

PRELIMINARY
 Notice ; This is not a final specification.
 some parametric limits are subject to change.

MITSUBISHI SOUND PROCESSOR ICs

M65845AFP

DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

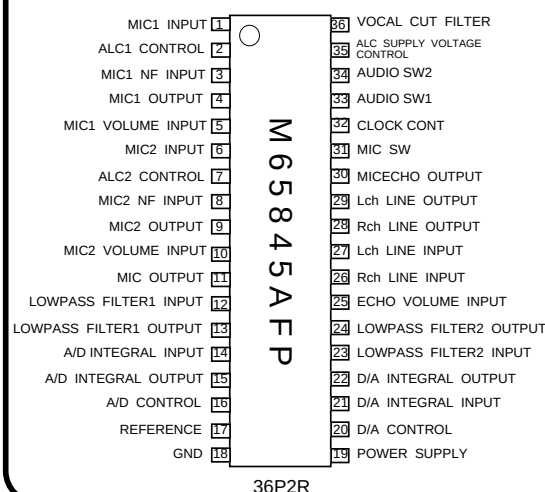
DESCRIPTION

- The M65845AFP is a CMOS IC built-in Digital Echo function with microphone peripheral circuits for "Karaoke" equipment packed in a single chip.
- It is suitable for "Karaoke" equipments such as Video CD Player, Mini Stereo, CD-Radio cassette, TV or VCR.
- Being pin compatible with the M65845FP, the M65845AFP is suitable for upgrading the series.

FEATURES

- High performance digital echo circuit thanks to 16Kbit memory
- Two microphone-mixing lines, vocal cut circuit, digital echo, and line-mixing amplifier are contained, enabling single-chip package of microphone peripheral circuit of "Karaoke" equipment.
- ALC-equipped microphone amplifiers permit excessively high-input. ALC operating voltage can be set as desired.
- Vocal cut circuit of complete stereo construction
- Compatibility with the M65845FP
- Built-in current-control oscillation circuit
- Built-in automatic reset circuit activated with power on
- Single power supply (5V)

