

## Hall-Effect Smart Fan Motor Controller

### Features

- Motor driver with integrated Hall sensor
- Lock-shutdown protection & auto-restart function
- Built output clamp voltage protection for output driver
- Operating voltage: 3.0V ~ 18V
- Output Current:  $I_{O(CONT)} = 500\text{mA}$
- Available in SIP-4L packages

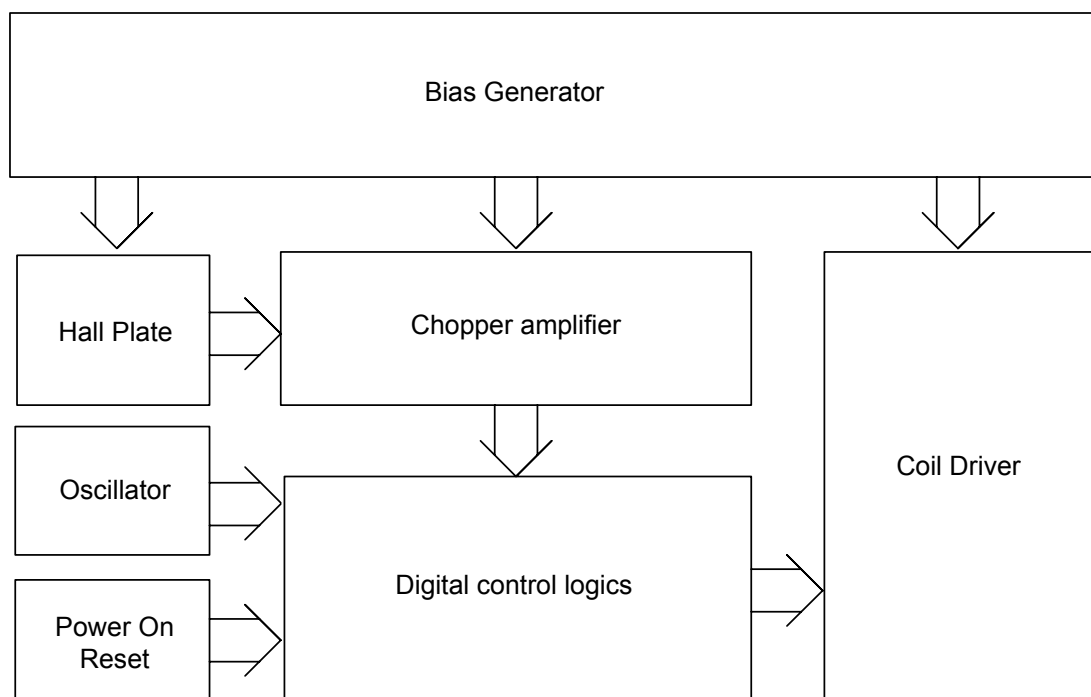
**Halogen Free**

### General Description

FD284 is a two coil motor driver with embedded Hall sensor. It integrates the motor driver with the Hall sensor, which simplifies the PCB(printed circuit board) design and make the fabrication of small-size motors possible. Lock-shutdown and auto-restart function restarts the motor after being locked.

The protected action is repeated and periodic during the blocked period. Until the blocking is removed, the motor Recovers and runs normally.

