



# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

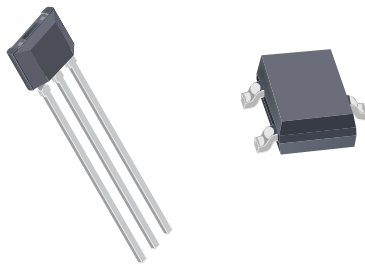
### FEATURES AND BENEFITS

- Low-noise output
- Fast power-on time
- Ratiometric rail-to-rail output
- 4.5 to 6.0 V operation
- Solid-state reliability
- Factory-programmed at end-of-line for optimum performance
- Robust ESD performance

### Packages:

3-Pin SOT23W (suffix LH)

3-Pin SIP (suffix UA)



Not to scale

### DESCRIPTION

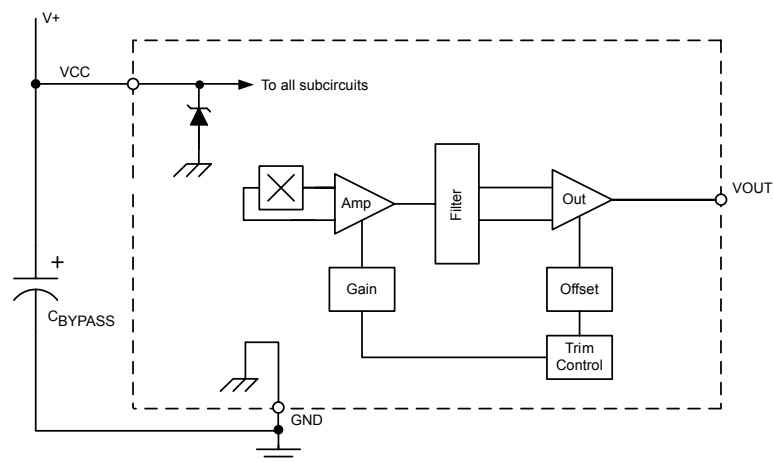
The A1301 and A1302 are continuous-time, ratiometric, linear Hall-effect sensor ICs. They are optimized to accurately provide a voltage output that is proportional to an applied magnetic field. These devices have a quiescent output voltage that is 50% of the supply voltage. Two output sensitivity options are provided: 2.5 mV/G typical for the A1301, and 1.3 mV/G typical for the A1302.

The Hall-effect integrated circuit included in each device includes a Hall circuit, a linear amplifier, and a CMOS Class A output structure. Integrating the Hall circuit and the amplifier on a single chip minimizes many of the problems normally associated with low voltage level analog signals.

High precision in output levels is obtained by internal gain and offset trim adjustments made at end-of-line during the manufacturing process.

These features make the A1301 and A1302 ideal for use in position sensing systems, for both linear target motion and rotational target motion. They are well-suited for industrial applications over extended temperature ranges, from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

Two device package types are available: LH, a 3-pin SOT23W type for surface mount, and UA, a 3-pin ultramini SIP for through-hole mount. They are lead (Pb) free (suffix, -T) with 100% matte tin plated leadframes.



Functional Block Diagram

A1301-DS, Rev. 19

원문: A1301-2- 데이터 시트 (1) .pdf (media.ncd.io) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### SPECIFICATIONS

#### Selection Guide

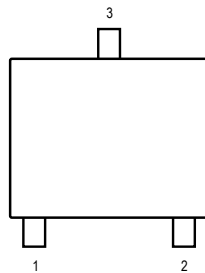
| Part Number  | Packing*                       | Package       | Ambient, T <sub>A</sub> | Sensitivity (Typical) |
|--------------|--------------------------------|---------------|-------------------------|-----------------------|
| A1301EUA-T   | Bulk, 500 pieces/bag           | SIP           | −40°C to 85°C           | 2.5 mV/G              |
| A1301KLHLT-T | 7-in. reel, 3000 pieces/reel   | Surface Mount | −40°C to 125°C          |                       |
| A1301KLHLX-T | 13-in. reel, 10000 pieces/reel | Surface Mount |                         |                       |
| A1301KUA-T   | Bulk, 500 pieces/bag           | SIP           |                         |                       |
| A1302ELHLT-T | 7-in. reel, 3000 pieces/reel   | Surface Mount | −40°C to 85°C           | 1.3 mV/G              |
| A1302ELHLX-T | 13-in. reel, 10000 pieces/reel | Surface Mount | −40°C to 125°C          |                       |
| A1302KLHLT-T | 7-in. reel, 3000 pieces/reel   | Surface Mount |                         |                       |
| A1302KLHLX-T | 13-in. reel, 10000 pieces/reel | Surface Mount |                         |                       |
| A1302KUA-T   | Bulk, 500 pieces/bag           | SIP           |                         |                       |