PIN CONFIGURATION

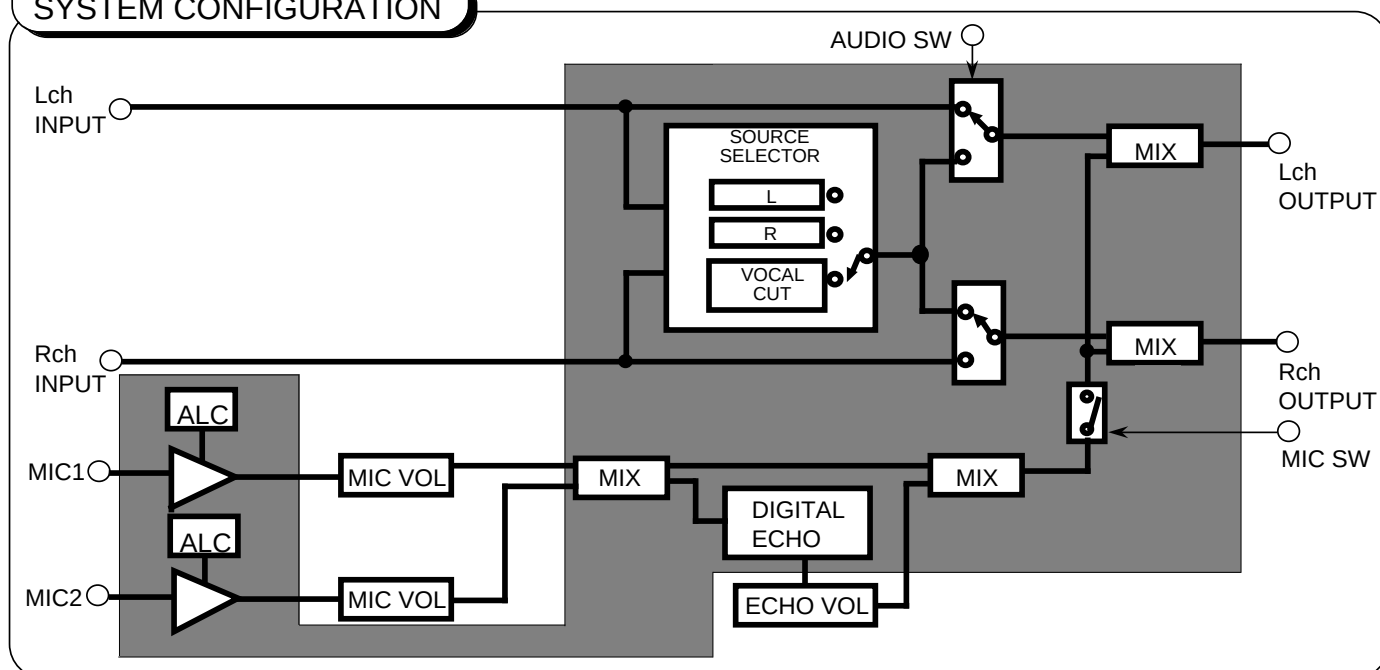


RECOMMENDED OPERATING CONDITION

Supply voltage range.....Vcc=4.5~5.5V

Rated supply voltage..... Vcc=5V

SYSTEM CONFIGURATION



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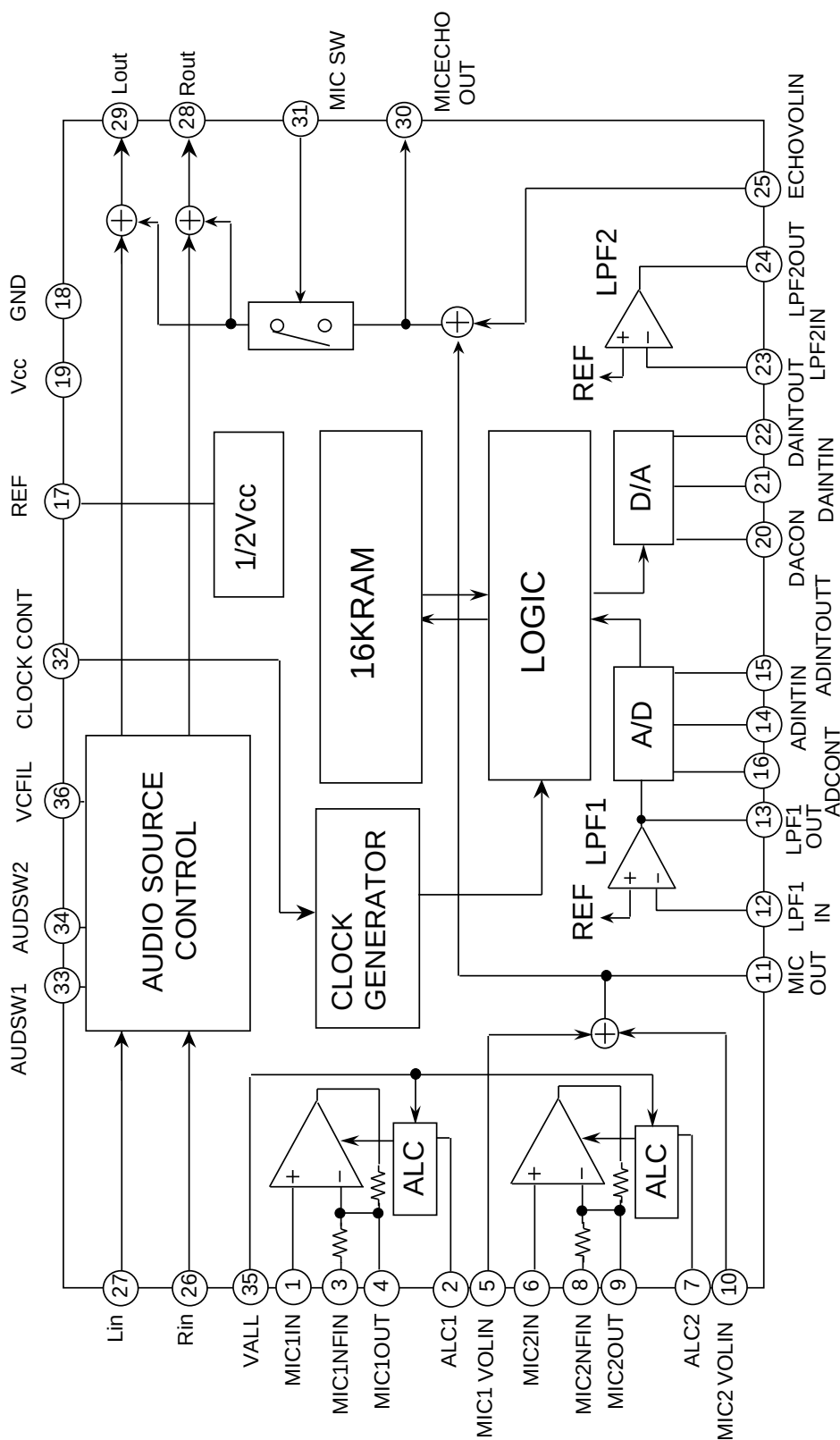
DIGITAL ECHO

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IC INTERNAL BLOCK DIAGRAM



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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

