

HA13490, 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

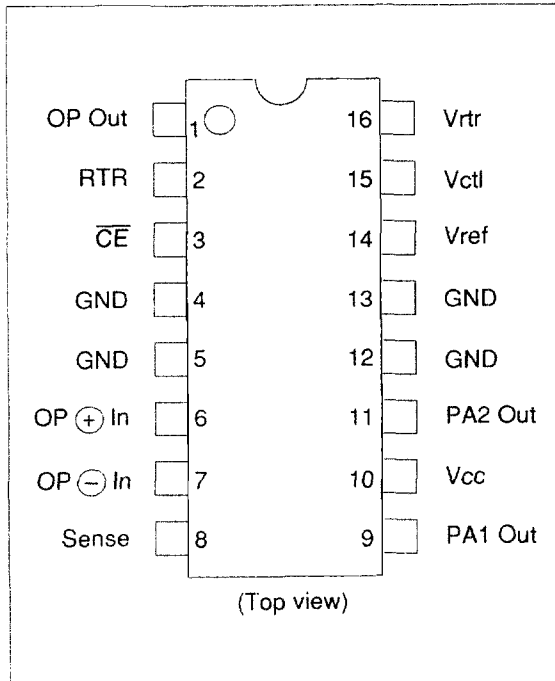
- Wide operating voltage range
- No cross-over distortion
- Small external components
- Low saturation voltage
- 3 types package line up

Ordering Information

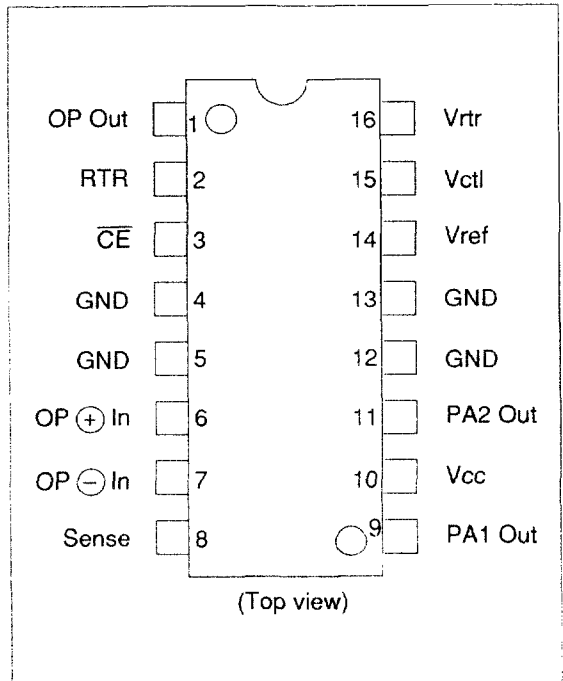
Type No.	Package
HA13490	300 mil 16 pin plastic DIP (DP-16C)
HA13490MP	18 pin plastic QFI (MP-18T)
HA13490FP	16 pin plastic SOP (FP-16T)

