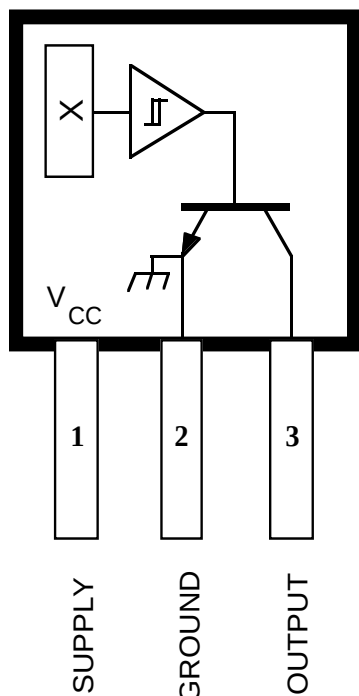


## ***BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMPERATURE OPERATION***



Dwg. PH-003A

Pinning is shown viewed from branded side.

### **ABSOLUTE MAXIMUM RATINGS at $T_A = +25^\circ\text{C}$**

|                                               |                 |
|-----------------------------------------------|-----------------|
| Supply Voltage, $V_{CC}$ .....                | 30 V            |
| Reverse Battery Voltage, $V_{RCC}$ .....      | -30 V           |
| Magnetic Flux Density, B .....                | Unlimited       |
| Output OFF Voltage, $V_{OUT}$ .....           | 30 V            |
| Reverse Output Voltage, $V_{OUT}$ .....       | -0.5 V          |
| Continuous Output Current,<br>$I_{OUT}$ ..... | 25 mA           |
| Operating Temperature Range, $T_A$            |                 |
| Suffix 'E-' .....                             | -40°C to +85°C  |
| Suffix 'L-' .....                             | -40°C to +150°C |
| Storage Temperature Range,<br>$T_S$ .....     | -65°C to +170°C |

This low-hysteresis bipolar Hall-effect switch is an extremely temperature-stable and stress-resistant sensor especially suited for operation over extended temperature ranges to  $+150^\circ\text{C}$ . Superior high-temperature performance is made possible through a novel Schmitt trigger circuit that maintains operate and release point stability by compensating for temperature changes in the Hall element. Additionally, internal compensation provides magnetic switch points that become more sensitive with temperature, hence offsetting the usual degradation of the magnetic field with temperature. Its low hysteresis makes this device ideal for detecting small changes in magnetic field strength or for use with inexpensive magnets.

The device includes on a single silicon chip a voltage regulator, quadratic Hall-voltage generator, temperature compensation circuit, signal amplifier, Schmitt trigger, and a buffered open-collector output to sink up to 25 mA. The on-board regulator permits operation with supply voltages of 4.5 volts to 24 volts.

The first character of the part number suffix determines the device operating temperature range. Suffix 'E-' is for  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , and suffix 'L-' is  $-40^\circ\text{C}$  to  $+150^\circ\text{C}$ . Two package styles provide a magnetically optimized package for most applications. Suffix '-LT' is a miniature SOT89/TO-243AA transistor package for surface-mount applications while suffix '-UA' is a three-lead ultra-mini-SIP.

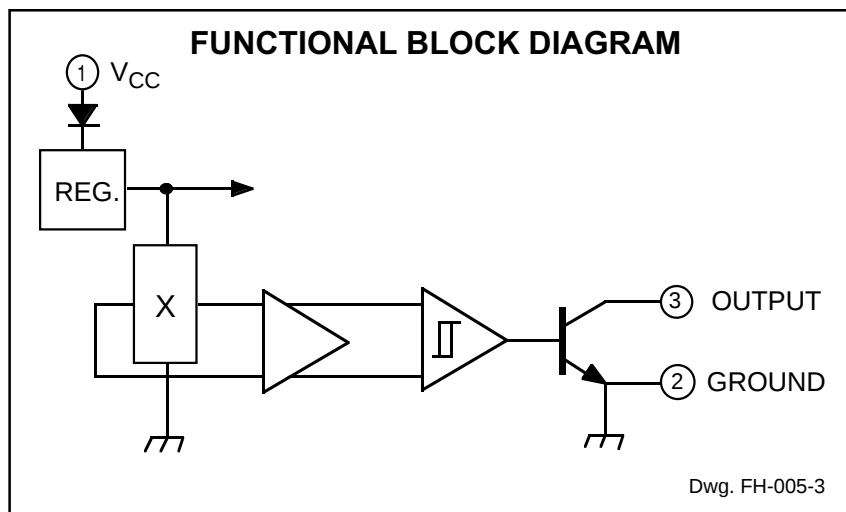
### **FEATURES**

- Superior Temperature Stability
- Operation From Unregulated Supply
- Open-Collector 25 mA Output
- Reverse Battery Protection
- Activate With Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

Always order by complete part number, e.g., **A3134ELT**.

