

Hall-Effect Smart Fan Motor Controller

■ Features

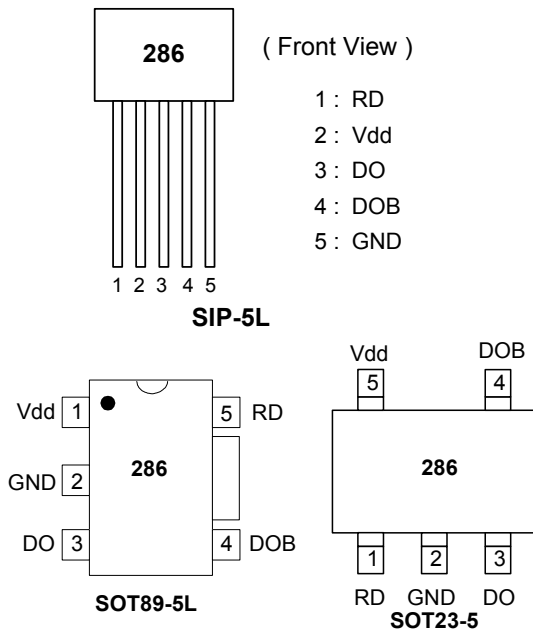
- On chip Hall sensor
- Rotor-locked shutdown
- Automatically restart
- Rotor-state detection (RD) output
- Built-in Zener protection for output driver
- Operating voltage: 3.8V~20 V
- Output current: $I_{O(AVE)} = 500\text{mA}$ for SIP-5/SOT89-5
- Output current: $I_{O(AVE)} = 400\text{mA}$ for SOT23-5
- Package: SIP-5L, SOT23-5L, SOT89-5L

■ General Description

AH286 is a monolithic fan motor controller with Hall sensor's capability. It contains two complementary open-drain transistors for motor's coil driving, automatic lock current shutdown, and recovery protections. In addition, rotor-state detection (RD) output is for Rotor-state detection.

To avoid coil burning, rotor-lock shutdown detection circuit shut down the output driver if the rotor is blocked and then the automatic recovery circuit will try to restart the motor. This function repeats while the rotor is blocked. Until the blocking is removed, the motor recovers running normally.

