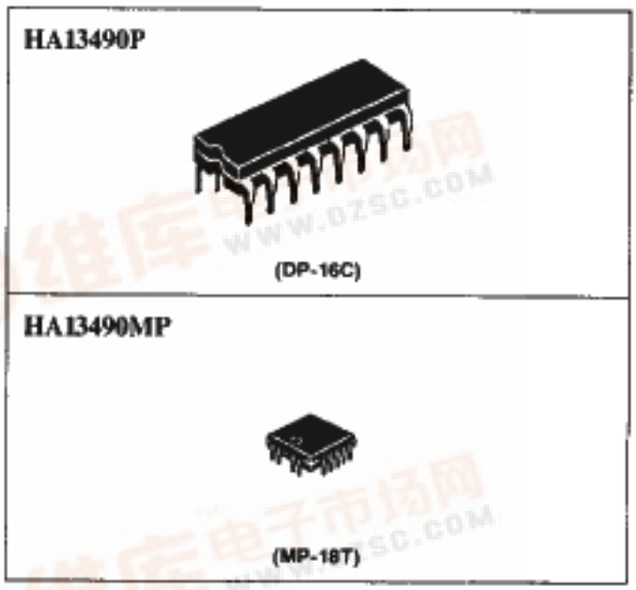
HA13490P, HA13490MP, HA13490FP

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)

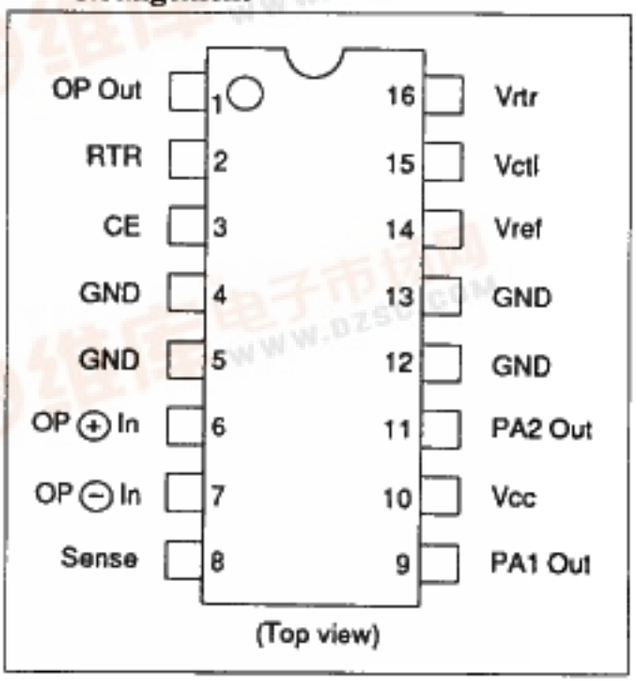
Features

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

Ordering Information

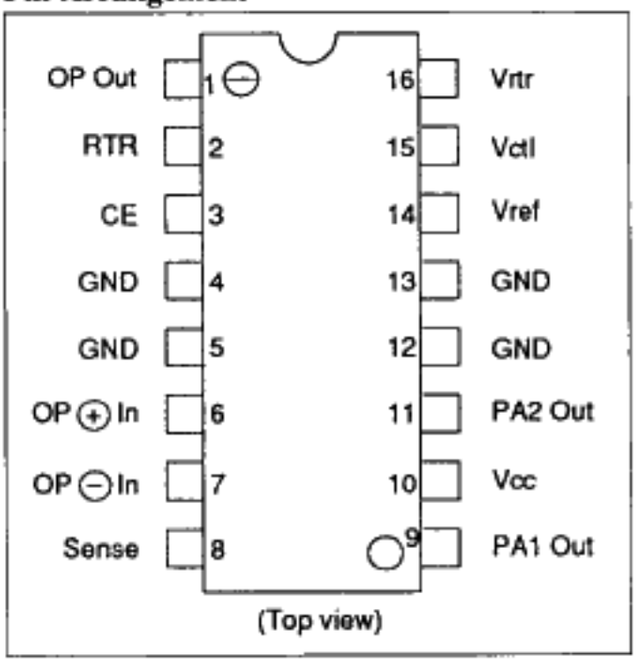
Type No.	Package
HA13490P	300 mil 16 pin plastic DIP (DP-16C)
HA13490MP	18 pin plastic QFI (MP-18T)
HA13490FP	16 pin plastic SOP (FP-16T)

