



3Features

- Exiemal adjustable VCO
- Includes an A/D, D/A converter(ADM),  
Two low pass filters and 48k bits SRAM
- Low distortion)(0.5% typ)
- Low noise (-85 dBV typ)
- Controlled by parallel data from EASY mode  
and serial data from uCOM mode
- Includes the auto reset circuit
- Stopping the IC function by the Sleep mode

DESCRIPTION

ES56031 is an echo IC with silicon type CMOS process It has an ADC, DAC, and uses digital processing audio signal for the time delay .

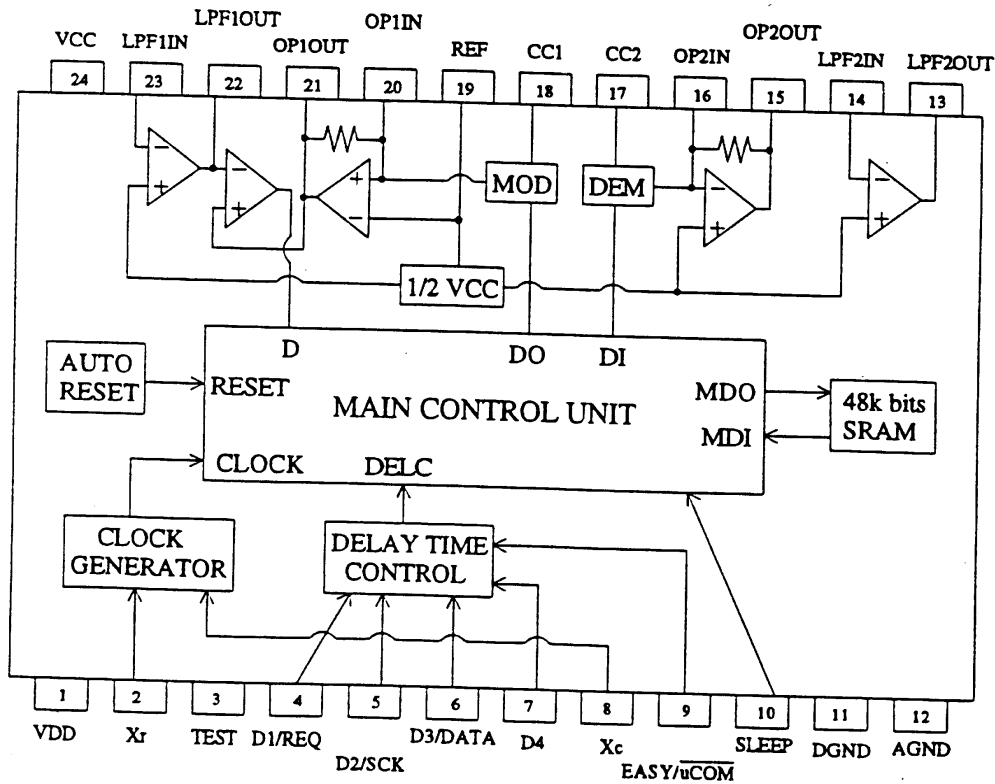
It includes an internal clock generator circuit to provide the system's clock . The system's clock can be easily adjusted by changing the exiemal resistor.

The delay time can be controlled by the uCOM interface or manual setting.

APPLICATIONS

- Karaoke
- TV
- Electronic instrument

FUNCTION BLOCK DIAGRAM





PIN CONFIGURATION

1	VDD	VCC	24
2	Xr	LPF1IN	23
3	TEST	LPF1OUT	22
4	D1/REQ	OP1OUT	21
5	D2/SCK	OP1IN	20
6	D3/DATA	REF	19
7	D4	CC1	18
8	Xc	CC2	17
9	EASY/ $\overline{\text{uCOM}}$	OP2IN	16
10	SLEEP	OP2OUT	15
11	DGND	LPF2IN	14
12	AGND	LPF2OUT	13

**PIN DESCRIPTION**

Pin	Name	Type	Function
1	VDD		Digital supply voltage
2	Xr	I	Connects to the internal clock generator
3	TEST	I	A "high" on this input indicates test mode; A "low" on this input indicates normal mode
4	D1 / REQ	I	In Easy mode, this input indicates D1 data; in uCOM mode, this input indicates request data.
5	D2 / SCK	I	In Easy mode, this input indicates D2 data; in uCOM mode, this input indicates shift clock.
6	D3 / DATA	I	In Easy mode, this input indicates D3 data; in uCOM mode, this input indicates serial data.
7	D4	I	In Easy mode, this input indicates D4 data.
8	Xc	O	Connects to the internal clock generator.
9	EASY / <u>uCOM</u>	I	A "high" on this input indicates EASY mode – parallel data control ; a "low" on this input indicates uCOM mode – serial data input.
10	SLEEP	I	A "high" on this input indicates the sleep mode; a "low" on this input indicates the normal mode.
11	DGND		Digital ground
12	AGND		Analog ground

