

Single-phase full-wave motor driver for fan motor

BA6908F

BA6908F is a single phase full-wave motor driver for fan motor corresponding to 5V and 12V. Switching noise is reduced by soft switching drive. This IC has lock detection and automatic restart functions as motor protection function.

●Applications

Motor drivers for fan motors

●Features

- 1) Single-phase full-wave drive system.
- 2) Built-in power transistor.
- 3) Soft switching drive.
- 4) Lock detection and automatic restart circuit.
- 5) Thermal shut-down circuit.
- 6) Hall signal output.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V _{CC}	15	V
Power dissipation	P _d	687 *1	mW
Operating temperature	T _{opr}	-40 to +85	°C
Storage temperature	T _{stg}	-55 to +150	°C
Output current	I _{OUT}	0.7 *2	A
Hall signal output current	I _{HO}	15	mA
Output voltage	V _{OUT}	15	V
Hall signal output voltage	V _{HO}	15	V
Junction temperature	T _{jmax}	150	°C

*1 To use at temperature above Ta=25°C reduce 5.5mW/°C.
(On 70.0mm×70.0mm×1.6mm glass epoxy board)

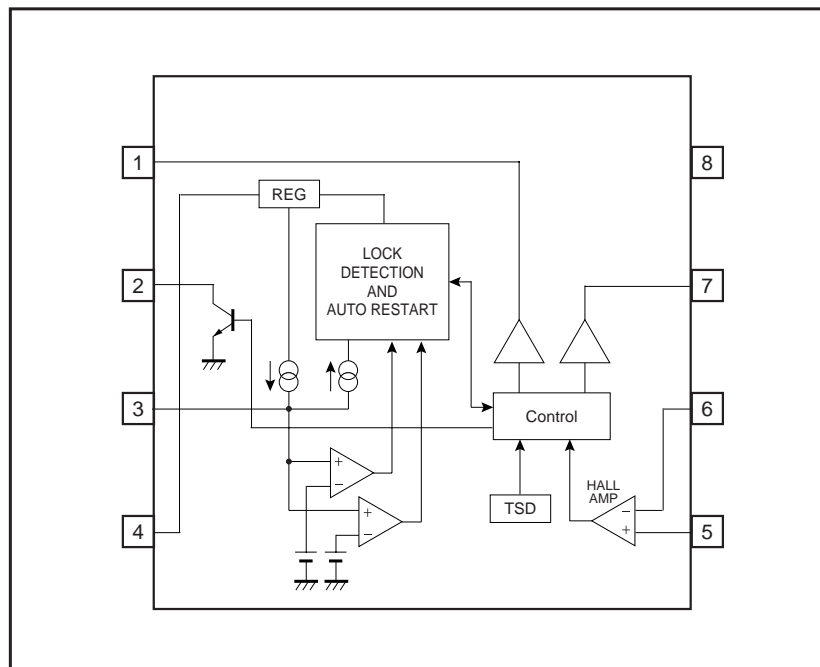
*2 This value is not to be over P_d and ASO.

●Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V _{CC}	3	–	14	V

Motor driver ICs

●Block diagram



●Terminal function table

Pin No.	Pin name	Function
1	OUT2	Output terminal 2
2	HO	Hall signal output terminal
3	LD	Connection terminal of capacitor for lock detection, auto restart
4	V _{cc}	Power supply terminal
5	H+	Hall signal input terminal +
6	H-	Hall signal input terminal -
7	OUT1	Output terminal 1
8	GND	GROUND terminal

