CYSJ902 GaAs HALL-EFFECT ELEMENTS

CYSJ902 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.

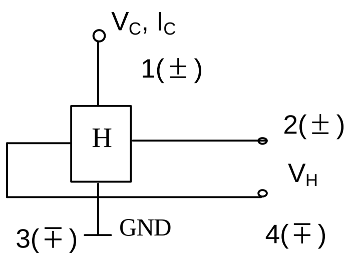
FEATURES

- 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 (Table 1.)

Parameter	Symbol	Value		Unit
Max. Input Current (Voltage)	Ic (Vc)	13 (12)		mA (V)
Operating temperature range	T_A	CYSJ902	CYSJ902H	°C
		-40~125	-55~150	
Storage temperature range	T_S	-45~150	-55~150	°C
MTBF (Mean Time Between Failures)		>100k		hour

ELECTRICAL CHARACTERISTICS（T_A=25°C）

Table 2. Electrical Characteristics of CYSJ902

Parameter	Symbol	Test conditions	Value	Unit
Hall output voltage	V_H	B=50mT, I_C=5mA	36~54	mV
Offset voltage	Vos(Vu)	I_C=5mA, B=0	±5	mV
Input resistance	R_{in}	B=0mT, I_C=0.1mA	650~850	Ω
Output resistance	R_{out}	B=0mT, I_C=0.1mA	650~850	Ω
Temperature coefficient of Hall output voltage	$αV_H$	I_C=5mA , B=50mT (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=5mA B=0.1~0.4T	±1.0	%

Notes: $V_H = V_{HM} - V_{OS}(V_u)$ (V_{HM}: measured voltage)

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

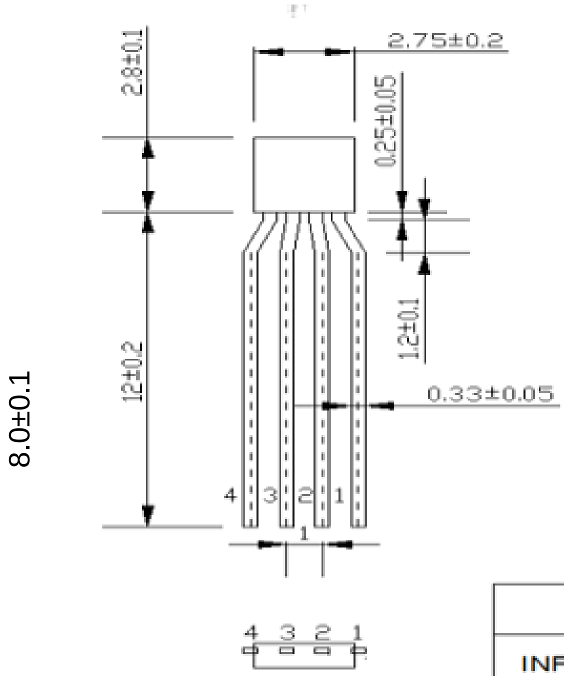
$$\alpha R_{in} = \frac{1}{R_{in}(T_1)} x \frac{R_{in}(T_2) - R_{in}(T_1)}{T_2 - T_1} x100$$

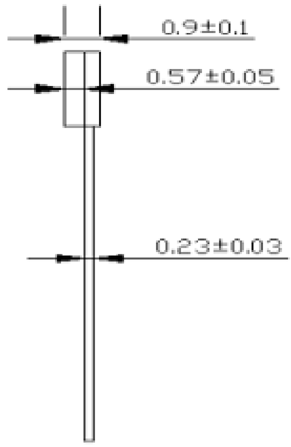
$$\Delta K_H = \frac{K(B_1) - K(B_2)}{[K(B_1) + K(B_2)]} x200$$

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

T_1=25°C, T_2=125°C, B_1=0.4T, B_2=0.1T

Package Outline Drawing (Unit: mm)





Pin Definition

PINNING		
INPUT	1 (+/−)	3 (−/+)
OUTPUT	2 (+/−)	4 (−/+)

