General Description

The AH49H 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 components. It also includes precision resistors to provide increased temperature stability and accuracy. The operating temperature range of these linear Hall sensors is -40°C to 105°C, appropriate for commercial, consumer, and industrial environments.

The AH49H is available in standard TO-92S-3 and SOT-23-3 packages.

Features

- Miniature Construction
- Power Consumption of 2mA at V_Cc=3.3V 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: -40°C to 105°C
- Responds to Either Positive or Negative Gauss
- The Maximum Instantaneous Supply Voltage Up to 50V
- High ESD Rating: 6000V (Human Body Model) 400V (Machine Model)

Application

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

Figure 1. Package Types of AH49H
Pin Configuration

Figure 2. Pin Configuration of AH49H

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-92S-3</td>
<td>VCC</td>
<td>Power supply pin</td>
</tr>
<tr>
<td>SOT-23-3</td>
<td>GND</td>
<td>Ground pin</td>
</tr>
<tr>
<td>1</td>
<td>OUT</td>
<td>Output pin</td>
</tr>
<tr>
<td>1</td>
<td>VCC</td>
<td>Power supply pin</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground pin</td>
</tr>
<tr>
<td>2</td>
<td>OUT</td>
<td>Output pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground pin</td>
</tr>
<tr>
<td>3</td>
<td>OUT</td>
<td>Output pin</td>
</tr>
</tbody>
</table>
**Functional Block Diagram**

![Functional Block Diagram of AH49H](image)

**Ordering Information**

- **Circuit Type**: AH49H
- **Package**
  - Z3: TO-92S-3
  - N: SOT-23-3
- **G1**: Green
- **Blank**: Bulk
- **TR**: Tape & Reel

<table>
<thead>
<tr>
<th>Package</th>
<th>Temperature Range</th>
<th>Part Number</th>
<th>Marking ID</th>
<th>Packing Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-92S-3</td>
<td>-40 to 105°C</td>
<td>AH49HZ3-G1</td>
<td>49HG</td>
<td>Bulk</td>
</tr>
<tr>
<td>SOT-23-3</td>
<td></td>
<td>AH49HNTR-G1</td>
<td>GT7</td>
<td>Tape &amp; Reel</td>
</tr>
</tbody>
</table>

BCD Semiconductor's Pb-free products, as designated with "G1" in the part number, are RoHS compliant and green.
### Absolute Maximum Ratings (Note 1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td>10</td>
<td>V</td>
</tr>
<tr>
<td>Instantaneous Supply Voltage</td>
<td>$V_{CC,INST}$</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TO-92S-3</td>
<td>$P_D$</td>
<td>400</td>
<td>mW</td>
</tr>
<tr>
<td>SOT-23-3</td>
<td></td>
<td>230</td>
<td>mW</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>$T_A$</td>
<td>-40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{STG}$</td>
<td>-50 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>ESD (Human Body Model)</td>
<td></td>
<td>6000</td>
<td>V</td>
</tr>
<tr>
<td>ESD (Machine Mode)</td>
<td></td>
<td>400</td>
<td>V</td>
</tr>
</tbody>
</table>

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and 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 ($T_A=25^\circ C$)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td>3</td>
<td>8</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>$T_{OP}$</td>
<td>-40</td>
<td>105</td>
<td>°C</td>
</tr>
</tbody>
</table>
Electrical Characteristics

$V_{CC}=3.3V$, $T_A=25^\circ C$, unless otherwise specified.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current</td>
<td>$I_{CC}$</td>
<td>1.2</td>
<td>2</td>
<td>3.2</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Quiescent Output Voltage</td>
<td>$V_{NULL}$</td>
<td>B=0 (Gauss)</td>
<td>1.45</td>
<td>1.7</td>
<td>1.85</td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage Sensitivity</td>
<td>$V_{SEN}$</td>
<td>B=±600 (Gauss)</td>
<td>0.33</td>
<td>mV/Gauss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage Span</td>
<td>$V_{OUT _S}$</td>
<td>0.85 to 2.6</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Resistor</td>
<td>$R_{OUT}$</td>
<td>30 to 70</td>
<td>50</td>
<td>70</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>Linear Magnetic Range</td>
<td>$B$</td>
<td>Bandwidth=10Hz to 10kHz</td>
<td>90</td>
<td>μV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transferring Characteristics ($V_{CC}=3.3V$)

When there is no outside magnetic field ($B=0$ Gauss), the quiescent output voltage is one-half the supply voltage in general.

For TO-92S-3 package, if a south magnetic pole approaches the front face (the side with marking ID) of the Hall effect sensor, the circuit will drive the output voltage higher. In contrary, a north magnetic pole will drive the output voltage lower. The variations of voltage level up or down are symmetrical. Because the SOT-23-3 is reversed packaging with TO-92S-3, so the magnetic performance is also reversed. Therefore, if the reversed magnetic pole approaches the front face, the output is the same as TO-92S-3 package. Greatest magnetic sensitivity is obtained with a supply voltage of 8V, 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 a next-level amplifier for further amplifying if the changing frequency of the magnetic field is high.

![Figure 4. Transferring Characteristic of AH49H](image1)

![Figure 5. Magnetic Characteristic of AH49H](image2)
Typical Performance Characteristics

Figure 6. Supply Current vs. Supply Voltage

Figure 7. Output Voltage vs. Magnetic Field

Figure 8. Output Voltage vs. Supply Voltage

Figure 9. Output Voltage vs. Ambient Temperature
Typical Performance Characteristics (Continued)

Figure 10. Power Dissipation vs. Ambient Temperature
Mechanical Dimensions

TO-92S-3

Unit: mm (inch)
Mechanical Dimensions (Continued)

SOT-23-3

Unit: mm (inch)
IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

MAIN SITE
- Headquarters
  BCD (Shanghai) Micro-electronics Limited
  No. 1460, Zi Xing Road, Shanghai ZiZhu Science-based Industrial Park, 200241, P. R. C.
  Tel: +86-021-2416-2266, Fax: +86-021-2416-2277

REGIONAL SALES OFFICE
Shenzhen Office
BCD Semiconductor (Taiwan) Company Limited, Shenzhen Office
Unit A Room 1203, Skyworth Bldg., Guoxin Ave.1.S., Nanshan District
Shenzhen 518057, China
Tel: +86-0755-8660-4900, Fax: +86-0755-8660-4958

Taiwan Office (Taipei)
BCD Semiconductor (Taiwan) Company Limited
3F, No.17, Lane 171, Sec. 2, Jiu-Zong Rd., Nei-Hu Dist., Taipei(114), Taiwan, R.O.C
Tel: +886-2-2656-2081
Fax: +886-2-2656-2656

Taiwan Office (Hsinchu)
BCD Semiconductor (Taiwan) Company Limited
8F, No.176, Sec. 2, Gong-Dao 5th Road, Hsinchu District
HsinChu City 300, Taiwan, R.O.C.
Tel: +886-3-5160181, Fax: +886-3-5160181

USA Office
BCD Semiconductor Corp.
48460 Kato Road, Fremont, CA 94538, USA
Tel: +1-510-668-1950
Fax: +1-510-668-1990

Korea Office
BCD Semiconductor Limited Korea office.
Room 101-1112, Digital Empire II, 486 Sin-dong, Yeongtong-Gu, Suwon-city, Gyeonggi-do, Korea
Tel: +82-31-695-8430