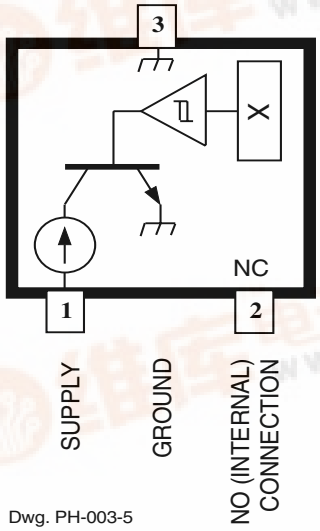
3260

Data Sheet
27631.50

2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

Suffix Code 'LH' Pinning



Dwg. PH-003-5

Pinning is shown viewed from branded side.

ADVANCE INFORMATION
(subject to change without notice)
June 30, 2000

ABSOLUTE MAXIMUM RATINGS
at T_A=+25°C

Supply Voltage, V_{CC} ..... **27 V**
Reverse Battery Voltage, V_{RCC} ..... **-16 V**
Magnetic Flux Density, B ..... **Unlimited**
Package Power Dissipation, P_D. **See Graph**
Junction Temperature, T_J ..... **+170°C**
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**

The A3260-- Hall-effect bipolar 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 dynamic offset cancellation, which reduces the residual offset voltage normally caused by device overmolding, temperature dependencies, and thermal stress.

The device includes on a single silicon chip a voltage regulator, Hall-voltage generator, small-signal amplifier, chopper stabilization, Schmitt trigger, and a constant-current open-collector output. A south pole of sufficient strength will turn the output OFF. An on-board regulator permits operation with supply voltages of 3.5 to 24 volts. Noise radiation is limited by control of the output current slew rate.

The first character of the part number suffix determines the device operating temperature range; suffix 'E–' is -40°C to +85°C and 'L–' is -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix '–LH' is a miniature low-profile surface-mount package, '–LT' is a miniature SOT-89/TO-243AA transistor package for surface-mount applications; while suffix '–UA' is a three-lead ultra-mini-SIP for through-hole mounting.

FEATURES

- Internal Current Regulator for 2-Wire Operation
- Output Slew Rate Controlled
- Resistant to Physical Stress
- Superior Temperature Stability
- Operation From Unregulated Supply
- Reverse Battery Protection
- Solid-State Reliability
- Small Size

Always order by complete part number: the prefix 'A' + the basic four-digit part number + a suffix to indicate operating temperature range + a suffix to indicate package style, e.g., **A3260ELH** .

