M50194AP

DIGITAL REVERBERATION

DESCRIPTION

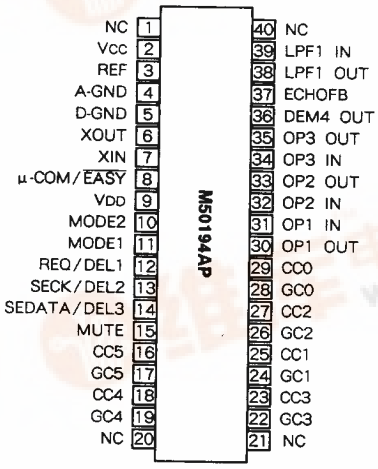
The M50194AP is a digital reverberation IC fabraicated with silicon-gate CMOS technology.

The M50194AP can mix each five delays and there delays can make reverberation of church or bathroom. And so the M50194AP is an one chip of needing of reverberation, includes an A-D, D-A converter (ADM) and memory that can be obtained a reverb system.

FEATURES

- Includes an A-D, D-A converter (Adaptive Delta Modulation), two low pass filters and a 20K-bit SRAM.
- Low noise, Low distortion
  Surround mode : Noise(−90dBV typ), Distortion(0.3% typ)
  Echo mode : Noise(−90dBV typ), Distortion(1.8% typ)
- Delay times :
  ① Surround mode ····· 4.1~41.0msec (eight steps)
  ② Echo mode ····· 20.5~163.8msec (eight steps)
  ③ Reverb mode···Short mode and long mode (five lines)
- Delay time and mode can be controlled by μ-COM or manual setting
- Includes auto mute circuit to protect sound from digital noise caused by delay time mode change or power supply
- Two control modes can be selected for delay time and mode setting, easy mode control by 5-bit parallel data and μ-COM mode control by serial data.
- Includes auto reset circuit

PIN CONFIGURATION (TOP VIEW)



