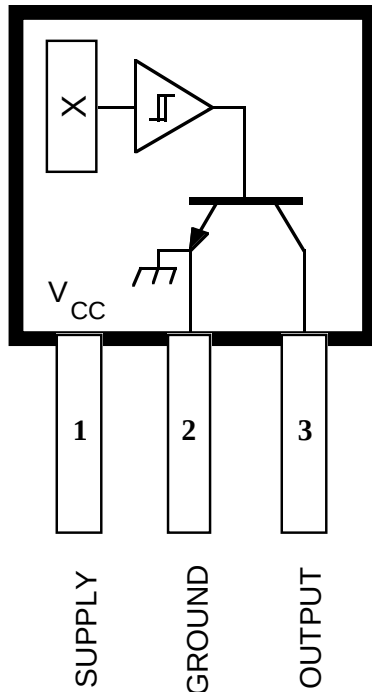


# 3132 AND 3133

Data Sheet  
27631.2C

## ULTRA-SENSITIVE BIPOLAR HALL-EFFECT SWITCHES



Dwg. PH-003A

Pinning is shown viewed from branded side.

### ABSOLUTE MAXIMUM RATINGS

Supply Voltage,  $V_{CC}$  ..... **25 V**  
Reverse Battery Voltage,  $V_{RCC}$  .... **-35 V**  
Magnetic Flux Density,  $B$  .... **Unlimited**  
Output OFF Voltage,  $V_{OUT}$  ..... **25 V**  
Continuous Output Current,  $I_{OUT}$  . **25 mA**  
Operating Temperature Range,  $T_A$   
    Prefix UGL ..... **-40°C to +150°C**  
    Prefix UGN ..... **-20°C to +85°C**  
    Prefix UGS ..... **-40°C to +125°C**  
Storage Temperature Range,  
     $T_S$  ..... **-65°C to +150°C**

These Hall-effect switches are designed for magnetic actuation using a bipolar magnetic field, i.e., a north-south alternating field. They combine extreme magnetic sensitivity with excellent stability over varying temperature and supply voltage. The high sensitivity permits their use with multi-pole ring magnets over relatively large distances.

Each device includes a voltage regulator, quadratic Hall voltage generator, temperature stability circuit, signal amplifier, Schmitt trigger, and open-collector output on a single silicon chip. The on-board regulator permits operation with supply voltages of 4.5 to 24 V. The switch output can sink up to 25 mA. With suitable output pull up, they can be used directly with bipolar or MOS logic circuits.

The three package styles available provide a magnetically optimized package for most applications. Suffix 'LT' is a miniature SOT89/TO-243AA transistor package for surface-mount applications; suffix 'UA' features wire leads for through-hole mounting. Prefix 'UGN' devices are rated for continuous operation over the temperature range of -20°C to +85°C, prefix 'UGS' devices over an extended range of -40°C to +125°C, and prefix 'UGL' devices over the range of -40°C to +150°C.

### FEATURES

- 4.5 V to 24 V Operation
- Reverse Battery Protection
- Superior Temperature Stability
- Superior Supply Voltage Stability
- Activate with Multi-Pole Ring Magnets
- Solid-State Reliability
- Small Size
- Constant Output Amplitude
- Resistant to Physical Stress

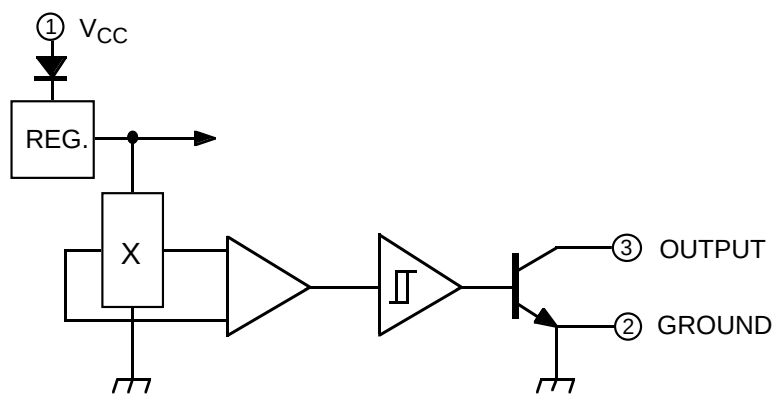
Always order by complete part number  
including prefix and suffix, e.g., **UGN3132LT**.