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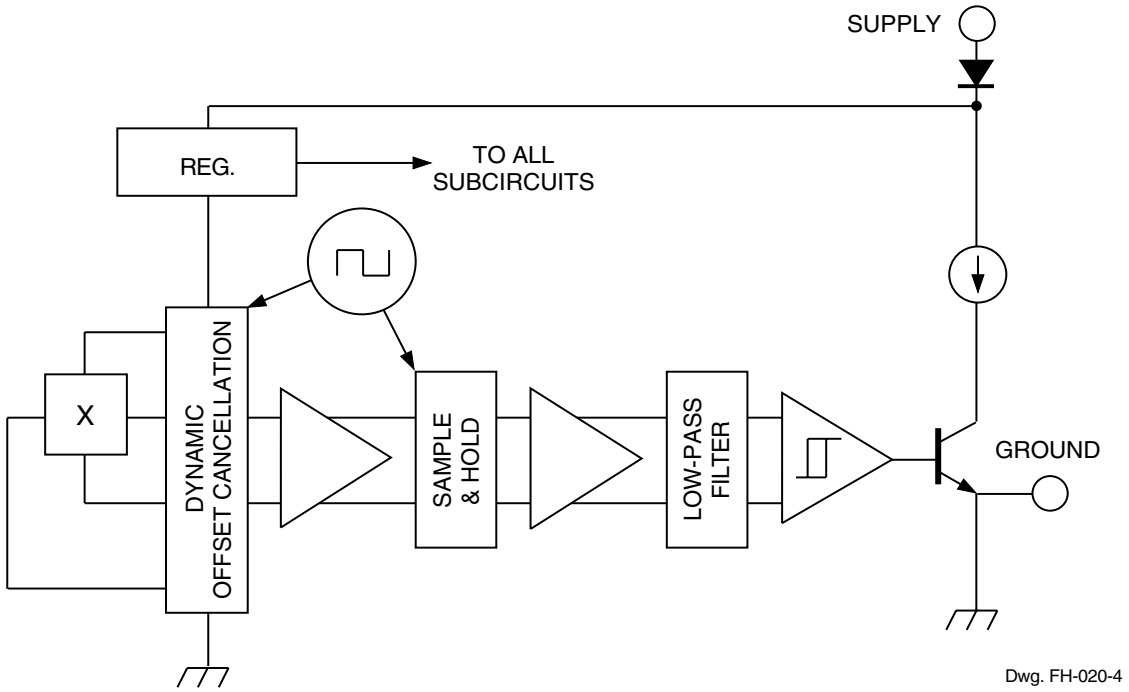
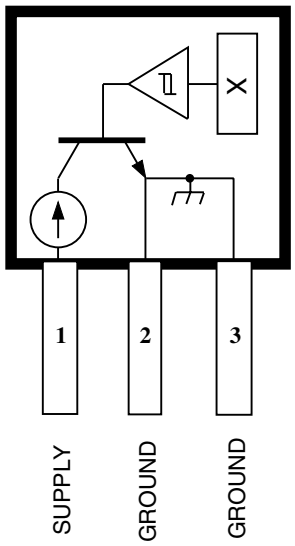
FUNCTIONAL BLOCK DIAGRAM



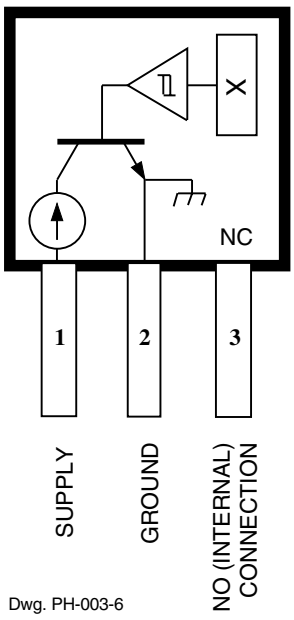
Dwg. FH-020-4

Suffix Code 'UA' Pinning (SIP)



Dwg. PH-003-7A

Suffix Code 'LT' Pinning (SOT-89/TO-243AA)



Dwg. PH-003-6

Pinning is shown viewed from branded side.

ELECTRICAL CHARACTERISTICS over operating temperature range.

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	Operating	3.5	12	24	V
Output Current	$I_{GND(L)}$	$B > B_{OP}$	-4.0	-6.5	-8.0	mA
	$I_{GND(H)}$	$B < B_{RP}$	-11	-14.5	-18	mA
Chopping Frequency	f_C		–	340	–	kHz
Output Slew Rate	di/dt	C_L = 20 pF	0.5	—	2.0	mA/µs
Output Settling Time	t_{sd}	C_L = 20 pF	—	—	20	µs
Reverse Battery Current	I_{CC}	V_{RCC} = -16 V	–	–	-15	mA

NOTES: 1. . B_{OP} = operate point (output turns OFF); B_{RP} = release point (output turns ON).
2. Typical Data is at T_A = +25°C and V_{CC} = 12 V and is for design information only.

MAGNETIC CHARACTERISTICS over operating supply voltage and temperature ranges.

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Operate Point	B_{OP}		–	10	30	G
Release Point	B_{RP}		-30	-10	–	G
Hysteresis	B_{hys}	$B_{OP} - B_{RP}$	–	20	–	G

NOTE — Typical Data is at T_A = +25°C and V_{CC} = 12 V and is for design information only.

