

LINEAR HALL-EFFECT IC

AH49E

General Description

The AH49E 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 these linear Hall sensors is -40°C to 85°C, appropriate for commercial, consumer and industrial applications.

The AH49E is available in standard TO-92S and SOT-23-3 packages.

Features

- Miniature Construction
- Power Consumption of 3.5mA at $V_{CC}=5V$ 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°C to 85°C
- Responds to Either Positive or Negative Gauss

Applications

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

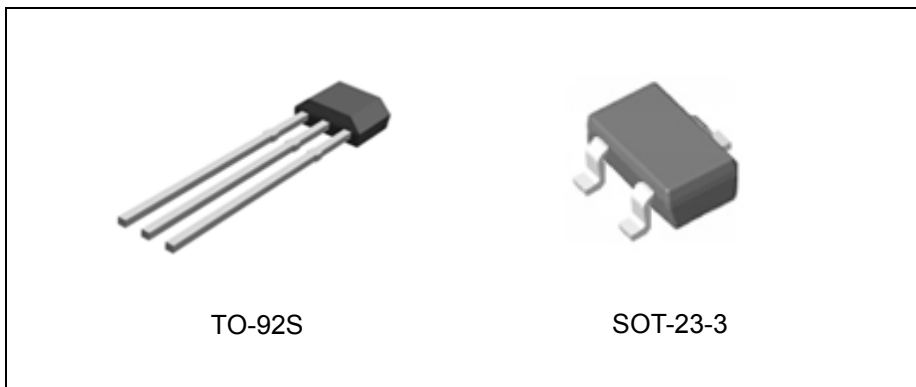


Figure 1. Package Types of AH49E

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Pin Configuration

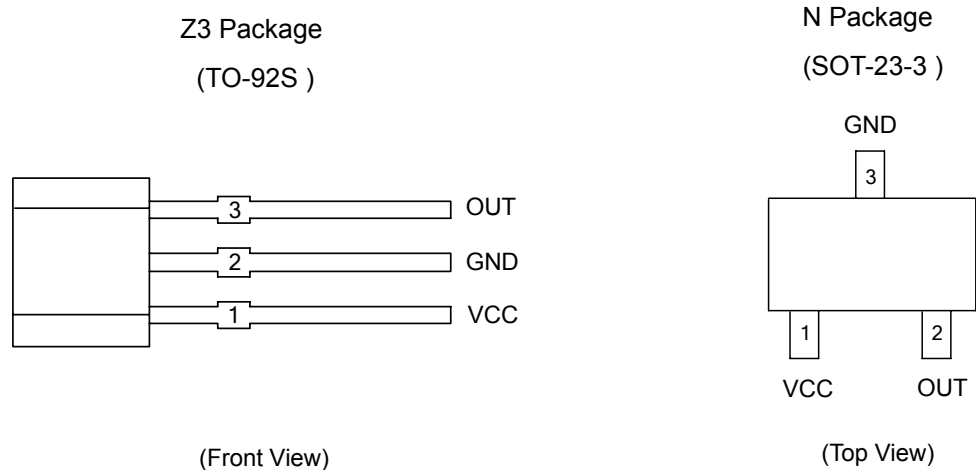


Figure 2. Pin Configuration of AH49E

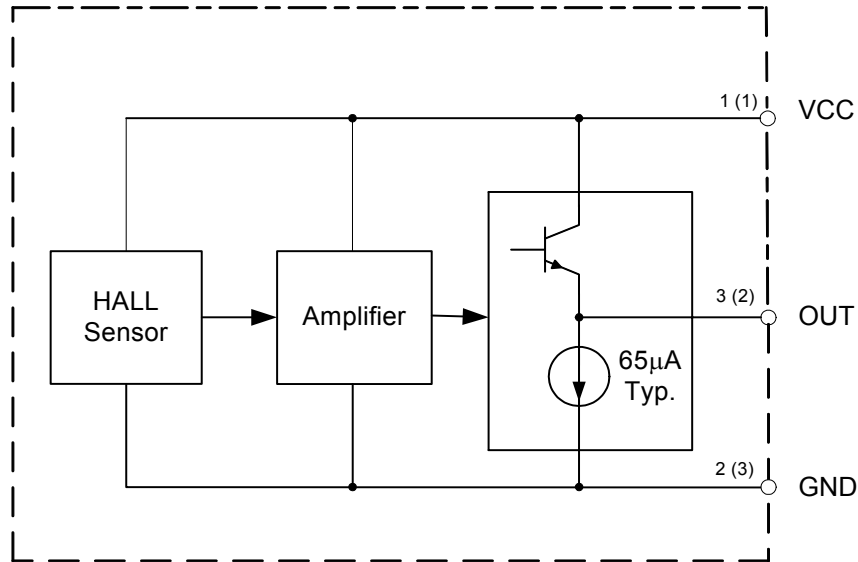
Pin Description

| Pin Number | | Pin Name | Function |
|------------|----------|----------|----------------|
| TO-92S | SOT-23-3 | | |
| 1 | 1 | VCC | Supply voltage |
| 2 | 3 | GND | Ground pin |
| 3 | 2 | OUT | Output |

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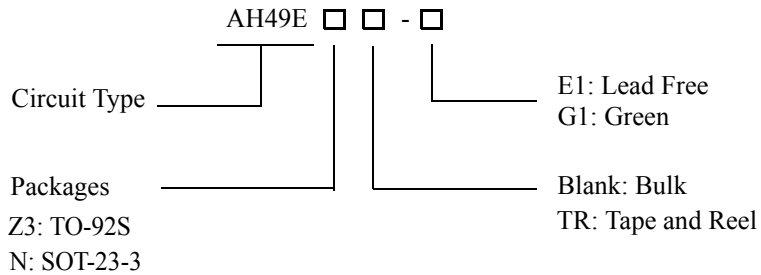
Functional Block Diagram



A (B)
 A for TO-92S
 B for SOT-23-3

Figure 3. Functional Block Diagram of AH49E

Ordering Information



| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|----------|-------------------|-------------|-------------|------------|-------|--------------|
| | | Lead Free | Green | Lead Free | Green | |
| TO-92S | -40 to 85°C | AH49EZ3-E1 | AH49EZ3-G1 | AH49E | AH49G | Bulk |
| SOT-23-3 | | | AH49ENTR-G1 | | GJ1 | Tape & Reel |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green package.

**LINEAR HALL-EFFECT IC****AH49E****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Value | Unit |
|---------------------------|-----------|------------|------|
