B =50 [mT]
T_a =25 [℃]
I_C
V_C


R_{in}-T
Input Resistance:R_{in} [Ω]
1400
1200
1000
800
600
400
200
0
−50
0
50
100
150
Ambient Temperature:T_a [℃]


Input Current Derating Curve
Input Current:IC [mA]
20
10
0
−60
−40
−20
0
20
40
60
80
100
120
Ambient Temp.:Ta [℃]
Input Resistance
R_{in} : 240~550Ω


Input Voltage Derating Curve
Input Voltage:V_C [V]
2
1
0
−60
−40
−20
0
20
40
60
80
100
120
Ambient Temp.:Ta [℃]
Input Resistance
R_{in} : 240~550Ω

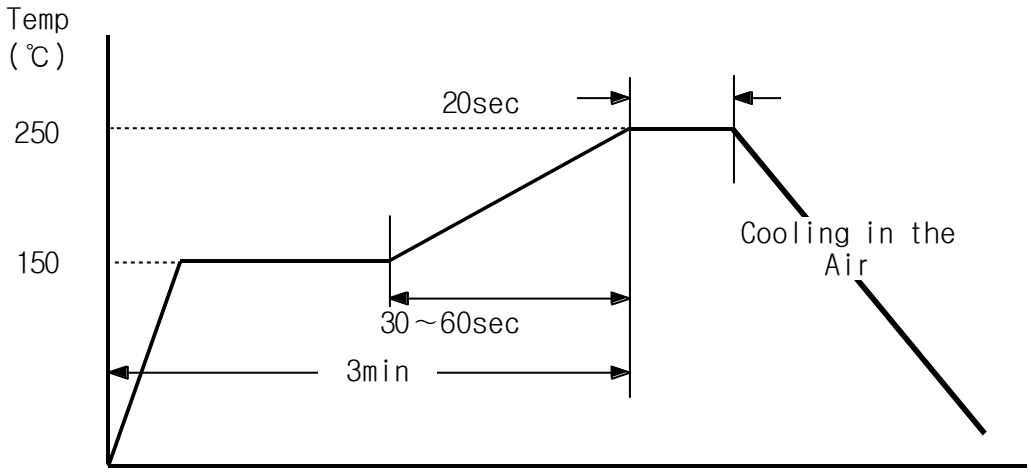
5. Method for Mounting

5-1. Soldering Conditions on PCB

1. No Rapid Heating and Cooling.
2. Recommended Preheating condition is at 130~150°C for 2~3minutes.
3. Recommended Reflowing condition is at 220~230°C for 10~15seconds.

5-2. Soldering Method and Temperature

Items	Methods	Temperature
Reflow	Soldering by Passing the Heated Zone	Max 250°C in 20sec
Solder Iron	Soldering by Soldering Iron	Max 300°C in 3sec

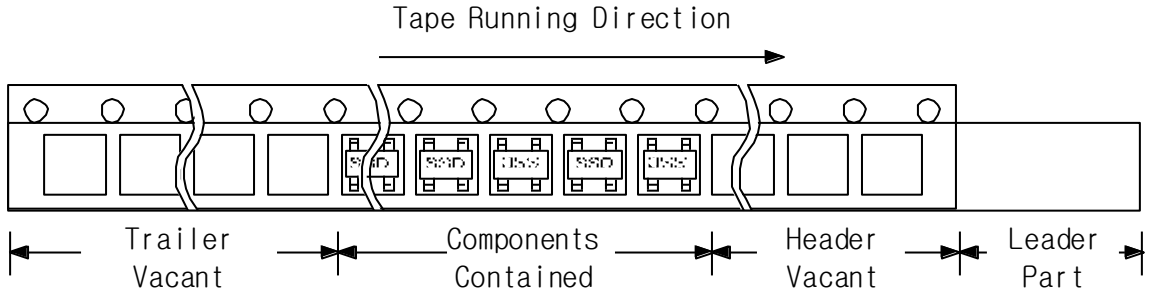


Reflow Method

6. Packaging

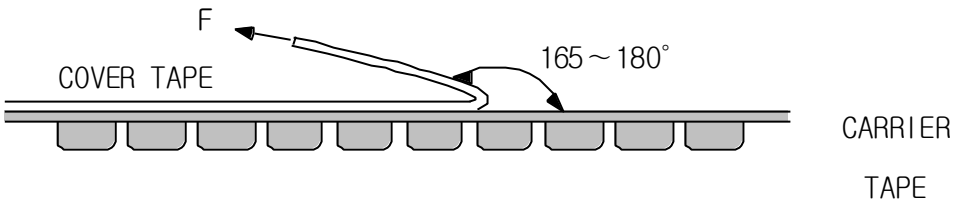
6-1. Taping

1. CYSH12AF, CYTY108A and CYTY302B should be packed that marked side is viewed from cover tape andlong side is put parallel with tape running direction. Making use of itafter 180° rotation has no problem because of its symmetric mode.
2. The vacant parts more than 40mm are located at front and end side of the reel.



6-2. Tape Specifications

1. Pull Strength(F) = 20~70g



2. Devices should not be flipped out of a pocket when tape is bent down by 15mm curvature.
3. Devices should not be stuck to cover tape.
4. Devices should be kept below 40°C and below RH80% in the shade.
5. Tape has no joint.

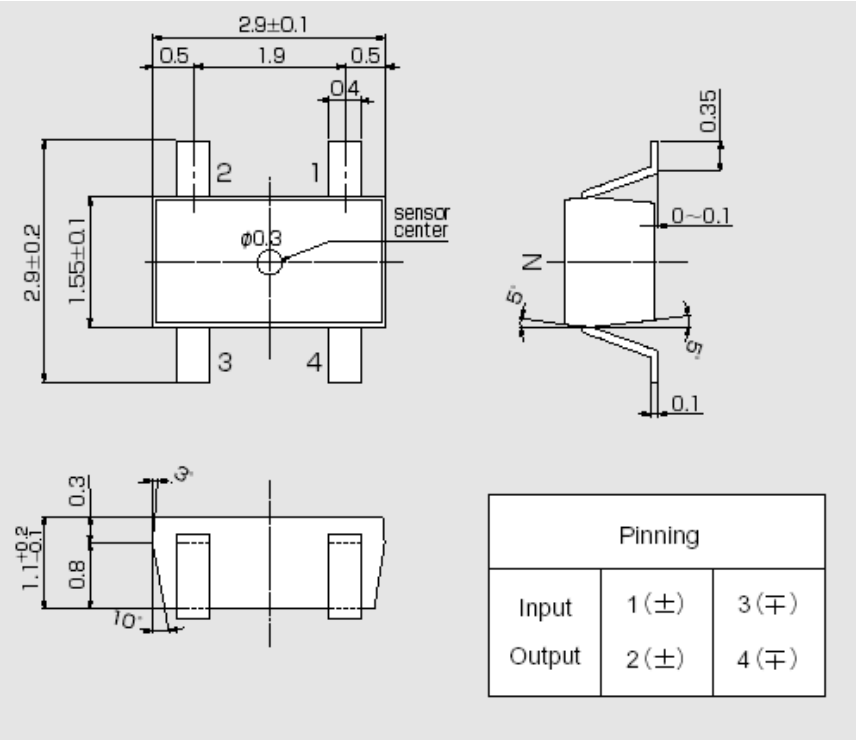
6-3. Packing Unit

1. 3,000pcs of devices are packed in one reel.
2. Five reels are packed in one inner box.
3. Four inner boxes, 60,000pcs of devices, are packed in one outer box.
4. Dummy could be packed for safe dealing.

7. External Dimensions (Unit: mm)

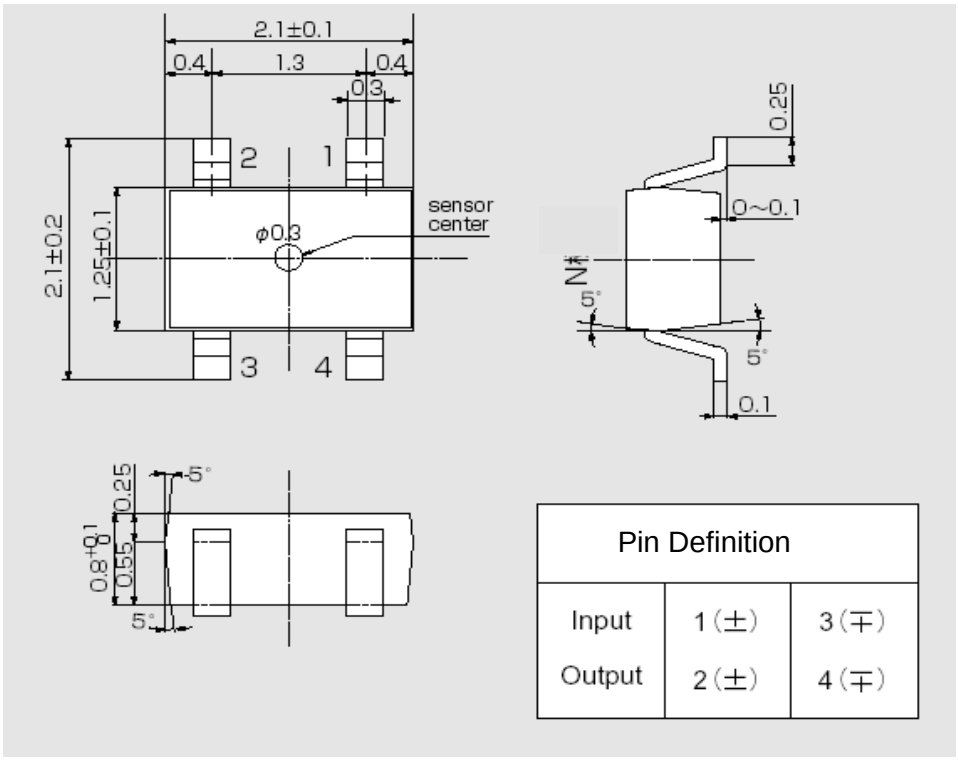
Four leads of input and output terminals are designed in the diagonally symmetric mode and are equal in dimensions. Regardless of 180°rotation of Hall sensor, CYSH12AF, CYTY108A and CYTY302B can be used.

- **CYSH12AF:**



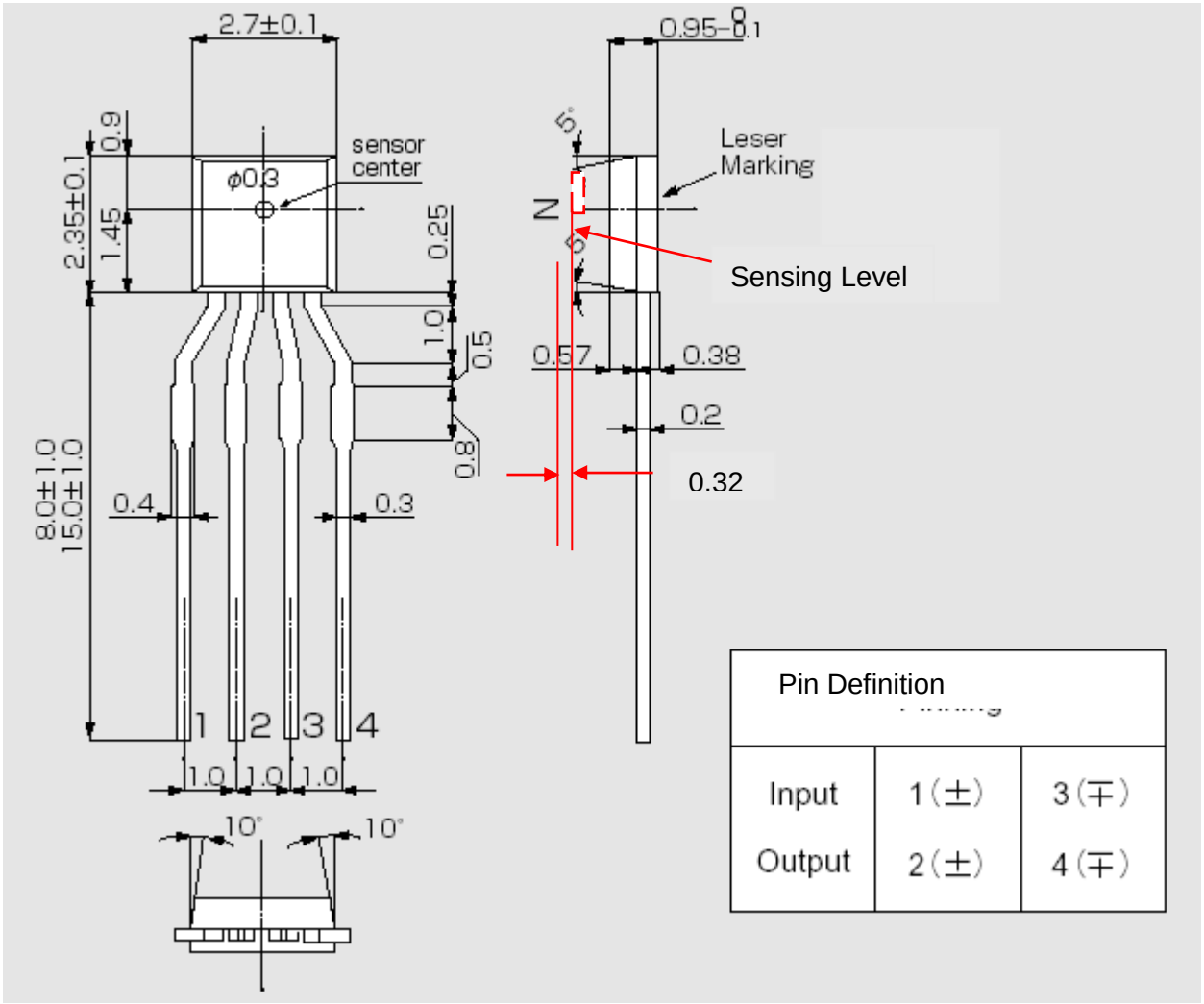
Pinning		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

- **CYTY108A:**



Pin Definition		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

- **CYTY302B:**



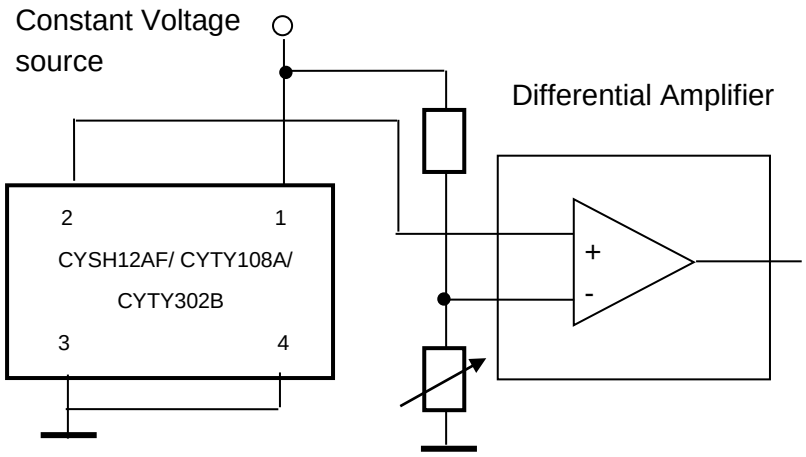
Pin Definition		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

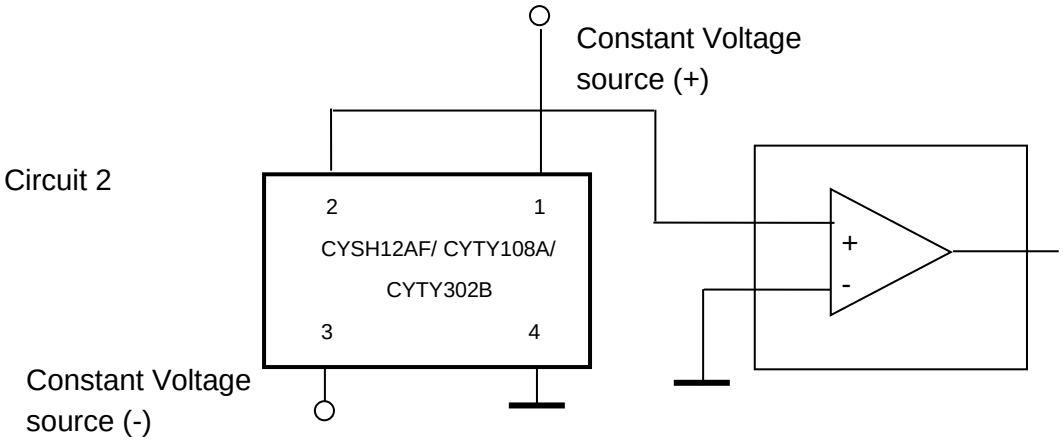
-

-

Connection

Circuit 1





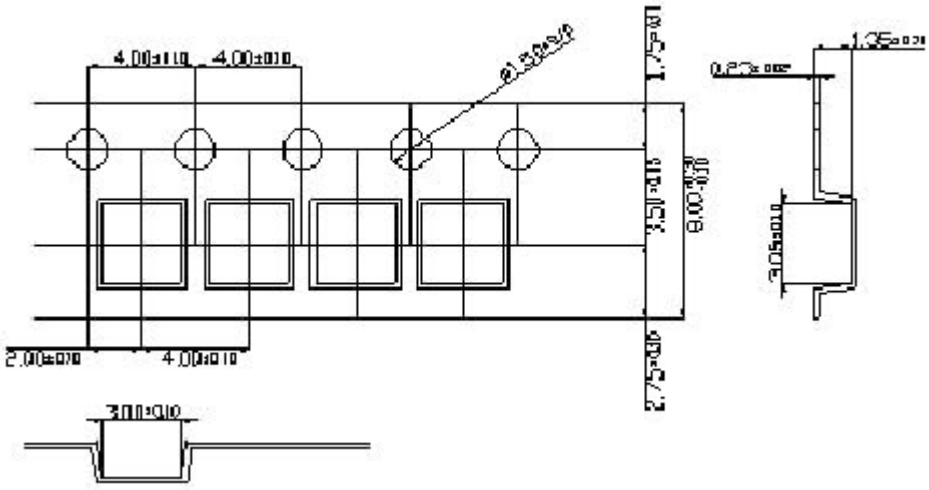
Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit1):
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.

The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):
Pin 1: positive input voltage V+, for instance +5VDC.
Pin 3: negative input voltage V-, for instance -5VDC
Pin 2: OUTPUT
Pin 4: GND
In this case the output voltage is equal to the Hall Voltage.

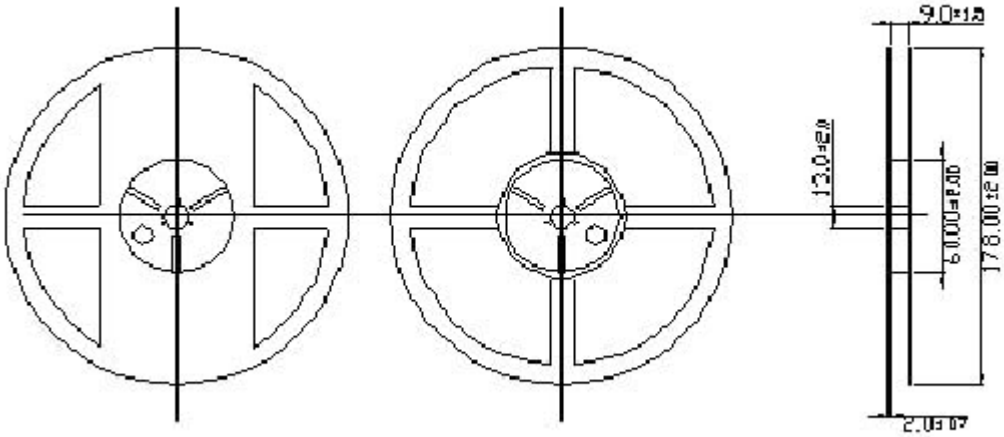
8. External Dimensions of Carrier Tape (Unit: mm)

CYTY108A:



9. External Dimensions of Reel (Unit: mm)

CYTY108A:



The above reel is made of plastic and is recyclable.

10. RELIABILITY

10.1 TEST CONDITION

	CONDITION
HIGH TEMP. STORAGE	Ta=110°C,t=1000HR
LOW TEMP. STORAGE	Ta=-40°C,t=1000HR
HIGH TEMP. OPERATION	Ta=100°C,Iopr=6mA,t=1000HR
LOW TEMP. OPERATION	Ta=-20°C,Iopr=6mA,t=1000HR
HIGH TEMP. HIGH UMIDITY OPERATION	Ta=60°C, HR=90%,Iopr=9mA,t=1000HR
HUMIDITY	Ta=60°C,HR=90%, t=1000HR
PCT	Ta=121°C,HR=100%, Pv=2atm, t=24HR
THERMAL SHOCK	T(L)=-55°C,T(H)=150°C, t=(L,H)=30min,M=30CYCLE
SOLDERING HEAT RESISTANCE	solder temp=250±5°C, t=10sec,REFLOW
SOLDABILITY	solder temp=230±5°C, t=5sec,dip
TERMINAL STRENGTH	TENSION 300g/30sec
SURGE	V=500V, C=200pF, R=0Ω (test method EIAJ EDX 8503)

10.2 CRITERION FOR JUDGING

After each reliability test, samples should be kept for at least 24 hrs at room temp. & humidity, and then measured.

The change rates should be confined within the ranges as follows.

item	OK SPEC	NG/OK
ΔRin	UNDER ±20%	OK (SPEC SATISFYING)
ΔRout	UNDER ±20%	
ΔVH	UNDER ±20%	
ΔVo/VH	UNDER ± 5%	

CYTY300B (InSb) HALL-EFFECT ELEMENT

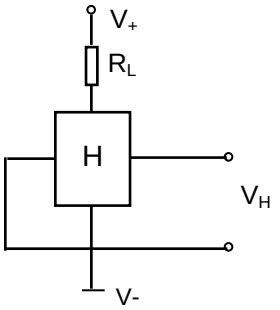
Hall-effect element CYTY300B is made of compound semiconductor material indium stibnite (InSb), which utilizes the Hall-effect principle. It can convert a magnetic flux density signal linearly into voltage output.

