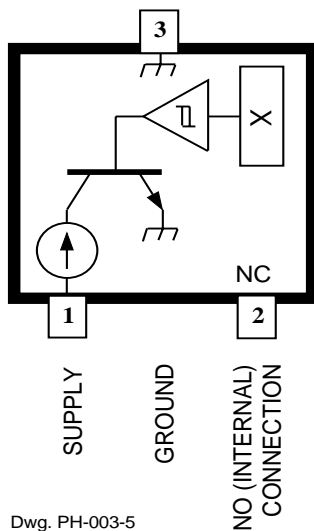


3361 AND 3362

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

Suffix Code 'LH' Pinning (SOT23W)



Pinning is shown viewed from branded side.

PRELIMINARY INFORMATION (subject to change without notice) December 6, 2002

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 SOT23W low-profile surface-mount package, 'xLT' is a miniature SOT89/TO-243AA transistor package for surface-mount applications; while suffix 'xUA' is a three-lead ultra-mini-SIP for through-hole mounting.

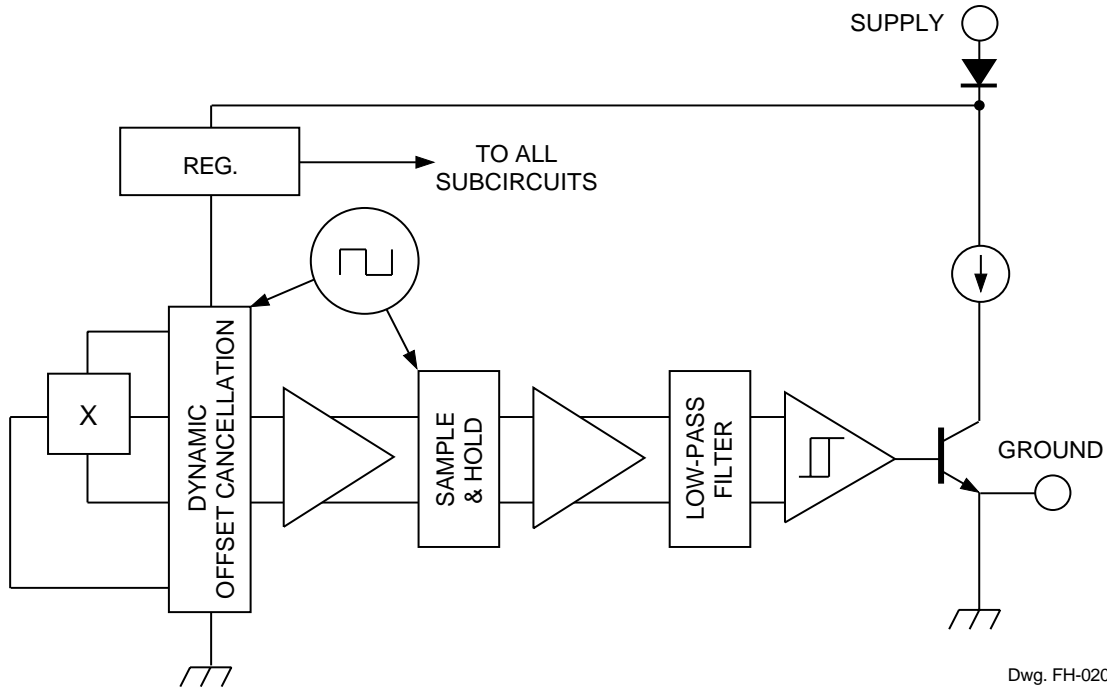
FEATURES

- Internal Current Regulator for 2-Wire Operation
- Resistant to Physical Stress
- Superior Temperature Stability
- Operation From Unregulated Supply
- Solid-State Reliability
- Small Size

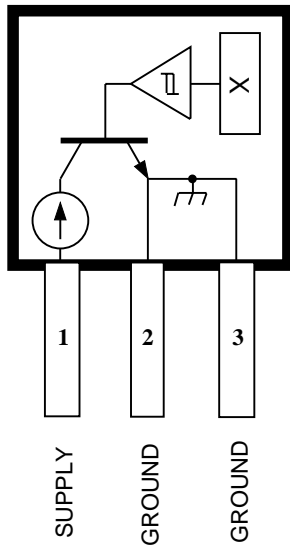
Always order by complete part number: the prefix 'A' + the basic four-digit part number + a suffix to indicate operating temperature range (E) + a two-letter suffix to indicate package style, e.g., **A3361ELH**.