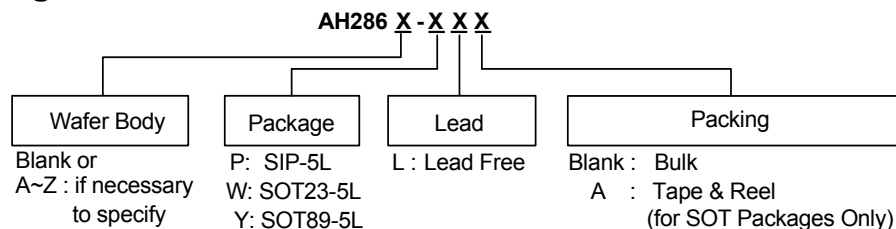
■ Pin Configuration



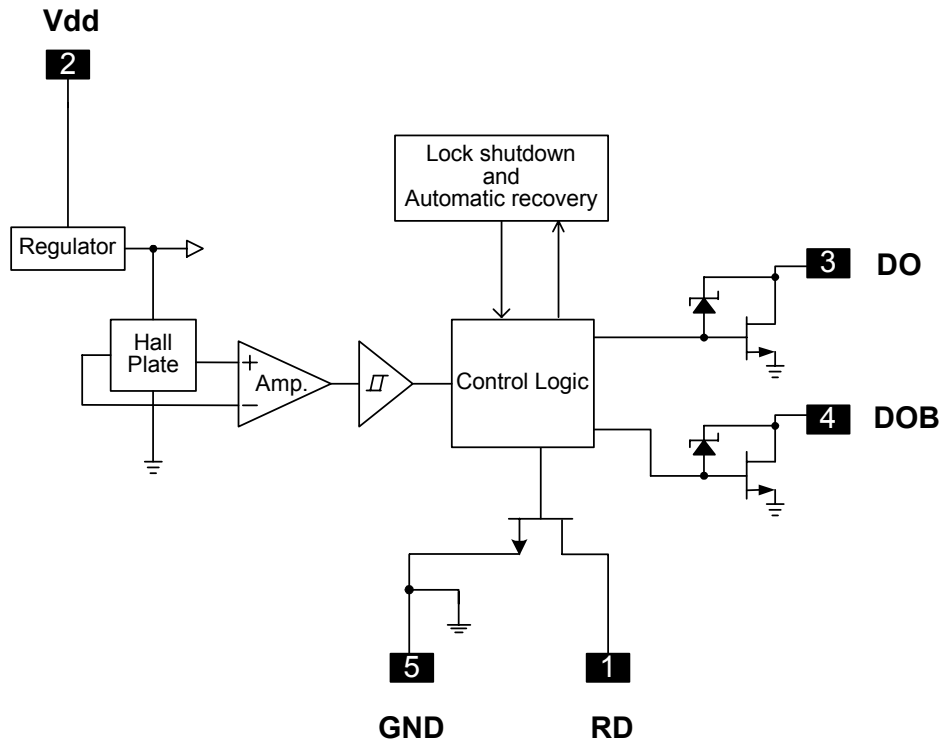
■ Pin Descriptions

| Symbol | Description |
|--------|-----------------------|
| RD | Rotor-state detection |
| Vdd | Input power |
| DO | Output pin |
| DOB | Output pin |
| GND | Ground |

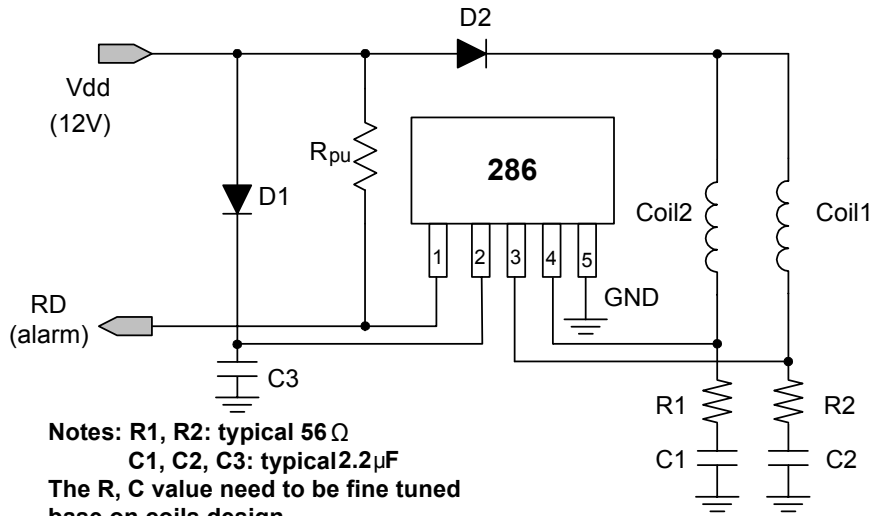
■ Ordering Information



■ Block Diagram (SIP5)



■ Typical Application Circuit (SIP5)



12V DC Brush-less Fan with RD output function

■ Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit | |
|------------------------|----------------------|--------------|------|------|
| Supply Voltage | Vdd | 24 | V | |
| Output Current | I _{O(AVE)} | SIP5/SOT89-5 | 500 | mA |
| | | SOT23-5 | 400 | |
| | I _{O(PEAK)} | 700 | | |
| Power Dissipation | P _D | SIP5 | 550 | mW |
| | | SOT23-5 | 230 | |
| | | SOT89-5 | 800 | |
| Operating Temperature | T _{opr} | -40 ~ 100 | °C | |
| Storage Temperature | T _{stg} | -55 ~ 150 | °C | |
| Maximum Junction Temp. | T _j | 150 | °C | |
| Thermal Resistance | θ _{jc} | SIP5 | 227 | °C/W |
| | | SOT23-5 | 543 | |
| | | SOT89-5 | 156 | |

■ Electrical Characteristics (Ta = 25 °C, Vdd = 12V, unless otherwise notice)

