HA13470 — Preliminary

Voice Coil Motor Driver

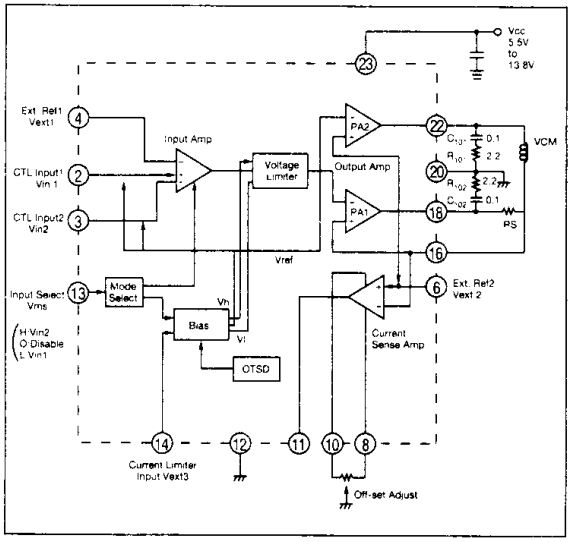
Functions

- Input amp.
- BTL output amp.
- Current sense amp.
- Current limiter
- Input selector with disable
- OTSD (Over Temperature Shut Down)

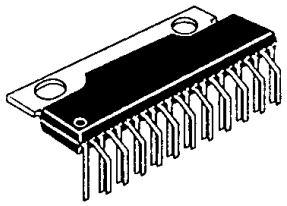
Features

- Selectable output current
  HA13470 ..... 2.5A Max.
- Easy to retract with control 2 inputs
- No cross-over distortion
- Low saturation voltage
- Externally adjustable current limiter
- Few—external components
- Wide operating voltage range

Block Diagram



HA13470

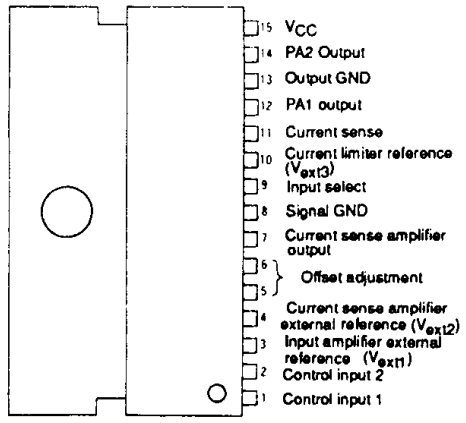


(SP-23TA)

