A3134

Bipolar Hall Effect Switch for High-Temperature Operation

Discontinued Product

These parts are no longer in production The device should not be purchased for new design applications. Samples are no longer available.

Date of status change: October 31, 2005

Recommended Substitutions:

For new customers and applications, refer to the A1201

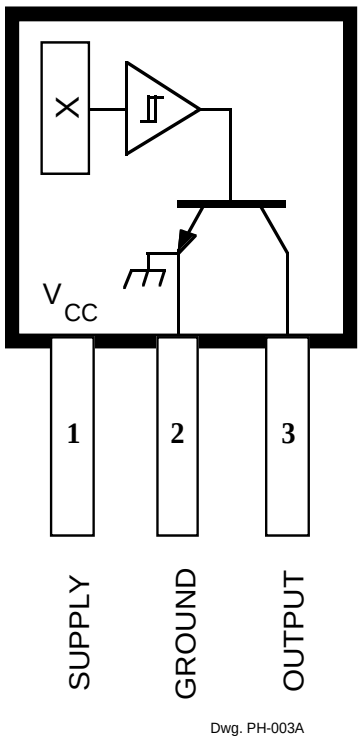
NOTE: For detailed information on purchasing options, contact your local Allegro field applications engineer or sales representative.

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Data Sheet
27631.4D

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°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,
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,
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°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°C to +85°C, and suffix 'L–' is -40°C to +150°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.

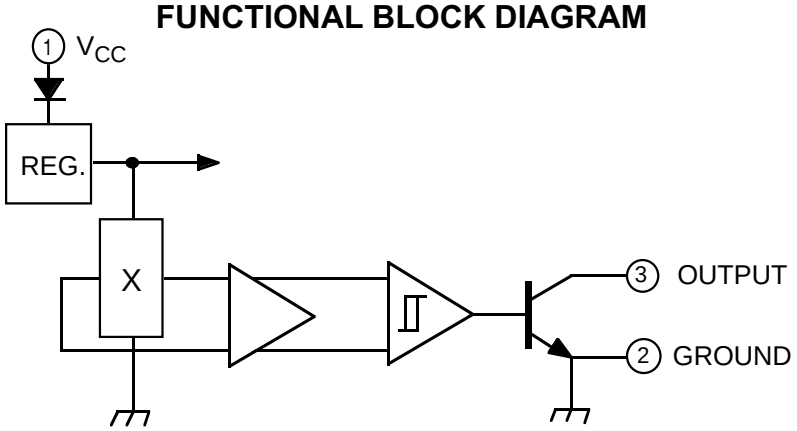
FEATURES

- 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** .

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

FUNCTIONAL BLOCK DIAGRAM



Dwg. FH-005-3

ELECTRICAL CHARACTERISTICS over operating temperature range, at V_{CC} = 12 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 mA, B > B_{OP}	—	175	400	mV
Output Leakage Current	I_{OFF}	V_{OUT} = 24 V, B < B_{RP}	—	0.05	1.0	µA
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 Ω, C_L = 20 pF	—	100	—	ns
Output Fall Time	t_f	R_L = 820 Ω, C_L = 20 pF	—	100	—	ns

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

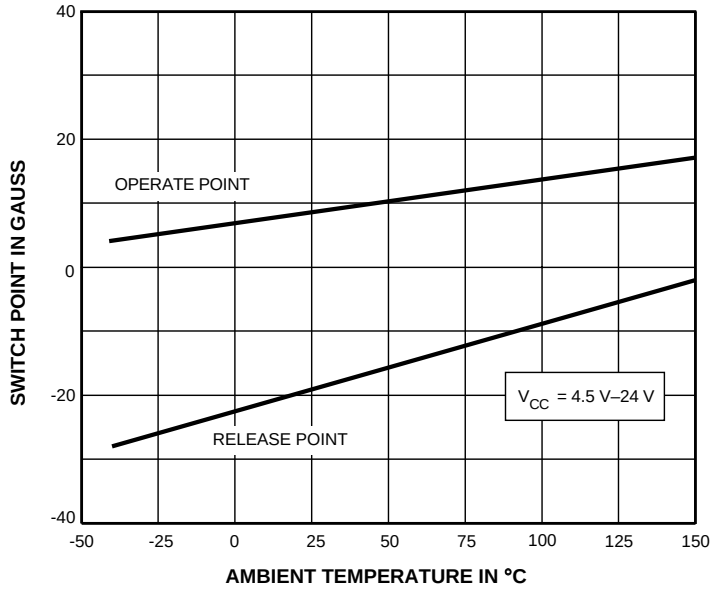
Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Operate Point	B_{OP}		-40	8.5	60	G
Release Point	B_{RP}		-50	-19	50	G
Hysteresis	B_{hys}		5.0	27	55	G

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°C and V_{CC} = 12 V.
1 gauss (G) is exactly equal to 0.1 millitesla (mT).

