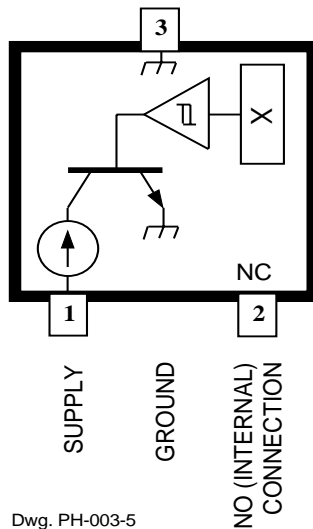


# 3361 AND 3362

## 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

### Suffix Code 'LH' Pinning



Pinning is shown viewed from branded side.

### PRELIMINARY INFORMATION (subject to change without notice) May 28, 1999

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

Supply Voltage, $V_{CC}$ .....	26.5 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,	
$T_A$ .....	-40°C to +85°C
Storage Temperature Range,	
$T_S$ .....	-65°C to +170°C

The A3361x and A3362x Hall-effect switches are extremely temperature-stable and stress-resistant sensors. Superior performance over temperature is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device overmolding, temperature dependencies, and thermal stress. The two devices differ only in output polarity; the A3361x output current goes low in the presence of a south pole of sufficient strength; the A3362x output current goes high.

Each 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. 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.

Three package styles provide a magnetically optimized package for most applications. Suffix 'xLH' is a miniature low-profile surface-mount package, 'xLT' is a miniature SOT-89/TO-243AA transistor package for surface-mount applications; while suffix 'xUA' is a three-lead ultra-mini-SIP for through-hole mounting.

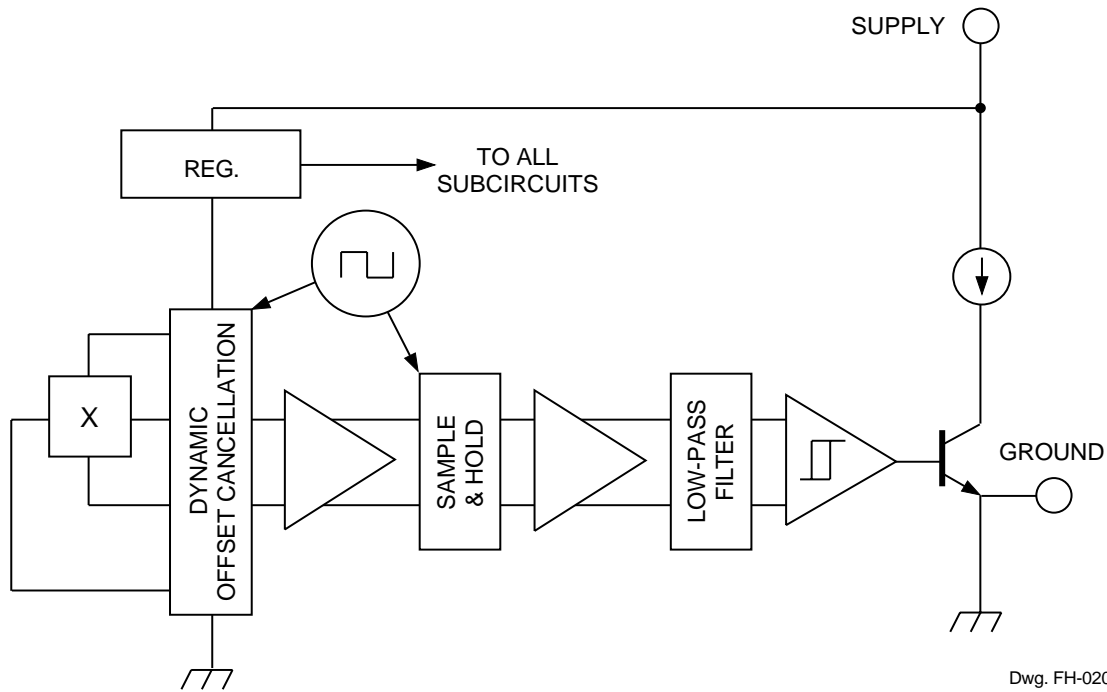
#### FEATURES

- Internal Current Regulator for 2-Wire Operation
- Resistant to Physical Stress
- Superior Temperature Stability
- Operation From Unregulated Supply
- 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 (E) + a two-letter suffix to indicate package style, e.g., **A3361ELH**.

