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# LOW VOLTAGE HALL-EFFECT SMART FAN MOTOR CONTROLLER

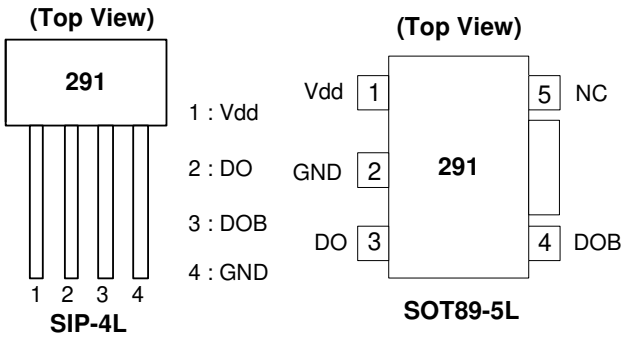
## Description

AH291 is a monolithic fan motor controller with Hall sensor's capability. It contains two complementary open-collector drivers for motor's coil driving, automatic lock shutdown and restart function relatively.

Rotor-lock shutdown detection circuit turns off the output driver when the rotor is blocked to avoid coil overheat. Then, the automatic recovery circuit will restart the motor. These protected actions are repeated and periodic during the blocked period. Until the blocking is removed, the motor recovers and runs normally.

The AH291 is available in SIP4 and SOT89-5L packages.

## Pin Assignments



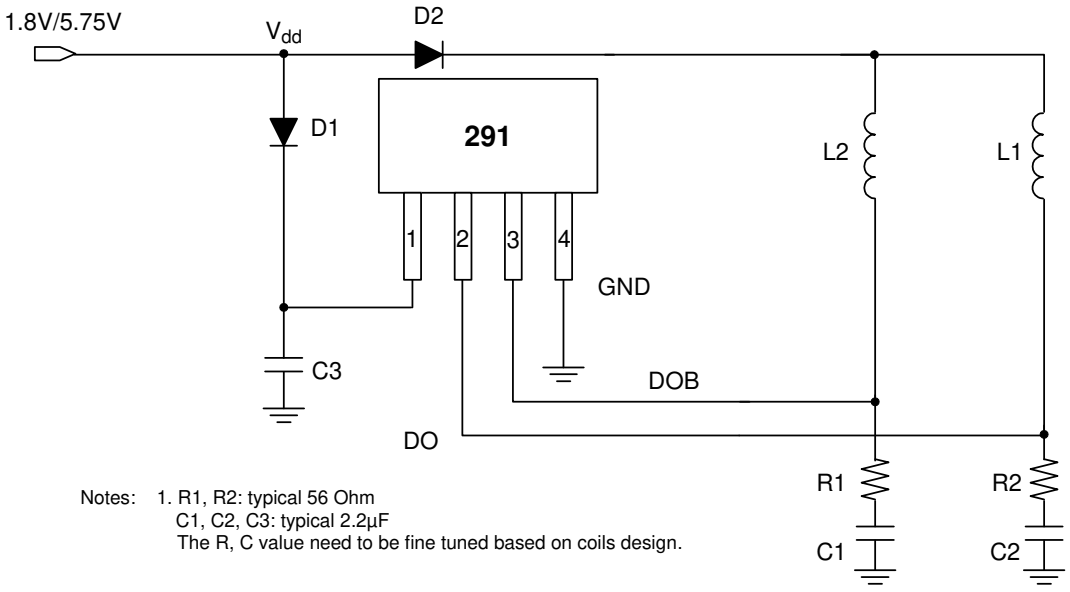

## Features

- On Chip Hall Sensor
- Rotor-Locked Shutdown
- Automatically Restart
- Built-in Zener Protection for Output Driver
- Operating Voltage: 1.8V to 5.75V
- Output Current: $I_{O(AVE)}$= 400mA
- Packages: SIP-4L and SOT89-5L
- Green Molding Compound