Characteristic Curves

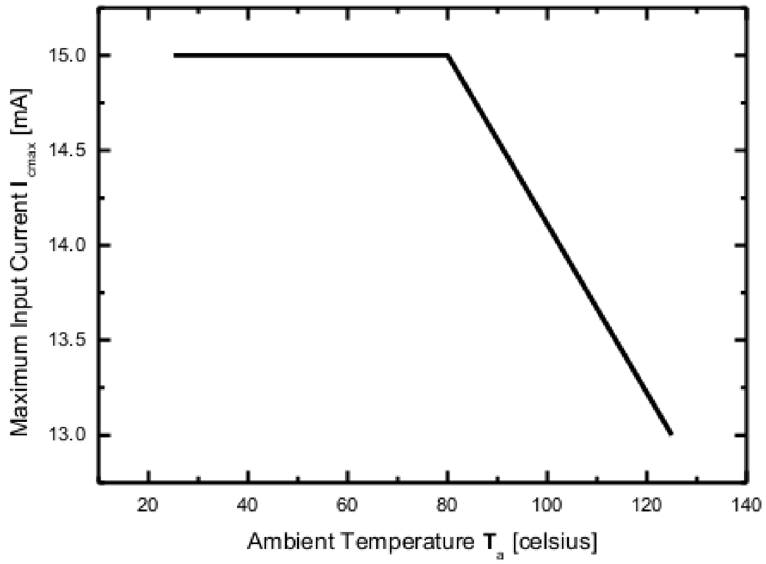


Figure 1. Maximum Input Current I_{cmax}

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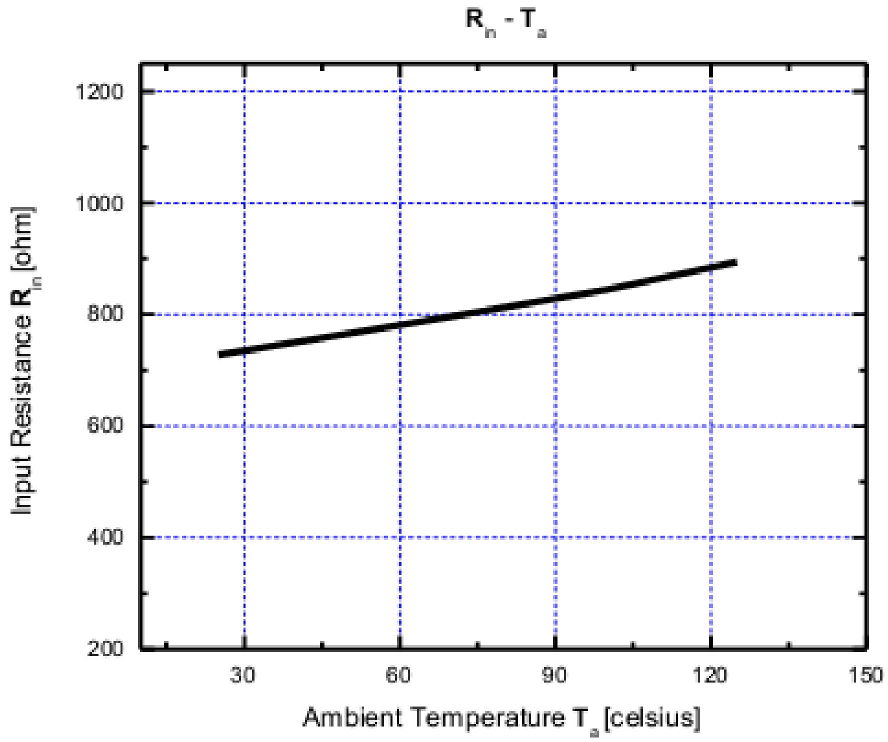


