CYSJ302C GaAs HALL-EFFECT ELEMENTS

CYSJ302C series Hall-effect element is a ion-implanted magnetic field sensor made of monocrystal 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

ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. input voltage</td>
<td>( V_C )</td>
<td>10V</td>
<td>V</td>
</tr>
<tr>
<td>Max. input power</td>
<td>( P_D )</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>( T_A )</td>
<td>-40~125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>( T_S )</td>
<td>-40~150</td>
<td>°C</td>
</tr>
<tr>
<td>MTBF (Mean Time Between Failure)</td>
<td></td>
<td>&gt;100k</td>
<td>hour</td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS \( (T_A=25^\circ C) \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test conditions</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall output voltage</td>
<td>( V_H )</td>
<td>( B=50mT, V_C=6V )</td>
<td>55~75</td>
<td>mV</td>
</tr>
<tr>
<td>Offset voltage</td>
<td>( V_{os} )</td>
<td>( V_C=6V, B=0 )</td>
<td>±11</td>
<td>mV</td>
</tr>
<tr>
<td>Input resistance</td>
<td>( R_{in} )</td>
<td>( B=0mT, I_C=0.1mA )</td>
<td>650~850</td>
<td>Ω</td>
</tr>
<tr>
<td>Output resistance</td>
<td>( R_{out} )</td>
<td>( B=0mT, I_C=0.1mA )</td>
<td>650~850</td>
<td>Ω</td>
</tr>
<tr>
<td>Temperature coefficient of Hall output voltage</td>
<td>( \alpha V_H )</td>
<td>( I_C=5mA, B=50mT ) ( (T_A=25^\circ C \sim 125^\circ C) )</td>
<td>Max: -0.06</td>
<td>%/°C</td>
</tr>
<tr>
<td>Temperature coefficient of input resistance</td>
<td>( \alpha R_{in} )</td>
<td>( I_C=0.1mA, B=0mT ) ( (T_A=25^\circ C \sim 125^\circ C) )</td>
<td>0.3</td>
<td>%/°C</td>
</tr>
<tr>
<td>Linearity</td>
<td>( \Delta K_H )</td>
<td>( I_C=5mA ) ( B=0.1/0.5T )</td>
<td>2</td>
<td>%</td>
</tr>
</tbody>
</table>

Notes: \( V_{in}=V_H-I_{in}V_{os}(V_u) \) \( (V_{HM}: \) measured voltage)

\[
\alpha V_H = \frac{1}{V_H(T_1)} \times \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} \times 100,
\]

\[
\alpha R_{in} = \frac{1}{R_{in}(T_1)} \times \frac{R_{in}(T_2) - R_{in}(T_1)}{T_2 - T_1} \times 100
\]

\[
\Delta K_H = \frac{K(B_1) - K(B_2)}{K(B_1) + K(B_2)} \times 200
\]

\[
T_1=25^\circ C, \ T_2=125^\circ C, \ B_1=0.5T, \ B_2=0.1T
\]
**Package Outline Drawing (Unit: mm)**

- **Sensor Wafer:**
  - Pin 1: 1.0 ± 0.1 mm
  - Pin 2: 1.0 ± 0.1 mm
  - Pin 3: 1.0 ± 0.1 mm
  - Pin 4: 1.0 ± 0.1 mm

- **Marking:**
  - Marking 0.53 mm

<table>
<thead>
<tr>
<th>Pin Definition</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (±)</td>
<td>3 (±)</td>
<td></td>
</tr>
<tr>
<td>2 (±)</td>
<td>4 (±)</td>
<td></td>
</tr>
</tbody>
</table>

**Characteristic Curves**

**Allowable Package Power Dissipation**

- Max. Input Power: $P_{in}$ (mW)
- Ambient Temperature: $T_{amb}$ (°C)

![Characteristic Curves Graph](chart.png)
**Chen Yang Technologies GmbH & Co. KG**

**Version 2**

**Released in May 2016**

Dr. Ing. habil. Jigou Liu

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**Ambient Temperature $T_a$ [°C]**

**Input Current $I_c$ [mA]**

**Input Voltage $V_c$ [V]**

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**Input Resistance $R_{in}$ [Ω]**

- $I_c$ const
- $V_c$ const

**Output Hall Voltage $V_{os}$ [mV]**

- $I_c$ const
- $V_c$ const

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**Output Hall Voltage $V_{os}$ [mV]**

- $I_c$ const
- $V_c$ const

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**Offset Voltage $V_{os}$ [mV]**

- $I_c$ const
- $V_c$ const

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**In this Example $R_{in}=750\,\Omega$, $V_{os}=0.6\,mV$, $V_c=6\,V$**
Connection

Circuit 1

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

Application Notes

The Hall voltage $V_{H}$ can be positive and negative. But if one connects the sensor as follows (circuit 1):

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.