# 3134

## LOW-HYSTERESIS BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMP. OPERATION



### ELECTRICAL CHARACTERISTICS over operating temperature range, at $V_{CC} = 12\text{ V}$ .

| Characteristic            | Symbol         | Test Conditions                            | Limits |      |      |               |
|---------------------------|----------------|--------------------------------------------|--------|------|------|---------------|
|                           |                |                                            | Min.   | Typ. | Max. | Units         |
| Supply Voltage            | $V_{CC}$       | Operating                                  | 4.5    | —    | 24   | V             |
| Output Saturation Voltage | $V_{OUT(SAT)}$ | $I_{OUT} = 20\text{ mA}$ , $B > B_{OP}$    | —      | 175  | 400  | mV            |
| Output Leakage Current    | $I_{OFF}$      | $V_{OUT} = 24\text{ V}$ , $B < B_{RP}$     | —      | 0.05 | 1.0  | $\mu\text{A}$ |
| Supply Current            | $I_{CC}$       | $B < B_{RP}$ (Output OFF)                  | —      | 3.2  | 9.0  | mA            |
|                           |                | $B > B_{OP}$ (Output ON)                   | —      | 5.0  | —    | mA            |
| Output Rise Time          | $t_r$          | $R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$ | —      | 100  | —    | ns            |
| Output Fall Time          | $t_f$          | $R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$ | —      | 100  | —    | ns            |

### MAGNETIC CHARACTERISTICS over oper. temp. and oper. supply voltage ranges.

| Characteristic | Symbol    | Test Conditions | Limits |      |      |       |
|----------------|-----------|-----------------|--------|------|------|-------|
|                |           |                 | Min.   | Typ. | Max. | Units |
| Operate Point  | $B_{OP}$  |                 | -40    | 8.5  | 60   | G     |
| Release Point  | $B_{RP}$  |                 | -50    | -19  | 50   | G     |
| Hysteresis     | $B_{hys}$ |                 | 5.0    | 27   | 55   | G     |

NOTES:  $B_{OP}$  = operate point (output turns ON);  $B_{RP}$  = release point (output turns OFF);  $B_{hys}$  = hysteresis ( $B_{OP} - B_{RP}$ ).

As used here, negative flux densities are defined as less than zero (algebraic convention).

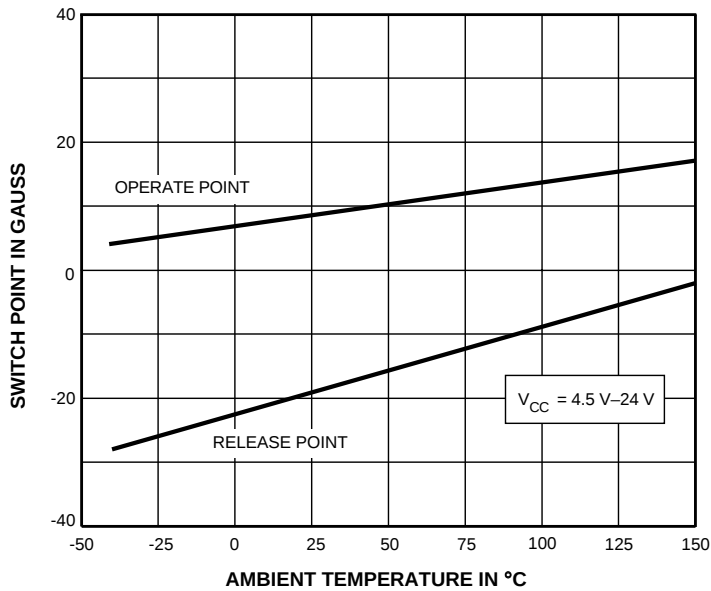
Typical values are at  $T_A = +25^\circ\text{C}$  and  $V_{CC} = 12\text{ V}$ .