Figure 2. Input resistance Rin as a function of ambient temperature Ta

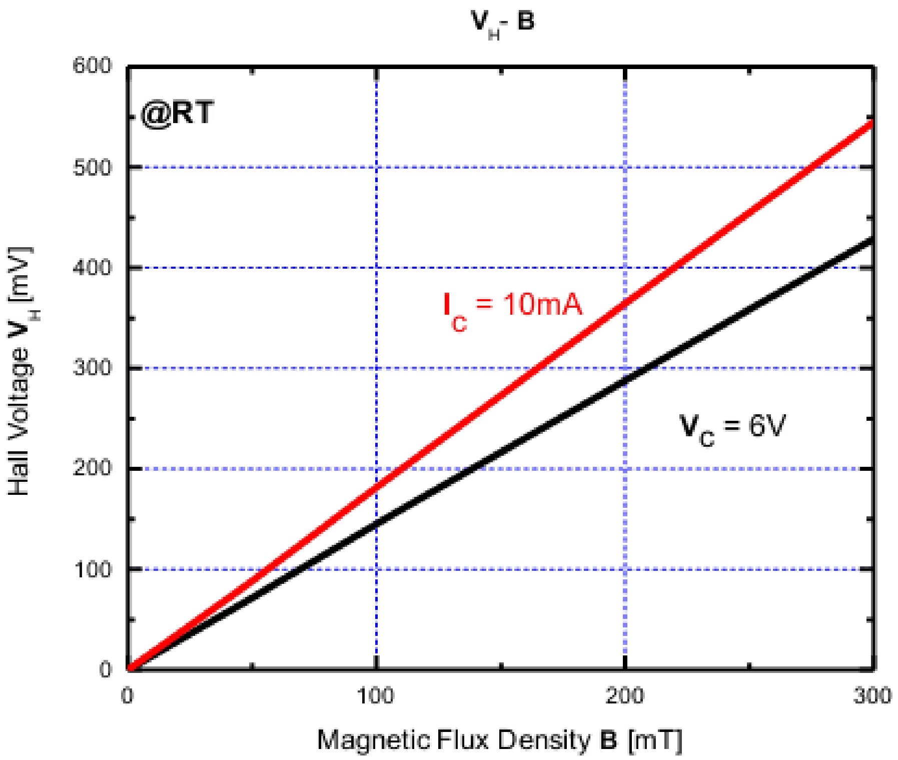
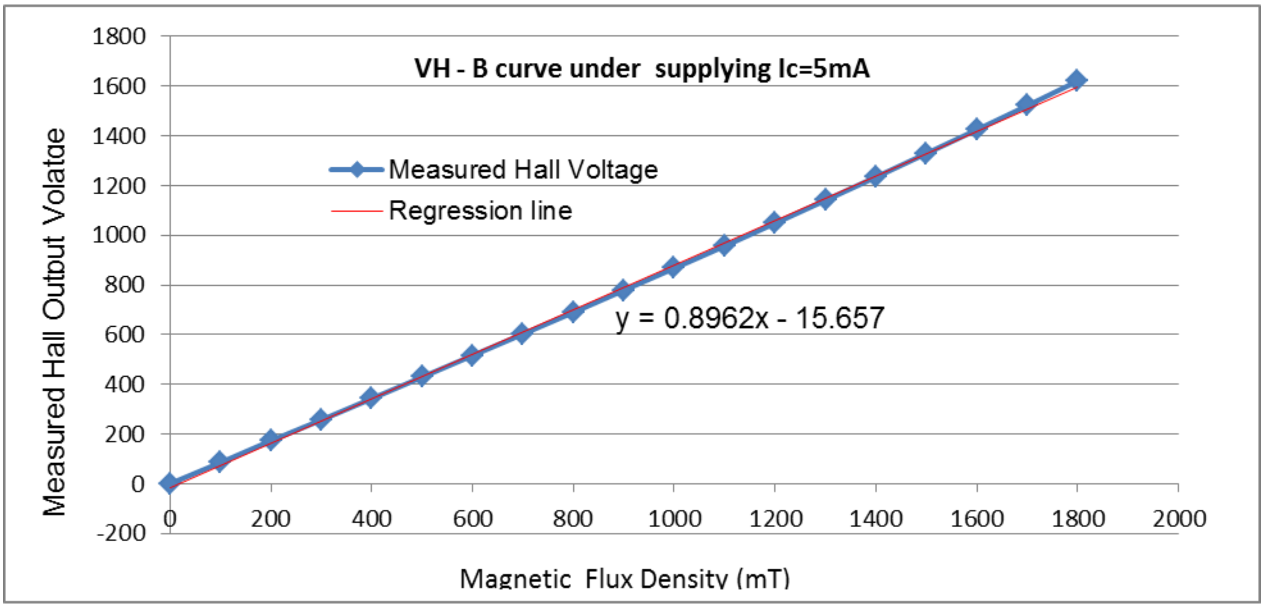


Figure 3. Hall voltage ***VH*** as a function of magnetic flux density ***B*** .