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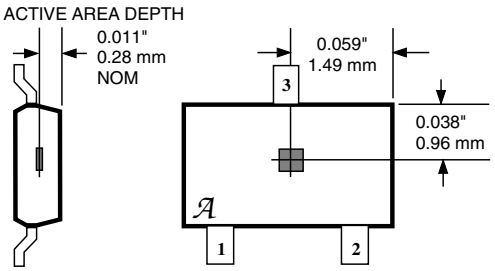
SENSOR LOCATIONS

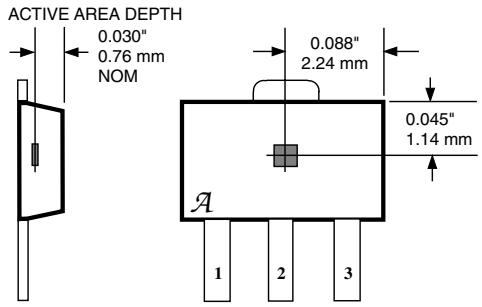
(±0.005” [0.13 mm] die placement)

Package Designator “LH”



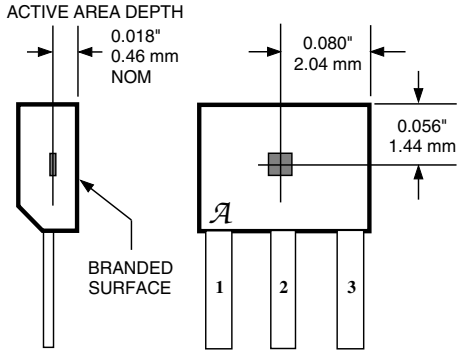
Dwg. MH-025

Package Designator “LT”

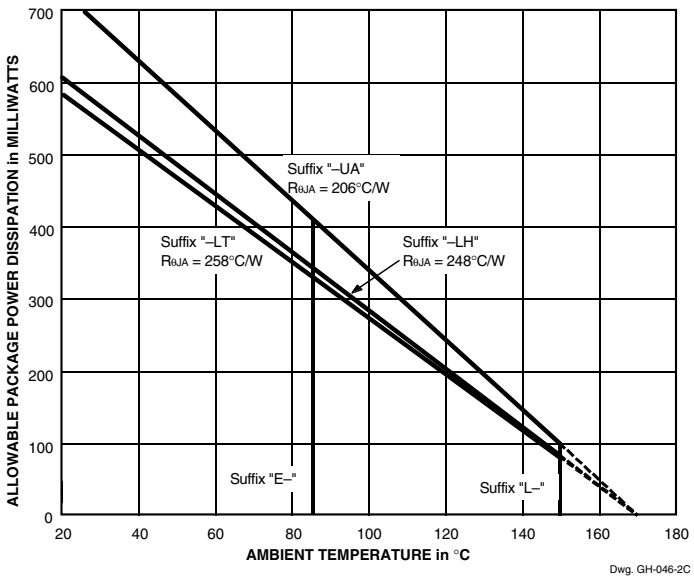


Dwg. MH-008-8

Package Designators “UA” and "UA-TL"



Dwg. MH-011-9A



Dwg. GH-046-2C

Although sensor location is accurate to three sigma for a particular design, product improvements may result in small changes to sensor location.

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CRITERIA FOR DEVICE QUALIFICATION

All Allegro sensors are subjected to stringent qualification requirements prior to being released to production. To become qualified, except for the destructive ESD tests, no failures are permitted.