\*Contact Allegro™ for additional packing options.

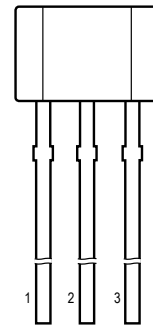


#### Absolute Maximum Ratings

| Characteristic                | Symbol       | Notes   | Rating     | Units |
|-------------------------------|--------------|---------|------------|-------|
| Supply Voltage                | $V_{CC}$     |         | 8          | V     |
| Output Voltage                | $V_{OUT}$    |         | 8          | V     |
| Reverse Supply Voltage        | $V_{RCC}$    |         | -0.1       | V     |
| Reverse Output Voltage        | $V_{ROUT}$   |         | -0.1       | V     |
| Output Sink Current           | $I_{OUT}$    |         | 10         | mA    |
| Operating Ambient Temperature | $T_A$        | Range E | -40 to 85  | °C    |
|                               |              | Range K | -40 to 125 | °C    |
| Maximum Junction Temperature  | $T_{J(max)}$ |         | 165        | °C    |
| Storage Temperature           | $T_{stg}$    |         | -65 to 170 | °C    |



Package LH SOT23W Pin-out Diagram



Package UA, 3-Pin SIP Pin-out Diagram

#### Terminal List

| Symbol | Number     |            | Description                   |
|--------|------------|------------|-------------------------------|
|        | Package LH | Package UA |                               |
| VCC    | 1          | 1          | Connects power supply to chip |
| VOU    | 2          | 3          | Output from circuit           |
| GND    | 3          | 2          | Ground                        |



Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### DEVICE CHARACTERISTICS over operating temperature range, $T_A$ , and $V_{CC} = 5\text{ V}$ , unless otherwise noted