Ordering Information

Type No.	Package
HA13470	SP-23TA

Pin Assignment



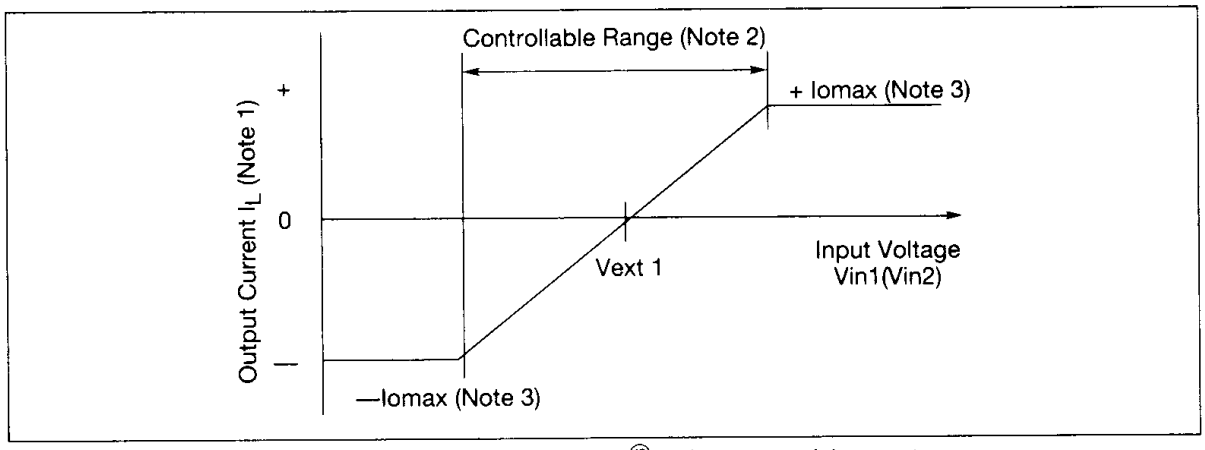
Top View

External Components

Parts No.	Recommended Value	Purpose	Note
R_{101}, R_{102}	2.2Ω	For Stability	
VR_1	10KΩ	Offset Adjust	
R_S	1.0Ω	Current Sense	1
C_{101}, C_{102}	0.1μF	For Stability	
C_{102}	≥ 0.1μF	Power Supply Bypass	

Note: 1. Use a reactance free resistance.

Current Voltage Conversion Characteristics



Notes: 1. Output current ⊕ means source current from Pin ⑱ and ⊖ means sink current.

2. In this range the relation between output current and input voltage can be described as follows (under not saturated condition at output).

$$I_O = \frac{GV_1 (V_{in} - V_{ext1})}{R_S}$$

Where GV_1 = 2 typ. (internal constant)

3. The relation between + I_{omax} and V_{ext3}, and between −I_{omax} and V_{ext3}, can be described as follows respectively.

$$+I_{omax} = \frac{GV_3\, V_{ext3}}{R_S}, \quad -I_{omax} = -\frac{GV_3\, V_{ext3}}{R_S}$$

Where GV_3 = 0.5 typ. (internal constant)

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	HA13470	Unit	Note
Supply Voltage	V_{CC}	15	V	1
Output Peak Current	I_{opeak}	2.5	A	2
Output Constant Current	I_O	1.67	A	
Input Voltage	V_{in}	−0.5 ~ V_{CC}	V	
Power Dissipation	P_1	10	W	3
Junction Temperature	T_j	150	°C	1
Storage Temperature	T_{stg}	−55 ~ +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. The recommended operating supply voltage range is: V_{CC} = 5.5 to 13.8V, T_{jopr} = 0 ~ +125°C

2. t ≤ 20msec.

3. The value is at T_C = 120°C. Thermal resistance show as follows: $\Theta_{j-c} \leq$ 5°C/W, $\Theta_{j-a} \leq$ 40°C/W

Electrical Characteristics (T_a = 25°C, V_{CC} = 12V, R_S = 1.0Ω, R_L = 4Ω)

Item		Symbol	Test Condition	min.	typ.	max.	Unit	Applicable Terminal	Note
	Quiescent Current	I_{CCO}	V_{ms} = Open	—	—		mA	23	
		I_{CC}	V_{ms} = 0.8V	—	30	.50	mA		
Input Select	Input Current	I_{ms}	V_{ms} = 0 ~ 5V	—	—	±0.5	mA	13	
	Select 1 Voltage	V_{ms1}		—	—	0.8	V		
	Disable Voltage	V_{msm}		2	—	3	V		
	Select 2 Voltage	V_{msh}		4.2	—	—	V		
Input Amp.	Input Current	I_{in}	V_{in} = 4 ~ 8V	—	—	±30	μA	2–4	
	Common Mode Input Voltage	V_{ext1}		4	—	8	V		
	Offset Voltage	V_{IO1}	V_{sens} = 0	—	—	±10	mV	2–4	1
Output Amp.	Saturation Voltage	V_{sat}	I_O = 0.55A (0.33A)	—	1.4	1.8	V	18, 22	2
			I_O = 1.67A (1.0A)	—	2.0	2.8	V		
Input Amp. to Output Amp.	Voltage Gain	GV_1	f_{in} = 1KHz	—	6	—	dB	16, 18	1
	Gain Band Width	BW_1	$\triangle G_{V1}$ = -3dB		—	—	KHz	16, 18	
	Phase Delay	$\triangle\phi$	f_{in} = KHz	—	—		deg.		
	Total Harmonic Distortion	THD	f_{in} = 1KHz I_O = 100mArns	—	—	2	%		
Current Limiter	Input Current	I_{ext3}	V_{ext3} = 0 ~ 5V	—	—	±10	μA	14	
	Offset Voltage	V_{IO3}	V_{SCNS} = ± 10mV	—	—	±50	mV	14	3
	Setting Gain	GV_3	V_{ext3} < 2V	—	-6	—	dB		
	Gain Difference	$\triangle G_{V3}$		—	—	±1	dB		
Current Sense Amp.	Common Mode Input Voltage	V_{ext2}		4	—	8	V	6	
	Offset Voltage	V_{IO2}		—	—	±10	mV	16, 18	
	Output Voltage Swing	V_O		8	—	—	V_{PP}	11	
	Gain Band Width	BW_2	G_V = 0dB	—	1.0	—	MHz		
OTSD	Shut Down Temperature	T_{sd}		125	150	—	°C		