## Applications

- Two-coil BLDC cooling fans
- Low to medium voltage, low power BLDC motors

## Typical Application Circuit (Note 1)



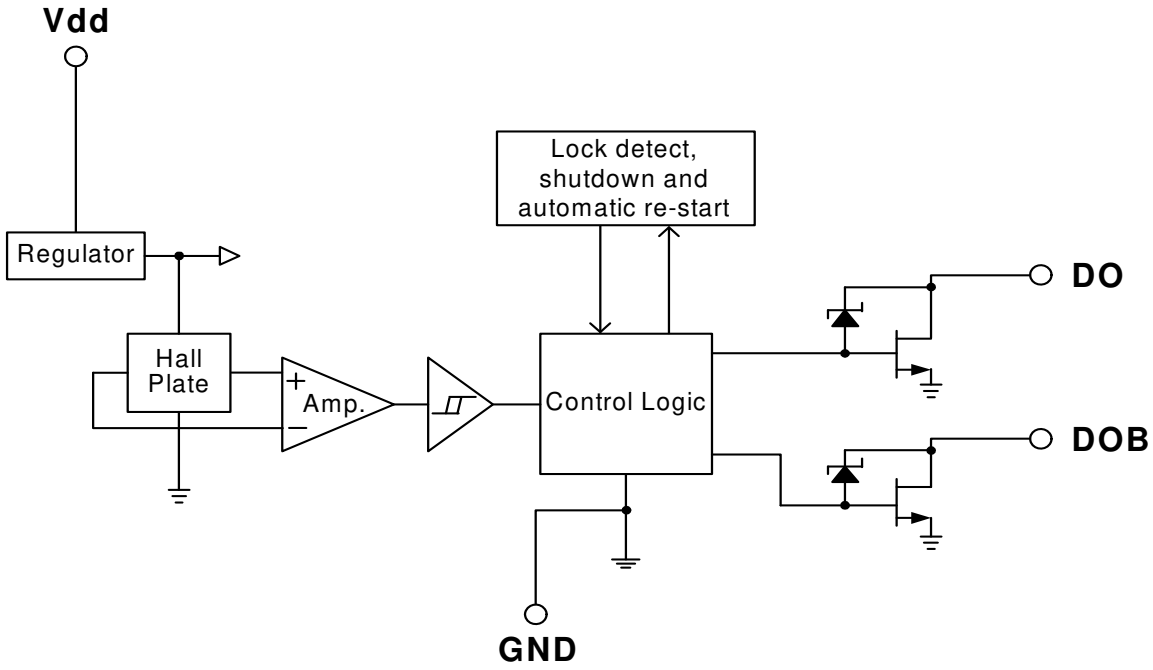

Notes: 1. R1, R2: typical 56 Ohm
C1, C2, C3: typical 2.2μF
The R, C value need to be fine tuned based on coils design.

**1.8V/5.75V Brush-Less DC Fan**

## Pin Descriptions

| Pin Name | Description |
|---|---|
| Vdd | Input Power |
| DO | Output Pin |
| DOB | Output Pin |
| GND | Ground |
| NC | Not Connected |

## Functional Block Diagram



## Absolute Maximum Ratings ($T_A$ = 25°C)

| Symbol | Characteristics | | | Rating | Unit |
|---|---|---|---|---|---|
| Vdd | Operating Supply Voltage | | | 8 | V |
| $I_O$ | Output Current | $I_{O(AVE)}$ | SIP-4L | 400 | mA |
| | | | SOT89-5L | 400 | mA |
| | | $I_{O(PEAK)}$ | | 700 | mA |
| $P_D$ | Power Dissipation | SIP-4L | | 550 | mW |
| | | SOT89-5L | | 800 | mW |
| $T_{ST}$ | Storage Temperature | | | -55 ~ 150 | °C |
| $T_J$ | Maximum Junction Temperature | | | 150 | °C |

## Recommended Operating Conditions

| Symbol | Characteristic | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| Vdd | Supply Voltage (Note 2) | Operating | 1.8 | 5.75 | V |
| $T_A$ | Operating Ambient Temperature | Operating | -20 | 100 | °C |

Notes: 2. The output of IC will be switched after the supply voltage is over 1.8V, but the magnetic characteristics won't be normal until the supply is over 2.0V.