Pin Arrangement

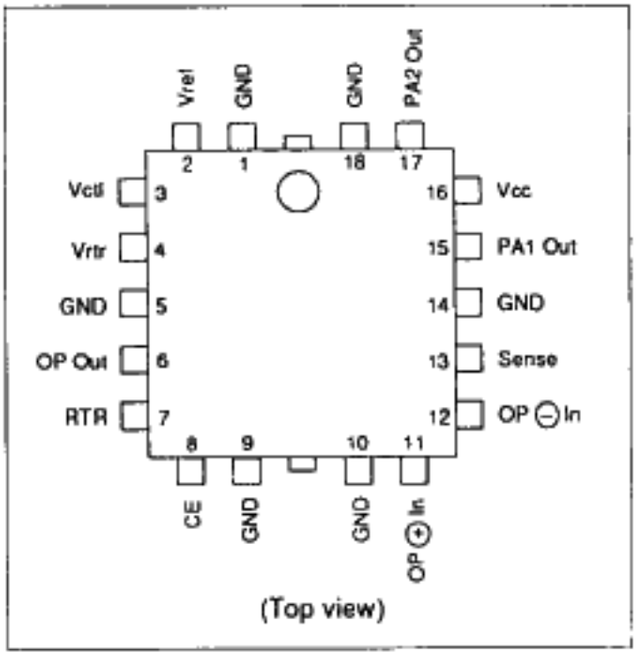


HA13490P

Pin Arrangement



HA13490FP



HA13490MP

Block Diagram

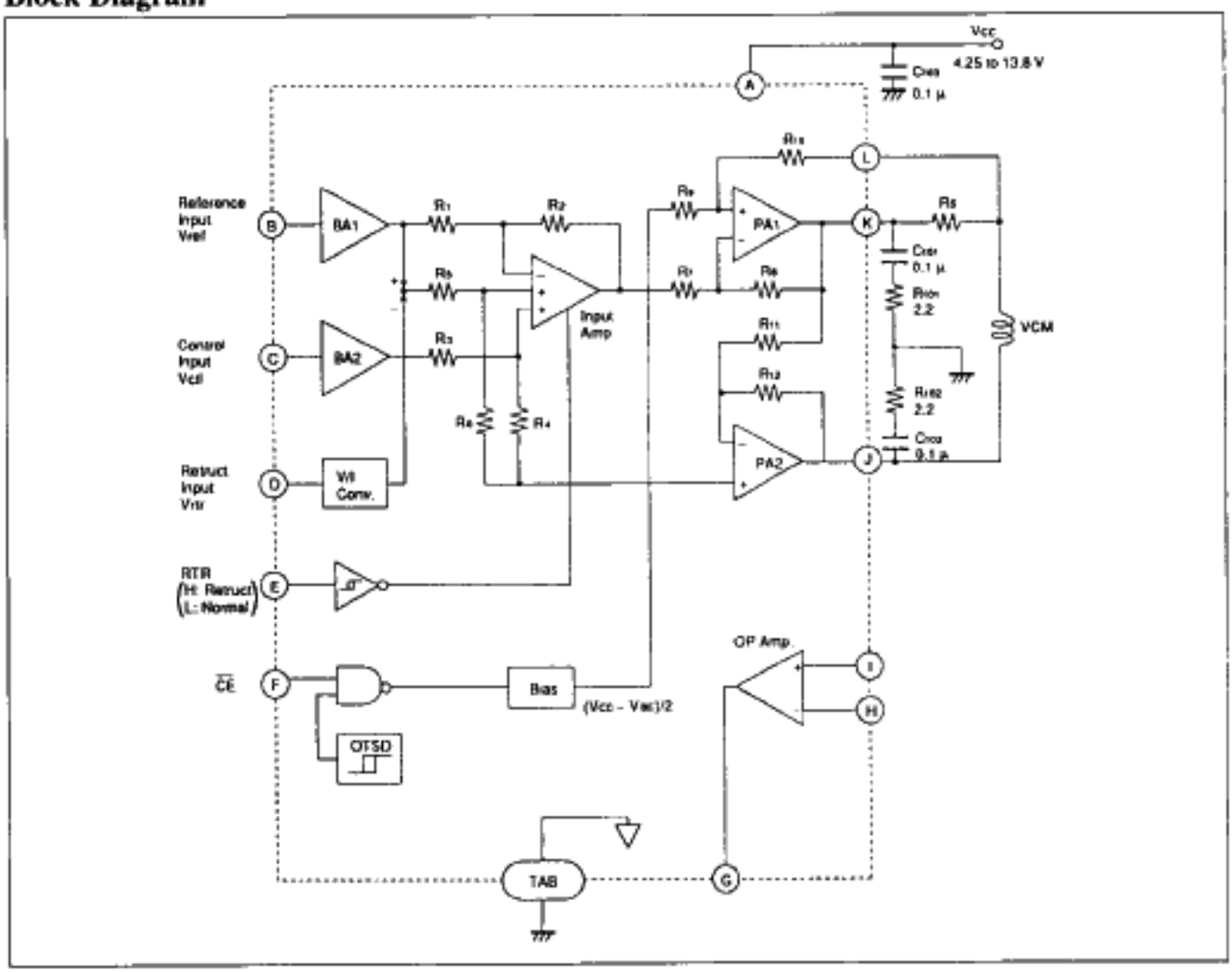


Table 1 External Components

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
$Io = -gm(Vctl-Vref)$
When RTR is H
$Io = -gmr\ Vrtr$
Where gm and gmr are internal constant (see electrical characteristics) and output current "+" means source current from PA1 and "–" means sink current.

