HA13460FP — Preliminary

Brushless DC Fan Motor Driver

Description

The HA13460FP is a two-phase half-wave brushless motor driver for 12-V and 24-V fans.

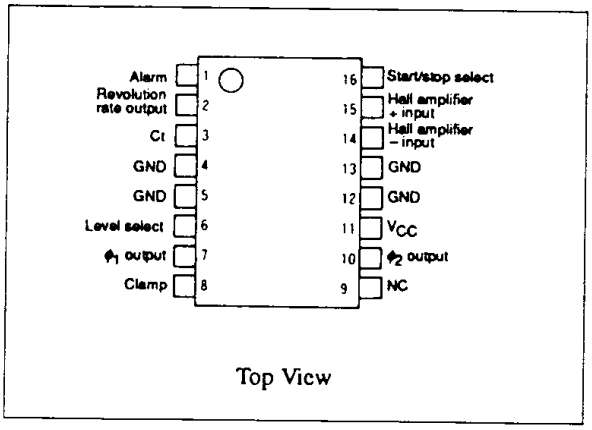
Features

- Stuck rotor protection circuit (slow speed and stuck)

Functions

- 1.5-A two-phase half-wave driver circuits
- Clamp diode
- Stuck rotor protection circuit
- Revolution rate signal
- Alarm output
- Start/stop select
- Overtemperature shutdown (OTSD)

Pin Assignment



Top View

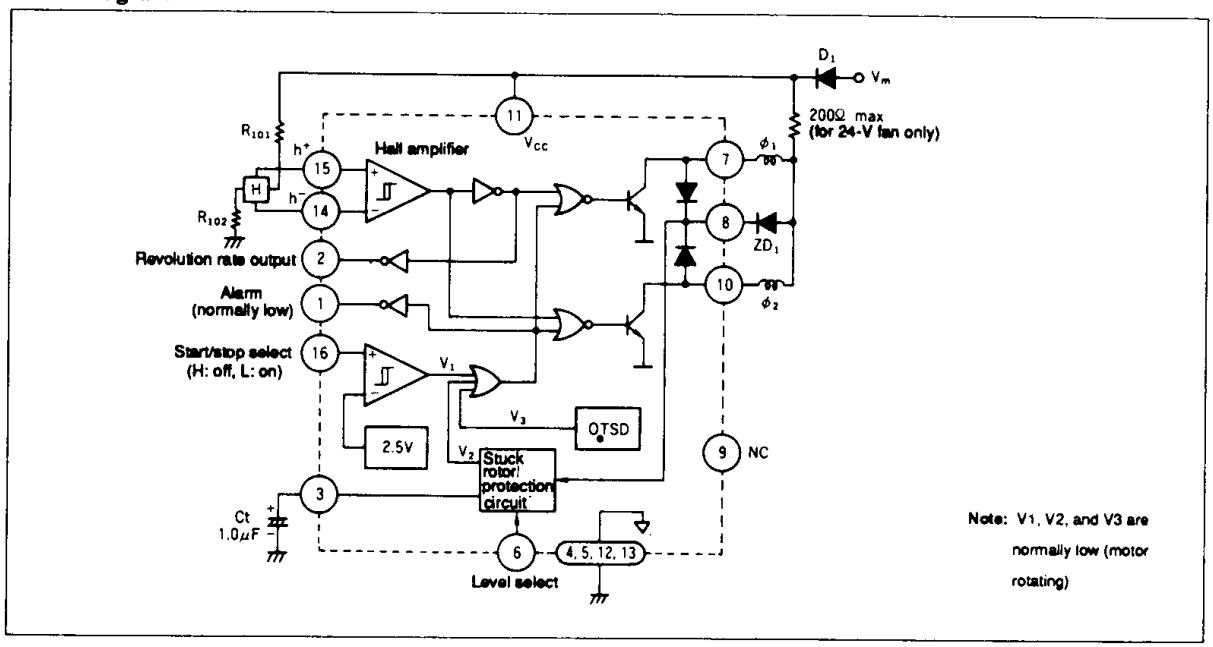
Logic Table

Input		Output		
Pin 16	Pin 15–14	ϕ_1	ϕ_2	Pin 2
High	×	Off	Off	High
Low	+	On	Off	High
	−	Off	On	Low

Ordering Information

Type No.	Package
HA13460FP	FP-16T

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Parameter	Symbol	Rating	Unit	Notes
Power supply voltage	V_{CC}	30	V	1
Output voltage	V_{out}	60	V	
Peak output current	V_{opeak}	1.5	A	2
Normal output current	I_{out}	1.0	A	
Input voltage	$V_{in}7$	0 to V_{CC}	V	3
Input voltage	$V_{in}2$	0 to V_{CC}	V	5
Power dissipation	P_T	1.5	W	5
Junction temperature	T_j	150	°C	1
Storage temperature	T_{stg}	−55 to +125	°C	

The absolute maximum ratings are limiting values, to be applied individually, beyond which the device may be permanently damaged. Functional operation under any of these conditions is not guaranteed. Exposing a circuit to its absolute maximum rating for extended periods of time may affect the device's reliability.