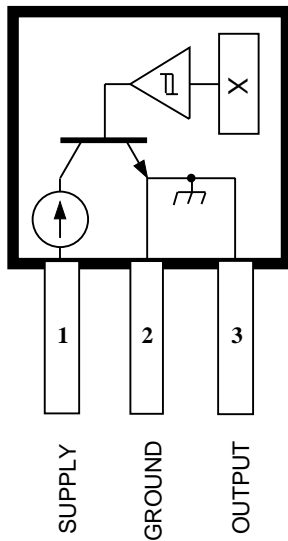
**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

**FUNCTIONAL BLOCK DIAGRAM**



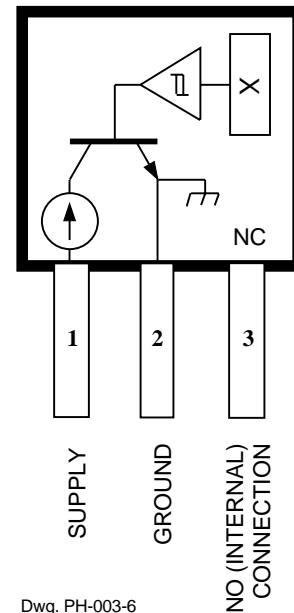
Dwg. FH-020-6

**Suffix Code 'UA' Pinning (SIP)**



Dwg. PH-003-7

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



Dwg. PH-003-6

Pinning is shown viewed from branded side.

**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

**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	$I_{GND(L)}$	Output Current Low	5.0	–	6.9	mA
	$I_{GND(H)}$	Output Current High	12	–	17	mA
Chopping Frequency	$f_C$		–	340	–	kHz
Output Settling Time	$t_{sd}$	$C_L = 20$ pF	–	–	20	$\mu$ s
Output Rise Time	$t_r$	$C_L = 20$ pF	–	3.5	–	$\mu$ s
Output Fall Time	$t_f$	$C_L = 20$ pF	–	3.5	–	$\mu$ s
Reverse Battery Current	$I_{CC}$	$V_{RCC} = -16$ V	–	–	-15	mA

NOTE: Typical Data is at  $T_A = +25^\circ\text{C}$  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	$B_{OP}$	A3361 $I_{GND}$ goes low, A3362 high	–	–	120	G
Release Point	$B_{RP}$	A3361 $I_{GND}$ goes high, A3362 low	50	–	–	G
Hysteresis	$B_{hys}$	$B_{OP} - B_{RP}$	5.0	–	30	G

NOTE — Typical Data is at  $T_A = +25^\circ\text{C}$  and  $V_{CC} = 12$  V and is for design information only.

**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

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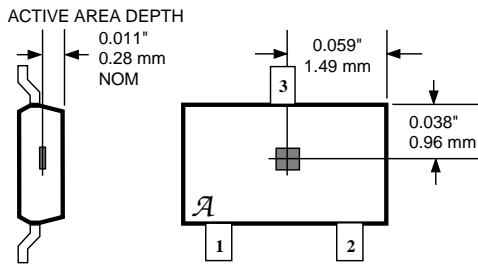


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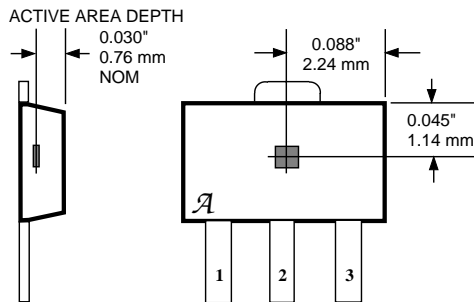
# 3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