### PIN DESCRIPTION

Pin	Name	Type	Function
13	LPF2OUT	O	Low pass filter 2out put
14	LPF2IN	I	Low pass filter 2input
15	OP2OUT	O	It can be used as demodulated integrator by connect capacitor.
16	OP2IN	I	It can be used as demodulated integrator by connect capacitor.
17	CC2		Current control 2.
18	CC1		Current control 1.
19	REF		Reference voltage( = 1/2 VCC)
20	OP1IN	I	It can be used as moddulated integrator by connect capacitor.
21	OP1OUT	O	It can be used as moddulated integrator by connect capacitor.
22	LPF1OUT	O	Low pass filter 1 output.
23	VCC	I	Low pass filter 1 output.
24	VCC		Analog supply voltage.



**Absolute Maximum Ratings**

( $T_a=25^{\circ}\text{C}$ , unless otherwise noted)

Symbol	Description	Limits	Unit
Vcc	Supply voltage	6.5	V
Icc	Supply current	100	mA
Pd	Power dissipation	1	W
Topr	Operation temperature	-20~75	$^{\circ}\text{C}$

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
Vcc/Vdd	Supply voltage	4.5	5	5.5	V
Fck	Clock frequency		2	3	MHz
V <sub>IH</sub>	“H” input voltage	0.7Vdd		Vdd	V
V <sub>IL</sub>	“L” input voltage	0		0.3Vdd	V

### ELECTRICAL CHARACTERISTICS

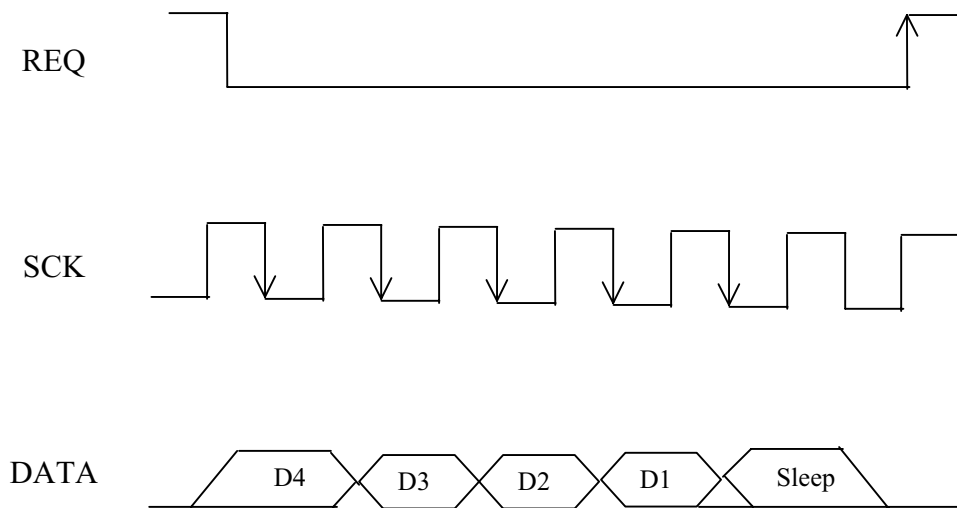
(VCC = 5.0V, fin = 1 KHz, Vi = 100 mVrms, Ta = 25°C,  
 unless otherwise noted)

Symbol	Parameter	Test condition	Limits			
			Min	Typ	Max	Unit
Icc	Circuit current			16	40	mA
Gv	Voltage gain	R <sub>L</sub> = 47k $\Omega$	-2.5	-0.5	2.5	dB
Vomax	Maximum output voltage	THD = 10%	0.7	1.5		V <sub>rms</sub>
THD	Output distortion	30kHz LPF	Fs = 500kHz	0.3	1.0	%
			Fs = 250kHz	0.5	1.5	
No	Output noise	Fs = 250kHz		-85	-75	dBV
SVRR	Supply voltage Rejection ratio	$\Delta V_{cc} = -20\text{dBV}$ , f=100Hz		-40	-25	dB
T <sub>mute</sub>	Mute time	D4 = low	508	528	548	Msec
		D4 = high	1.016	1.056	1.096	sec
I <sub>ccs</sub>	Sleep mode current	In sleep mode		12	30	mA

**OPERATION MODE**
**\*uCOM MODE (serial data input)**

When the pin EASY /  $\overline{\text{uCOM}}$  = “low”, then in the uCOM mode.

