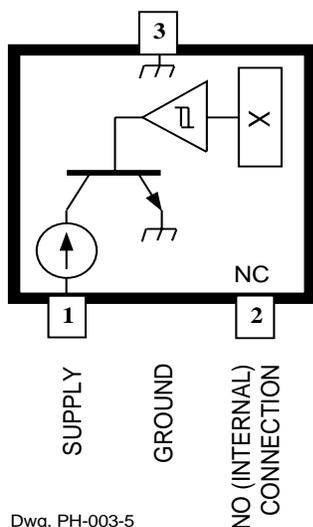


## 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

### Suffix Code 'LH' Pinning



Pinning is shown viewed from branded side.

**ADVANCE INFORMATION**  
(subject to change without notice)  
December 9, 1998

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

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.

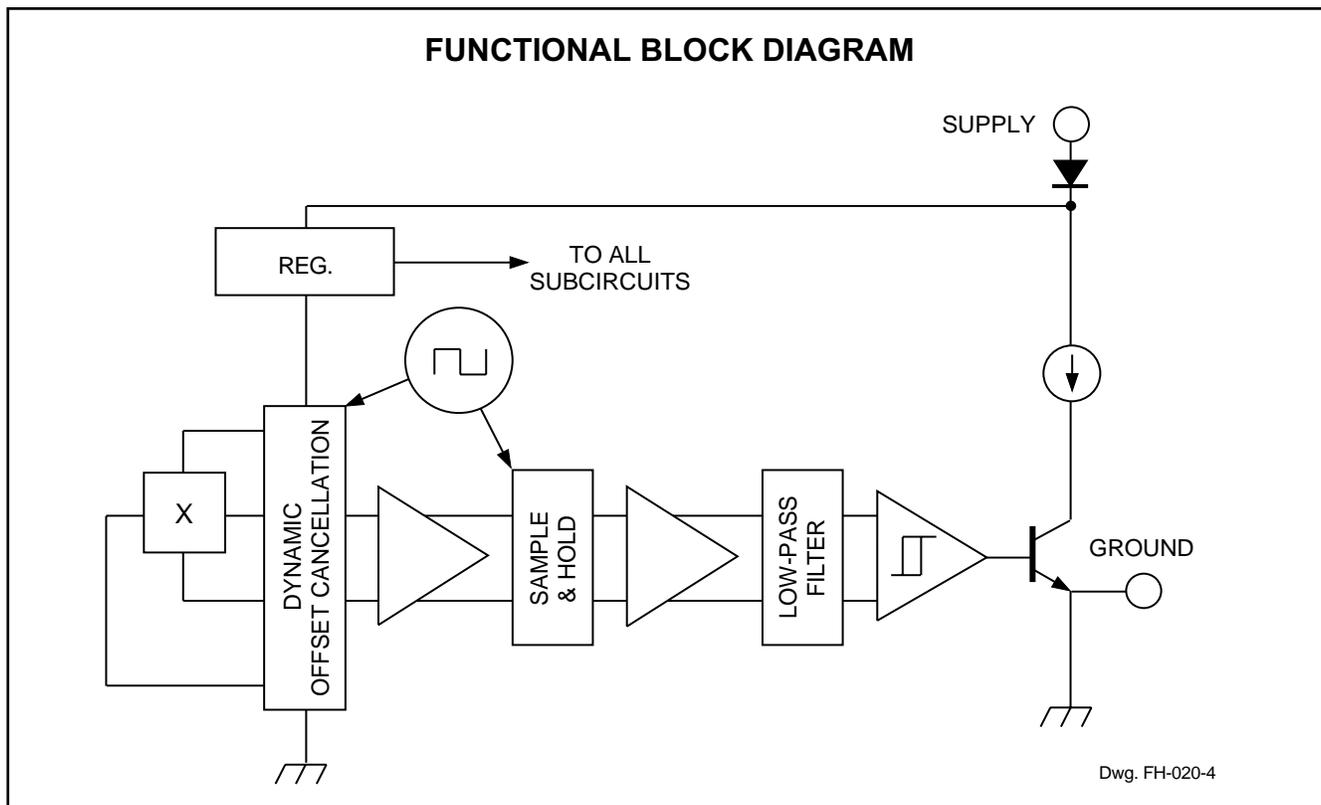
The first character of the part number suffix determines the device operating temperature range; suffix 'E-' is for -40°C to +85°C and 'L-' is -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix '-LH' is a miniature low-profile surface-mount package, '-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