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

### Package Designator "LH"

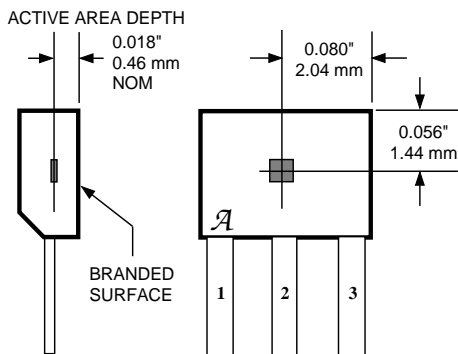


### Package Designator "LT"

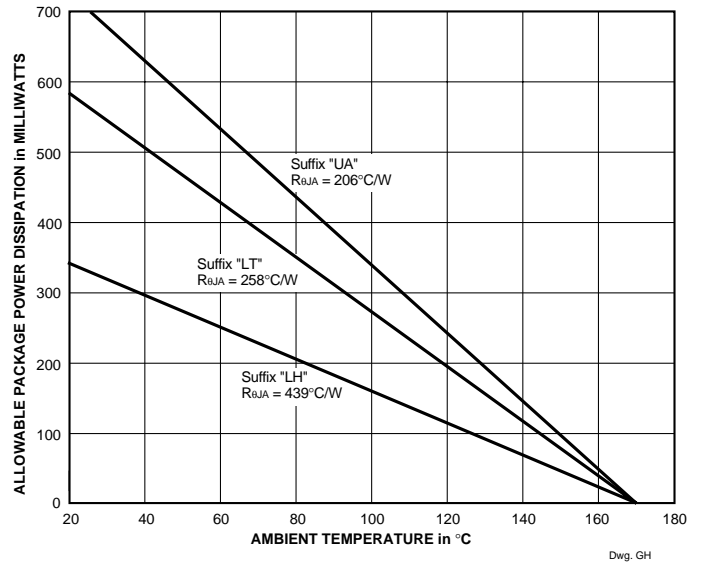


Dwg. MH-008-8

### Package Designators "UA" and "UA-TL"



Dwg. MH-011-9A



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

**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

**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 <sub>A</sub> = 130°C, RH = 85%	50 hrs	77	V <sub>CC</sub> = V <sub>OUT</sub> = 5 V
High-Temperature Operating Life (HTOL)	JESD22-A108, T <sub>A</sub> = 150°C, T <sub>J</sub> = 165°C	408 hrs	77	V <sub>CC</sub> = 24 V, V <sub>OUT</sub> = 20 V
Accelerated HTOL	JESD22-A108, T <sub>A</sub> = 175°C, T <sub>J</sub> = 190°C	504 hrs	77	V <sub>CC</sub> = 24 V, V <sub>OUT</sub> = 20 V
Autoclave, Unbiased	JESD22-A102, Condition C, T <sub>A</sub> = 121°C, 15 psig	96 hrs	77	
High-Temperature (Bake) Storage Life	MIL-STD-883, Method 1008, T <sub>A</sub> = 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	