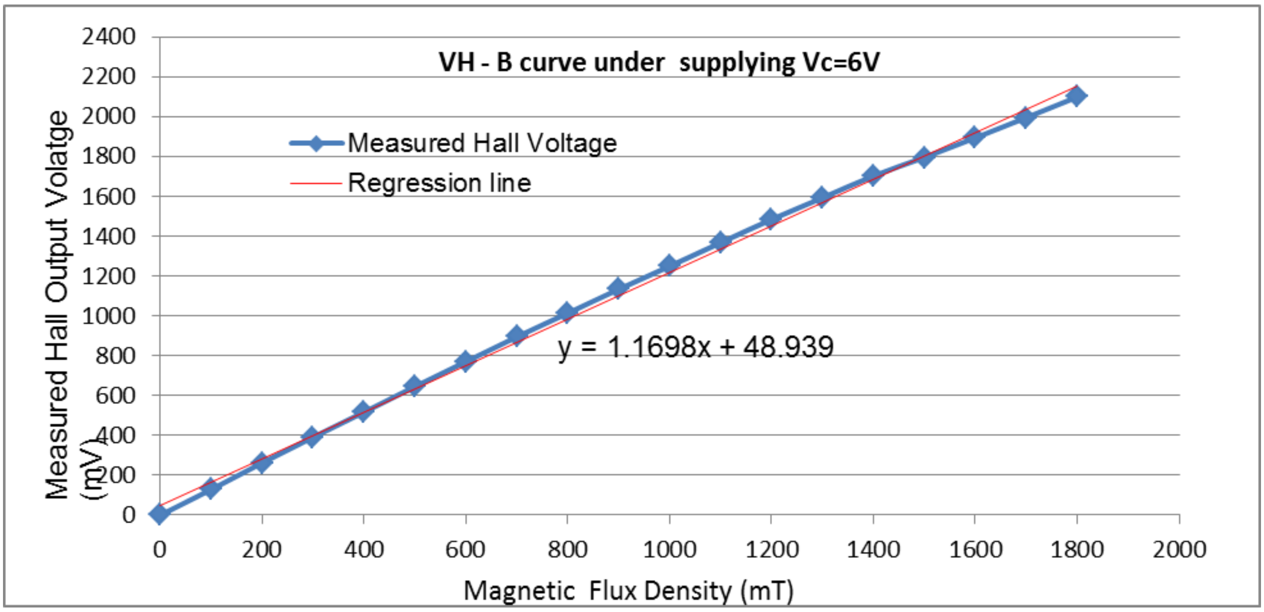


Figure 4. Hall voltage ***VH*** as a function of magnetic flux density ***B*** (0 -1800mT) .

Table 3. Linearity of CYSJ902 in different ranges

Measuring range	0-500mT	0-1000mT	0-1500mT	0-1800mT
Under supplying 5mA	-0.18% ~ 0.08%	-0.25% ~ 0.40%	-0.60% ~ 1.10%	-0.85% ~ 1.5%
Under supplying 6V	-0.25% ~ 0.45%	-1.15% ~ 0.70%	-2.20% ~ 1.15%	-2.65% ~ 1,50%

