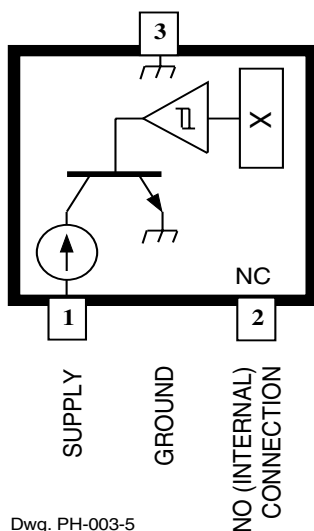


3260

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)
June 30, 2000

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 -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.

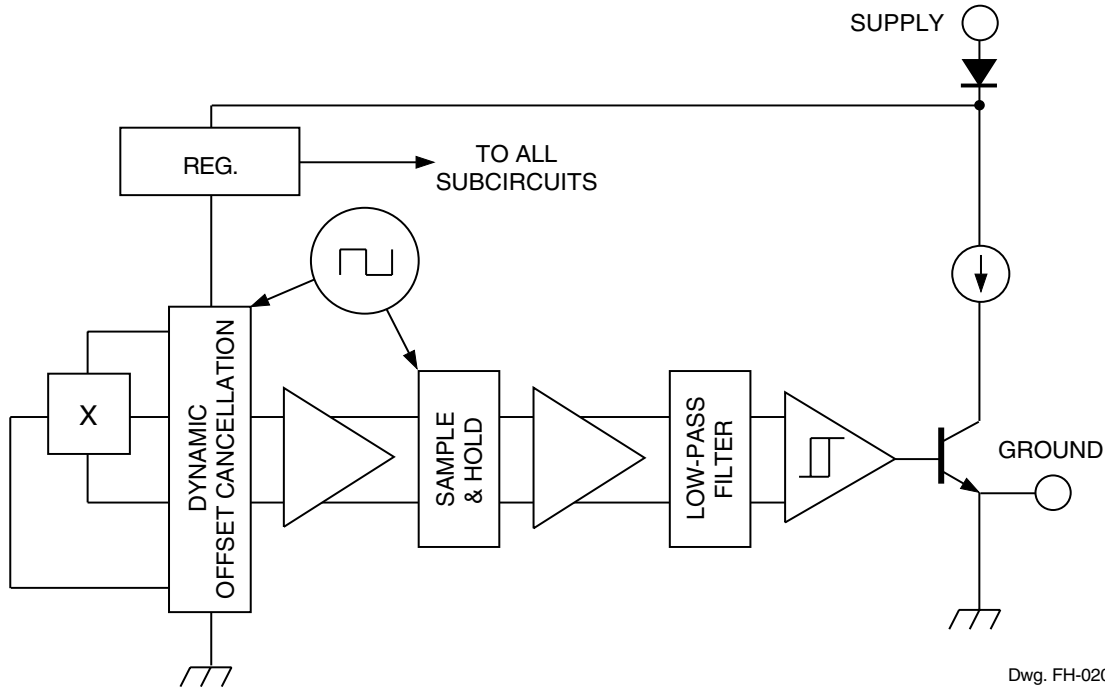
FEATURES

- 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

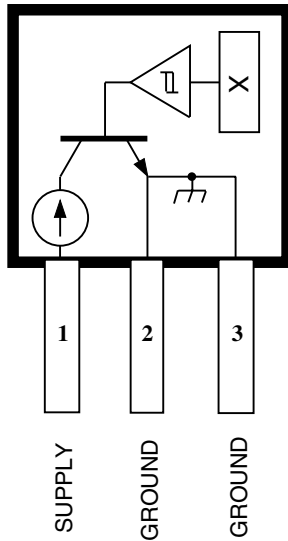
Always order by complete part number: the prefix 'A' + the basic four-digit part number + a suffix to indicate operating temperature range + a suffix to indicate package style, e.g., **A3260ELH**.