PIN DESCRIPTION

No	Symbol	Pin Name	Function
1	MIC1IN	MIC1 INPUT	Connect MIC1
2	ALC1	ALC1 CONTROL	Connect C which determine recovery time
3	MIC1NFIN	MIC1 NF INPUT	Set up MIC1 amp gain for feedback circuit
4	MIC1OUT	MIC1 OUTPUT	
5	MIC1VOLIN	MIC1 VOLUME INPUT	Connect microphone volume which turn down input signal
6	MIC2IN	MIC2 INPUT	Connect MIC 2
7	ALC2	ALC2 CONTROL	Connect C which determine ALC attack ,recovery time
8	MIC2NFIN	MIC2 NF INPUT	Forms MIC 2 amp gain with feedback
9	MIC2OUT	MIC2 OUTPUT	
10	MIC2VOLIN	MIC2 VOLUME INPUT	Connect microphone volume which turn down input signal
11	MICOUT	MIC OUTPUT	Mixing output with MIC 1 and MIC 2
12	LPF1 IN	LOWPASS FILTER1 INPUT	Forms the front lowpass filter with external CR for digital echo
13	LPF1 OUT	LOWPASS FILTER1 OUTPUT	
14	ADINTIN	A/D INTEGRAL INPUT	Forms integrator with external C and R
15	ADINTOUT	A/D INTEGRAL OUTPUT	
16	ADCONT	A/D CONTROL	ADM A/D adaptive control
17	REF	REFERENCE	1/2Vcc, connect filter C
18	GND	GND	
19	Vcc	POWER SUPPLY	
20	DACONT	D/A CONTROL	ADM A/D adaptive control

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No	Symbol	Pin name	Function
21	DAINTIN	D/A INTEGRAL INPUT	Forms integrator with external C
22	DAINTOUT	D/A INTEGRAL OUTPUT	
23	LPF2 IN	LOWPASS FILTER'2 INPUT	Forms post lowpass filter with external CR for digital echo
24	LPF2 OUT	LOWPASS FILTER2 OUTPUT	
25	ECHOVOLIN	ECHO VOLUME INPUT	Connect microphone volume which turn down input signal
26	RLINEIN	Rch LINE INPUT	
27	LLINEIN	Lch LINE INPUT	
28	RLINEOUT	Rch LINE OUTPUT	Mixing output with line and microphone
29	LLINEOUT	Lch LINE OUTPUT	
30	MICECHOOOUT	MIC ECHO OUTPUT	Mixing output with microphone and echo
31	MICSW	MIC SW	L; Microphone OFF H; Microphone ON
32	CLOCK CONT	CLOCK CONTROL	Controls built-in clock generation circuit with external R
33	AUDSW1	AUDIO SW1	Changing source sound signal
34	AUDSW2	AUDIO SW2	
35	VALC	ALC SUPPLY VOLTAGE CONTROL	Forms ALC operation voltage with control voltage
36	VCFIL	VOCAL CUT FILTER	Through frequency under vocal level

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

ABSOLUTE MAXIMUM RATINGS

(Ta=25°C,unless otherwise noted)

Symbol	Parameter	Conditions	Rations	Unit
Vcc	Supply voltage		6.0	V
Icc	Circuit current		85	mA
Vi	Input voltage		-0.3~Vcc+0.3	V
Pd	Power dissipation		860	mW
Topr	Operating temperature		-20~+75	°C
Tstg	Storage temperature		-40~+125	°C

RECOMMENDED OPERATING CONDITION

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
Vcc	Supply voltage		4.5	5	5.5	V
ViL	L input voltage	33,34PIN	0	—	1	V
ViH	H input voltage		4	—	Vcc	V

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

ELECTRICAL CHARACTERISTICS

(Vcc=5V,f=1kHz,Vi=100mVrms,fck=2MHz,Ta=25°C ,unless otherwise noted)

	Symbol	Parameter	Conditions	Limits			Unit
				Min	Typ	Max	
T/L	Icc	Circuit current	No signal	25	34	70	mA
MICROPHONE AMPLIFIER	Gvo	Voltage gain	Vo=-17dBV	44	47	50	dB
	THD1	Distortion1	Vo=-17dBV,without ALC	—	0.5	1.5	%
	THD2	Distortion2	Vi=-27dBV,ALC operate	—	3.0	6.0	%
	VoALC	ALC voltage	at -10 ~ +3dBV	-3	0	+3	dB
	TALCAT	ALC Attack time	at C=4.7μF	25	40	55	ms
	TALCRE	ALC Recovery time	at C=4.7μF	1.0	1.5	2.0	s
	VoMAX	Maximum output voltage	THD=10%	-1	2	—	dBV
	No	Noise Voltage	Gv=47dB,JIS-A,Vi=0Vrms	—	-68	-57	dBV
	Zi	input impedance		5	10	20	kΩ
ECHO	Td	Delay Time	Rc=51kΩ	167	197	226	ms
	Gv	Voltage gain		-3.0	0	3.0	dB
	THD	Distortion		—	2.0	4.0	%
	VoMAX	Maximum output voltage	THD=10%	-3	1.0	—	dBV
	No	Noise voltage	JIS-A	—	-82	-67	dBV
LINE	Gv	Voltage gain		-3	0	+3	dB
	THD	Distortion		—	0.02	0.1	%
	VoMAX	Maximum output voltage	THD=10%	1	4	—	dBV
	No	Noise voltage	JIS-A,MICSW=off	—	-97	-88	dBV
	Zi	Input impedance		10	20	40	kΩ
VOCAL CUT	No	Noise voltage	JIS-A,Vocal cut ON	—	-95	-72	dBV
	Gv	Voltage gain	input one side channel	-3	0	+3	dB
	VoMAX	Maximum output voltage	THD=10%	1	4	—	dBV
	GREJ	Vocal rejection ratio		14	18	—	dB