# 3132 AND 3133

## BIPOLAR

## HALL-EFFECT SWITCHES

### FUNCTIONAL BLOCK DIAGRAM



Dwg. FH-005-2

### ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$

| Characteristic            | Symbol         | Test Conditions                                                     | Limits |      |      |               |
|---------------------------|----------------|---------------------------------------------------------------------|--------|------|------|---------------|
|                           |                |                                                                     | Min.   | Typ. | Max. | Units         |
| Supply Voltage            | $V_{CC}$       | Operating                                                           | 4.5    | —    | 24   | V             |
| Output Saturation Voltage | $V_{OUT(SAT)}$ | $I_{OUT} = 20\text{ mA}$ , $B \geq B_{OP}$                          | —      | 145  | 400  | mV            |
| Output Leakage Current    | $I_{OFF}$      | $V_{OUT} = 24\text{ V}$ , $B \leq B_{RP}$                           | —      | <1.0 | 10   | $\mu\text{A}$ |
| Supply Current            | $I_{CC}$       | $V_{CC} = 24\text{ V}$ , $B \leq B_{RP}$                            | —      | 4.3  | 9.0  | mA            |
| Output Rise Time          | $t_r$          | $V_{CC} = 12\text{ V}$ , $R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$ | —      | 0.04 | 2.0  | $\mu\text{s}$ |
| Output Fall Time          | $t_f$          | $V_{CC} = 12\text{ V}$ , $R_L = 820\ \Omega$ , $C_L = 20\text{ pF}$ | —      | 0.18 | 2.0  | $\mu\text{s}$ |

### MAGNETIC CHARACTERISTICS over operating temperature and voltage range.

| Characteristic | Symbol    | Device Type* | Limits |      |      |       |
|----------------|-----------|--------------|--------|------|------|-------|
|                |           |              | Min.   | Typ. | Max. | Units |
| Operate Point  | $B_{OP}$  | 3132         | —      | 32   | 95   | G     |
|                |           | 3133         | —      | 32   | 75   | G     |
| Release Point  | $B_{RP}$  | 3132         | -95    | -20  | —    | G     |
|                |           | 3133         | -75    | -20  | —    | G     |
| Hysteresis     | $B_{hys}$ | Both         | 30     | 52   | —    | G     |

NOTE: 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).