| Characteristic                                                              | Symbol                       | Test Conditions                                                                                                                    | Min. | Typ. | Max.      | Units         |
|-----------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| <b>Electrical Characteristics</b>                                           |                              |                                                                                                                                    |      |      |           |               |
| Supply Voltage                                                              | $V_{CC}$                     | Running, $T_J < 165^\circ\text{C}$                                                                                                 | 4.5  | –    | 6         | V             |
| Supply Current                                                              | $I_{CC}$                     | Output open                                                                                                                        | –    | –    | 11        | mA            |
| Output Voltage                                                              | $V_{OUT(High)}$              | $I_{SOURCE} = -1\text{ mA}$ , Sens = nominal                                                                                       | 4.65 | 4.7  | –         | V             |
|                                                                             | $V_{OUT(Low)}$               | $I_{SINK} = 1\text{ mA}$ , Sens = nominal                                                                                          | –    | 0.2  | 0.25      | V             |
| Output Bandwidth                                                            | BW                           |                                                                                                                                    | –    | 20   | –         | kHz           |
| Power-On Time                                                               | $t_{PO}$                     | $V_{CC(min)}$ to $0.95 V_{OUT}$ ; $B = \pm 1400\text{ G}$ ; Slew rate = $4.5\text{ V}/\mu\text{s}$ to $4.5\text{ V}/100\text{ ns}$ | –    | 3    | 5         | $\mu\text{s}$ |
| Output Resistance                                                           | $R_{OUT}$                    | $I_{SINK} \leq 1\text{ mA}$ , $I_{SOURCE} \geq -1\text{ mA}$                                                                       | –    | 2    | 5         | $\Omega$      |
| Wide Band Output Noise, rms                                                 | $V_{OUTN}$                   | External output low pass filter $\leq 10\text{ kHz}$ ; Sens = nominal                                                              | –    | 150  | –         | $\mu\text{V}$ |
| <b>Ratiometry</b>                                                           |                              |                                                                                                                                    |      |      |           |               |
| Quiescent Output Voltage Error with respect to $\Delta V_{CC}$ <sup>1</sup> | $\Delta V_{OUTQ(V)}$         | $T_A = 25^\circ\text{C}$                                                                                                           | –    | –    | $\pm 3.0$ | %             |
| Magnetic Sensitivity Error with respect to $\Delta V_{CC}$ <sup>2</sup>     | $\Delta \text{Sens}_{(V)}$   | $T_A = 25^\circ\text{C}$                                                                                                           | –    | –    | $\pm 3.0$ | %             |
| <b>Output</b>                                                               |                              |                                                                                                                                    |      |      |           |               |
| Linearity                                                                   | Lin                          | $T_A = 25^\circ\text{C}$                                                                                                           | –    | –    | $\pm 2.5$ | %             |
| Symmetry                                                                    | Sym                          | $T_A = 25^\circ\text{C}$                                                                                                           | –    | –    | $\pm 3.0$ | %             |
| <b>Magnetic Characteristics</b>                                             |                              |                                                                                                                                    |      |      |           |               |
| Quiescent Output Voltage                                                    | $V_{OUTQ}$                   | $B = 0\text{ G}$ ; $T_A = 25^\circ\text{C}$                                                                                        | 2.4  | 2.5  | 2.6       | V             |
| Quiescent Output Voltage over Operating Temperature Range                   | $V_{OUTQ(\Delta T_A)}$       | $B = 0\text{ G}$                                                                                                                   | 2.2  | –    | 2.8       | V             |
| Magnetic Sensitivity                                                        | Sens                         | A1301; $T_A = 25^\circ\text{C}$                                                                                                    | 2.0  | 2.5  | 3.0       | mV/G          |
|                                                                             |                              | A1302; $T_A = 25^\circ\text{C}$                                                                                                    | 1.0  | 1.3  | 1.6       | mV/G          |
| Magnetic Sensitivity over Operating Temperature Range                       | $\text{Sens}_{(\Delta T_A)}$ | A1301                                                                                                                              | 1.8  | –    | 3.2       | mV/G          |
|                                                                             |                              | A1302                                                                                                                              | 0.85 | –    | 1.75      | mV/G          |

<sup>1</sup>Refer to equation (4) in Ratiometric section on page 4.

<sup>2</sup>Refer to equation (5) in Ratiometric section on page 4.



Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

## A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### CHARACTERISTIC DEFINITIONS

#### Quiescent Output Voltage

In the quiescent state (no significant magnetic field:  $B = 0$ ), the output,  $V_{OUTQ}$ , equals one half of the supply voltage,  $V_{CC}$ , throughout the entire operating ranges of  $V_{CC}$  and ambient temperature,  $T_A$ . Due to internal component tolerances and thermal considerations, there is a tolerance on the quiescent output voltage,  $\Delta V_{OUTQ}$ , which is a function of both  $\Delta V_{CC}$  and  $\Delta T_A$ . For purposes of specification, the quiescent output voltage as a function of temperature,  $\Delta V_{OUTQ}(\Delta T_A)$ , is defined as:

$$\Delta V_{OUTQ}(\Delta T_A) = \frac{V_{OUTQ}(T_A) - V_{OUTQ}(25^\circ\text{C})}{Sens_{(25^\circ\text{C})}} \quad (1)$$

where Sens is in mV/G, and the result is the device equivalent accuracy, in gauss (G), applicable over the entire operating temperature range.