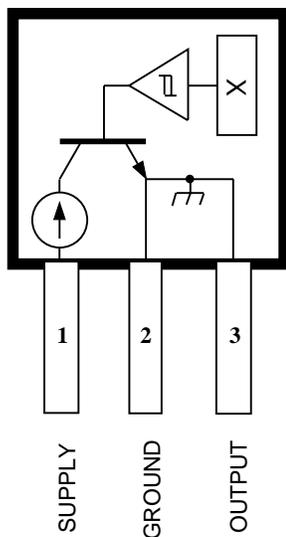
- Internal Current Regulator for 2-Wire Operation
- Output Slew Rate Controlled
- Resistant to Physical Stress
- Superior Temperature Stability
- Operation From Unregulated Supply
- Reverse Battery Protection
- Solid-State Reliability
- Small Size

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**.

**3260**  
**2-WIRE, CHOPPER-STABILIZED,**  
**PRECISION HALL-EFFECT**  
**BIPOLAR SWITCH**

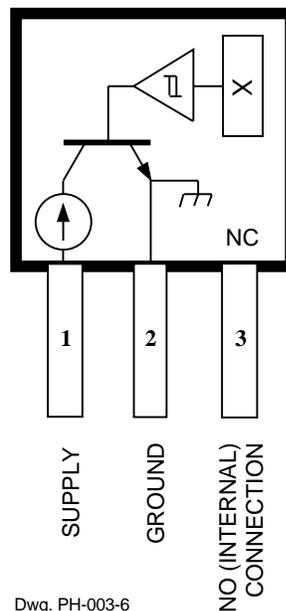


**Suffix Code 'UA' Pinning (SIP)**



Dwg. PH-003-7

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



Dwg. PH-003-6

Pinning is shown viewed from branded side.

**3260****2-WIRE, CHOPPER-STABILIZED,  
PRECISION HALL-EFFECT  
BIPOLAR SWITCH****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/ $\mu$ s
Output Settling Time	$t_{sd}$	$C_L = 20$ pF	—	—	20	$\mu$ s
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  $T_A = +25^\circ\text{C}$  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	$B_{OP}$		—	10	30	G
Release Point	$B_{RP}$		-30	-10	—	G
Hysteresis	$B_{hys}$	$B_{OP} - B_{RP}$	—	20	—	G

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

**3260**  
***2-WIRE, CHOPPER-STABILIZED,  
PRECISION HALL-EFFECT  
BIPOLAR SWITCH***

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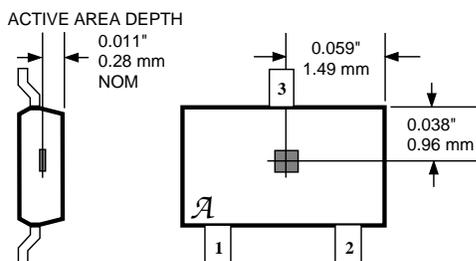


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Worcester, Massachusetts 01615-0036 (508) 853-5000

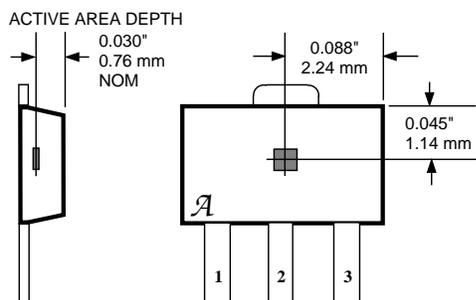
# 3260 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