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

FUNCTIONAL BLOCK DIAGRAM

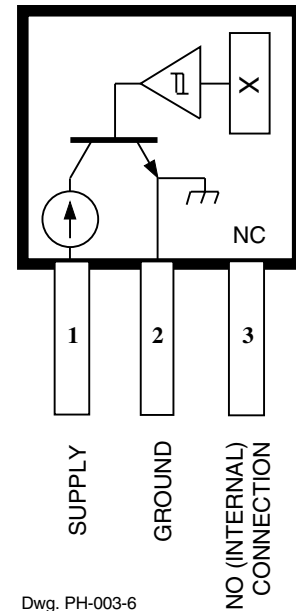


Suffix Code 'UA' Pinning
(SIP)



Dwg. PH-003-7A

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



Dwg. PH-003-6

Pinning is shown viewed from branded side.

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

ELECTRICAL CHARACTERISTICS over operating temperature range.

| Characteristic | Symbol | Test Conditions | Limits | | | Units |
|-------------------------|--------------|-------------------|--------|-------|------|-------------|
| | | | Min. | Typ. | Max. | |
| 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/ μ s |
| Output Settling Time | t_{sd} | $C_L = 20$ pF | — | — | 20 | μ 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 | | | Units |
|----------------|-----------|-------------------|--------|------|------|-------|
| | | | Min. | Typ. | Max. | |
| 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.

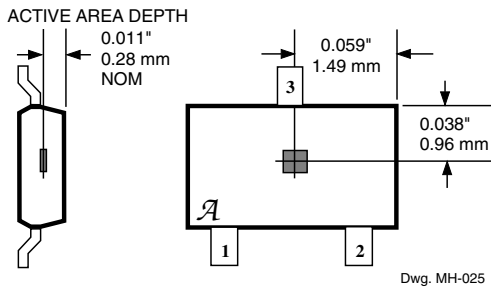
3260
***2-WIRE, CHOPPER-STABILIZED,
PRECISION HALL-EFFECT
BIPOLAR SWITCH***

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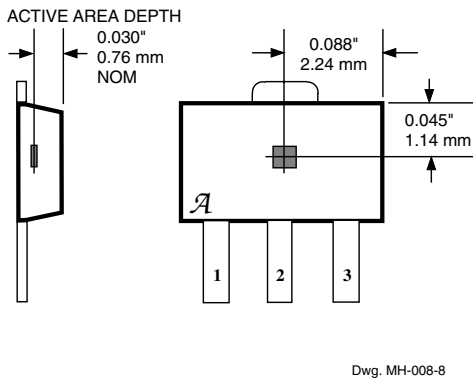
3260 2-WIRE, CHOPPER-STABILIZED, PRECISION HALL-EFFECT BIPOLAR SWITCH

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

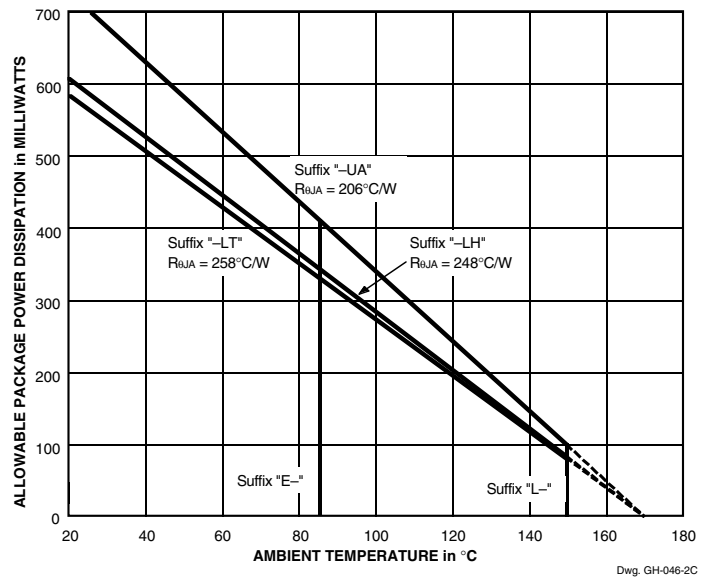
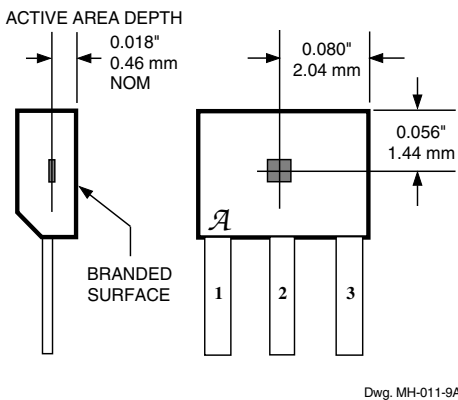
Package Designator "LH"