FEATURES

- High Magnetic Sensitivity
- Low Offset Voltage
- Miniature Package

TYPICAL APPLICATION

- Magnetic Field Measurement
- Current Sensor
- Detection of Speed
- DC Brushless Motor
- Position Control



1. Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Maximum Input Current	Imax	20 (at 25°C)	mA
Maximum Power Dissipation	Pmax	150 (at 25°C)	mW
Operating Temperature Range	Top	− 40 ~ + 110	°C
Storage Temperature Range	Tst	− 40 ~ + 125	°C

2. Electrical Characteristics (Measured at 25°C)

Parameter	Symbol	Measurement Conditions	Min	Max	Unit
Output Hall Voltage	VH	Vin = 1V, B = 50mT	196	320	mV
Input Resistance	Rin	I = 0.1mA	240	550	Ω
Output Resistance	Rout	I = 0.1mA	240	550	Ω
Offset Voltage	VO	Vin = 1V, B = 0G	− 7	+ 7	mV
Temp. Coeff. of VH	α	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Temp. Coeff. of Rin, Rout	β	Ta = 0 ~ + 40°C AVG.	-	− 1.8	% /°C
Dielectric strength		100V DC	1.0		MΩ

$V_H = V_{HM} - V_O$ (V_{HM} : The output voltage measured at 500G.)

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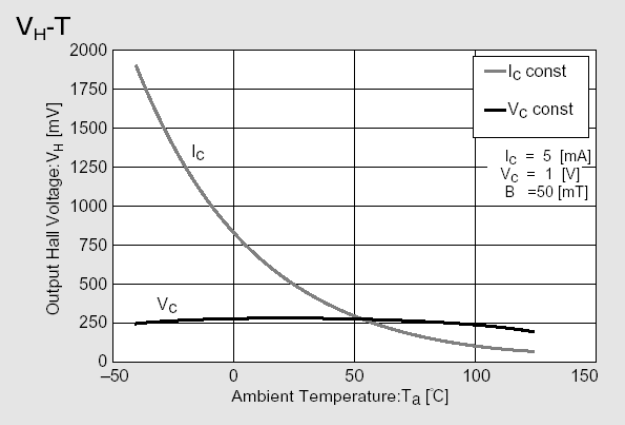
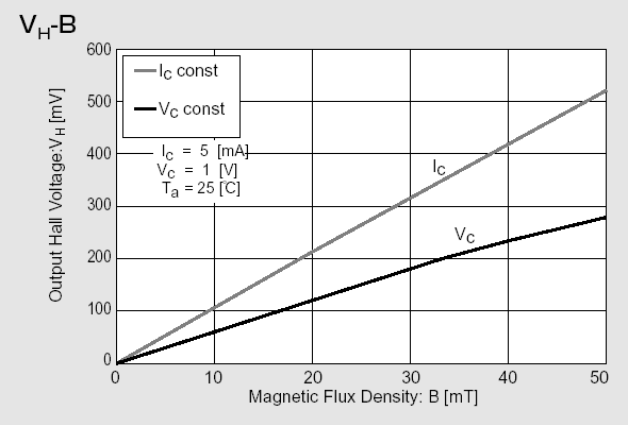
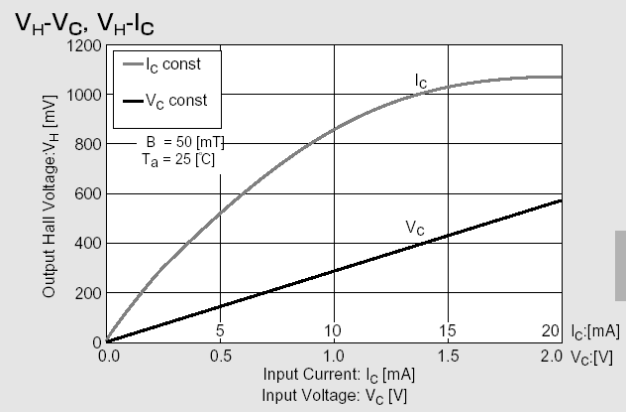
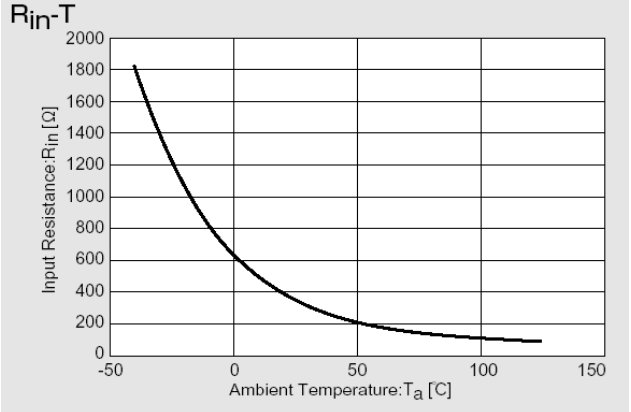
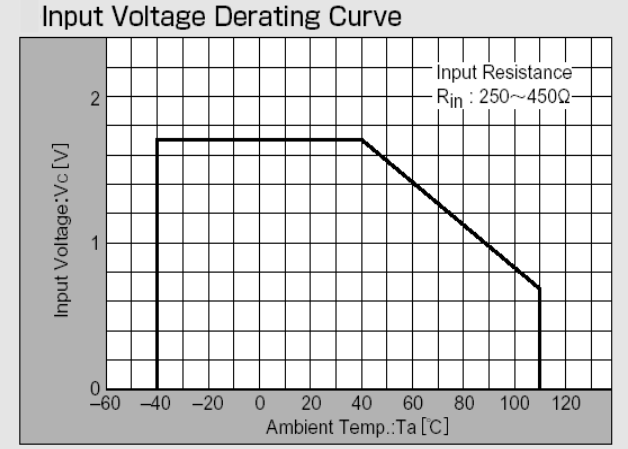
3. CHARACTERISTIC CURVES (only for references)

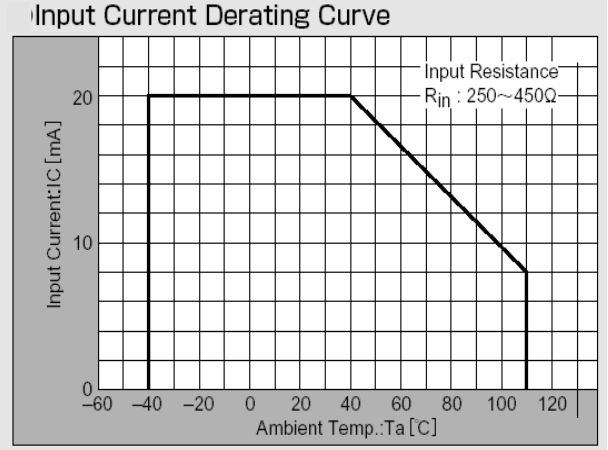




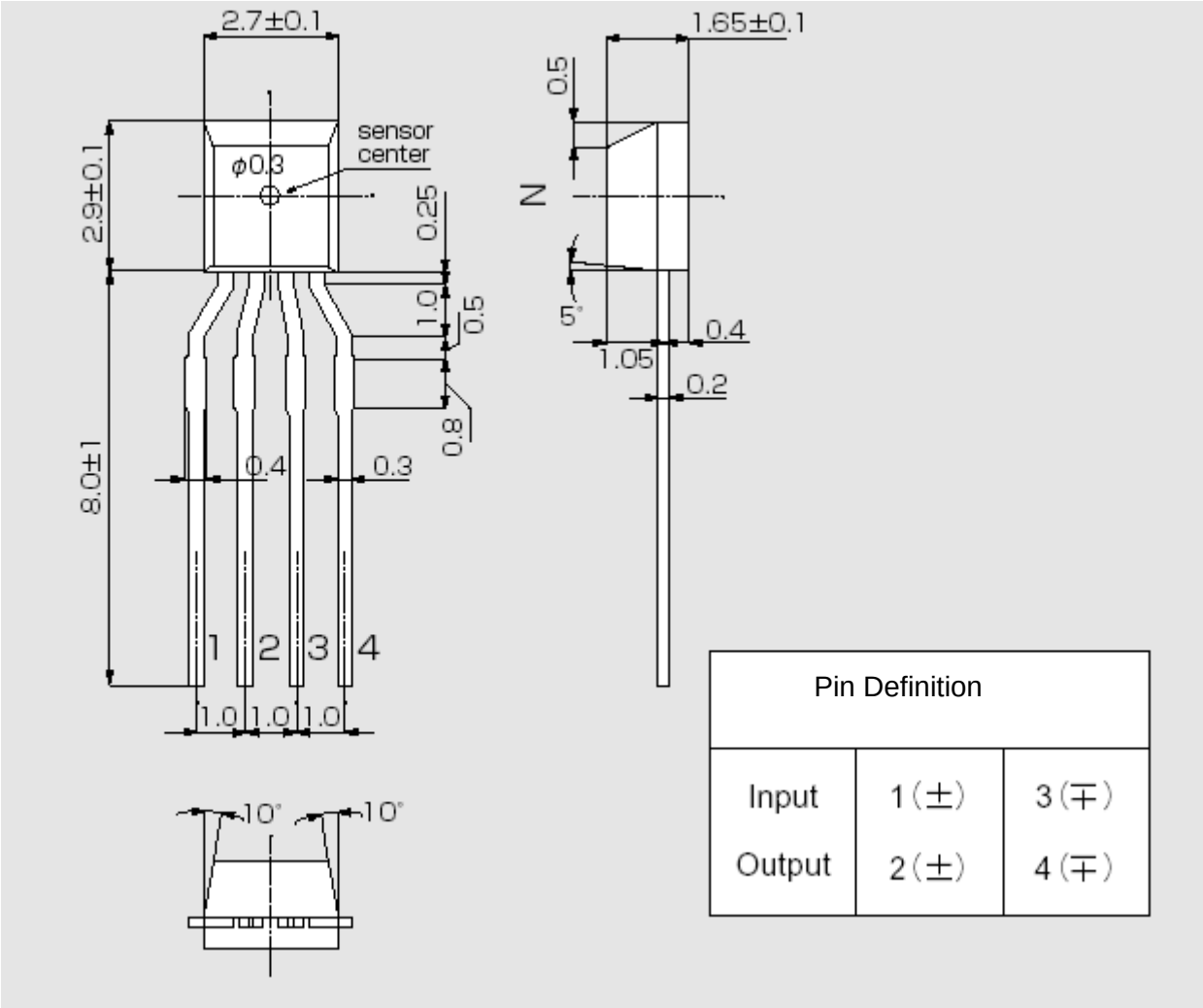






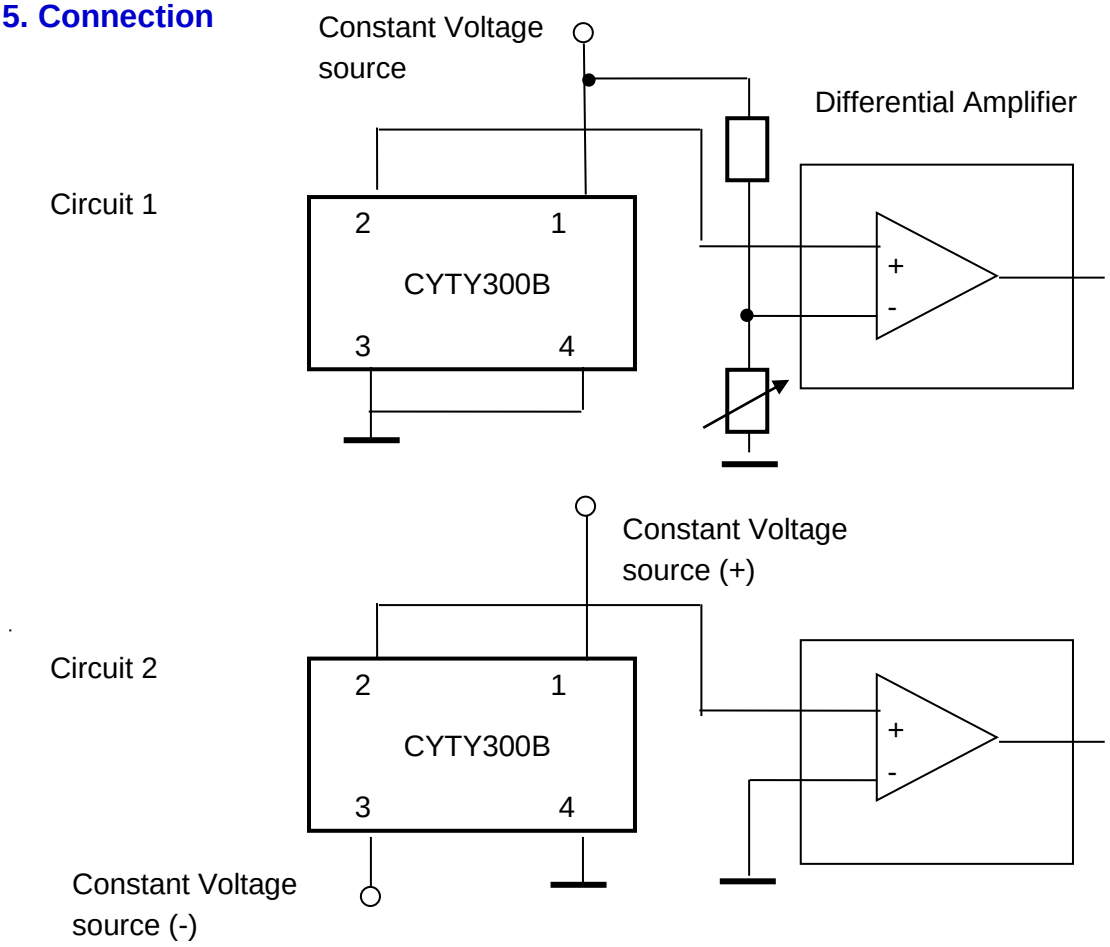


4. External Dimensions (Unit: mm)



Pin Definition		
Input	1 (±)	3 (∓)
Output	2 (±)	4 (∓)

5. Connection



6. Application Notes

The Hall voltage V_H can be positive and negative. But if one connects the sensor as follows (circuit 1):

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.

The offset voltage will be zero if you connect double power supplies V+ and V- to the sensor (circuit 2):

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

In this case the output voltage is equal to the Hall Voltage.

CYTY211, CYTY320, CYTY300B-CS (InSb) HALL-EFFECT ELEMENTS

CYTY series Hall-effect elements are made of compound semiconductor material indium stibnite (InSb), which utilizes the Hall Effect principle. It can convert a magnetic flux density signal linearly into voltage output.

FEATURES

- High Magnetic Sensitivity
- Low Offset Voltage
- Miniature Package

TYPICAL APPLICATION

- Magnetic Field Measurement
- Current Sensor
- Detection of Speed
- DC Brushless Motor
- Position Control

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Input Current	Ii	20 (T_A=40°C)	mA
Operating Temperature Range	T_A	-40~110	°C
Storage Temperature Range	T_S	-40~120	°C

Hall Output Voltage VH (mV)

Label	Hall Output Voltage
Q	45～60
R	55～75
D	195～230
E	225～275
F	270～320
G	315～370

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Parameter	Symbol	Test Condition	Type and Value				
				CYTY211		CYTY320	
Hall output voltage	V_H (mV)	Constant voltage driven, Vi=1V B=50mT	Min	45		195	
			Max	75		370	
Offset voltage	Vo (mV)	B=0 Vi=1V	Min	-7		-7	
			Max	+7		+7	
Input resistance	Ri(Ω)	B=0 Ii=0.1mA	Min	240		240	
			Max	550		550	
Output resistance	Ro(Ω)	B=0 Ii=0.1mA	Min	240		240	
			Max	550		550	
Output voltage temperature coefficient	αV_H (%/°C)	B=50mT Ii=5mA	Max	-2		-2	
Input, Output resistance temperature coefficient	αRi (%/°C)	B=0 Ii=0.1mA					
Isolation resistance	(MΩ)	100V DC		>1.0		>1.0	

Note: 1. The Hall output voltage V_H =the effective voltage-V_0

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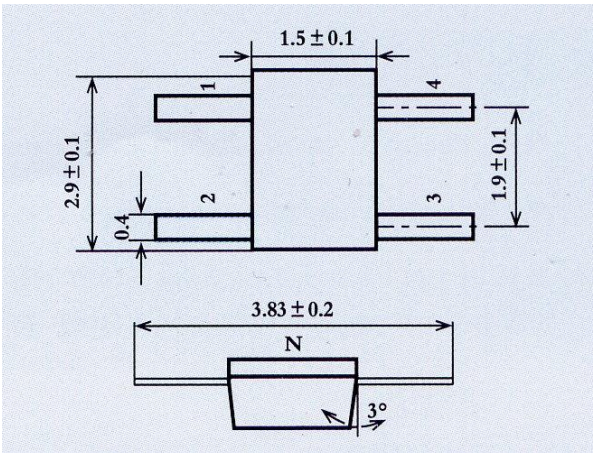
2. The types are different according to the Hall output voltage V_H (mV)

Package Outline Drawing (Unit: mm)



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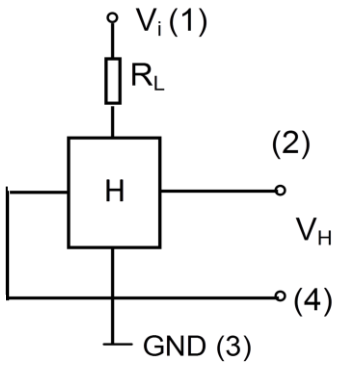
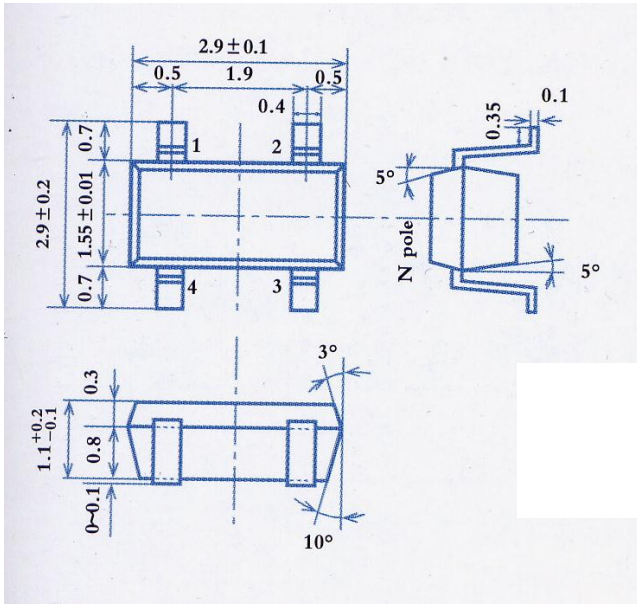
CYTY320 (SOT-143-1)

1, 3: Input; 2, 4: Output

FUNCTIONAL BLOCK DIAGRAM

For CYTY320



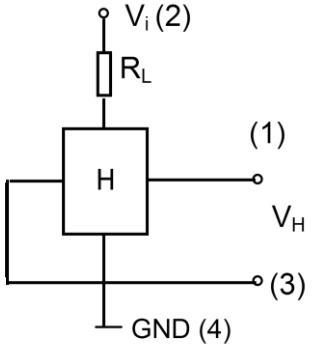


CYTY211 (SOT-143)

4: Input; 1, 3: Output

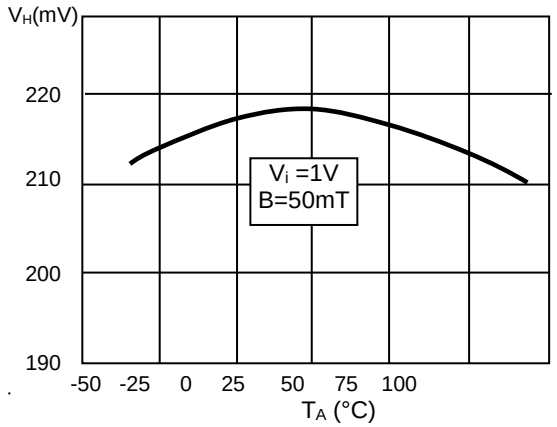
FUNCTIONAL BLOCK DIAGRAM

For CYTY211

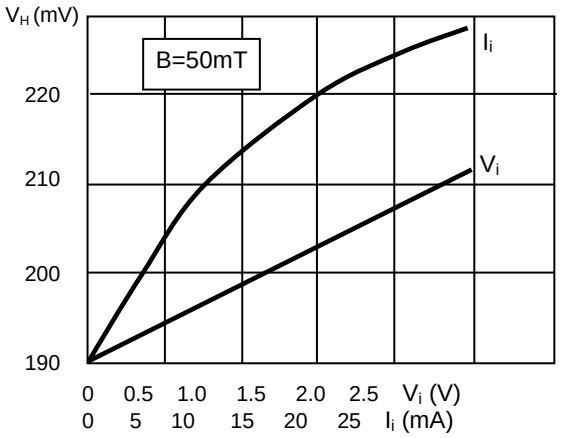


CHARACTERISTIC CURVES

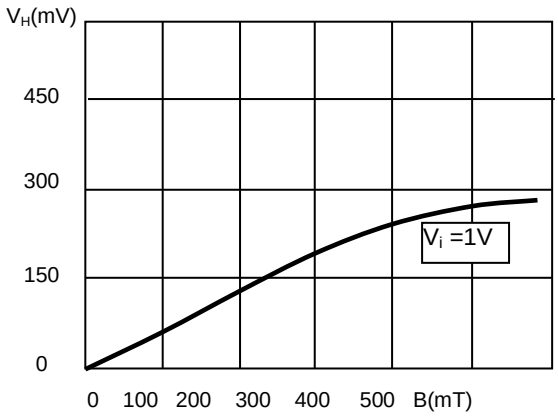
V_H ~T_A (CYTY320)



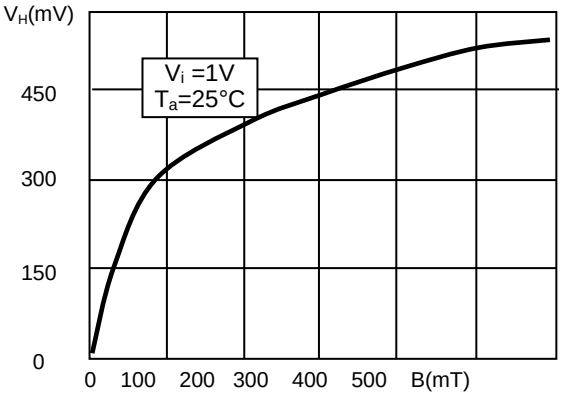
V_H ~V_i, I_i (CYTY320)



V_H~B (CYTY211)



V_H~B (CYTY320)



Unipolar Hall Effect Switch ICs

CYD443H Unipolar HALL-EFFECT SWITCH IC

CYD443H Hall-effect switch integrated circuit for high temperature operating is based on Hall-effect principle and the semiconductor monolithic technology, which includes a voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output on a single silicon chip. ICs can convert the input magnetic field signal into digital voltage output.

