# A3290 and A3291

## Chopper-Stabilized, Precision Hall-Effect Latches for Consumer and Industrial Applications

## FEATURES AND BENEFITS

- Symmetrical switchpoints
- Resistant to physical stress
- Superior temperature stability
- Output short-circuit protection
- Operation from unregulated supply
- Reverse battery protection
- Solid-state reliability
- Small package size

## APPLICATIONS

- Industrial motor/encoders
- Commutation/index sensing
- BLDC motors
- Fan motors

## PACKAGES:

*Not to scale*

3-pin SOT23W
(suffix LH)

3-pin SIP,
matrix HD style
(suffix UA)

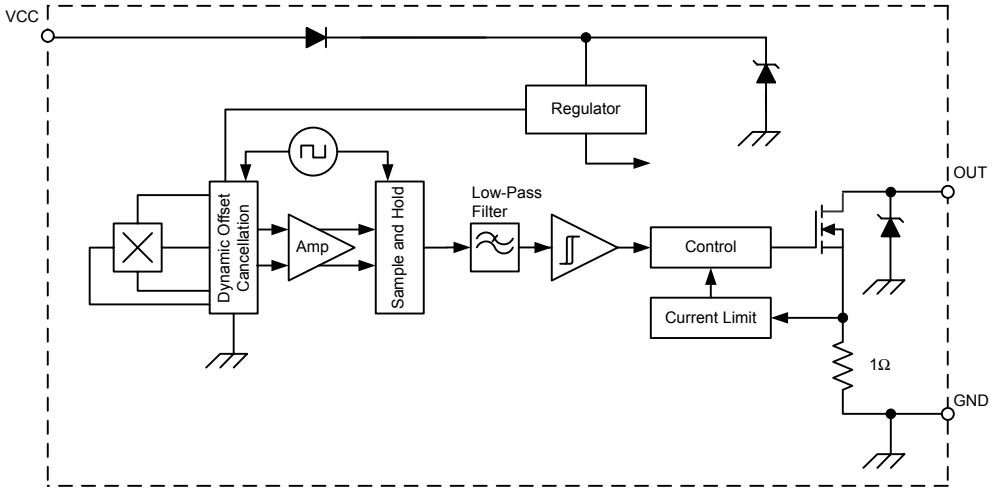

3-pin SIP,
chopper style
(suffix UA)

## DESCRIPTION

The A3290 and A3291 Hall-effect latches are extremely temperature-stable and stress-resistant sensor ICs, especially suited for operation over extended temperature ranges (up to 125°C). Superior high-temperature performance is made possible through dynamic offset cancellation, which reduces the residual offset voltage normally caused by device package overmolding, temperature dependencies, and thermal stress. The two devices are identical except for their magnetic switchpoints. They are not intended for automotive applications.

Both devices include, on a single silicon chip, a voltage regulator, a Hall voltage generator, a small-signal amplifier, chopper stabilization, a Schmitt trigger, and a short-circuit protected open-drain output to sink up to 25 mA. A south polarity magnetic field of sufficient strength is required to turn the output on. A north polarity field of sufficient strength is necessary to turn the output off. An onboard regulator permits operation with supply voltages in the range of 3 to 24 V.

Two package styles provide a magnetically optimized package for most applications: type LH is a miniature SOT23W low-profile surface-mount package, and type UA is a three-pin ultramini SIP for through-hole mounting. Both packages are lead (Pb) free with 100% matte-tin leadframe plating.




