

## HIGH VOLTAGE HALL-EFFECT SMART FAN MOTOR CONTROLLER

### Features

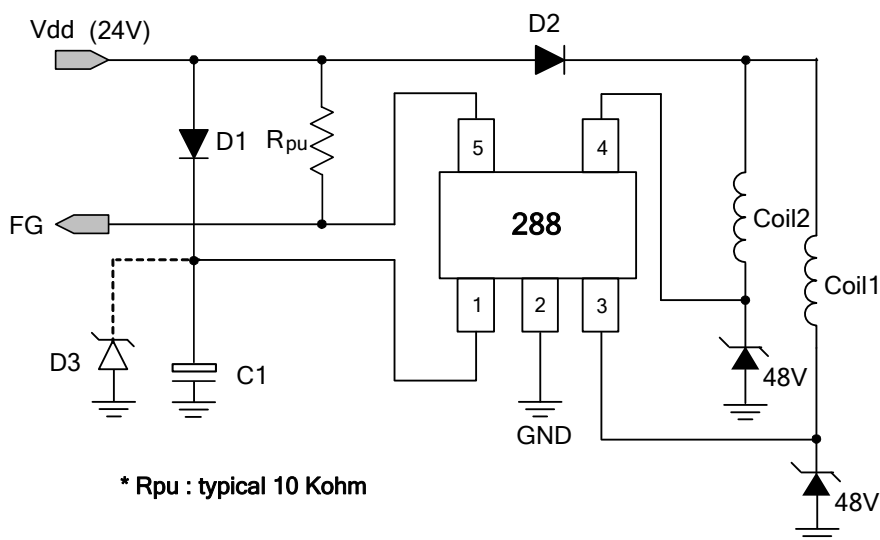
- On chip Hall sensor
- Rotor-locked shutdown
- Automatically restart
- Frequency generator (FG) output
- Built-in Zener protection for output driver
- Operating voltage: 3.8V~28V
- Output current:  $I_{O(AVE)} = 400\text{mA}$
- Lead Free Package: SOT89-5L (Note 1)
- SOT89-5L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/RoHS Compliant (Note 2)

### General Description

AH288 is a monolithic fan motor controller with Hall sensor's capability. It contains two complementary open-drain transistors as motor coil drivers, automatic lock current shutdown, and recovery protections. Additional, frequency generator (FG) output is for speed detection 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.

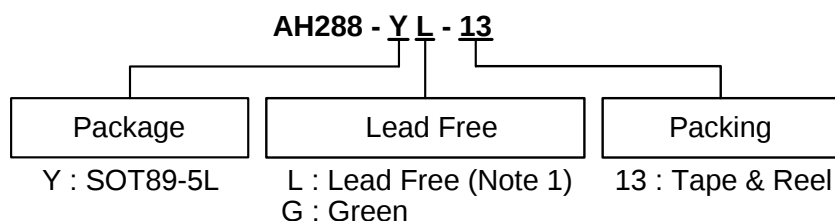
### Typical Application Circuit



Note: The optional Capacitor C1 and Diode D3 are for power stabilization. C1 is recommended to be E-Cap.,  $\mu\text{F}/25\text{V}$ ; D3 is recommended to be Zener Diode,  $V_Z = 27\text{V}$ . Which C1 and D3 value need to be fine tuned to optimize design for different coils and power suppliers.

#### 24V DC Brush-less Fan with FG output function

### Ordering Information

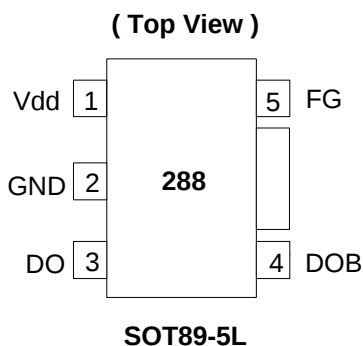


| Device      | Package Code | Packaging (Note 3) | 13" Tape and Reel |                    |
|-------------|--------------|--------------------|-------------------|--------------------|
|             |              |                    | Quantity          | Part Number Suffix |
| AH288-YL-13 | Y            | SOT89-5L           | 2500/Tape & Reel  | -13                |
| AH288-YG-13 | Y            | SOT89-5L           | 2500/Tape & Reel  | -13                |

Notes:

- AH288-YL-13 will be replaced by AH288-YG-13
- EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).
- 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>.
- 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>.