Notes: 1. See Figure 1. For Offset Voltage (V_{IO1}) and by can be calibrated as.

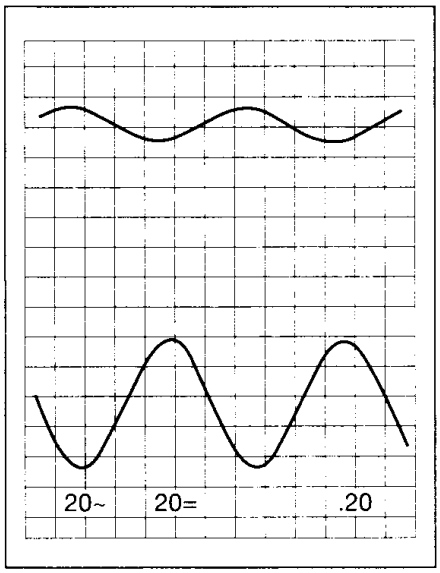
$$G_{V1} = 20\log_{10} \frac{\triangle V_{sens}}{\triangle V_{in}} \text{ (dB)}$$

2. Specified by the sum of upper and lower saturation voltage
3. See Figure 2.

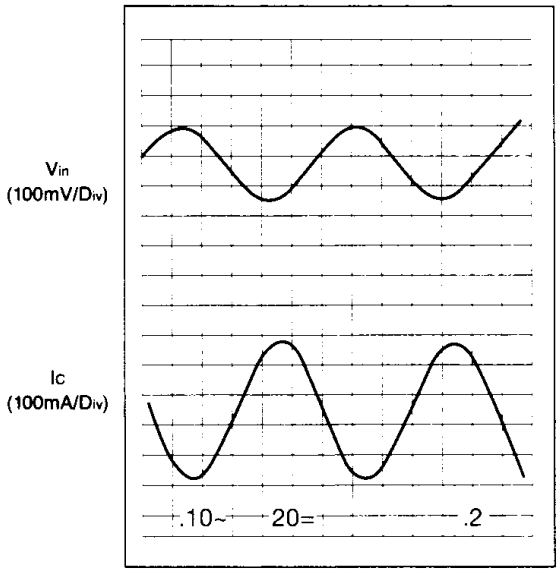
$$G_{V0} = 20\log_{10} \frac{\triangle V_{sens}}{\triangle V_{ext3}} \text{ (dB)}$$

The Waveform of HA13470 R_S = 0.5Ω, R_L = 4Ω, L = 1.0mH

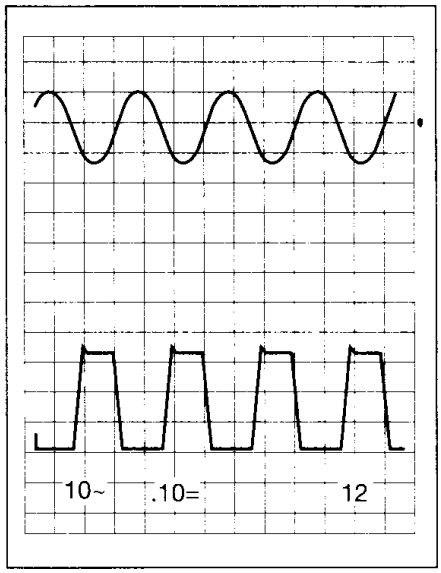
(1) f_{in} = 1KHz, V_{in} = 20mV$_{P-P}$