Outline 40P4B

NC : NO CONNECTION

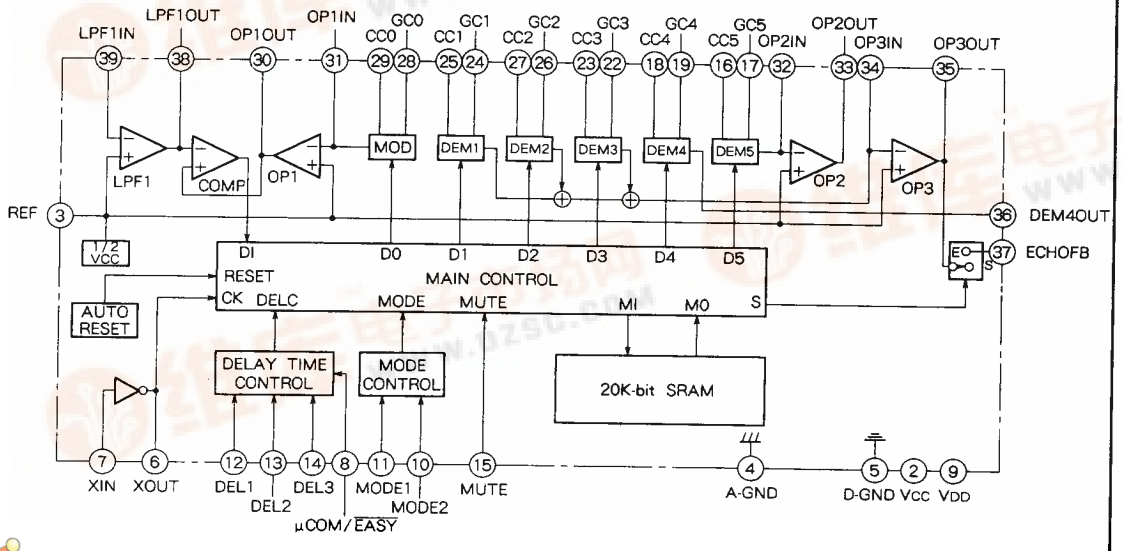
APPLICATION

Karaoke, TV, VCR, Surround processor, Electronic instrument

RECOMMENDED OPERATING CONDITIONS

Supply voltage range ····· 4.5~5.5V
Rated supply voltage ····· 5V

BLOCK DIAGRAM



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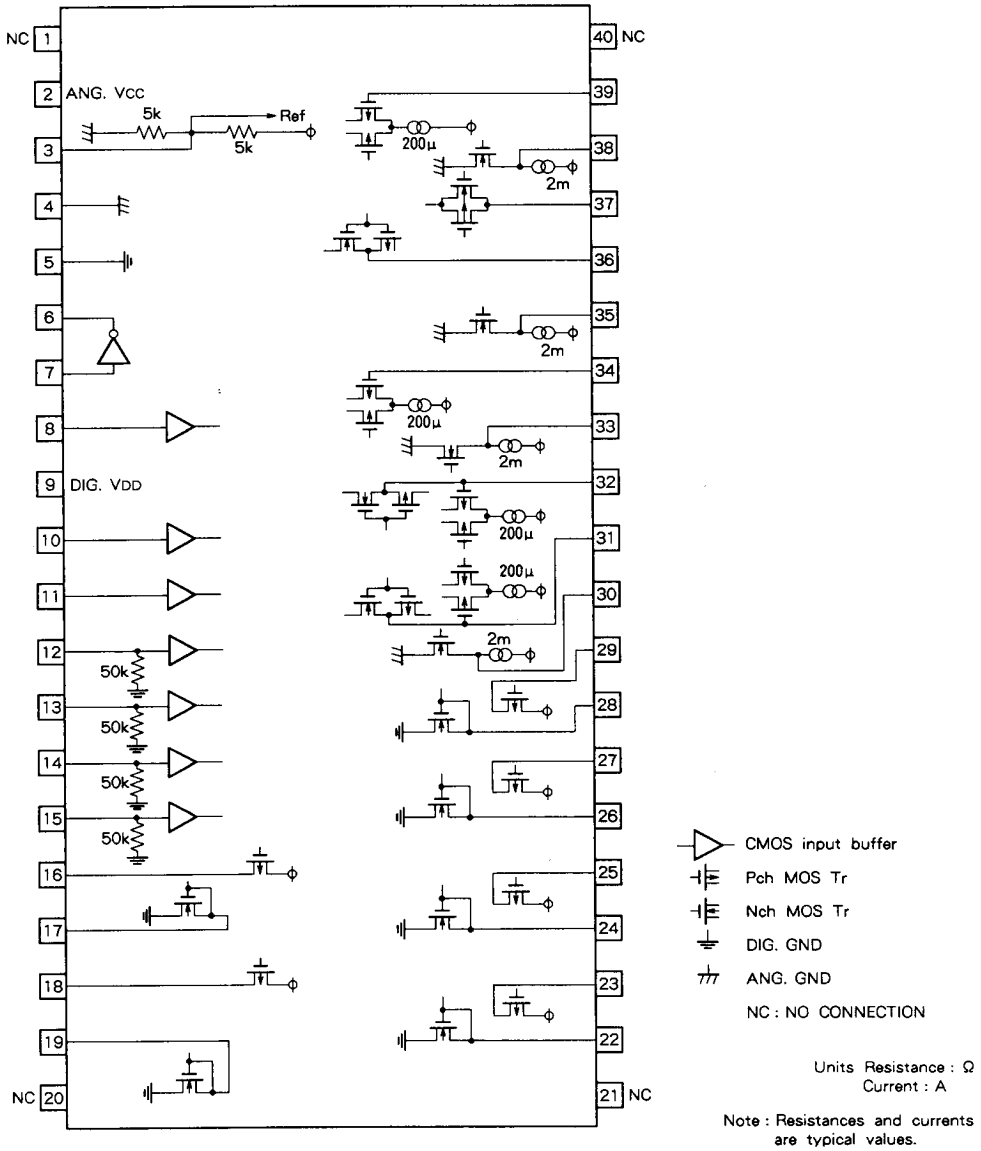
I/O INTERFACE



Units Resistance : Ω
Current : A

Note : Resistances and currents are typical values.