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

### Package Designator "LH"

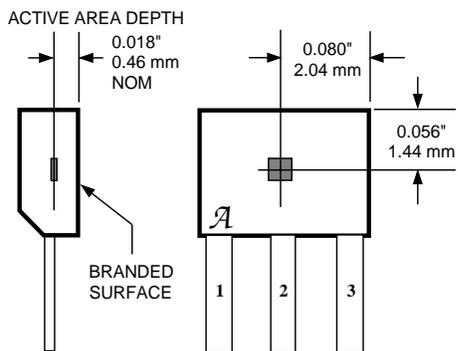


### Package Designator "LT"

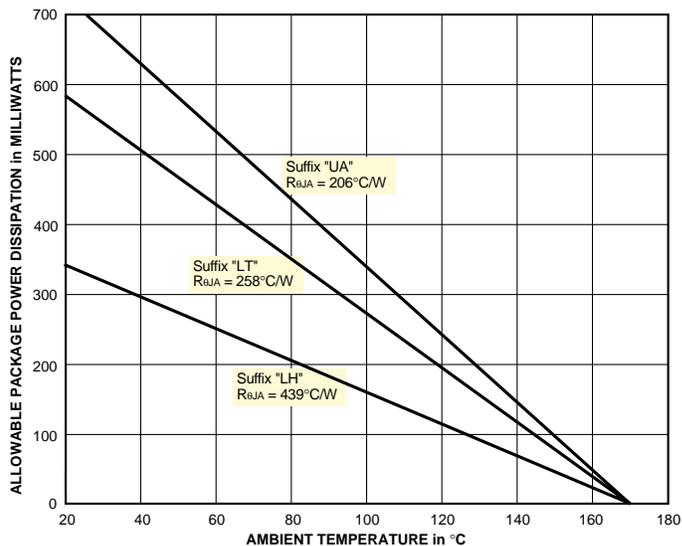


Dwg. MH-008-8

### 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.

# 3260 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

## 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, $-65^{\circ}\text{C}$ 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	

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

FUNCTIONAL DESCRIPTION

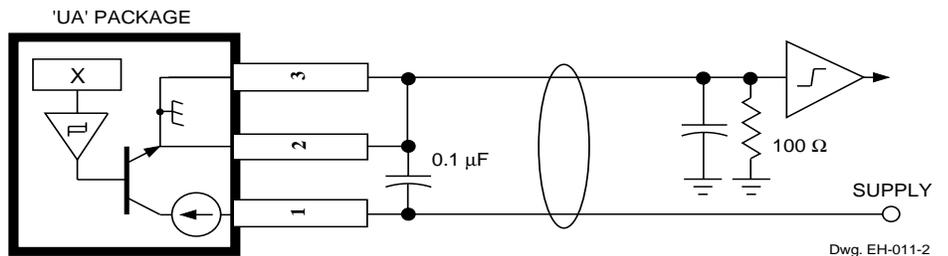
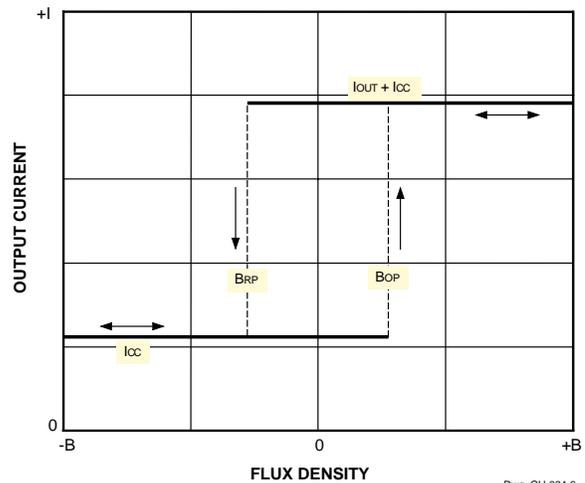
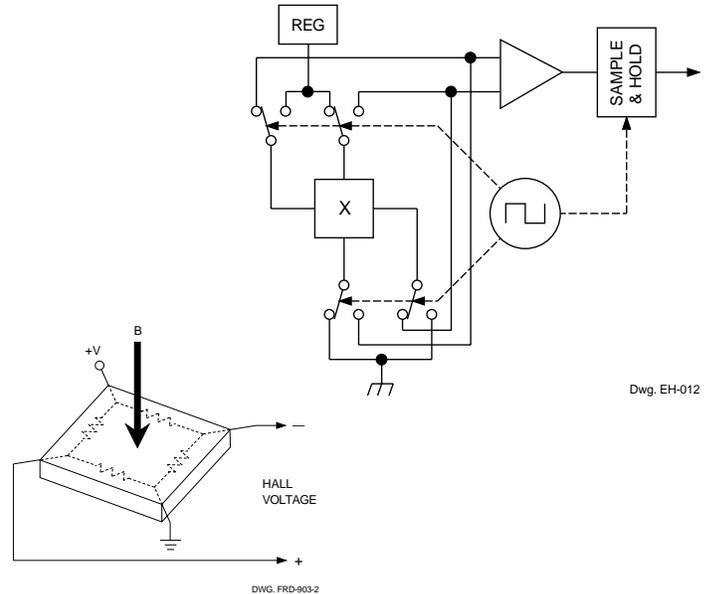
**Chopper-Stabilized Technique.** These devices use a proprietary dynamic offset cancellation technique, with an internal high-frequency clock to reduce the residual offset voltage of the Hall element that is normally caused by device overmolding, temperature dependencies, and thermal stress. This technique 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*.