# 3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

## FUNCTIONAL DESCRIPTION

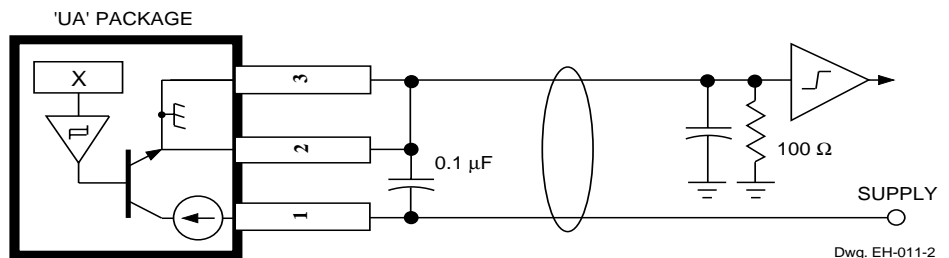
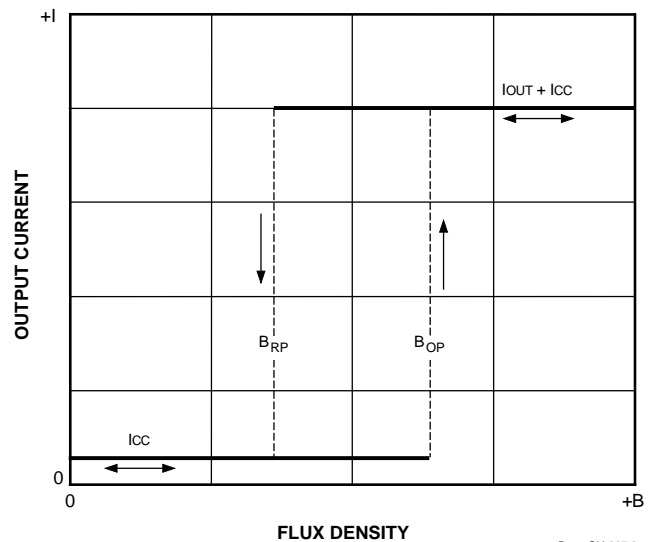
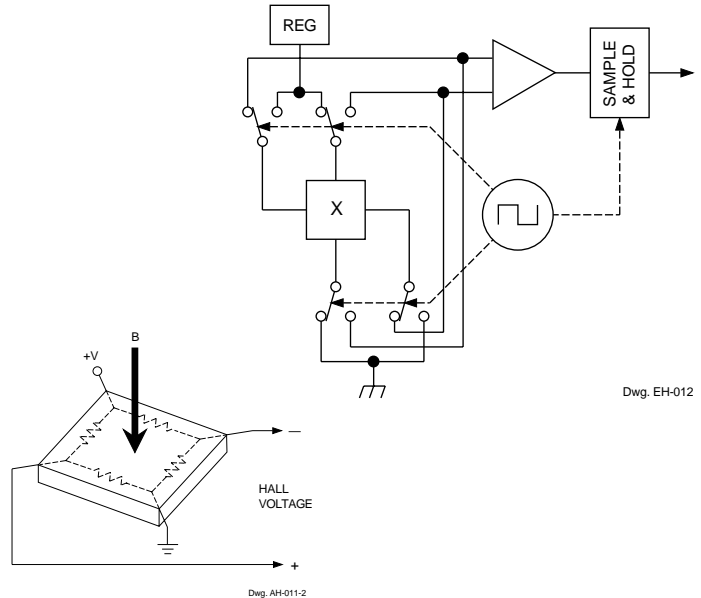
**Chopper-Stabilized Technique.** These devices use a proprietary dynamic offset cancellation technique, with an internal high-frequency clock to reduce the residual offset voltage of the Hall element that is normally caused by device overmolding, temperature dependencies, and thermal stress. This technique 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* or [www.allegromicro.com](http://www.allegromicro.com)



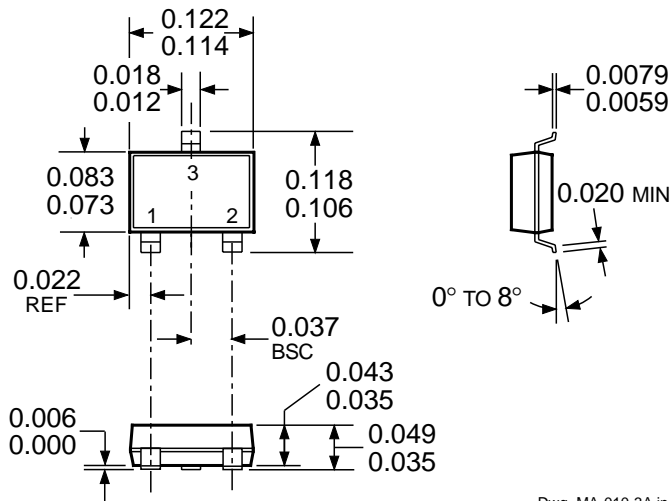
# 3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

## PACKAGE DESIGNATOR 'LH'

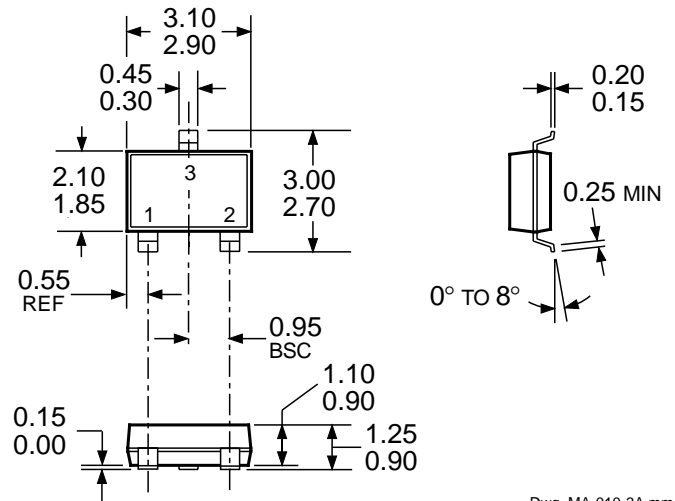
(fits SC-74A solder-pad layout)