Package Designator "LT"



Package Designators "UA" and "UA-TL"



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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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, $T_A = 150^{\circ}\text{C}$, $T_J \leq 165^{\circ}\text{C}$ | 408 hrs | 77 | $V_{CC} = 24\text{ V}$, $V_{OUT} = 20\text{ V}$ |
| Accelerated HTOL | $T_A = 175^{\circ}\text{C}$, $T_J = 190^{\circ}\text{C}$ | 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 | |

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

FUNCTIONAL DESCRIPTION

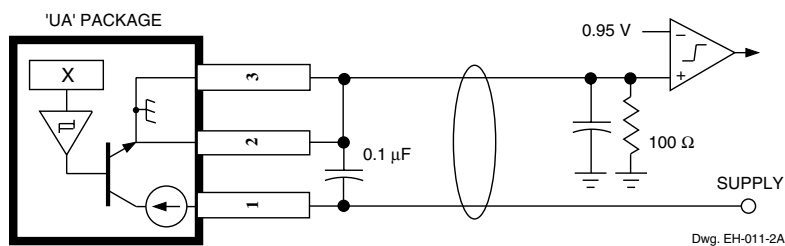
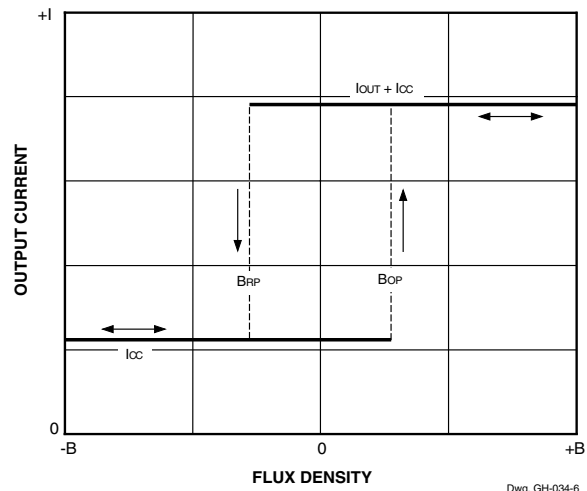
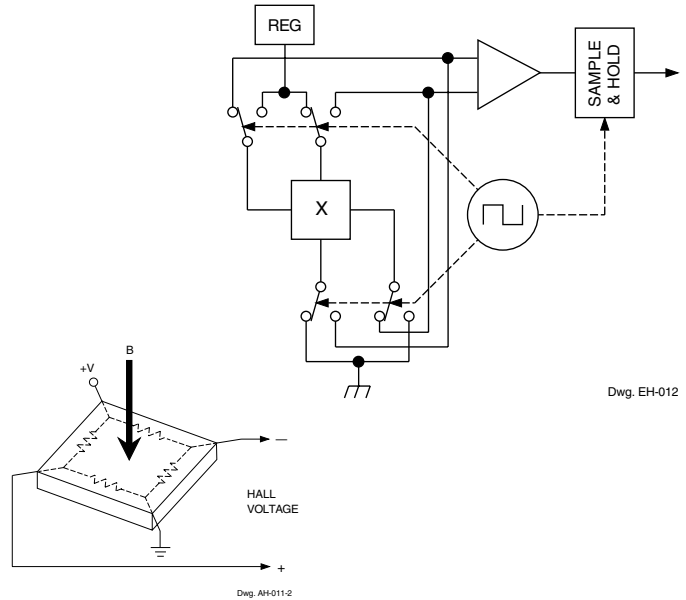
Chopper-Stabilized Technique. These devices use a proprietary dynamic offset cancellation technique, with an internal high-frequency clock to reduce the residual offset voltage of the Hall element that is normally caused by device overmolding, temperature dependencies, and thermal stress. This technique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