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

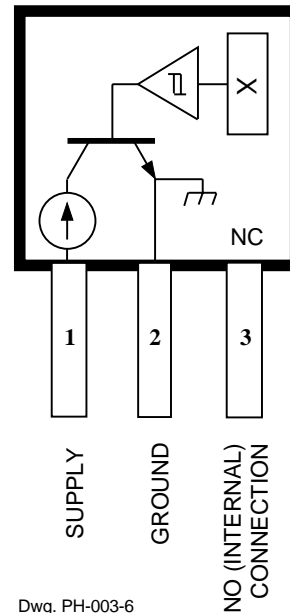
FUNCTIONAL BLOCK DIAGRAM



Suffix Code 'UA' Pinning
 (ultra-mini SIP)



Suffix Code 'LT' Pinning
 (SOT89/TO-243AA)



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	–	–	50	μ s
Output Rise Time	t_r	$C_L = 20$ pF	–	3.5	–	μ s
Output Fall Time	t_f	$C_L = 20$ pF	–	3.5	–	μ 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.

A3361 MAGNETIC CHARACTERISTICS over operating supply voltage and temperature ranges.

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Operate Point	B_{OP}	$B > B_{OP}$, $I_{GND} = \text{LOW}$	–	–	125	G
Release Point	B_{RP}	$B < B_{RP}$, $I_{GND} = \text{HIGH}$	40	–	–	G
Hysteresis	B_{hys}	$B_{OP} - B_{RP}$	5.0	–	30	G

A3362 MAGNETIC CHARACTERISTICS over operating supply voltage and temperature ranges.

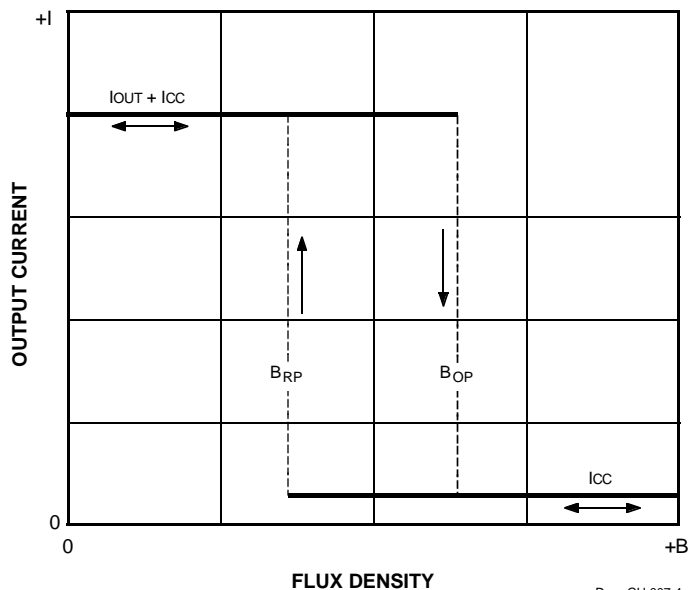
Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Operate Point	B_{OP}	$B > B_{OP}$, $I_{GND} = \text{HIGH}$	–	–	125	G
Release Point	B_{RP}	$B < B_{RP}$, $I_{GND} = \text{LOW}$	40	–	–	G
Hysteresis	B_{hys}	$B_{OP} - B_{RP}$	5.0	–	30	G

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

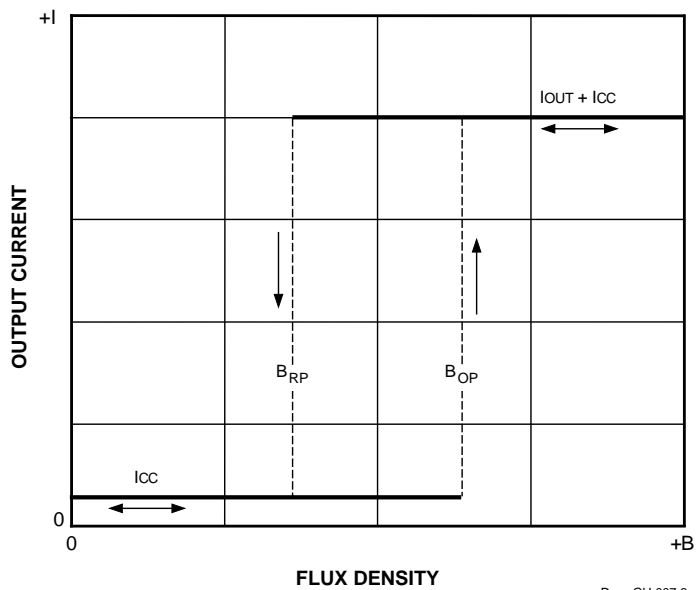
3361 AND 3362
2-WIRE,
CHOPPER-STABILIZED,
HALL-EFFECT SWITCHES