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

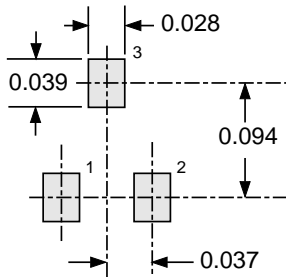
**Dimensions in Millimeters**  
(controlling dimensions)



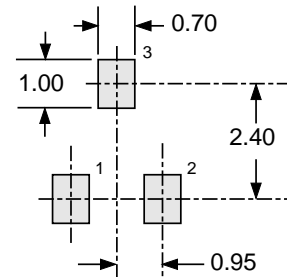
Dwg. MA-010-3A in



Dwg. MA-010-3A mm



Dwg. MA-011-3 in



Dwg. MA-011-3 mm

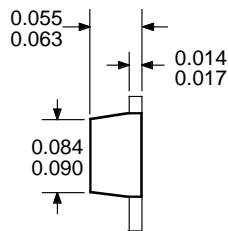
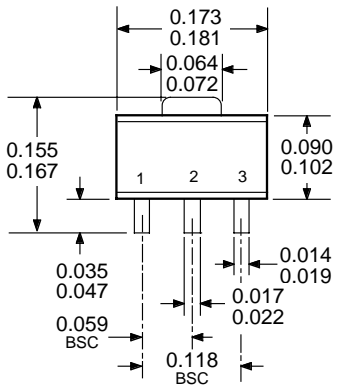
- NOTES:
1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
  2. Exact body and lead configuration at vendor's option within limits shown.
  3. Height does not include mold gate flash.
  4. Where no tolerance is specified, dimension is nominal.



# 3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

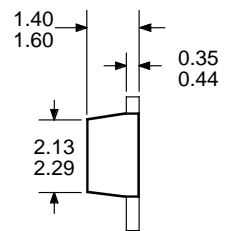
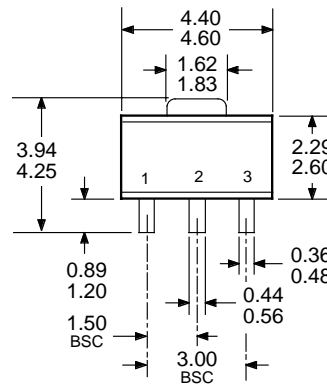
## PACKAGE DESIGNATOR 'LT' (SOT-89/TO-243AA)

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

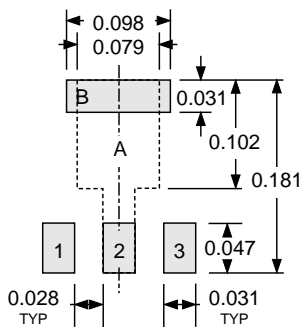


Dwg. MA-009-3 in

**Dimensions in Millimeters**  
(controlling dimensions)

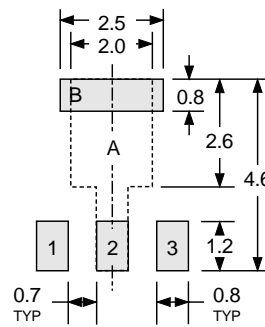


Dwg. MA-009-3 mm



ds 1, 2, 3, and A — Standard SOT-89 Layout  
 ds 1, 2, 3, and B — Low-Stress Version  
 ds 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