#### Sensitivity

The presence of a south-polarity (+B) magnetic field, perpendicular to the branded face of the device package, increases the output voltage,  $V_{OUT}$ , in proportion to the magnetic field applied, from  $V_{OUTQ}$  toward the  $V_{CC}$  rail. Conversely, the application of a north polarity (-B) magnetic field, in the same orientation, proportionally decreases the output voltage from its quiescent value. This proportionality is specified as the magnetic sensitivity of the device and is defined as:

$$Sens = \frac{V_{OUT(-B)} - V_{OUT(+B)}}{2B} \quad (2)$$

The stability of the device magnetic sensitivity as a function of ambient temperature,  $\Delta Sens_{(\Delta T_A)}$  (%) is defined as:

$$\Delta Sens_{(\Delta T_A)} = \frac{Sens_{(T_A)} - Sens_{(25^\circ\text{C})}}{Sens_{(25^\circ\text{C})}} \times 100\% \quad (3)$$

#### Ratiometric

The A1301 and A1302 feature a ratiometric output. This means that the quiescent voltage output,  $V_{OUTQ}$ , and the magnetic sensitivity, Sens, are proportional to the supply voltage,  $V_{CC}$ .

The ratiometric change (%) in the quiescent voltage output is defined as:

$$\Delta V_{OUTQ}(\Delta V) = \frac{V_{OUTQ}(V_{CC}) / V_{OUTQ}(5V)}{V_{CC} / 5V} \times 100\% \quad (4)$$

and the ratiometric change (%) in sensitivity is defined as:

$$\Delta Sens_{(\Delta V)} = \frac{Sens_{(V_{CC})} / Sens_{(5V)}}{V_{CC} / 5V} \times 100\% \quad (5)$$

#### Linearity and Symmetry

The on-chip output stage is designed to provide linear output at a supply voltage of 5 V. Although the application of very high magnetic fields does not damage these devices, it does force their output into a nonlinear region. Linearity in percent is measured and defined as:

$$Lin+ = \frac{V_{OUT(+B)} - V_{OUTQ}}{2(V_{OUT(+B/2)} - V_{OUTQ})} \times 100\% \quad (6)$$

$$Lin- = \frac{V_{OUT(-B)} - V_{OUTQ}}{2(V_{OUT(-B/2)} - V_{OUTQ})} \times 100\% \quad (7)$$

and output symmetry as:

$$Sym = \frac{V_{OUT(+B)} - V_{OUTQ}}{V_{OUTQ} - V_{OUT(-B)}} \times 100\% \quad (8)$$