## Electrical Characteristics ($T_A$ = 25 °C, Vdd = 5V, unless otherwise specified)

| Symbol | Characteristics | Conditions | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Idd | Supply Current | Operating | - | 2.6 | 4.0 | mA |
| $T_{RLP-ON}$ | Rotor Lock Protection On Time | | - | 0.4 | - | Sec |
| $T_{RLP-OFF}$ | Rotor Lock Protection Off Time | | 2.4 | 3 | 3.6 | Sec |
| $V_{OUT(SAT)}$ | Output Saturation Voltage | $I_O$ = 180mA | - | 300 | - | mV |
| | | $I_O$ = 350mA | - | 600 | - | mV |
| $R_{DS(ON)}$ | Output On Resistance | | - | 1.75 | - | ohm |
| Vz | Output Zener-Breakdown Voltage | | - | 15 | - | V |

**Truth Table**

| IN- | IN+ | CT | OUT1 | OUT2 | Mode |
|---|---|---|---|---|---|
| H | L | L | H | L | Rotating |
| L | H | L | L | H | Rotating |
| - | - | H | off | off | Lockup protection activated |

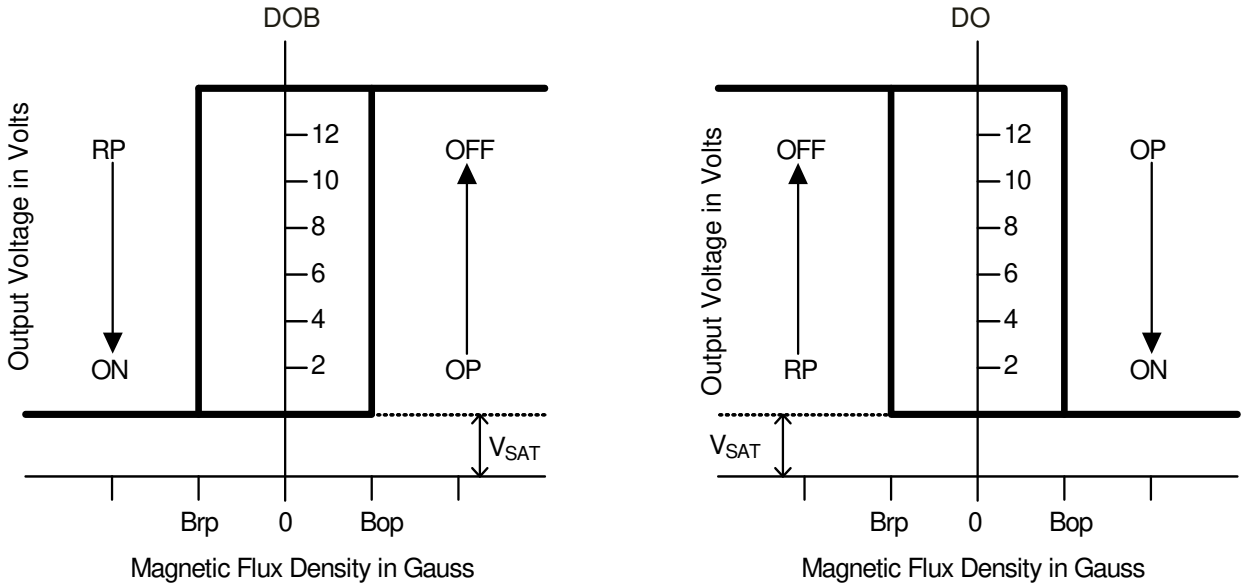
## Magnetic Characteristics ($T_A$ = 25 °C, Vcc = 24V, unless otherwise specified, Note 3)

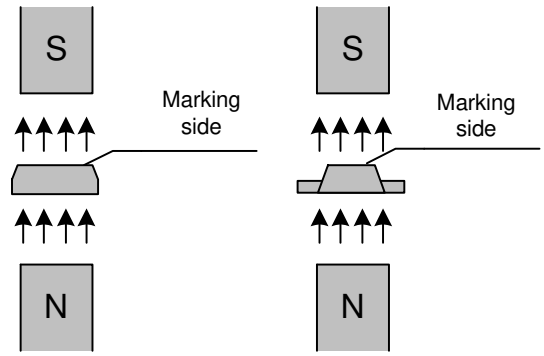
(1mT = 10 Gauss)

| Symbol | Characteristics | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Bop | Operation Point | - | 30 | 60 | Gauss |
| Brp | Release Point | -60 | -30 | - | Gauss |
| Bhy | Hysteresis | - | 60 | - | Gauss |