OUTPUT CHARACTERISTICS

A3361x

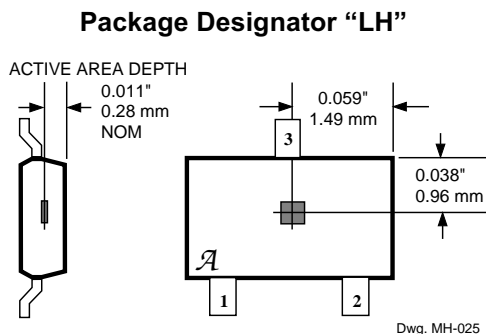


A3362x

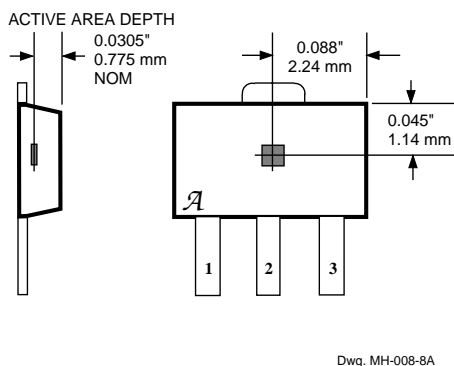


3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

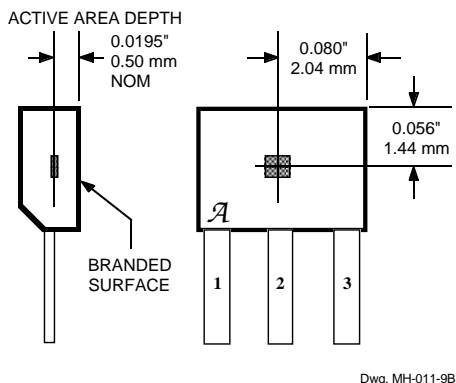
SENSOR LOCATIONS (±0.005" [0.13 mm] die placement)



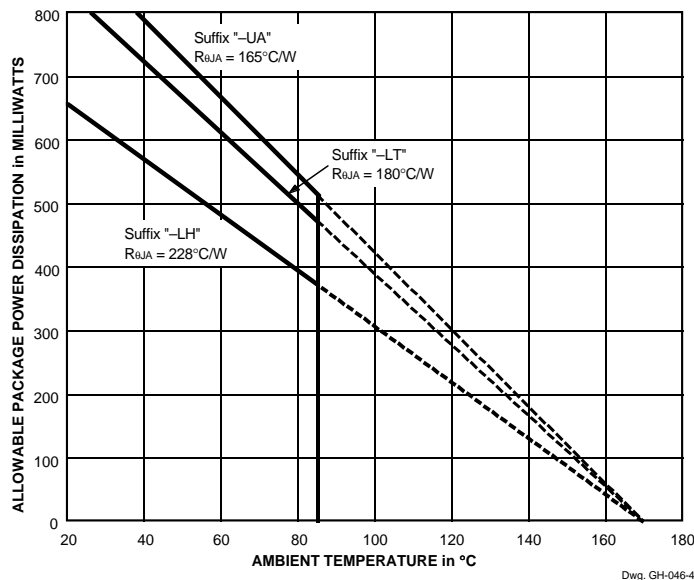
Package Designator "LT"



Package Designators "UA"



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



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;
- *Soldering of Surface-Mount Hall-Sensor Devices*, Application Note 27703.2.