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

FUNCTION DESCRIPTION

(1) Microphone amplifier

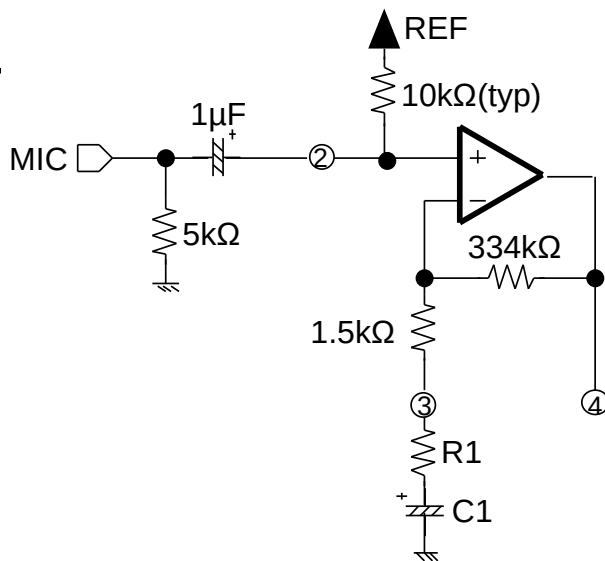
The gain(G_v) and low cut-off frequency(f_{cl}) of microphone amplifier are expressed as follows.

$$G_v = 20 \log \left(\frac{R_1 + 1.5K + 334K}{R_1 + 1.5K} \right) \quad f_{cl} = \frac{1}{2\pi \cdot (R_1 + 1.5K) \cdot C_1}$$

Gv(max)=47dB, fcl=50Hz
R1=0Ω, C1=2.2μF

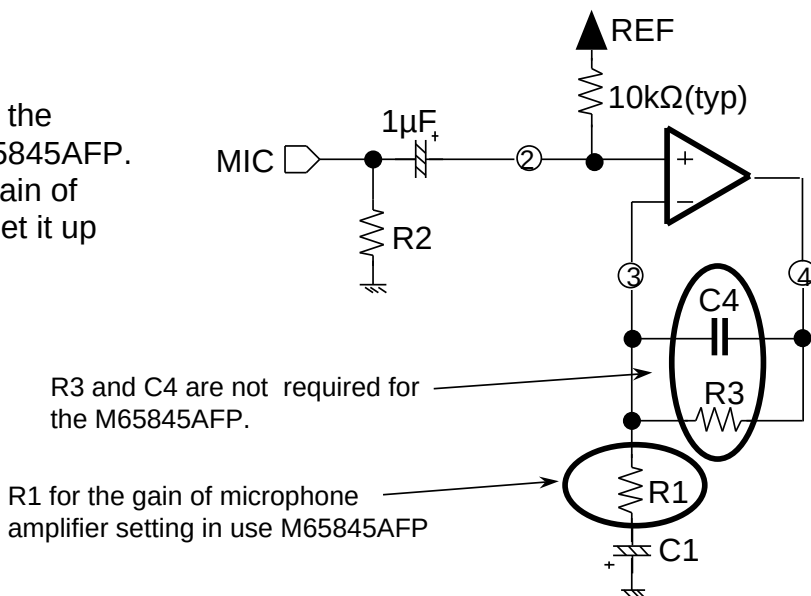
Assuming $G_v=37\text{dB}$, $f_{cl}=15\text{Hz}$, for instance, the constants take the following values.

$R1=3.3K\Omega, C1=2.2\mu F$



<< Attention point when M65845FP is replaced with M65845AFP >>

R3 and C4 are required for the M65845FP, not for the M65845AFP. As mentioned above, the gain of microphone amplifier can set it up with R1.