Motor driver ICs

●Input / output circuit

<Hall input>

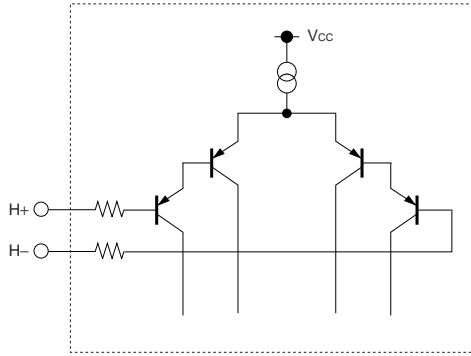


Fig.1

<Coil output>

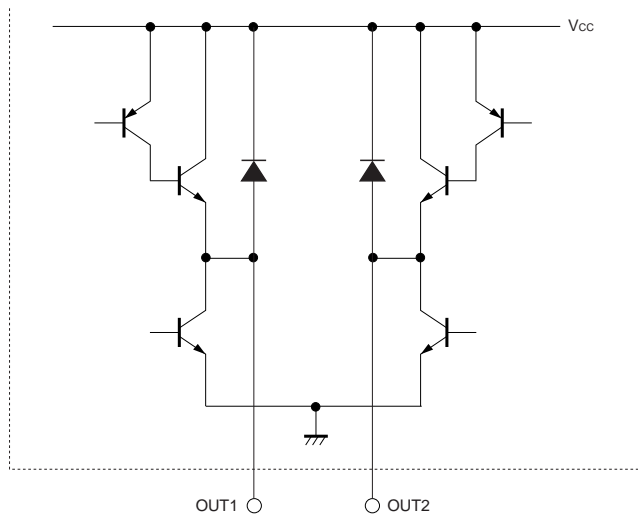


Fig.2

<HO output>

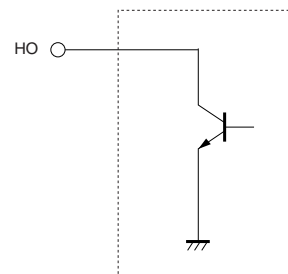


Fig.3

Motor driver ICs

●Electrical characteristics (Unless otherwise specified, Ta=25°C, Vcc=5V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current	I _{cc}	1.5	3.4	8.7	mA	At output : OFF
Charge current of capacitor for lock detection	ILDC	1.50	2.75	4.50	μA	VLD=1.1V
Discharge current of capacitor for lock detection	ILDD	0.24	0.48	0.90	μA	VLD=1.1V
Charge-discharge current ratio of capacitor for lock detection	rCD	4.2	5.7	9.5	–	rCD=ILDC/ILDD
Clamp voltage of capacitor for lock detection	VLDCL	1.14	1.80	2.47	V	
Comparison voltage of capacitor for lock detection	VLDCP	0.47	0.76	1.06	V	
Output voltage L	VOL	–	0.2	0.3	V	I _o =200mA
Output voltage H	VOH	3.9	4.1	–	V	I _o =200mA
"HO" terminal voltage L	VHOL	–	0.3	0.5	V	IHO=5mA
"HO" terminal leak current	IHOL	–	0	50	μA	VHO=15V
Hall input offset voltage	Hofs	–10	–	10	mV	
Hall input-output gain	GHO	320	500	680	–	

© This product is not designed for protection against radioactive rays.

●Lock detect circuit, automatic restart circuit

Charge and discharge time at motor lock condition varies with the value of external capacitor at LD terminal and is given by the following equation.

$$T_{on} \text{ (Charge time)} = \frac{C \cdot (VLDCL - VLDCP)}{ILDC}$$

$$T_{off} \text{ (Discharge time)} = \frac{C \cdot (VLDCL - VLDCP)}{ILDD}$$

- C : Value of capacitor at LD terminal
 VLDCL : Clamp voltage of capacitor lock detection (1.80V Typ.)
 VLDCP : Comparison voltage of capacitor lock detection (0.76V Typ.)
 ILDC : Charge current of capacitor lock detection (2.75μA Typ.)
 ILDD : Discharge current of capacitor lock detection (0.48μA Typ.)

The following value shows charge time and discharge time at C=0.47μF for reference.

Charge time = 0.18SEC (Output : ON)
 Discharge time = 1.02SEC (Output : OFF)

