# BIPOLAR HALL-EFFECT POSITION SENSORS AH41

## General Description

The AH41 is an integrated Hall-effect latched sensor designed for electronic commutation of brushless DC motor applications. The device includes an on-chip Hall voltage generator for magnetic sensing, a comparator that amplifiers the Hall voltage, and a Schmitt to provide switching hysteresis for noise rejection and open-collector output. An internal bandgap regulator is used to provide temperature compensated supply voltage for internal circuits and allows a wide operating supply range.

A north pole of sufficient strength will turn the output ON. In the absence of a magnetic field, the output is OFF.

This IC is available in TO-92S-3 package.

## Features

- On-chip Hall Sensor
- Wide Operating Voltage Range: 4V to 24V
- Internal Bandgap Regulator for Temperature Compensation
- Maximum Output Sink Current: 50mA
- Low Profile TO-92S-3
- Operating Temperature: -40˚C to 150˚C
- ESD Rating: 2000V (Human Body Model)
  300V (Machine Model)

## Application

- Brushless DC Motor

TO-92S-3

Figure 1. Package Type of AH41

## Pin Configuration

Z3 Package
(TO-92S-3)

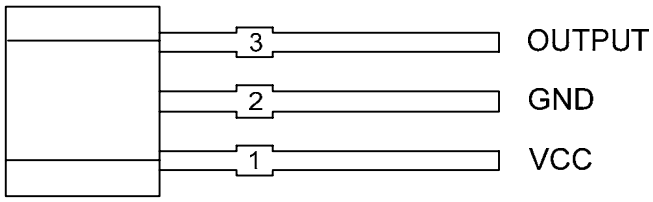



Figure 2. Pin Configuration of AH41 (Front View)

## Pin Description

| Pin Number | Pin Name | Function |
|---|---|---|
| 1 | VCC | Power supply pin |
| 2 | GND | Ground pin |
| 3 | OUTPUT | Output pin. It is low during the N magnetic field |

## Functional Block Diagram

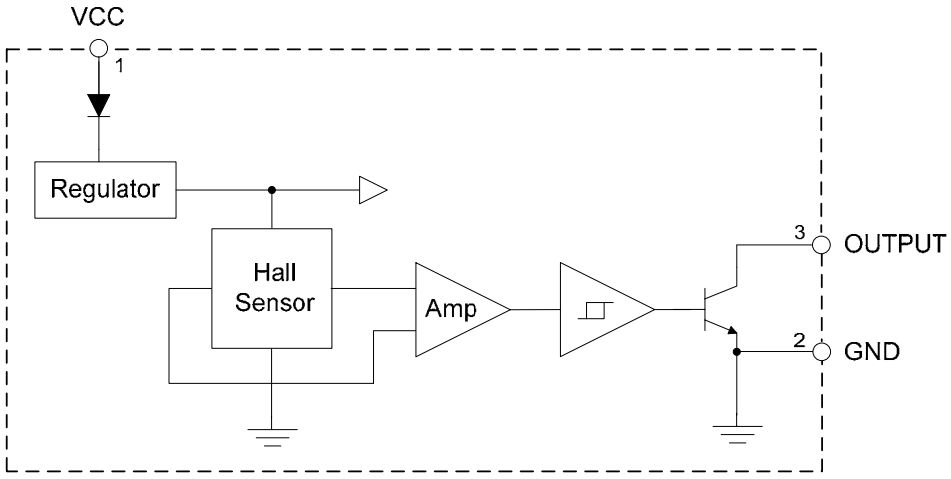
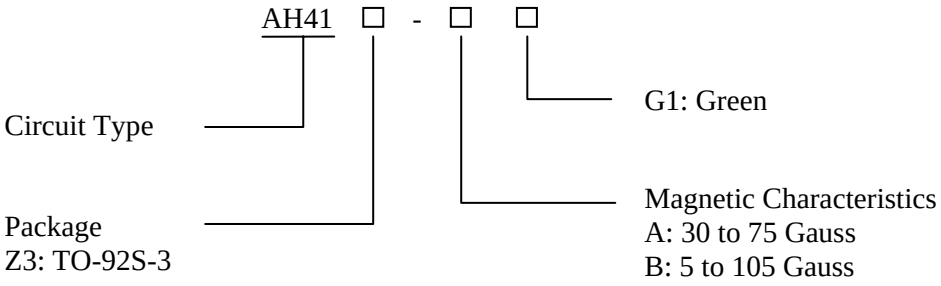