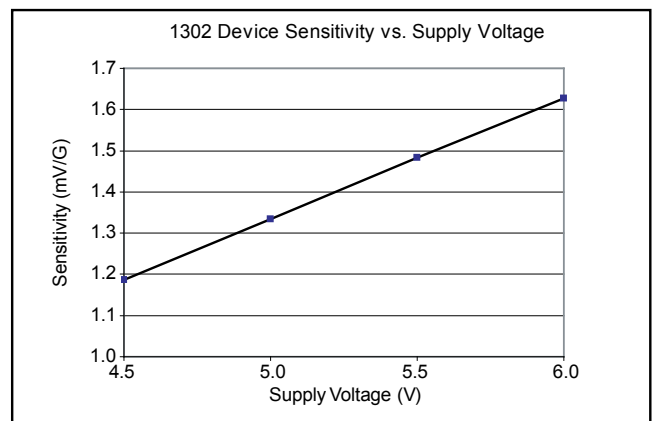
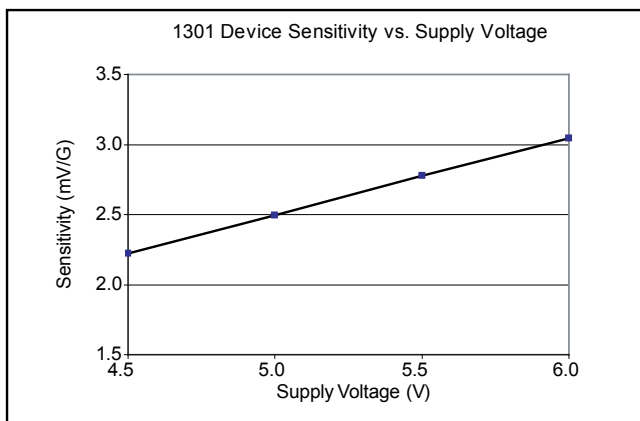
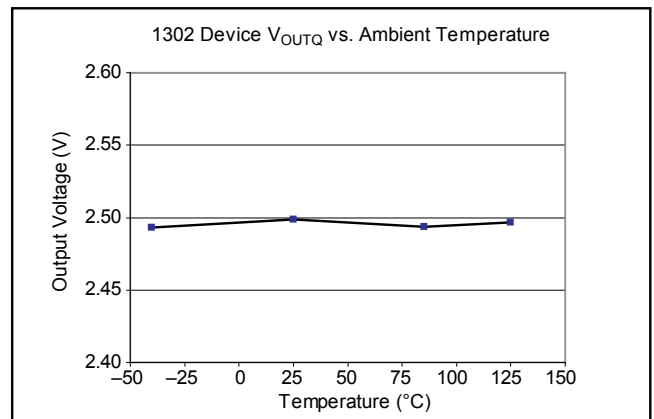
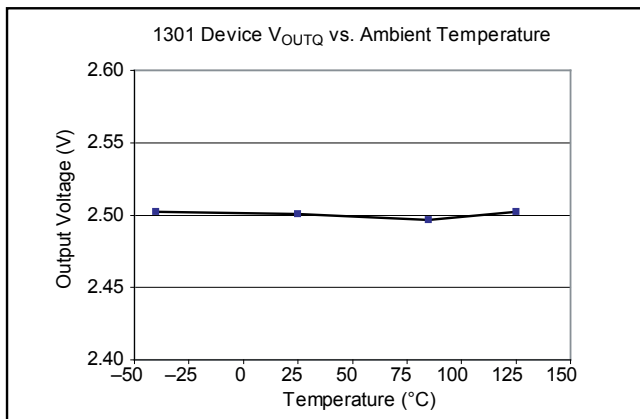
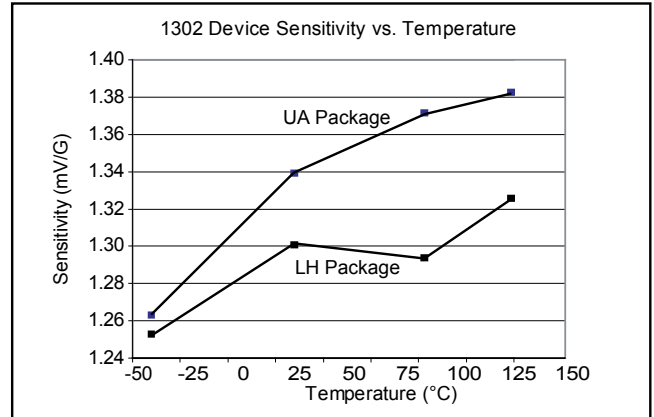
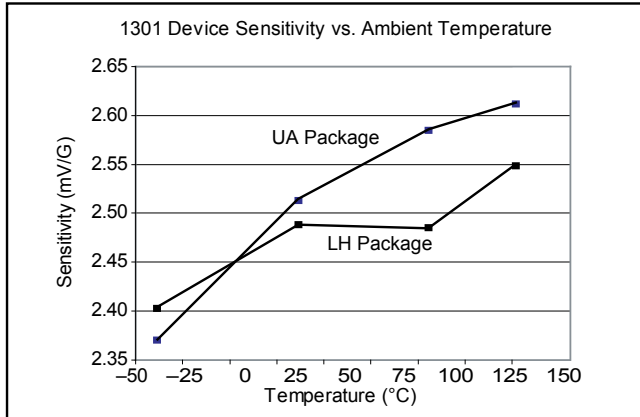


Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### TYPICAL CHARACTERISTICS (30 pieces, 3 fabrication lots)



Continued on the next page...