### Block Diagram



**Figure.1**



## Pin Connection

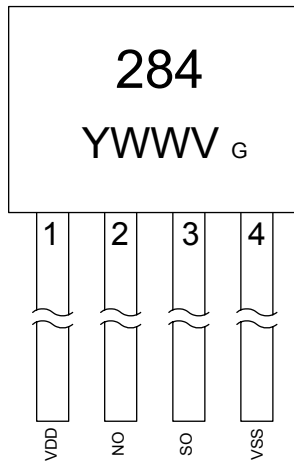


Figure.2

## Marking Distinguish

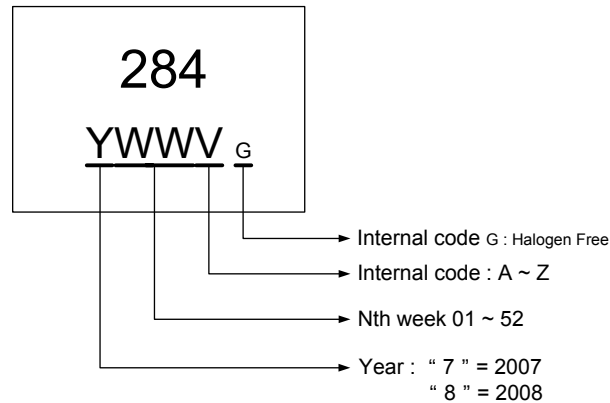


Figure.3

## Pin Descriptions

| Name | I/O | FD284 | Description           |
|------|-----|-------|-----------------------|
| VSS  | G   | 4     | Ground                |
| SO   | O   | 3     | Driver output         |
| NO   | O   | 2     | Driver output         |
| VDD  | P   | 1     | Positive power supply |

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

## Functional Descriptions

Refer to the block diagram (Figure.1), FD284 is composed of the following building blocks:

- Bias generator

The bias generator provides precise, temperature- and process-insensitive bias references for the analog circuit blocks. These references guarantee proper operation of the IC under all conditions specified in this specification.

- Oscillator

The built-in oscillator provides the clock signal for the digital control logics

- Power-on Reset

Used to detect the power-up ramp and reset the digital circuits to achieve correct operation as soon as the power is ready.

- Chopper Amplifier

To achieve a higher magnetic sensitivity the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

- Digital control logics

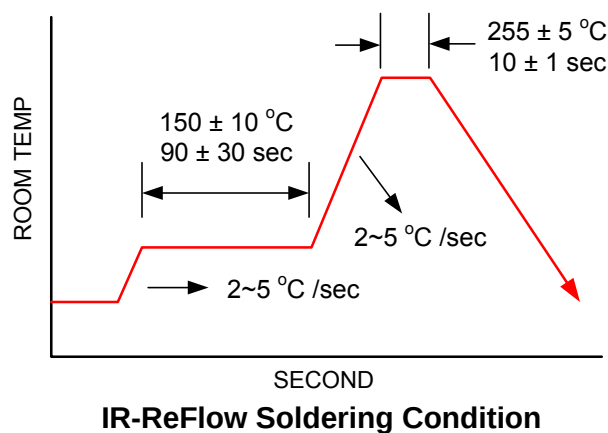
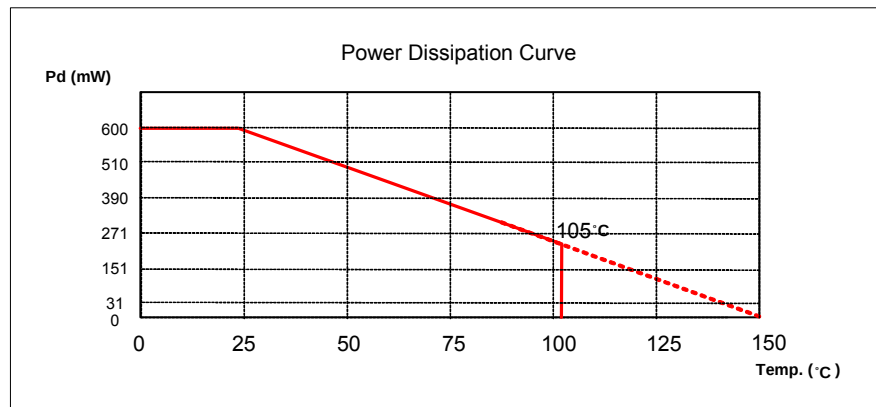
- Hall sensor part – generates controlling signals for the Hall sensor.
- Coil driver part – generates controlling signals for the Coil driver.



