

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
- Retruct 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



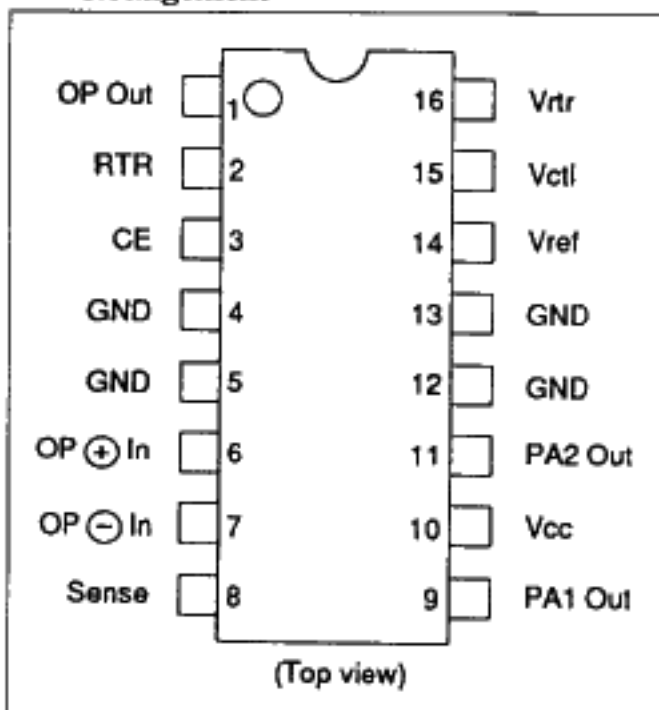
(DP-16C)

HA13490MP



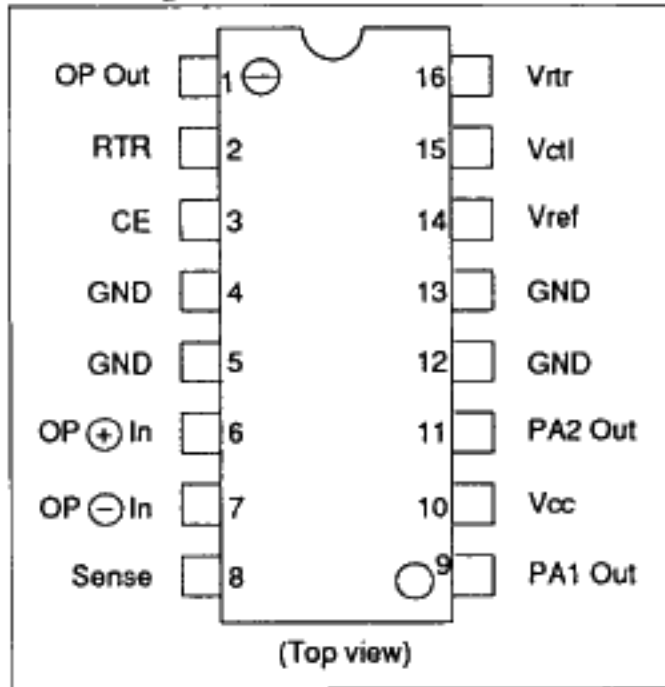
(MP-18T)