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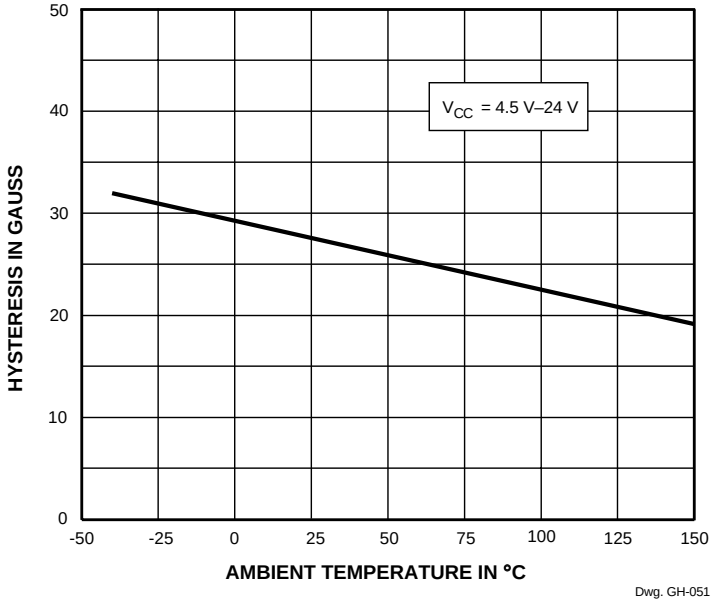
TYPICAL OPERATING CHARACTERISTICS