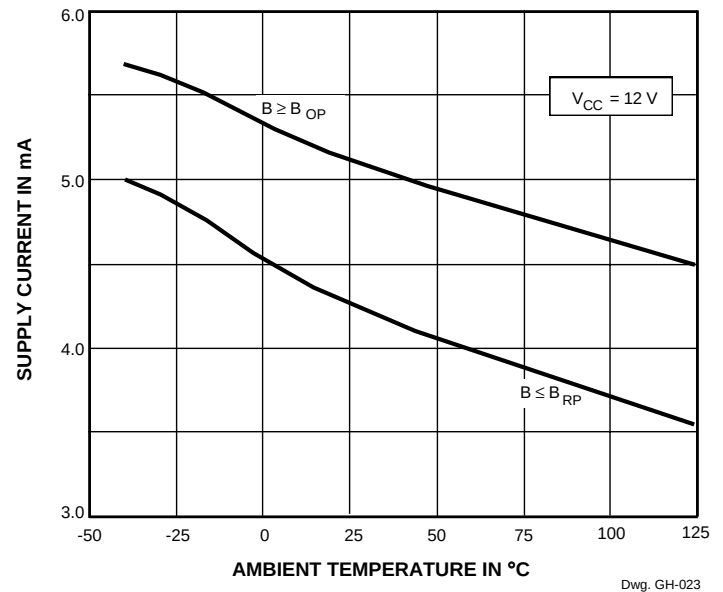
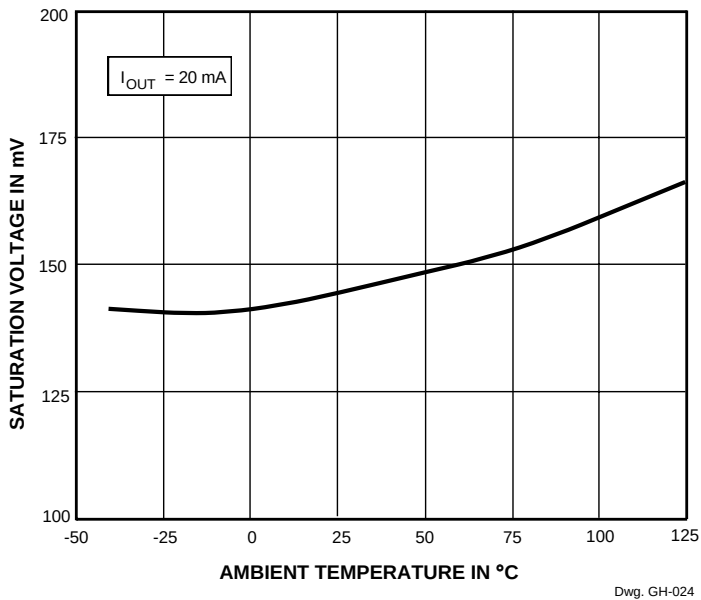
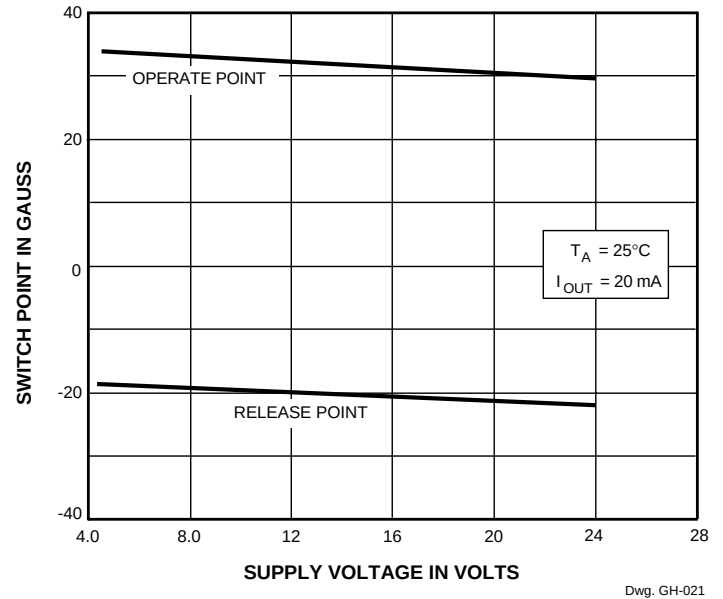
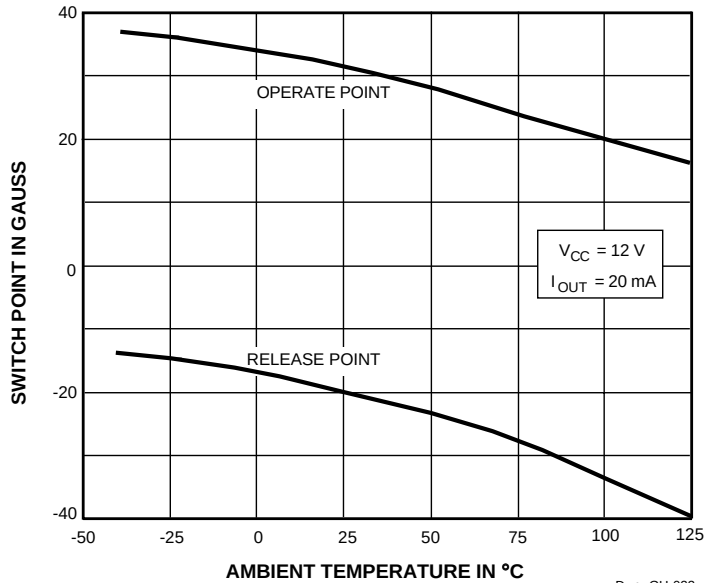
\* Complete part number includes a prefix denoting operating temperature range (UGL, UGN, or UGS) and a suffix denoting package type (LT or UA).



115 Northeast Cutoff, Box 15036  
Worcester, Massachusetts 01615-0036 (508) 853-5000  
Copyright © 1996, 2003 Allegro MicroSystems, Inc.

# 3132 AND 3133 BIPOLAR HALL-EFFECT SWITCHES

## TYPICAL CHARACTERISTICS



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

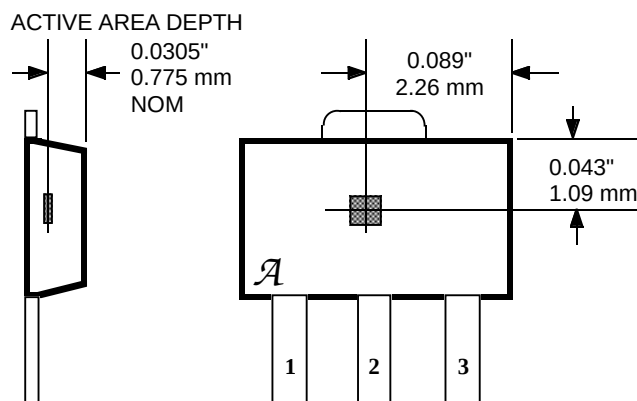
Bipolar switches may switch on removal of field but require field reversal for reliable operation over temperature range; latches will not switch on removal of magnetic field.