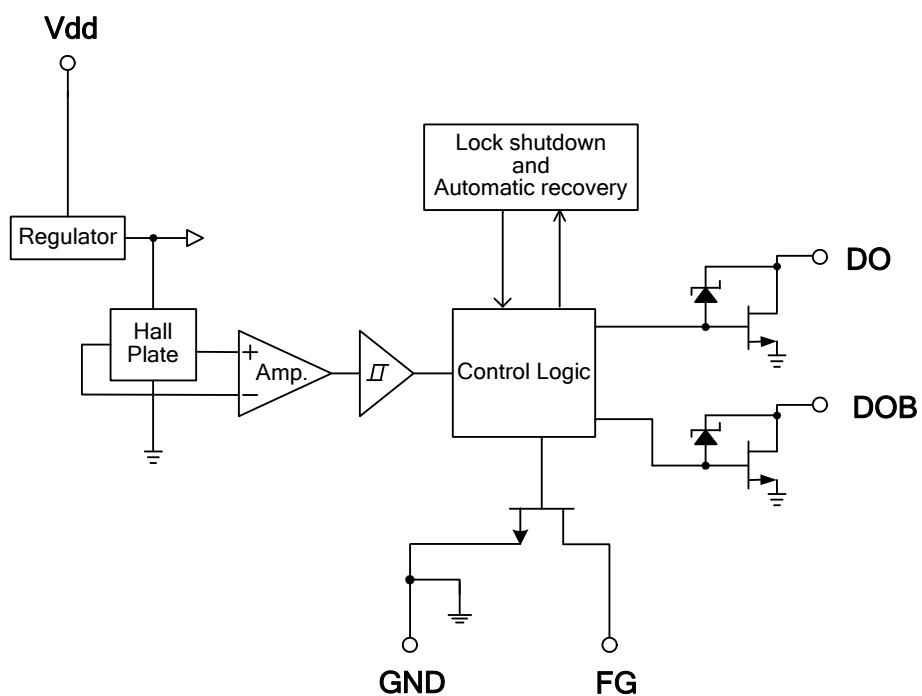
### Pin Assignments



### Pin Descriptions

| Pin Name | Pin No. | Description          |
|----------|---------|----------------------|
| Vdd      | 1       | Input power          |
| GND      | 2       | Ground               |
| DO       | 3       | Output pin           |
| DOB      | 4       | Output pin           |
| FG       | 5       | Frequency generation |

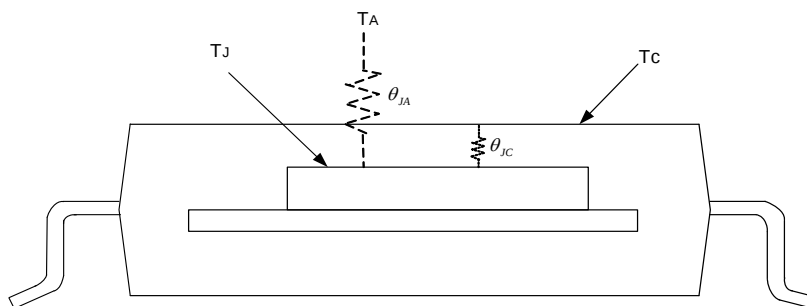
## Block Diagram



# HIGH VOLTAGE HALL-EFFECT SMART FAN MOTOR CONTROLLER

## Absolute Maximum Ratings (TA = 25°C)

| Symbol          | Parameter                                    | Rating               | Unit   |
|-----------------|----------------------------------------------|----------------------|--------|
| V <sub>DD</sub> | Supply Voltage                               | 30                   | V      |
| I <sub>O</sub>  | Output Current                               | I <sub>O(AVE)</sub>  | 400 mA |
|                 |                                              | I <sub>O(PEAK)</sub> | 700 mA |
| P <sub>D</sub>  | Power Dissipation                            | 800                  | mW     |
| T <sub>ST</sub> | Storage Temperature                          | -55 ~ 150            | °C     |
| T <sub>J</sub>  | Maximum Junction Temperature                 | 150                  | °C     |
| θ <sub>JA</sub> | Thermal Resistance Junction-to-Case (Note 5) | 156                  | °C/W   |



Notes: 5. θ<sub>JA</sub> should be confirmed with what heat sink thermal resistance. If no heat sink contacting, θ<sub>JA</sub> is almost the same as θ<sub>JC</sub>.

## Recommended Operating Conditions

| Symbol          | Characteristic                | Conditions | Min | Max | Unit |
|-----------------|-------------------------------|------------|-----|-----|------|
| V <sub>DD</sub> | Supply Voltage (Note 6)       | Operating  | 3.8 | 28  | V    |
| T <sub>A</sub>  | Operating Ambient Temperature | Operating  | -40 | 100 | °C   |

Notes: 6. Please watch out the current limit issue when the operation voltage is over 26.4V, because of the different efficiency in the coil.