## Absolute Maximum Ratings

| Parameter                  | Symbol        | Conditions | Values |      |                   | Unit  |
|----------------------------|---------------|------------|--------|------|-------------------|-------|
|                            |               |            | min.   | Typ. | max.              |       |
| Operating Temperature      | $T_{OP}$      | -          | -20    |      | 100               | °C    |
| Storage Temperature        | $T_{ST}$      | -          | -40    |      | 150               | °C    |
| Output clamp Voltage       | $V_C$         |            | 25     |      | 27                | V     |
| DC Supply Voltage          | $V_{DD}$      | -          |        |      | 18 <sup>(1)</sup> | V     |
| Supply Current             | $I_{DD}$      | -          |        |      | 6                 | mA    |
| Continuous Current         | $I_{O(CONT)}$ |            |        |      | 500               | mA    |
| Peak Current               | $I_{O(PEAK)}$ |            |        |      | 700               | mA    |
| Junction temperature       | $T_J$         |            |        |      | 150               | °C    |
| Power Dissipation          | $P_D$         | SIP-4L     |        |      | 600               | mW    |
| Thermal Resistance         | $\theta_{JC}$ | SIP-4L     |        | 209  |                   | °C/W  |
| Magnetic Flux Density      | B             |            |        |      | Unlimited         | Gauss |
| IR-Reflow Lead Temperature |               | 10sec      |        |      | 260               | °C    |

**Note 1:**  $V_{DD}=18V$ , If  $V_{BEMF}$  is lower than the output clamp voltage ( $V_C$ ).



### Recommended Operating Conditions

| Parameter                   | Symbol   | Conditions | Values |      |                   | Unit |
|-----------------------------|----------|------------|--------|------|-------------------|------|
|                             |          |            | min.   | typ. | max.              |      |
| Supply Voltage              | $V_{DD}$ | -          | 3.0    |      | 16 <sup>(1)</sup> | V    |
| Operating Temperature Range | $T_A$    | -          | -20    |      | 85                | °C   |

**Note 1:**  $V_{DD}=16V$ , If  $V_{BEMF}$  is lower than the output clamp voltage ( $V_c$ ).

### Electrical Characteristics $V_{DD}=12.0V$ , $T_A=25^{\circ}C$ (unless otherwise specified)

| Parameter                       | Symbol       | Conditions                                        | Values |      |      | Unit |
|---------------------------------|--------------|---------------------------------------------------|--------|------|------|------|
|                                 |              |                                                   | min.   | typ. | max. |      |
| Average Supply Current(no load) | $I_{DD}$     |                                                   |        | 2.5  |      | mA   |
| On resistance (NO, SO pin)      | $R_{DS(on)}$ | $V_{DD}=5V$ , $T_A=25^{\circ}C$ , $I_{out}=300mA$ |        | 1    |      | Ohm  |
| Locked Rotor Period             | $T_{ON}$     |                                                   |        | 0.4  |      | s    |
| Locked Rotor Period             | $T_{OFF}$    |                                                   |        | 2.8  |      | s    |

### Magnetic Characteristics

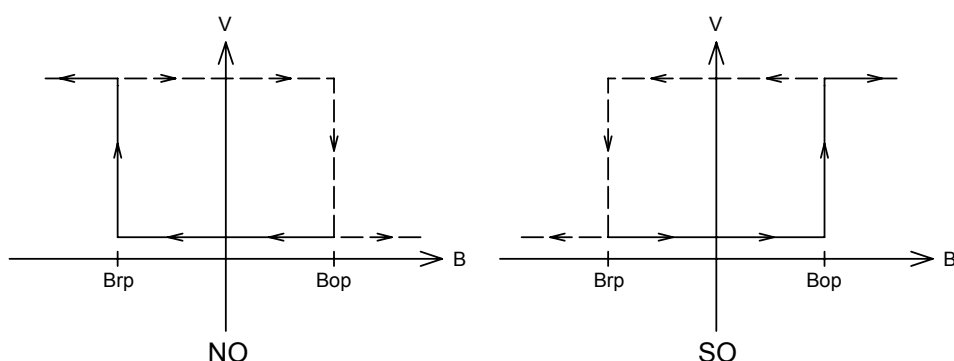
| Parameter      | Symbol   | Conditions | Values |      |      | Unit |
|----------------|----------|------------|--------|------|------|------|
|                |          |            | min.   | typ. | max. |      |
| Operate Points | $B_{OP}$ |            | 5      | 20   | 40   | G    |
| Release Points | $B_{RP}$ |            | -5     | -20  | -40  | G    |

