# ST1116B

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## *Variable Speed Double Coil*

## *DC Brushless Motor Driver*

This product is protected by the following patents :

China PAT.NO : ZL99207658.7

Other Patents are pending now, including USA 09/307,906, Taiwan 88202931, et al.

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# ST1116B

## Variable Speed Double Coil

## DC Brushless Motor Driver

## General Specifications

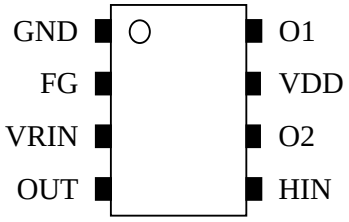
The device is a driver with variable speed control for two-phase unipolar driver of DC brushless fan motor applications. The device is intended to be used as an interface between a HALL effect latch and a double coil load. The device has functions such as driving, rotation detecting, lock protection, self-restart and speed control.

An open-drain FG pin outputs the pulses, of which the frequency is proportional to the fan speed. With suitable output pull up, this fan tachometer output can be used directly with bipolar or MOS logic for motor speed monitoring/control.

## Features and Benefits

- Variable fan speed control
- Motor starts at low speed
- Lock protection and automatic self-restart
- Tachometer output
- High output sinking current capability
- Connectable direct to a HALL Latch IC
- Thin, highly reliable package ( SOP-8 )

## Pin Assignment




| Pin NO. | Pin Name | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | FG | Fan tachometer output (open-drain) |
| 3 | VRIN | Input pin for variable speed control function |
| 4 | OUT | Output pin to control the external source driver |
| 5 | HIN | Input pin from Hall Latch IC |
| 6 | O2 | Output sinking driver 2 |
| 7 | VDD | Power supply |
| 8 | O1 | Output sinking driver 1 |

## Absolute Maximum Ratings ( $T_A$=25℃ )

| Characteristic | Symbol | Rating | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 14 | V |
| Input Voltage | $V_{IN}$ | $V_{DD}$+0.4 | V |
| Output Current at Lock | $I_{OUT}$ | 600 | mA |
| Output Current at Operating | $I_{OPR}$ | 300 | mA |
| Power Dissipation | $P_D$ | 0.44 | W |
| Operating Temperature Range | $T_A$ | -40 ~ 125 | °C |
| Storage Temperature Range | $T_S$ | -65 ~ 150 | °C |
| Operating Junction Temperature | $T_J$ | 125 | °C |
| Thermal Resistance, Junction to Ambient | $\theta_{JA}$ | 156.5 | °C/ W |
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 42 | °C/ W |

## Electrical Characteristic ( $T_A$ = 25℃ & $V_{DD}$ = 12 V )

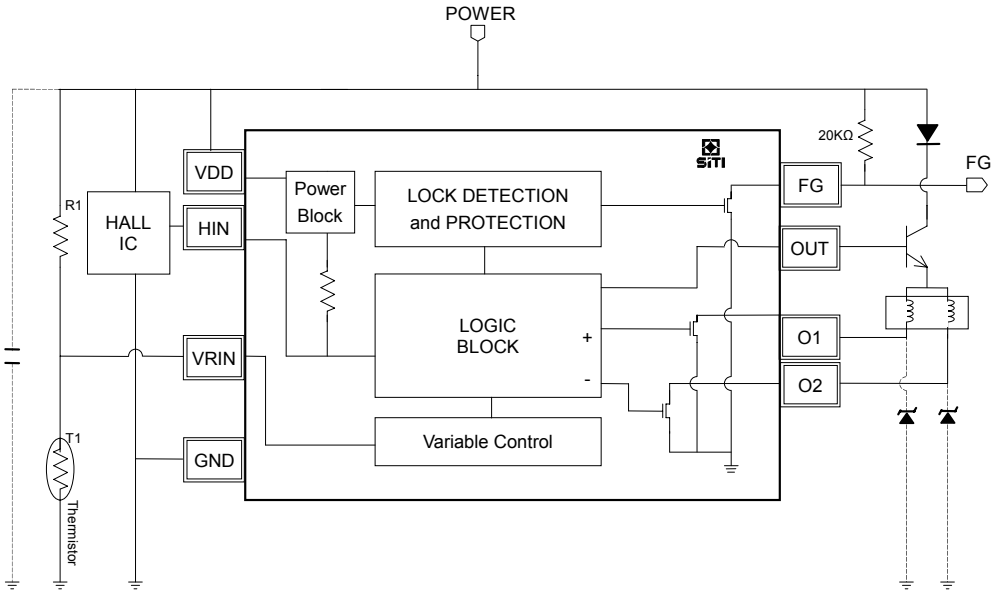
| Characteristic | Sym. | Condition | Limit | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Supply Voltage | $V_{DD}$ | Operating | 3 | 12 | 14 | V |
| Quiescent Current | $I_{DD}$ | No load, All Inputs = 0V or $V_{DD}$ | - | 4.5 | - | mA |
| HIN Input Terminal | | | | | | |
| Input Voltage "H" | $V_{IH}$ | - | 0.8*$V_{DD}$ | - | $V_{DD}$+0.4 | V |
| Input Voltage "L" | $V_{IL}$ | - | -0.4 | - | 0.2*$V_{DD}$ | V |
| Input Current "H" | $I_{IH}$ | $V_{IN}$ = $V_{DD}$ | - | - | 4 | μA |
| O1 / O2 Output Terminal ( $T_J$ = 25℃ ) | | | | | | |
| Output Voltage Low | $V_{OL}$ | $I_{OUT}$ = 250mA | - | 0.3 | - | V |
| FG Open-Drain Terminal ( $T_J$ = 25℃ ) | | | | | | |
| Output Leakage Current | $I_{Leak}$ | $V_{FG}$ =12V | -- | - | 10 | μA |
| Output Current | $I_{FG}$ | $V_{FG}$ = 0.4V | - | 10 | - | mA |
| Output Voltage High | $V_{FGOH}$ | - | - | - | 15 | V |
| Automatic Self-Restart Circuit | | | | | | |
| On Time | $T_{ON}$ | | - | 160 | - | ms |
| Duty Ratio | $R_{DR}$ | $T_{OFF}$ / $T_{ON}$ | 6 | 7 | 8 | |
| OUT Terminal | | | | | | |
| OUT Voltage High | $V_{OUTH}$ | VRIN =3.81V | - | 11.9 | - | V |
| OUT Voltage Low | $V_{OUTL}$ | VRIN =4.89V | - | 3.2 | - | V |