The timing diagram is shown as follows:



When the REQ signal is low level, the DATA signal is latched at the falling edge of the SCK signal, and the last five delay time modes are set at the rising edge of the REQ signal.



\* EASY MODE(parallel data input)

When the pin EASY / uCOM = “high” , then in the easy mode.

D4	D3	D2	D1	Fs	Td
L	L	L	L	500	12.3
			H		24.6
		H	L		36.9
			H		57.4
	H	L	L		61.4
			H		73.7
		H	L		86.0
			H		98.3
H	H	L	L	250	110.6
			H		122.9
		H	L		135.2
			H		147.5
	L	L	L		159.7
			H		172.0
		H	L		184.3
			H		196.6

Fs = Sampling frequency (kHz)

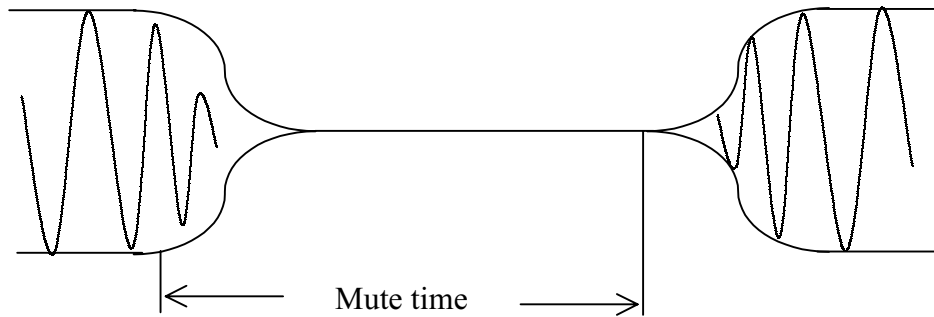
Td = Delay time (msec)



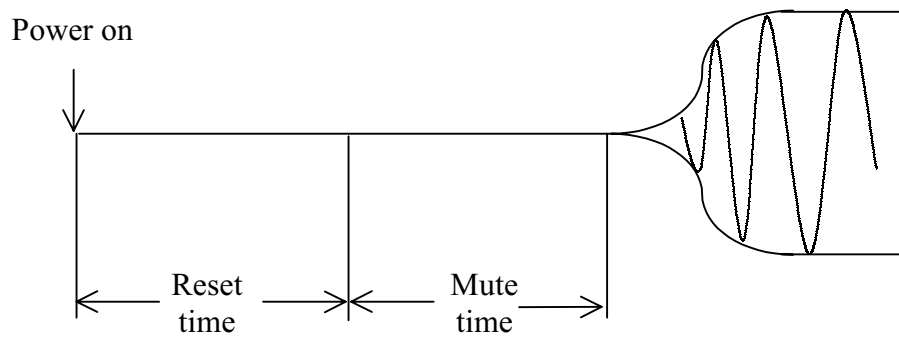


\* MUTING

Delay signal before change mode                      Delay signal After change mode