More detailed descriptions of the chopper-stabilized circuit operation can be found in:

- *Monolithic Magnetic Hall Sensor Using Dynamic Quadrature Offset Cancellation*, Technical Paper STP 97-10; and
- *Chopper-Stabilized Amplifiers With A Track-and-Hold Signal Demodulator*, Technical Paper STP 99-1.

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

www.allegromicro.com

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)	$T_A = 130^{\circ}\text{C}$, RH = 85%	50 hrs	77	$V_{CC} = V_{OUT} = 5\text{ V}$
High-Temperature Operating Life (HTOL)	JESD22-A108, $T_A = 150^{\circ}\text{C}$, $T_J = 165^{\circ}\text{C}$	408 hrs	77	$V_{CC} = 24\text{ V}$, $V_{OUT} = 20\text{ V}$
Accelerated HTOL	JESD22-A108, $T_A = 175^{\circ}\text{C}$, $T_J = 190^{\circ}\text{C}$	504 hrs	77	$V_{CC} = 24\text{ V}$, $V_{OUT} = 20\text{ V}$
Autoclave, Unbiased	JESD22-A102, Condition C, $T_A = 121^{\circ}\text{C}$, 15 psig	96 hrs	77	
High-Temperature (Bake) Storage Life	MIL-STD-883, Method 1008, $T_A = 170^{\circ}\text{C}$	1000 hrs	77	
Temperature Cycle	MIL-STD-883, Method 1010, -65°C to $+150^{\circ}\text{C}$	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	

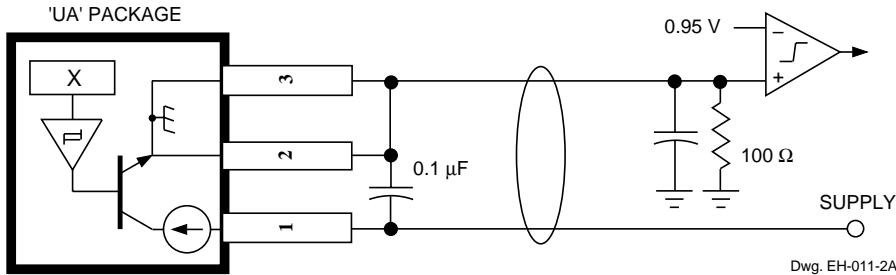
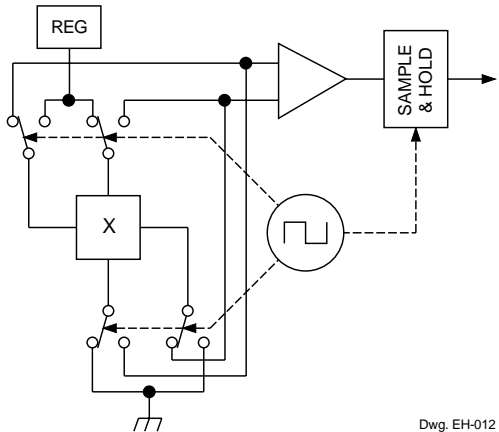
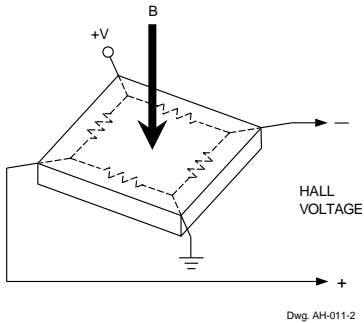
3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

FUNCTIONAL DESCRIPTION

Chopper-Stabilized Technique. 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. 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. The chopper-stabilizing technique cancels the mismatching of the resistor circuit by changing the direction of the current flowing through the Hall plate using CMOS switches 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 and further processed using low-offset bipolar circuitry. 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. A relatively high sampling frequency is used in order that faster signals can be processed.

Operation. As shown in the output characteristic graphs, the output of the A3362 turns on when a magnetic field (south pole) perpendicular to the Hall sensor is increased above the operate point threshold (B_{OP}). 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 decreased below the release point (B_{RP}), the output turns off and will source current equal only to the Hall-effect sensor operating current ($I_{GND(L)}$). The A3361 output is inverted and the device turns off at B_{OP} and on at B_{RP} . 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.