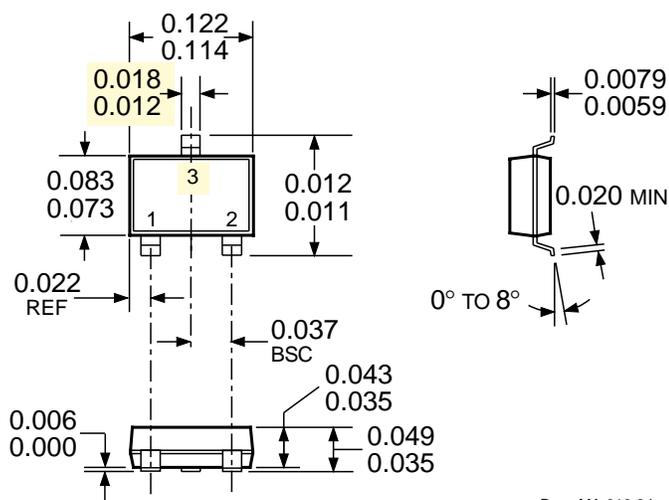
# 3260 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

## PACKAGE DESIGNATOR 'LH'

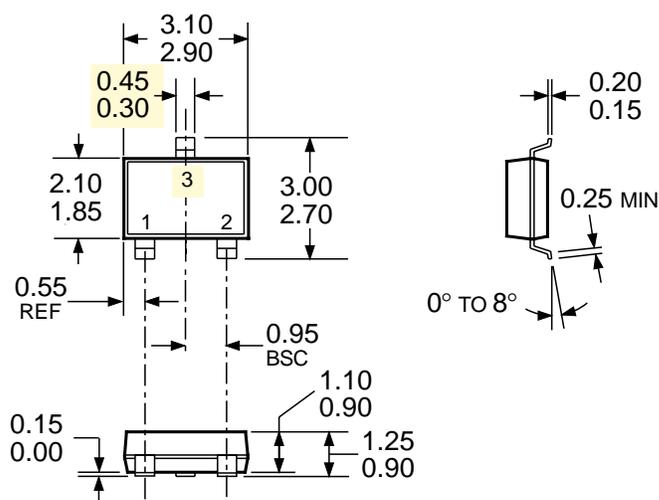
(fits SC-74A solder-pad layout)