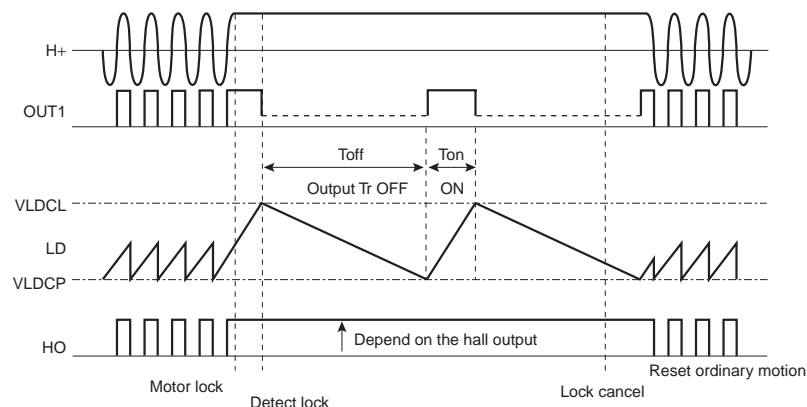


Fig.4 Timing chart

Motor driver ICs

●Application circuit

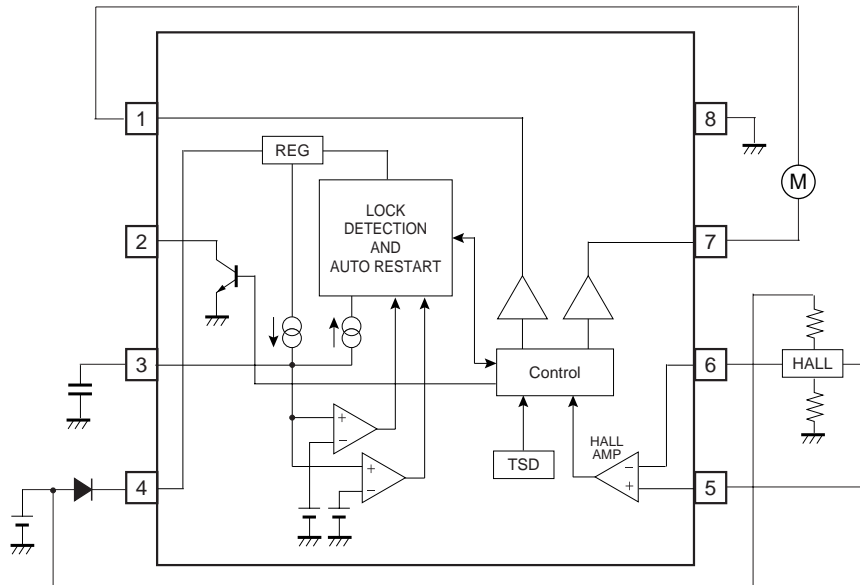


Fig.5

●Cautions

- 1) Thermal shut down(TSD)
This IC is built-in TSD.
TSD has the temperature hysteresis.

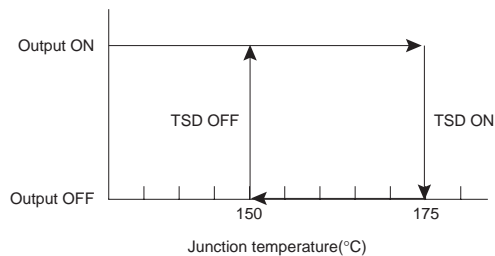


Fig.6 TSD

TSD ON (Typ. : 175°C)
All output transistor OFF.

TSD OFF (Typ. : 150°C)
Reset ordinary motion.
(It has the temperature hysteresis of 25°C<TYP>)

- 2) Power dissipation
IC power dissipation widely varies with supply voltage, output current and application of IC. Please be careful for the thermal design not to exceed the allowable power dissipation.

Motor driver ICs

3) Hall signal input terminals (H+, H-)

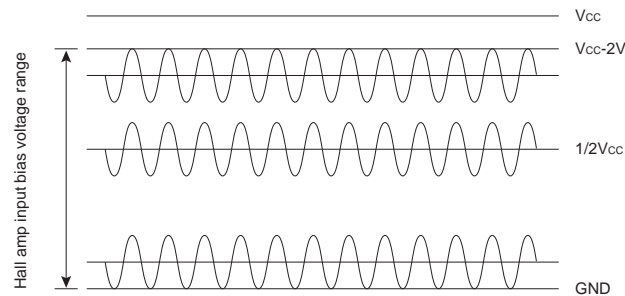


Fig.7 Hall amp input bias voltage range.

- A. Please adjust hall input bias voltage by value of resistor for hall element, so that hall signal contains amplitude input within rang from 0V to $V_{cc}-2V$. At this time, to set hall amp input bias voltage for $V_{cc}/2$ is recommended.
- B. Please be careful of input signal because hall amp of this IC doesn't have input hysteresis.
- C. The output signal of this IC is the amplified hall input signal. Therefore, the output signal depends on hall input signal. When the amplitude of hall signal is small, the output signal becomes gentle. Oppositely, when the amplitude is big, the output signal becomes steep. The hall-input/output gain is about 500 times (TYP), so please input the hall signal that is suitable to make adequate amplitude of the output signal.