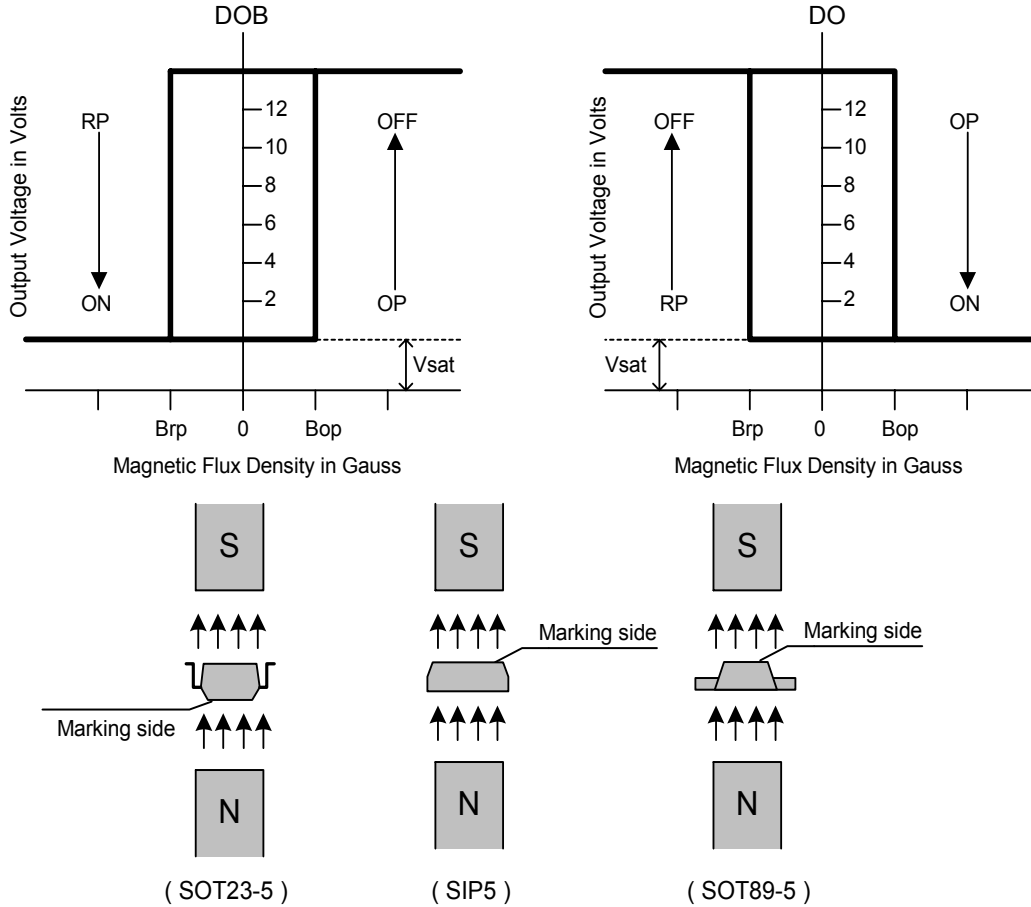
| Characteristics | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------------|-----------------------|-----------------------|------|-------|------|------|
| Supply Voltage | Vdd | Operating | 3.8 | - | 20 | V |
| Supply current | I _{dd} | Operating | - | 2.0 | 4.0 | mA |
| Output Leakage Current | I _{off} | V _{OUT} =24V | - | < 0.1 | 10 | μA |
| Locked Protection On | T _{lrp-on} | | 0.4 | 0.5 | 0.6 | Sec |
| Locked Protection Off | T _{lrp-off} | | 2.4 | 3 | 3.6 | Sec |
| Output saturation voltage | V _{OUT(sat)} | I _O =300mA | - | 375 | 500 | mV |
| | | I _O =500mA | - | 625 | 900 | |
| Output On resistance | R _{ds(on)} | I _O =300mA | - | 1.25 | 1.67 | ohm |
| RD output V _{ds} | V _{ol} | I _O =10mA | - | 0.5 | - | V |
| Output Zener-breakdown Voltage | V _z | | 35 | 42 | 60 | V |

■ Magnetic Characteristics (Ta = 25 °C, Vdd = 12V, unless otherwise specified)

(1mT=10 Gauss)