### Driver output vs. Magnetic Pole

| Parameter  | Test Conditions | NO   | SO   |
|------------|-----------------|------|------|
| North pole | $B < B_{RP}$    | High | Low  |
| South pole | $B > B_{OP}$    | Low  | High |

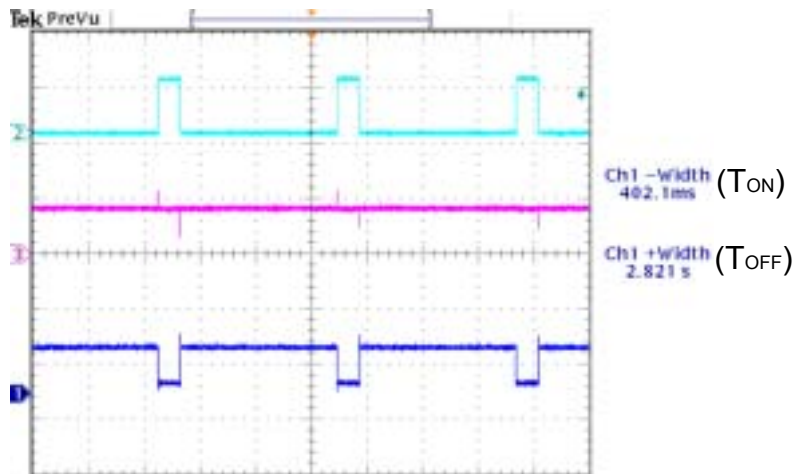
**Note:** The magnetic pole is applied facing the branded side of the package

### Hysteresis Characteristics





## Lock shutdown – Restart Timing Description:



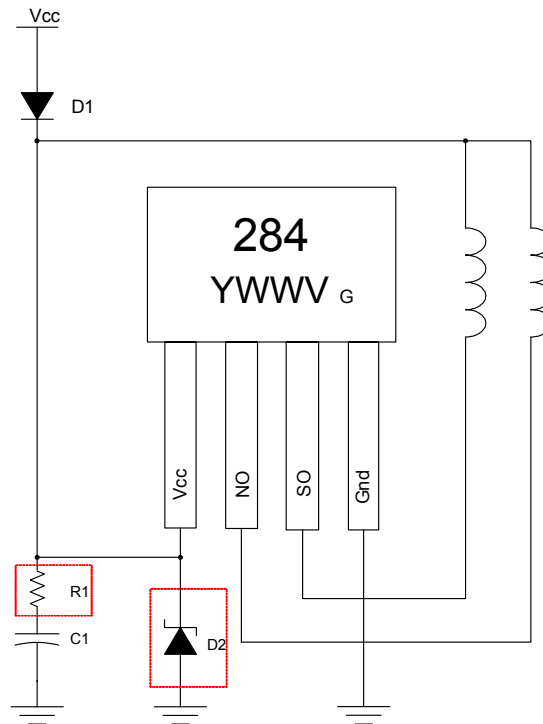
Channel2:  $V_{DD}$  pin current waveform