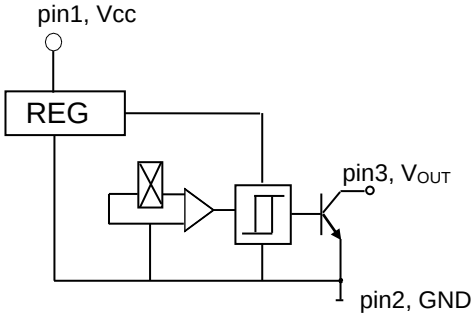
FEATURES

- Small size
- High Sensitivity
- Quick Response
- High temperature (-40°C ~+150°C)
- Good Temperature Performance
- High Accuracy
- Excellent Reliability

TYPICAL APPLICATION

- Non-contact Switch
- Automotive Ignition
- Brake ICs
- Position control
- Revolution detection
- Automobile Electronics
- Brushless Motor

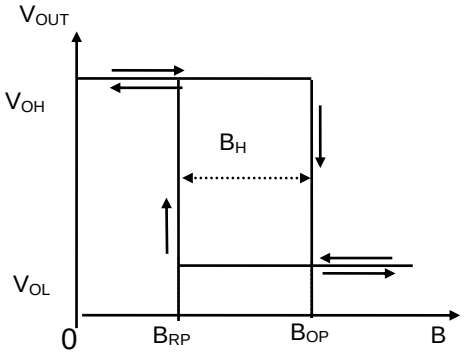
FUNCTIONAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	30	V
Quiescent Output Voltage	Vo	30	V
Output Current	Io	50	mA
Operating Temperature Range	T_A	-40 ~ +150	°C
Storage Temperature Range	T_S	-55 ~ +150	°C

Magnetic-Electrical Transfer Characteristics



ELECTRICAL CHARACTERISTICS

Parameter	Test Condition	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage	Vcc=4.0V ~ 30V	V_{CC}	4.0	-	30	V
Output Low Voltage	Vcc=4.5v, Vo=24V Io=20mA, B≥B_{OP}	V_{OL}	-	0.2	0.4	V
Output Leakage Current	Vo=24V, B<B_{RP}	I_{OH}	-	<1.0	10	μA
Supply Current	Vcc=24V, Vo open-collector output	Icc	-	5.0	-	mA
Output Rise time	Vcc=12V, R_L=820Ω C_L=20pF	tr	-	0.2	2.0	μS
Output Fall time		tf	-	0.18	2.0	μS

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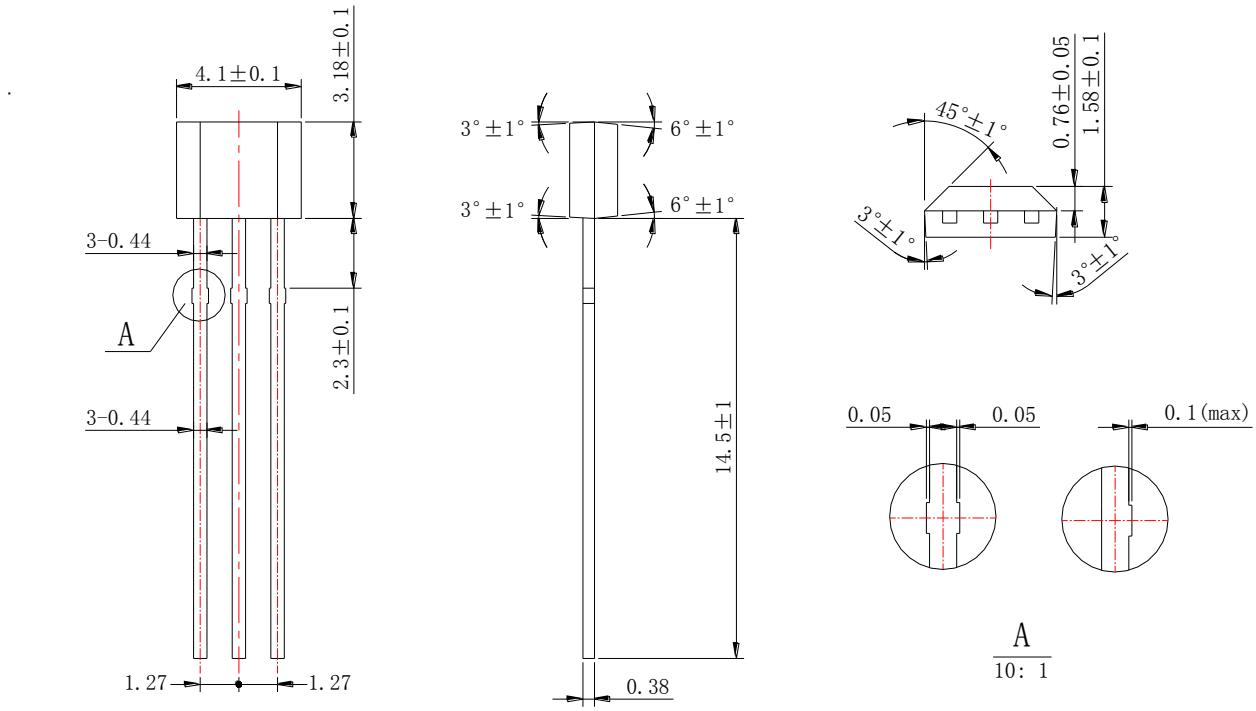
Magnetic Characteristics

Parameter		Min (mT)	Typ (mT)	Max (mT)
Operate Point (B_{OP})	T_A=25°C	5.0	7.0	10.0
	Full Operating Temperature Range	3.0	7.5	10.5
Release Point (B_{RP})	T_A=25°C	2.0	4.5	7.0
	Full Operating Temperature Range	2.0	4.5	7.5
Hysteresis (B_H)	T_A=25°C	-	3.0	-
	Full Operating Temperature Range	-	3.0	-

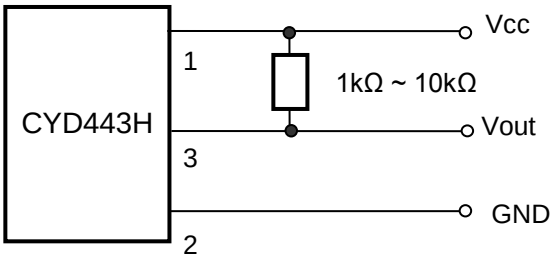
Package Outline Drawing (Unit: mm)



Pin Notes: 1. Power Supply, 2. Ground, 3. Output

Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



Cautions:

1) It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2) Pay attention to the soldering temperature (<260°C) at the leads; keep it lower in a short time (<3s) to guarantee good soldering quality.

CYD3141E and CYD3144E HALL-EFFECT SWITCH IC

CYD3141E and CYD3144E Hall-effect switch integrated circuits is based on the semiconductor monolithic technology, which includes a voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output on a single silicon chip. ICs can convert the input magnetic field signal into digital voltage output.

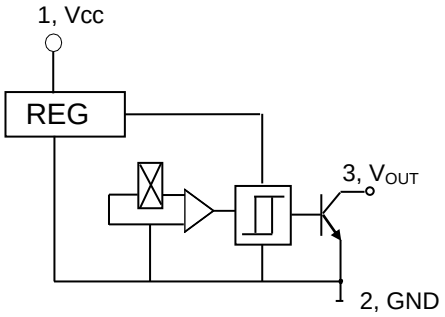
FEATURES

- Small size
- High Sensitivity
- Quick Response
- Good Temperature Performance
- High Accuracy
- Excellent Reliability

TYPICAL APPLICATION

- Non-contact Switch
- Automotive Ignition
- Brake ICs
- Position control
- Revolution detection
- Safe alarm device
- Textile control system

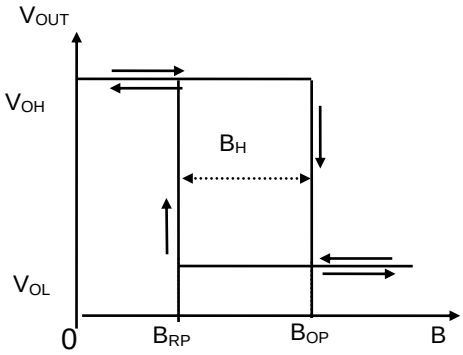
FUNCTIONAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	Vcc	28	V
Quiescent Output Voltage	Vo	28	V
Output Current	Io	25	mA
Operating Temperature Range	T_A	-40 ～+85	°C
Storage Temperature Range	T_S	-65 ～+150	°C

Magnetic-Electrical Transfer Characteristics



ELECTRICAL CHARACTERISTICS

Parameter	Test Condition	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage	Vcc=4.5V ～24V	V_{CC}	4.5	-	24	V
Output Low Voltage	Vcc=4.5v, Vo=24V Io=20mA, B≥B_{OP}	V_{OL}	-	175	400	mV
Output Leakage Current	Vo=24V, B<B_{RP}	I_{OH}	-	<1.0	10	μA
Supply Current	Vcc=24V, Vo open-collector output	Icc	-	3.0	9.0	mA
Output Rise time	Vcc=12V, R_L=820Ω C_L=20pF	tr	-	0.2	2.0	μS

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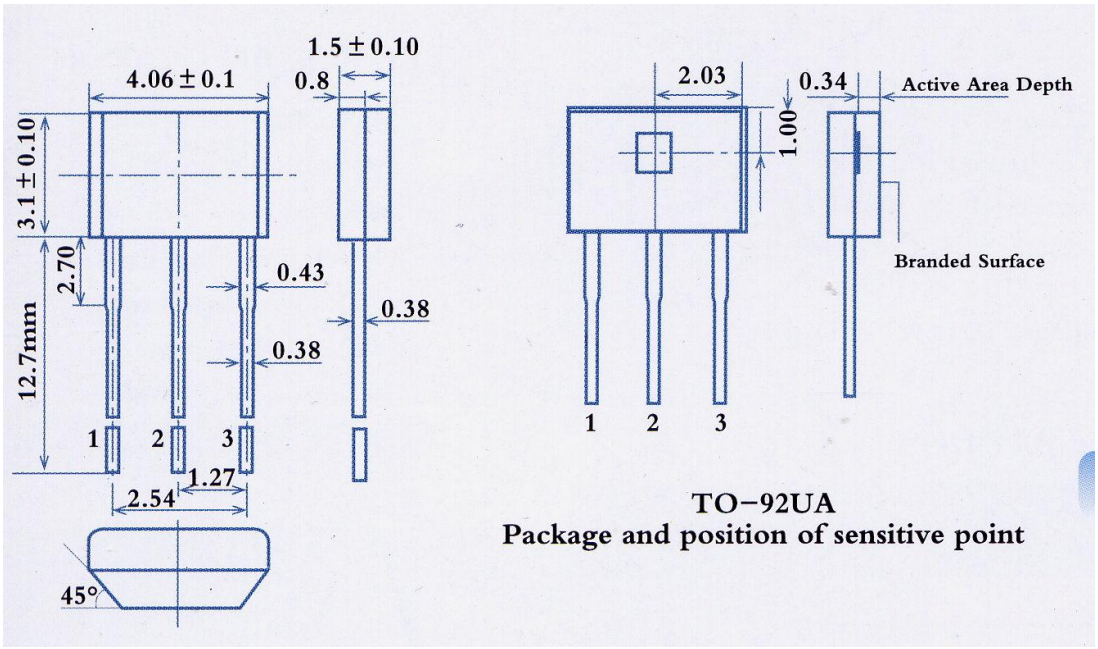
Output Fall time		tf	-	0.18	2.0	µS

Magnetic Characteristics

Parameter		CYD3141E		
		Min (mT)	Typ (mT)	Max (mT)
Operate Point (B_{OP})	T_A=25°C	5.0	10.0	16.0
	Full Operating Temperature Range	3.0	10.0	17.5
Release Point (B_{RP})	T_A=25°C	1.0	4.5	13.0
	Full Operating Temperature Range	1.0	4.5	14.5
Hysteresis (B_H)	T_A=25°C	2.0	5.5	8.0
	Full Operating Temperature Range	2.0	5.5	8.0

Parameter	Symbol	CYD3144EH			CY3144E		
		Min (mT)	Typ (mT)	Max (mT)	Min (mT)	Typ (mT)	Max (mT)
Operate Point	B_{OP}	5.0	10.0	16.0	10.0	15	20.0
Release Point	B_{RP}	1.0	4.5	13.0	4.0	8.5	14.0
Hysteresis	B_H	2.0	5.5	8.0	-	6.5	-

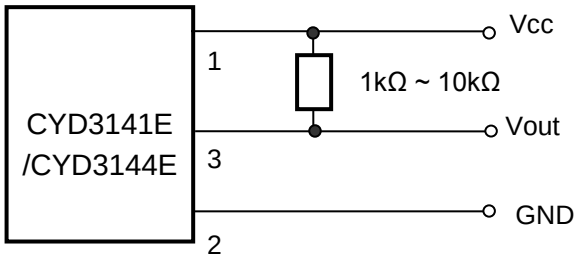
Package Outline Drawing (Unit: mm)



Pin Notes: 1. Power Supply, 2. Ground, 3. Output

Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



Cautions:

1) It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2) Pay attention to the soldering temperature at the leads; keep it lower in a short time to guarantee good soldering quality.

CYD543 Hall Effect Unipolar IC Switches

These Hall-effect switches are monolithic integrated circuit consisting of a voltage regulator, Hall-voltage generator, differential amplifier, Schmitt trigger, temperature compensation circuit and open-collector output stage. Its input is a magnetic flux density signal and output is a digital voltage signal.

FEATURES

- Wide supply voltage range
- Fast response time
- Wide frequency and temperature range
- Long operating life
- Small size, convenient installing
- Output compatible with all digital logic families
- Unipolar Sensor
- **ROHS Compliant**

TYPICAL APPLICATIONS

- Contact-less switch
- Position control
- Speed measurement
- Revolution detection
- Isolation measurement
- Brushless dc motor
- Automotive igniters

ABSOLUTE MAXIMUM RATING

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	24	V
Magnetic flux density	B	Unlimited	mT
Output OFF voltage	V_{ce}	50	mV
Continuous output current	I_{OL}	50	mA
Operating temperature range	T_A	-50~150	°C
Storage temperature range	T_S	-55~150	°C

ELECTRICAL CHARACTERISTICS T_A=25°C

Parameter	Symbol	Test conditions	Type and Value			Unit
			min	type	max	
Supply voltage	V_{CC}		4.5	-	24	V
Output saturation voltage	V_{OL}	Iout=20mA B>B_{OP}	-	200	400	mV
Output leakage current	I_{OH}	Vout=24V B<B_{RP}	-	0.1	10	µA
Supply current	I_{CC}	V_{CC}=Output open	-	-	10	mA
Output rise time	t_r	R_L=820Ω C_L=20PF	-	0.12	-	µS
Output fall time	t_f	R_L=820Ω C_L=20PF	-	0.18	-	µS

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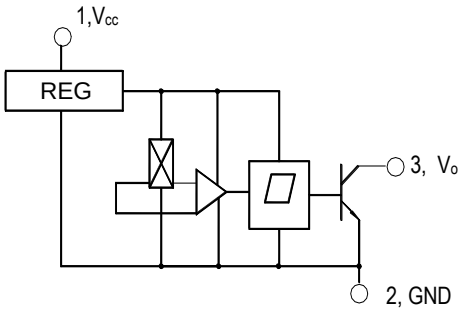
MAGNET CHARACTERISTICS

V_{CC}=4.5 ~ 24V

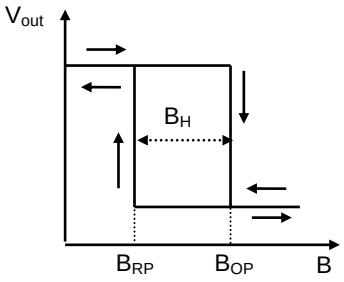
Paramenter	Symbol	Min.	Typical	Max.	Unit
Operate point	B_{OP}		15	20	mT
Release point	B_{RP}	3	10		mT
Hysteresis	B_H		5	-	mT

NOTE: 1mT=10GS

BLOCK DIAGRAM

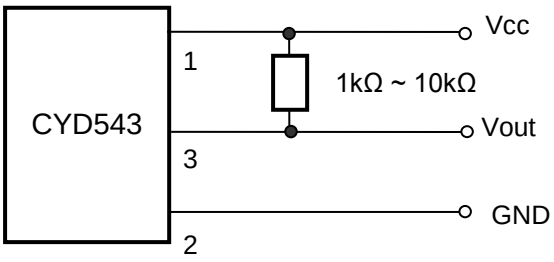


Magnetic-electrical transfer

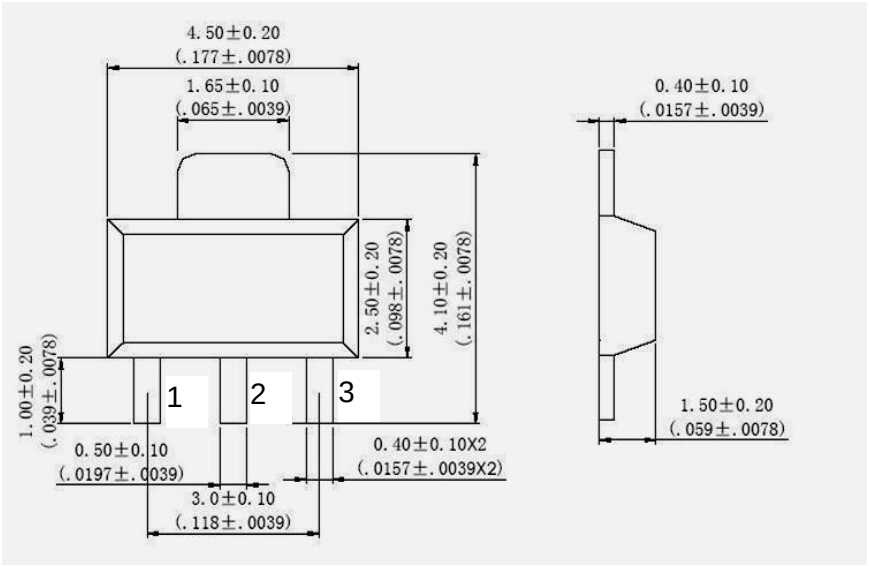


Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



DIMENSIONS (in mm)



Cautions

1. When install, should as full as possible decrease the mechanical stress acting on the Hall IC, to avoid the influence of the operate point and release point.
2. On the premise of ensuring welding quality, use as possible as low welding temperature an short time.

SOT-89 PACKAGE 1. Supply Voltage 2. GND 3. Output

CYD1102G Unipolar Hall Effect Switch ICs

The CYD1102G is an integrated Hall effect latched sensor designed for electronic commutation of brush-less DC motor applications. The device includes an on-chip Hall voltage generator for magnetic sensing, a comparator that amplifies the Hall voltage, and a Schmitt trigger to provide switching hysteresis for noise rejection, and open-collector output. An internal band gap regulator is used to provide temperature compensated supply voltage for internal circuits and allows a wide operating supply range.
A north pole of sufficient strength will turn the output ON. In the absence of a magnetic field, the output is OFF.

Features

◆ Wide operating voltage range 3V to 28V	◆ Reverse polarity protection
◆ Maximum output sink current 50mA	◆ Package : SIP-3L
◆ Open collector pre-driver	

.

