ST1111J

PWM Input Control

Single Coil Brushless DC Motor Drivers

(1.5 to 7.5 Volts)

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General Specifications

The device is a single coil DC brushless motor driver IC with pwm control, lock protection, power polarity reverse protection and frequency generator function. The driver is optimal for single coil fan applications with less external components.

Features and Benefits
- Support single-phase full wave Brushless DC Motor Driver
- Low voltage startup
- High output sinking and driving capability
- Lock detection and automatic self-restart
- Without external timing capacitor, reduces the numbers of external component required
- Thin, compact, highly reliable package (SOT-28)

Pin Description

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      O1  ■  ○    ■  O2
     VSS  ■       ■  VDD
      FG  ■       ■  PWM
     FGS  ■       ■  HIN
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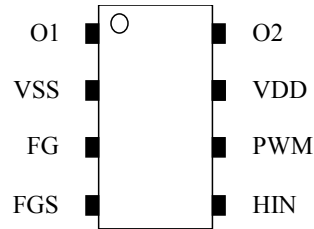
NO.	NAME	DESCRIPTION
1	O1	Output driving & sinking pin
2	VSS	Ground pin
3	FG	Frequency Generator
4	FGS	FG output Frequency Selection
5	HIN	Input from HALL IC
6	PWM	Input pin from Hall IC
7	VDD	Power supply pin
8	O2	Output driving & sinking pin

Absolute Maximum Ratings (Unless otherwise noted, $T_A = 25\ °C$)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	7.5	V
Input Voltage from a Hall Effect Latch Output	V_{IN}	V_{DD}+0.4	V
Output Current (peak)	I_{OL}	1000 [*]	mA
Output Current	I_{OUT}	400	mA
Power Dissipation	P_D	350	mW
Operating Temperature Range	T_{OPR}	-40 ~ 125	°C
Storage Temperature Range	T_{STG}	-65 ~ 150	°C

*Note: When operating large output current, do not excess allowable P_D & temperature range.

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Electrical Characteristics (T_A= 25°C , V_{DD}= 5V)

Characteristic	Sym.	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	Operating	1.5	5	7.5	V
Supply Current	I_{DD0}	(Lock protection)	-	0.5	1	mA
Supply Current	I_{DD0}	Operating	-	5	10	mA
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}	$V_{IN} = V_{DD}$	-	-	±1	μA
Input Current "L"	I_{IL}	$V_{IN} = 0V$	-	-	±5	mA
O1/O2 Output Terminal (T_J = 25℃)						
Output Voltage High	V_{OH}	I_{OUT} = 300 mA	4.4	-	-	V
Output Voltage Low	V_{OL}	I_{OUT} = 300 mA	-	-	0.6	V
Output Current	I_{OUT}	$R_L = 30\Omega$	-	148	-	mA
FG Open-Drain Terminal (T_J = 25℃)						
Output Leakage Current	I_{Leak}	V_{FG} = 5V	-	-	5	μA
Output Current	I_{FG}	V_{FGOL} = 0.4V	6	-	-	mA
Output Voltage Low	V_{FGOL}	I_{FG}= 6 mA	-	-	0.4	V
Automatic Self-Restart Circuit						
On Time	T_{ON}	-	-	215	-	ms
Duty Ratio	FG_R	T_{OFF}/T_{ON}	6	7	8	

Truth Table

HIN	FGS	PWM	O1	O2	FG output Frequency
H	(H)	(H)	H	L	FG/2
L	(H)	(H)	L	H	FG/2
-	-	L	OFF	OFF	-
H/L operating	L	(H)	-	-	FG/1

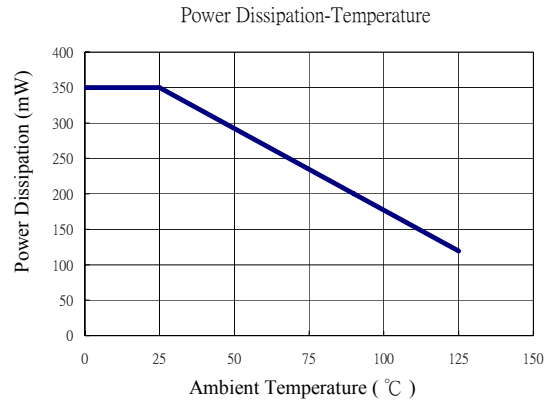* The (H) state is pull-high through the internal pull-up resistor in IC.