SWITCH POINTS



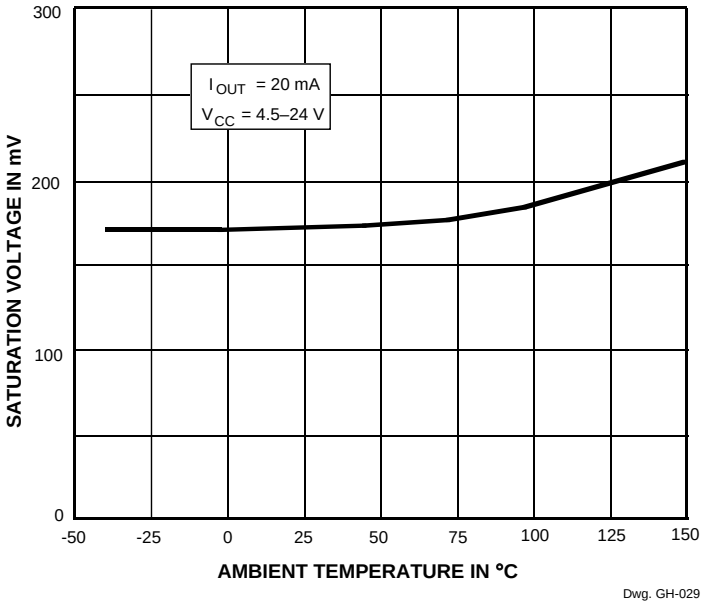
Dwg. GH-052

HYSTERESIS



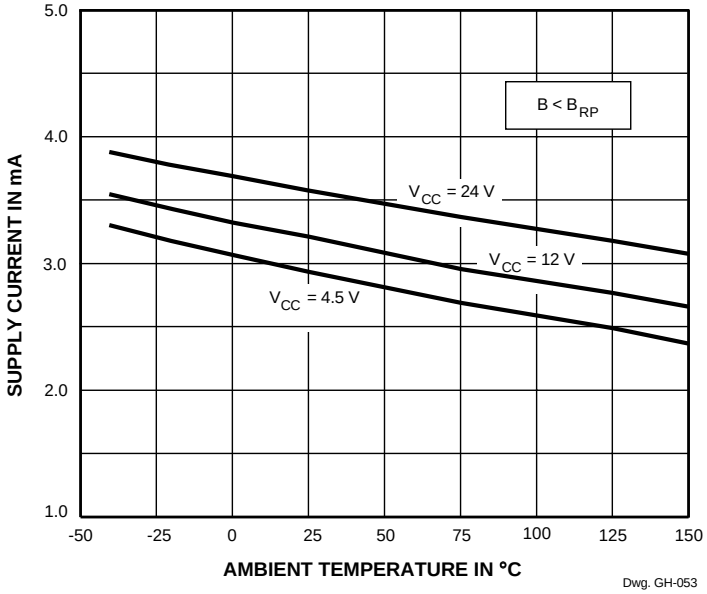
Dwg. GH-051

OUTPUT SATURATION VOLTAGE



Dwg. GH-029

SUPPLY CURRENT



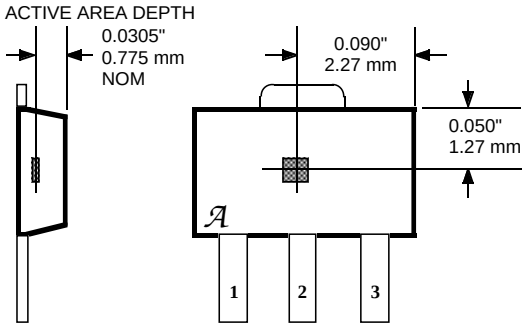
Dwg. GH-053

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

SENSOR LOCATIONS

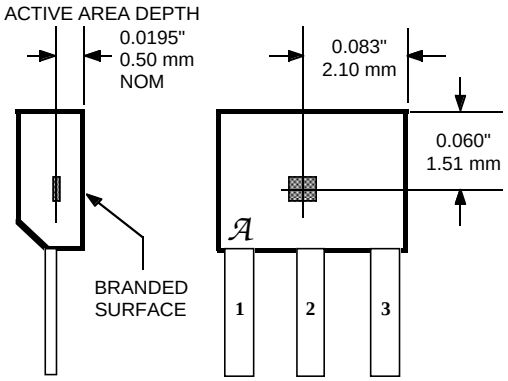
(±0.005" [0.13 mm] die placement)

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 Dervices*, 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

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.

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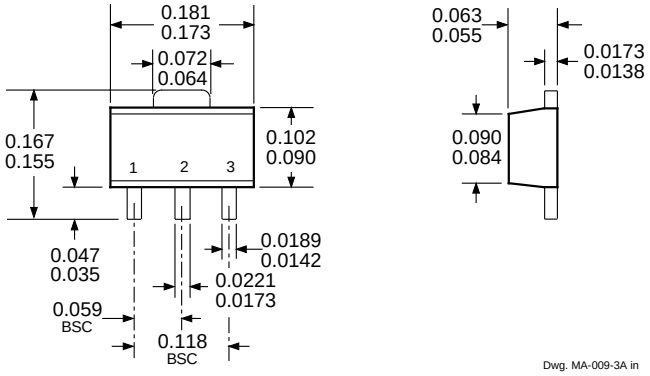
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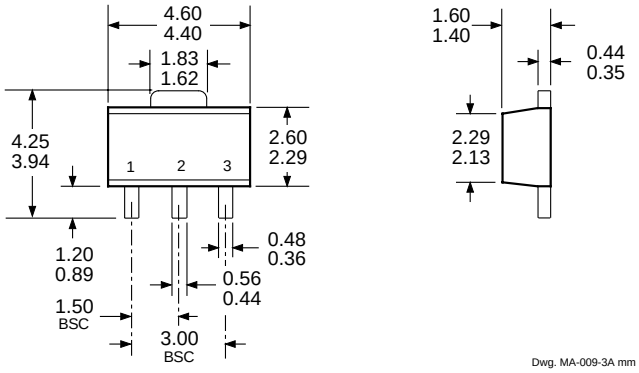
PACKAGE DESIGNATOR 'LT'
(SOT89/TO-243AA)

Dimensions in Inches
(for reference only)

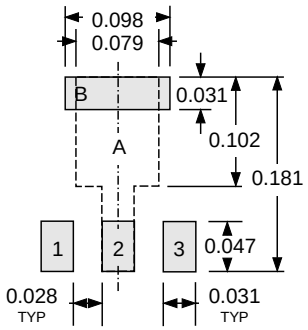


Dwg. MA-009-3A in

Dimensions in Millimeters
(controlling dimensions)

