

HA13490P, HA13490MP, HA13490FP

Voice Coil Motor Driver

Description

HA13490/FP/MP are VCM drive IC for HDD and have following functions and features.

Functions

- Input buffer amp
- 1.2 A peak BTL output amp
- Retract input
- Chip enable input
- Independent OP amp
- OTSD (Over Temperature Shut Down)

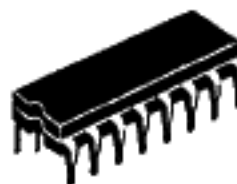
Features

- Wide operating voltage range
- No cross-over distortion
- Small external components
- Low saturation voltage
- 3 types package line up

Ordering Information

Type No.	Package
HA13490P	300 mil 16 pin plastic DIP (DP-16C)
HA13490MP	18 pin plastic QFI (MP-18T)
HA13490FP	16 pin plastic SOP (FP-16T)

HA13490P



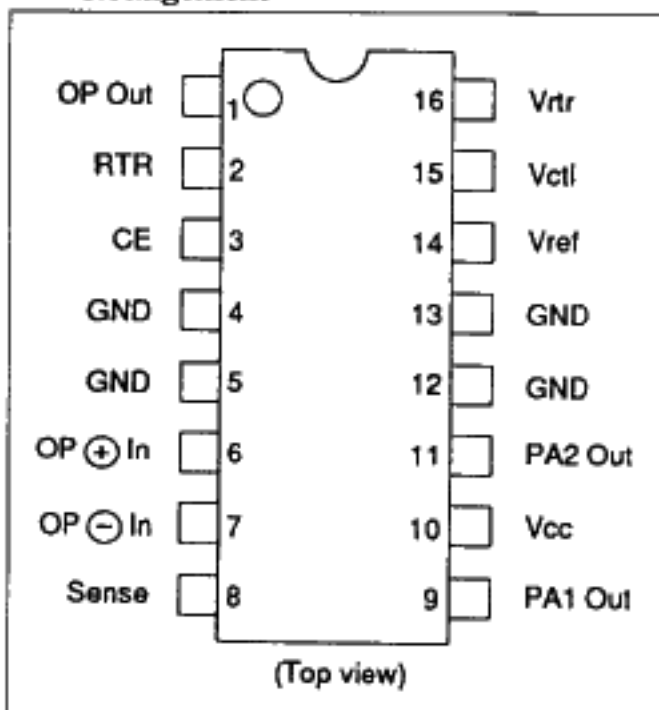
(DP-16C)

HA13490MP



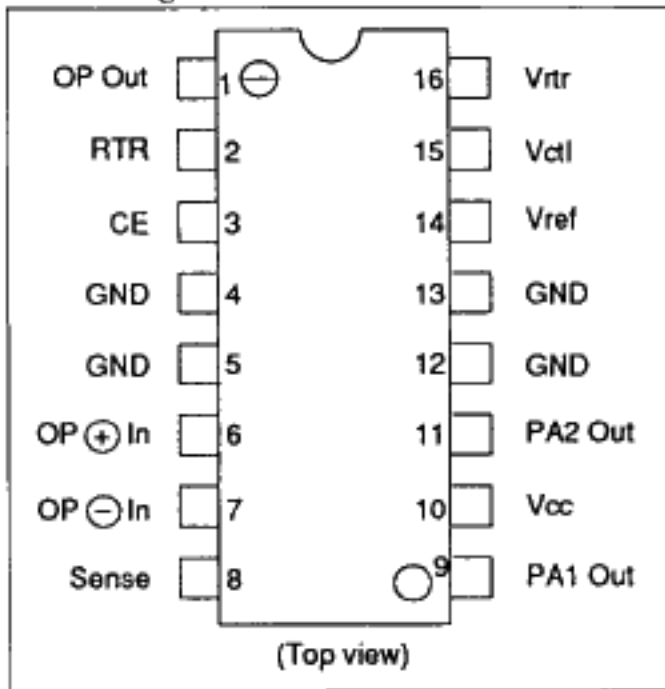
(MP-18T)