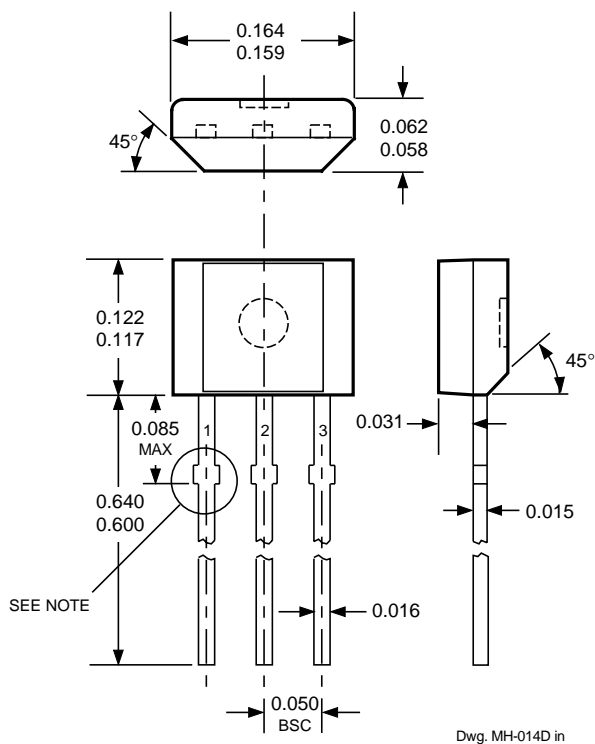
Dwg. MA-012-3 mm

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

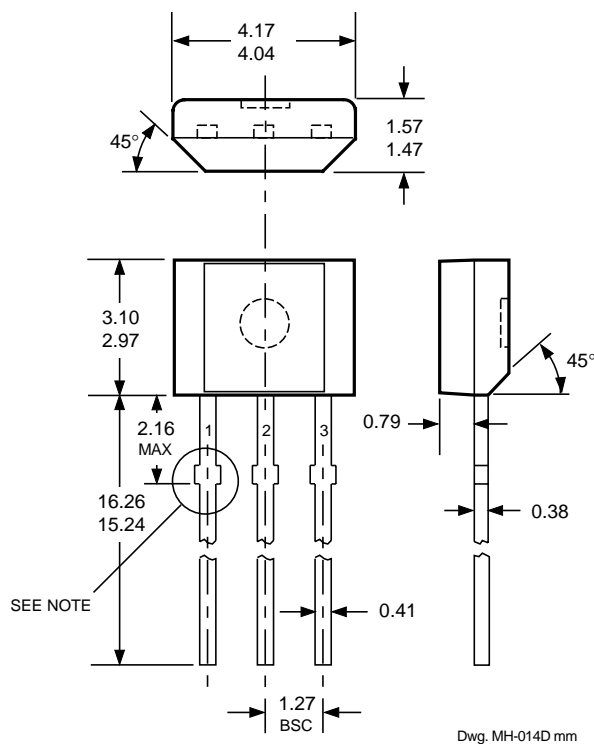
# 3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

## PACKAGE DESIGNATOR 'UA'

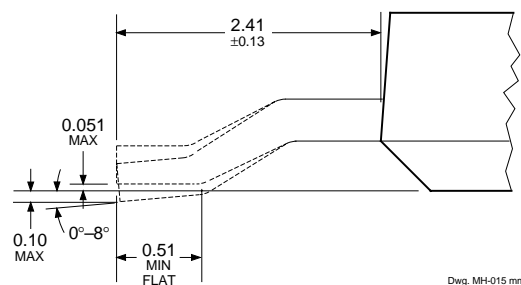
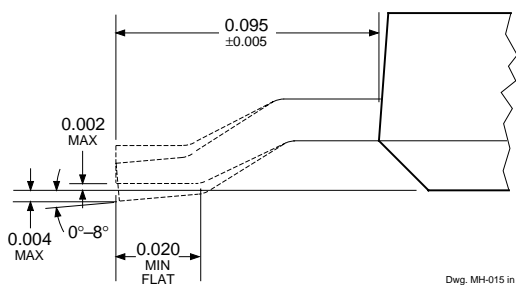
**Dimensions in Inches**  
(controlling dimensions)



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



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



- 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.

**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

*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 design of its products.*

*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 which may result from its use.*

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**3361 AND 3362**  
**2-WIRE,**  
**CHOPPER-STABILIZED,**  
**HALL-EFFECT SWITCHES**

**HALL-EFFECT SENSORS SELECTION GUIDE**

Partial Part Number	Avail. Oper. Temp.	Characteristics at T <sub>A</sub> = +25°C			Features	Notes
		BOP(max)	BRP(min)	B <sub>hys</sub> (typ)		
<b>HALL-EFFECT UNIPOLAR SWITCHES in order of B<sub>OP</sub> and B<sub>hys</sub></b>						
3240	E/L	+50	+5.0	10	chopper stabilized	1
3210	E	±70	±5.0	7.7	micropower, chopper stabilized	
3361	E	+120	+50	5.0*	2-wire, chopper stabilized	
3362	E	+120	+50	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
<b>HALL-EFFECT LATCHES &amp; BIPOLAR SWITCHES<sup>†</sup> in order of B<sub>OP</sub> and B<sub>hys</sub></b>						
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.

† 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.