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

Item	Symbol	HA13490	HA13490MP	HA13490FP	Unit	Note
Supply voltage	Vcc	15	15	15	V	1
Input voltage	Vin	0 to Vcc	0 to Vcc	0 to Vcc	V	2
Peak output current	Iopeak	1.2	1.2	1.2	Ap	3
DC output current	Io	0.8	0.8	0.8	A	
Power dissipation	P_T	2(Tpin=120 °C)	2(Tpin=100 °C)	2(Tpin=70 °C)	W	4
Junction temperature	Tj	150	150	150	°C	1
Storage temperature	Tstg	–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.
Vcc = 4.25 to 13.8 V
Tjopr = 0 to 125 °C
2. Apply to CE, RTF, Vref, Vctl and Vrtr input.
3. t ≤ 20 ms
4. Package thermal data

Item	HA13490	HA13490MP	HA13490FP	Unit
θj-pin	15	25	40	°C/W
θj-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		Icco	—	0.15	0.4	mA	Vcc= 13.8 V	CE=H	A	
		Icc	—	7.5	15	mA	Io=0	CE=L		
$\overline{CE}$ & 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	Vin=0 to Vcc			
BA1 & BA2	Input current	I_{CTL}	—	—	±2.5	µA	Vref=6 V, Vctl=0 to 12 V		B, C	
	Input offset current	ΔI_{CTL}	—	—	±0.5	µA				
	Input offset voltage	V_{IO1}	—	—	±10	mV	Vref=6 V		B, C	1
	Common mode voltage range	V_{CM1}	$\frac{1}{3}$Vcc	—	$\frac{2}{3}$Vcc	V			B, C	
PA1 & PA2	Quiescent voltage	Vo	5.3	5.65	6.0	V			K, J	
	Leak current	I_{CER}	—	—	4.0	mA	V_{CE}=15 V			
	Output total Saturation voltage	Vsat	—	1.8	2.4	V		Io=0.8 A	K, J	
			—	1.2	1.4	V		Io=0.1 A		
BA to PA	V/I transfer gain	gm	—	0.5	—	A/V	Rs=2 Ω		K, L	1
	Gain bandwidth	B	—	75	—	kHz	gm=–3 dB		K, L	2
	Phase shift	Δφ	—	8	—	deg.	f=10 kHz			
	Total harmonic distortion	D	—	—	2	%	f=1 kHz, Io=0.1 Arms			
Vrtr to PA	Offset voltage	V_{IO2}	—	—	±20	mV			D	3
	Retruct gain	gmr	—	0.1	—	A/V	Rs=2 Ω		L	

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_{OI}	—	60	—	dB	f=1 kHz	G
	Gain bandwidth	B_3	—	1000	—	kHz	G_{OI}=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	Tsd	—	150	—	°C		
	Hysteresis	Thys	—	25	—	°C		

Notes: 1. See figure 1.
The gm(V/I transfer gain) can be calculated as.
gm = ΔIo/ΔVctl (A/V)
2. Test conditions are follows.
Rs = 2 Ω
R_L = 10.5 Ω (Non inductive)
3. See figure 2.
The gmr(Retruct gain) can be calculated as

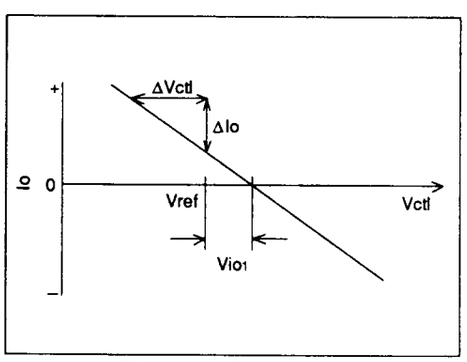


Figure 1 Io vs. Vctl

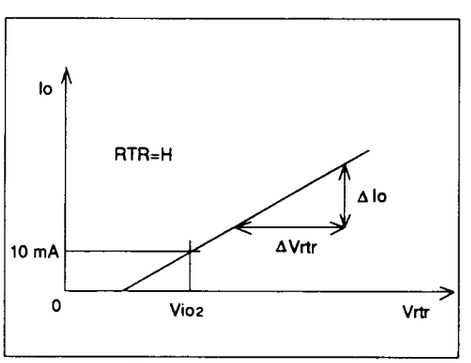


Figure 2 Io vs. Vrtr