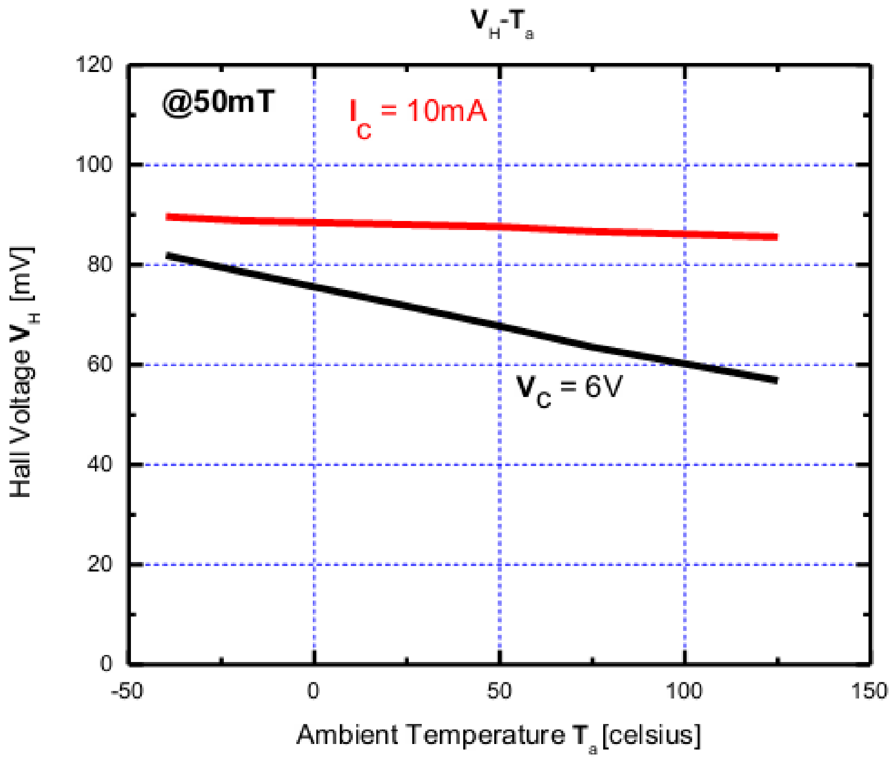


Figure 4. Hall voltage***VH*** as a function ofambient temperature***Ta***

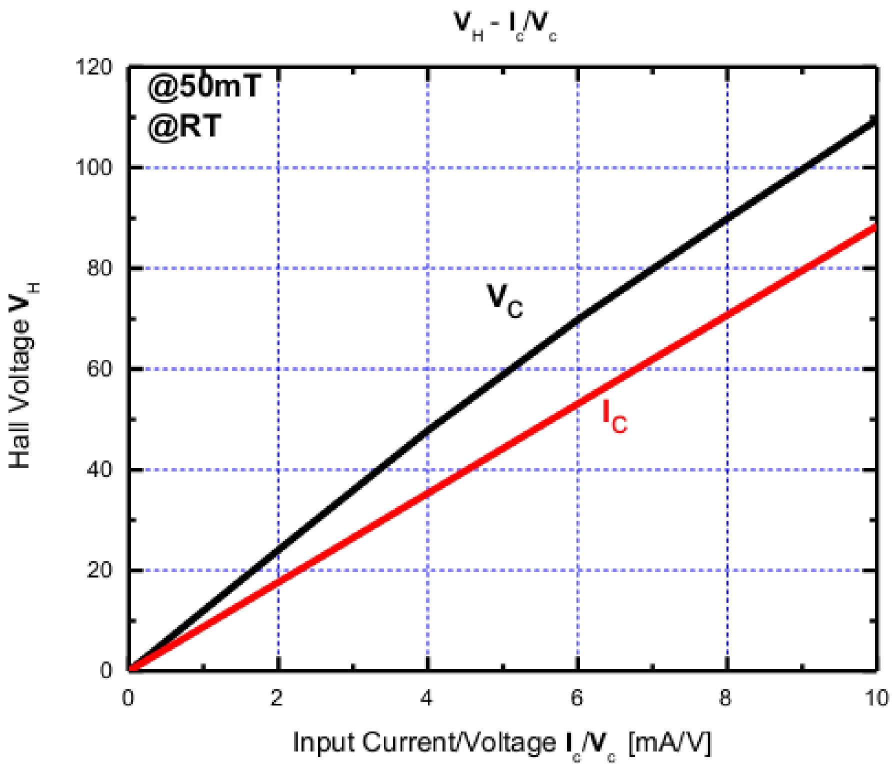
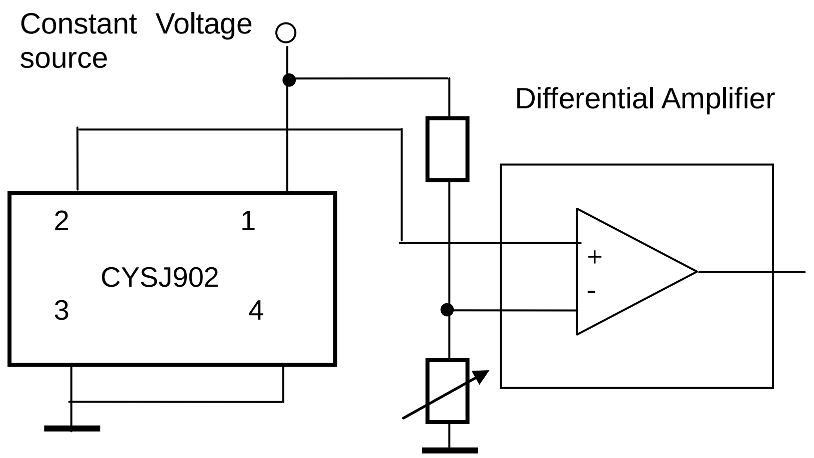