ABSOLUTE MAXIMUM RATINGS (Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		6.5	V
I_{CC}	Circuit current		150	mA
P_d	Power dissipation		1.7	W
T_{opr}	Operating temperature		−20~75	℃
T_{stg}	Storage temperature		−40~125	℃

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
V_{CC}	Supply voltage		4.5	5	5.5	V
f_{ck}	Clock frequency		3	4	6	MHz
V_{IH}	High input voltage		0.7V_{DD}		V_{DD}	V
V_{IL}	Low input voltage		0		0.3V_{DD}	V
f_{SECK}	μCOM mode serial clock				4	MHz

ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, f = 1kHz, V_i = 100mVrms, f_{ck} = 4MHz, Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Test conditions			Limits			Unit
					Min	Typ	Max	
I_{CCO}	Circuit current					65	100	mA
G_V	Voltage gain	R_L = 47kΩ			−3.5	−0.5	2.5	dB
V_{Omax}	Maximum output voltage	THD = 10%			0.7	1.4		Vrms
THD	Output distortion	30kHz L.P.F	Echo mode, Reverb mode	fs = 250kHz		0.7	1.5	%
				fs = 125kHz		1.8	2.5	
			Surround mode	fs = 500kHz		0.3	1	
N_O	Output noise voltage	DIN Audio (Low Sampling)	Reverb mode			−85	−60	dBV
			Echo mode			−90	−70	
			Surround mode			−90	−75	
SVRR	Supply voltage rejection ratio	△ V_{CC} = −20dBV, f = 100Hz				−40	−25	dB
TMUTE	Mute time	Echo mode, Reverb mode			515		525	ms
		Surround mode			122		132	

fs = Sampling frequency (kHz)

DELAY TIME

1. MODE

MODE1	MODE2	Mode	ECHOFB output
L	H	Surround mode	OFF
H	H	Echo mode	ON
H	L	Reverb mode	OFF
L	L	Test mode	–

2. EASY MODE (Parallel Data Input)

μ-COM/$\overline{EASY}$ = "L" (f_{ck} = 4MHz)

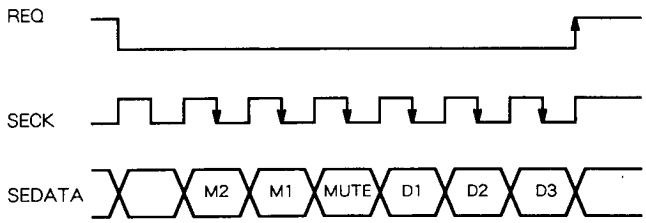
Pin name (Note1)				Surround mode		Echo mode		Reverb mode	
μ-COM/EASY	DEL1	DEL2	DEL3	f_s	T_d	f_s	T_d	f_s	T_d
L	L	L	L	500	4.1	250	20.5	250	81.9
	H	H	L		10.2		41.0		49.2
	H	L	L		14.3		61.4		61.4
	L	H	L		20.5		81.9		69.6
	H	L	H	500	24.6	125	98.3	125	41.0
	L	L	H		30.7		122.9		163.8
	L	H	H		34.8		139.3		98.3
	H	H	H		41.0		163.8		122.9
									139.3
									81.9

f_s = Sampling frequency (kHz)
T_d = Delay time (msec)

Noet 1. DEL1, DEL2, DEL3 and MUTE are inputs pins with pull-down.

3. μ-COM MODE (Serial Data Input)

Timing Diagram (μ COM/$\overline{EASY}$ = "H")



The time chart shown is μ-COM mode.