Functional Block Diagram

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ELECTRICAL CHARACTERISTICS: Over operating temperature range, unless otherwise noted

| Characteristic | Symbol | Test Conditions | Min. | Typ. [1] | Max | Units |
|---|---|---|---|---|---|---|
| Supply Voltage Range [2] | $V_{CC}$ | Operating, $T_J$ < 165°C | 3.0 | – | 24 | V |
| Output Leakage Current | $I_{OFF}$ | $V_{OUT}$ = 24 V, B < $B_{RP}$ | | | | µA |
| Output Saturation Voltage | $V_{OUT(SAT)}$ | I | | | | |
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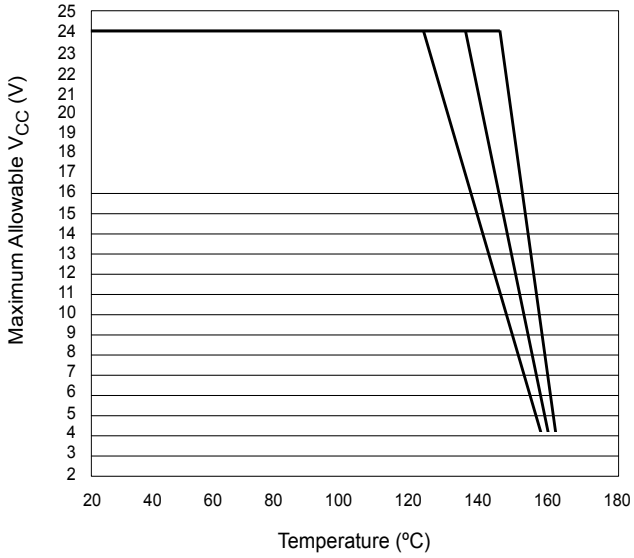
THERMAL CHARACTERISTICS: May require derating at maximum conditions; see application information

| Characteristic | Symbol | Test Conditions [1] | Value | Units |
|---|---|---|---|---|
| Package Thermal Resistance | $R_{\theta JA}$ | Package LH, 1-layer PCB with copper limited to solder pads | 228 | °C/W |
| | | Package LH, 2-layer PCB with 0.463 in.$^2$ of copper area each side connected by thermal vias | 110 | °C/W |
| | | Package UA, 1-layer PCB with copper limited to solder pads | 165 | °C/W |

[1] Additional thermal information available on Allegro website.

Power Derating Curve



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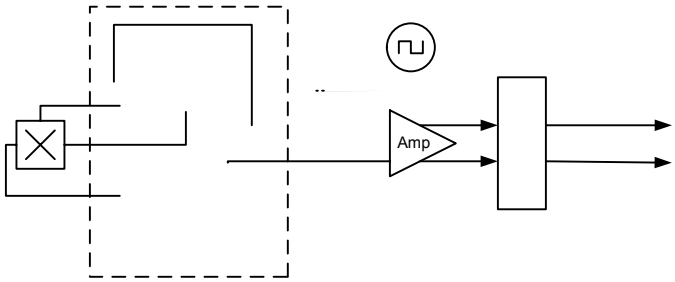
## FUNCTIONAL DESCRIPTION



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## APPLICATION INFORMATION

It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall element) between the supply and ground of the device to reduce both external noise and noise generated by the chopper stabilization technique. This configuration is shown in Figure 4.

The simplest form of magnet that will operate these devices is a ring magnet. Other methods of operation, such as linear magnets, are possible.

The device must be operated below the maximum junction temperature of the device ($T_{J(max)}$). Under certain combinations of peak conditions, reliable operation may require derating supplied power or improving the heat dissipation properties of the application. The Package Thermal Resistance ($R_{\theta JA}$) is a figure of merit summarizing the ability of the application and the device to dissipate heat from the junction (die), through all paths to the ambient air. Its primary component is the Effective Thermal Conductivity (K) of the printed circuit board, including adjacent devices and traces. Radiation from the die through the device case ($R_{\theta JC}$) is relatively small component of $R_{\theta JA}$. Ambient air temperature ($T_A$) and air motion are significant external factors, damped by overmolding. Sample power dissipation results are given in the Thermal Characteristics section. Additional thermal data is also available on the Allegro website.

Extensive applications information for Hall-effect devices is available in: *Hall-Effect IC Applications Guide*, Application Note 27701 and *Guidelines for Designing Subassemblies Using Hall-Effect Devices*, Application Note 27703.1.

VCC

Figure 4: Typical Basic Application Circuit
A bypass capacitor is highly recommended.