## HIGH VOLTAGE HALL-EFFECT SMART FAN MOTOR CONTROLLER

### Electrical Characteristics (TA = 25 °C, Vdd = 24V, unless otherwise specified)

| Symbol                | Parameter                      | Conditions             | Min | Typ.  | Max | Unit |
|-----------------------|--------------------------------|------------------------|-----|-------|-----|------|
| I <sub>CC</sub>       | Supply Current                 | Operating              | -   | 2     | 4   | mA   |
| I <sub>OFF</sub>      | Output Leakage Current         | V <sub>OUT</sub> = 24V | -   | < 0.1 | 10  | μA   |
| T <sub>LRP-ON</sub>   | Locked Protection On           |                        | 0.4 | 0.46  | 0.6 | Sec  |
| T <sub>LRP-OFF</sub>  | Locked Protection Off          |                        | 2.4 | 2.76  | 3.6 | Sec  |
| V <sub>OUT(SAT)</sub> | Output Saturation Voltage      | I <sub>O</sub> = 200mA | -   | 450   | 700 | mV   |
|                       |                                | I <sub>O</sub> = 300mA | -   | 680   | 800 |      |
| R <sub>DS(ON)</sub>   | Output On Resistance           | I <sub>O</sub> = 200mA | -   | 2.25  | 3.5 | ohm  |
| V <sub>OL</sub>       | FG Output Vds                  | I <sub>O</sub> = 10mA  | -   | 0.3   | 0.5 | V    |
| V <sub>Z</sub>        | Output Zener-breakdown Voltage |                        | 42  | 55    | 65  | V    |

### Truth Table

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

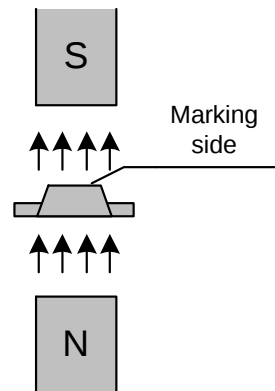
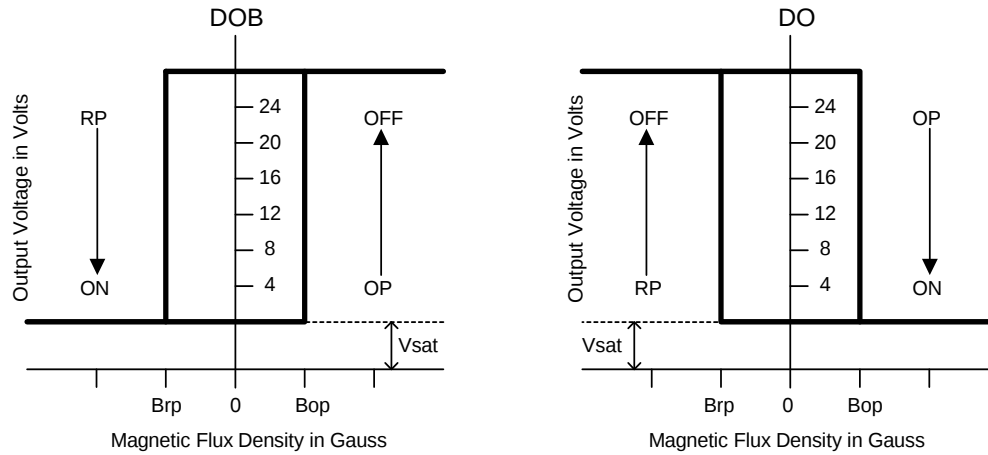
### Magnetic Characteristics (TA = 25 °C, Vdd = 24V, unless otherwise specified, Note 7)

(1mT=10 Gauss)

| Symbol | Characteristics | Min | Typ. | Max | Unit  |
|--------|-----------------|-----|------|-----|-------|
| Bop    | Operate Point   | 10  | 30   | 60  | Gauss |
| Brp    | Release Point   | -60 | -30  | -10 | Gauss |
| Bhy    | Hysteresis      | -   | 60   | -   | Gauss |

Notes: 7. Magnetic characteristics are for design information, which will vary with supply voltage, operating temperature and after soldering.