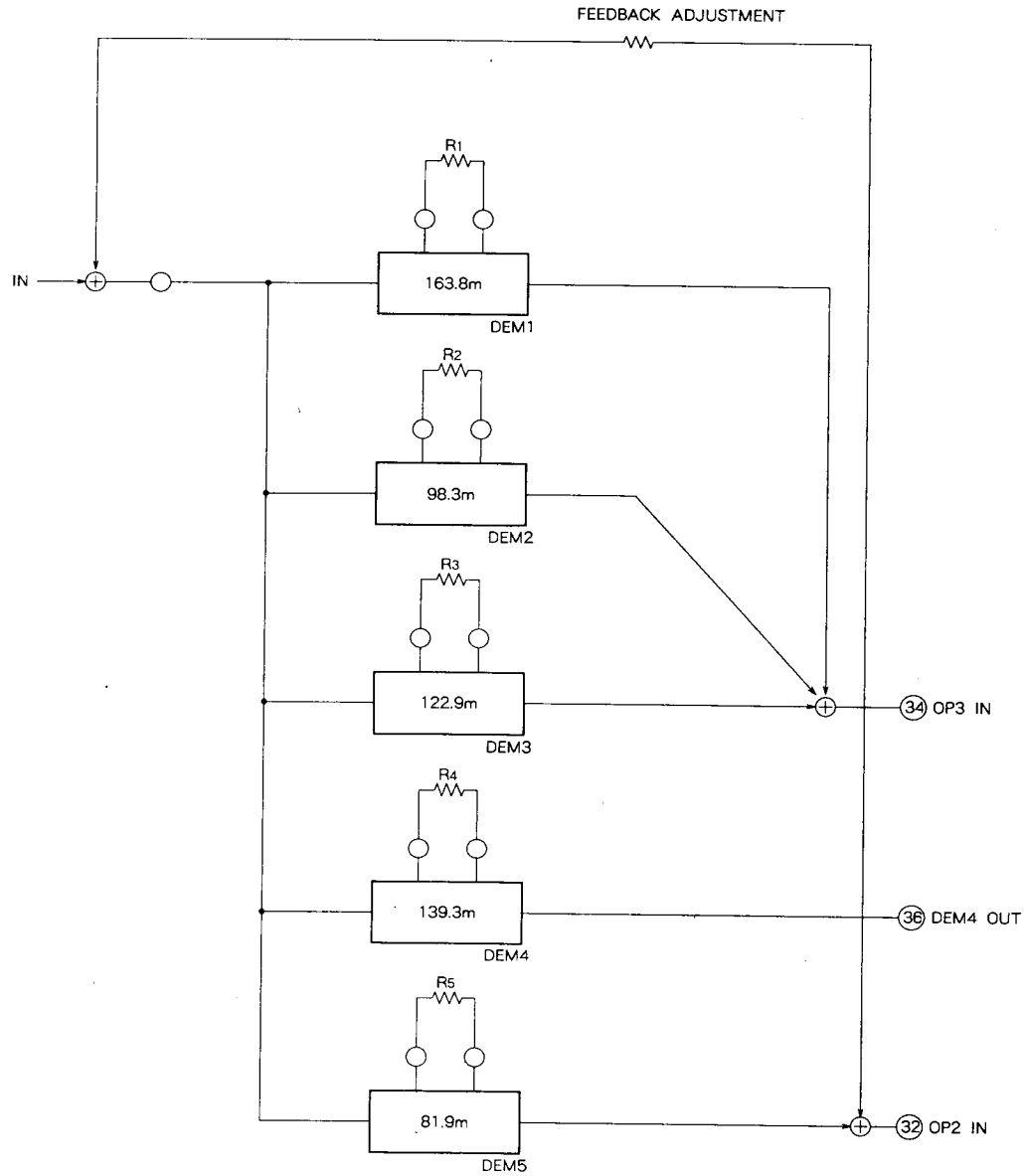
When REQ signal is low-level, SEDATA signal is latched at the falling edge of the SECK signal, and the last 6-delay time mode data are set at the rising edge of the REQ signal.

Delay Time :
D1 = DEL1
D2 = DEL2
D3 = DEL3
} 2)

Mode :
M1 = MODE1
M2 = MODE2
} 1)

Mute :
MUTE = H (Mute)

4. REVERBERATION OUTLINE



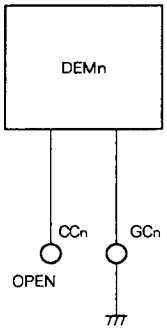
R1~R5 : Resistors for gain adjustment of delay lines
(Delay times show·····Long mode operation)

5. DEMODULATOR SELECTION

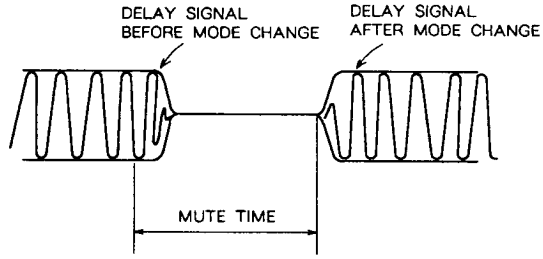
Demodulator and Delay Time (msec) diagram

(fck = 4.0MHz) (∵ msec)

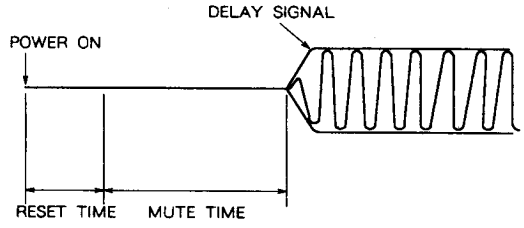
Demodulator	Surround mode	Echo mode	Reverb mode	
			Short	Long
DEM1	–	–	81.9	163.8
DEM2	4.1~41.0	20.5~163.8	49.2	98.3
DEM3	–	–	61.4	122.9
DEM4	–	–	69.6	139.3
DEM5	–	–	41.0	81.9