Pin Arrangement

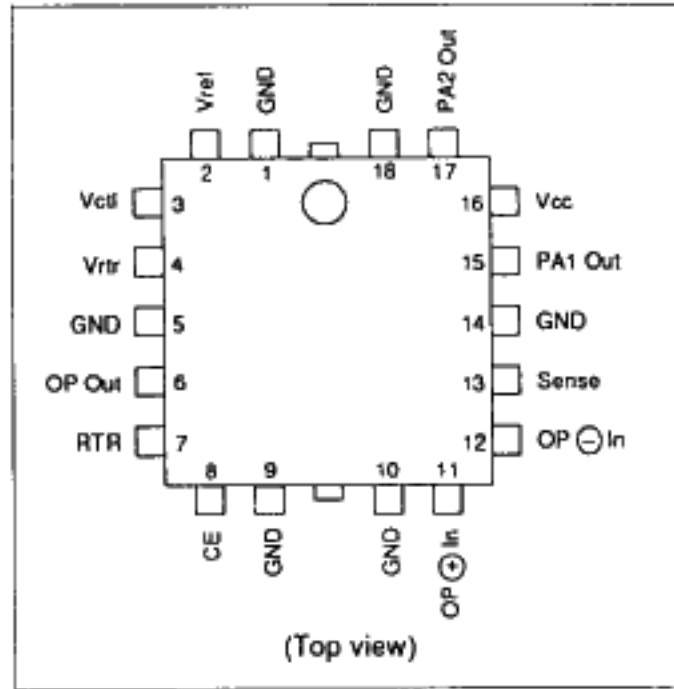


HA13490P

Pin Arrangement

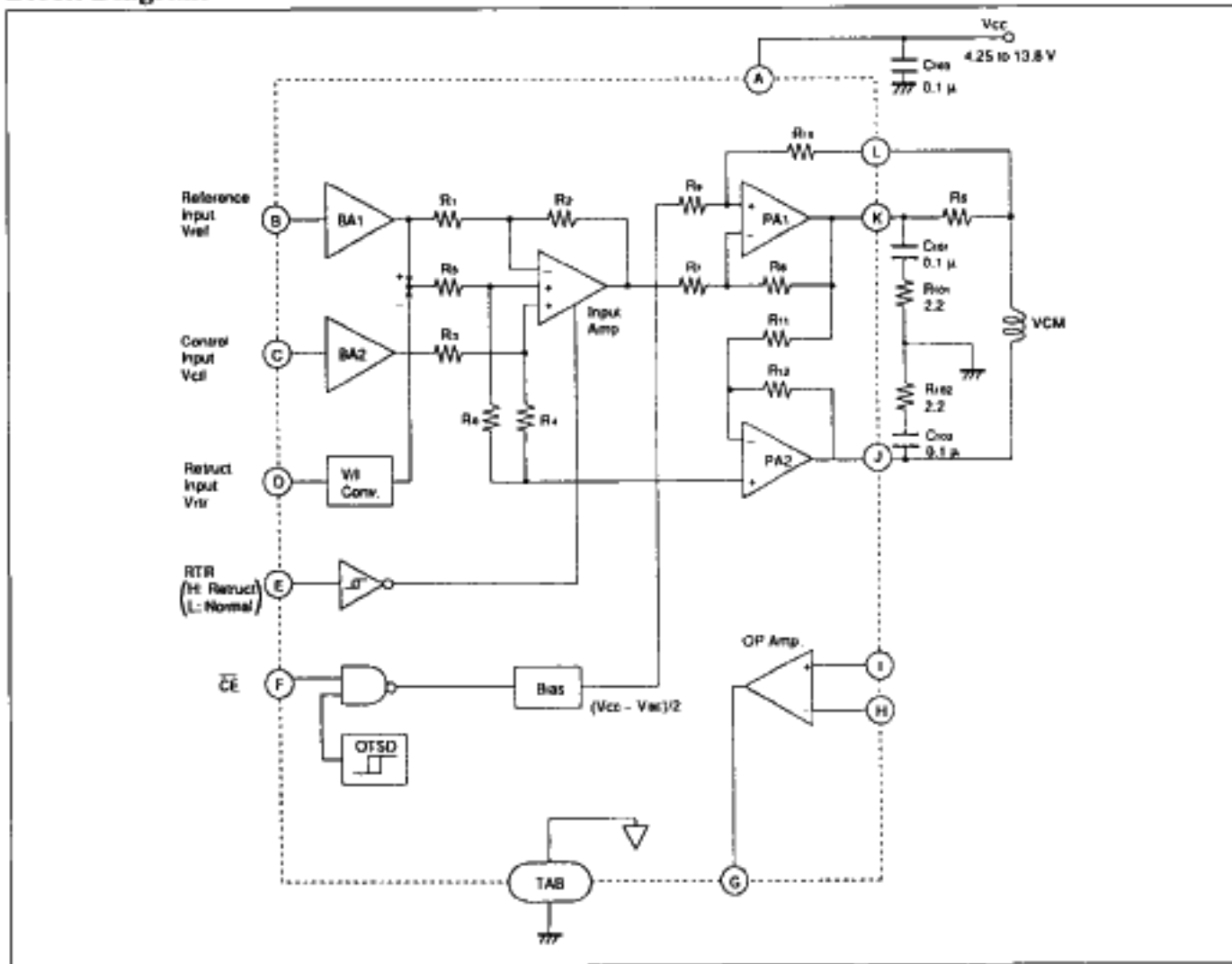


HA13490FP



HA13490MP

Block Diagram



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Table 1 External Components

Parts No.	Recommended Value	Purpose	Note
R ₁₀₁ , R ₁₀₂	2.2 Ω	Stability	
R _s	2.0 Ω	Current sense	1
C ₁₀₁ , C ₁₀₂	0.1 μF	Stability	2
C ₁₀₃	≥0.1 μF	Power supply bypass	

Note: Use a reactance free resistance.

The relation between output current and input voltage can be described as follows.

When RTR is L

$$I_o = -g_m(V_{ct1} - V_{ref})$$

When RTR is H

$$I_o = -g_m V_{tr}$$

Where g_m and g_{mr} are internal constant (see electrical characteristics) and output current "+" means source current from PA1 and "-" means sink current.

Table 2 Absolute Maximum Ratings (T_a = 25 °C)