(i) Waveforms of the signal during delay time changing mode

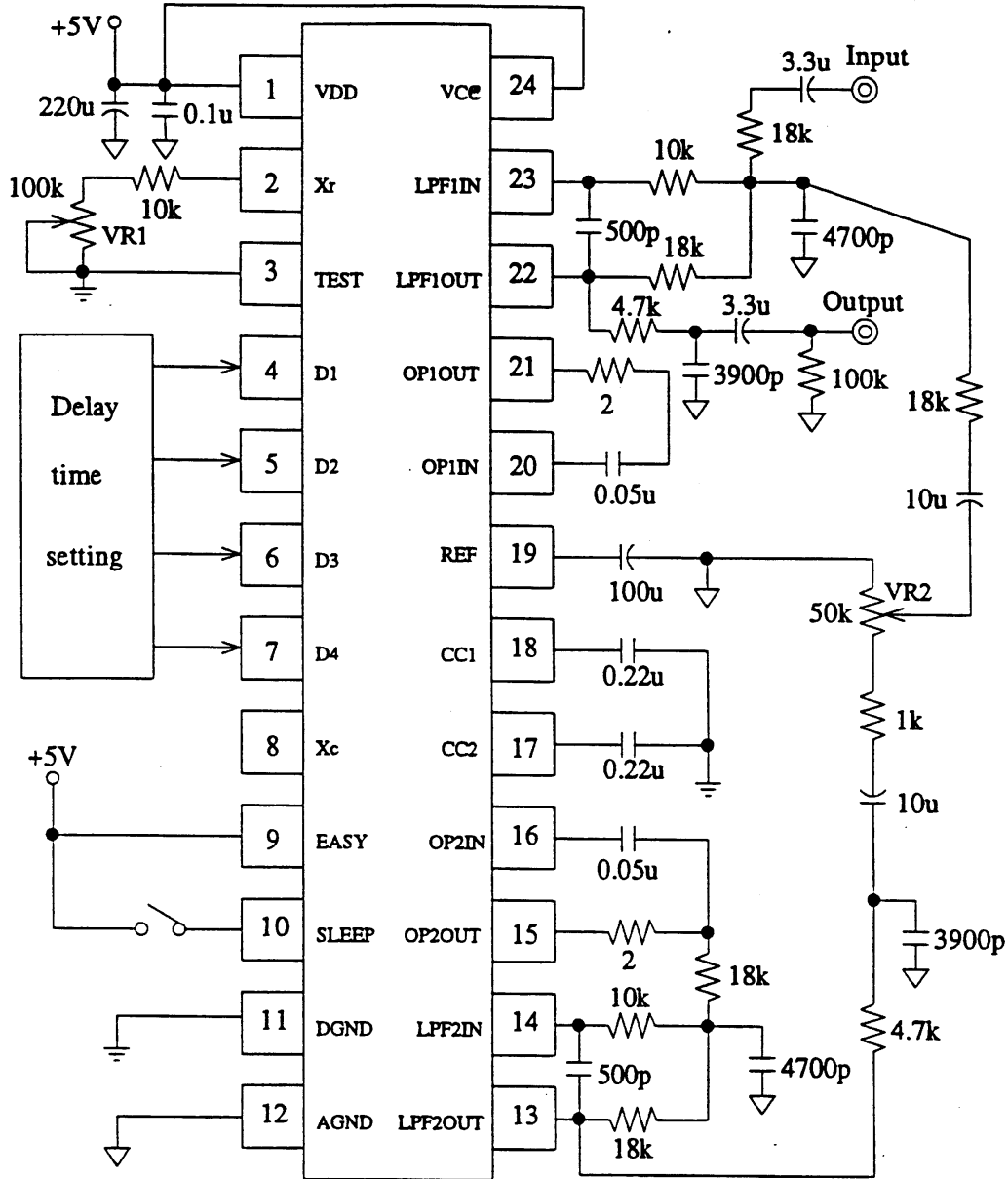


(ii) Waveforms of the