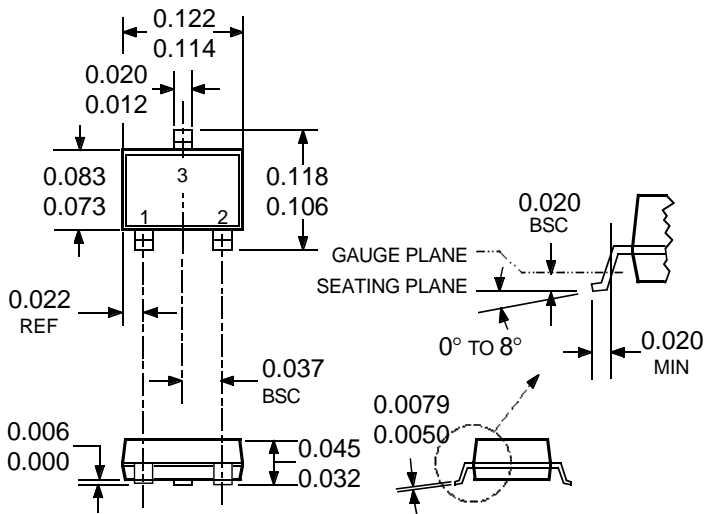


3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

PACKAGE DESIGNATOR 'LH'

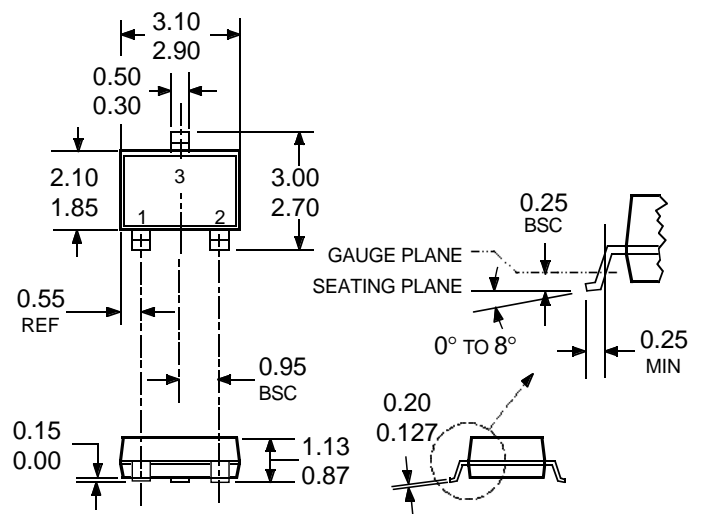
(fits SC-74A solder-pad layout)

Dimensions in Inches
(for reference only)

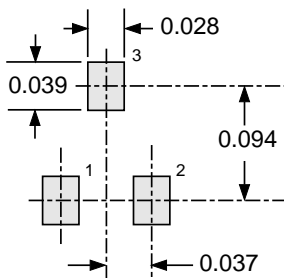


Dwg. MA-010-3C in

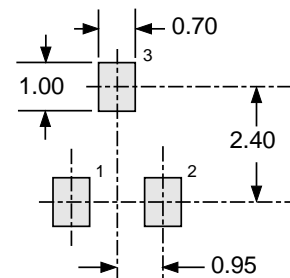
Dimensions in Millimeters
(controlling dimensions)



Dwg. MA-010-3C mm



Dwg. MA-011-3 in



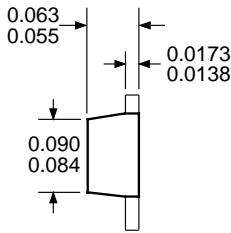
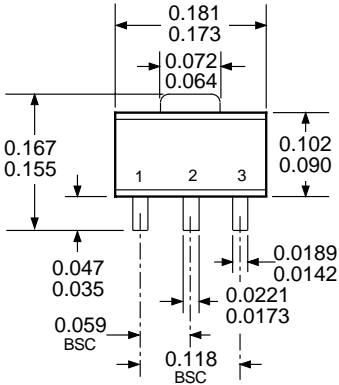
Dwg. MA-011-3 mm

- 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.
 5. Add "LT" to part number for tape and rfeel.