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

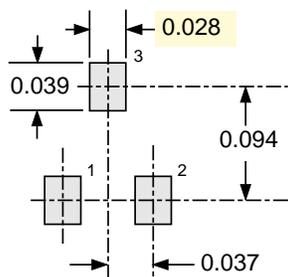
**Dimensions in Millimeters**  
(controlling dimensions)



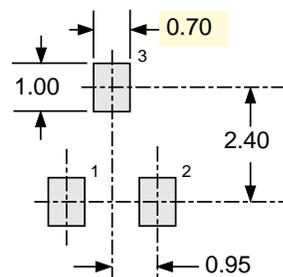
Dwg. MA-010-3 in



Dwg. MA-010-3 mm



Dwg. MA-011-3 in



Dwg. MA-011-3 mm

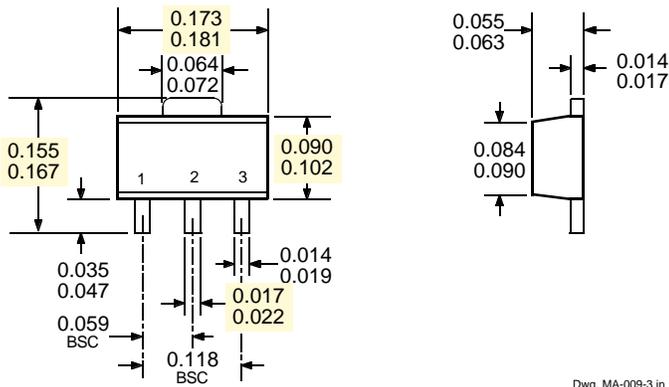
- NOTES:
1. Tolerances on package height and width represent allowable mold offsets. Dimensions given are measured at the widest point (parting line).
  2. Exact body and lead configuration at vendor's option within limits shown.
  3. Height does not include mold gate flash.
  4. Where no tolerance is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

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

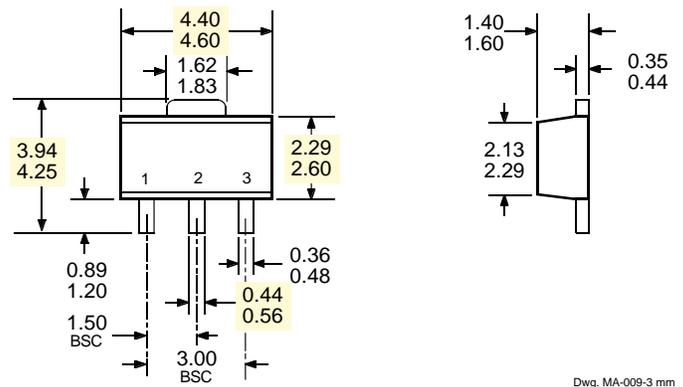
PACKAGE DESIGNATOR 'LT'  
(SOT-89/TO-243AA)

Dimensions in Inches  
(for reference only)

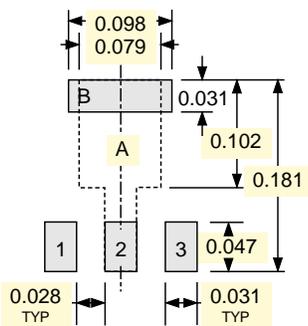


Dwg. MA-009-3 in

Dimensions in Millimeters  
(controlling dimensions)