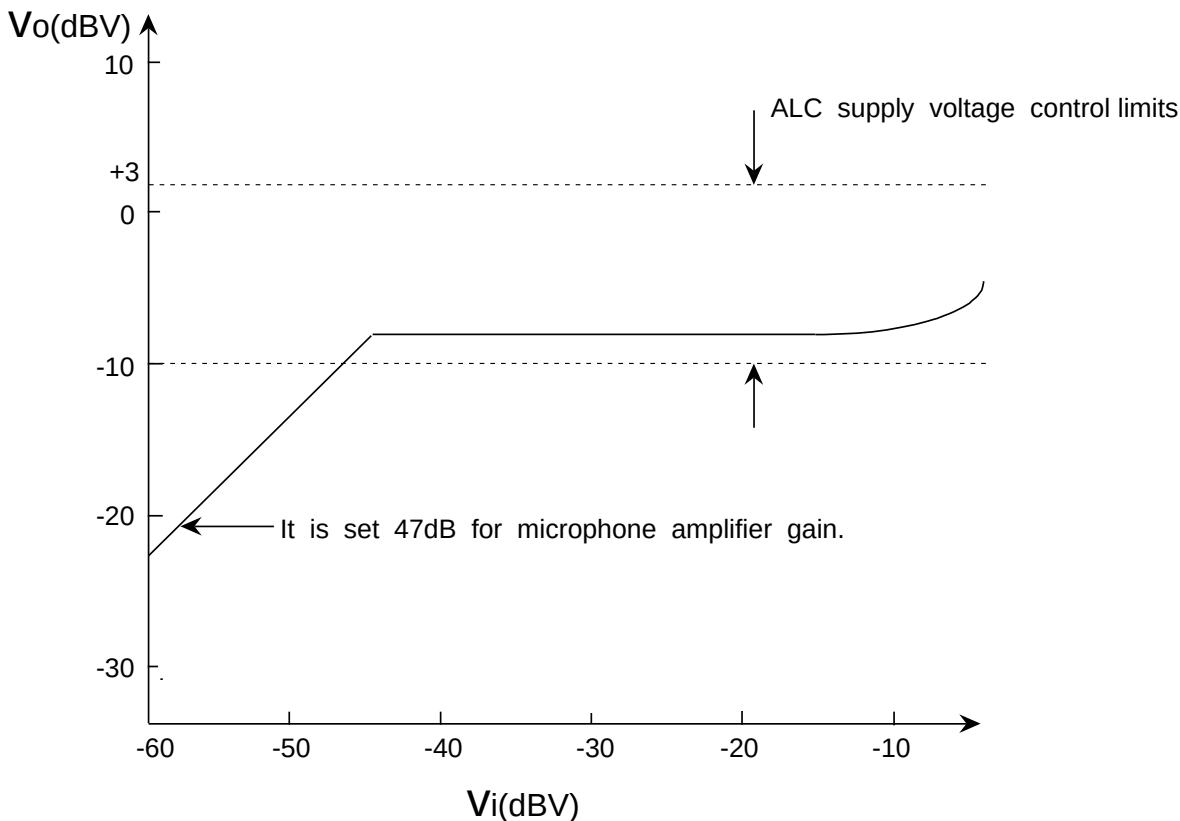


Recommended circuit In use M65845FP

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

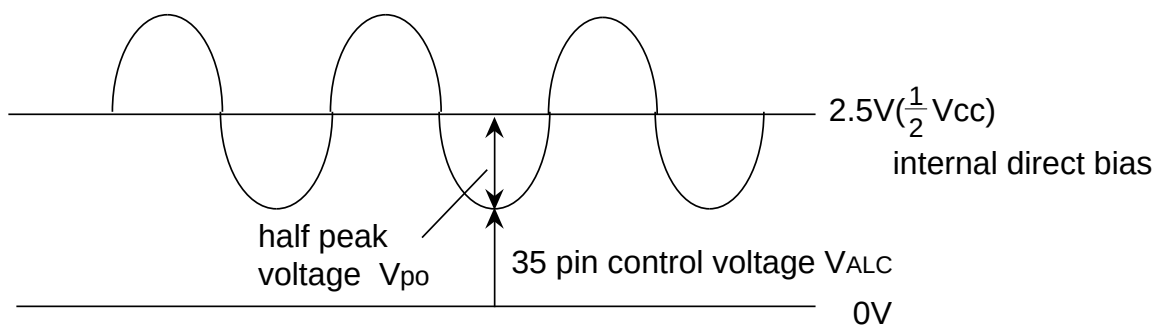
(2) ALC level block diagram



(3) ALC operation voltage control

ALC operation voltage can be formed within the limits of -10 to +3 dBV controlled by DC control voltage which connect 35 pin.