HM13490, HA13490MP, HA13490FP

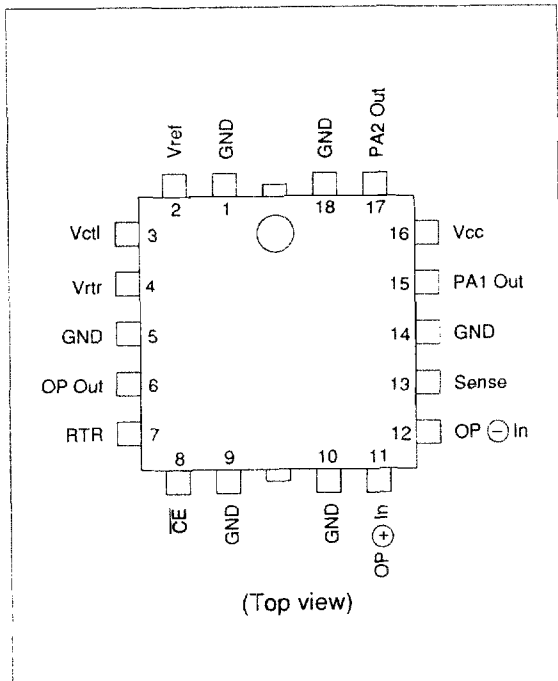
Pin Arrangement



HA13490



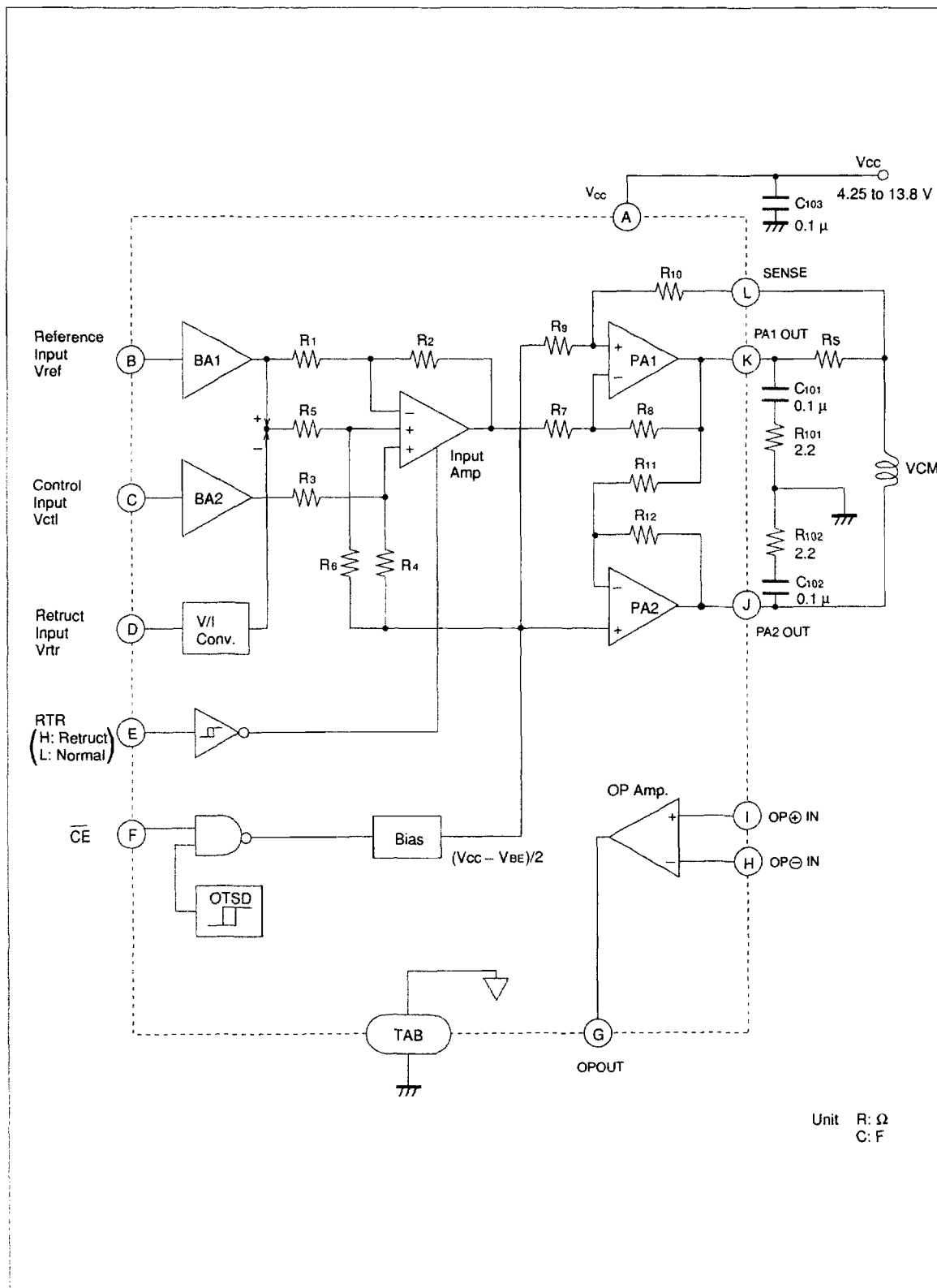
HA13490FP



HA13490MP

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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

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

When RTR is H

$$I_o = -g_{mr} V_{rtr}/R_s$$

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 (Ta = 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	

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, RTR, V_{ref}, V_{ctl} and V_{rtr} 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	80	°C/W

HM13490, HA13490MP, HA13490FP

Table 3 Electrical Characteristics (Ta = 25 °C, Vcc = 12 V)