Figure 3. Functional Block Diagram of AH41

## Ordering Information




| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|---|---|---|---|---|
| TO-92S-3 | -40 to 150°C | AH41Z3-AG1 | AH41 | Bulk |
| | | AH41Z3-BG1 | AH41 | Bulk |

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

## Absolute Maximum Ratings (Note 1)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | -24 to 28 | V |
| Output OFF Voltage | $V_{CE}$ | 30 | V |
| Output Sink Current (Continuous Current) | $I_{OUT}$ | 50 | mA |
| Power Dissipation ($T_A$=25°C) | $P_D$ | 400 | mW |
| Storage Temperature | $T_{STG}$ | -65 to 150 | °C |
| Junction Temperature | $T_J$ | 150 | °C |
| ESD (Machine Model) | | 300 | V |
| ESD (Human Body Model) | | 2000 | 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 ($T_A$=25°C)

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 4 | 24 | V |
| Operating Temperature | $T_{OP}$ | -40 | 150 | °C |

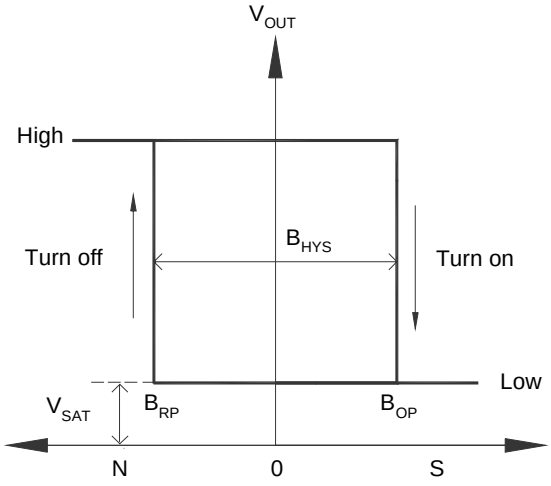
## Electrical Characteristics

$V_{CC}$ =12V, $T_A$ =25°C, unless otherwise specified.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 4 | | 24 | V |
| Supply Current | $I_{CC}$ | $V_{CC}$=4V to 24V | | 6 | 9 | mA |
| Output Leakage Current | $I_{OL}$ | $V_{CE}$=14V | | 0.1 | 10 | μA |
| Output Saturation Voltage | $V_{SAT}$ | $I_{OUT}$ =20mA | | 110 | 300 | mV |
| Rise Time | tr | $R_L$=820Ω<br>$C_L$=20pF | | 200 | | ns |
| Fall Time | tf | $R_L$=820Ω<br>$C_L$=20pF | | 100 | | ns |

## Magnetic Characteristics ($T_A$=25°C)

| Parameter | Symbol | Grade | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Point | $B_{OP}$ | A | 30 | | 75 | Gauss |
| | | B | 5 | | 105 | |
| Releasing Point | $B_{RP}$ | A | -75 | | -30 | Gauss |
| | | B | -105 | | -5 | |
| Hysteresis | $B_{HYS}$ | | 80 | 110 | 140 | Gauss |