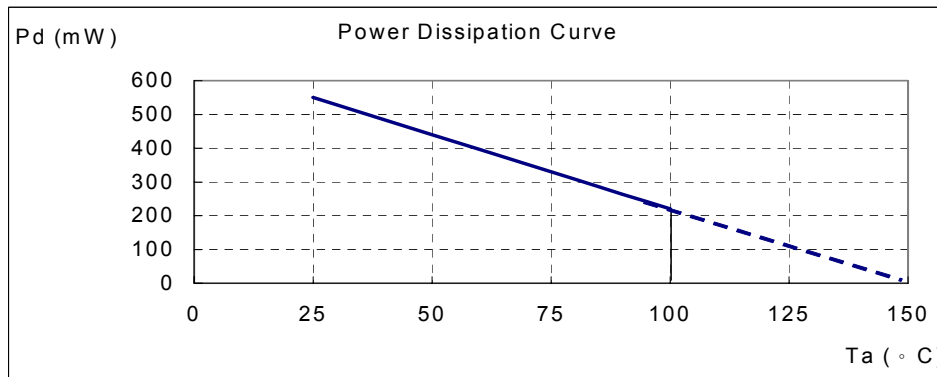
| Characteristics | Symbol | Min. | Typ. | Max. | Unit |
|-----------------|-----------------|------|------|------|-------|
| Operate Point | B _{op} | 10 | 30 | 60 | Gauss |
| Release Point | B _{rp} | -60 | -30 | -10 | Gauss |
| Hysteresis | B _{hy} | -- | 60 | -- | Gauss |

■ Operating Characteristics



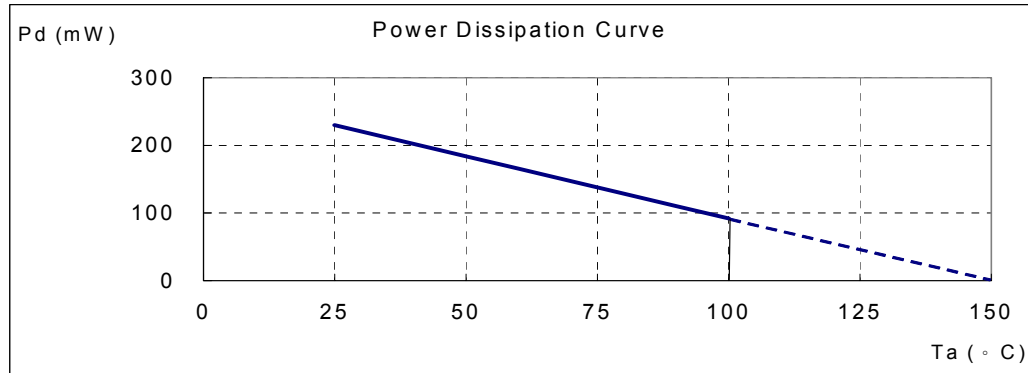
■ Performance Characteristics (SIP5)

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



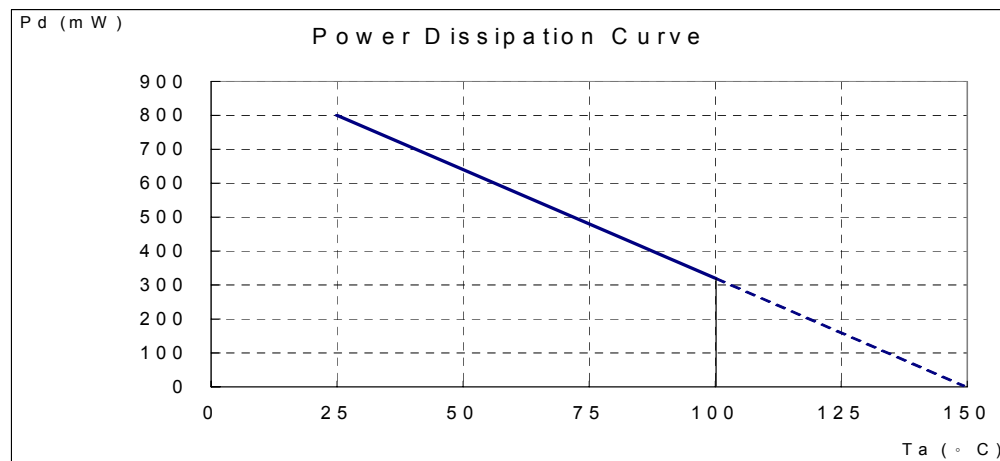
■ Performance Characteristics (SOT23-5)

| Ta (°C) | 25 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pd (mW) | 230 | 184 | 166 | 147 | 129 | 110 | 92 | 74 | 55 | 37 | 18 | 0 |