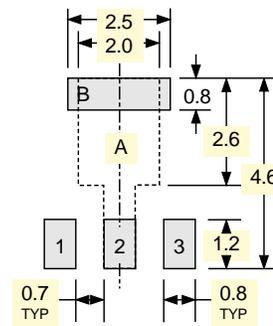


Dwg. MA-009-3 mm



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

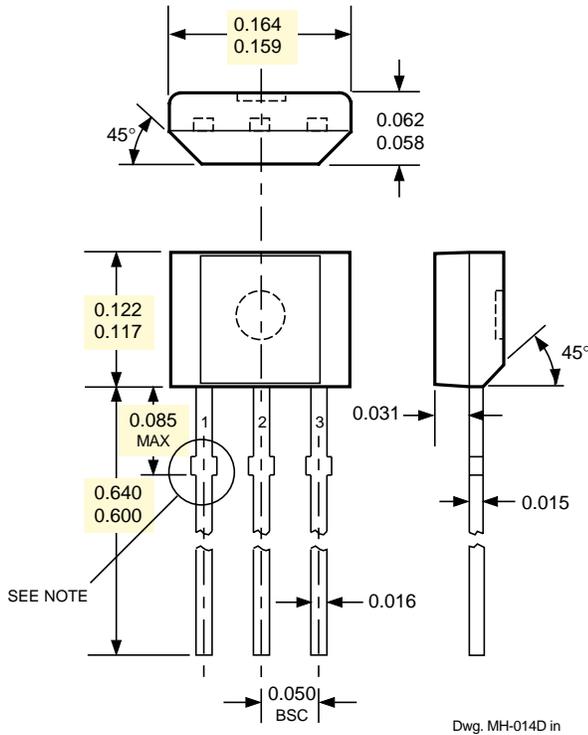
Dwg. MA-012-3 mm

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

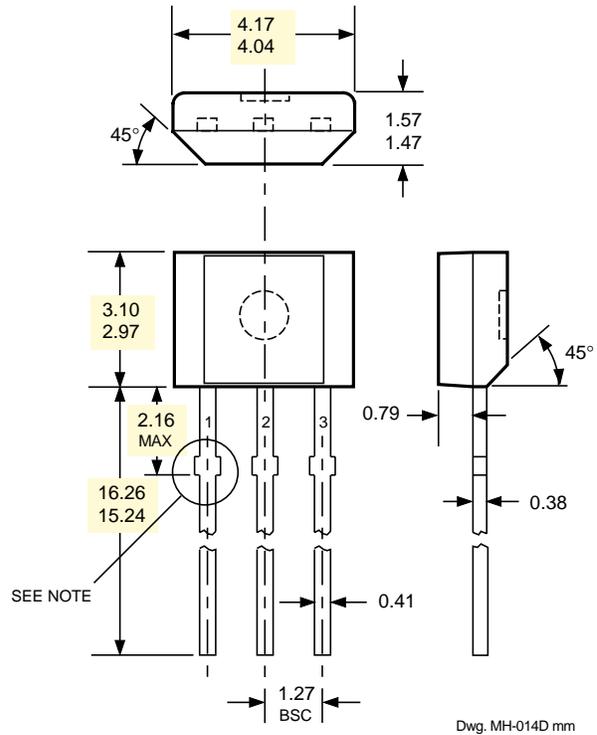
# 3260 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

## PACKAGE DESIGNATOR 'UA'

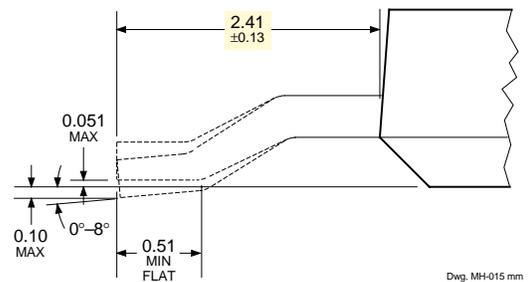
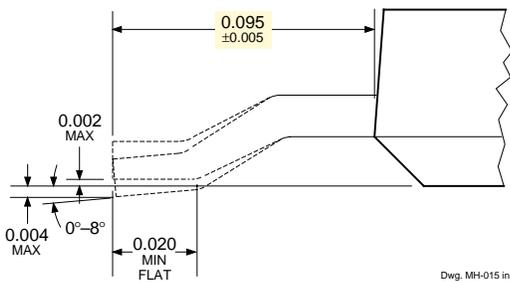
**Dimensions in Inches**  
(controlling dimensions)