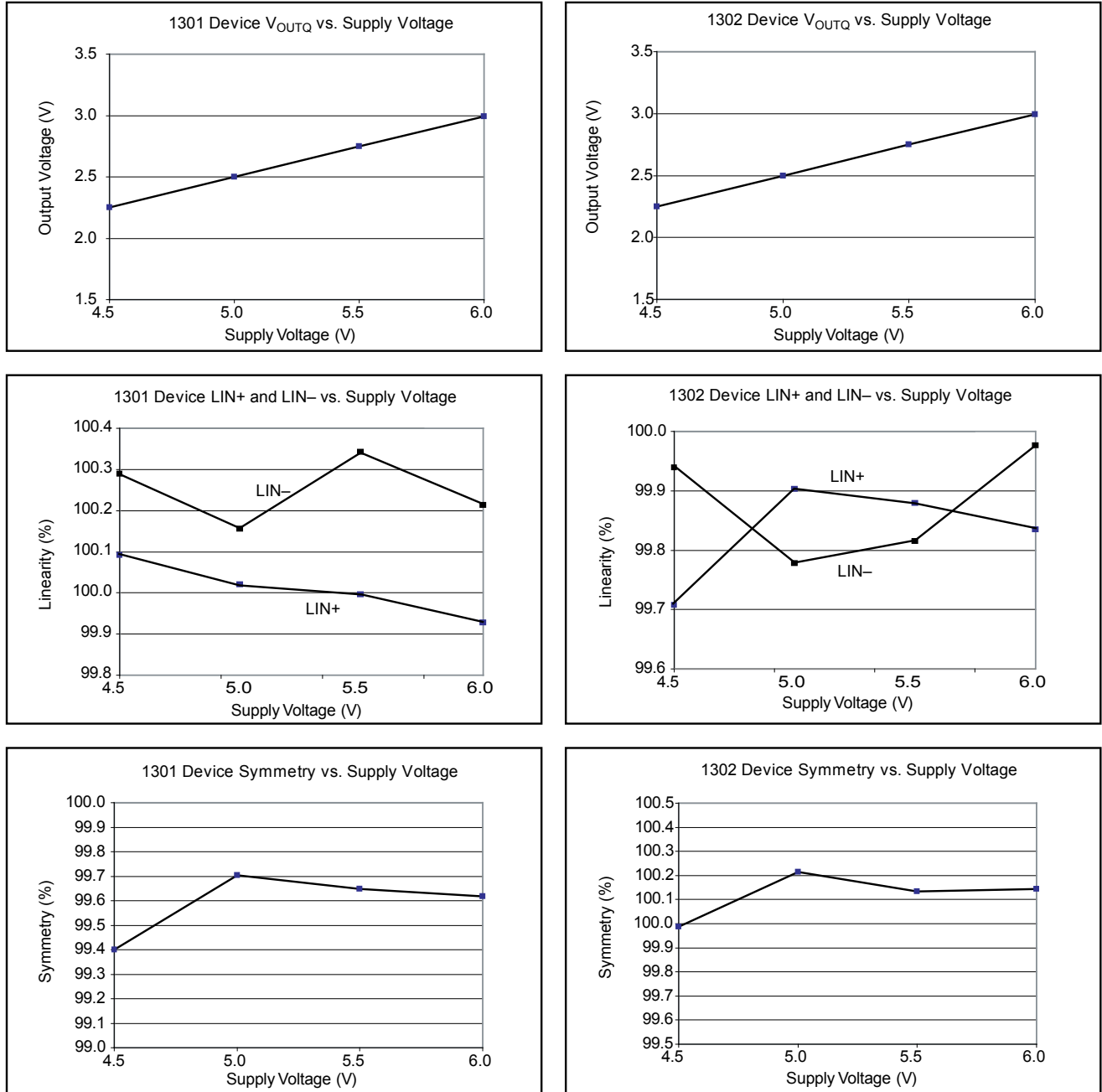


Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

## A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### TYPICAL CHARACTERISTICS CONTINUED (30 pieces, 3 fabrication lots)



Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### CUSTOMER OUTLINE DRAWINGS

#### For Reference Only – Not for Tooling Use

(Reference DWG-2840)