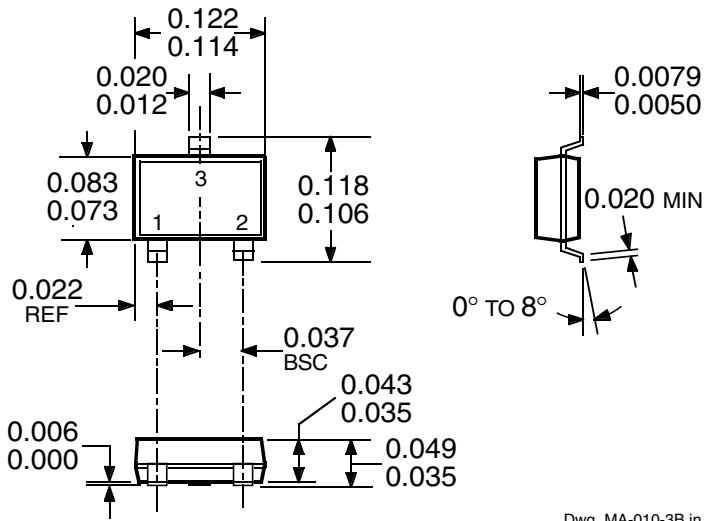


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2-WIRE, CHOPPER-STABILIZED,
PRECISION HALL-EFFECT
BIPOLAR SWITCH

PACKAGE DESIGNATOR 'LH'

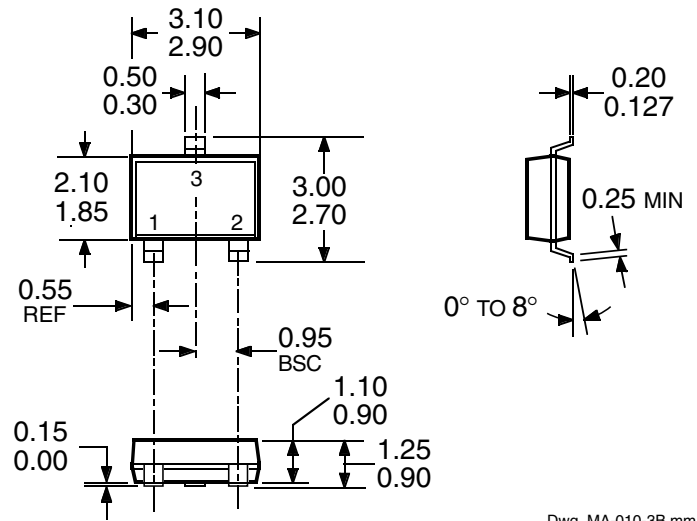
(fits SC-74A solder-pad layout)

Dimensions in Inches
 (for reference only)

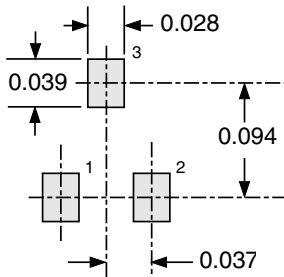


Dwg. MA-010-3B in

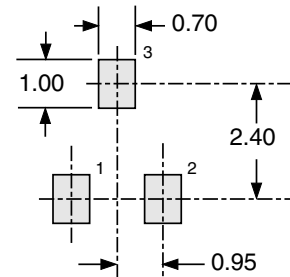
Dimensions in Millimeters
 (controlling dimensions)