signal during power on



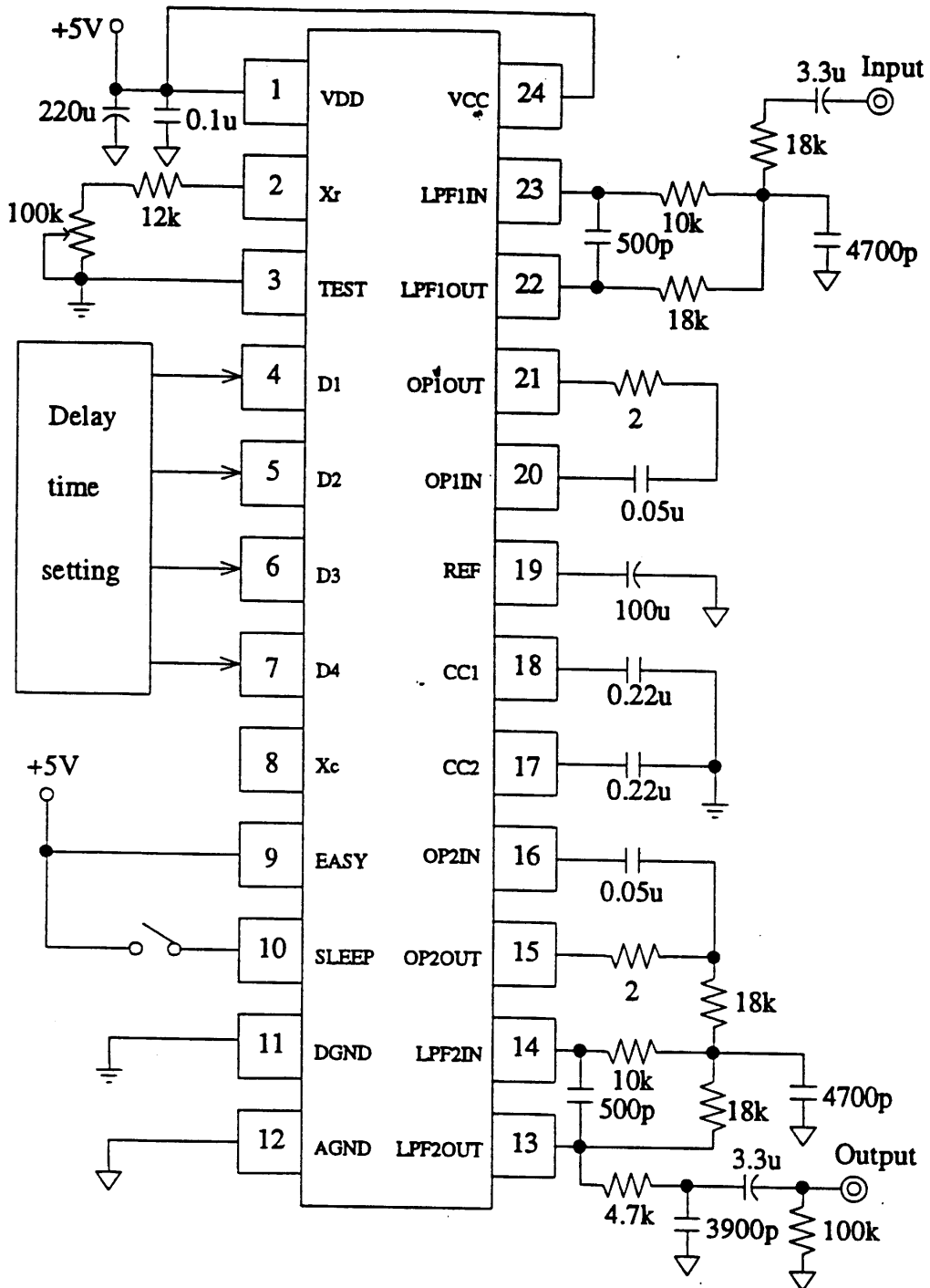
APPLICATION CIRCUIT

\* EASY MODE ( for echo application )