Qualification Test	Test Method and Test Conditions	Test Length	Samples	Comments
Biased Humidity (HAST)	T_A = 130°C, RH = 85%	50 hrs	77	$V_{CC} = V_{OUT}$ = 5 V
High-Temperature Operating Life (HTOL)	JESD22-A108, T_A = 150°C, $T_J \leq$ 165°C	408 hrs	77	V_{CC} = 24 V, V_{OUT} = 20 V
Accelerated HTOL	T_A = 175°C, T_J = 190°C	504 hrs	77	V_{CC} = 24 V, V_{OUT} = 20 V
Autoclave, Unbiased	JESD22-A102, Condition C, T_A = 121°C, 15 psig	96 hrs	77	
High-Temperature (Bake) Storage Life	MIL-STD-883, Method 1008, T_A = 170°C	1000 hrs	77	
Temperature Cycle	MIL-STD-883, Method 1010, -65°C to +150°C	500 cycles	77	
Latch-Up	—	Pre/Post Reading	6	
Electro-Thermally Induced Gate Leakage	—	Pre/Post Reading	6	
ESD, Human Body Model	CDF-AEC-Q100-002	Pre/Post Reading	x per test	Test to failure, All leads > TBD
Electrical Distributions	Per Specification	—	30	

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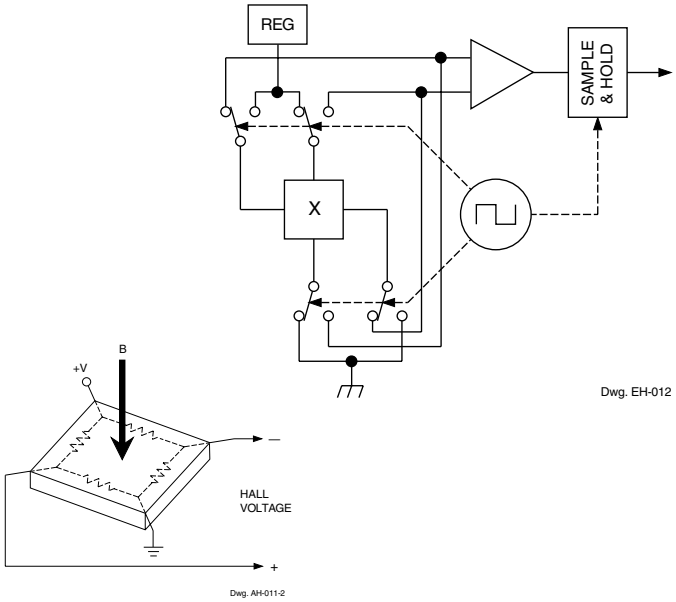
2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

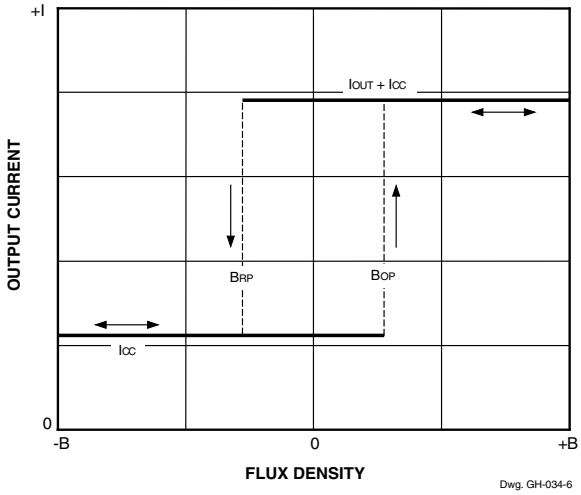
FUNCTIONAL DESCRIPTION

Chopper-Stabilized Technique. These devices use a proprietary dynamic offset cancellation technique, with an internal high-frequency clock to reduce the residual offset voltage of the Hall element that is normally caused by device overmolding, temperature dependencies, and thermal stress. This technique produces devices that have an extremely stable quiescent Hall output voltage, are immune to thermal stress, and have precise recoverability after temperature cycling. This technique will also slightly degrade the device output repeatability.

The Hall element can be considered as a resistor array similar to a Wheatstone bridge. A large portion of the offset is a result of the mismatching of these resistors. The chopper-stabilizing technique cancels the mismatching of the resistors by changing the direction of the current flowing through the Hall plate and Hall voltage measurement taps, while maintaining the Hall-voltage signal that is induced by the external magnetic flux. The signal is, then, captured by a sample-and-hold circuit.