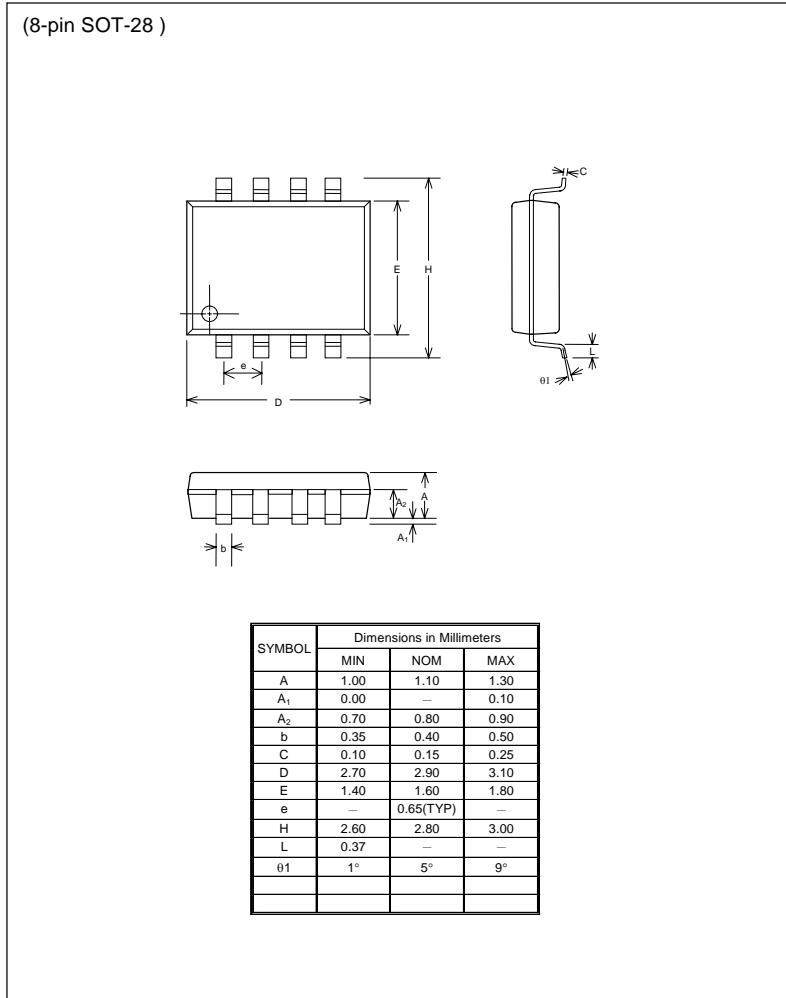## Block Diagram & Application Circuit
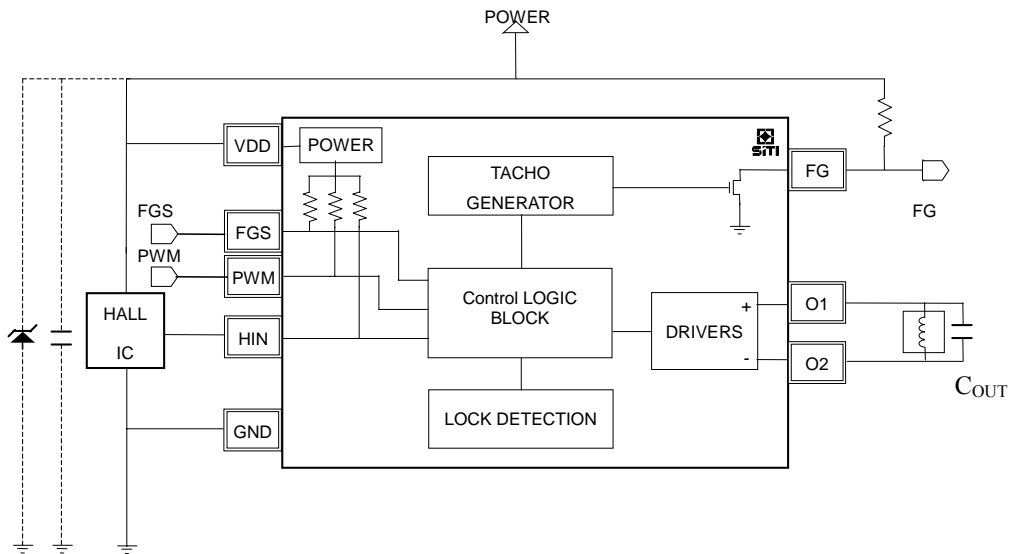
Application Notes

□ The capacitor C_{OUT} between output nodes is required for high current application. The capacitor C_{OUT} is dependent on coil load and external PWM frequency. The recommended capacitor C_{OUT} is about 0.1μF for external PWM frequency larger than 20KHz and about 1μF for external PWM frequency less than 2KHz.

□ The output driver node O1/O2 will be "turned to sink/drive" for V(HIN) = logic low. Similarly, the output O1/O2 will be "turned to drive/sink" for V(HIN) = logic high .

□ The **FG** pin is an open-drained output and the output frequency is dependent on the logical voltage of FGS pin. The output frequency is the same with HIN input signal when V(FGS) is logical low and 1/2 HIN frequency when V(FGS) is logical high. If there is no need for FG output, let FG output pin open.

□ The pull-up resistors are built-in at pins HIN, PWM and FGS. For multiple usage of PCB, connecting 0Ω resistor between the FGS pin and GND will select FG output function or floating 0Ω resistor will select FG/2 function.

□ There is no need of external timing capacitor for lock protection and auto-restart function. For 5V application, the drivers will be shut down roughly 1 to 3 seconds after the motor is locked. When the drivers have been shut down, the automatic self-restart circuit will try to power up the drivers every 1 to 3 seconds until lock is released.

□ The power polarity reverse protection circuit is built-in. The external protection diode for power reverse fault is no need.

□ There is no requirement of the bypass capacitor or Zener Diode between VDD and GND in normal applications. The connection of this capacitor or Zener Diode between VDD and GND will reduce noise effect and increase stability of operation, if required.

□ 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:

Power Dissipation-Temperature

Package

(8-pin SOT-28)

SYMBOL	Dimensions in Millimeters		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A$_1$	0.00	—	0.10
A$_2$	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	—	0.65(TYP)	—
H	2.60	2.80	3.00
L	0.37	—	—
θ1	1°	5°	9°

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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