CYSJ166A GaAs HALL-EFFECT ELEMENTS

CYSJ166A 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
- Wide measuring range 0-3T

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

ABSOLUTE MAXIMUM RATING

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Input Current/Voltage</td>
<td>V_C</td>
<td>12</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>-55~150</td>
<td>°C</td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS (T_A=25°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=100mT, V_C=6V )</td>
<td>156~204</td>
<td>mV</td>
</tr>
<tr>
<td>Offset voltage</td>
<td>V_{os(V_u)}</td>
<td>( V_C=6V, B=0mT )</td>
<td>±8</td>
<td>mV</td>
</tr>
<tr>
<td>Input resistance</td>
<td>R_{in}</td>
<td>( B=0mT, I_{C}=0.1mA )</td>
<td>1000~1500</td>
<td>Ω</td>
</tr>
<tr>
<td>Output resistance</td>
<td>R_{out}</td>
<td>( B=0mT, I_{C}=0.1mA )</td>
<td>1800~3000</td>
<td>Ω</td>
</tr>
<tr>
<td>Temperature coefficient of Hall output voltage</td>
<td>( \alpha V_H )</td>
<td>( I_{C}=5mA, B=100mT ) ( (T_a=25°C ~ 125°C) )</td>
<td>-0.06</td>
<td>%/°C</td>
</tr>
<tr>
<td>Temperature coefficient of input and output resistance</td>
<td>( \alpha R_{in} )</td>
<td>( I_{C}=0.1mA, B=0mT ) ( (T_a=25°C ~ 125°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:
\[
\alpha V_H = \frac{1}{V_H(T_1)} \times \frac{V_H(T_2) - V_H(T_1)}{T_2 - T_1} \times 100,
\]
\[
\alpha R_{in} = \frac{1}{R_{in}(T_1)} \times \frac{R_{in}(T_2) - R_{in}(T_1)}{T_2 - T_1} \times 100
\]
\[
\Delta K_H = \left[ \frac{K(B_1) - K(B_2)}{K(B_1) + K(B_2)} \right] \times 200
\]
\[
T_1=25°C, T_2=125°C, B_1=0.5T, B_2=0.1T
\]
Package Outline Drawing (Unit: mm)

Characteristic Curves
Allowable Package Power Dissipation
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.