Notes:

1 Operating ranges are as follows:
V_{CC} = 7.5 to 2 8 V
T_{jopr} = −10 to +135°C
2. t ≤ 0.2 seconds
3. Applies to Hall amplifier input and start/stop select.
4. For T_{pin} = 90°C. Thermal resistance is as follows:
θj − pin ≤ 40°C/W
θj − a ≤ 80°C/W (When mounted on paper phenol)

Electrical Characteristics (Ta = 25°C, V_{CC} = 7.5 V to 28 V)

Parameter		Symbol	Min	Typ	Max	Unit	Test Conditions		Pins	Notes
Current consumption		I_{CC} 1	—	6	12	mA	V_{CC} = 28 V	V_{pin}16 = 5 V	11	
		I_{CC} 2	—	8	12	mA		V_{pin}16 = 0 V		
Start/stop select	Input current	$I_{S/S}$	—	+250	+360	μA	V_{pin}16 =	7.0 V	16	
			—	—	±10			GND		
	Threshold voltage	V_{OFF}	2.25	2.5	2.75	V	Turn off		16	1
		V_{ON}	1.10	1.35	1.60	V	Turn on			
Hall amplifier	Input current	I_{HI}	—	—	±50	μA	V_h = 1/2V_{CC}		14, 15	
	Common mode input voltage range	V_H	2	—	V_{CC} − 2.5	V				
	Hysteresis	ΔV_H	6	10	18	mV	R_h = 400 Ω		14, 15	2
	Offset voltage	V_{OS}	−5	0	+5	mV			14, 15	
Output transistor	Leakage current	I_{CEX}	—	6	10	mA	V_{out} = 60 V, V_{CC} = 7.5 V		7, 10	3
	Sustaining voltage	$V_{CE(SUS)}$	60	—	—	V	V_Z = 60 V, R_L = 27 Ω, L = 20 mH		7, 10	
	Saturation voltage	V_{sat} 1	—	0.85	1.1	V	I_{out} = 0.2 A		7, 10	
		V_{sat} 2	—	1.4	2.0	V	I_{out} = 1.0 A			
Clamp diode	Leakage current	I_R	—	—	100	μA	V_R = 60 V		8	
	Forward voltage	V_F	—	2.5	3.0	V	I_F = 1.0 A			
Stuck rotor protection circuit	Threshold voltage	V_{th} 1	4.3	4.9	5.3	V	Turn off		3	4
		V_{th} 2	0.4	0.6	0.8	V	Turn on			
	Ct charge current	I_{tf}	4.0	6.6	10.0	μA	V_{ct} = 2.8 V			
	Ct discharge current	I_{ts}	0.3	0.6	1.0	μA	V_{ct} = 2.8 V			
	Current ratio	A_i	9	11	13		I_{tf}/I_{ts}		3	

Electrical Characteristics (cont)

Parameter		Symbol	Min	Typ	Max	Unit	Test Conditions	Pins	Notes
Stuck rotor protection circuit (cont)	B.emf detect threshold level	V_{Eth1}	$1/4V_{CC}$ − 1.5	$1/4V_{CC}$	$1/4V_{CC}$ + 1.5	V	Pin 6 = Open	8	5
		V_{Eth2}	$1/8V_{CC}$ −1.5	$1/8V_{CC}$	$1/8V_{CC}$ +1.5	V	Pin 6 = GND		
Revolution rate	Output low voltage	V_{OL1}	—	—	0.6	V	I_O = 2 mA	2	
	Leakage current	I_{OFF1}	—	—	±10	μA	V_{CE} = 28 V		
Alarm	Output low voltage	V_{OL2}	—	—	0.6	V	I_O = 2 mA	1	
	Leakage current	I_{OFF2}	—	—	±10	μA	V_{CE} = 28 V		
OTSD	Operating temperature	T_{sd}	135	160	—	°C			6
	Hysteresis	T_{hys}	—	25	—	°C			

Notes:

1. See figure 1.
2. See figure 2.
3. Including stuck rotor protection circuit input current (figure 5).
4. See figure 3.
5. See figure 4.
6. These are development targets, and will not be factory tested.

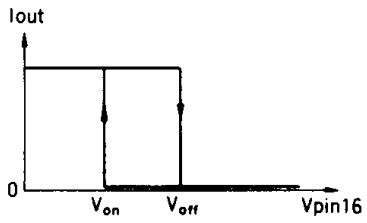


Figure 1

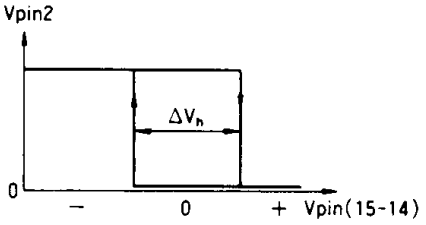


Figure 2

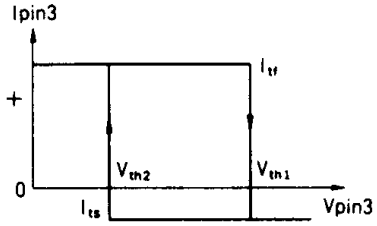


Figure 3

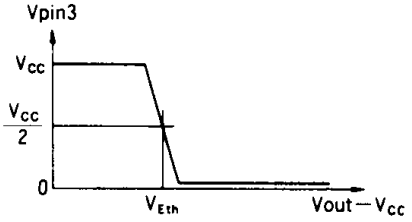


Figure 4

Timing Chart