Notes: 3. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

## Operating Characteristics



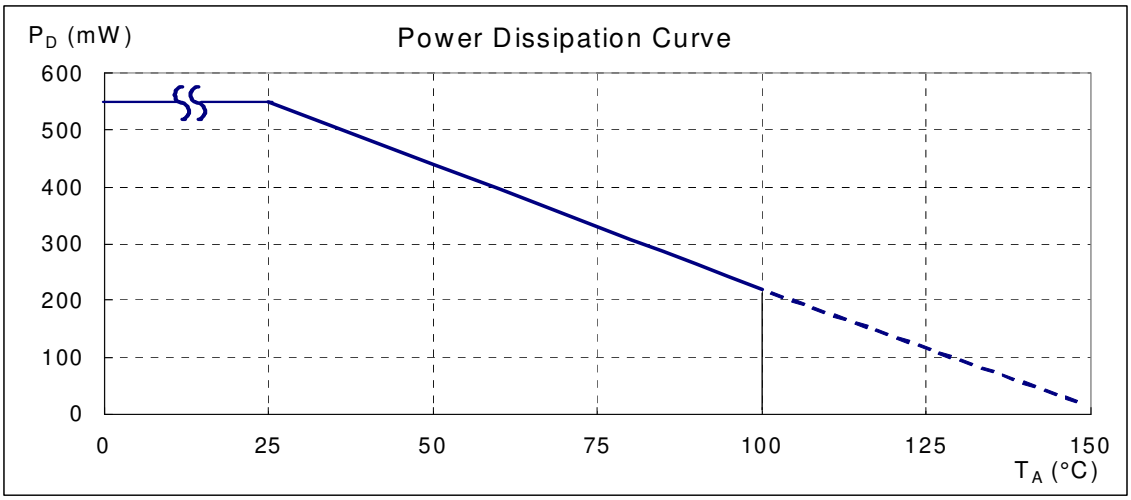




**( SIP-4L )** **( SOT89-5L )**

## Performance Characteristics

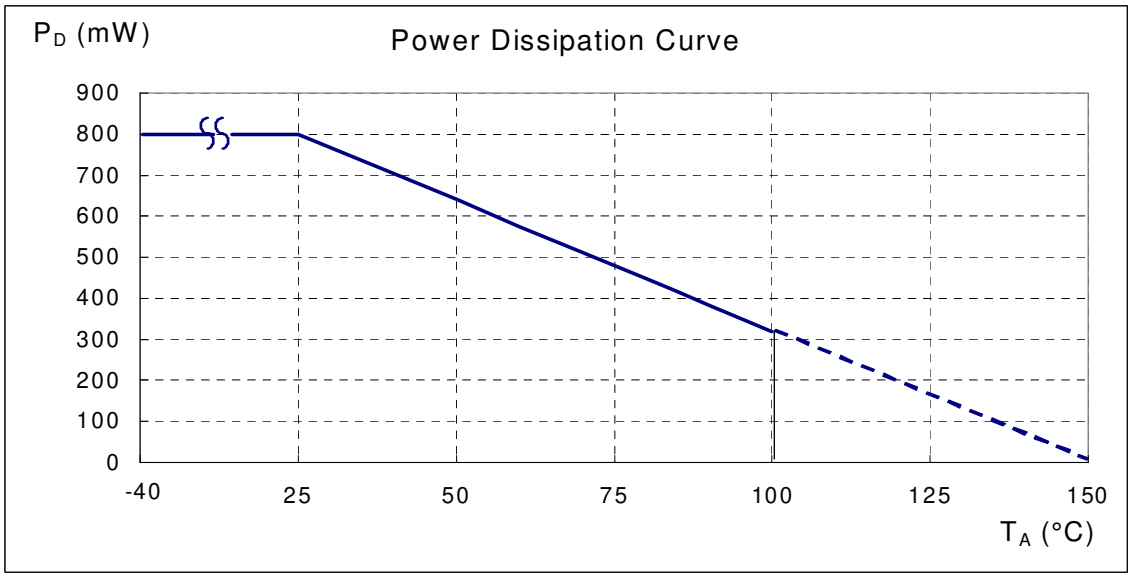
### (1) SIP-4L

| $T_A$ (°C) | 25 | 50 | 60 | 70 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| $P_D$ (mW) | 550 | 440 | 396 | 352 | 308 | 286 | 264 | 242 | 220 |
| **$T_A$ (°C)** | **105** | **110** | **115** | **120** | **125** | **130** | **135** | **140** | **150** |
| $P_D$ (mW) | 198 | 176 | 154 | 132 | 110 | 88 | 66 | 44 | 0 |

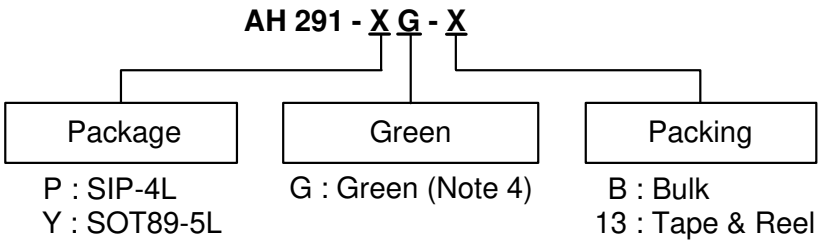