Block Diagram

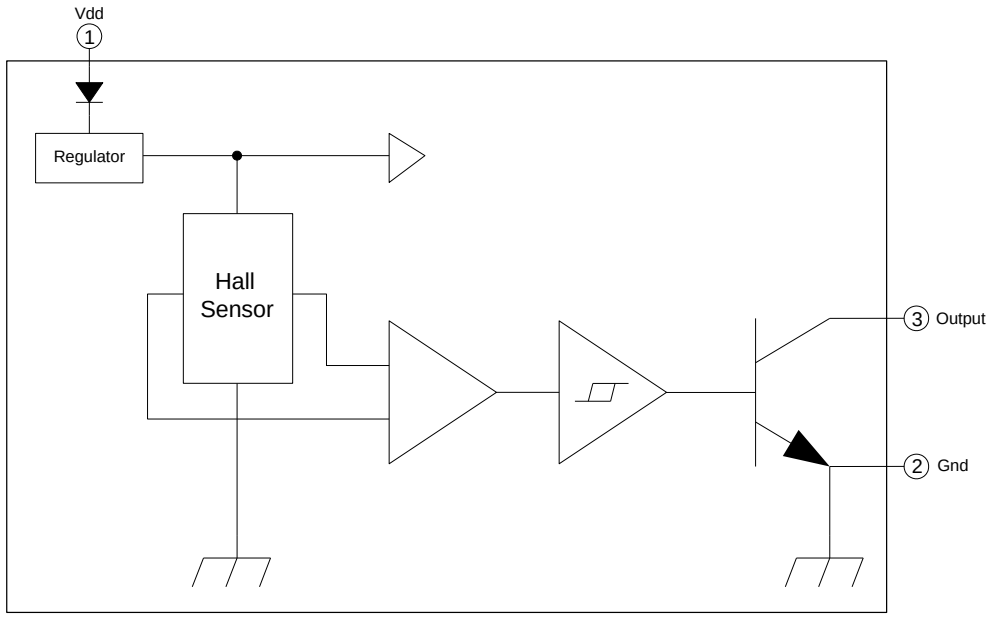


Figure.1

Recommended Operating Conditions

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}	-	3.0		28	V
Operating Temperature Range	T_A	-	-40		150	℃

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operating Temperature	T_{OP}	-	-40		150	℃
Storage Temperature	T_{ST}	-	-65		150	℃
DC Supply Voltage	V_{DD}	-	3.0		28	V
Supply Current	I_{DD}	-			10	mA
Continuous Current	$I_{O(CONT)}$				50	mA
Junction temperature	T_J				160	℃
Power Dissipation	P_D	SIP-3L			500	mW
Thermal Resistance	θ_{JC}	SIP-3L		0.27		℃/mW
Lead Temperature		10sec			260	℃

Electrical Characteristics VDD=12.0V, TA=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Average Supply Current(no load)	I_{DD}	-		3.5	10	mA
Output Saturation Voltage	V_{SAT}	Iout= 20mA		165	200	mV
Output Rise time	t_r	RL=500Ω, CL=20pF(Figure 7)	0.2	-	0.75	μs
Output Fall time	t_f	RL=500Ω, CL=20pF(Figure 7)	20	-	150	ns

Magnetic Characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operate Points	B_{OP}		+140	-	-	G
Release Points	B_{RP}		-	-	+60	G
Hysteresis	B_{HYST}		30	-	120	G

Hysteresis Characteristics

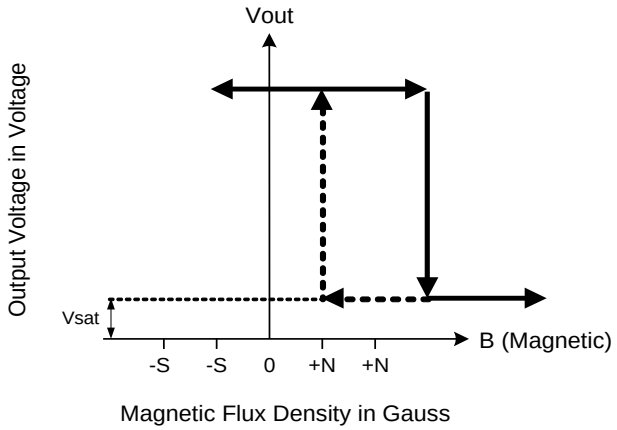


Figure.2

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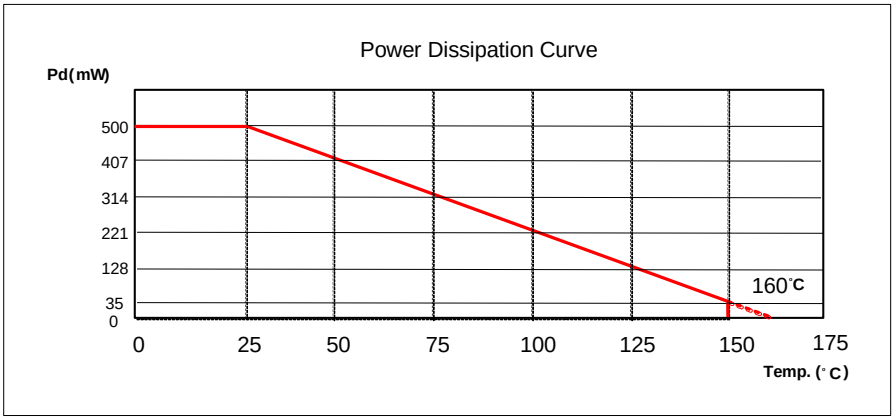
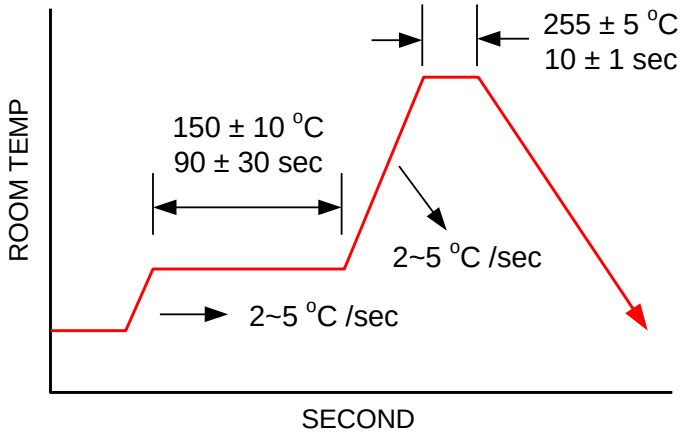


Figure.3



Soldering Condition

Figure.4

Pin Connection

[Top View]

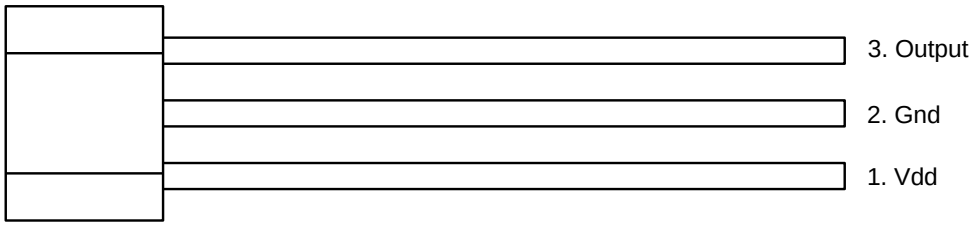


Figure.5

Pin Description

Name	I/O	Pin No.	Description
Vdd	P	1	Positive power supply
Gnd	G	2	Ground
Output	O	3	Driver output

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

Marking Information

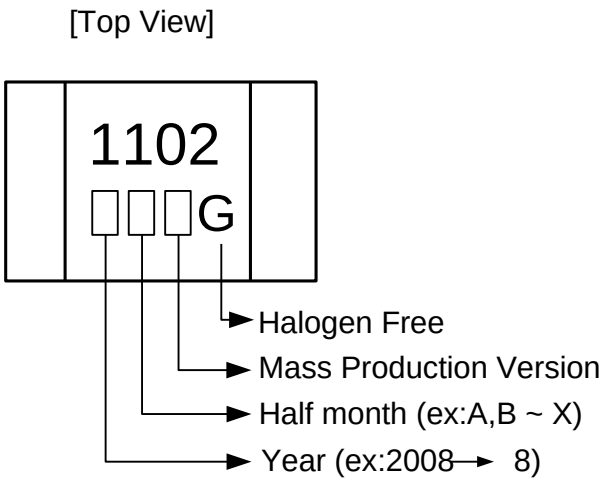


Figure.6

Order Information

Part Number	Operating Temperature	Package	MOQ
CYD1102G	-40 ℃ to +150 ℃	SIP-3L	1000ea

Package Dimension (Unit: mm)

SIP-3L(Halogen Free)

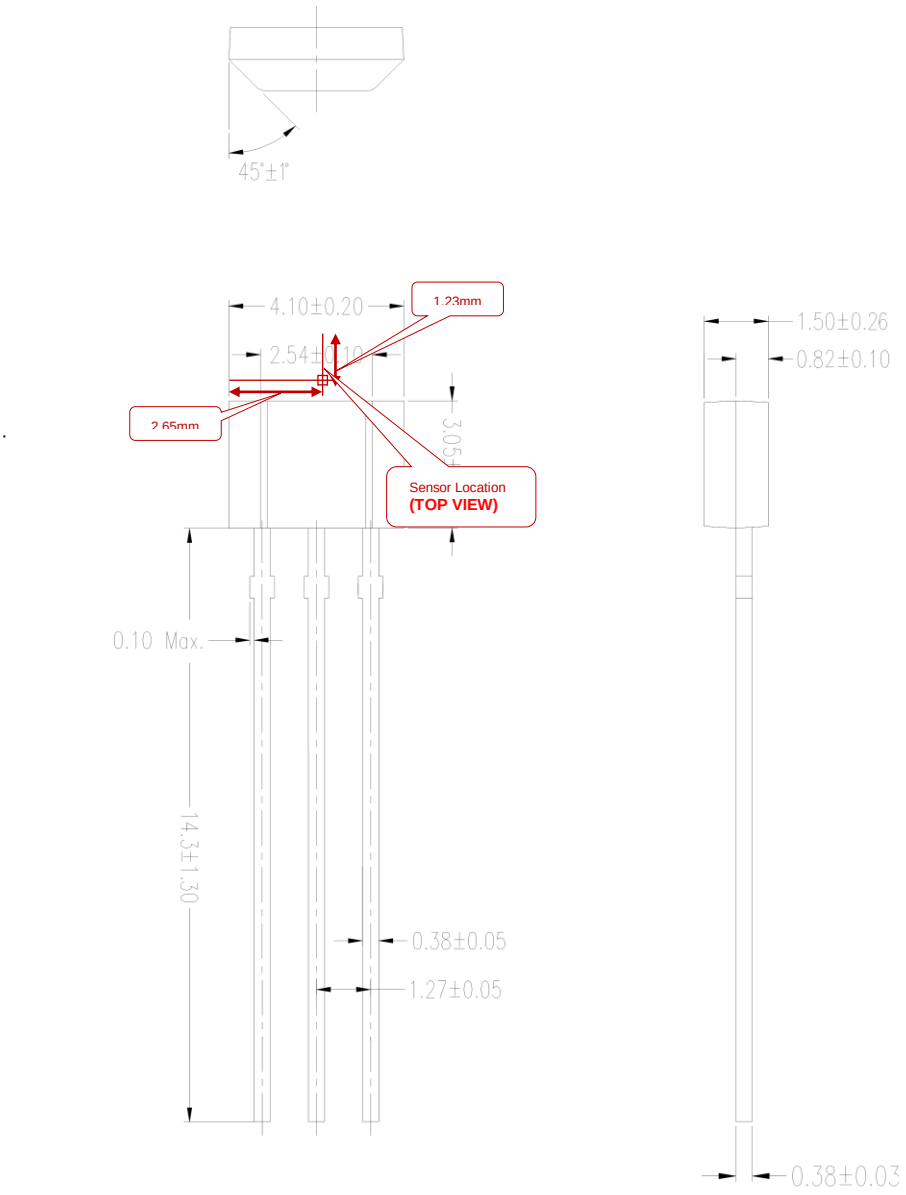


Figure.7

Test Circuit

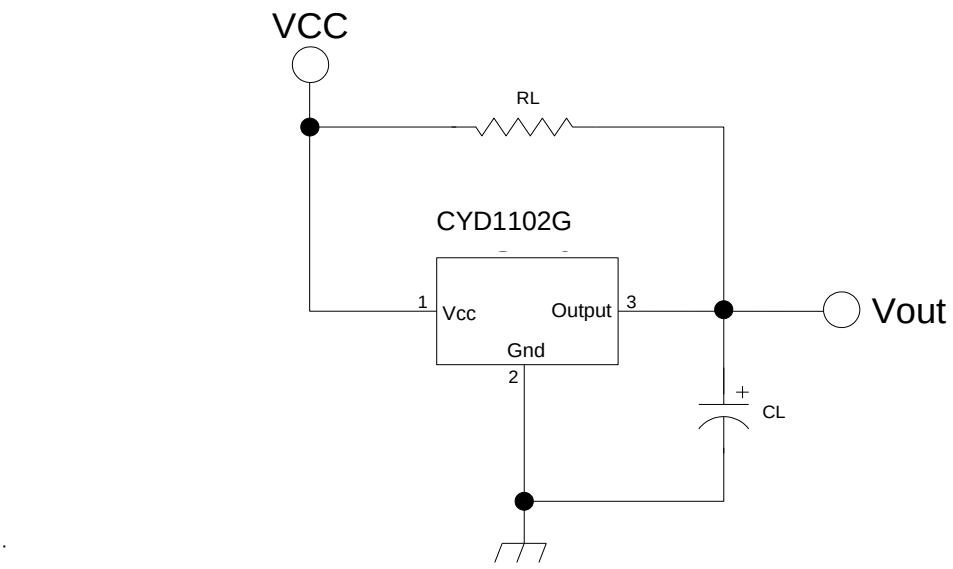


Figure.8

Functional Application Circuit

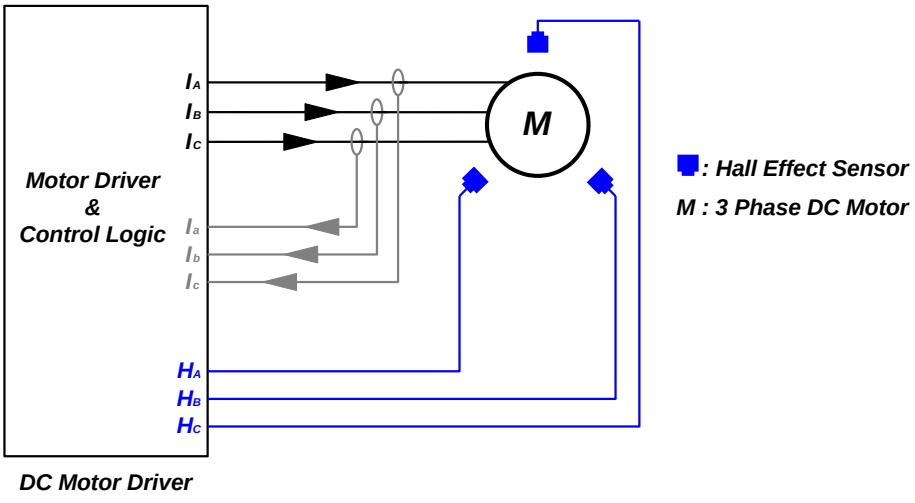


Figure.9

Bipolar Hall Effect Latching Switch ICs

CYD3601 Hall Effect Latching IC Switches

The CYD3601 is a bipolar Hall Effect switch with a latched digital output. The built-in dynamic offset cancellation of pre-amplifier stage achieves optimal symmetrical magnetic sensing. This Hall Effect IC is optimal for DC brushless fan applications. The supply voltage range is from 2.5V to 18V.

FEATURES

- 2.5V to 18V power supply
- Built-in dynamic offset cancellation
- Small size, convenient installing
- High balance and low thermal drift
- magnetic sensing
- **ROHS Compliant**

TYPICAL APPLICATIONS

- Brushless DC motor
- VCD/DVD loader, CD/DVD-ROM
- Contactless switch
- Cover detector
- Speed measurement
- Home applications
- Home safty

Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	18	V
Magnetic flux density	B	Unlimited	mT
Storage temperature range	T_S	-55 ~ +150	°C
Operating temperature range	T_A	-40 ~ +85	°C

ELECTRICAL CHARACTERISTICS

T_A=25°C, V_{DD}=12V

Parameter	Symbol	Test conditions	Type and Value			Unit
			min	typical	max	
Supply voltage	V_{CC}		2.5	-	18	V
Output sink voltage	V_{OL}	Iout=15mA	-	0.3	0.5	V
Output Breakdown voltage	V_{BV}		-	22	30	V
Supply current	I_{DD}	Output open@12V	-	6	8	mA

MAGNET CHARACTERISTICS

(V_{DD}=12V DC, T_A=+25°C)

Parameter	Symbol	Type and Value			Unit
		min	typical	max	
Operating point	B_{OP}		3	6	mT
Release point	B_{RP}	-6	-3		mT
Hysteresis	B_H	4	6	10	mT

NOTE: 1mT=10GS

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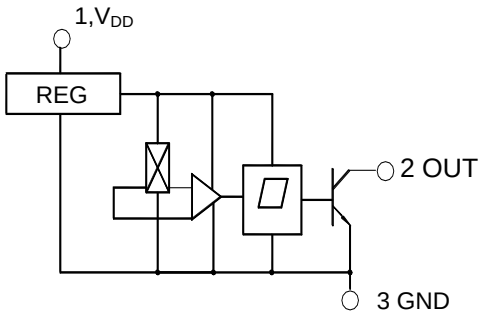
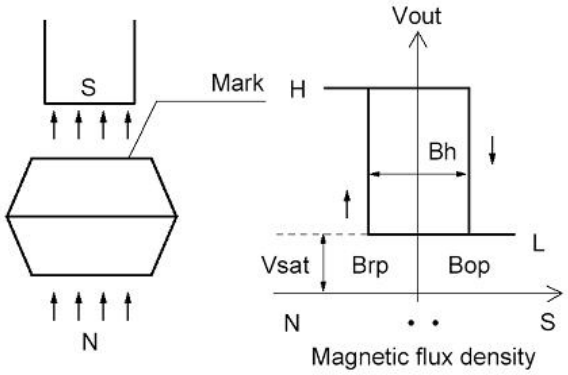
BLOCK DIAGRAM

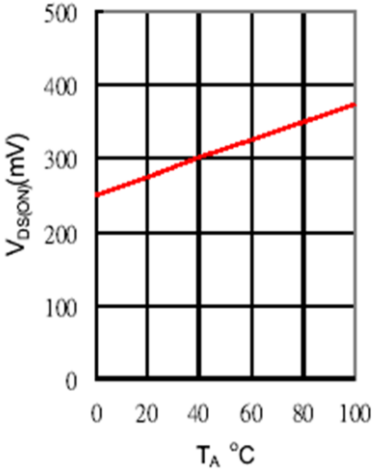


This Hall Effect sensor IC integrates the sensor, Pre-amplifier with dynamic offset cancellation and hysteresis comparator in single chip.

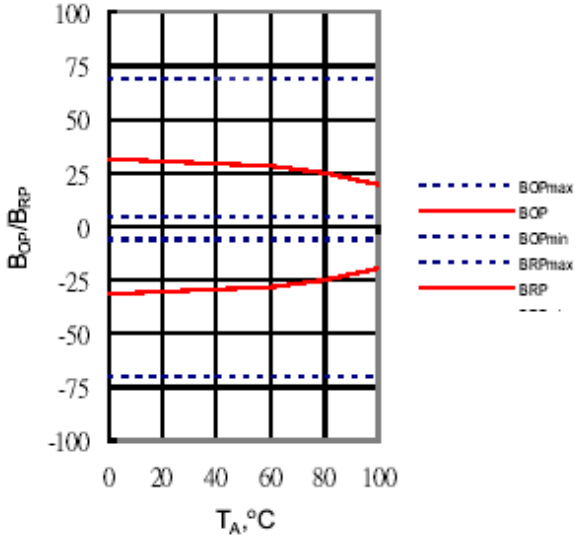
Magnetic-electrical transfer characteristics



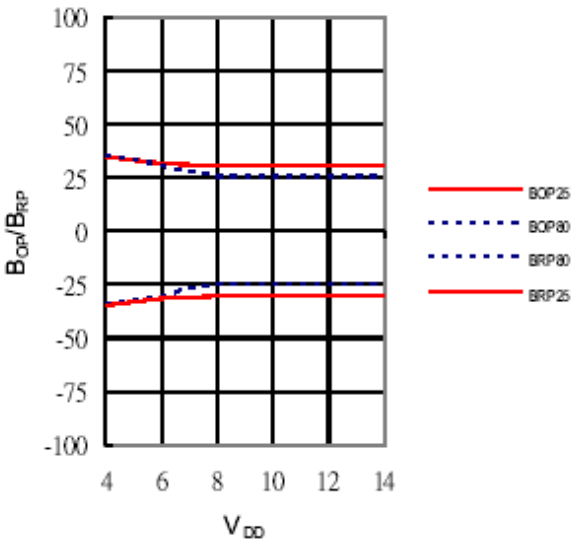
Output voltage versus temperature



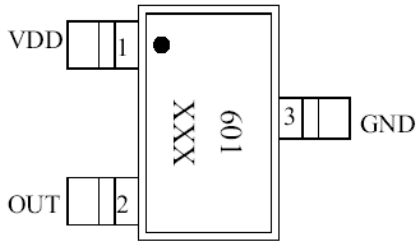
B_{OP}, B_{RP} versus temperature



B_{OP}, B_{RP} versus supply voltage



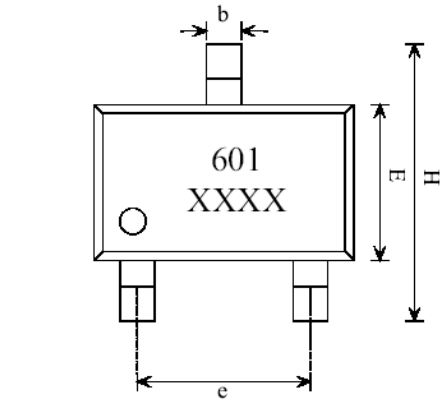
Package Type: SOT-23

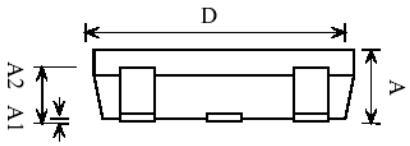


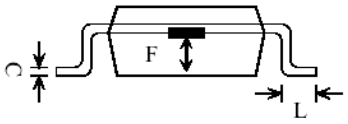
XXX: Date code

Pin Description

Name	Pin	Description	Type
VDD	1	DC power supply	P
OUT	2	Output pin	O
GND	3	DC ground	P

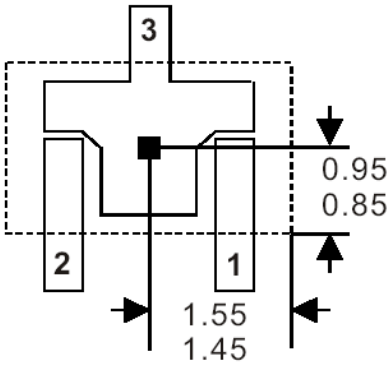






Sensor Location

Bottom view



SYMBOLS	DIMENSIONS IN MILLIMETERS(mm)		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	-	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
F	0.55	0.60	0.65
H	2.60	2.8	3.00
e	1.7	1.9	2.1
L	0.20	-	-