1 gauss (G) is exactly equal to 0.1 millitesla (mT).

# 3134 LOW-HYSTERESIS BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMP. OPERATION

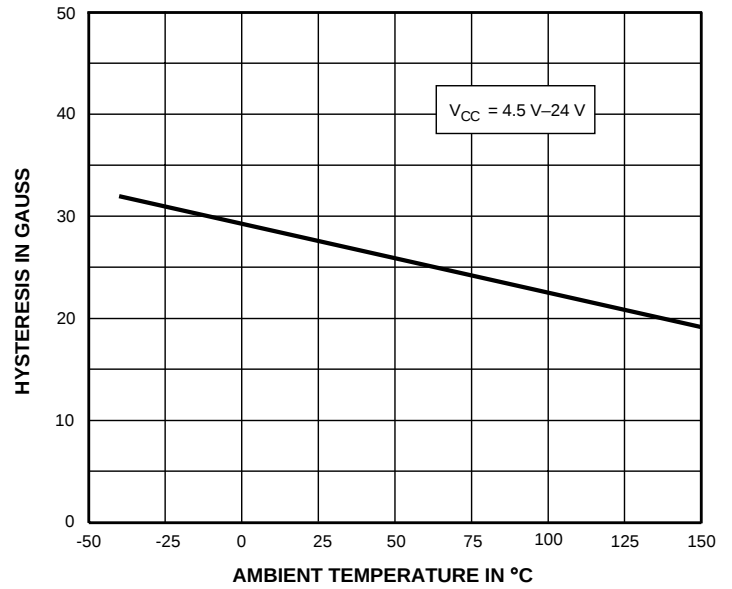
## TYPICAL OPERATING CHARACTERISTICS

### SWITCH POINTS



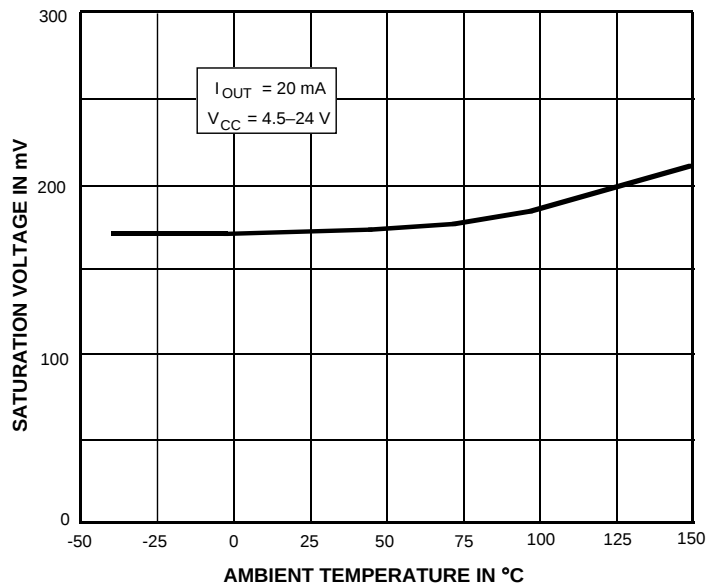
Dwg. GH-052

### HYSTERESIS



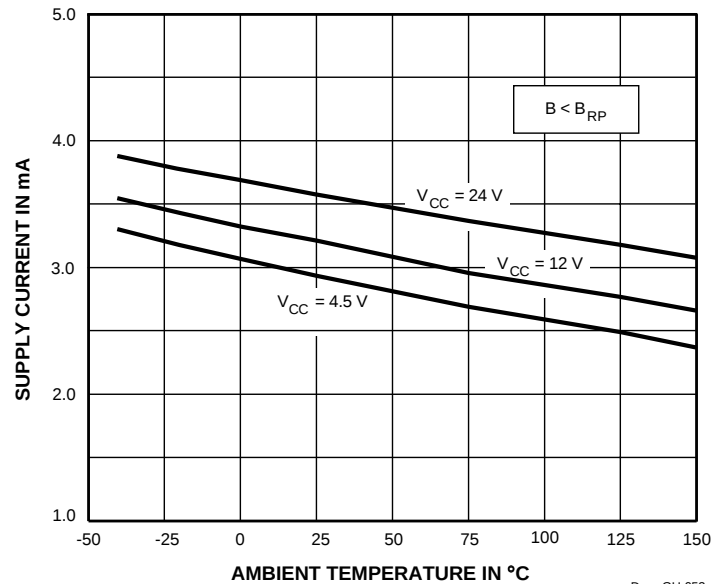
Dwg. GH-051

### OUTPUT SATURATION VOLTAGE



Dwg. GH-029

### SUPPLY CURRENT



Dwg. GH-053

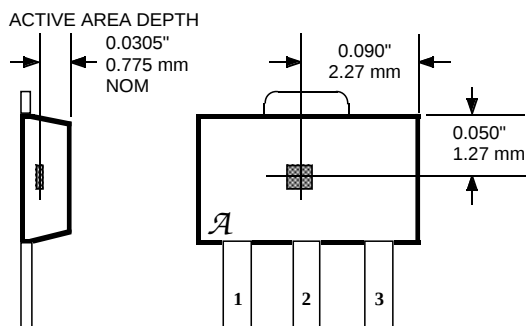
# 3134

## LOW-HYSTERESIS BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMP. OPERATION

### SENSOR LOCATIONS

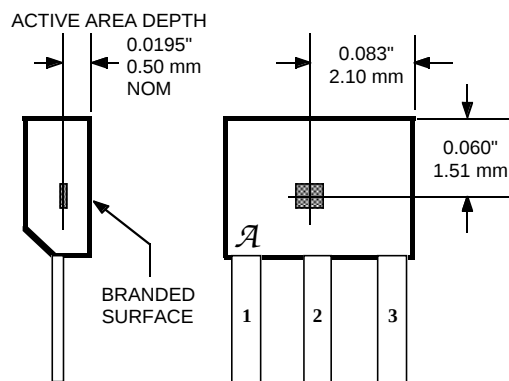
( $\pm 0.005$ " [0.13 mm] die placement)

#### Suffix "LT"



Dwg. MH-008-4C

#### Suffix "UA"



Dwg. MH-011-4C

### APPLICATIONS INFORMATION

Extensive applications information for Hall-effect sensors is available in:

- *Hall-Effect IC Applications Guide*, Application Note 27701;
- *Hall-Effect Devices: Soldering, Gluing, Potting, Encapsulating, and Lead Forming*, Application Note 27703.1;
- *Soldering of Through-Hole Hall-Sensor Devices*, Application Note 27703;
- and
- *Soldering of Surface-Mount Hall-Sensor Devices*, Application Note 27703.2.

All are provided in *Allegro Electronic Data Book*, AMS-702. or at

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

### OPERATION

The output of these devices (pin 3) switches low when the magnetic field at the Hall sensor exceeds the operate point threshold ( $B_{OP}$ ). At this point, the output voltage is  $V_{OUT(SAT)}$ . When the magnetic field is reduced to below the release point ( $B_{RP}$ ) the device output goes high. Note especially that release can occur when the magnetic field is removed but to ensure release, a field reversal is required. The difference in the magnetic operate and release points is called the hysteresis ( $B_{hys}$ ) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.

Powering up the device in the absence of a magnetic field (less than  $B_{OP}$  and higher than  $B_{RP}$ ) will allow in indeterminate output state. The correct state is warranted after the first excursion beyond  $B_{OP}$  or  $B_{RP}$ .

The products described herein are manufactured under one or more of the following U.S. patents: 5,045,920; 5,264,783; 5,442,283; 5,389,889; 5,581,179; 5,517,112; 5,619,137; 5,621,319; 5,650,719; 5,686,894; 5,694,038; 5,729,130; 5,917,320; and other patents pending.

Allegro MicroSystems, Inc. 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 products are not authorized for use as critical components in life-support appliances, devices, or systems without express written approval.