Pin Arrangement

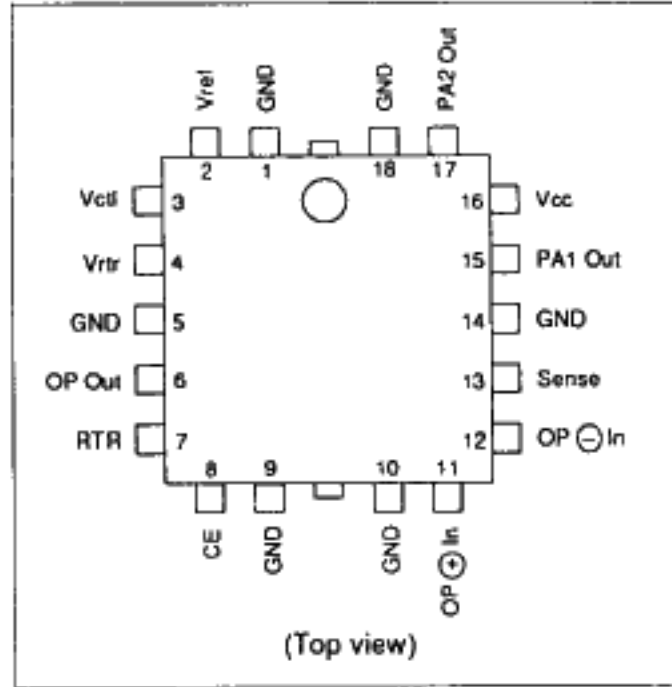


HA13490P

Pin Arrangement

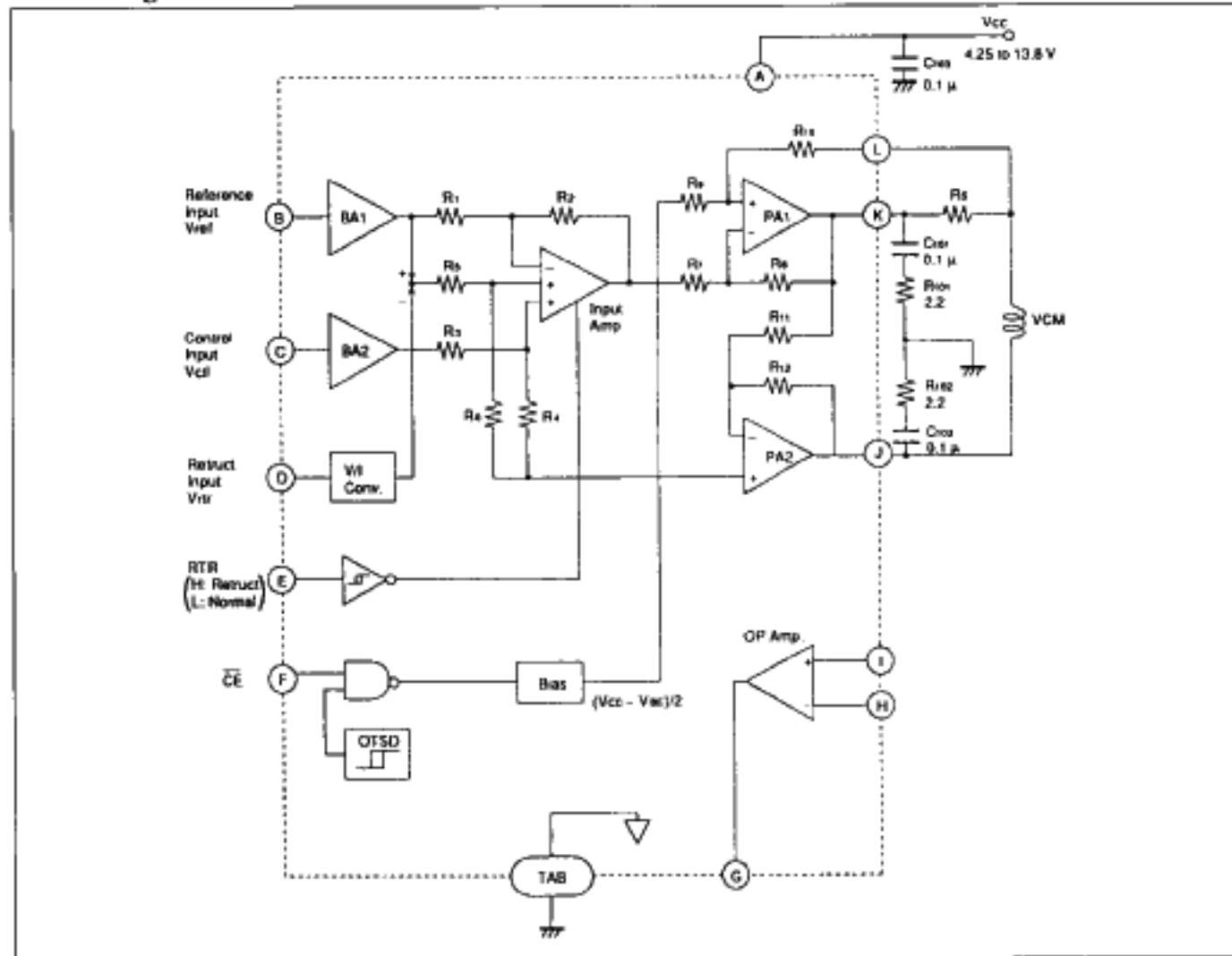


HA13490FP



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 μ F	Stability	2
C ₁₀₃	≥ 0.1 μ F	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

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

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	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.

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

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

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

3. $t \leq 20$ 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	Appli- cation 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	Δ I _{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 A _{rms}		
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 _{cm3}	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
OTSD	Output high voltage	V _{OH}	V _{CC} -1.0	—	—	V	I _{OH} =1 mA
	Shutdown temperature	T _{sd}	—	150	—	°C	
	Hysteresis	Thys	—	25	—	°C	

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

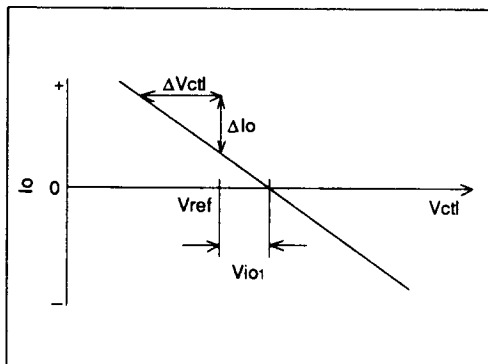


Figure 1 Io vs. Vctl

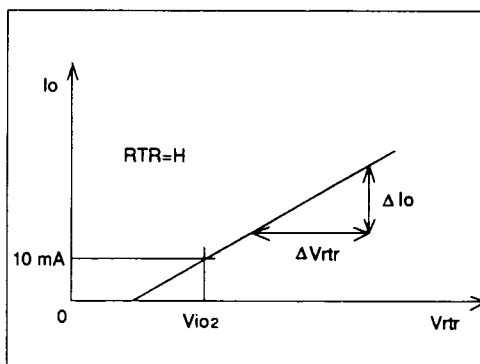


Figure 2 Io vs. Vrtr