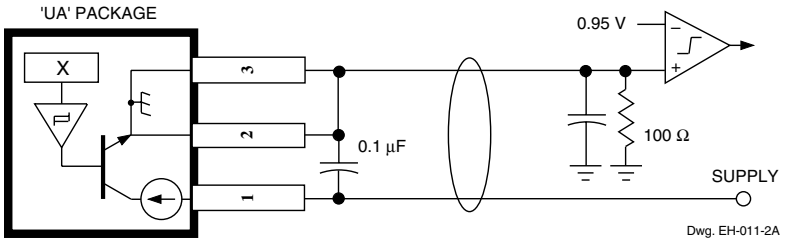


Operation. The output of these devices turns ON when a magnetic field (north pole) perpendicular to the Hall sensor exceeds the release point threshold (B_{RP}). After turn-ON, the output will source current equal to the device operating current plus a current source ($I_{GND(H)}$). When the magnetic field is increased (south pole) above the operate point (B_{OP}), the output will source current equal to the Hall-effect sensor operating current with the current source turned OFF ($I_{GND(L)}$). The difference in the magnetic operate and release points is the hysteresis (B_{hys}) of the device. The hysteresis allows clean switching of the output even in the presence of external mechanical vibration or electrical noise.



Applications. It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall sensor) between the supply and ground of the device to reduce both external noise and noise generated by the chopper-stabilization technique.

Extensive applications information on magnets and Hall-effect sensors is also available in the *Allegro Electronic Data Book* AMS-702 or *Application Note* 27701.



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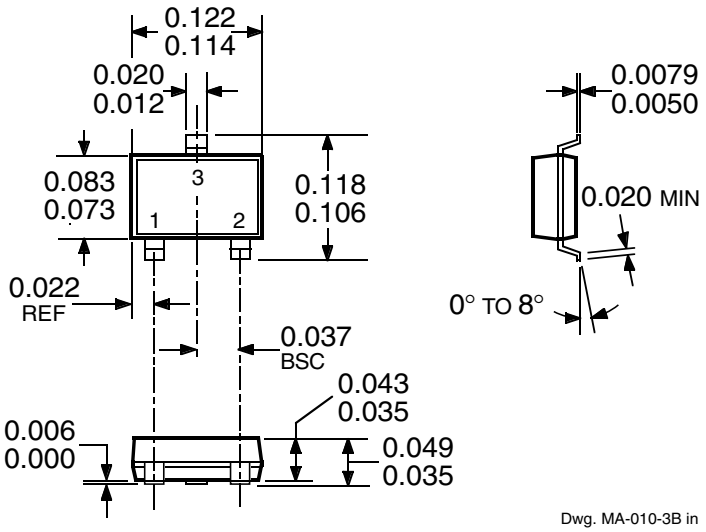
2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

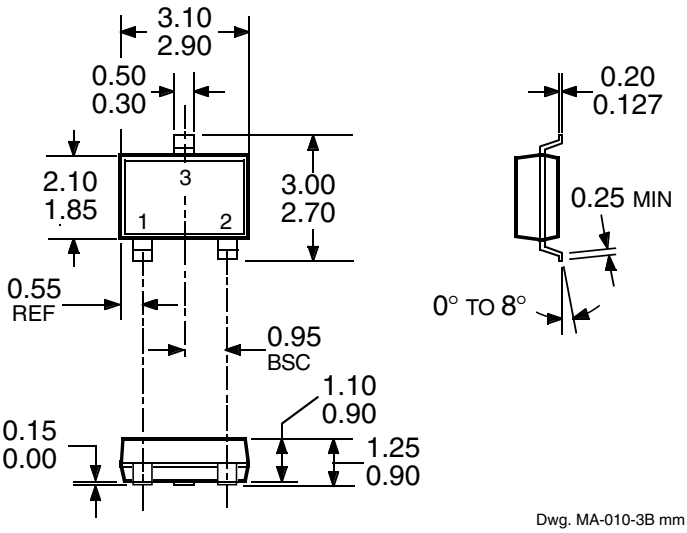
PACKAGE DESIGNATOR 'LH'
(fits SC-74A solder-pad layout)