Item	Symbol	HA13490	HA13490MP	HA13490FP	Unit	Note
Supply voltage	V _{cc}	15	15	15	V	1
Input voltage	V _{in}	0 to V _{cc}	0 to V _{cc}	0 to V _{cc}	V	2
Peak output current	I _{opeak}	1.2	1.2	1.2	A _p	3
DC output current	I _o	0.8	0.8	0.8	A	
Power dissipation	P _T	2(T _{pin} =120 °C)	2(T _{pin} =100 °C)	2(T _{pin} =70 °C)	W	4
Junction temperature	T _j	150	150	150	°C	1
Storage temperature	T _{stg}	-55 to +125	-55 to +125	-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. Recommended operating range is as follows.

$$V_{cc} = 4.25 \text{ to } 13.8 \text{ V}$$

$$T_{jopr} = 0 \text{ to } 125 \text{ °C}$$

2. Apply to CE, RTF, V_{ref}, V_{ct1} and V_{tr} input.

3. t ≤ 20 ms

4. Package thermal data

Item	HA13490	HA13490MP	HA13490FP	Unit
θ _{j-pin}	15	25	40	°C/W
θ _{j-a}	60	80	100	°C/W



Table 4 Electrical Characteristics (Ta = 25 °C, Vcc = 12 V)