### (2) SOT89-5L

| $T_A$ (°C) | 25 | 50 | 60 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| $P_D$ (mW) | 800 | 640 | 576 | 512 | 480 | 448 | 416 | 384 | 352 | 320 |
| **$T_A$ (°C)** | **105** | **110** | **115** | **120** | **125** | **130** | **135** | **140** | **145** | **150** |
| $P_D$ (mW) | 288 | 256 | 224 | 192 | 160 | 128 | 96 | 64 | 32 | 0 |



## Ordering Information

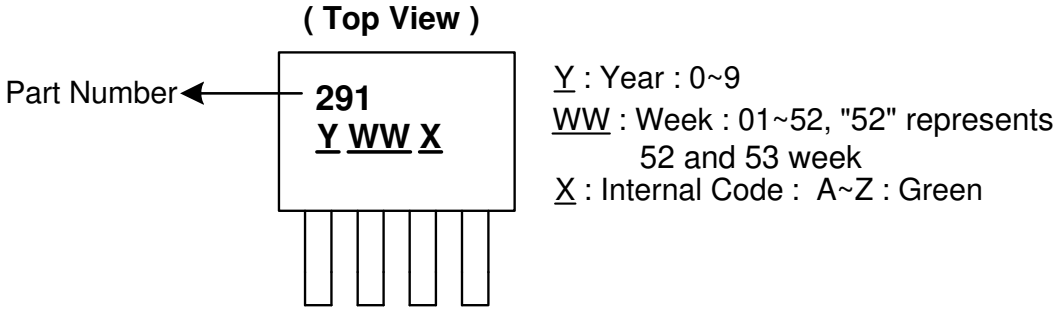



| Device | Package Code | Packaging (Note 5, 6) | Bulk | | 13" Tape and Reel | |
|---|---|---|---|---|---|---|
| | | | Quantity | Part Number Suffix | Quantity | Part Number Suffix |
| AH291-YG-13 | Y | SOT89-5L | NA | NA | 2500/Tape & Reel | -13 |