Dwg. MA-010-3B mm



Dwg. MA-011-3 in



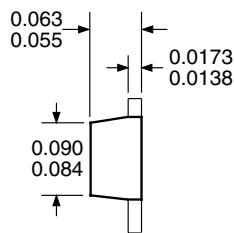
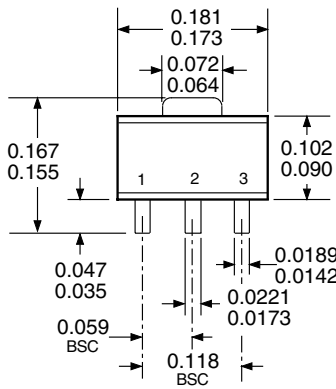
Dwg. MA-011-3 mm

- 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.

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

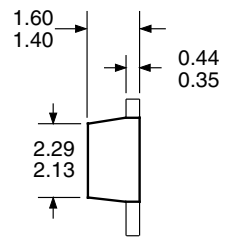
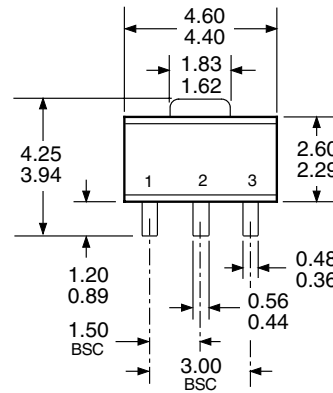
PACKAGE DESIGNATOR 'LT' (SOT-89/TO-243AA)

Dimensions in Inches
(for reference only)

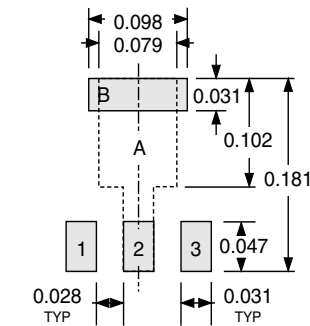


Dwg. MA-009-3A in

Dimensions in Millimeters
(controlling dimensions)