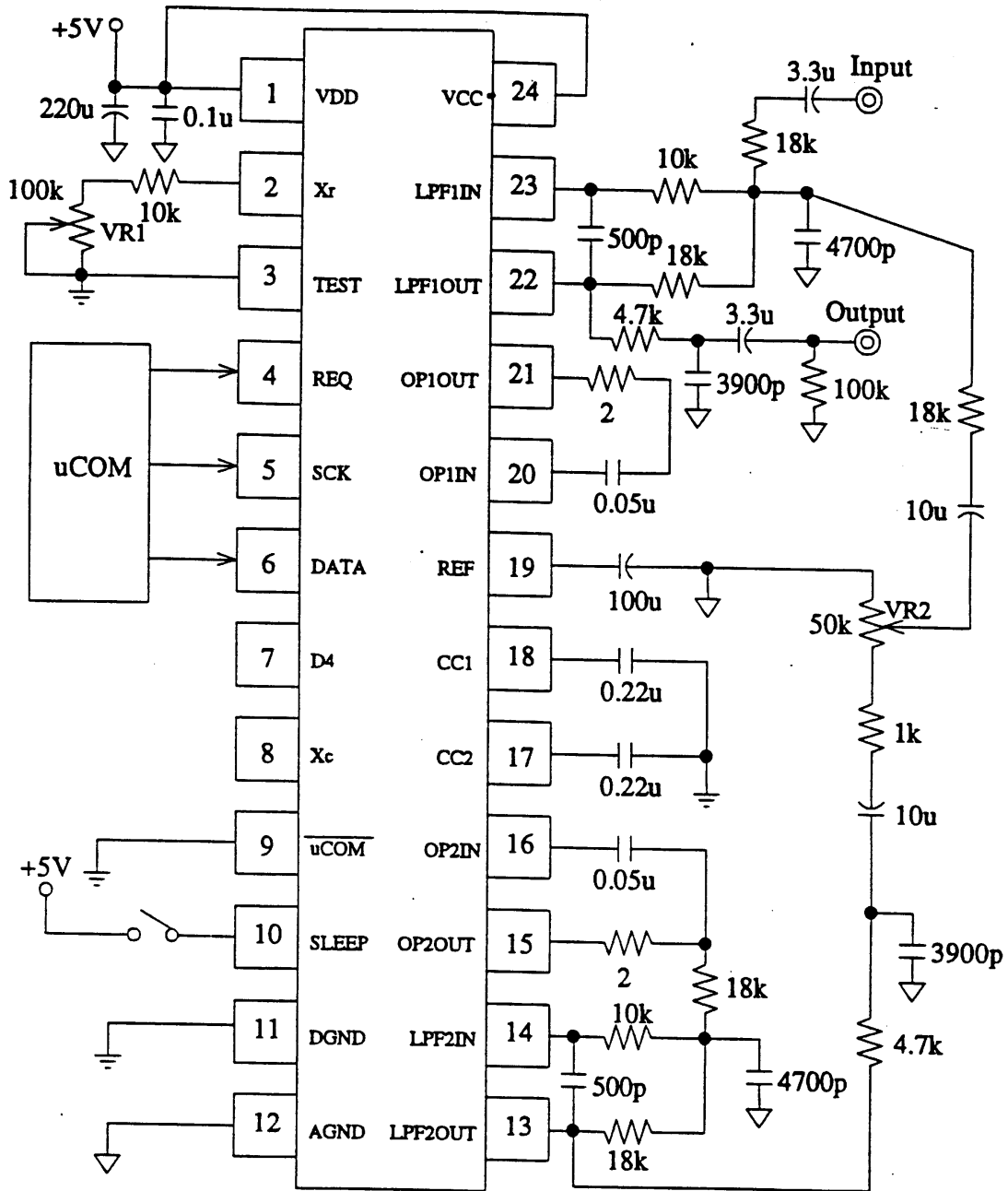


\* EASY MODE ( for surround application )



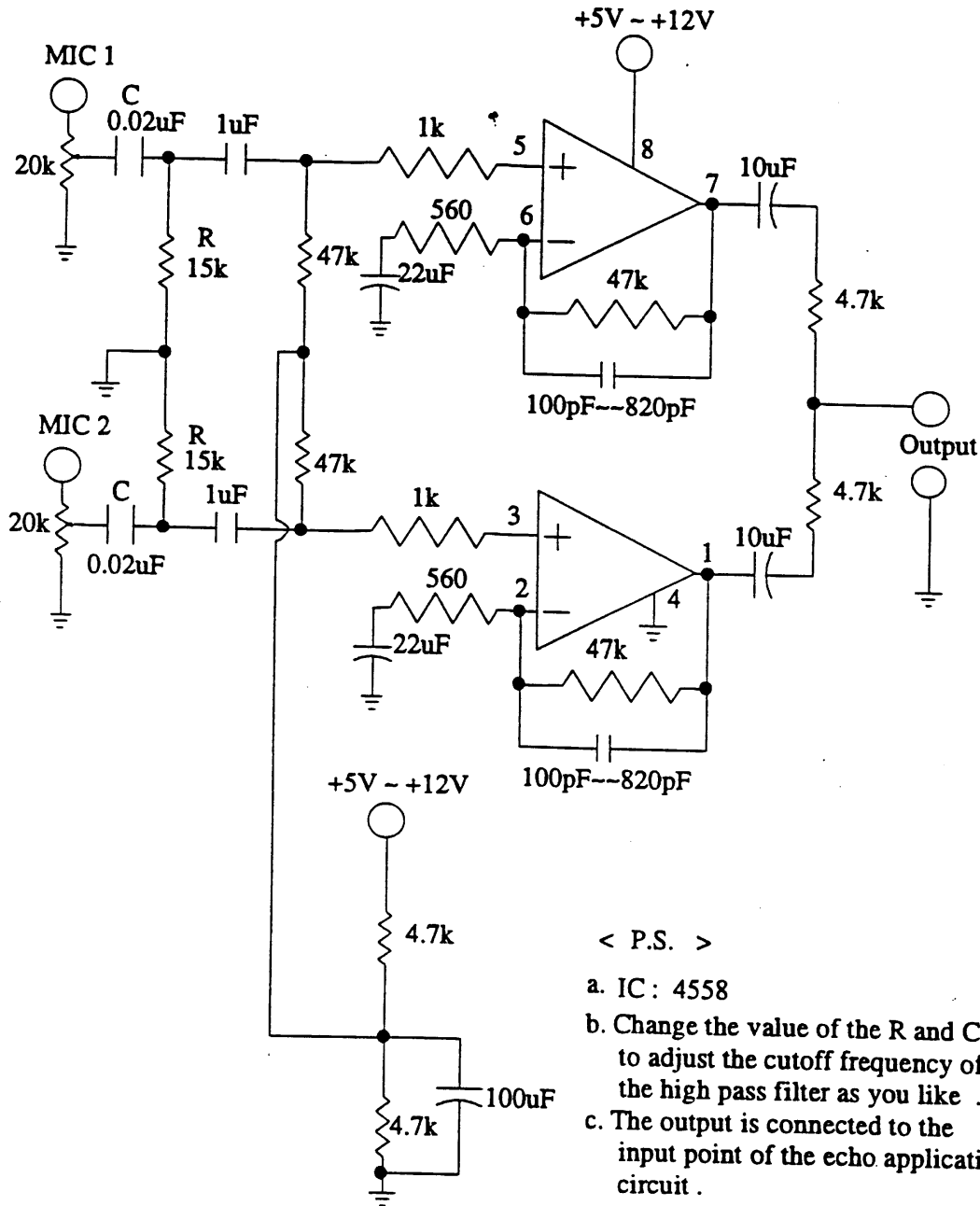


\* uCOM MODE ( for echo application )