## Test Circuit

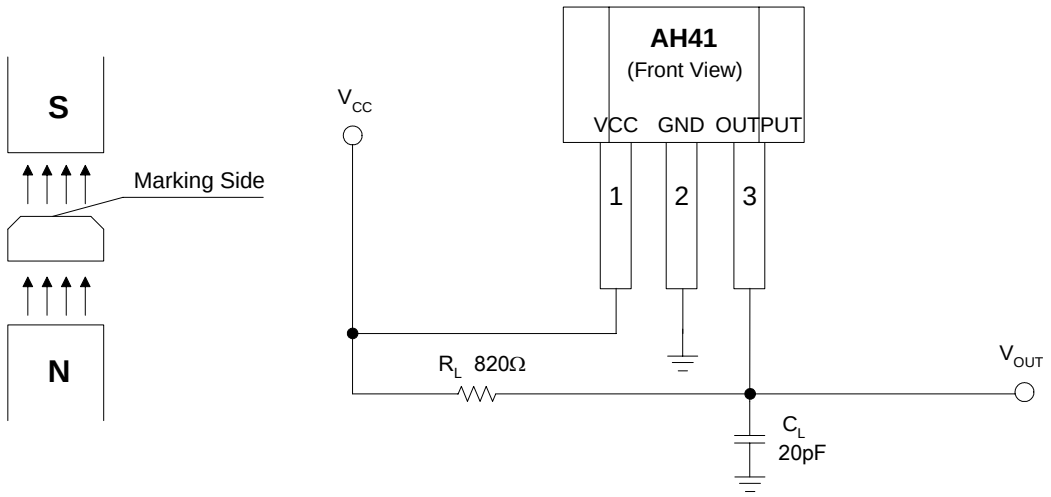



Figure 4. Basic Test Circuit of AH41

## Typical Performance Characteristics

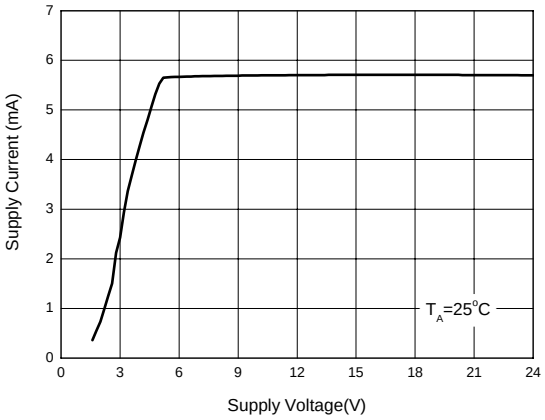



Figure 5. Supply Current vs. Supply Voltage

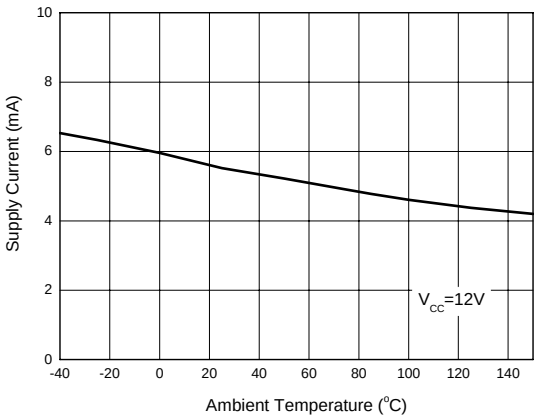



Figure 6. Supply Current vs. Ambient Temperature

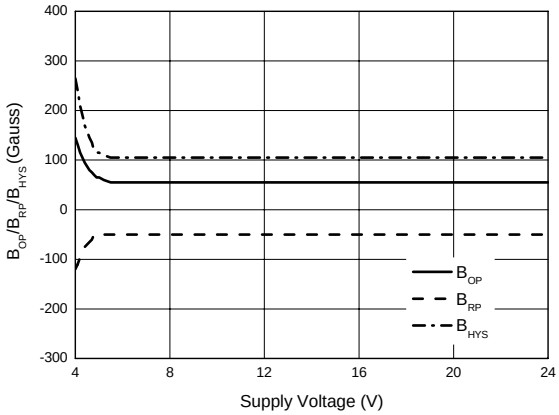



Figure 7. $B_{OP}/B_{RP}/B_{HYS}$ vs. Supply Voltage