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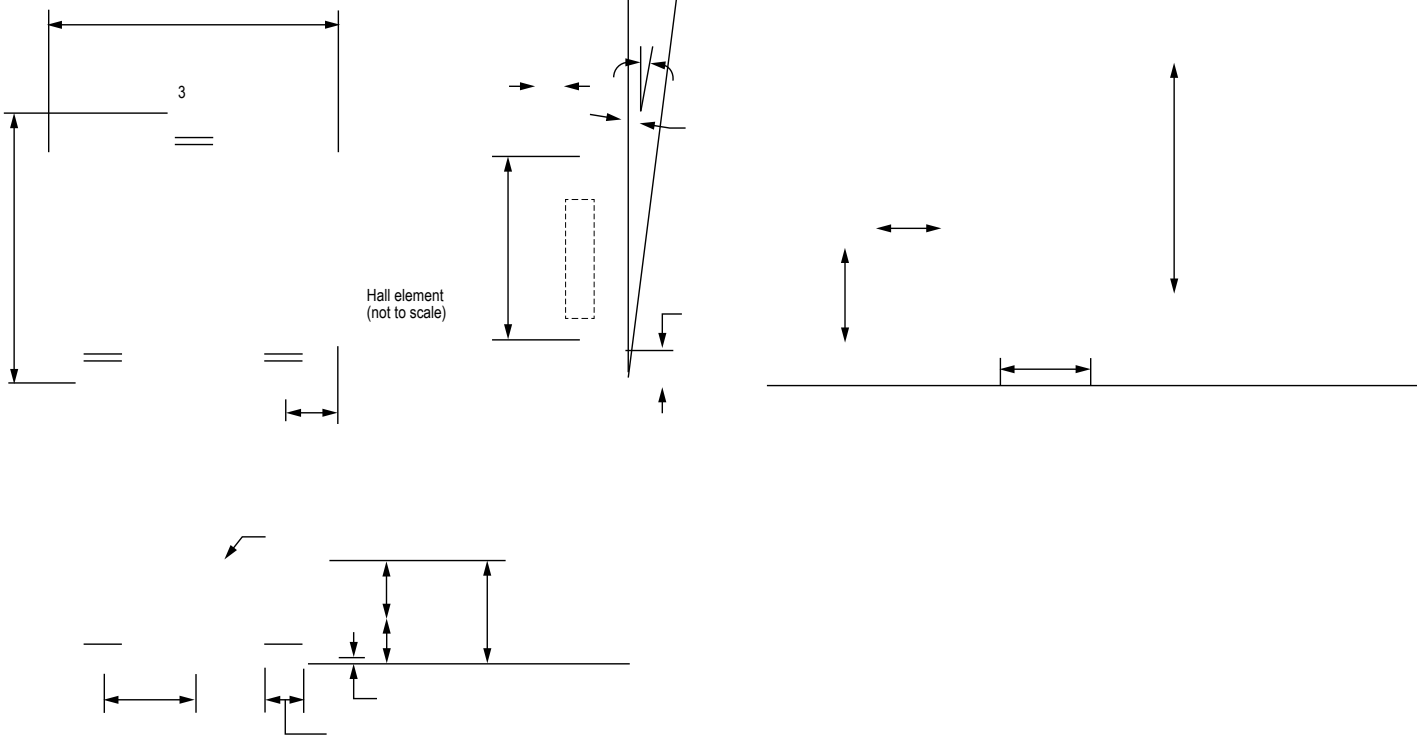