# 3132 AND 3133 BIPOLAR HALL-EFFECT SWITCHES

## SENSOR LOCATIONS

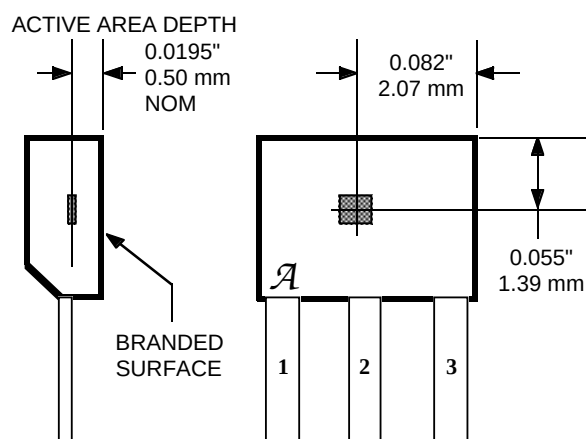
( $\pm 0.005$ " [0.13mm] die placement)

### SUFFIX "LT"



Dwg. MH-008-2D

### SUFFIX "UA"



Dwg. MH-011-10A

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.

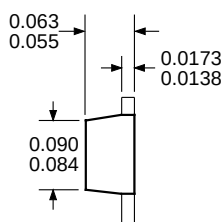
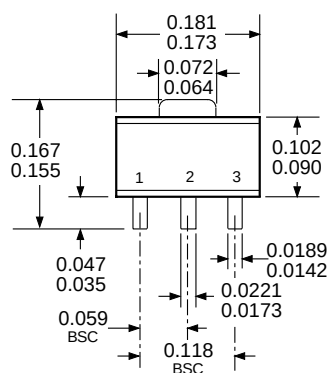
Allegro products are not authorized for use as critical components in life-support appliances, devices, or systems without express written approval.

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.

# 3132 AND 3133 BIPOLAR HALL-EFFECT SWITCHES

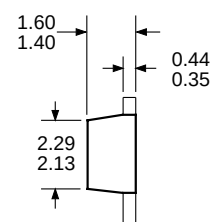
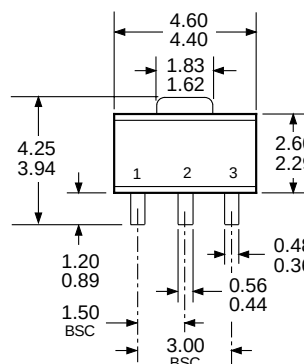
## PACKAGE DESIGNATOR 'LT' (SOT89/TO-243AA)

### Dimensions in Inches (for reference only)

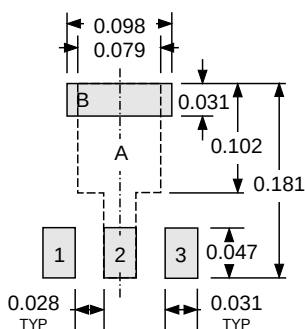


Dwg. MA-009-3A in

### Dimensions in Millimeters (controlling dimensions)

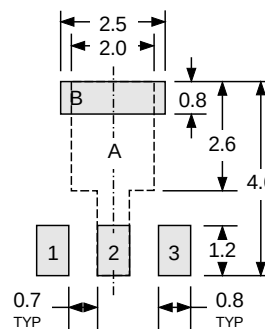


Dwg. MA-009-3A mm



Pads 1, 2, 3, and A — Standard SOT89 Layout  
Pads 1, 2, 3, and B — Low-Stress Version  
Pads 1, 2, and 3 only — Lowest Stress, But Not Self Aligning