Item	Symbol	Min	Typ	Max	Unit	Test Condition	Application Terminal	Note	
Quiescent current	I _{CCO}	—	0.15	0.4	mA	V _{CC} = 13.8 V	CE=H	A	
	I _{CC}	—	7.5	15	mA	I _o =0	CE=L		
CE & RTR	Input low voltage	V _{IL}	—	—	0.8	V		E, F	
	Input high voltage	V _{IH}	2.0	—	—	V			
	Input current	I _I	—	—	±2.5	μA	V _{in} =0 to V _{CC}		
BA1 & BA2	Input current	I _{CTL}	—	—	±2.5	μA	V _{ref} =6 V, V _{ctl} =0 to 12 V	B, C	
	Input offset current	ΔI _{CTL}	—	—	±0.5	μA			
	Input offset voltage	V _{IO1}	—	—	±10	mV	V _{ref} =6 V	B, C	1
	Common mode voltage range	V _{CM1}	$\frac{1}{3}V_{CC}$	—	$\frac{2}{3}V_{CC}$	V		B, C	
PA1 & PA2	Quiescent voltage	V _O	5.3	5.65	6.0	V		K, J	
	Leak current	I _{CER}	—	—	4.0	mA	V _{CE} =15 V		
	Output total Saturation voltage	V _{sat}	—	1.8	2.4	V	I _o =0.8 A	K, J	
—			1.2	1.4	V	I _o =0.1 A			
BA to PA	V/I transfer gain	g _m	—	0.5	—	A/V	R _s =2 Ω	K, L	1
	Gain bandwidth	B	—	75	—	kHz	g _m =-3 dB	K, L	2
	Phase shift	Δφ	—	8	—	deg.	f=10 kHz		
	Total harmonic distortion	D	—	—	2	%	f=1 kHz, I _o =0.1 Arms		
V _{tr} to PA	Offset voltage	V _{IO2}	—	—	±20	mV		D	3
	Retract gain	g _{mr}	—	0.1	—	A/V	R _s =2 Ω	L	

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Electrical Characteristics (Ta = 25 °C) (cont)

OP amp	Input current	I_{op}	—	—	± 1.0	μA	H, I
	Input offset current	ΔI_{op}	—	—	± 0.1	μA	
	Input offset voltage	V_{io3}	—	—	± 5	mV	
	Common mode voltage range	V_{cms}	2	—	10	V	
	Openloop voltage gain	G_{ol}	—	60	—	dB	f=1 kHz G
	Gain bandwidth	B_3	—	1000	—	kHz	$G_{ol}=0$ dB
	Output low voltage	V_{OL}	—	—	1.0	V	$I_{OL}=1$ mA
Output high voltage	V_{OH}	V_{CC} -1.0	—	—	V	$I_{OH}=1$ mA	
OTSD	Shutdown temperature	T_{sd}	—	150	—	°C	
	Hysteresis	T_{hys}	—	25	—	°C	

- Notes: 1. See figure 1.
The $g_m(V/I)$ transfer gain can be calculated as.
 $g_m = \Delta I_o / \Delta V_{ctl}$ (A/V)
2. Test conditions are follows.
 $R_s = 2 \Omega$
 $R_L = 10.5 \Omega$ (Non inductive)
3. See figure 2.
The $g_m(R)$ (Retract gain) can be calculated as

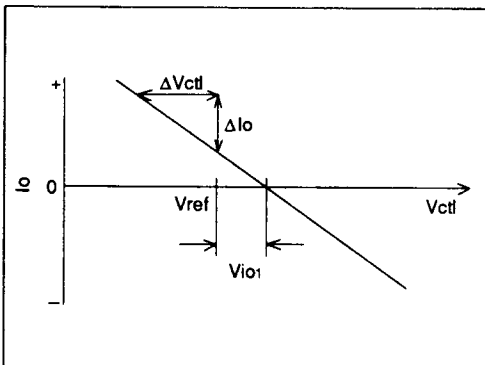


Figure 1 I_o vs. V_{ctl}

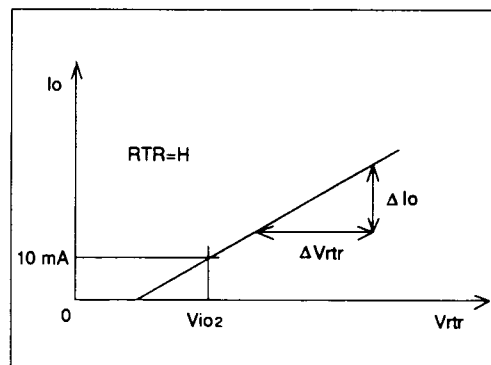


Figure 2 I_o vs. V_{rtr}