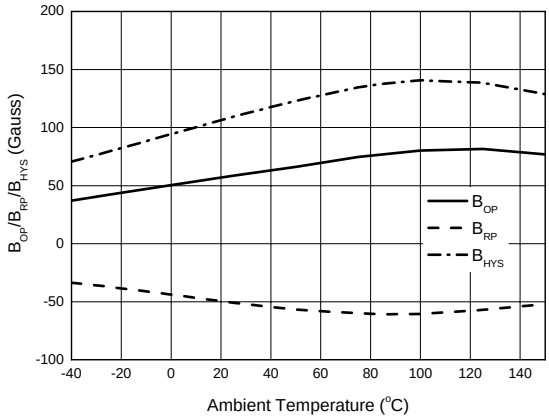



Figure 8. $B_{OP}/B_{RP}/B_{HYS}$ vs. Ambient Temperature

## Typical Performance Characteristics (Continued)

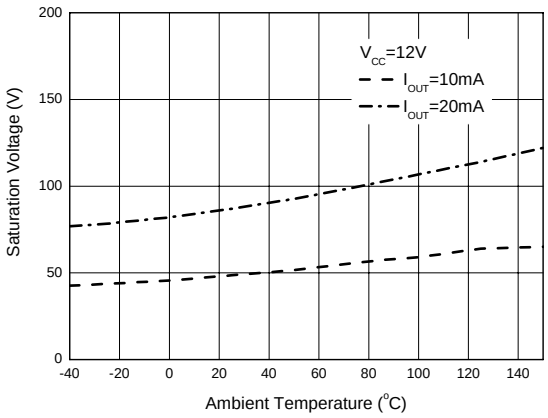
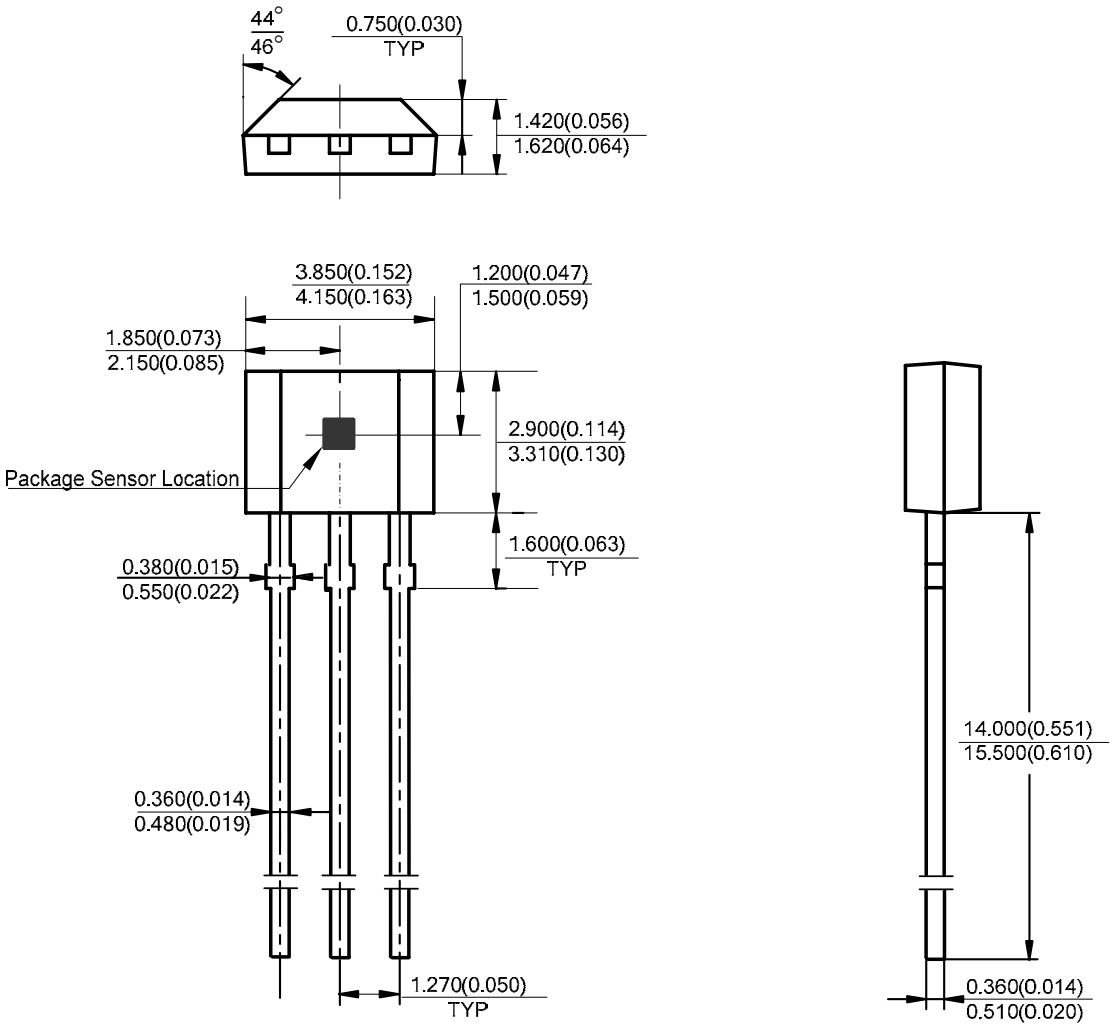



Figure 9. Saturation Voltage vs. Ambient Temperature

## Mechanical Dimensions

**TO-92S-3** **Unit: mm(inch)**



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