Channel3: Output (SO pin) voltage waveform

Channel1: Output (NO pin) voltage waveform

**Note:** The North pole ( $B > Bop$ ) is applied facing the branded side of the package.

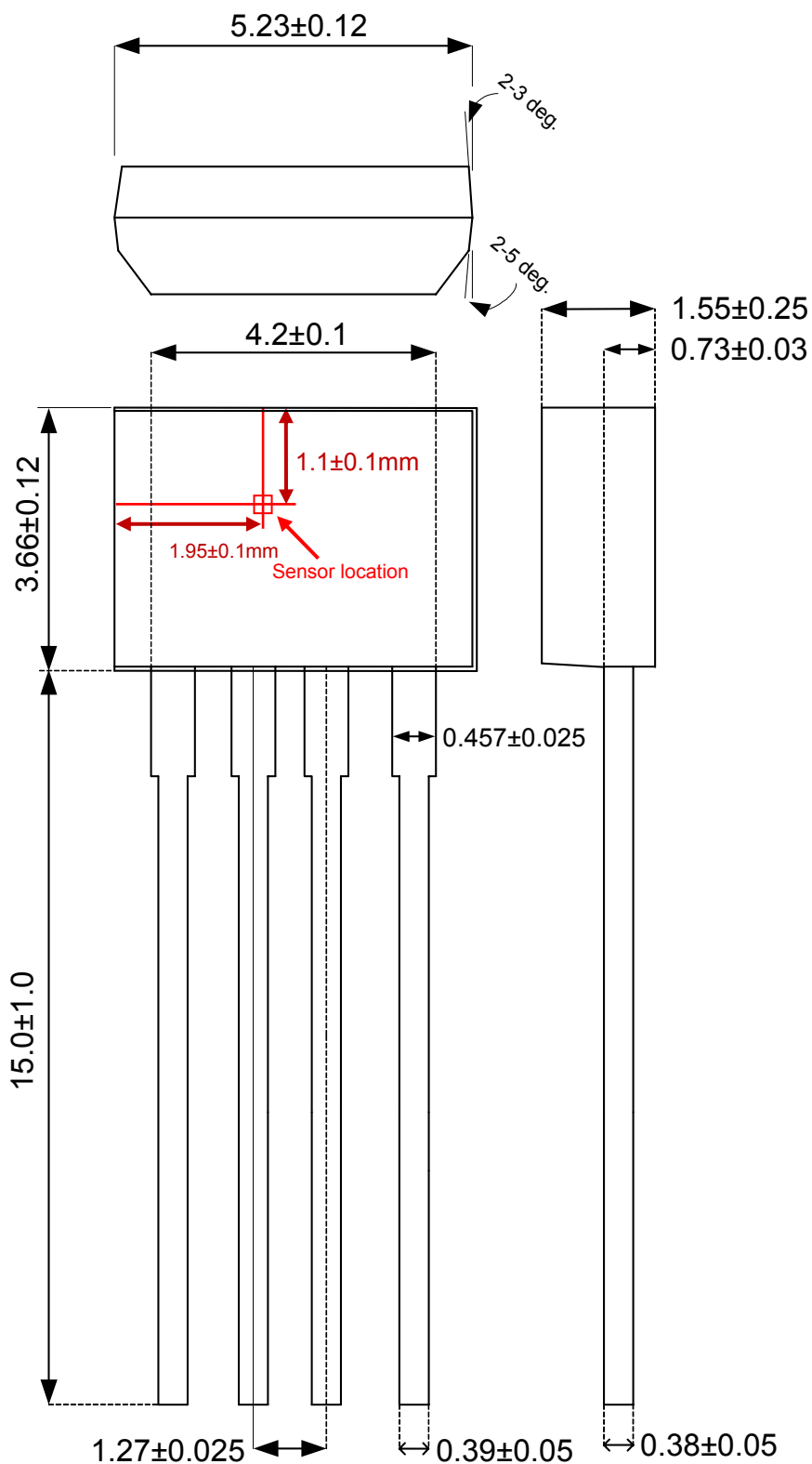
### Application Circuit Reference



**Figure.10**

**Note:**  $C1=1\mu F$ ,  $R1=2\sim 5\ \Omega$ (option),  $D2$ (option) breakdown voltage 16V

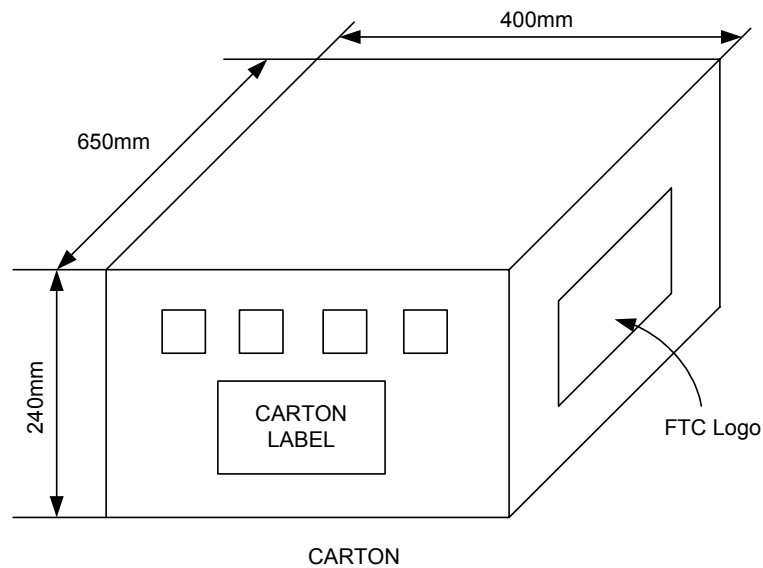
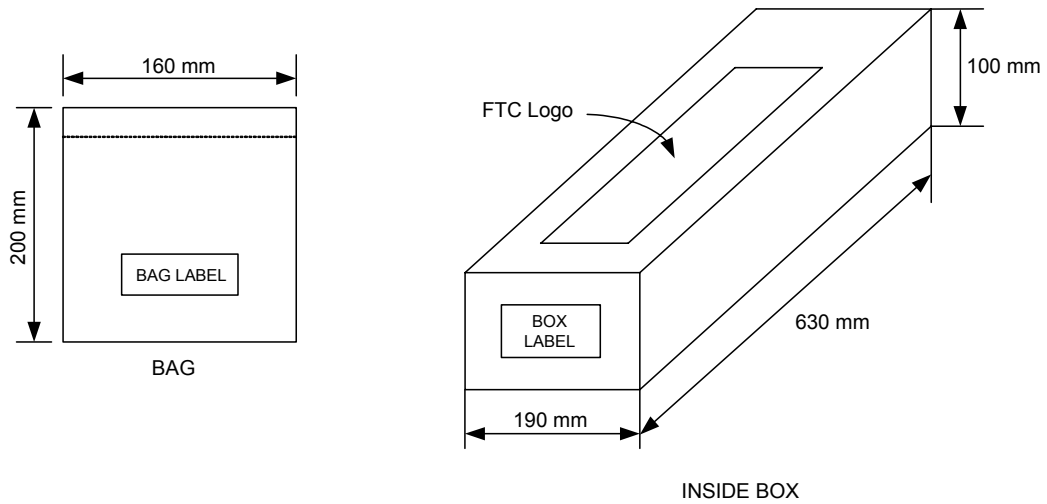
**Package Dimension (Unit: mm)**  
**SIP-4L(Halogen Free)**





## Packing Specification

### BAG & BOX DIMANSION



## Packing Quantity Specifications

1000 EA / 1 BAG

25 BAGS / 1 INSIDE BOX

4 INSIDE BOXES / 1 CARTON



## Order Information

| Part Number | Operating Temperature | Package | Description | Marking |
|-------------|-----------------------|---------|-------------|---------|
| FD284-G1    | -20 °C to +85 °C      | SIP-4L  | ±20G (B)    | -       |