(2) f_{in} = 1KHz, V_{in} = 200mV$_{P-P}$



(3) f_{in} = 400Hz, V_{in} = 2V$_{P-P}$, V_{ext3} = 1.5V



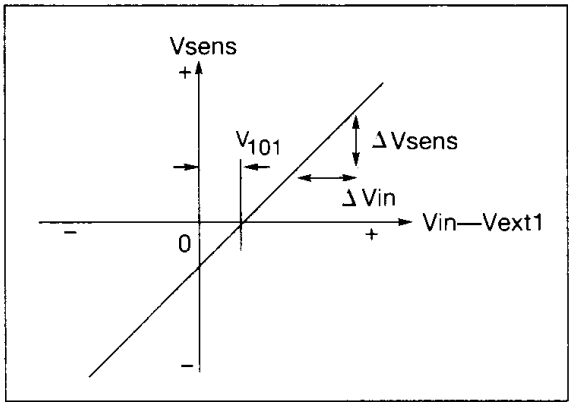


Figure 1

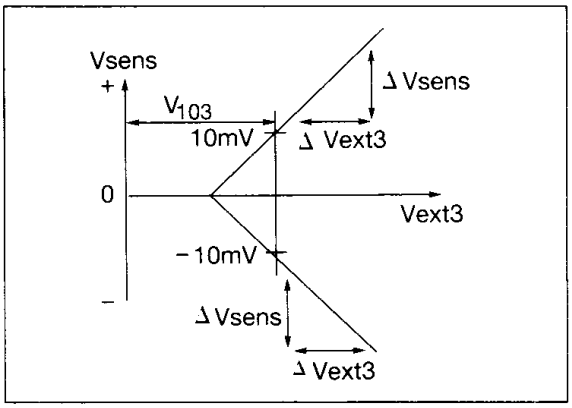
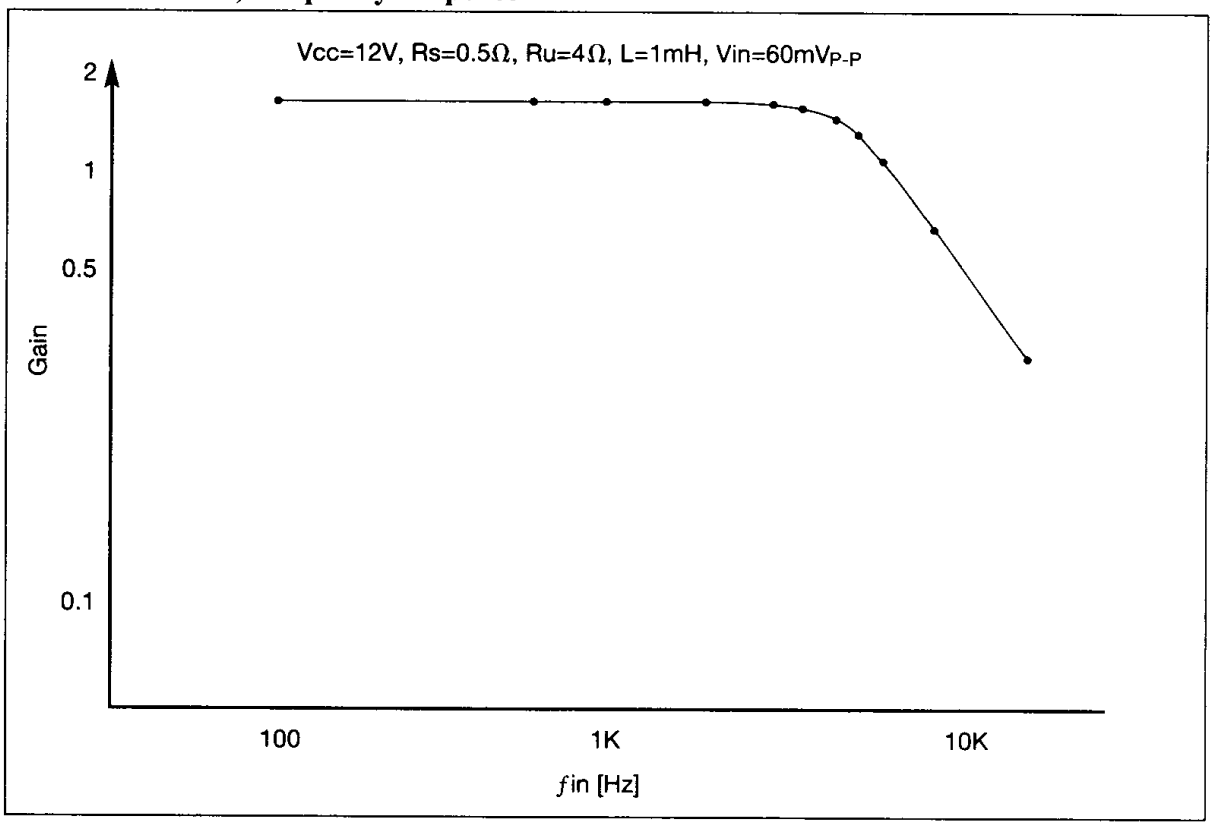
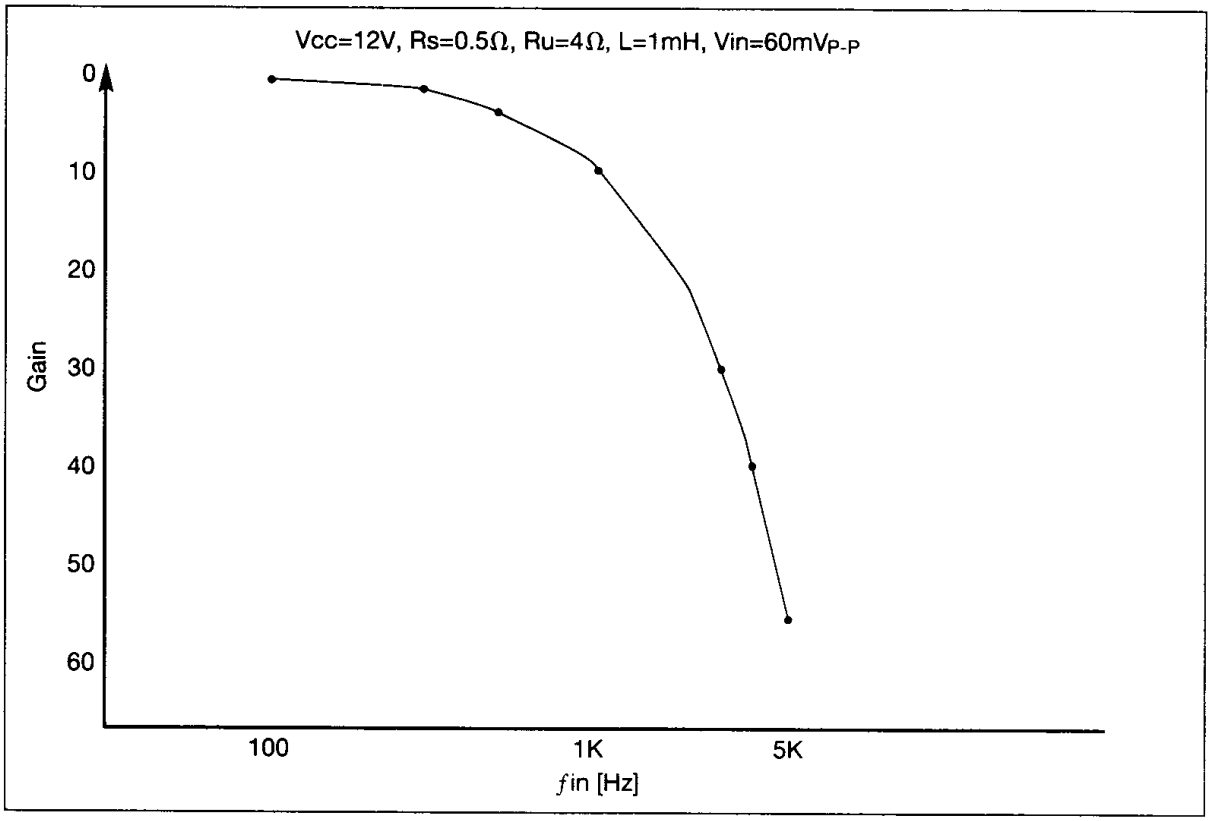