| Supply Voltage | V_{CC} | 8 | V |
| Output Current | I_O | 10 | mA |
| Operating Temperature | T_A | -40 to 100 | °C |
| Storage Temperature Range | T_{STG} | -50 to 150 | °C |
| ESD (Human Body Model) | | 3000 | V |

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

| Parameter | Symbol | Min | Max | Unit |
|-----------------------|----------|-----|-----|------|
| Supply Voltage | V_{CC} | 3.0 | 6.5 | V |
| Operating Temperature | T_{OP} | -40 | 85 | °C |

**LINEAR HALL-EFFECT IC****AH49E****Electrical Characteristics**

($V_{CC}=5V$, $T_A=25^{\circ}C$, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|----------------------------|------------|-----------------------|----------------------------|----------------------------|------|----------|
| Supply Current | I_{CC} | | | 3.5 | 4.5 | mA |
| Quiescent Output Voltage | V_{NULL} | @ B=0GS | 2.25 | 2.5 | 2.75 | V |
| Output Voltage Sensitivity | | B=0GS to $\pm 1000GS$ | 1.1 | 1.6 | 2.1 | mV/GS |
| Output Voltage Span | V_{OS} | | 1.0 to ($V_{CC}-1.0$) | 0.8 to ($V_{CC}-0.8$) | | V |
| Output Resistor | R_O | | | 60 | 120 | Ω |
| Magnetic Field Range | B | | ± 650 | ± 1000 | | GS |
| Linearity of Span | | | | 0.7 | | % |
| Output Noise | | BW=10Hz to 10kHz | | 90 | | μV |

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Transfer Characteristics ($V_{CC}=5V$)

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

For TO-92S 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. Contrary, a north magnetic pole will drive the output voltage lower. The variations of voltage level up or down are symmetrical. Due to SOT-23-3 is reversed packaging with TO-92S, so the magnetic performance is also reversed. Therefore, if the reversed magnetic pole approaches to the front face (the side with marking ID), the output is the same as TO-92S package.