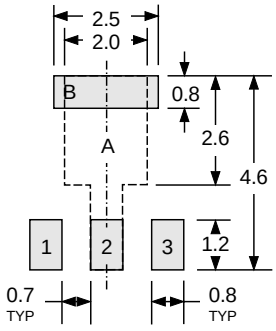


Dwg. MA-009-3A mm



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

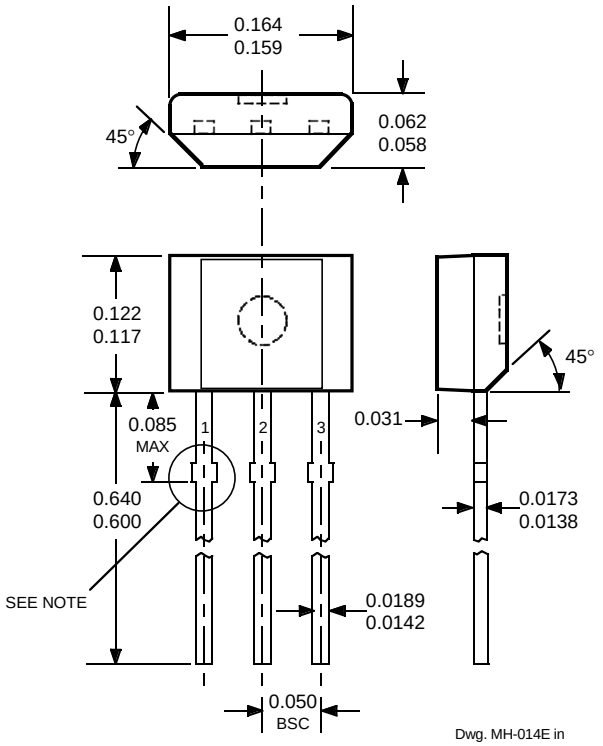
Dwg. MA-012-3 mm

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 (≤240°C) reflow-soldering techniques are recommended for SOT89 devices.

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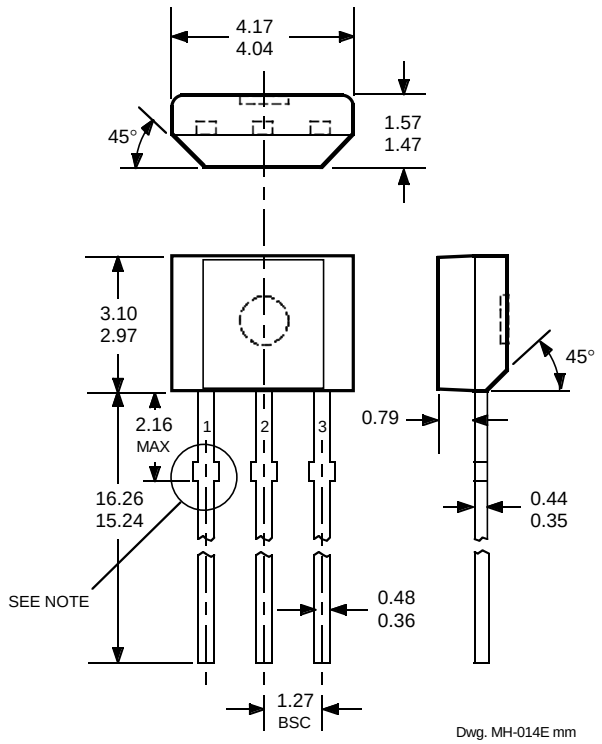
PACKAGE DESIGNATOR 'UA'

Dimensions in Inches
(controlling dimensions)



Dwg. MH-014E in

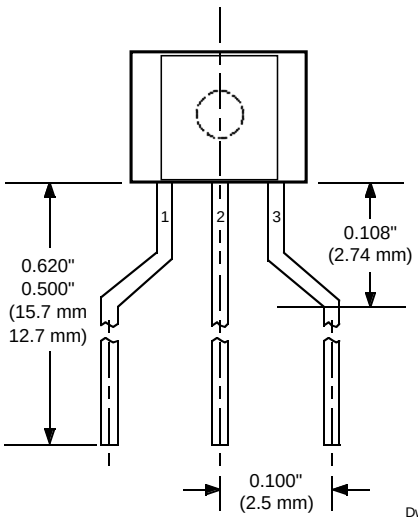
Dimensions in Millimeters
(for reference only)



Dwg. MH-014E mm

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)



Dwg. MH-026

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).

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