Dimensions in Inches
(for reference only)

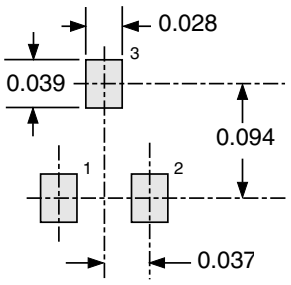


Dwg. MA-010-3B in

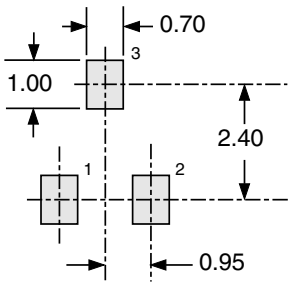
Dimensions in Millimeters
(controlling dimensions)



Dwg. MA-010-3B mm



Dwg. MA-011-3 in



Dwg. MA-011-3 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. Where no tolerance is specified, dimension is nominal.

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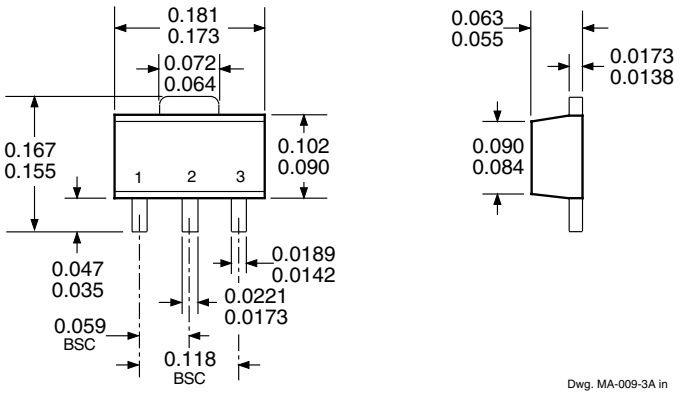
2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

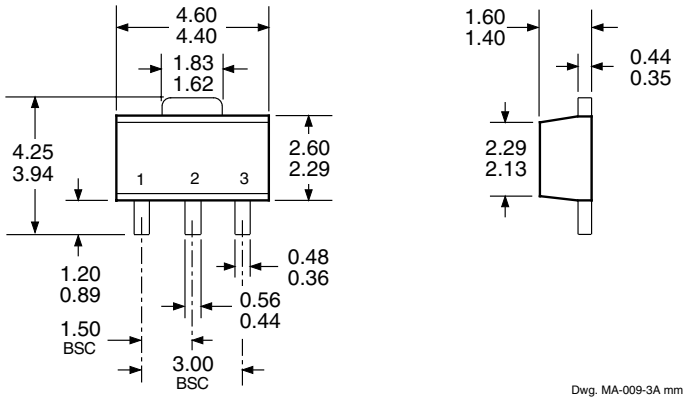
PACKAGE DESIGNATOR 'LT'
(SOT-89/TO-243AA)

Dimensions in Inches
(for reference only)

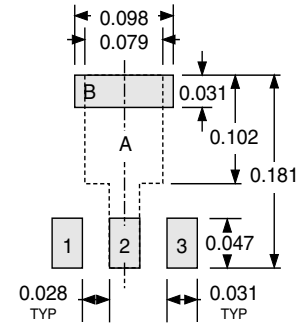


Dwg. MA-009-3A in

Dimensions in Millimeters
(controlling dimensions)

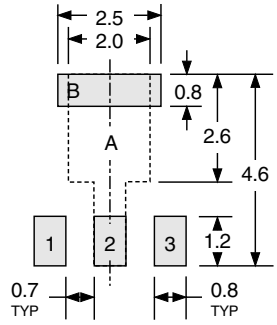


Dwg. MA-009-3A mm



Pads 1, 2, 3, and A — Standard SOT-89 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 SOT-89 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

NOTE: Exact body and lead configuration at vendor's option within limits shown.

