

Brushless DC Fan Motor Driver

Description

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

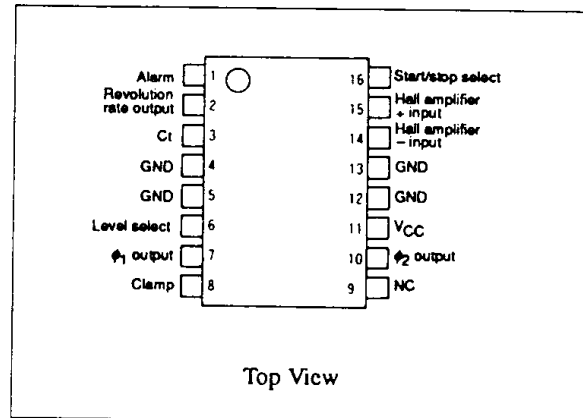
Features

- 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



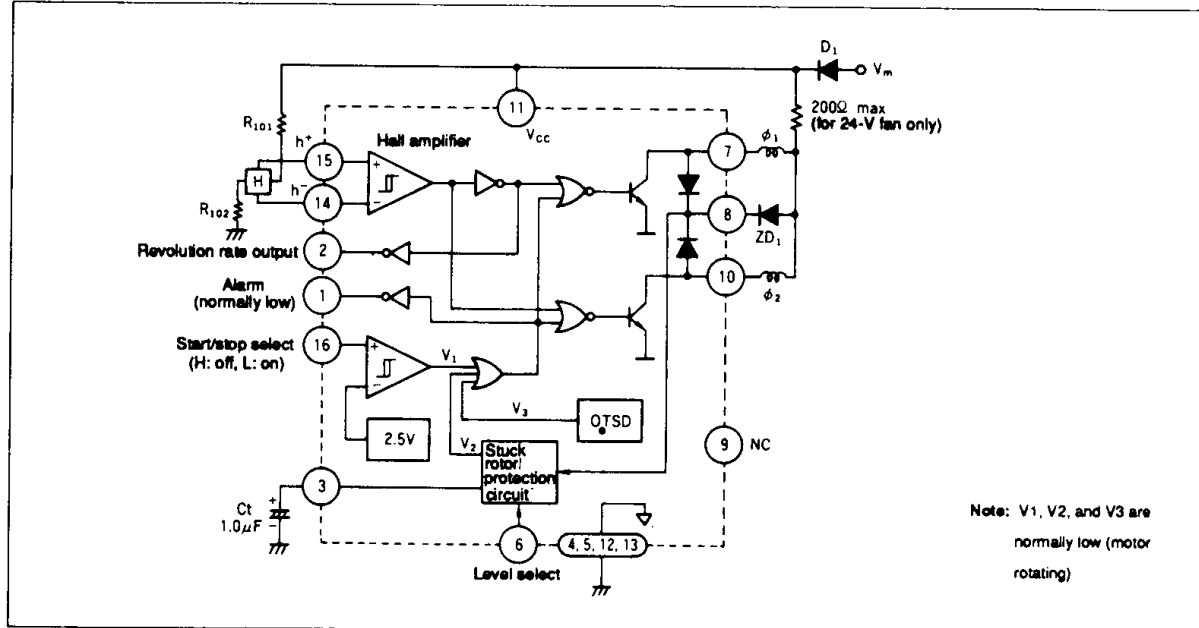
Logic Table

Input		Output		
Pin 16	Pin 15-14	ϕ_1	ϕ_2	Pin 2
High	x	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 _{in7}	0 to V _{CC}	V	3
Input voltage	V _{in2}	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:

- Operating ranges are as follows:
 V_{CC} = 7.5 to 28 V
 T_{jopr} = -10 to +135°C
- t ≤ 0.2 seconds
- Applies to Hall amplifier input and start/stop select.
- For T_{pin} = 90°C. Thermal resistance is as follows:
 θ_{j - pin} ≤ 40°C/W
 θ_{j - 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 _{pin16} = 5 V	11	
	I _{CC 2}	—	8	12	mA	V _{pin16} = 0 V		
Start/stop select Input current	I _{S/S}	—	+250	+360	μA	V _{pin16} = 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	—	—	±50	μA	V _h = 1/2V _{CC}	14, 15	
	Common mode input voltage range	—	—	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	



HA13460FP

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}	$1/4V_{CC}$	$1/4V_{CC}$	$1/4V_{CC}$	V	Pin 6 = Open	8	5
			-1.5		+1.5				
Revolution rate	Output low voltage	V_{OL1}	—	—	0.6	V	$I_o = 2 \text{ mA}$	2	
	Leakage current	I_{OFF1}	—	—	± 10	μA	$V_{CE} = 28 \text{ V}$		
Alarm	Output low voltage	V_{OL2}	—	—	0.6	V	$I_o = 2 \text{ mA}$	1	
	Leakage current	I_{OFF2}	—	—	± 10	μA	$V_{CE} = 28 \text{ V}$		
OTSD	Operating temperature	T_{sd}	135	160	—	$^{\circ}\text{C}$			6
	Hysteresis	T_{hys}	—	25	—	$^{\circ}\text{C}$			

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.

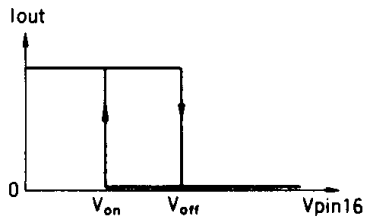


Figure 1

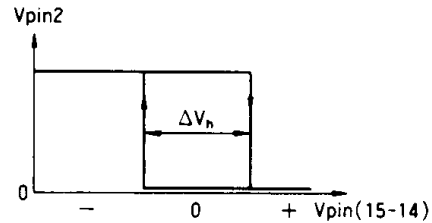


Figure 2

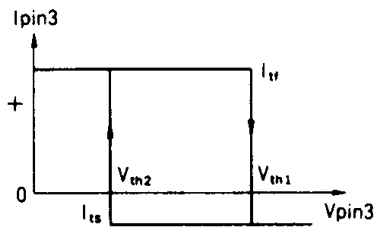


Figure 3

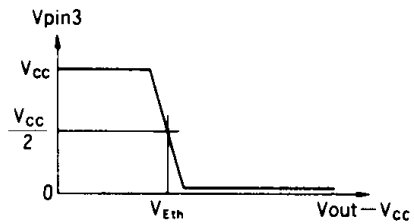


Figure 4



Timing Chart