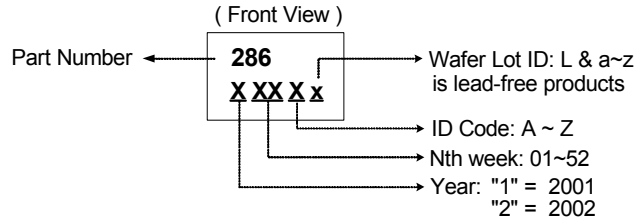
■ Performance Characteristics (SOT89-5)

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

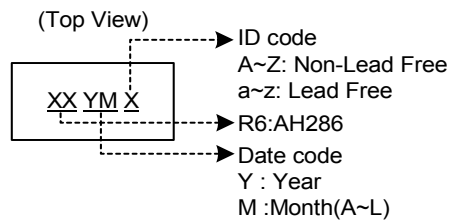


■ Marking Information

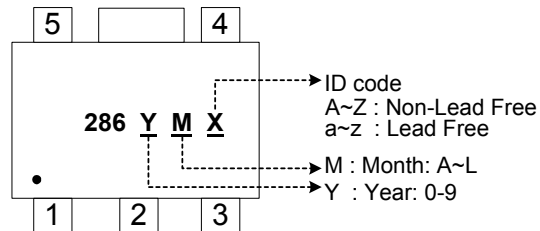
(1)SIP-5L



(2)SOT23-5L

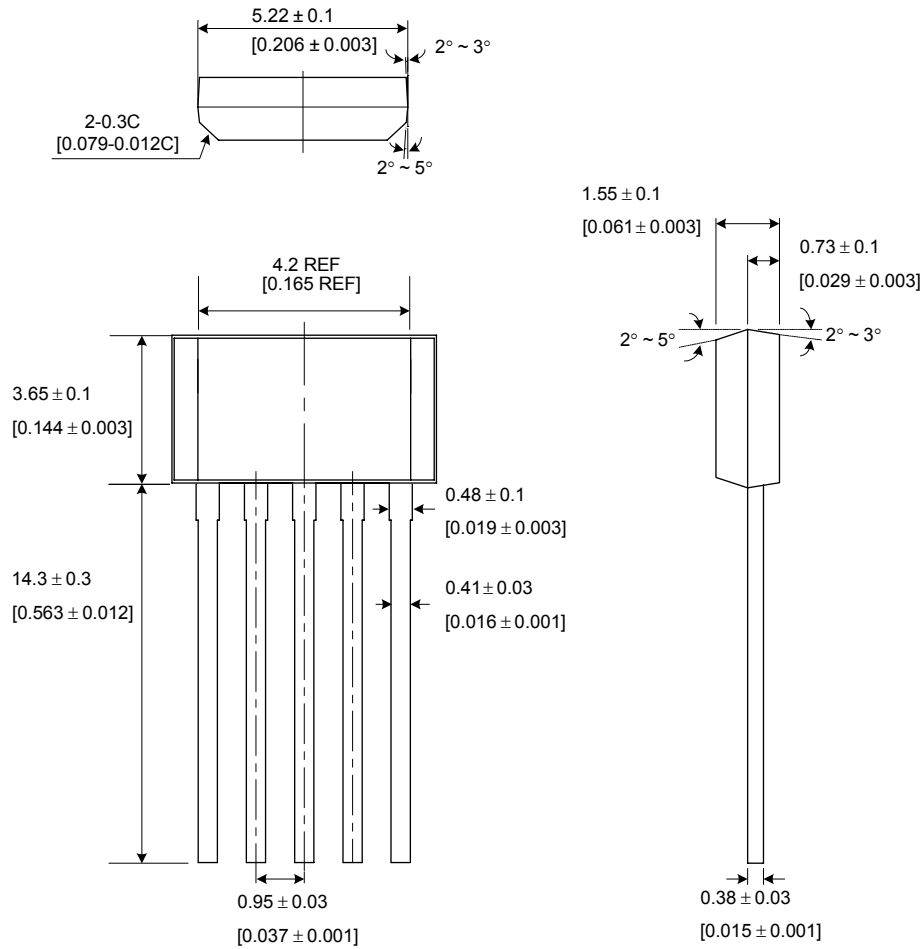


(3)SOT89-5L

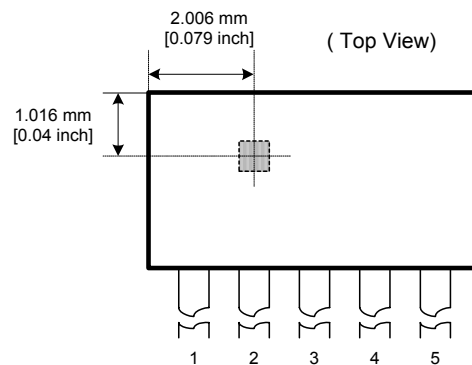


■ Package Information

(1) Package type: SIP-5L (unit: mm / [inch])