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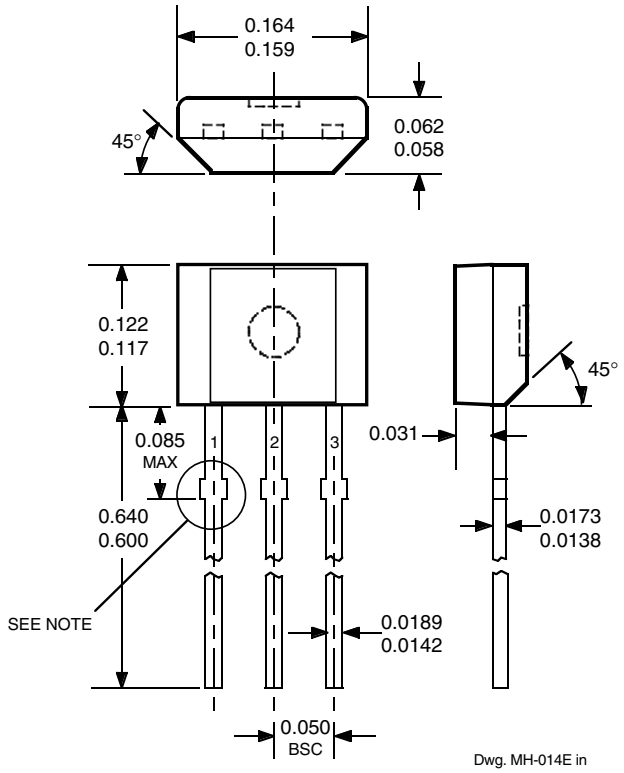
2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

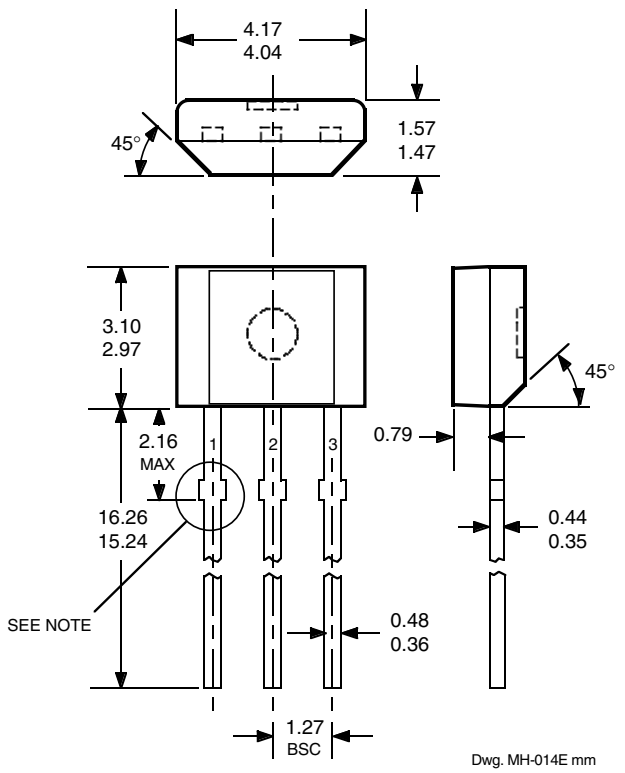
PACKAGE DESIGNATOR 'UA'

Dimensions in Inches
(controlling dimensions)



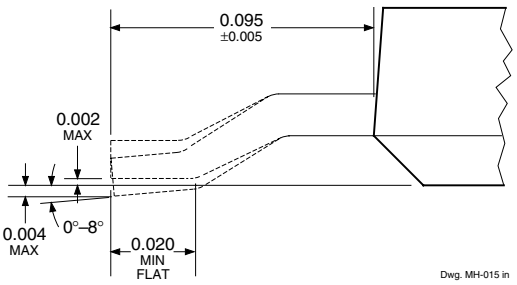
Dwg. MH-014E in

Dimensions in Millimeters
(for reference only)