Item		Symbol	Min	Typ	Max	Unit	Test Condition	Appli- cation Terminal	Note
Quiescent current		Icco	—	0.15	0.4	mA	Vcc=13.8 V	CE=H	A
		Icc	—	7.5	15	mA	Io=0 A	CE=L	
CE & RTR	Input low voltage	VIL	—	—	0.8	V			E, F
	Input high voltage	VIH	2.0	—	—	V			
	Input current	II	—	—	±2.5	µA	Vin=0 to Vcc		
BA1 & BA2	Input current	IcTL	—	—	±2.5	µA	Vref=6 V, Vctl=0 to 12 V		B, C
	Input offset current	ΔIcTL	—	—	±0.5	µA			
	Input offset voltage	VIO1	—	—	±10	mV	Vref=6 V		
	Common mode voltage range	VCM1	4	—	8	V			
PA1 & PA2	Quiescent voltage	VQ	5.3	5.65	6.0	V			K, J
	Leak current	IcER	—	—	4.0	mA	VCE=15 V		
	Output total Saturation voltage	Vsat	—	1.8	2.4	V	Io=0.8 A		
			—	1.2	1.4	V	Io=0.1 A		3
BA to PA	Voltage gain	gm	0.8	1.0	1.2	V/V	Rs=2 Ω		K, L
	Gain bandwidth	B	52	63.7	—	kHz	gm=−3 dB		
	Phase shift	Δφ	—	10.2	—	deg.	f=10 kHz		
	Total harmonic distortion	D	—	—	2	%	f=1 kHz, Io=0.1 Arms		
Vtr to PA	Offset voltage	VIO2	—	—	±20	mV			D
	Retract gain	gmr	0.08	0.1	0.12	V/V			

HM13490, HA13490MP, HA13490FP

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

Item		Symbol	Min	Typ	Max	Unit	Test Condition	Appli- cation Terminal	Note
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	4
	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			4
	Hysteresis	Thys	—	25	—	°C			

- Notes:
- See figure 1.
 $g_m = \Delta V_{sense} / \Delta V_{ctl}$
 V_{sense} is R_S voltage.
 - See figure 2.
 $g_{mr} = \Delta V_{sense} / \Delta V_{rtr}$
 - Sum of upper and lower saturation voltage.
 - Design guide only.