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

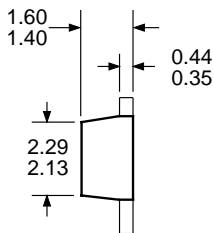
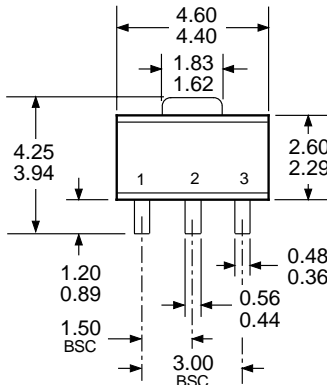
PACKAGE DESIGNATOR 'LT' (SOT89/TO-243AA)

Dimensions in Inches
(for reference only)

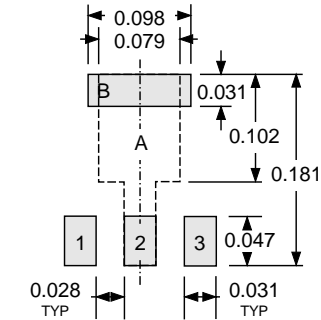


Dwg. MA-009-3A in

Dimensions in Millimeters
(controlling dimensions)

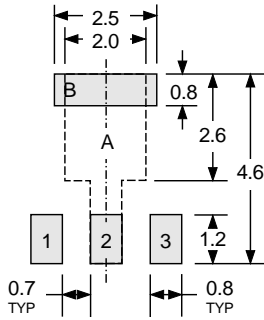


Dwg. MA-009-3A mm



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

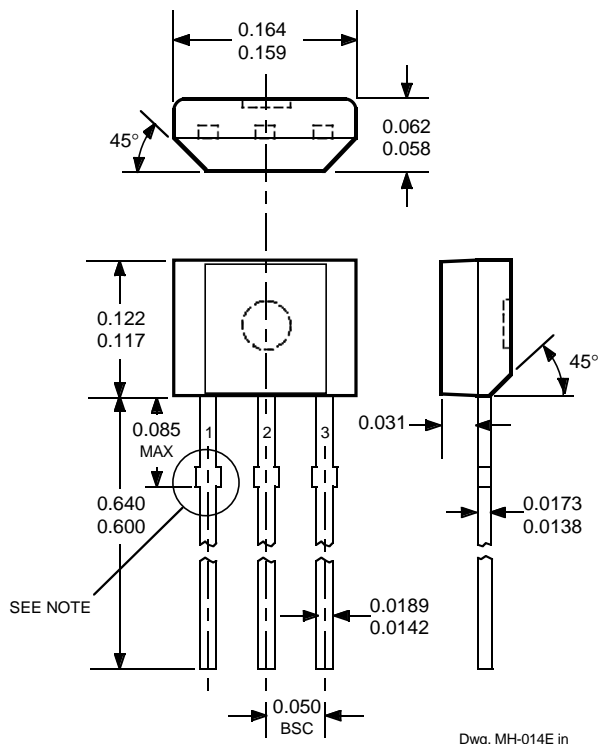
Dwg. MA-012-3 mm

- 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.

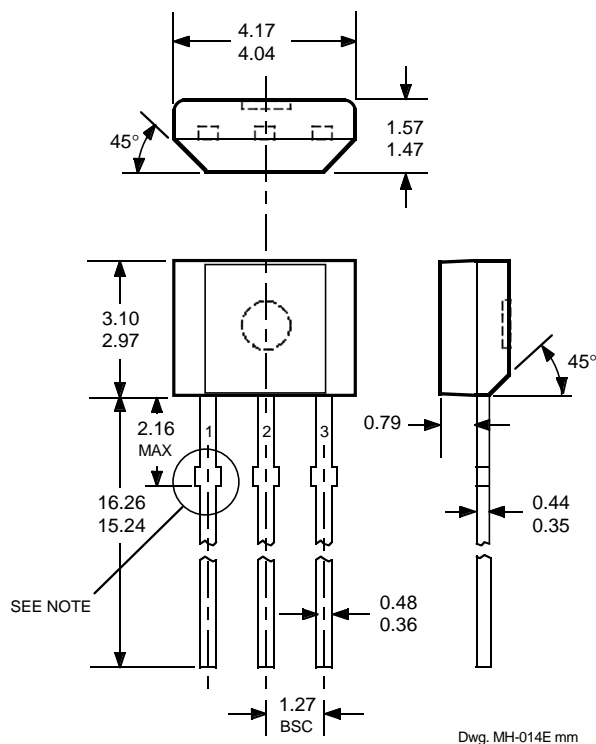
3361 AND 3362 2-WIRE, CHOPPER-STABILIZED, HALL-EFFECT SWITCHES