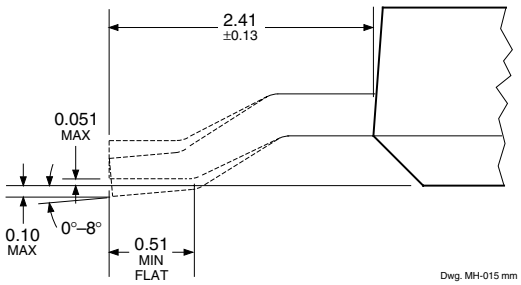


Dwg. MH-014E mm

Surface-Mount Lead Form (Suffix '-TL')



Dwg. MH-015 in



Dwg. MH-015 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.

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2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

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.

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2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

HALL-EFFECT SENSORS

Partial Part Number	Avail. Oper. Temp.	Characteristics at T_A = +25°C $B_{OP(max)}$	$B_{RP(min)}$	$B_{hys(typ)}$	Features	Notes
HALL-EFFECT UNIPOLAR SWITCHES in order of B_{OP} and B_{hys}						
3240	E/L	+50	+5.0	10	chopper stabilized	1
3209	E	±60	±5.0	7.7	400 µW, chopper stabilized	
3210	E	±60	±5.0	7.7	25 µW, chopper stabilized	
3361	E	+55*	+110‡	5.0*	2-wire, chopper stabilized	
3362	E	+110	+55	5.0*	2-wire, chopper stabilized	
3161	E	+160	+30	20	2-wire	
3141	E/L	+160	+10	55		
3235	S	+175	+25	15*	output 1	2
		-25	-175	15*	output 2	2
5140	E	+200	+50	55	300 mA output	1, 3
3142	E/L	+230	+75	55		
3143	E/L	+340	+165	55		
3144	E/L	+350	+50	55		
3122	E/L	+400	+140	105		
3123	E/L	+440	+180	105		
3121	E/L	+450	+125	105		
3150	J	+40 to +850	–	20	programmable, chopper stabilized	1
HALL-EFFECT LATCHES & BIPOLAR SWITCHES† in order of B_{OP} and B_{hys}						
3260	E/L	+30	-30	20	bipolar, chopper stabilized	
3280	E/L	+40	-40	45	chopper stabilized	
3134	E/L	+50	-50	27	bipolar switch	
3133	K/L/S	+75	-75	52	bipolar switch	
3281	E/L	+90	-90	100	chopper stabilized	
3132	K/L/S	+95	-95	52	bipolar switch	
3187	E/L	+150	-150	100*		
3177	S	+150	-150	200		
3625	S	+150	-150	200	900 mA outputs	1, 3, 5
3626	S	+150	-150	200	400 mA outputs	1, 3, 5
3195	E/L	+160	-160	220		1, 4
3197	L	+160	-160	230		1
3175	S	+170	-170	200		
3188	E/L	+180	-180	200*		
3283	E/L	+180	-180	300	chopper stabilized	
3189	E/L	+230	-230	100*		
3275	S	+250	-250	100*		5
3185	E/L	+270	-270	340*		

Operating Temperature Ranges:
S = -20°C to +85°C, E = -40°C to +85°C, J = -40°C to +115°C, K = -40°C to +125°C, L = -40°C to +150°C

Notes 1. Protected.
2. Output 1 switches on south pole, output 2 switches on north pole for 2-phase, bifilar-wound, unipolar-driven brushless dc motor control.
3. Power driver output.
4. Active pull down.
5. Complementary outputs for 2-phase bifilar-wound, unipolar-driven brushless dc motor control.

* Minimum. ‡ Maximum

† Latches will not switch on removal of magnetic field; bipolar switches may switch on removal of field but require field reversal for reliable operation over operating temperature range.