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.

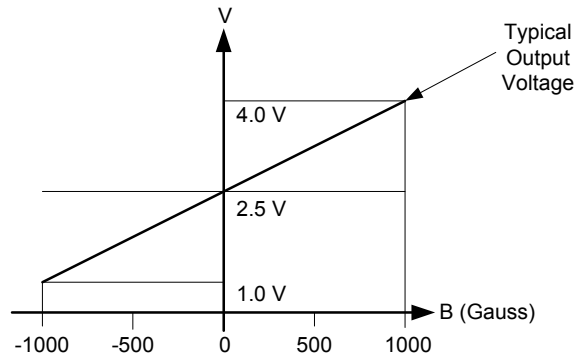
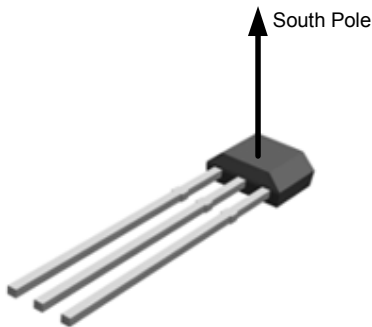
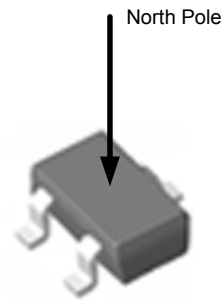