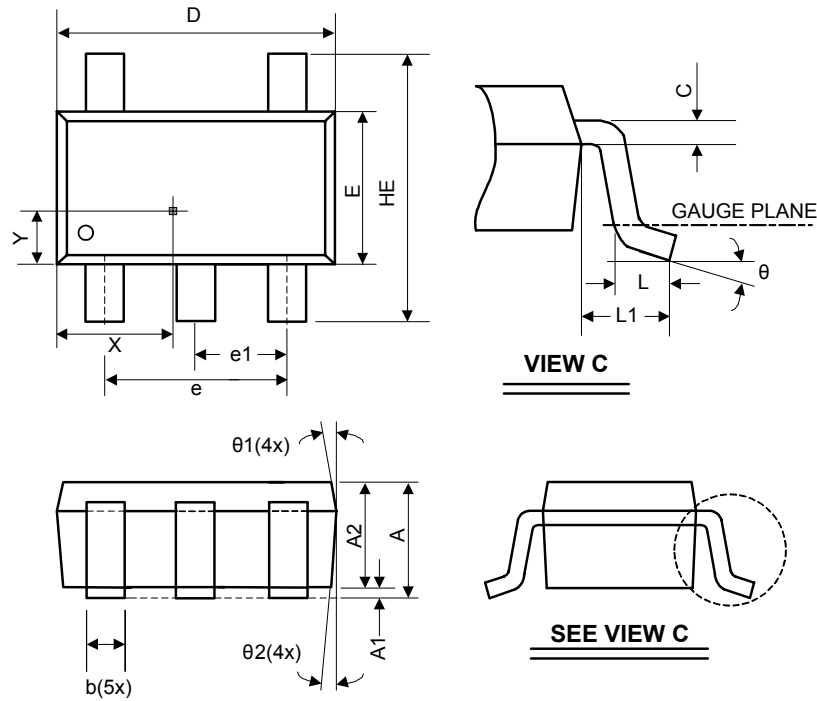


■ Location of Sensing Point



Hall-Effect Smart Fan Motor Controller

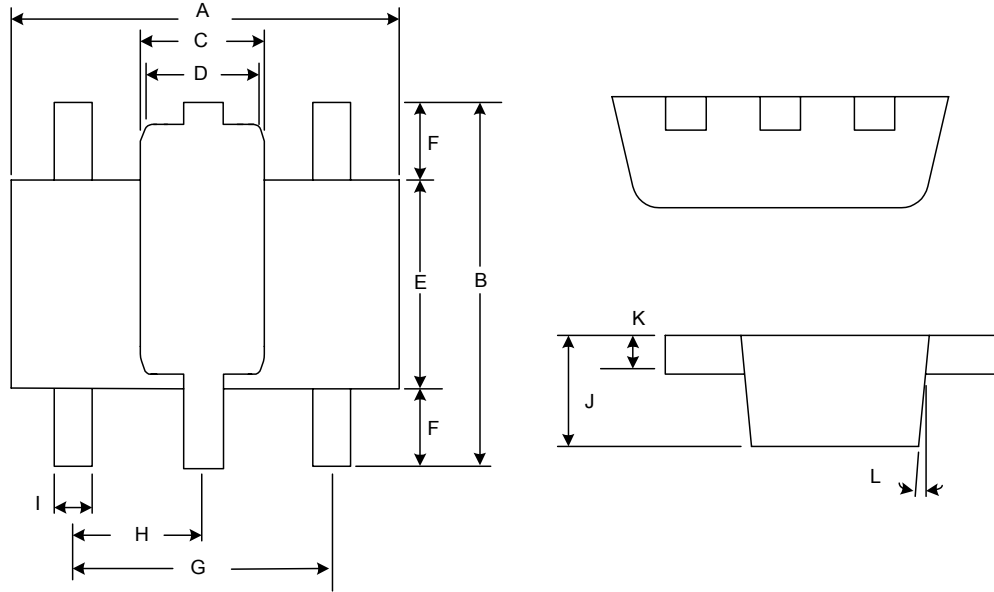
(2) SOT23-5L



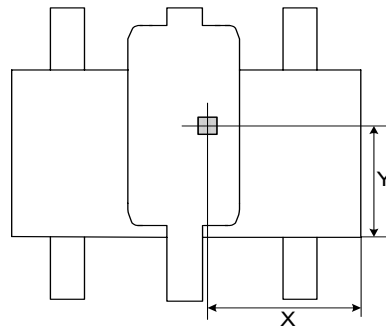
| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|------------|---------------------------|-------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 1.05 | - | 1.35 | 0.041 | - | 0.053 |
| A1 | 0.05 | - | 0.15 | 0.002 | - | 0.006 |
| A2 | 1.00 | 1.10 | 1.20 | 0.039 | 0.043 | 0.047 |
| b | 0.25 | - | 0.50 | 0.010 | - | 0.020 |
| C | 0.08 | - | 0.20 | 0.003 | - | 0.008 |
| D | 2.70 | 2.90 | 3.00 | 0.106 | 0.114 | 0.118 |
| E | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| HE | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| L | 0.30 | - | 0.60 | 0.012 | - | 0.024 |
| L1 | 0.50 | 0.60 | 0.70 | 0.020 | 0.024 | 0.028 |
| e | 1.80 | 1.90 | 2.00 | 0.071 | 0.075 | 0.079 |
| e1 | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 |
| θ | 0° | 5° | 10° | 0° | 5° | 10° |
| θ_1 | 3° | 5° | 7° | 3° | 5° | 7° |