Dimensions in millimeters – NOT TO SCALE

Dimensions exclusive of mold flash, gate burrs, and dambar protrusions

Exact case and lead configuration at supplier discretion within limits shown

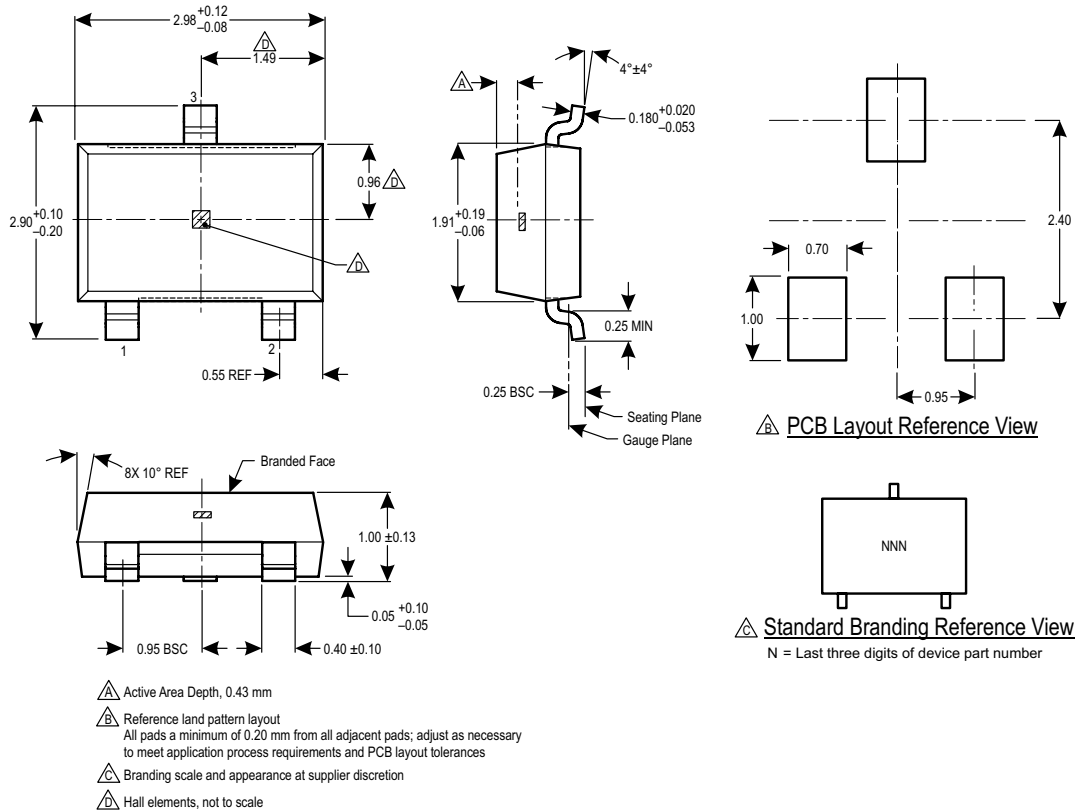


Figure 1: Package LH, 3-Pin; (SOT-23W)



Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; www.allegromicro.com

# A1301 and A1302

## Continuous-Time Ratiometric Linear Hall Effect Sensor ICs

### For Reference Only – Not for Tooling Use

(Reference DWG-9065)  
Dimensions in millimeters – NOT TO SCALE  
Dimensions exclusive of mold flash, gate burrs, and dambar protrusions  
Exact case and lead configuration at supplier discretion within limits shown