Figure 4. The Transfer Characteristics of AH49E



TO-92S Package



SOT-23-3 Package



Typical Performance Characteristics

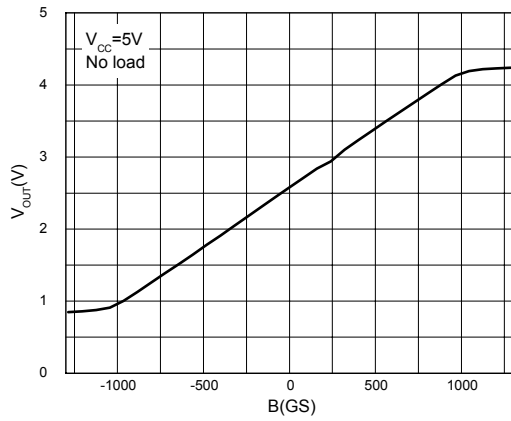


Figure 5. Output Voltage vs. Magnetic Field

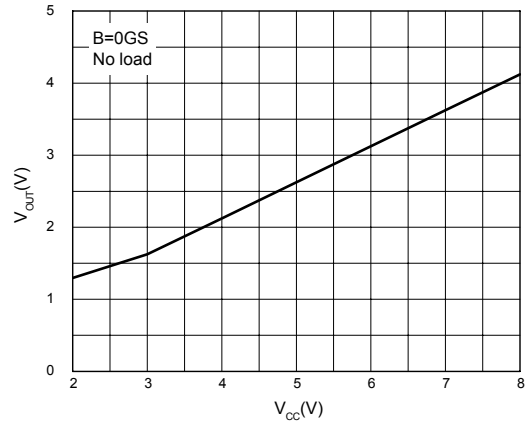


Figure 6. Output Voltage vs. Supply Voltage

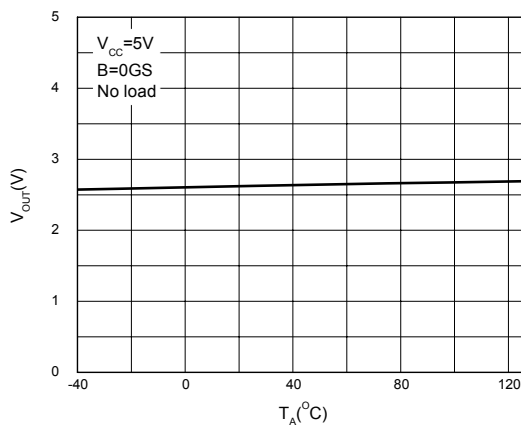


Figure 7. Output Voltage vs. Ambient Temperature



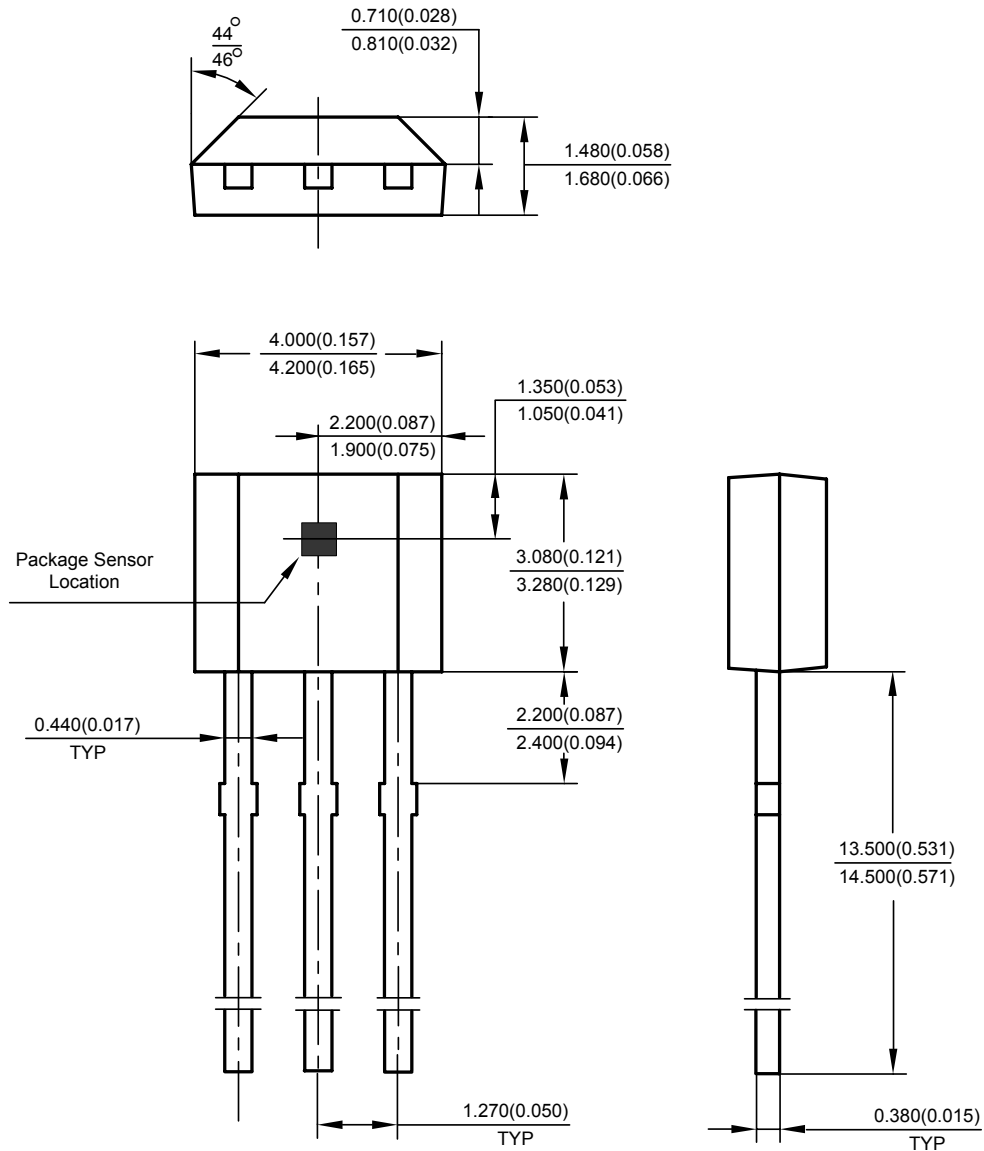
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Mechanical Dimensions