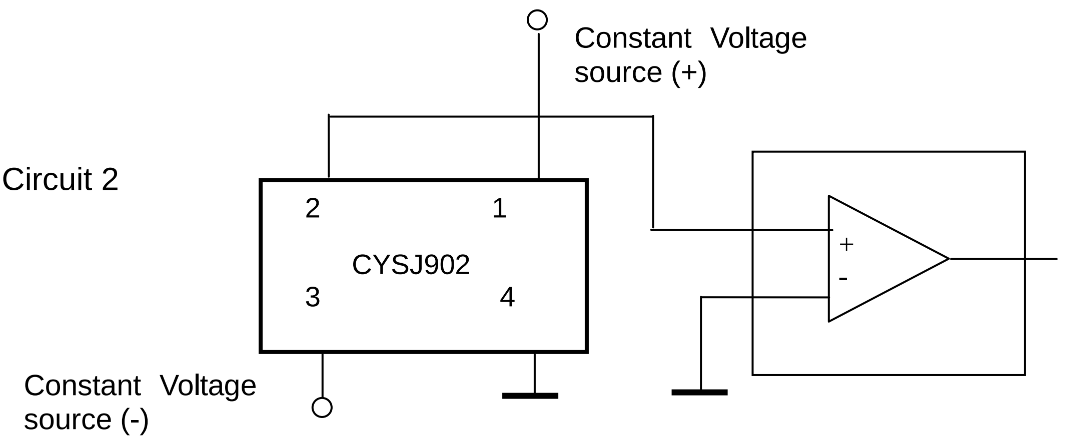
Figure 5. Hall voltage***VH*** as a function ofelectrical stimuli ***Ic***/ ***Vc.***

Connection

Circuit 1



Circuit 2



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.

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Reliability Test Terms

Table 4. Reliability Test Terms, Conditions and Durations.

Item	Terms	Conditions	Duration
1	High Temperature Storage(HTS)	[JEITA EIAJ ED-4701] Ta=150(0~10)°C	1000h
2	Heat Cycle (HC)	[JEITA EIAJ ED-4701] Ta=-55°C~150°C high temp. - normal temp. - low temp. 30 min - 5 min - 30 min	50cycles
3	Temp. Humidity Storage (THS)	[JEITA EIAJ ED-4701] Ta =85±3°C, RH =85±5 %	1000h
4	Resist. to Hand Soldering Heat (RHSH)	[JEITA EIAJ ED-4701] Dipped in the 300±5°C solder up to the 1 mm part from the body	5 sec
5	High Temp. Operating(HTO)	Ta =125°C, Vc =7.5V	1000h

Criteria:

- Variation of Hall Voltage V_H and input/output resistances Rin /Rout are less than 20%.
- Variation of offset voltage Vos is less than 1mV.
- Other parameters in Table 2 are still within their ranges stated in Table 2.

Soldering Conditions

The following conditions should be preserved. Solder ability should be checked by yourself, because it is depend on solder paste material and other parameters.

Material of solder flux

Use the resin based flux and refrain from using organic or inorganic acid based and water-soluble one.

Cleansing of solder flux conditions

- Use Ethanol or Isopropyl alcohol as cleansing material.
- Process temperature should be 50℃ or less.
- Duration should be 5 min or less.

Hand soldering conditions

- Apart from the mold resin more than 1mm.
- Solder at temperature 300℃ for less than 5s.

Wave soldering conditions

- Temperature in Pre-heating zone should be lower than 150℃.
- Temperature in Soldering zone should be lower than 280℃.

Precautions for ESD

This product is the device that is sensitive to ESD (Electrostatic Discharge). Handling Hall Elements with the ESD-Caution mark under the environment in which

- Static electrical charge is unlikely to arise. (Ex; Relative Humidity; over 40%RH).
- Wearing the antistatic suit and wristband when handling the devices.
- Implementing measures against ESD as for containers that directly touch the devices.

Precautions for Storage

- Products should be stored at an appropriate temperature and humidity (5 to 35°C, 40 to 60% RH) after the unsealing of MBB. Using self-sealer is highly recommended for keeping products away from chlorine and corrosive gas.
- Long-term storage
  Products are sealed in MBB with a desiccant and a moisture indicator. The moisture indicator should be checked right after the unsealing of MBB. If the moisture indicator reveals the internal moisture is above 50%HR, please contact the local distributor.
- For storage longer than 2 years, it is recommended to store in nitrogen atmosphere with MBB sealed. Oxygen and $H2O$ of atmosphere oxidizes leads of products and lead solder ability get worse.

Precautions for Safety

- Do not alter the form of this product into a gas, powder or liquid through burning, crushing or chemical processing.
- Observe laws and company regulations when discarding this product.

Order Information

Part Number	Operating Temperature	Package	MOQ
CYSJ902	-40°C ~ 125°C	SIP/2.75x2.8x0.9mm	500ea or 1000ea
CYSJ902H	-55°C ~ 150°C	SIP/2.75x2.8x0.9mm	500ea or 1000ea