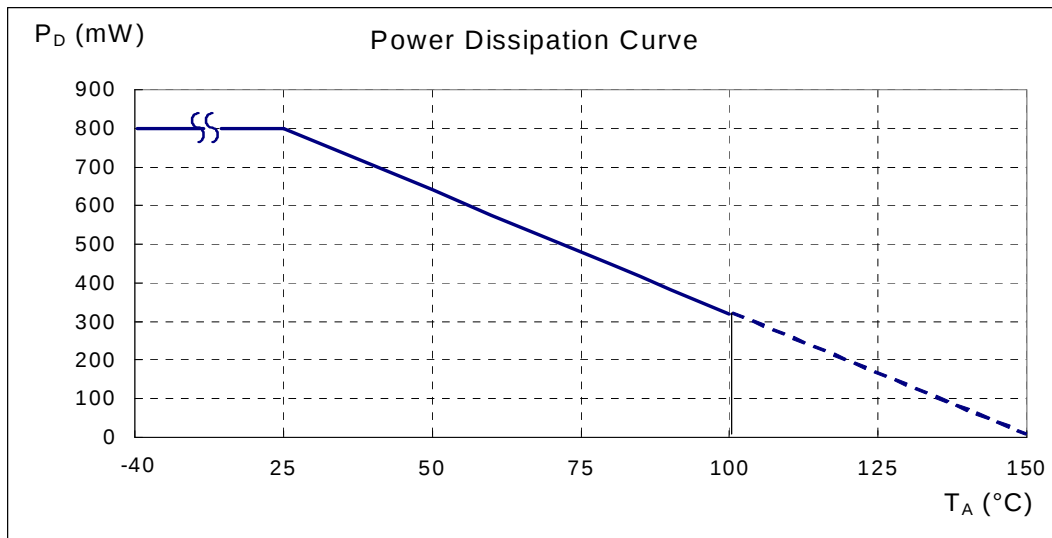
## Operating Characteristics



( SOT89-5L )

**Performance Characteristics (SOT89-5L)**

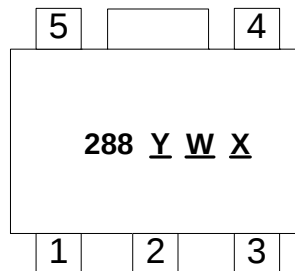
| T <sub>A</sub> (°C) | 25  | 50  | 60  | 70  | 75  | 80  | 85  | 90  | 95  | 100 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| P <sub>D</sub> (mW) | 800 | 640 | 576 | 512 | 480 | 448 | 416 | 384 | 352 | 320 |
| T <sub>A</sub> (°C) | 105 | 110 | 115 | 120 | 125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



**Marking Information**

(1) SOT89-5L

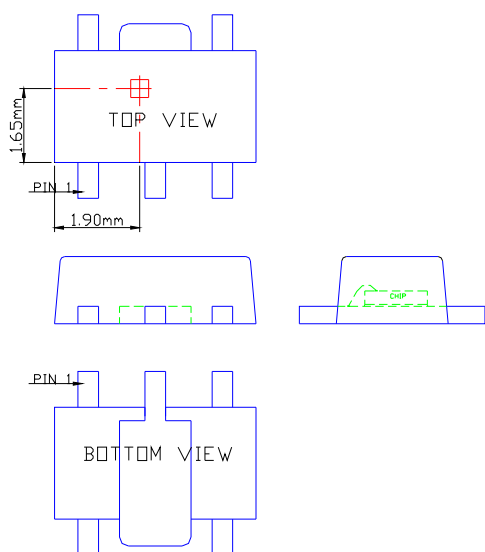
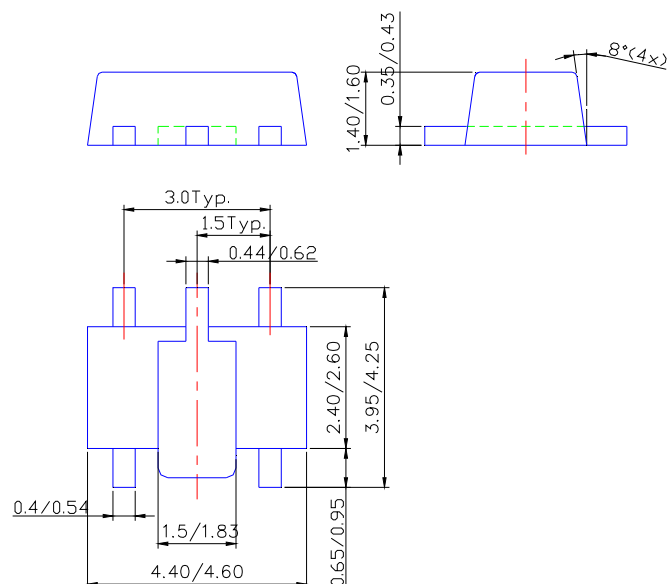
( Top View )



Y : Year : 0~9  
W : Week : A~Z : 1~26 week;  
           a~z : 27~52 week;  
           z represents 52 and 53 week  
X : Internal code  
           a~z : Lead Free  
           A~Z : Green

**Package Information (All Dimensions in mm)**

**(1) Package type: SOT89-5L**



**Sensor Location**

**HIGH VOLTAGE HALL-EFFECT SMART FAN MOTOR  
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