TO-92S

Unit: mm(inch)





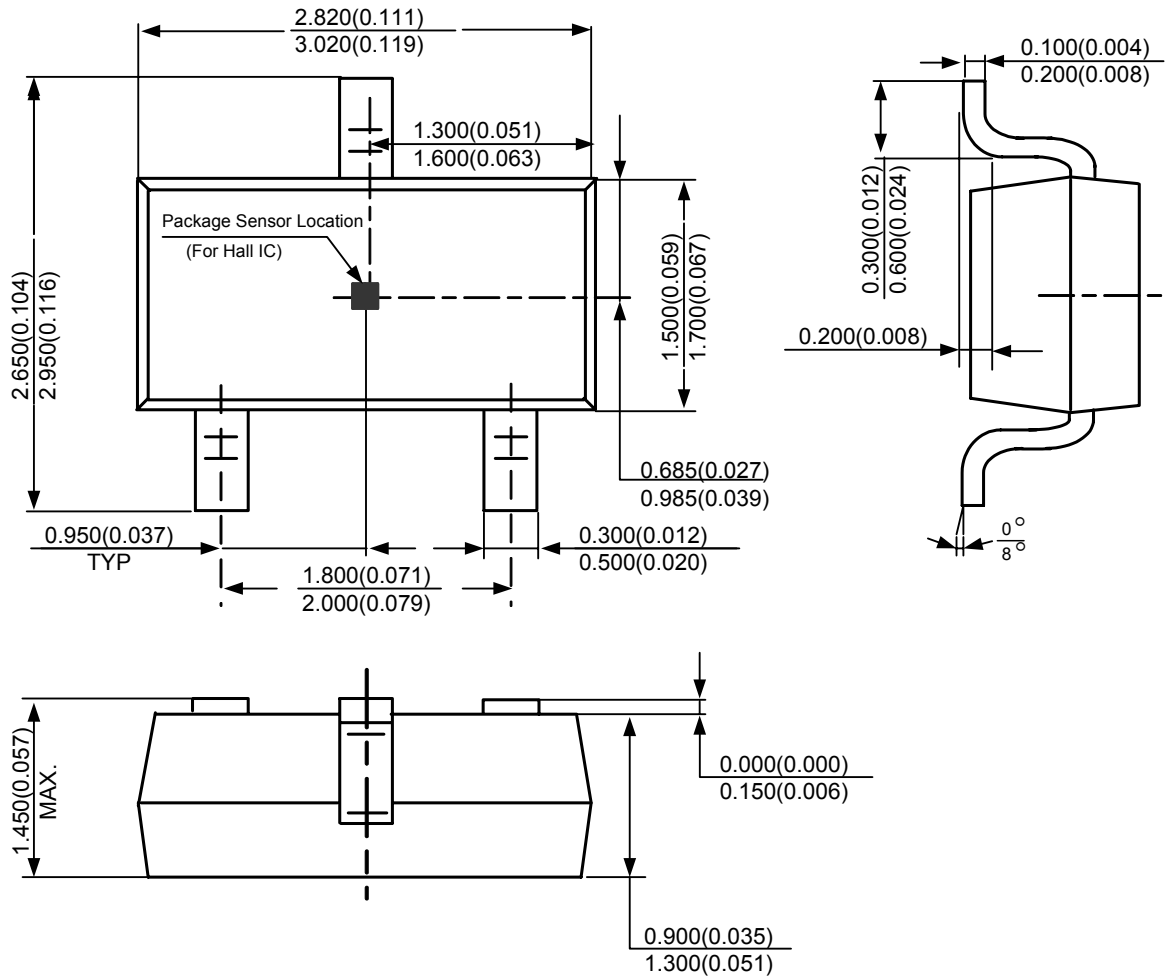
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Mechanical Dimensions (Continued)

SOT-23-3

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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