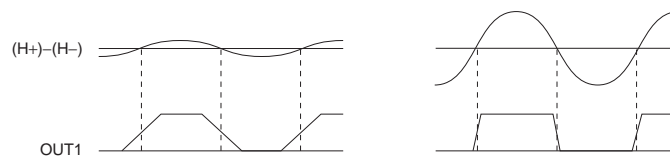


Fig.8 Difference of output signal depending on hall input signal

- 4) ASO
Please consider output transistors not to exceed absolute maximum ratings and ASO.
- 5) GND
Please keep up the voltage of GND less than the voltage of another terminal surely.
- 6) This product is produced with strict quality control, but destroyed in using beyond absolute maximum ratings. Once IC destroyed, a failure mode cannot be defined (like short-mode or open-mode). Therefore, physical security counter measure like fuse is to be given when a specific mode to be beyond absolute maximum ratings is considered.

Motor driver ICs

●Electrical characteristic curves

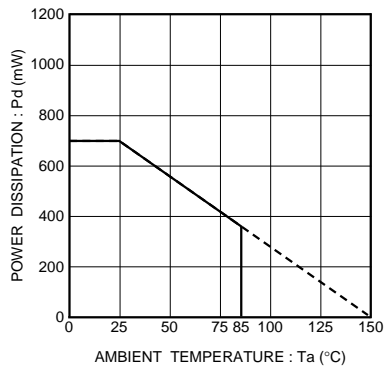


Fig.9 Power dissipation curve

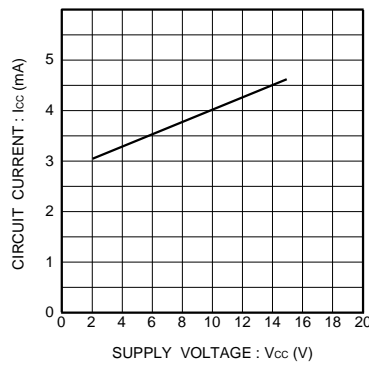


Fig.10 Circuit current vs. Power supply voltage

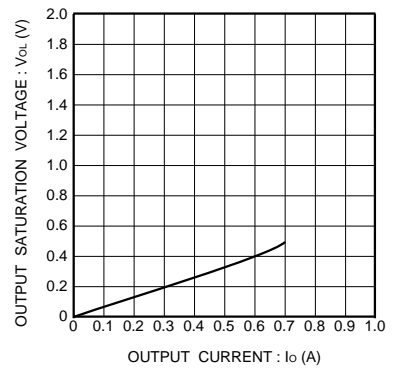


Fig.11 Low level saturation voltage vs. Output current

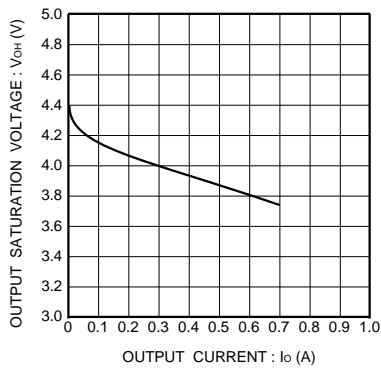
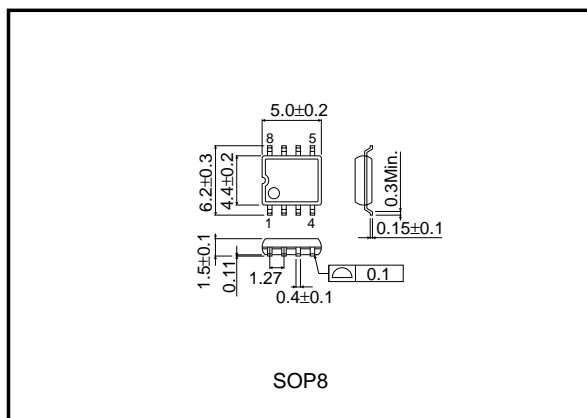


Fig.12 High level saturation voltage vs. Output current

●External dimensions (Unit : mm)



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