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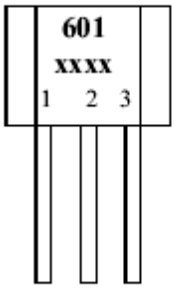
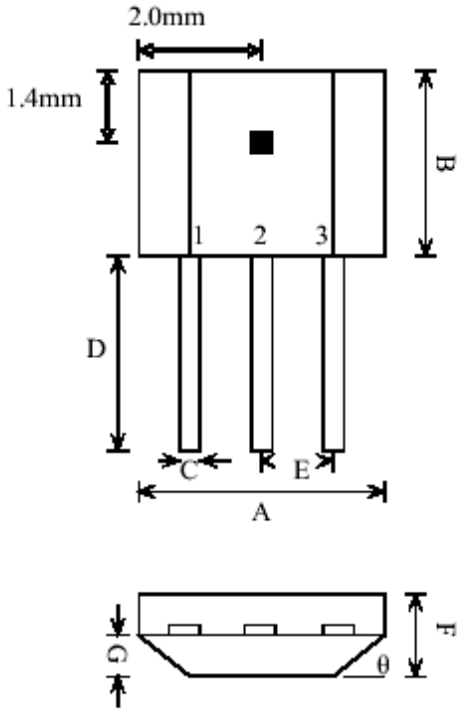
Package Type: TO-92 3Pin

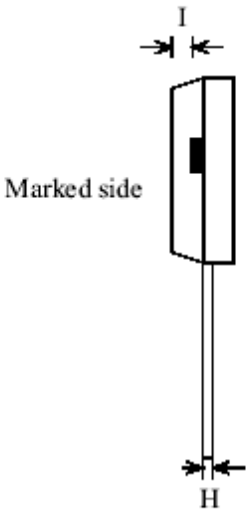


XXXX: Date code

Pin Description

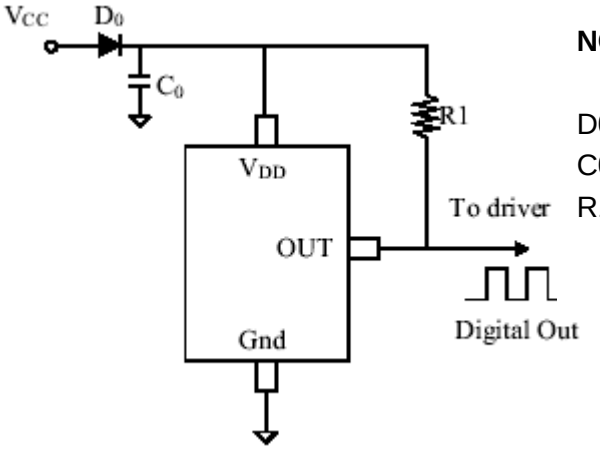
Name	Pin	Description	Type
VDD	1	DC power supply	P
GND	2	DC ground	P
OUT	3	Output pin	O





SYMBOLS	DIMENSIONS IN MILLIMETERS(mm)		
	MIN	NOM	MAX
A	3.80	4.00	4.20
B	2.90	3.10	3.30
C	0.38	0.45	0.52
D	15.10	15.30	15.50
E	1.24	1.27	1.30
F	1.45	1.50	1.55
G	0.68	0.73	0.78
H	0.36	0.43	0.50
I	0.41	0.43	0.45
θ		45°	

Application circuit



NOTE:

D0: general diode
C0: decoupling capacitor 1µF (recommended)
R1: 1k ~ 10k Ω (recommended)

Ordering Information

Package	Ordering no.	Mark	Packing	Temperature range
SOT-23	CYD3601S	601	3000units/reel	-40°C ~ +85°C
TO-92	CYD3601T	601	500-1000units/pack	-40°C ~ +85°C

CYD513 Hall Effect Bipolar IC Switches

(ROHS compliant)

These Hall-effect switches are monolithic integrated circuit consisting of a voltage regulator, Hall-voltage generator, differential amplifier, Schmitt trigger, temperature compensation circuit and open-collector output stage. Its input is a magnetic flux density signal and output is a digital voltage signal.

Features

- Wide supply voltage range
- Fast response time
- Wide frequency and temperature range
- Long operating life
- Small size, convenient installing
- Output compatible with all digital logic families
- Bipolar sensor
- **ROHS compliant**

Typical Applications

- Contactless switch
- Position control
- Speed measurement
- Revolution detection
- Isolation measurement
- Brushless dc motor
- Automotive igniters

ABSOLUTE MAXIMUM RATING

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	24	V
Magnetic flux density	B	Unlimited	mT
Output OFF voltage	V_{ce}	50	mV
Continuous output current	I_{OL}	50	mA
Operating temperature range	T_A	-40~150	°C
Storage temperature range	T_S	-55~150	°C

ELECTRICAL CHARACTERISTICS T_A=25°C

Parameter	Symbol	Test conditions	Type and Value			Unit
			min	type	max	
Supply voltage	V_{CC}		4.5	-	24	V
Output saturation voltage	V_{OL}	Iout=20mA B>B_{OP}	-	200	400	mV
Output leakage current	I_{OH}	Vout=24V B<B_{RP}	-	0.1	10	μA
Supply current	I_{CC}	V_{CC}=Output open	-	-	10	mA
Output rise time	t_r	R_L=820Ω C_L=20PF	-	0.12	-	μS
Output fall time	t_f	R_L=820Ω C_L=20PF	-	0.18	-	μS

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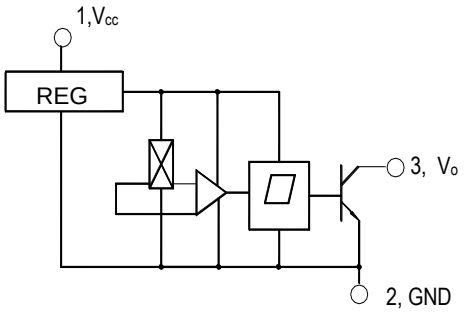
MAGNET CHARACTERISTICS

V_{CC}=4.5~24V

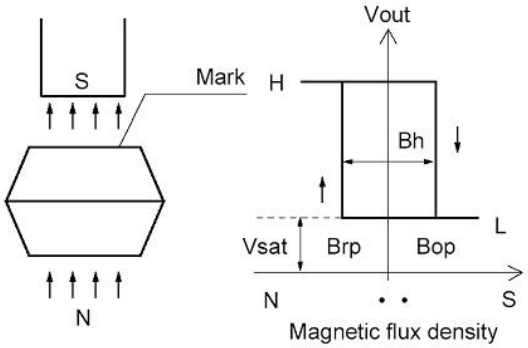
Parameter	Symbol	Type and Value			Unit
		min	typ	max	
Operate point	B_{OP}		4	6	mT
Release point	B_{RP}	-6	-4		mT
Hysteresis	B_H		8	-	mT

NOTE: 1mT=10GS

BLOCK DIAGRAM

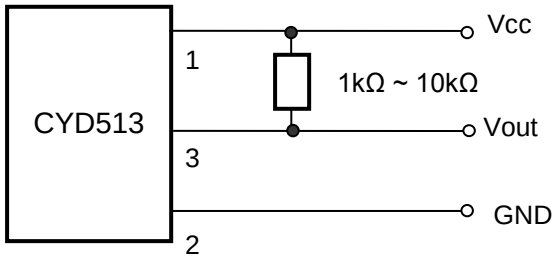


MAGNETID-ELECTRICAL TRANSFER CHARACTERISTICS

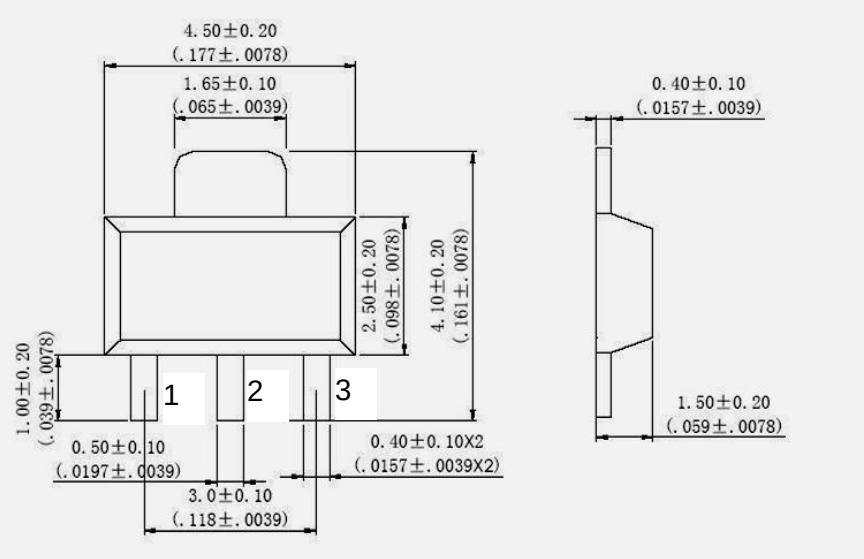


Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



DIMENSIONS (in: mm)



1. V_{cc} 2. GND 3. Output

SOT-89 Package

Cautions

1. When install, should as full as possible decrease the mechanical stress acting on the Hall IC, to avoid the influence of the operate point and release point.
2. On the premise of ensuring welding quality, use as possible as low welding temperature as short time.

CYD3172X HALL-EFFECT SWITCH IC

CYD3172X Hall effect latch IC is composed of a reverse protector, voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output on a single silicon chip. ICs can convert the changeable magnetic field signal into digital voltage output.

FEATURES

- High Sensitivity
- Resistant to Physical Stress
- Wide Supply Voltage Range
- Interfacing with all Kinds of Logic Circuits Directly

TYPICAL APPLICATION

- High Sensitive Non-contact Switch
- DC Brushless Motor
- DC Brushless Fan

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit
		Min	Max	
Supply Voltage	Vcc	4.5V ~ 24V		V
Magnetic Flux Density	B	unlimited	unlimited	mT
Output Current	Io	-	25	mA
Operating Temperature Range	T_A	-40	85	°C
Storage Temperature Range	T_S	-65	170	°C

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage	Vcc=4.5V~24V	V_{CC}	4.5	-	24.0	V
Output Low Voltage	Vcc=4.5V R_L=960Ω	V_{OL}	-	0.2	0.4	V
Output Leakage Current	Vo=Vccmax B≤B_{RP}	I_{OH}	-	1.0	10.0	μA
Supply Current	Vcc=Vccmax open-collector output	Icc		-	12.0	mA
Output Rise time	Vcc=12V R_L=820Ω C_L=20pF	t_r	-	1.0	2.0	μS
Output Fall time		t_f	-	1.0	2.0	μS

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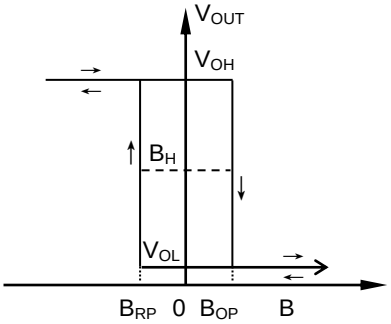
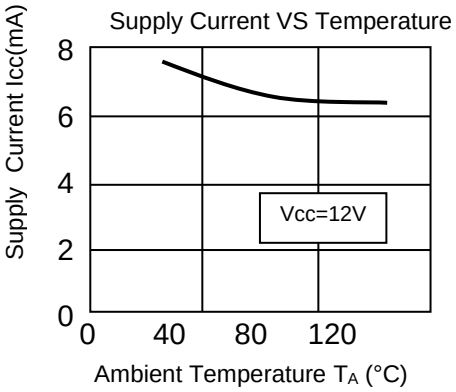
Magnetic Characteristics (Unit: mT)

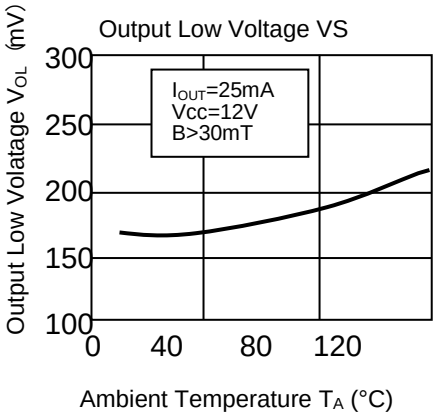
Parameter	Value			Unit
	Min	Typ	Max	
Operate Point (B_{OP})	1	-	7	mT
Release Point (B_{RP})	-7	-	-1	
Hysteresis (B_H)	4	-	-	

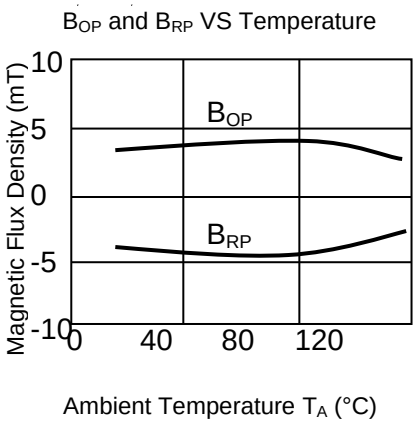
Magnetic-Electrical Transfer Characteristics



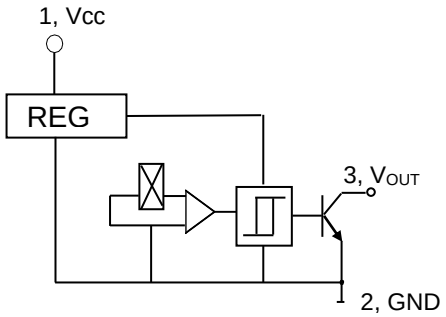
Characteristic Curves



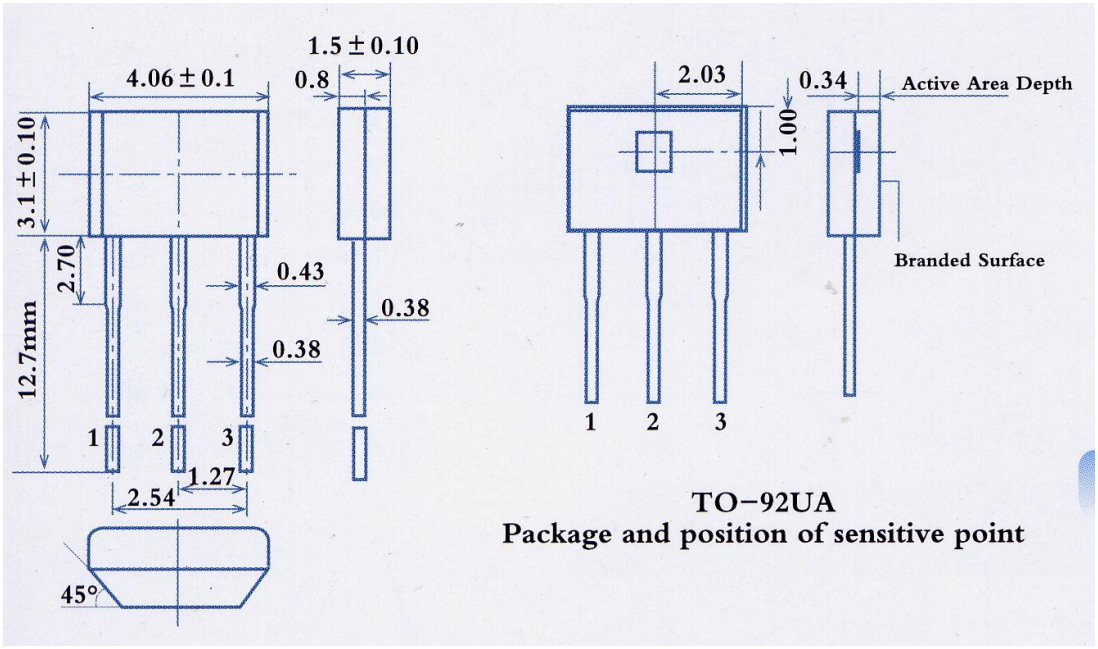




FUNCTIONAL BLOCK DIAGRAM



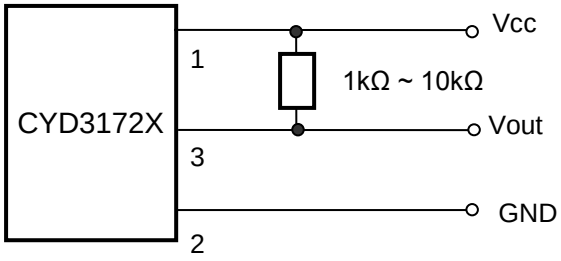
Package Outline Drawing (Unit: mm)



Pin Notes: 1. Power Supply 2. Ground 3. Output

Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



Cautions:

1) It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2) Pay attention to the soldering temperature at the leads; keep it lower in a short time to guarantee good soldering quality.

CYD512 Latching Hall-effect Switch IC

CYD512 Hall Effect latch ICs are composed of a reverse protector, voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output (bipolar latch) on a single silicon chip. ICs can convert the changeable magnetic field signal into digital voltage output.

FEATURES

- High Sensitivity
- Resistant to Physical Stress
- Wide Supply Voltage Range
- Interfacing with All Kinds of Logic Circuits Directly

TYPICAL APPLICATION

- High Sensitive Non-contact Switch
- DC Brushless Motor
- DC Brushless Fan

ABSOLUTE MAXIMUM RATINGS

	Symbol	Value		Unit
		Min	Max	
Supply Voltage	Vcc	4.5	18	
Output Current	Io	-	15	mA
Operating Temperature Range	T_A	-40	150	℃
Storage Temperature Range	T_S	-50	150	℃

ELECTRICAL & MAGNETIC CHARACTERISTICS

Parameter	Test Condition	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage		V_{CC}	4.5	-	18	V
Output Low Voltage	V_{CC} = 4.5 V~18V	V_{OL}	-	0.2	0.4	V
Supply Current	V_{CC}= 18V	I_{CC}	-	-	8	mA
Operate Point	V_{CC} = 4.5 V~18V	B_{OP}	1	-	6	mT
Release Point	V_{CC} = 4.5 V~18V	B_{RP}	-6	-	-1	mT
Hysteresis	V_{CC} = 4.5 V~18V	B_H	2	-	7	mT
Internal Load Resistance		R_L	7		13	KΩ

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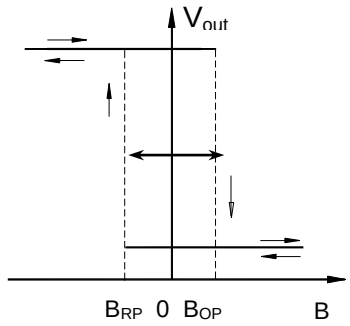
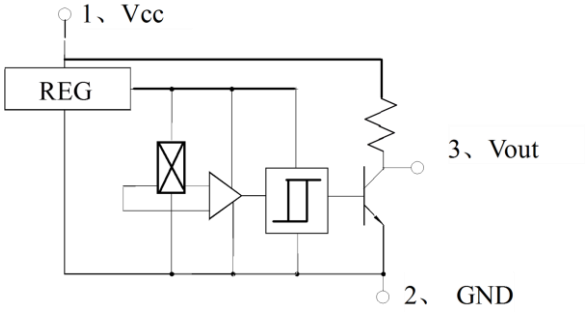
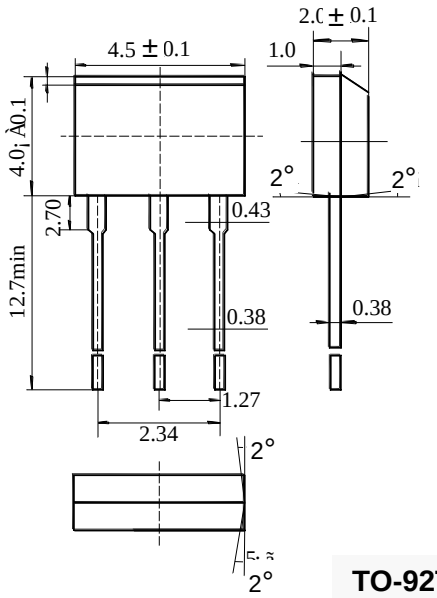
Magnetic-Electrical Transfer Characteristics

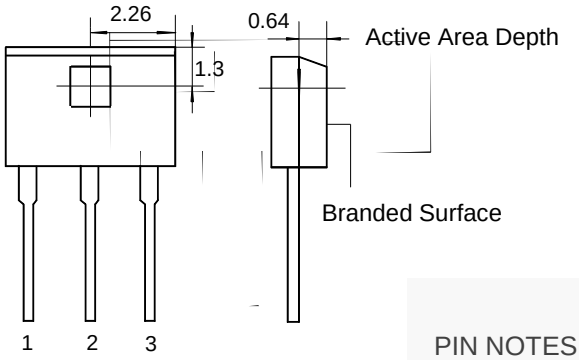


FUNCTIONAL BLOCK DIAGRAM



Package Unit：(mm)





PIN NOTES

1. Power Supply
2. Ground
3. Output

TO-92T
Package and position of sensitive point

Cautions:

1. It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2. Pay attention to the soldering temperature at the leads, and keep it lower in a short time to guarantee good soldering quality.

CYD41 High Sensitive Hall Effect Switch IC for high temperature

CYD41 Series high sensitive Hall Effect switch IC is composed of a reverse protector, voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output on a single silicon chip. ICs can convert the changeable magnetic field signal into digital voltage output.