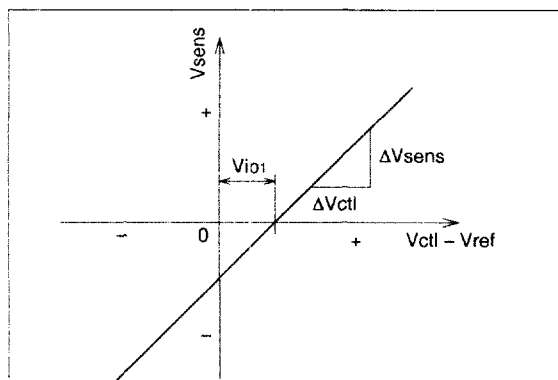


Figure 1 Vsens vs. Vctl

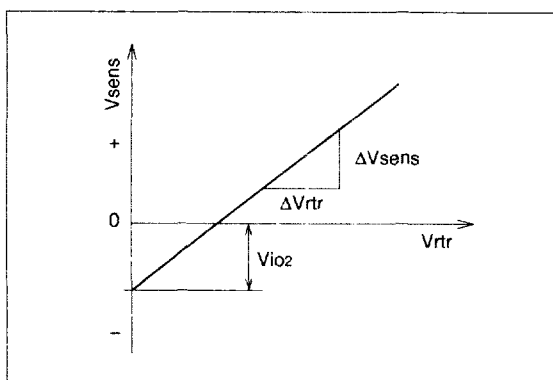


Figure 2 Vsens vs. Vrtr

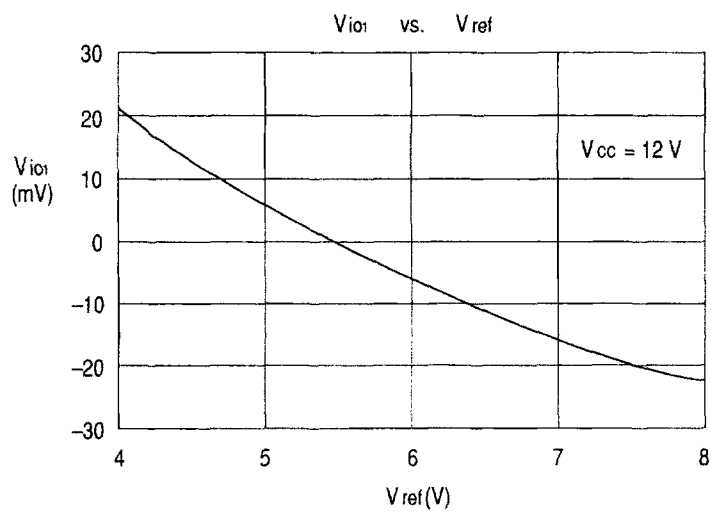
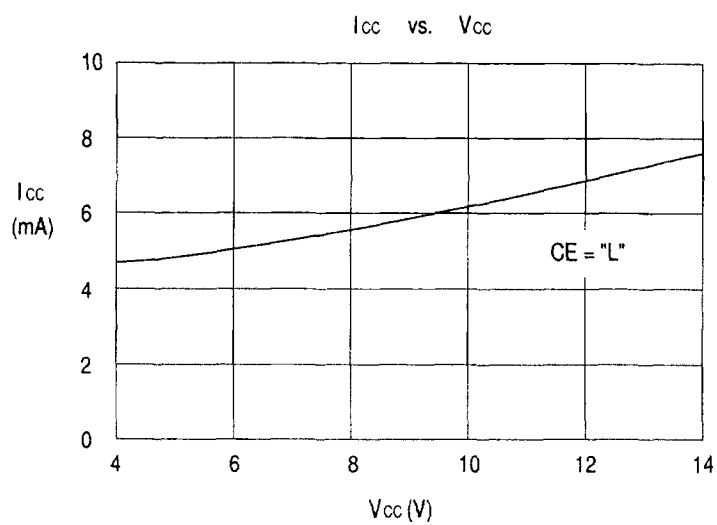


Figure 3 Electrical Characteristics

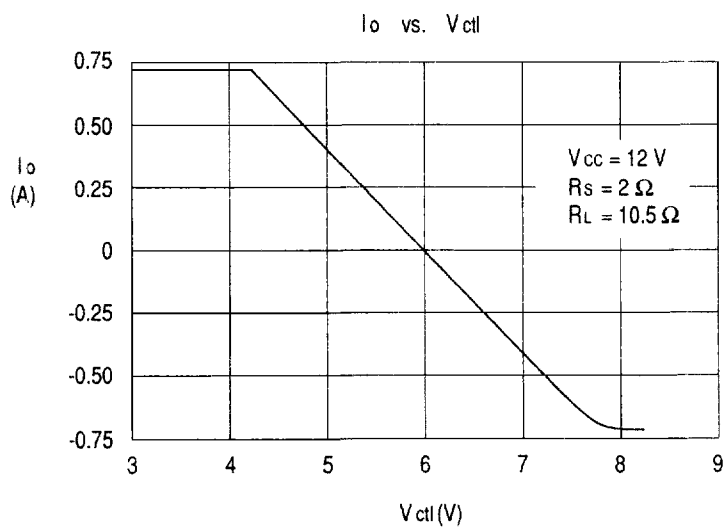
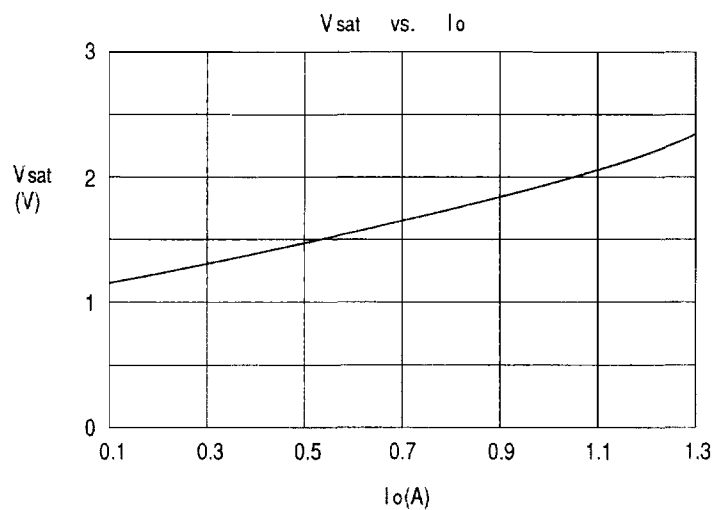


Figure 3 Electrical Characteristics (cont)