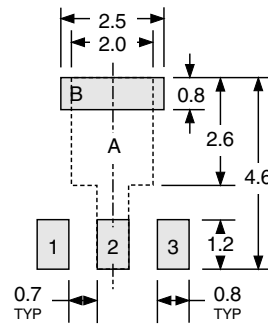


Dwg. MA-009-3A mm



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



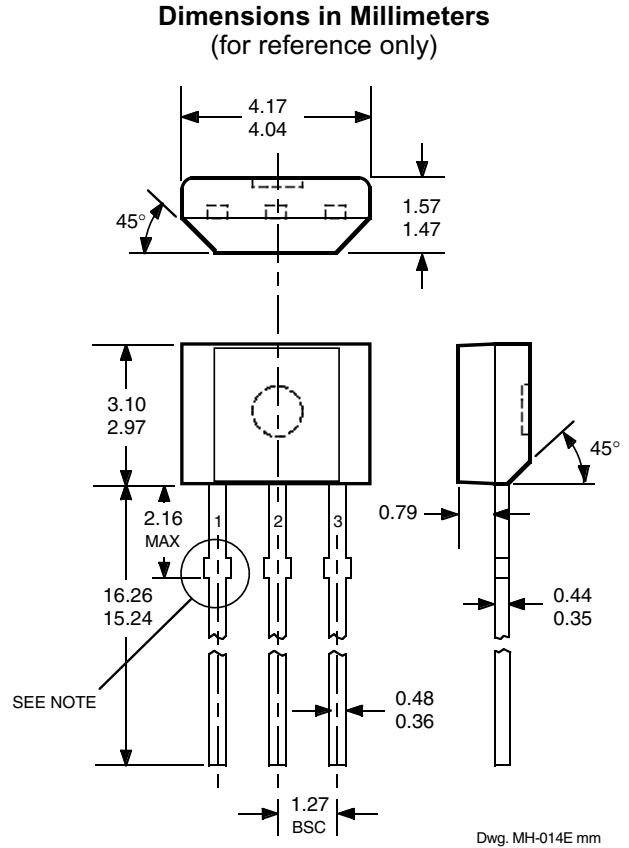
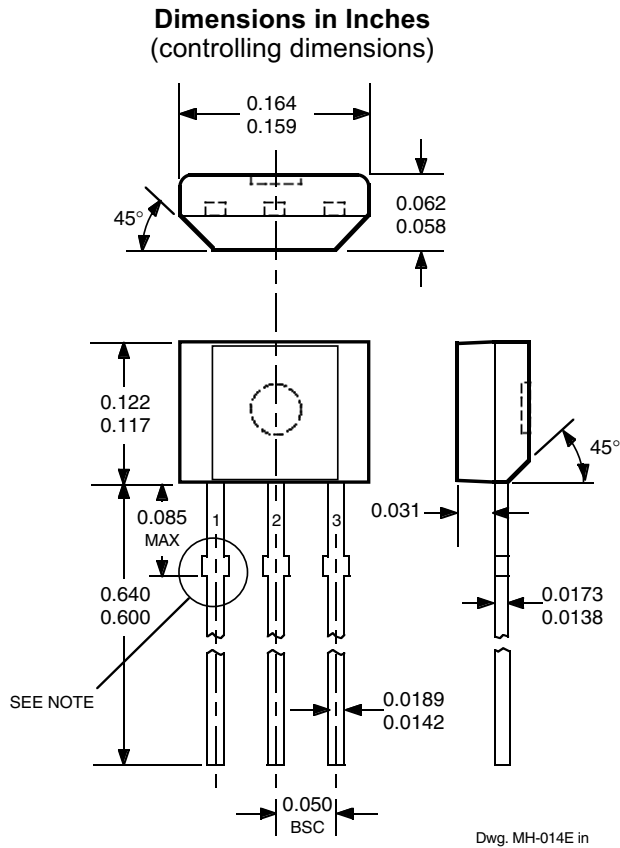
Pads 1, 2, 3, and A — Standard SOT-89 Layout
 Pads 1, 2, 3, and B — Low-Stress Version
 Pads 1, 2, and 3 only — Lowest Stress, But Not Self Aligning

Dwg. MA-012-3 mm

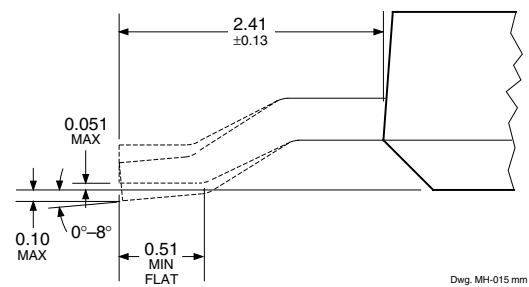
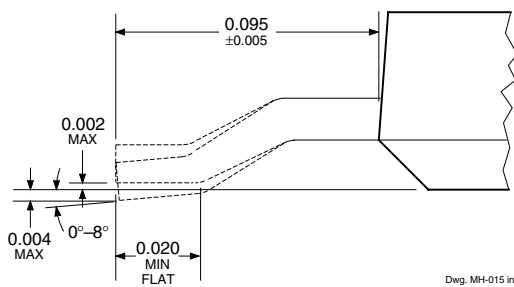
NOTE: Exact body and lead configuration at vendor's option within limits shown.

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

PACKAGE DESIGNATOR 'UA'



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.

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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.

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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 | | | Features | Notes |
|---|--------------------|---|----------|------------------------|----------------------------------|---------|
| | | BOP(max) | BRP(min) | B _{hys} (typ) | | |
| HALL-EFFECT UNIPOLAR SWITCHES in order of BOP 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 BOP 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.