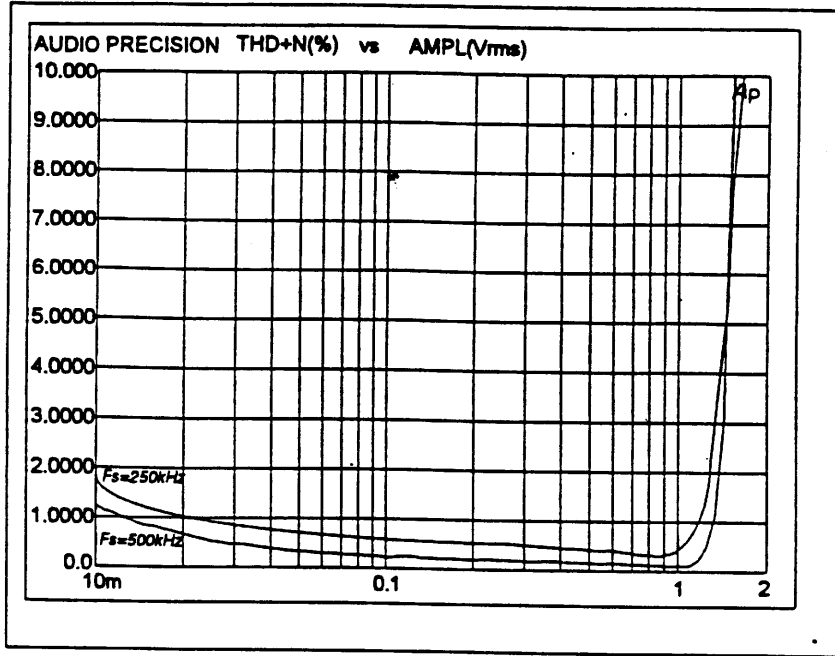


\* MIC Pre-Amp Application circuit

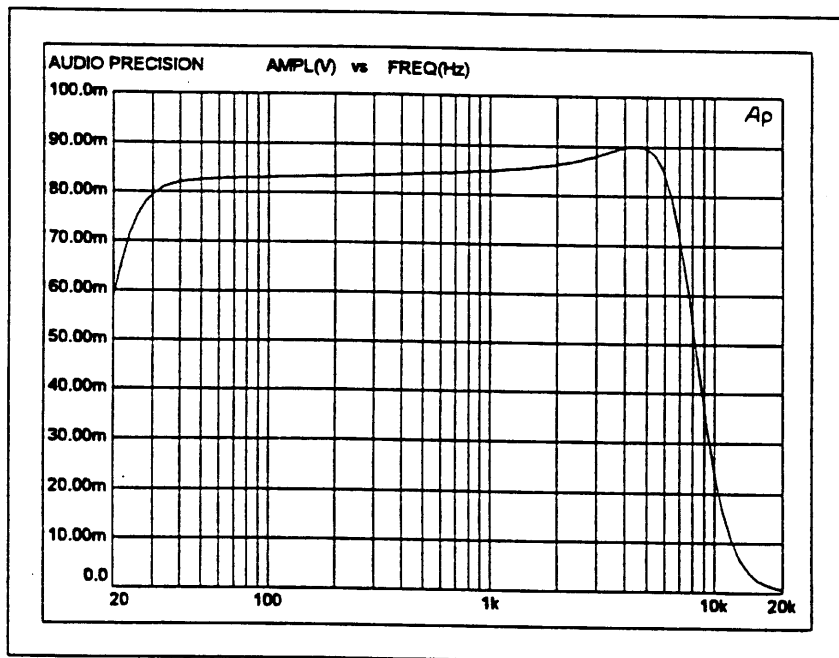




### Output THD vs. Input voltage

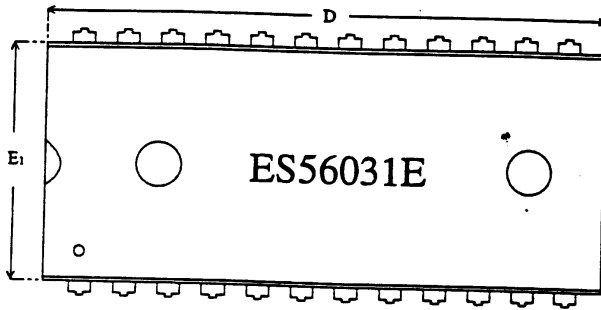


### Output voltage vs. frequency

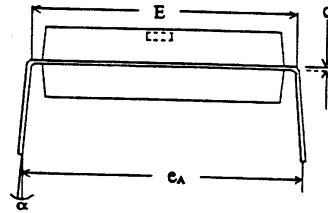
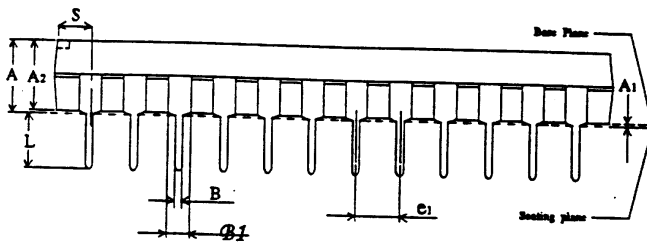




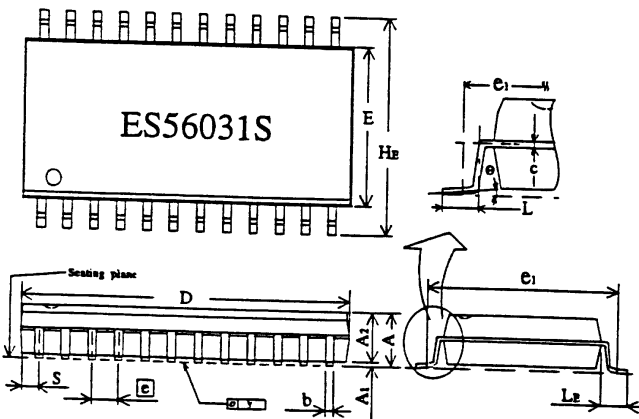
DIP 24 PINS OUTLINE DIMENSION



Symbol	Dimension in inch	Dimension in mm
A	0.210 MAX	5.334 MAX
A1	0.010 MIN	0.254 MIN
A2	0.155 +/- 0.005	3.937 +/- 0.127
B	0.018 <sup>+0.004</sup> / <sub>-0.002</sub>	0.457 <sup>+0.102</sup> / <sub>-0.051</sub>
B1	0.060 <sup>+0.004</sup> / <sub>-0.002</sub>	1.524 <sup>+0.102</sup> / <sub>-0.051</sub>
C	0.010 <sup>+0.004</sup> / <sub>-0.002</sub>	0.254 <sup>+0.102</sup> / <sub>-0.051</sub>
D	1.250TYP (1.260MAX)	31.750TYP (32.004MAX)