MUTING

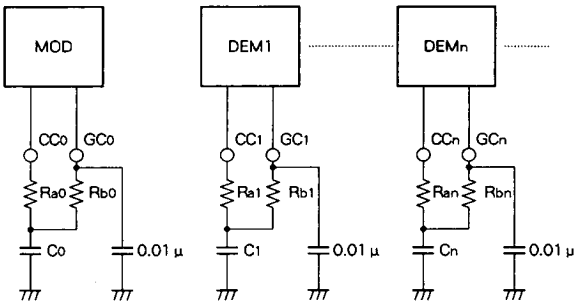


Waveforms of the signal re-initialized after change of delay time mode



Waveforms of the signal initialized at power-on

6. GAIN AJUSTMENT



Pin name	Mute mode	Mute time (msec)
MODE1		
L	Surround	132.0
H	Reverb echo	525.0

$$A_n = \frac{R_{b0}}{R_{bn}}$$

$$R_{an} = \frac{R_{bn}}{10}$$

$C_n = A_n \cdot C_0$

ex

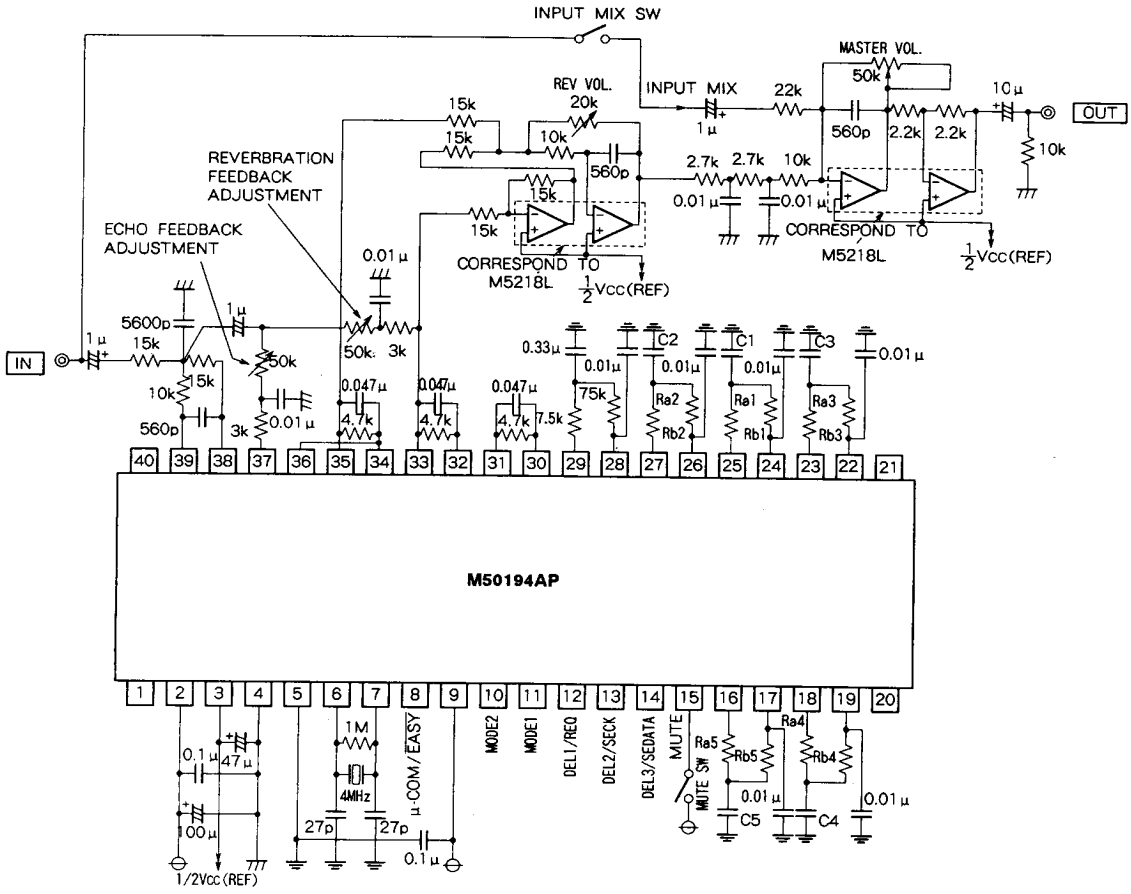
$R_{a0} = 7.5k\ \Omega$

$R_{b0} = 75k\ \Omega$

$C_0 = 0.33\ \mu F$

APPLICATION EXAMPLE

1ch OUT



Units Resistance : Ω
Capacitance : F

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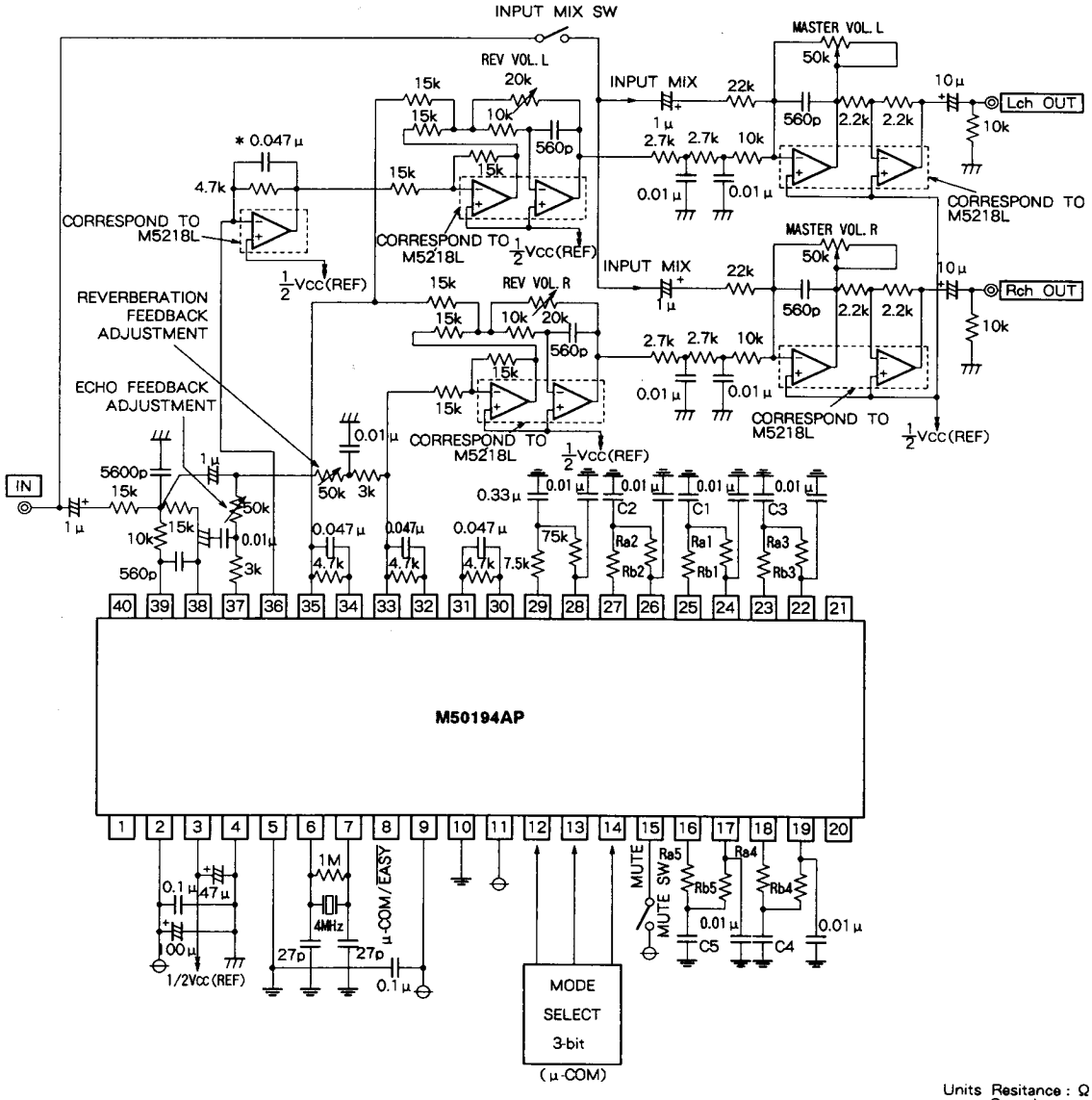
APPLICATION EXAMPLE

2ch OUT



Units Resitance : Ω
Capacitance : F