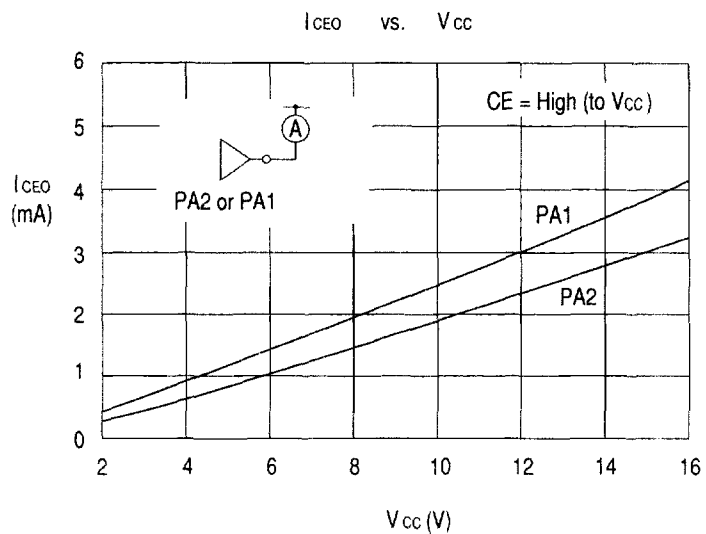
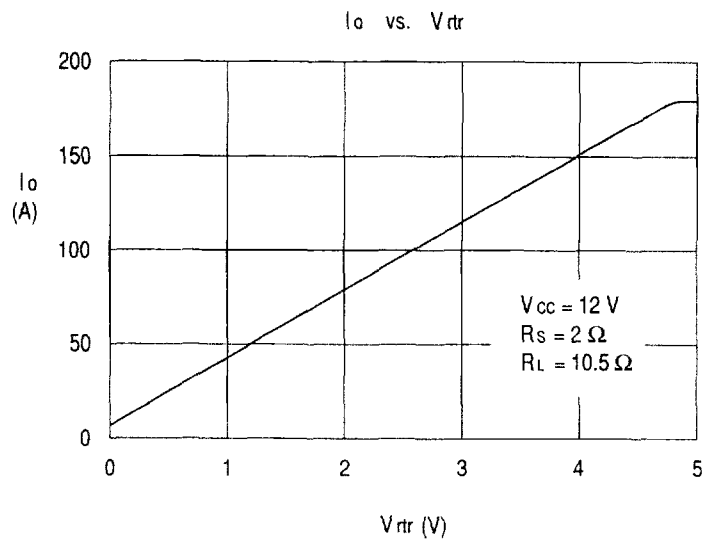


Figure 3 Electrical Characteristics (cont)

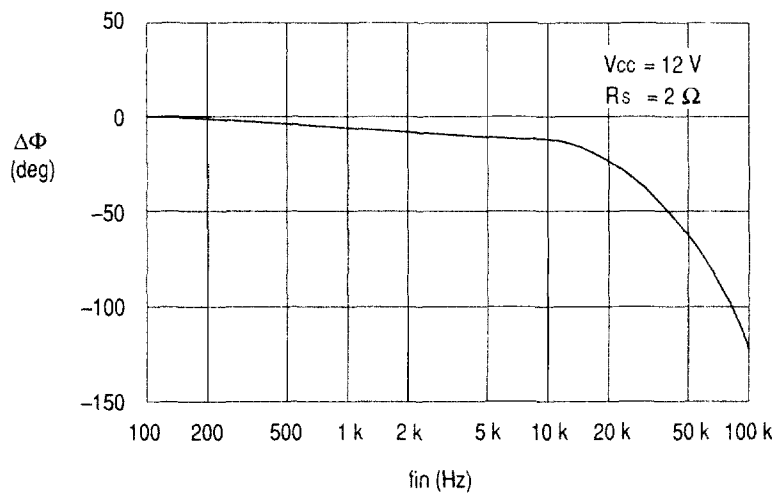
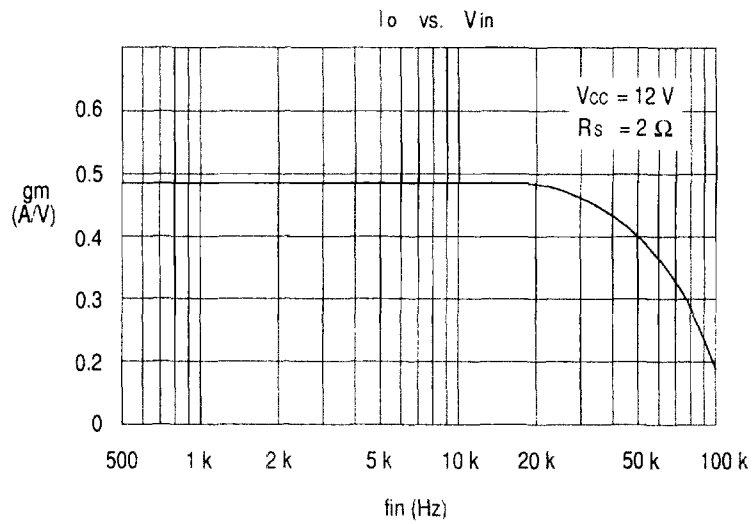


Figure 3 Electrical Characteristics (cont)