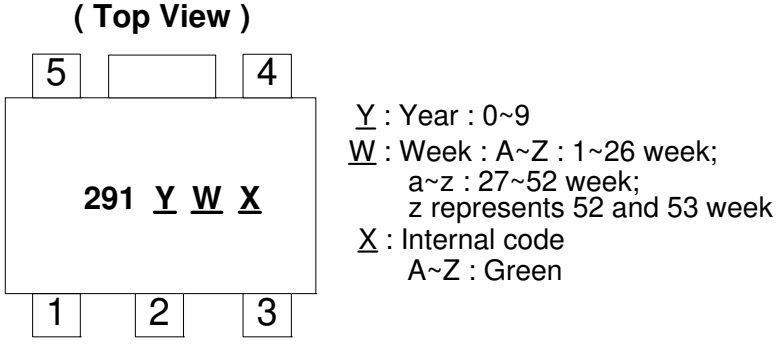
Notes: 4. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at http://www.diodes.com/products/lead_free.html.
5. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
6. Reverse taping as shown on Diodes Inc. Surface Mount (SMD) Packaging document AP02007, which can be found on our website http://www.diodes.com/datasheets/ap02007.pdf.

## Marking Information

**(1) SIP-4L**

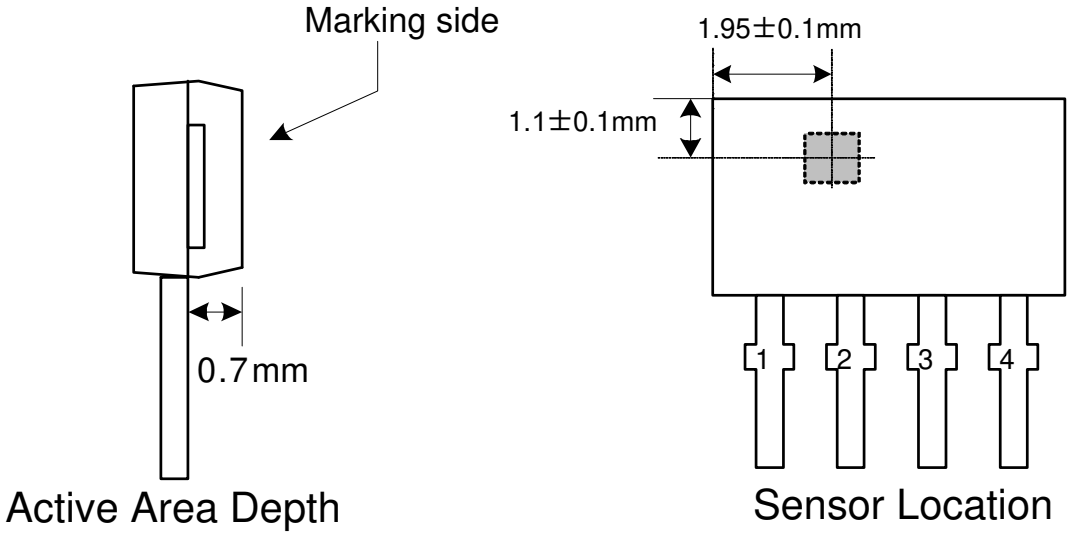



**(2) SOT89-5L**

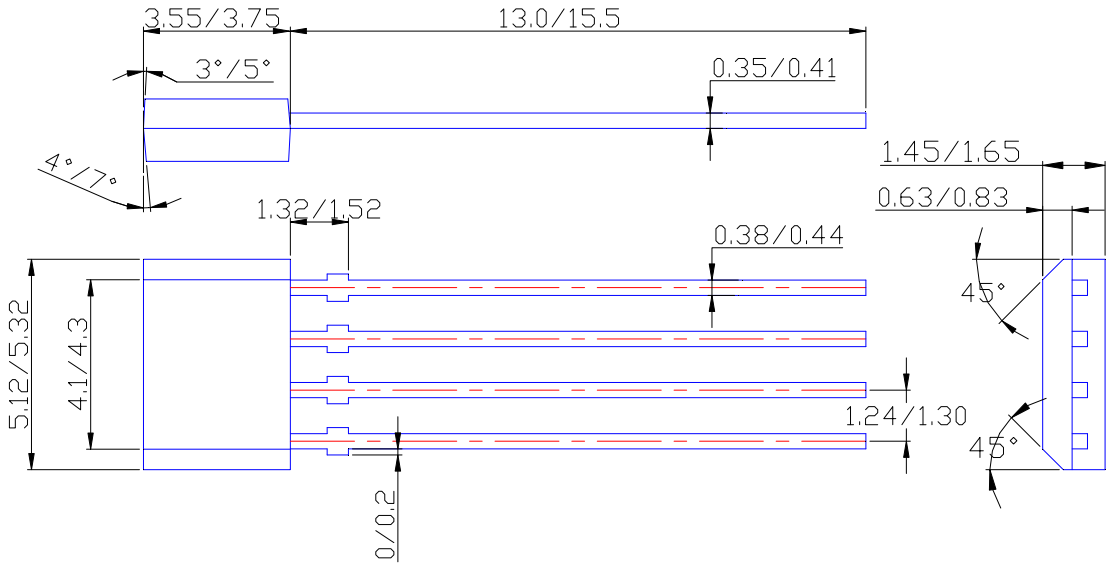


## Package Outline Dimensions (All Dimensions in mm)

**(1) Package type: SIP-4L**

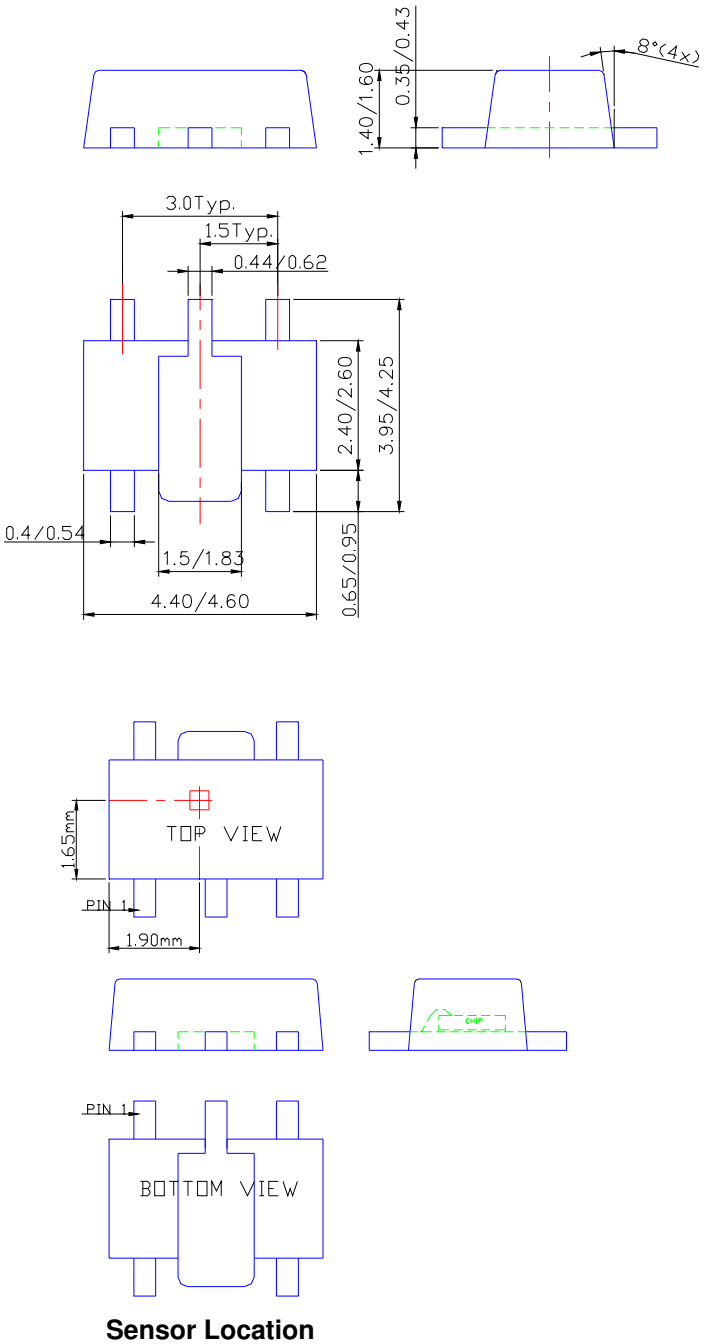



**Package Dimension**



## Package Outline Dimensions (Continued)

### (2) Package type: SOT89-5L




**Sensor Location**

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