(Setting up forms)



$$V_{ALC} = \frac{1}{2}V_{cc} - V_{po}$$

When ALC operation voltage is -5dBV
 (at $V_{cc}=5V$)

$$-5dBV = 0.56V_{rms} = 1.59V_{p-p} = 0.80V_{p-o}$$

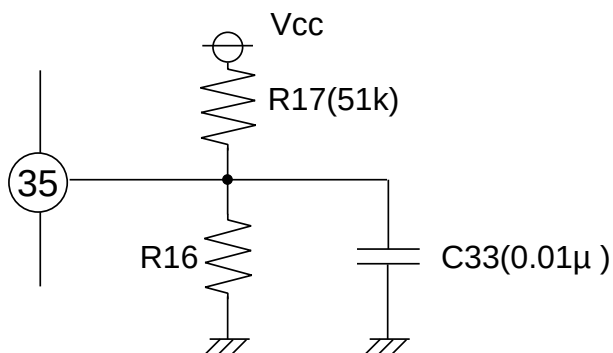
$$V_{ALC} = 2.5 - 0.8 = 1.7V$$

are concerned.

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

Input impedance to 35 pin is so high ($1M\Omega$) that ALC base voltage can be determined by division resistance.



at $V_{cc}=5V$

ALC operation voltage (dBV)	35 pin control voltage VALC (V)	resistance R16 (Ω)
+3	0.50	5.6k
0	1.09	15k
-2	1.38	20k
-4	1.61	24k
-6	1.79	27k
-8	1.94	33k
-10	2.05	36k

(4) MIC SW

Input low level to 31 pin (MIC SW) ,then microphone and echo signal can be cut.

31 pin (MIC SW)	MIC SW	ECHO SIGNAL OUTPUT
H or OPEN	ON	ON
L	OFF	MUTE

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

(5) Audio source select

Changing the switch ,sound source changes four patterns matching with KARAOKE soft.

③③ AUDSW1;D1	③④ AUDSW2;D2	Movements
L	L	Stereo
L	H	Lch monaural
H	L	Rch monaural
H	H	vocal cut

① Stereo

Under the conditions usual 2channels are played back to each outputs.

② Lch monaural

Under the conditions Lch source is played back to 2ch outputs and suitable for KARAOKE reproduction of multiple KARAOKE soft and main sound reproduction of laser disks.

③ Rch monaural

Under the conditions Rch source is played back to 2ch outputs and suitable for reference vocal reproduction of multiple KARAOKE soft and sub sound reproduction of laser disks.

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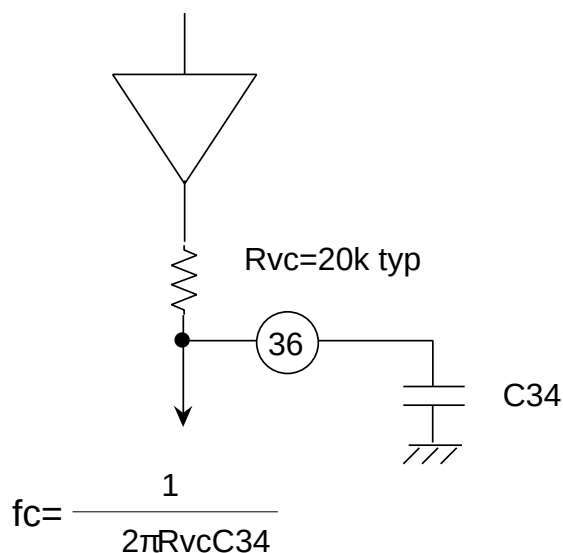
DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

④ Vocal cut

It is a method turned down Lch and Rch input having the same phase and sound .

Lowpass cut off frequency f_c is determined by a capacitance which connect to 36 pin (vocal cut filter).

It is also having a function which through frequency under vocal level for supplying a lack of low level sound.



at $f_c=50\text{Hz}$, $C_{34}=0.15\mu\text{F}$ is determined.

Caution; Inside resistance is changeable one by one which rate is $\pm 30\%$.

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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

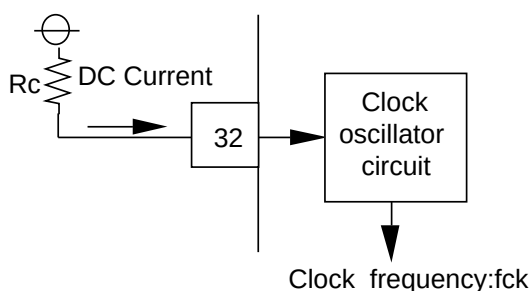
(6) Digital Echo

① Clock oscillator circuit

This IC incorporates a current control type clock oscillator circuit in it, thus providing circuit configuration just by connecting an R_c for current control pin 32 (CLOCK CONT). Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit.

The oscillator frequency f_{ck} is following.

$$f_{ck} = 2 \text{ MHz}(R_c=51K\Omega)$$



Note:

The delay time(T_d) for echo is determined by the clock frequency(f_{ck}).