Dwg. MA-012-3 in



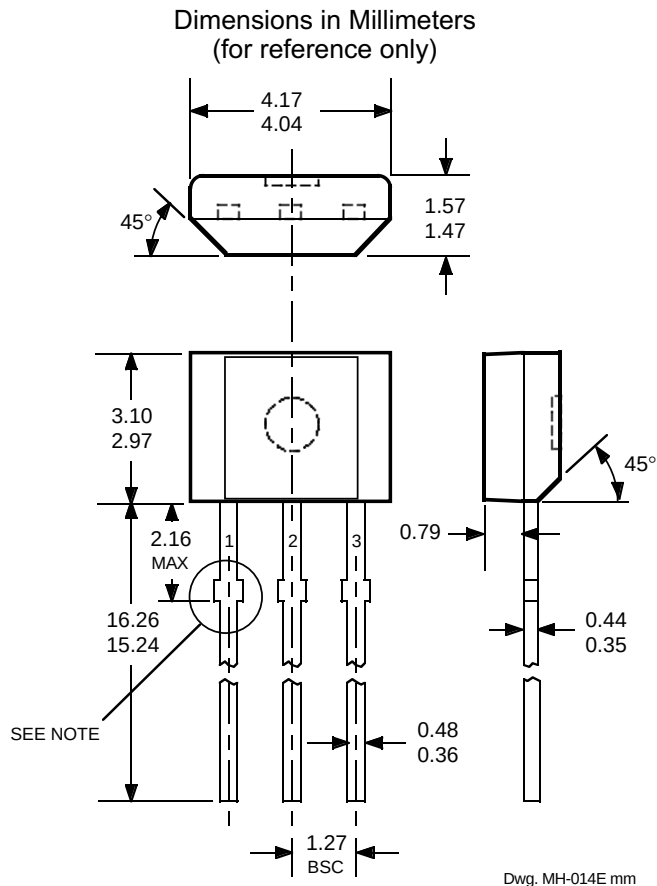
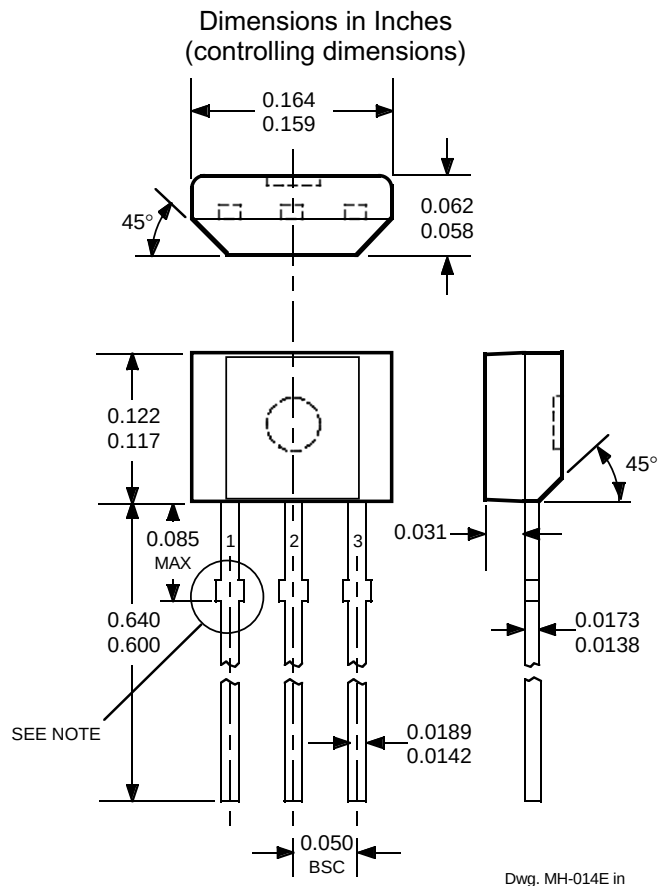
Pads 1, 2, 3, and A — Standard SOT89 Layout  
Pads 1, 2, 3, and B — Low-Stress Version  
Pads 1, 2, and 3 only — Lowest Stress, But Not Self Aligning

Dwg. MA-012-3 mm

- NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.  
2. Supplied in bulk pack (500 pieces per bag) or add "TR" to part number for tape and reel.  
3. Only low-temperature ( $\leq 240^{\circ}\text{C}$ ) reflow-soldering techniques are recommended for SOT89 devices.

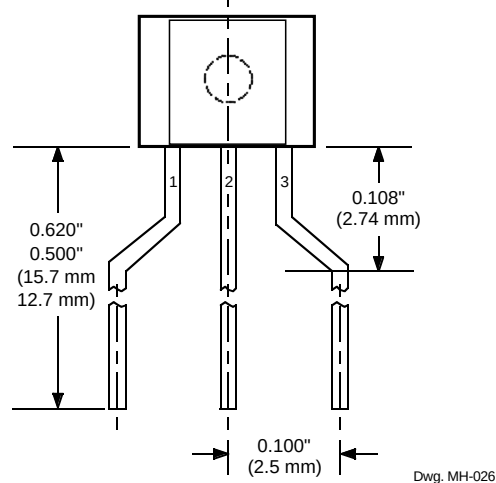
# 3132 AND 3133 BIPOLAR HALL-EFFECT SWITCHES

## PACKAGE DESIGNATOR 'UA'



- 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 UGx313xUA-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).