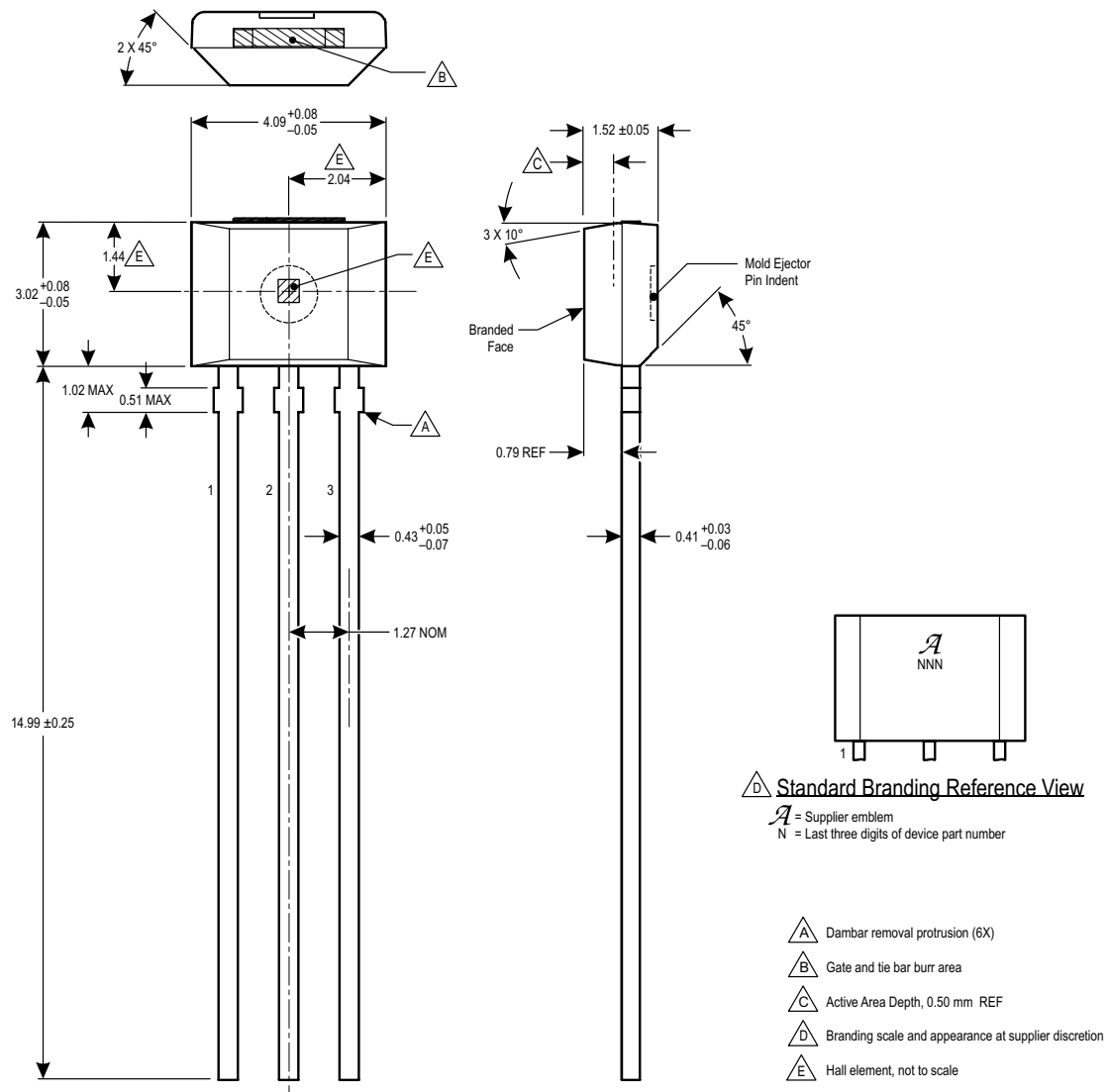


Figure 2: Package UA, 3-Pin SIP



Allegro MicroSystems, LLC  
 115 Northeast Cutoff  
 Worcester, Massachusetts 01615-0036 U.S.A.  
 1.508.853.5000; www.allegromicro.com

**A1301 and  
A1302*****Continuous-Time Ratiometric  
Linear Hall Effect Sensor ICs*****Revision History**

| Revision | Revision Date   | Description of Revision          |
|----------|-----------------|----------------------------------|
| 18       | April 26, 2013  | Update UA package drawing        |
| 19       | January 1, 2015 | Add LX option to Selection Guide |

Copyright ©2005-2015, Allegro MicroSystems, LLC

Allegro MicroSystems, LLC reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the performance, reliability, or manufacturability of its products. Before placing an order, the user is cautioned to verify that the information being relied upon is current.

Allegro's products are not to be used in life support devices or systems, if a failure of an Allegro product can reasonably be expected to cause the failure of that life support device or system, or to affect the safety or effectiveness of that device or system.

The information included herein is believed to be accurate and reliable. However, Allegro MicroSystems, LLC assumes no responsibility for its use; nor for any infringement of patents or other rights of third parties which may result from its use.

For the latest version of this document, visit our website:

[www.allegromicro.com](http://www.allegromicro.com)



Allegro MicroSystems, LLC  
115 Northeast Cutoff  
Worcester, Massachusetts 01615-0036 U.S.A.  
1.508.853.5000; [www.allegromicro.com](http://www.allegromicro.com)

9

원문: A1301-2- 데이터 시트 (1) .pdf (media.ncd.io) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.