**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.

**3260**  
**2-WIRE, CHOPPER-STABILIZED,**  
**PRECISION HALL-EFFECT**  
**BIPOLAR SWITCH**

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

## HALL-EFFECT SENSORS SELECTION GUIDE

Partial Part Number	Avail. Oper. Temp.	Operate Limits Over Temp.			Function†	Notes
		BOP max	BRP min	B <sub>hys</sub> min		
3046	E/L	+200	-200	15	Gear-Tooth Sensor	
3054	K/S	+300	+5	5.0	Unipolar Multiplex	1
3056	E/L	+225	-225	15	Gear-Tooth Sensor	
3058	E/L	+300	-300	150	Gear-Tooth Sensor	
3059	K/S	+100	-100	20	AC Gear-Tooth Sensor	
3060	K/S	+35	-35	10	AC Gear-Tooth Sensor	
3121	E/L	+500	+80	60	Unipolar Switch	
3122	E/L	+430	+120	70	Unipolar Switch	
3123	E/L	+470	+160	70	Unipolar Switch	
3132	K/L/S	+95	-95	30	Bipolar Switch	
3133	K/L/S	+75	-75	30	Bipolar Switch	
3134	E/L	+50	-50	5.0	Bipolar Switch	
3141	E/L	+175	+10	20	Unipolar Switch	
3142	E/L	+245	+60	30	Unipolar Switch	
3143	E/L	+355	+150	30	Unipolar Switch	
3144	E/L	+450	+25	20	Unipolar Switch	
3161	E	+160	+30	5.0	2-Wire Unipolar Switch	
3175	S	+180	-180	80	Latch	
3177	S	+150	-150	50	Latch	
3185	E/K/L/S	+300	-300	280	Latch	
3187	E/K/L/S	+175	-175	100	Latch	
3188	E/K/L/S	+200	-200	160	Latch	
3189	E/K/L/S	+250	-250	100	Latch	
3195	E/L	+200	-200	110	Latch	2, 3
3197	L	+200	-200	110	Latch	3
3210	E	±70	±5	7.7*	Chopper-Stabilized Switch	
3235	S	+200	+15	15	Unipolar Switch	4
		-15	-200	15	Unipolar Switch	
3275	S	+250	-250	100	Latch	5
3421	E/L	+300	-300	240	Direction Detection	
3422	E/L	+85	-85	10	Direction Detection	
3503	S	Typ. 1.3 mV/G	–	–	Linear Sensor	
3515	E/L	Typ. 5.0 mV/G	–	–	Chopper-Stabilized Linear Sensor	
3516	E/L	Typ. 2.5 mV/G	–	–	Chopper-Stabilized Linear Sensor	
3517	L/S	Typ. 5.0 mV/G	–	–	Chopper-Stabilized Linear Sensor	
3518	L/S	Typ. 2.5 mV/G	–	–	Chopper-Stabilized Linear Sensor	
3625	S	+150	-150	200*	900 mA Latch	3, 5, 6
3626	S	+150	-150	200*	400 mA Latch	3, 5, 6
5140	E	+240	+25	20	300 mA Unipolar Switch	3, 6

**Operating Temperature Ranges:**

C = 0°C to +70°C, S = -20°C to +85°C, E = -40°C to +85°C, K = -40°C to +125°C, L = -40°C to +150°C

- Notes
1. Multiplexed two-wire sensor; after proper address, power/signal bus current indicates magnetic field condition.
  2. Active pull down.
  3. Protected.
  4. Output 1 switches on south pole, output 2 switches on north pole for 2-phase, bifilar-wound, unipolar-driven brushless dc motor control.
  5. Complementary outputs for 2-phase bifilar-wound, unipolar-driven brushless dc motor control.
  6. Power driver output.
- \* Typical.  
† 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.



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