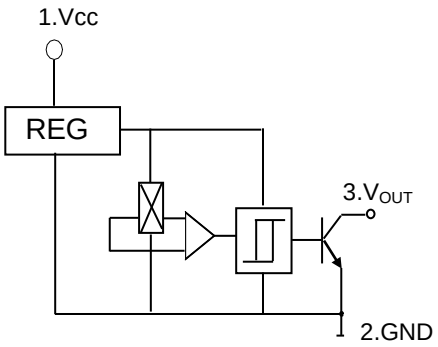
FEATURES

- High Sensitivity
- Resistant to Physical Stress
- Wide Supply Voltage Range
- Interfacing with All Kinds of Logic Circuits Directly

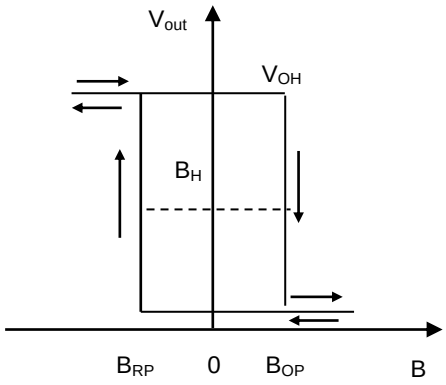
TYPICAL APPLICATION

- High Sensitive Non-contact Switch
- DC Brushless Motor
- DC Brushless Fan

FUNCTIONAL BLOCK DIAGRAM



MAGNETIC-ELECTRICAL TRANSFER CHARACTERISTICS



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit
		Min	Max	
Supply Voltage	Vcc	4.5V~24V		V
Magnetic Flux Density	B	unlimited	unlimited	mT
Output Current	Io	-	25	MA
Operating Temperature Range	T_A	-40	150	℃
Storage Temperature Range	T_S	-55	150	℃

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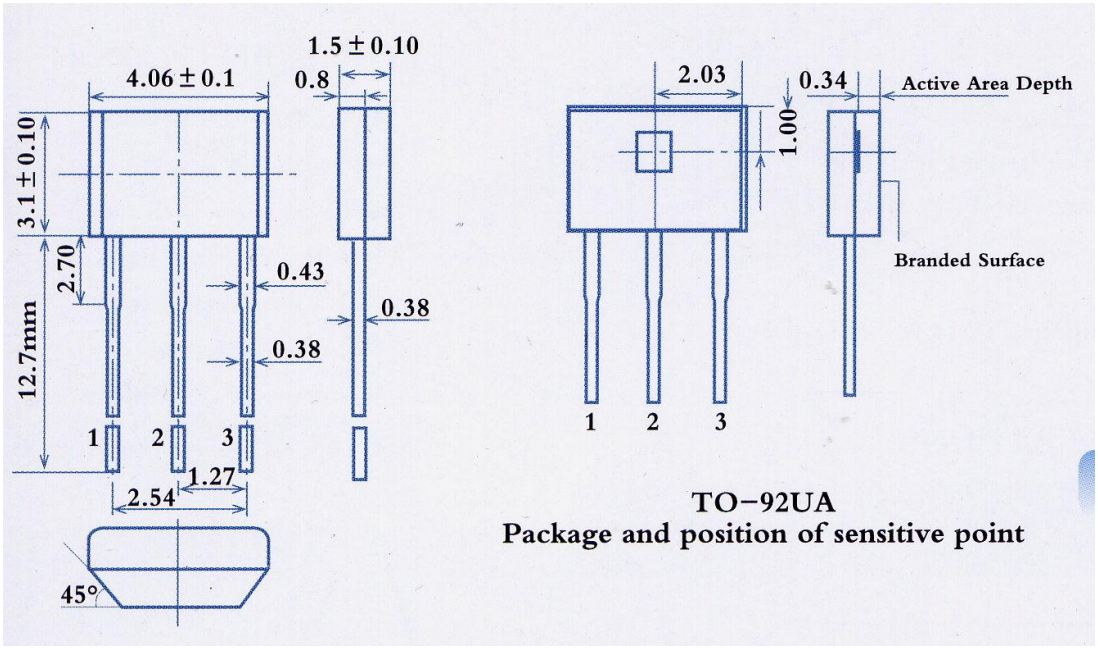
ELECTRICAL CHARACTERISTICS

Parameter	Test Condition	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage	Vcc=4.5V~24V	V_{CC}	4.5	-	24.0	V
Output Low Voltage	Vcc=4.5V, R_L=960Ω B≥B_{OP}	V_{OL}	-	0.2	0.4	V
Output Leakage Current	Vo=Vccmax, B≤B_{RP}	I_{OH}	-	1.0	10.0	μA
Supply Current	Vcc=Vccmax open-collector output	Icc	-	4.0	8.0	mA
Output Rise time	Vcc=12V, R_L=820Ω C_L=20pF	t_r	-	1.5	-	μS
Output Fall time		t_f	-	1.0	-	μS

Magnetic Characteristics (Unit: mT)

Parameter	Test condition	Value			Unit
		Min	Typ	Max	
Operate Point (B_{OP})	-20°C<TA<+90°C	1	4	7	mT
Release Point (B_{RP})	-20°C <TA<+90°C	-7	-4	-1	
Hysteresis (B_H)	-20°C<TA<+90°C	4	8		

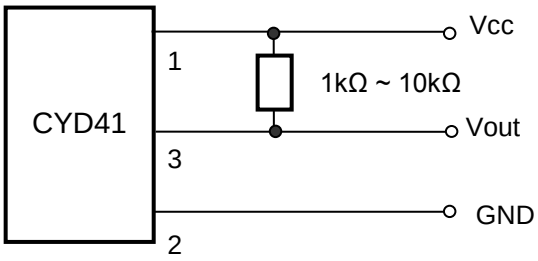
Package Outline Drawing (Unit: mm)



Pin Notes: 1. Power Supply 2. Ground 3. Output

Connection

This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



Cautions:

1) It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2) Pay attention to the soldering temperature at the leads; keep it lower in a short time to guarantee good soldering quality.

CYDF41 Bipolar Hall Effect Switch

The CYDF41 is an integrated Hall Effect latched sensor designed for electronic commutation of brush-less DC motor applications. The device includes an on-chip Hall voltage generator for magnetic sensing, a comparator that amplifies the Hall voltage, and a Schmitt trigger to provide switching hysteresis for noise rejection, and open-collector output. An internal band gap regulator is used to provide temperature compensated supply voltage for internal circuits and allows a wide operating supply range.
A north pole of sufficient strength will turn the output ON. In the absence of a magnetic field, the output is OFF.

Features

• Wide operating voltage range: 3.0V to 28V	• Reverse polarity protection
• Maximum output sink current	• Package : SIP-3L
• Open-Collector pre-driver	

Block Diagram

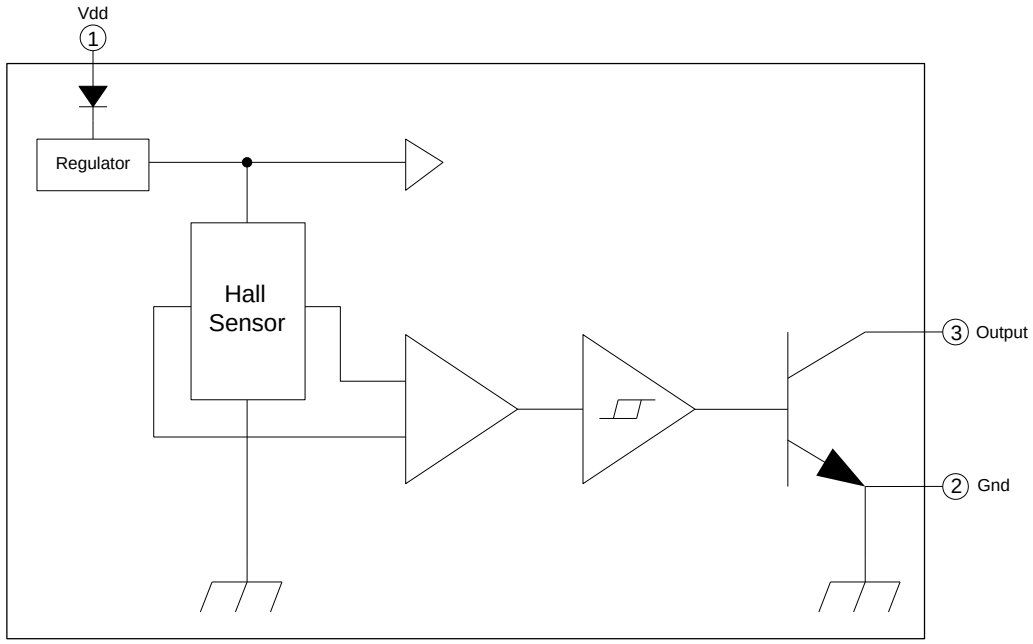


Figure 1

Recommended Operating Conditions

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}	-	3.0		28	V
Operating Temperature Range	T_A	-	-40		125	℃

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Electrical Characteristics V_{DD}=12.0V, T_A=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Average Supply Current(no load)	I_{DD}	-		3.5	10	mA
Output Saturation Voltage	V_{SAT}	Iout= 20mA		165	200	mV
Output Rise time	t_r	RL=500Ω, CL=20pF(Figure 7)	0.2	-	0.75	μs
Output Fall time	t_f	RL=500Ω, CL=20pF(Figure 7)	20	-	150	ns

Magnetic Characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operate Points	B_{OP}		+60	-	+80	G
Release Points	B_{RP}		-80	-	-60	G
Hysteresis	B_{HYST}		30	-	120	G

Hysteresis Characteristics

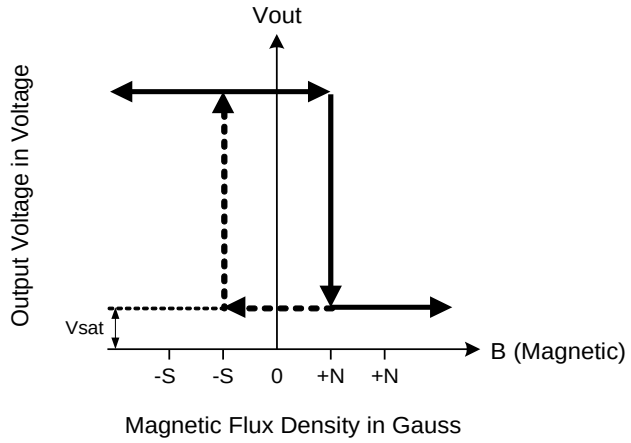


Figure 2

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operating Temperature	T_{OP}	-	-40		125	℃
Storage Temperature	T_{ST}	-	-65		150	℃
DC Supply Voltage	V_{DD}	-	3.0		28	V
Supply Current	I_{DD}	-			10	mA
Continuous Current	$I_{O(CONT)}$				50	mA
Junction temperature	T_J				160	℃
Power Dissipation	P_D	SIP-3L			500	mW
Thermal Resistance	θ_{JC}	SIP-3L		0.27		℃/mW
Lead Temperature		10sec			260	℃

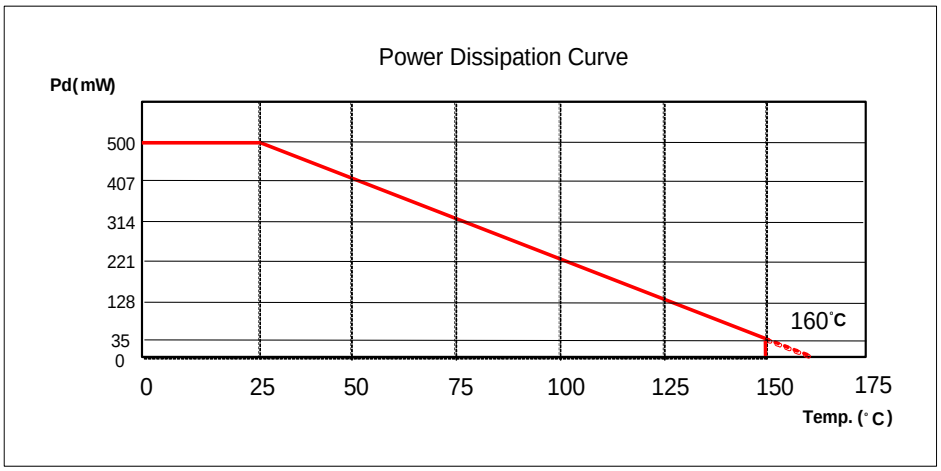
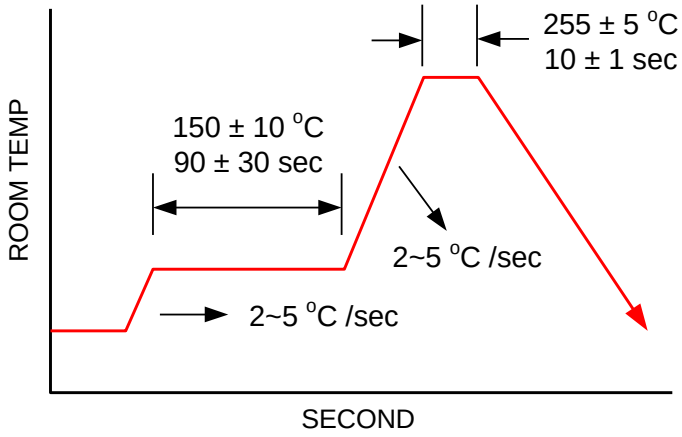


Figure 3



Soldering Condition

Figure 4

Pin Connection

[Top View]

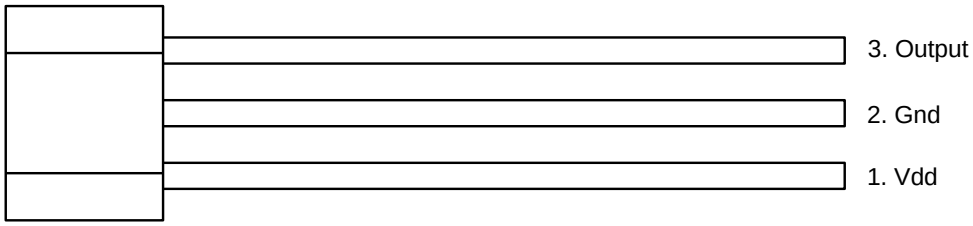


Figure 5

Pin Descriptions

Name	I/O	Pin No.	Description
Vdd	P	1	Positive power supply
Gnd	G	2	Ground
Output	O	3	Driver output

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

Marking Information

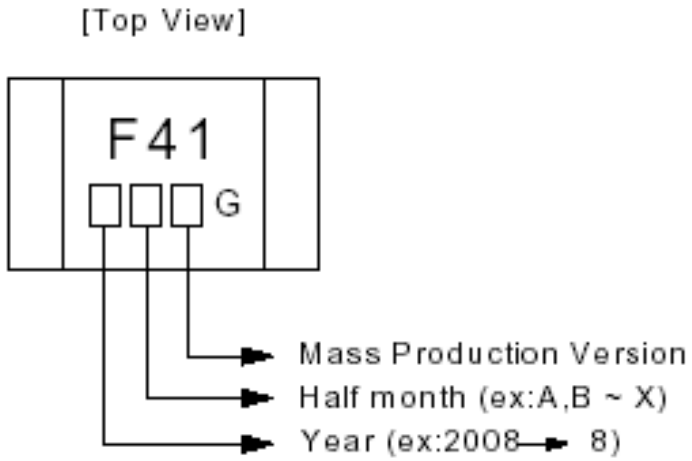


Figure 6

Order Information

Part Number	Operating Temperature	Package	MOQ
CYDF41	-40 ℃ to +125 ℃	SIP-3L	1000ea

Package Dimension (Unit: mm)

SIP-3L (Pb Free)

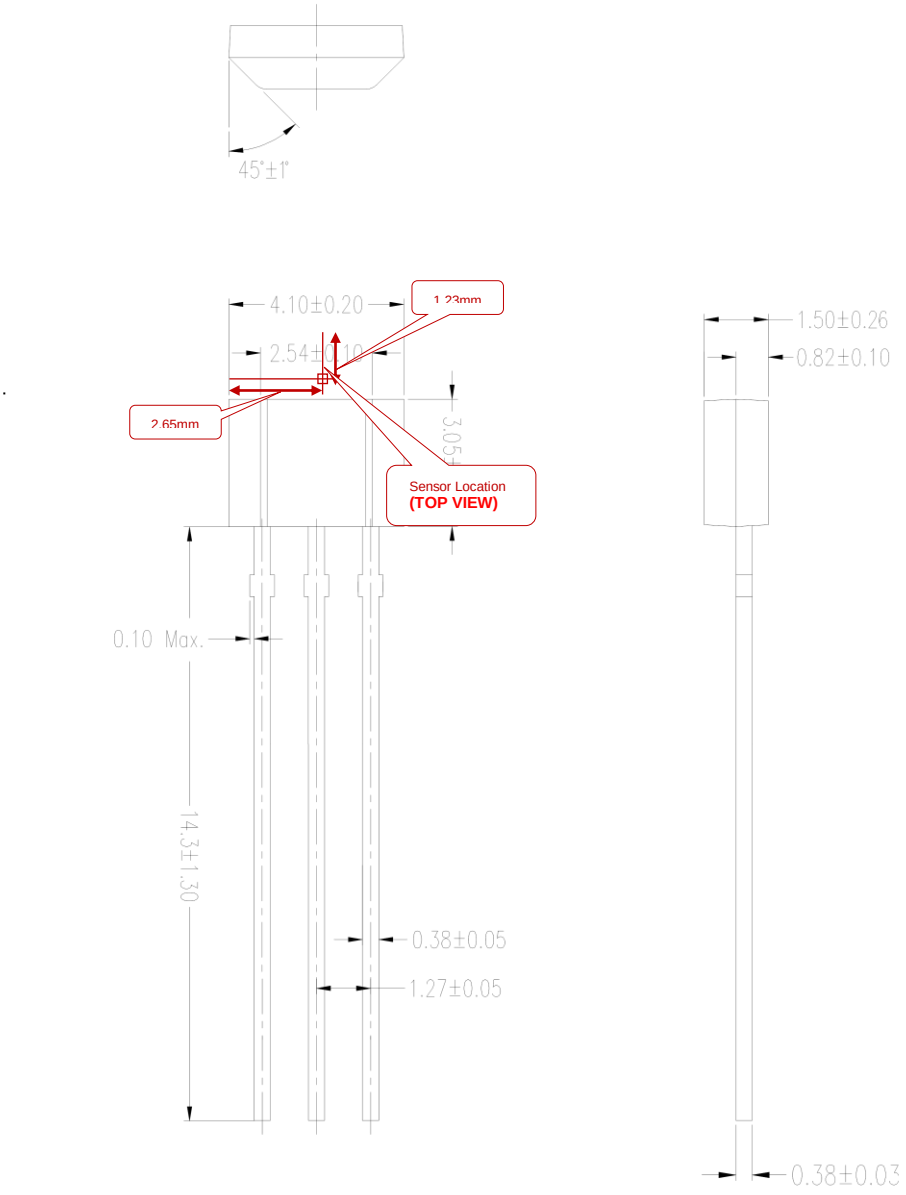


Figure 7

Test Circuit

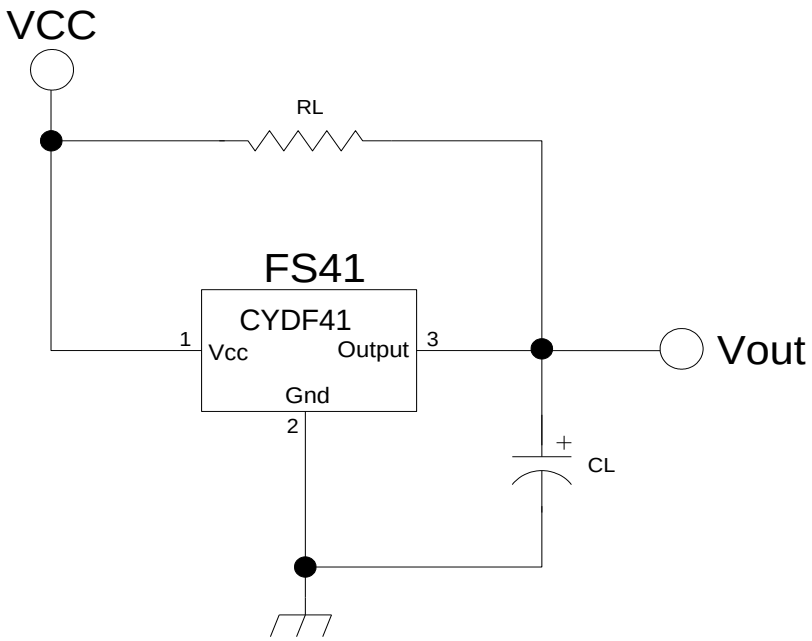


Figure 8

Functional Application Circuit

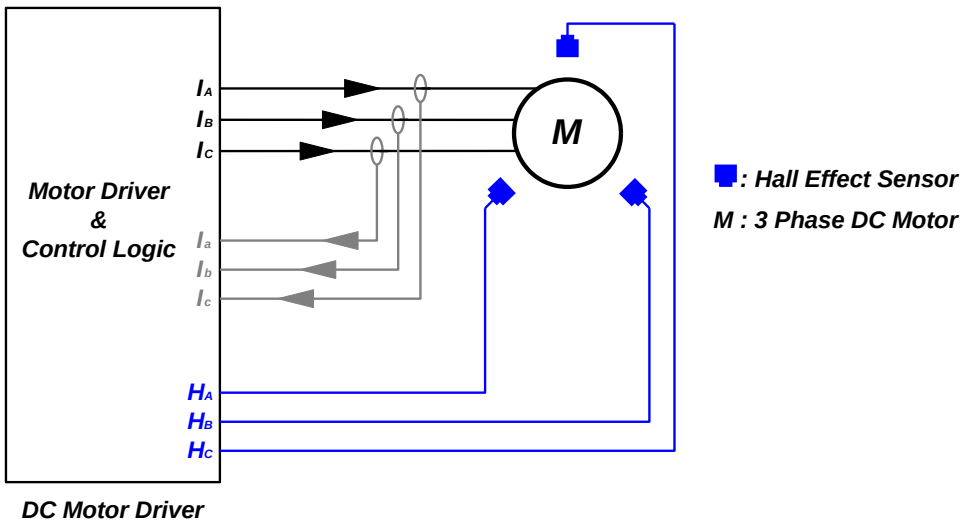


Figure 9

CYD72X Bipolar Hall Effect Switch

CYD72X is a Hall sensor with latched digital output. It's suitable for electronic commutation of brushless DC motor applications. The CYD72X uses a chopper amplifier for magnetic signal amplification, which can achieve a low offset. Thus it provides precise magnetic switching thresholds.
If a magnetic flux density larger than threshold Bop, NO is turned on(low). The output state is held until a magnetic flux density reversal falls below Brp causing NO to be turned off (high)

Features

• Maximum output sink current 50mA	• Reverse polarity protection
• Open collector pre-driver	• Package : SIP-3L

Block Diagram

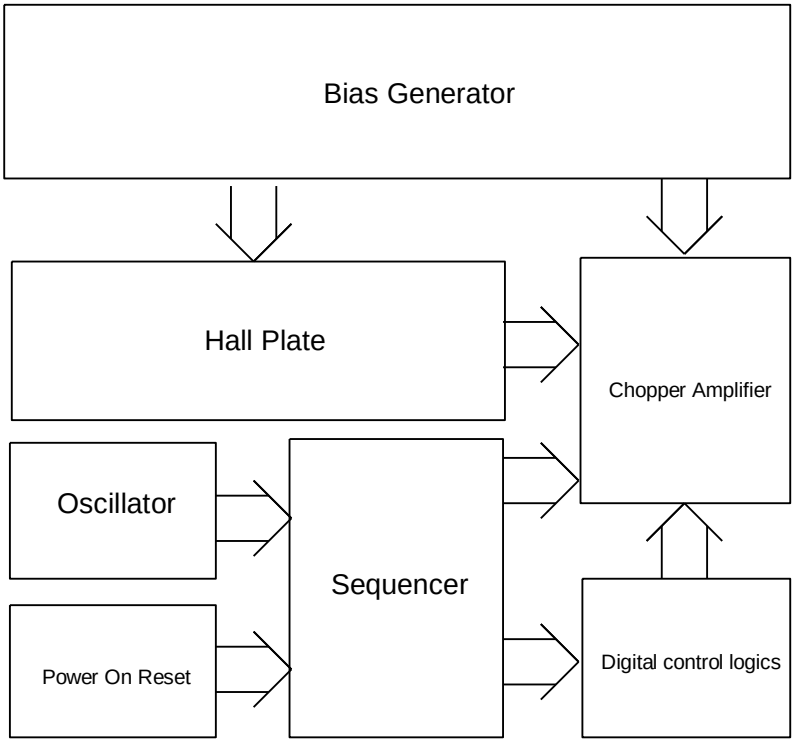


Figure 1

Functional Descriptions

Refer to the block diagram (Figure.1), CYD72X is composed of the following building blocks:

•+ Bias generator

The bias generator provides precise, temperature- and process-insensitive bias references for the analog blocks. These references guarantee proper operation of the chip under all conditions specified in this specification.