Figure 2

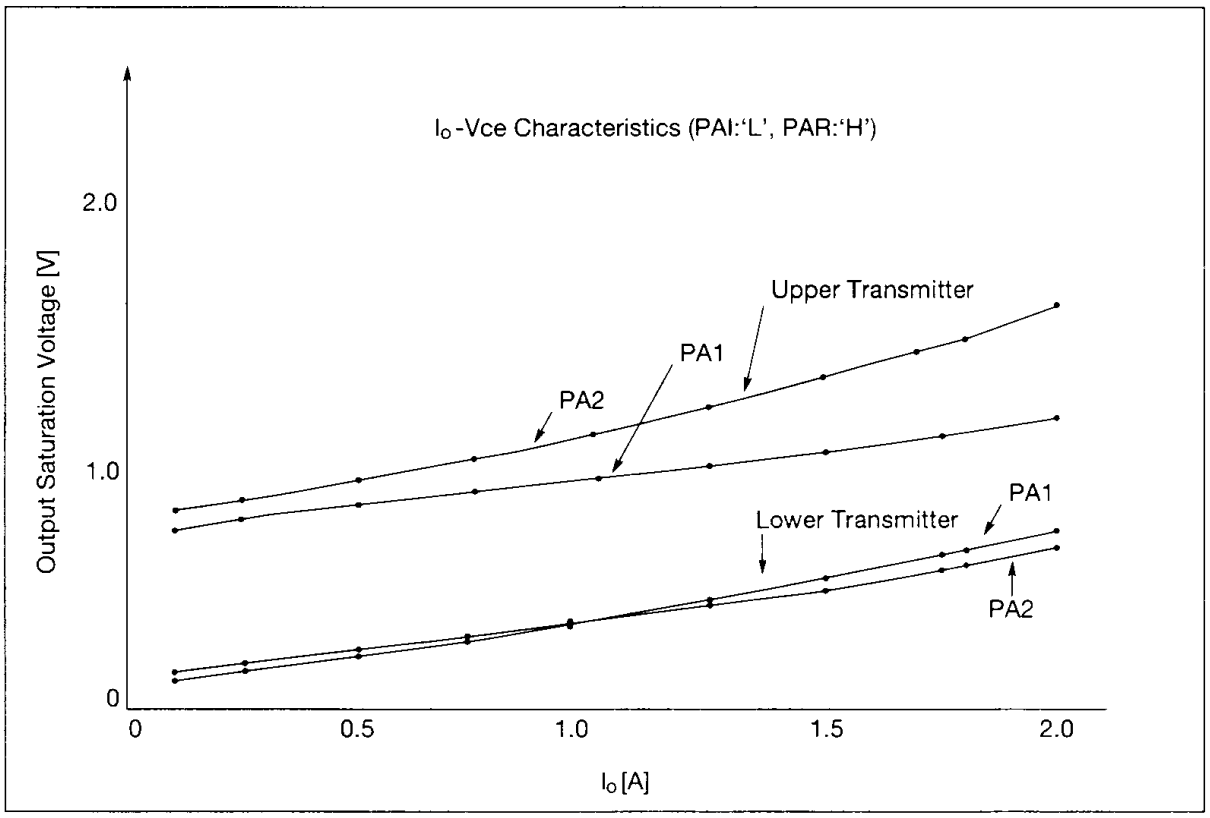
HA13470 Overall, Frequency Response



HA13470 Overall, Phase Shift



Transmitter



The Gain of Current Limiter Vext-Vsense