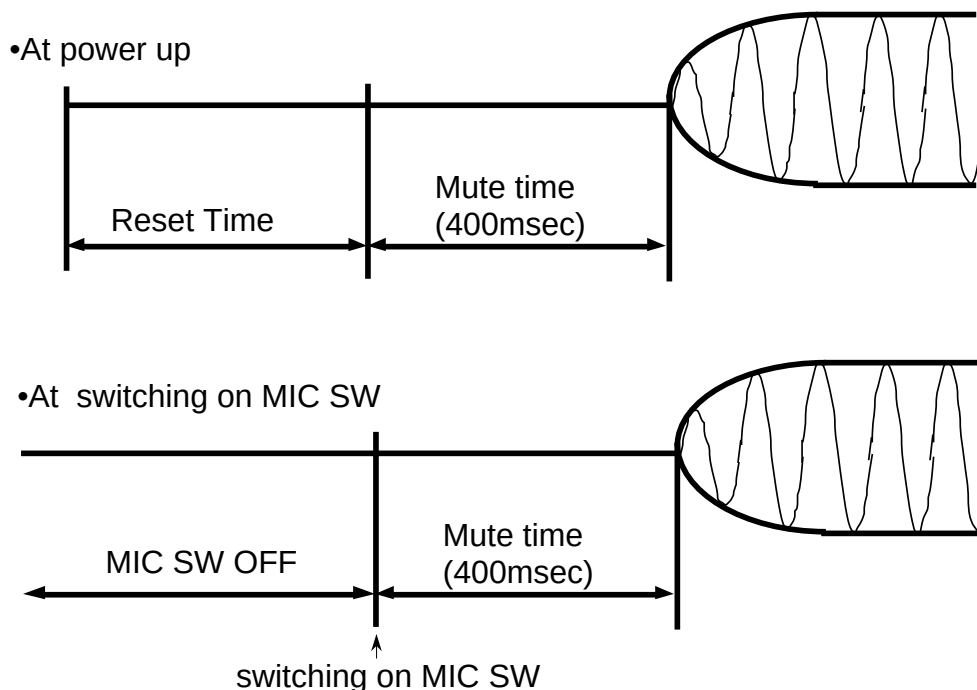
$$\text{Delay time} = 1/f_{ck} \times 24 \times N$$

(N =the number of memory bits = 16384)

$f_{ck} = 2 \text{ MHz}(R_c=51K\Omega)$	: Delay time=197msec
$f_{ck} = 2.6\text{MHz}(R_c=39K\Omega)$	: Delay time=150msec
$f_{ck} = 3.9\text{MHz}(R_c=24K\Omega)$	: Delay time=100msec

② Auto mute function

The IC carries out auto mute function at the time of powering up and switching on MIC SW in order to suppress shock noise that the digital delay may produce.



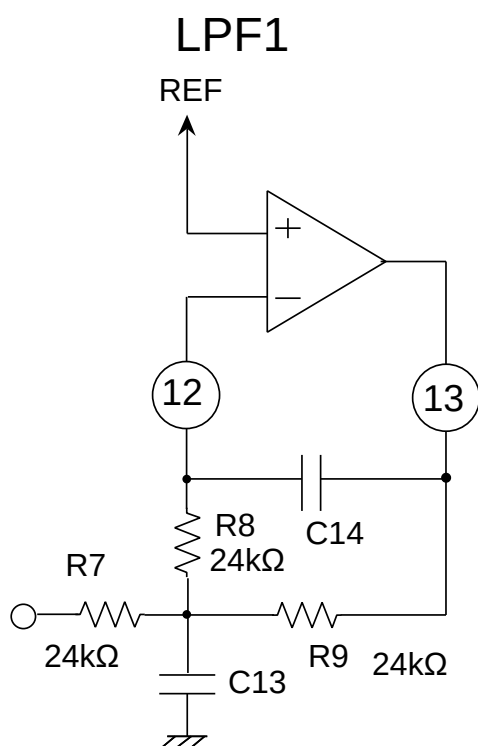
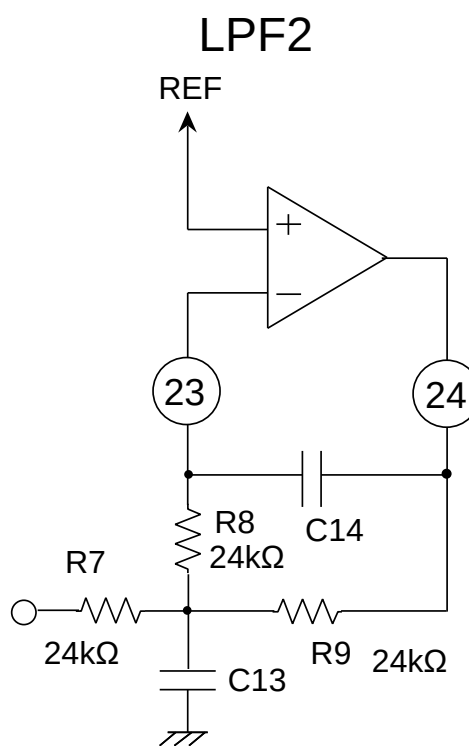
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③ Input and output LPF