•+ Oscillator + Sequencer

The built-in oscillator provides the clock signal, which is taken by the sequencer to generate the sequential signals necessary for both the Hall sensor and the digital control logics

•+ Power on Reset

It is used to detect the power-up ramp and reset the digital circuits to attain correct operation as soon as the power is ready.

•+ Chopper Amplifier

To achieve a higher magnetic sensitivity the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

•+ Digital control logics

It generates controlling signals for the Hall sensor.

.

Recommended Operating Conditions

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}	-	2.4		16	V
Operating Temperature Range	T_A	-	-20		105	℃

Electrical Characteristics V_{DD}=12.0V, T_A=25℃ (unless otherwise specified)

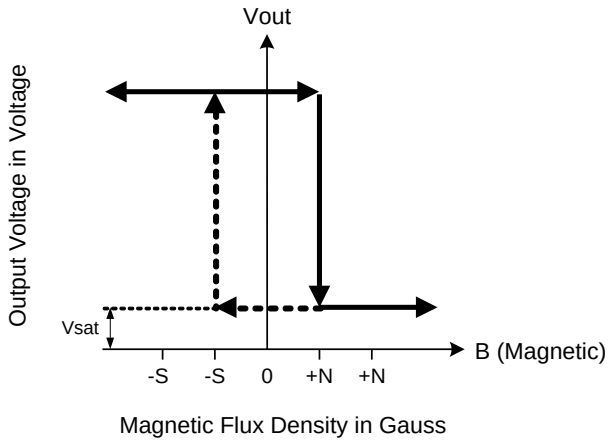
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Average Supply Current(no load)	I_{DD}	-		3.0	10	mA
Output Saturation Voltage	V_{SAT}	Iout= 50mA		0.5	0.8	V
Output leakage current	I_{LEAK}	V_{OUT}=12V			20	μA
On resistance	R_{ON}			10		Ω

Magnetic Characteristics

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operate Points	B_{OP}			+25		G
Release Points	B_{RP}			-25		G
Hysteresis	B_{HYST}			50		G

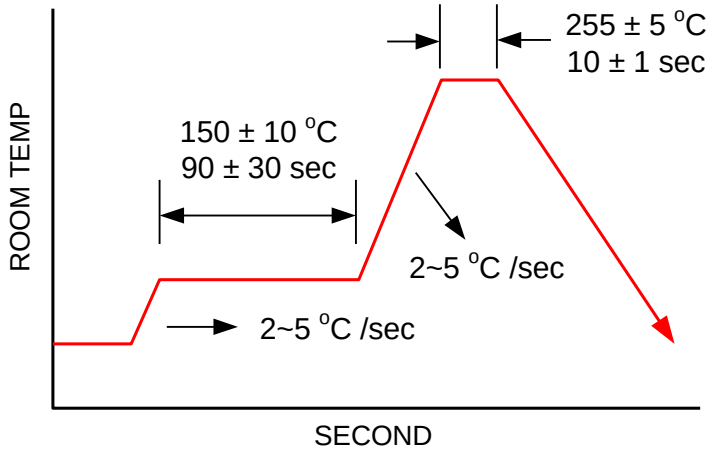
Hysteresis Characteristics

Figure 2



Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Operating Temperature	T_{OP}	-	-20		105	℃
Storage Temperature	T_{ST}	-	-40		150	℃
DC Supply Voltage	V_{DD}	-	2.4		16	V
Supply Current	I_{DD}	-			10	mA
Continuous Current	$I_{O(CONT)}$				50	mA
Junction temperature	T_J				150	℃
Lead Temperature		10sec			260	℃



Soldering Condition

Figure 3

Pin Connection

[Top View]

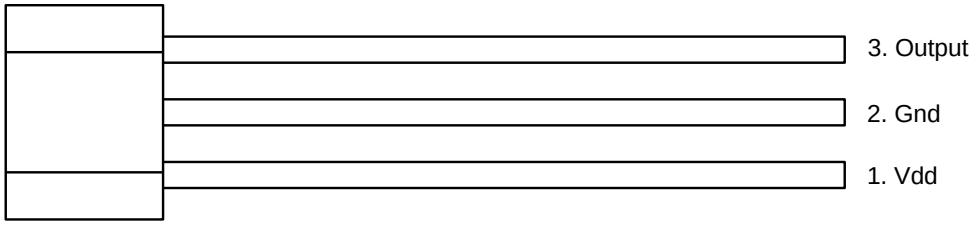


Figure 4

Pin Descriptions

Name	I/O	Pin No.	Description
Vdd	P	1	Positive power supply
Gnd	G	2	Ground
Output	O	3	Driver output

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

Marking Information

[Top View]

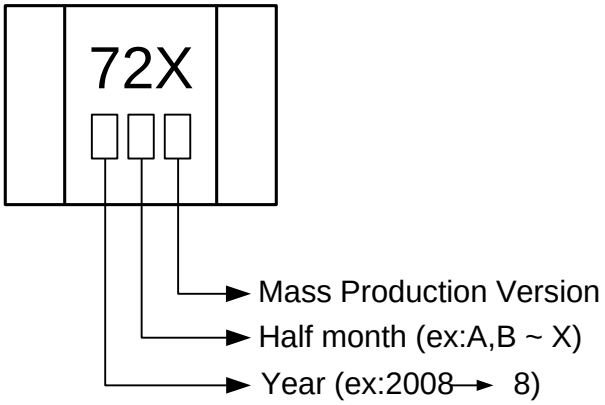


Figure 5

Order Information

Part Number	Operating Temperature	Package	MOQ
CYD72X	-20 ℃ to +105 ℃	SIP-3L	1000ea

Package Dimension (Unit: mm)

SIP-3L(Pb Free)

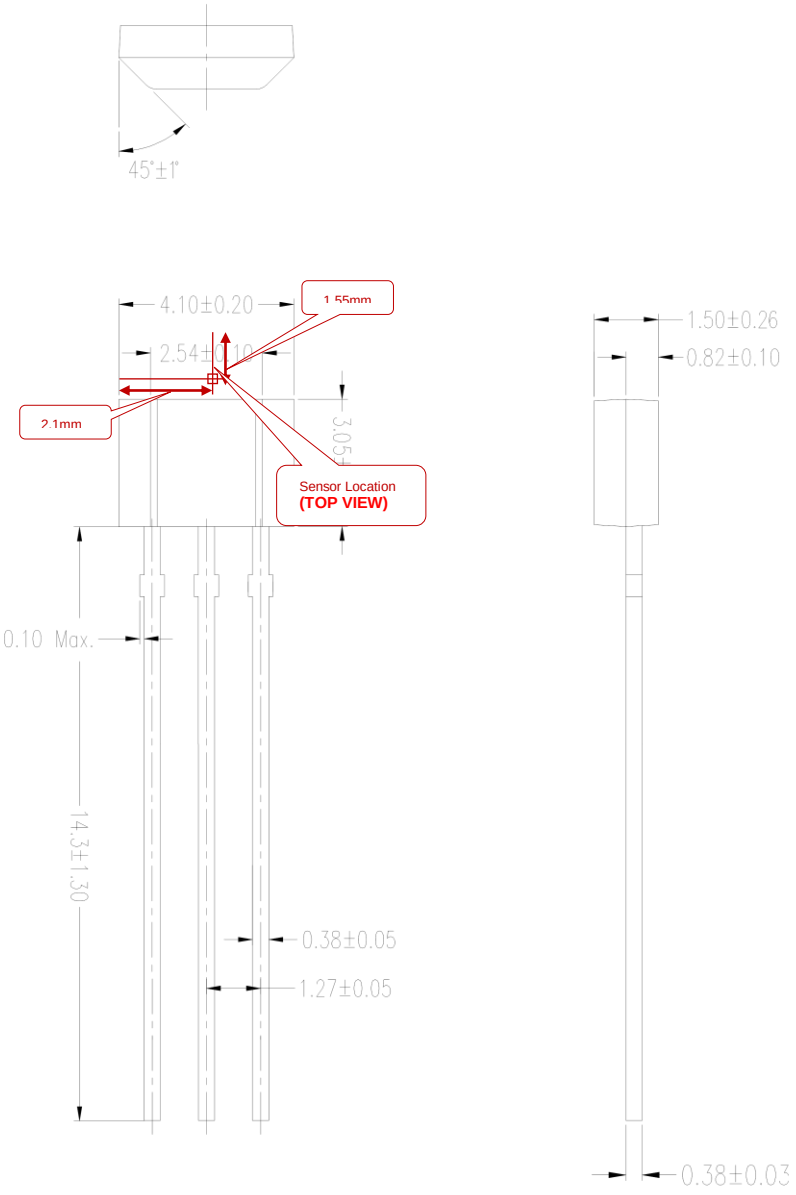
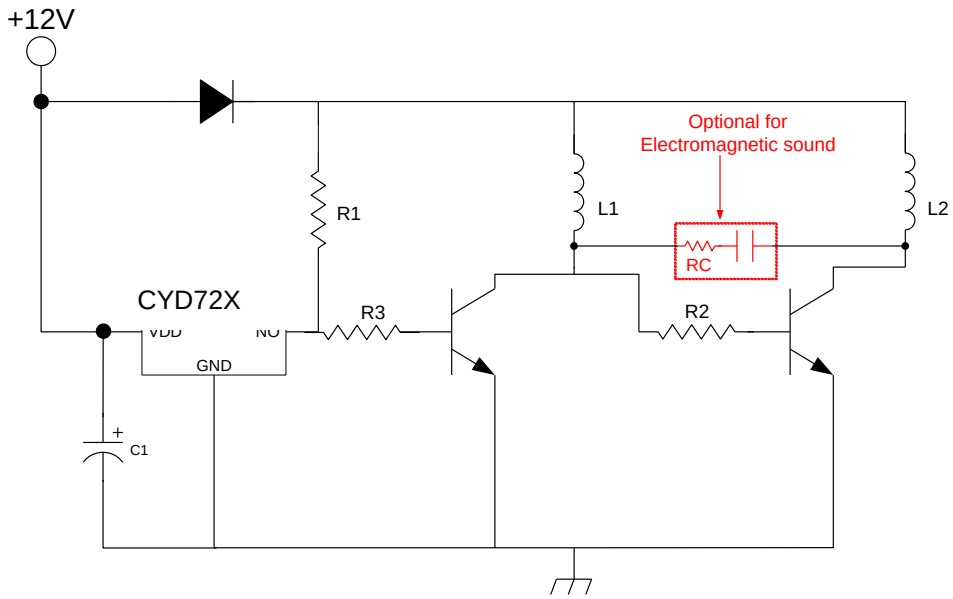


Figure 6

Application Circuit Reference



Brushless DC Fan

Figure 7

Note. Detail information please check application note.
Suggestion value: R1=1K ohm, R3=330 ohm, R=30 ohm, C=2.2uF, C1>0.1uF

Omni-polar Hall Effect Switch ICs

CYD3661-BC Micropower Ultra-Sensitivity Hall Effect Sensors

The CYD3661-BC is ultra-sensitive, pole independent Hall-Effect switches with a latched digital output. It is very suitable for operation in battery-operated, hand-held equipment such as cellular and cordless phone, PDA, pagers palmtop computers. The built-in dynamic offset cancellation of pre-amplifier stage achieves optimal symmetrical magnetic sensing. The supply voltage range is from 2.4V to 5.5V and the max output current is 5mA.
Unlike other Hall-effect switches, either a north or south pole of sufficient strength will turn the output on. In the absence of a magnetic field, the output is off. The polarity independence and minimal power requirement allows this device to easily replace reed switches for superior reliability.

APPLICATIONS

- Cover detector
- Battery-operated
- Hand-held equipment
- Door sensors

FEATURES

- Micro-power operation (5-7µW), **Omni -polar**
- 2.4V to 5.5V power supply
- Built-in dynamic offset cancellation
- Thin SOT package
- ESD protected to 5KV
- High balance and low thermal drift magnetic sensing
- **ROHS compliant**

ABSOLUTE MAX. RATINGS (T_A=25°C)

Parameter	Symbol	Condition	Value	Units
Supply voltage	$V_{DD(MAX)}$		7	V
Allowable power dissipation	Pd		300*	mW
Storage temperature	T_S		-55 ~ +150	°C
Operating temperature	Ta		-40 ~ +85	°C
Output current	I_{out}		5	mA

* On 50mm x 50mm x 1.6mm glass epoxy board

ELECTRICAL CHARACTERISTICS T_A=25°C, V_{DD}=3.0V

Parameter	Symbol	Test condition	Value			Units
			Min.	Typ.	Max..	
Supply voltage	V_{DD}		2.4	3.0	5.5	V
Output sink voltage	V_{DS}	I_{out}=1mA, V_{DD}=3.0V	-	0.1	0.25	V
Supply current	I_{AWK}	Awake, V_{DD}=3.0V	-	3	5	mA
	I_{SLP}	Sleep, V_{DD}=3.0V		2	4	µA
	I_{AVG}	V_{DD}=3.0V		5	9	µA
Awake time	T_{AWK}	Operating		45	90	µS
Period	T_P	Operating		90	180	mS
Duty cycle				0.05		%

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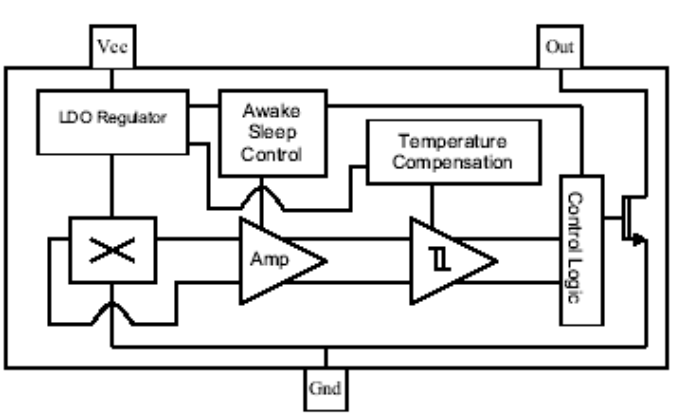
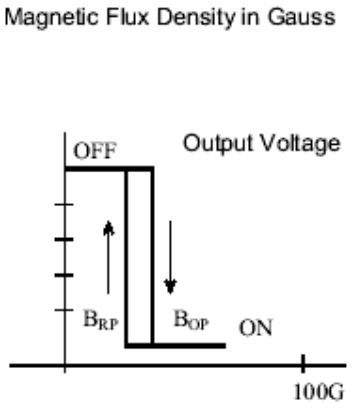
Magnetic Characteristics T_A=25°C, V_{DD}=3.0V

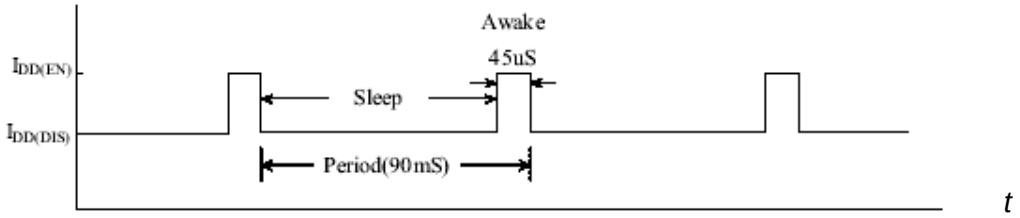
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Operation Point	B_{OP}	S pole operation point	18		47	GS
Release Point	B_{RP}	S pole release point	14		43	
Operation Point	B_{ON}	N pole operation point	-35		-55	
Release Point	B_{RN}	N pole release point	-27		-46	GS
Hysteresis	B_H	$\lvert B_{OP} - B_{RN} \rvert$		6		GS

BLOCK DIAGRAM

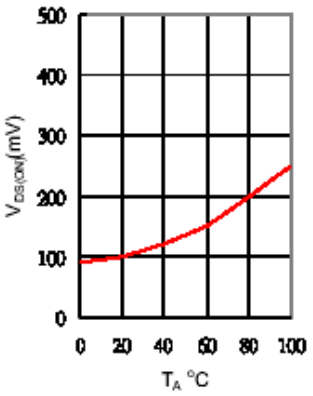




The micro power operation is realised by an awake/sleep timing control as shown in the following figure. Internal timing circuitry activates the sensor for 45µs and deactivates it for the remainder of the period (90ms). A short awake time allows for stabilization prior to the sensor sampling and data latching on the falling edge of the timing pulse. The output during the sleep time is latched in the last sampled state. The supply current is not affected by the output state.

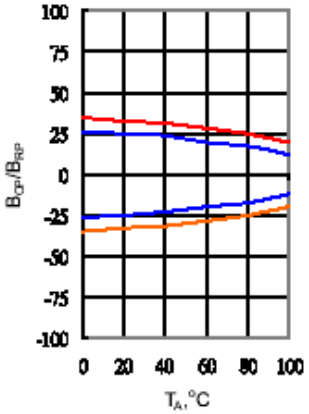


Output sink voltage versus temperature

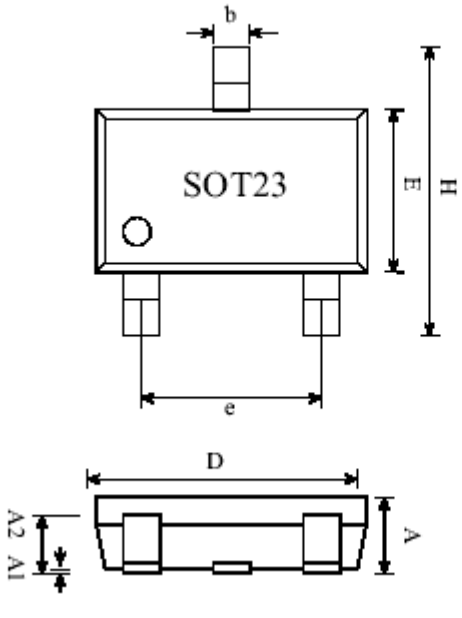


VDS (ON)

B_{OP}, B_{RP} Versus Temperature

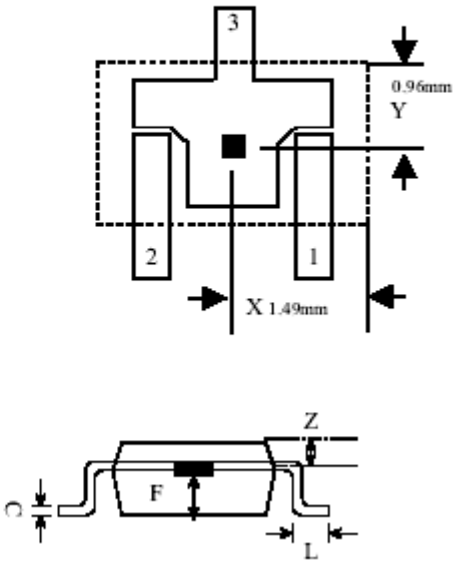


Package Outline



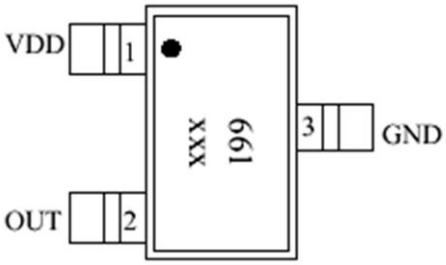
Sensor Location

Bottom view



SYMBOLS	DIMENSIONS IN MILLIMETERS(mm)		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	-	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.60	1.80	2.00
F	0.55	0.60	0.65
H	2.60	2.8	3.00
e	1.7	1.9	2.1
L	0.20	-	-
SENSOR LOCATION			
X	-	0.96	-
Y	-	1.49	-
Z	-	0.50	-