PACKAGE DESIGNATOR 'UA'

Dimensions in Inches
(controlling dimensions)

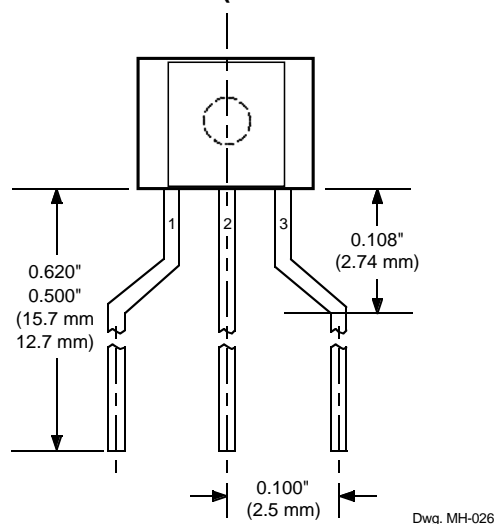


Dimensions in Millimeters
(for reference only)



- 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 A326xEUA-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).

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

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.

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

HALL-EFFECT SENSORS

UNIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Point (G) Over Oper. Voltage & Temp.	Release Point (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Replaces and Comments
A3121x	220 to 500	80 to 410	60 to 150	E, L	LT, UA	3019, 3113, 3119
A3122x	260 to 430	120 to 360	70 to 140	E, L	LT, UA	
A3123x	230 to 470	160 to 330	70 to 140	E, L	LT, UA	
A3141x	30 to 175	10 to 145	20 to 80	E, L	LT, UA	3040, 3140
A3142x	115 to 245	60 to 190	30 to 80	E, L	LT, UA	
A3143x	205 to 355	150 to 300	30 to 80	E, L	LT, UA	
A3144x	35 to 450	25 to 430	>20	E, L	LT, UA	3020, 3120
A3161E	<160 (Typ 130)	>30 (Typ 110)	5 to 80	E	LT, UA	2-wire operation
A3163E	<160 (Typ 98)	>30 (Typ 79)	5 to 40	E	LT, UA	2-wire
A3240x	<50 (Typ 35)	>5 (Typ 25)	Typ 10	E, L	LH, LT, UA	chopper stabilized
A3250x	<50 to >350	—	5 to 35	J, L	UA	programmable, chopper stabilized
A3251x	<50 to >350	—	5 to 35	J, L	UA	programmable, chopper stabilized
A3361E	<125	>40	5 to 30	E	LH, LT, UA	2-wire, chopper stabilized, output normally high
A3362E	<125	>40	5 to 30	E	LH, LT, UA	2-wire, chopper stabilized, output normally low
MICROPOWER OMNIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Points (G) Over Oper. Voltage & Temp.	Release Points (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Average Supply Current (µA)
A3209E	>-60, <60	<-5, >5	Typ 7.7	E	LH, UA	<425 (Typ 145)
A3210E	>-60, <60	<-5, >5	Typ 7.7	E	LH, UA	<60 (Typ 8.8)
A3212E	>-55, <55	<-10, >10	Typ. 8	E	LH, UA	<10 (Typ 4.2)
BIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Point (G) Over Oper. Voltage & Temp.	Release Point (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Replaces and Comments
UGx3132	<95 (Typ 32)	>-95 (Typ -20)	>30 (Typ 52)	K, L, S	LT, UA	3030, 3130, 3131
UGx3133	<75 (Typ 32)	>-75 (Typ -20)	>30 (Typ 52)	K, L, S	LT, UA	
UGx3134	-40 to 50	-50 to 40	5 to 55	E, L	LT, UA	
A3260x	<30 (Typ 10)	>-30 (Typ -10)	Typ 20	E, L	LH, LT, UA	2 wire, chopper stabilized

Notes: 1) Typical data is at $T_A = +25^\circ\text{C}$ and nominal operating voltage.

2) "x" = Operating Temperature Range [suffix letter or (prefix)]: S (UGN) = -20°C to $+85^\circ\text{C}$, E = -40°C to $+85^\circ\text{C}$, J = -40°C to $+115^\circ\text{C}$, K (UGS) = -40°C to $+125^\circ\text{C}$, L (UGL) = -40°C to $+150^\circ\text{C}$.