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

**PACKAGE DESIGNATOR 'LT'**  
**(SOT89/TO-243AA)**

### Dimensions in Millimeters (controlling dimensions)

Dwa. MA-009-3A in

Dwg. MA-009-3A mm

Dwg. MA-012-3 in

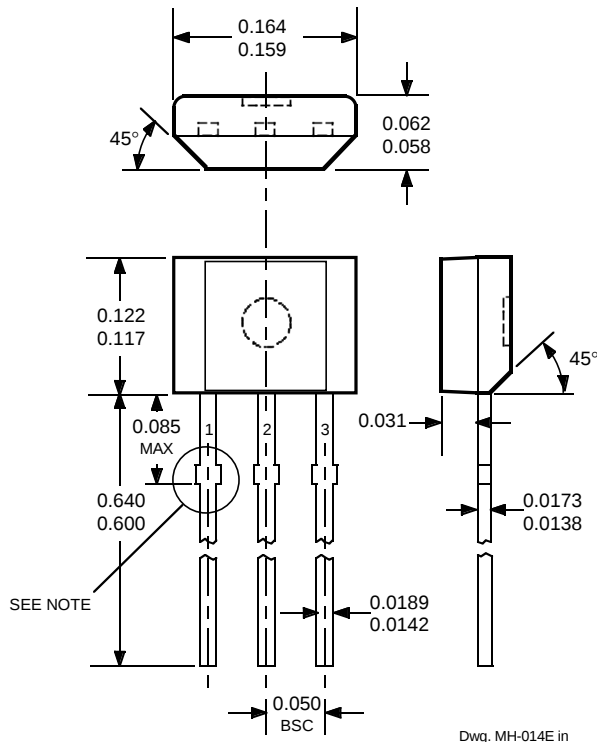
Dwg. MA-012-3 mm

# 3134

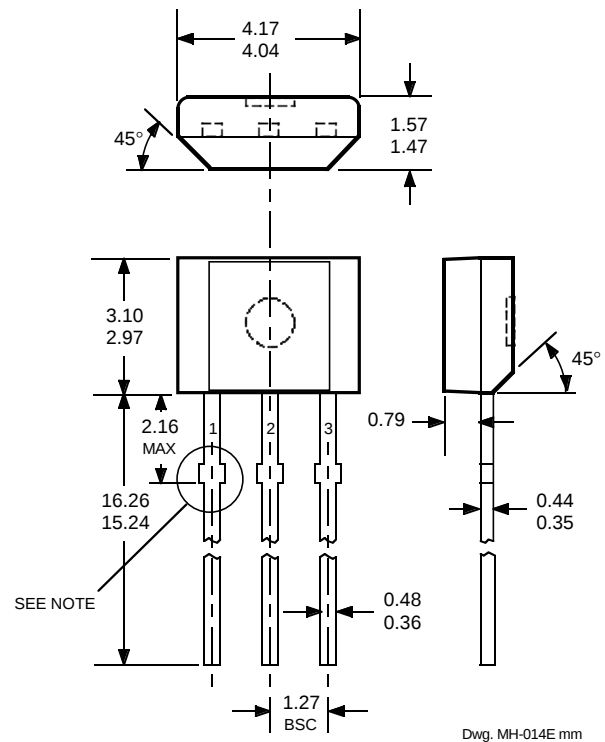
## LOW-HYSTERESIS BIPOLAR HALL-EFFECT SWITCH FOR HIGH-TEMP. OPERATION

### PACKAGE DESIGNATOR 'UA'

**Dimensions in Inches**  
(controlling dimensions)

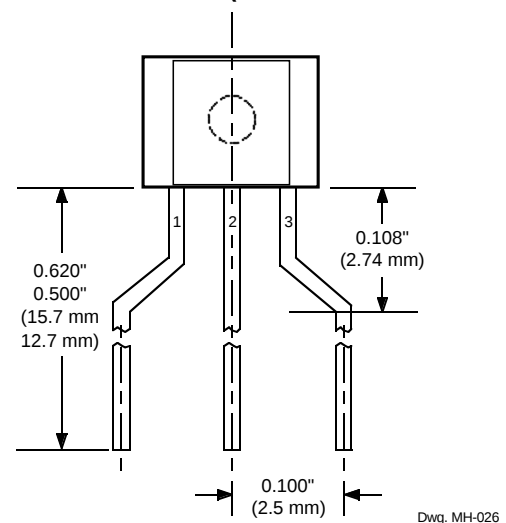


**Dimensions in Millimeters**  
(for reference only)



- NOTES:
1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
  2. Exact body and lead configuration at vendor's option within limits shown.
  3. Height does not include mold gate flash.
  4. Recommended minimum PWB hole diameter to clear transition area is 0.035" (0.89 mm).
  5. Where no tolerance is specified, dimension is nominal.
  6. Supplied in bulk pack (500 pieces per bag).

### Radial Lead Form (order A3240xUA-LC)



NOTE: Lead-form dimensions are the nominals produced on the forming equipment. No dimensional tolerance is implied or guaranteed for bulk packaging (500 pieces per bag).