SOT-23



XXX: Date Code

Pin Description

Name	Pin	Description
VDD	1	DC power supply
OUT	2	Output pin
GND	3	DC ground

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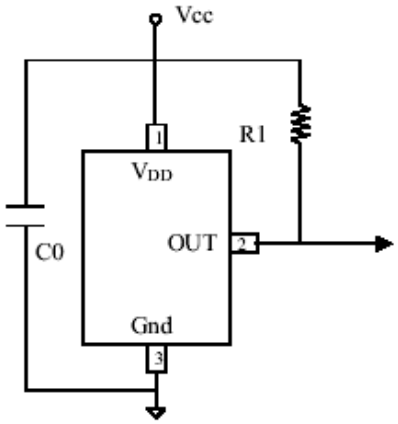
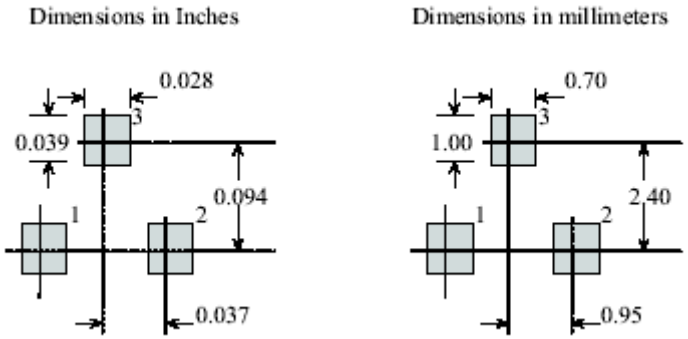
APPLICATION CIRCUITS



Solder-Pad Layout



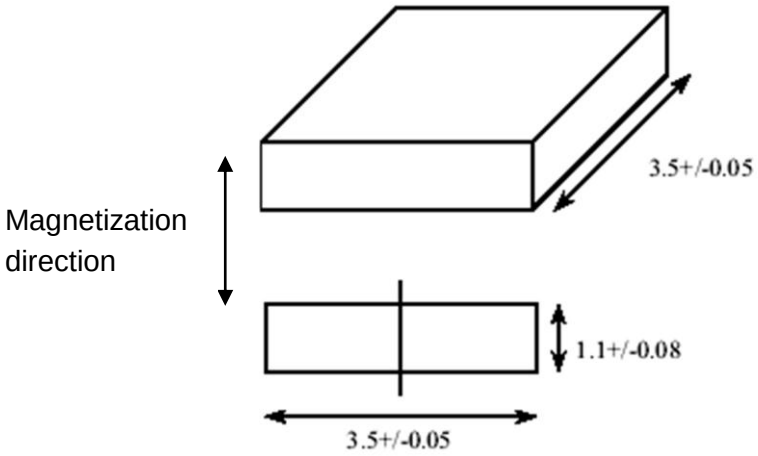
NOTE:

C0: 0.1µF decoupling capacitor
R1: >470 kΩ is recommended

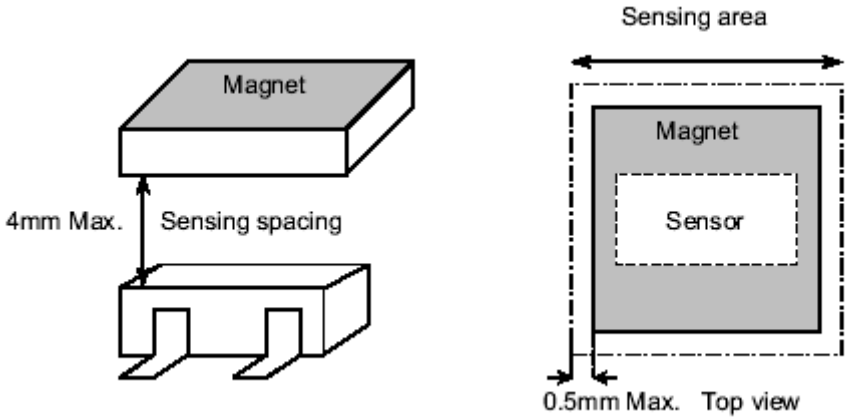
APPLICATION NOTES

Magnet Characteristic

Dimensions (mm)



Recommended Sensing Location



Ordering Information

Part no.	Mark	Package/Packing	Temperature range
CYD3661-BC	661	SOT-23 / 3000units/reel	-40°C ~ +85°C

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Other Hall Effect Switch ICs

CYD1024 HALL-EFFECT SWITCH ICs

CYD1024 Hall-effect switches are monolithic integrated circuits, which are composed of a reverse protector, voltage regulator, Hall voltage generator, differential amplifier, Schmitt trigger and an open-collector output on a single silicon chip. ICs can convert the changeable magnetic field signal into digital voltage output.

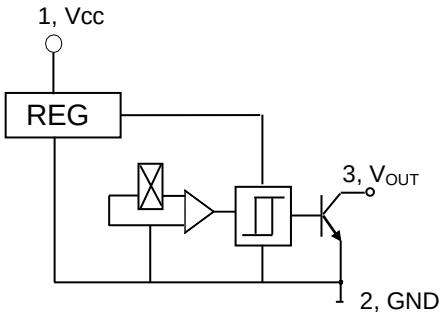
FEATURES

- High Sensitivity
- Resistant to Physical Stress
- Wide Supply Voltage Range
- Interfacing with All Kinds of Logic Circuits

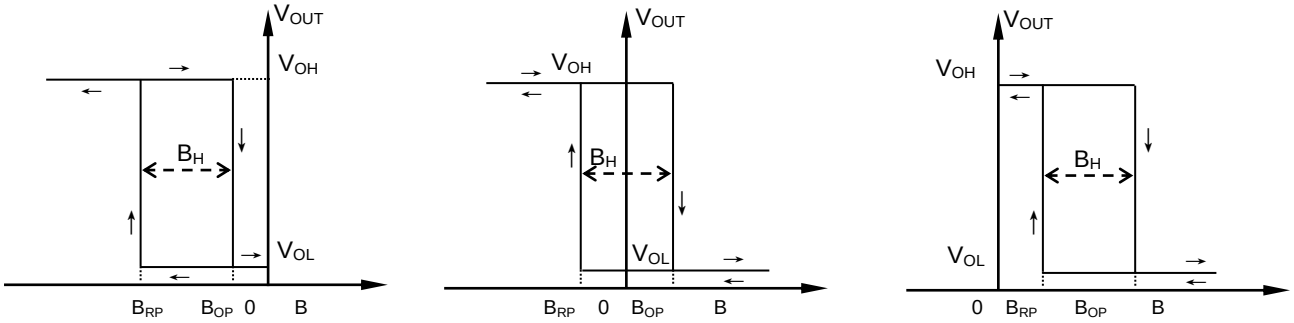
TYPICAL APPLICATION

- High Sensitive Non-contact Switch
- DC Brushless Motor
- DC Brushless Fan

FUNCTIONAL BLOCK DIAGRAM



Magnetic-Electrical Transfer Characteristics



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit
		Min	Max	
Supply Voltage	Vcc	4.5	20	V
Magnetic Flux Density	B	unlimited		mT
Output Current	Io	-	25	mA
Operating Temperature Range	T_A	-20	+100	°C
Storage Temperature Range	Ts	-55	+150	°C

ELECTRICAL CHARACTERISTICS

Parameter	Test Condition	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage		V_{CC}	4.5	-	20.0	V
Output Low Voltage	Vcc=4.5V Vo=Vccmax B=20mT Io=25mA	V_{OL}	-	0.2	0.4	V
Output Leakage Current	Vo=Vccmax, Vcc open-collector output	I_{OH}	-	0.1	10.0	μA
Supply Current	Vcc=Vccmax Vo open-collector output	Icc	-	8.0	12.0	mA
Output Rise time	Vcc=12V C_L=20pF R_L=480KΩ	t_r	-	0.3	1.5	μS
Output Fall time		t_f	-	0.3	1.5	μS

Magnetic Characteristics (Unit: mT)

Parameter	Rank	Value			Unit
		Min	Typ	Max	
Operate Point (B_{OP})	A_{11}	-	-	8	mT
	A_{12}	-	-	10	
	A_2	-	-	15	
	B	-	-	20	
Release Point (B_{RP})	A_{11}	-8	-	-	
	A_{12}	-10	-	-	
	A_2	-15	-	-	
	B	-20	-	-	
Hysteresis (B_H)		2	6	-	

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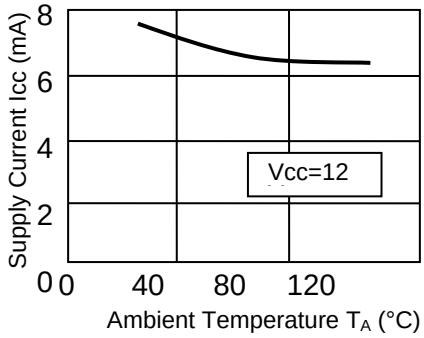
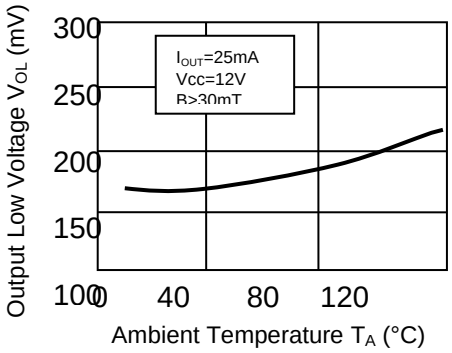
Characteristic Curves

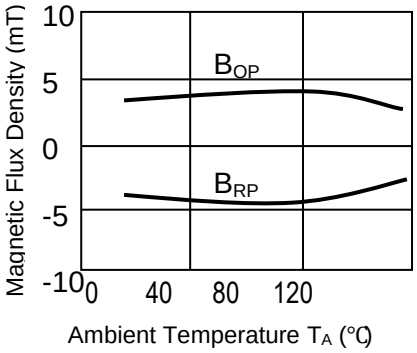
Supply Current VS



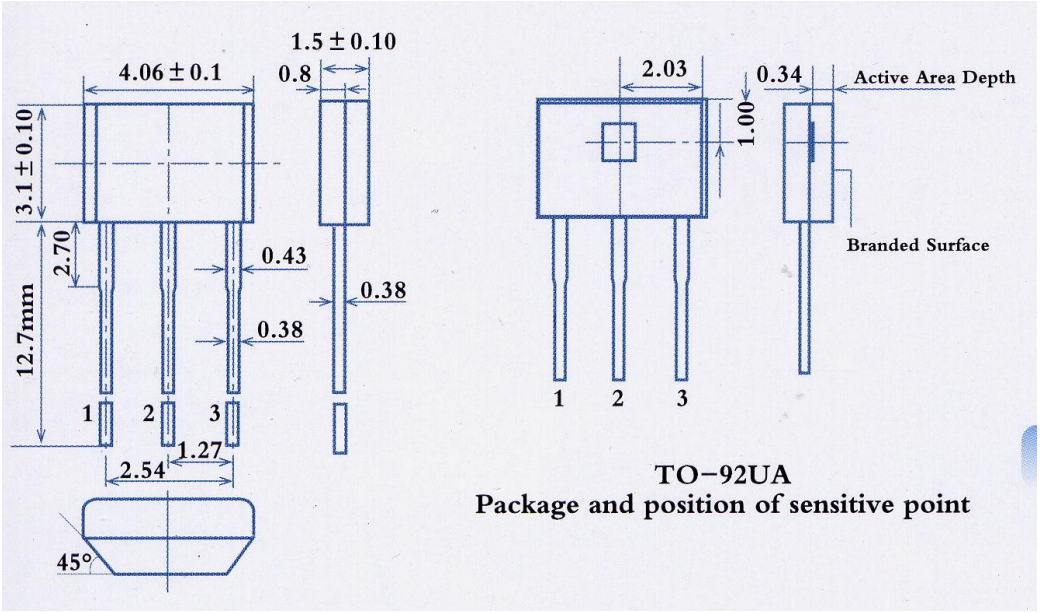
Output Low Voltage VS



B_{OP} and B_{RP} VS



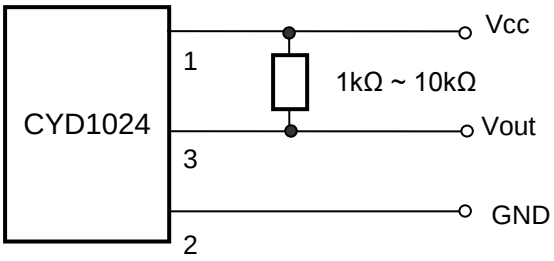
Package Outline Drawing (Unit: mm)



Pin Notes: 1. Power Supply 2. Ground, 3. Output

Connection

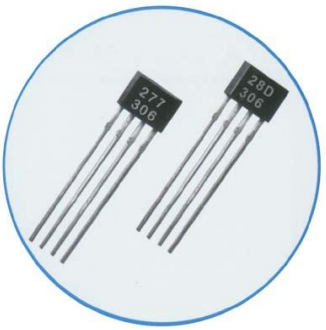
This sensor has an OC (NPN) output voltage. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



Cautions:

1) It is possible that outside mechanical stress affects the operating point and the release point of Hall-effect circuit, therefore, mechanical stress should be lessened as far as possible in the process of assembly;
2) Pay attention to the soldering temperature at the leads; keep it lower in a short time to guarantee good soldering quality.

CYD277 Series Hall Effect Switch IC



CYD277 series Hall-effect switch IC is a kind of one-chip semiconductor integrated circuit, which is composed of a reverse voltage protector, a precise voltage regulator, Hall voltage generator, a differential amplifier, Schmitt trigger, a temperature compensator and two open-collector output on a single silicon chip. The main characteristics are wide operating voltage range, high sensitivity to magnetic field, good load-carrying and reverse protection abilities. It is the best component for brushless fan, because its load-carrying ability is up to 400mA with complementary output.

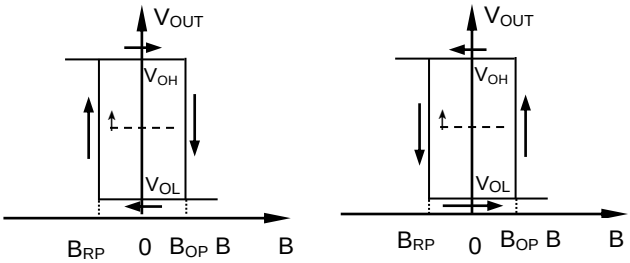
FEATURES

- Smart and Single Chip Integrated
- Temperature Compensation and Wide Operating Temperature Range
- Good Capability of Load
- Reverse Protection
- Open Collector Complementary Outputs
- Low Price , 4 Pin Epoxy Package
- Soldering Temperature can be Lowered Because of Alloy Tin Electroplating
- High Reliability

TYPICAL APPLICATION

- High Sensitive Non-contact Switch
- DC Brushless Motor
- DC Brushless Fan

Magnetic-Electrical Transfer Characteristics



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit
		Min	Max	
Supply Voltage	V_{CC}	4.5	20	V
Magnetic Flux Density	B	unlimited	unlimited	mT
Output current	Io	-	400	mA
Operating Temperature Range	T_A	-20	85	°C
Storage Temperature Range	T_S	-55	150	°C

ELECTRICAL CHARACTERISTICS (T_A=12°C~+85°C)

Parameter	Test Conditions	Symbol	Value			Unit
			Min	Typ	Max	
Supply Voltage		V_{CC}	4.5	-	20.0	V
Output Low Voltage	Vcc = 4.5V~20V, B=20mT, Io=300mA	V_{OL}	-	0.2	0.6	V
Output Leakage Current	Vo=Vccmax, Vcc open-collector output	I_{OH}	-	0.1	10.0	μA

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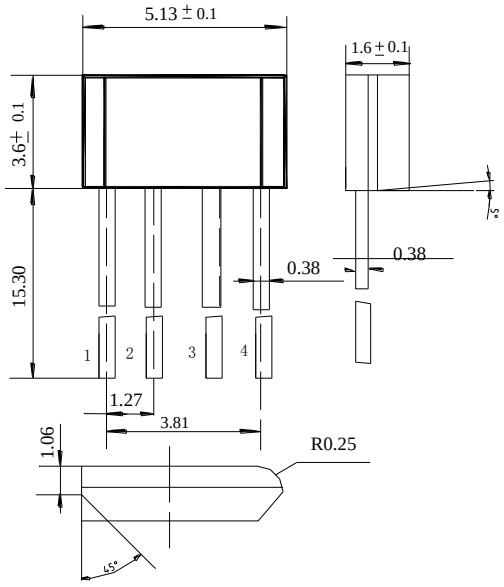
Supply Current	Vcc=Vccmax, Vo open-collector output	I_{CC}	-	17.0	30.0	mA
Output Rise time	Vcc=12V, R_L=820Ω, C_L=20pF	t_r	-	0.3	1.5	μS
Output Fall time	Vcc=12V, R_L=820Ω, C_L=20pF	t_f	-	0.3	1.5	μS

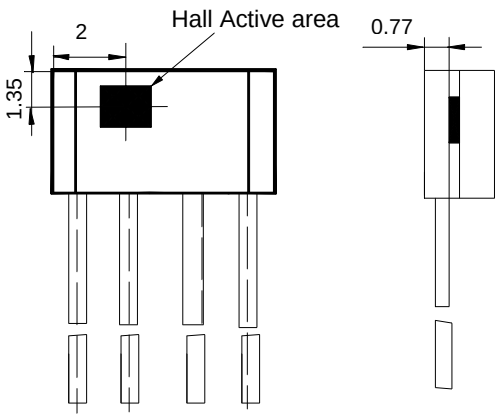
Package (Unit：mm)



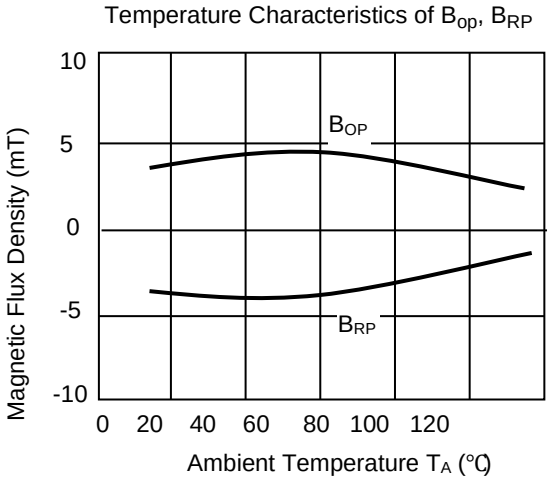
Magnetic Characteristics

Parameter	Type	Value			Unit
		Min	Typ	Max	
Operate Point (B_{OP})	A	-	-	5	mT
	B	-	-	8	
	C	-	-	12	
Release Point (B_{RP})	A	-5	-	-	
	B	-8	-	-	
	C	-12	-	-	
Hysteresis(B_H)		4	8	-	

Position of Sensitive Area



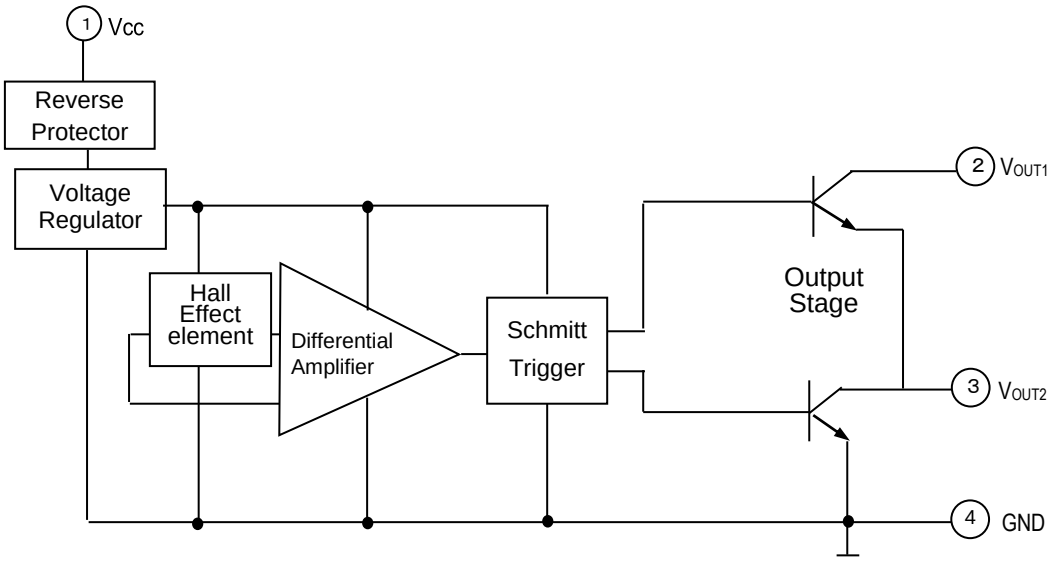
Characteristic Curves



PIN NOTES:

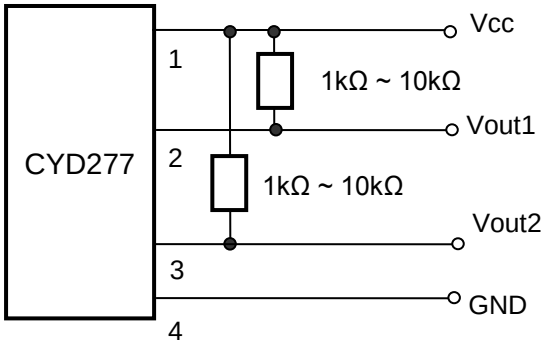
1. Vcc
2. Output 1
3. Output 2
4. GND

Functional Block Diagram



Connection

This sensor has OC (NPN) output voltages. Therefore it is necessary to connect a pull-up resistor in value from 1kΩ to 10kΩ between the power supply Vcc and output pins.



NOTES:

Voltage Regulator:	The output is stable when supply voltage varies from 4.5V to 20V.
Reverse Protector:	When supply voltage is opposed or interfered by reverse pulse voltage in usage, It protects circuit and protective voltage is up to 30V.

Hall Effect Voltage Generator:	It transfers the magnetic signal to the corresponding electric signal.
Differential Amplifier:	It can amplify the weak voltage signal from Hall voltage generator output.
Schmitt Trigger:	It transfers analogy signal from differential amplifier output to digital signal.
Temperature Compensator:	It ensures that the Hall-effect ICs over the temperature range of -20°C to +85°C.
Complementary Follower:	Output current can drive two windings of brushless fan directly. Turning on the brushless fan, and the output stage V_{OUT1} & V_{OUT2} will change when the Hall voltage generator is forced by alternating magnetic, the fan can operate because the direction of load current(winding of the fan) is changed.

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