Figure 5: Package LH, 3-Pin SOT23W



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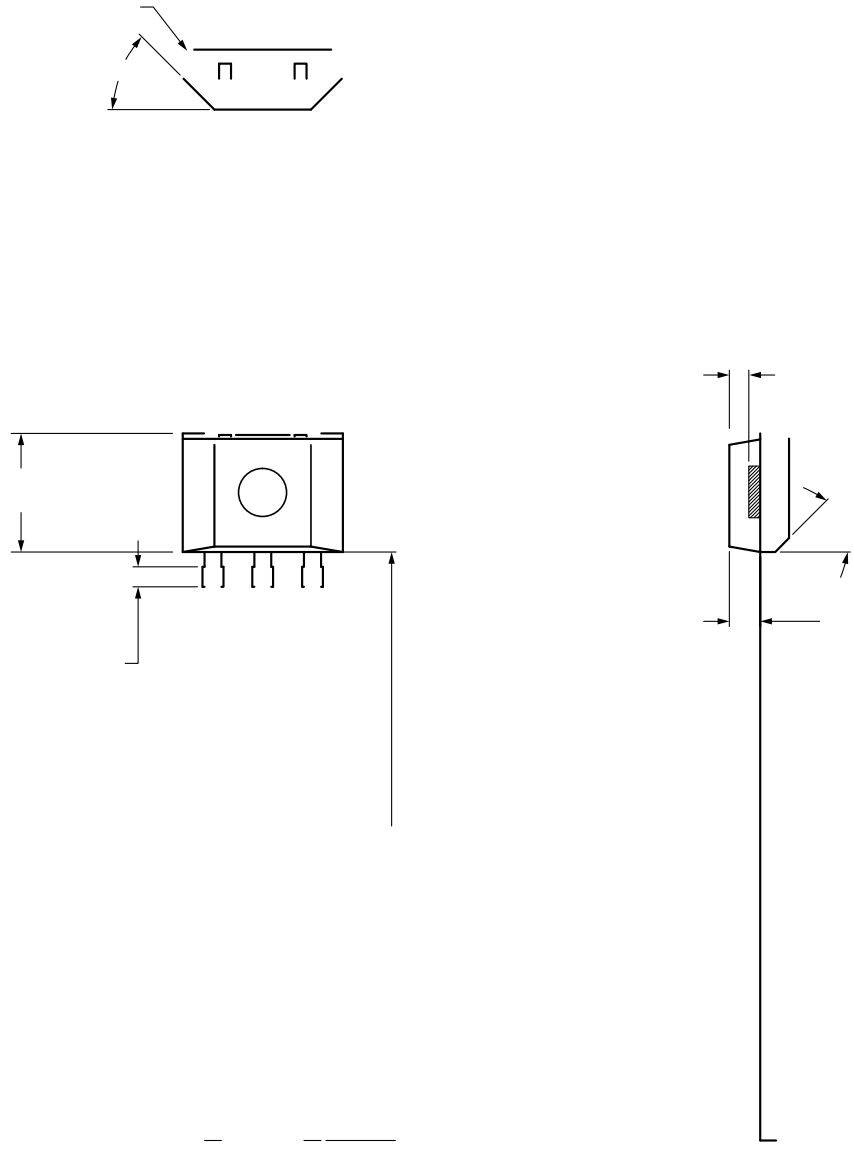