| θ_2 | 6° | 8° | 10° | 6° | 8° | 10° |
| X | - | 1.067 | - | - | 0.042 | - |
| Y | - | 0.432 | - | - | 0.017 | - |

Hall-Effect Smart Fan Motor Controller

(3) Package type: SOT89-5L



Package Sensor Location



| Symbol | Dimensions In Millimeters | | | Dimensions In Inches | | |
|--------|---------------------------|------|------|----------------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 4.40 | 4.50 | 4.60 | 0.173 | 0.177 | 0.181 |
| B | 4.05 | 4.15 | 4.25 | 0.159 | 0.163 | 0.167 |
| C | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| D | 1.30 | 1.40 | 1.50 | 0.051 | 0.055 | 0.059 |
| E | 2.40 | 2.50 | 2.60 | 0.094 | 0.098 | 0.102 |
| F | 0.80 | - | - | 0.031 | - | - |
| G | 3.00 Ref. | | | 0.118 Ref. | | |
| H | 1.50 Ref. | | | 0.059 Ref. | | |
| I | 0.40 | 0.46 | 0.52 | 0.016 | 0.018 | 0.020 |
| J | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| K | 0.35 | 0.39 | 0.43 | 0.014 | 0.015 | 0.017 |
| L | 5° Typ. | | | 5° Typ. | | |
| X | - | 1.90 | - | - | 0.075 | - |
| Y | - | 1.65 | - | - | 0.065 | - |