## Truth Table

- **Drivers Output**

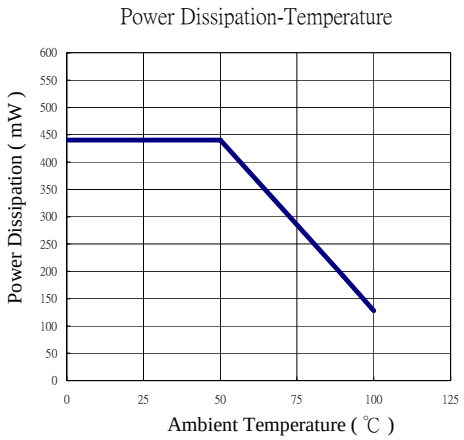
| HIN | O1 | O2 |
|---|---|---|
| H | OFF | ON |
| L | ON | OFF |

## Block Diagram & Application Circuit



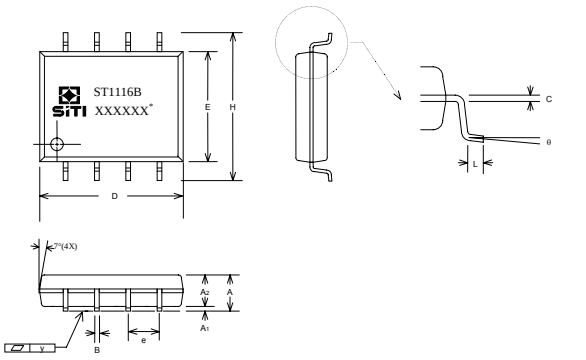
## Application Notes

- The FG pin is an open-drain output. A resistor can be used to pull up the FG voltage to the appropriate level, which depends on the voltage level of the monitoring/control system. Without the additional pull-up resistor, the FG voltage will be $V_{DD}$ when the fan stops.
- The power dissipated by the IC varies widely with the supply voltage, the output current, and loading. It is important to ensure the application does not exceed the allowable power dissipation of the IC package. The recommended ***motor driver*** power dissipation versus temperature is depicted as follows:



## Package Specifications (SOP-8)

( 8-pin SOP )




| SYMBOL | Dimensions in Millimeter | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.35 | 1.60 | 1.75 | 0.053 | 0.063 | 0.069 |
| $A_1$ | 0.10 | — | 0.25 | 0.004 | — | 0.010 |
| $A_2$ | — | 1.45 | — | — | 0.057 | — |
| B | 0.33 | — | 0.51 | 0.013 | — | 0.020 |
| C | 0.19 | — | 0.25 | 0.007 | — | 0.010 |
| D | 4.80 | — | 5.00 | 0.189 | — | 0.197 |
| E | 3.80 | — | 4.00 | 0.150 | — | 0.157 |
| e | — | 1.27 | — | — | 1.27 | — |
| H | 5.80 | — | 6.20 | 0.228 | — | 0.244 |
| L | 0.40 | — | 1.27 | 0.016 | — | 0.050 |
| Y | — | — | 0.10 | — | — | 0.004 |
| θ | 0° | — | 8° | 0° | — | 8° |
| | | | | | | |

* The package marking "XXXX" is a lot number of ST1116A and therefore being subject to change.

The products listed herein are designed for ordinary electronic applications, such as electrical appliances, audio-visual equipment, communications devices and so on. Hence, it is advisable that the devices should not be used in medical instruments, surgical implants, aerospace machinery, nuclear power control systems, disaster/crime-prevention equipment and the like. Misusing those products may directly or indirectly endanger human life, or cause injury and property loss.

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