Figure 6: Package UA, 3-Pin SIP, Matrix Style



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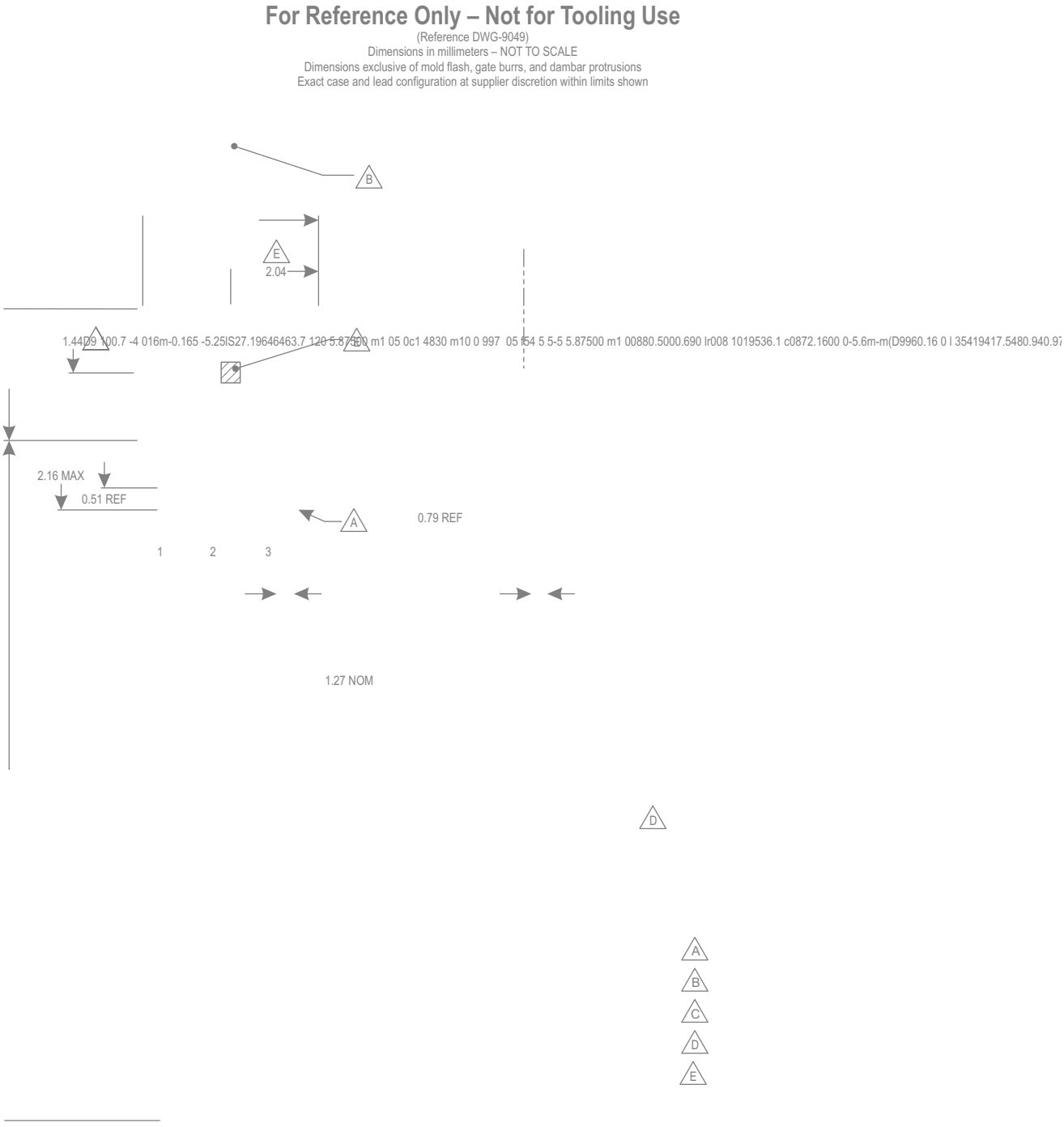


Figure 7: Package UA, 3-Pin SIP, Chopper Style (A3290)



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## Revision History

| Number | Date | Description |
|---|---|---|
| 11 | November 11, 2013 | Conform Description |
| 12 | January 1, 2015 | Added LX option to Selection Guide |
| 13 | May15, 2015 | Added new package for A3291 |
| 14 | July 13, 2015 | Corrected LH package Active Area Depth value |
| 15 | January 12, 2016 | Updated Reverse Supply Current test conditions in Electrical Characteristics table |
| 16 | October 31, 2016 | Chopper-style UA package designated as not for new design |
| 17 | September 21, 2017 | Updated Power-On Time test conditions (p. 3) |
| 18 | September 25, 2018 | Minor editorial updates |
| 19 | October 2, 2019 | Updated LH and UA matrix package drawings (pages 7-8) and other minor editorial updates |
| 20 | March 25, 2021 | Added Applications (page 1); updated pinout diagrams (page 2) and UA package drawing (page 8) |
| 21 | April 6, 2022 | Updated package drawings (pages 7-8) |



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