E	0.600 +/- 0.010	15.240 +/- 0.254
E1	0.550 +/- 0.005	13.970 +/- 0.127
E1	0.100 +/- 0.010	2.540 +/- 0.254
L	0.130 +/- 0.010	3.302 +/- 0.254
α	0° - 15°	0° - 15°
Ca	0.650 +/- 0.020	16.510 +/- 0.508
S	0.085 MAX	2.159 MAX



SOP 24 PINS OUTLINE DIMENSION



Symbol	Dimension in inch	Dimension in mm
A	0.110 MAX	2.794 MAX
A1	0.004 MIN	0.102 MIN
A2	0.091 +/- 0.005	2.311 +/- 0.127
b	0.016 <sup>+0.004</sup> / <sub>-0.002</sub>	0.406 <sup>+0.102</sup> / <sub>-0.051</sub>
C	0.006 <sup>+0.004</sup> / <sub>-0.002</sub>	0.152 <sup>+0.102</sup> / <sub>-0.051</sub>
D	0.606TYP (0.611MAX)	15.392TYP (15.519MAX)
E	0.295 +/- 0.005	7.493 +/- 0.127
E	0.050 +/- 0.006	1.270 +/- 0.152
e1	0.370 NOM	9.398 NOM
Hs	0.406 +/- 0.012	10.312 +/- 0.305
L	0.036 +/- 0.008	0.914 +/- 0.202
Ls	0.055 +/- 0.008	1.397 +/- 0.203
S	0.035 MAX	0.889 MAX
y	0.004 MAX	0.102 MAX
θ	0° - 10°	0° - 10°