Signal through frequency f_{sig} is also determined by LPF of Digital Echo cut off frequency. 2 degree LPF of Digital Echo is formed by external resistance and capacitor . (refer to next figure) So, cut off frequency is determined by next formula.

$$f_{sig} = \frac{1}{2\pi \sqrt{R8 \cdot R9 \cdot C13 \cdot C14}}$$



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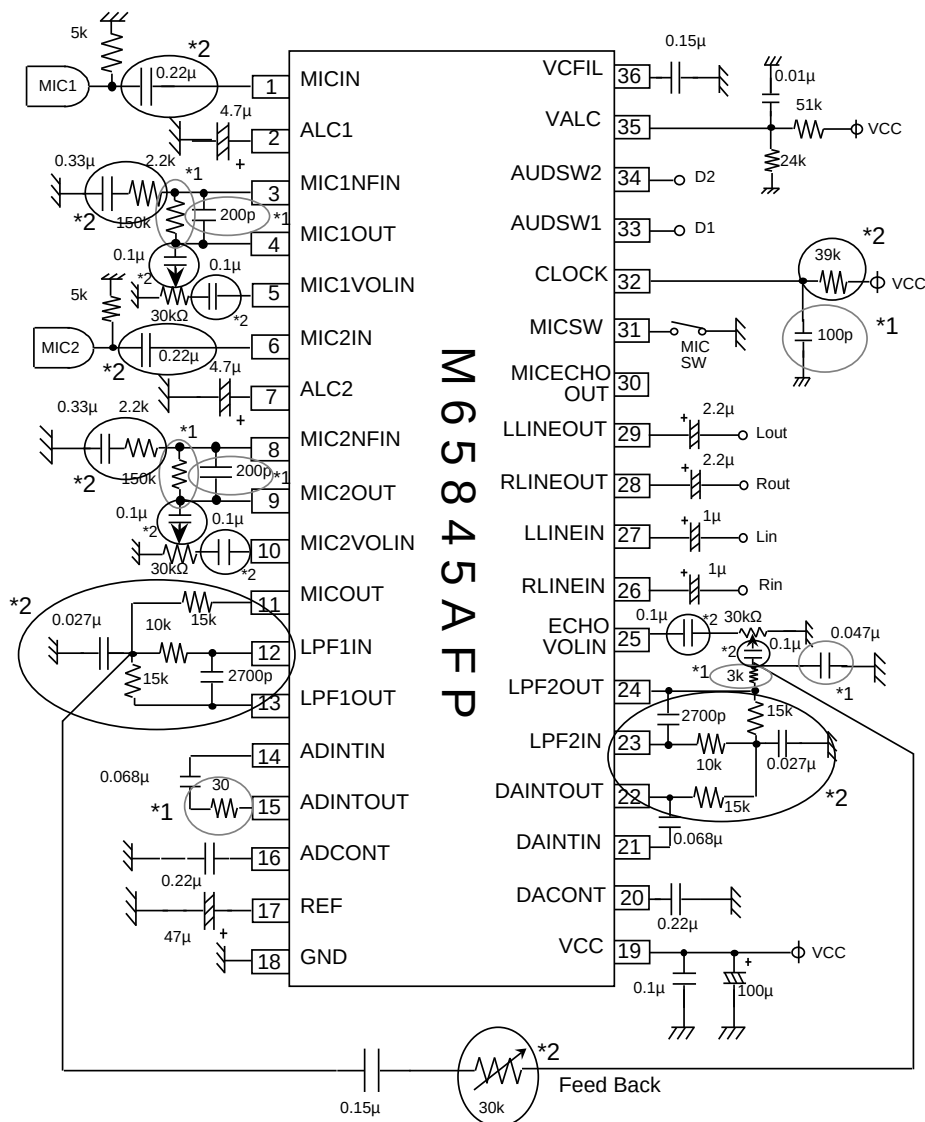
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DIGITAL ECHO WITH MICROPHONE MIXING CIRCUIT

COMPATIBILITY WITH M65845FP

<APPLICATION EXAMPLE IN USE M65845FP>

Units Resistance : Ω
 Capacitance:F



As mentioned above, the M65845AFP can be replaced with the M65845FP without changing the board.

Note *1: The components marked with a circle are required for the M65845FP, not for the M65845AFP.

*2: The M65845AFP is different from the M65845FP a part of the components marked with a circle.

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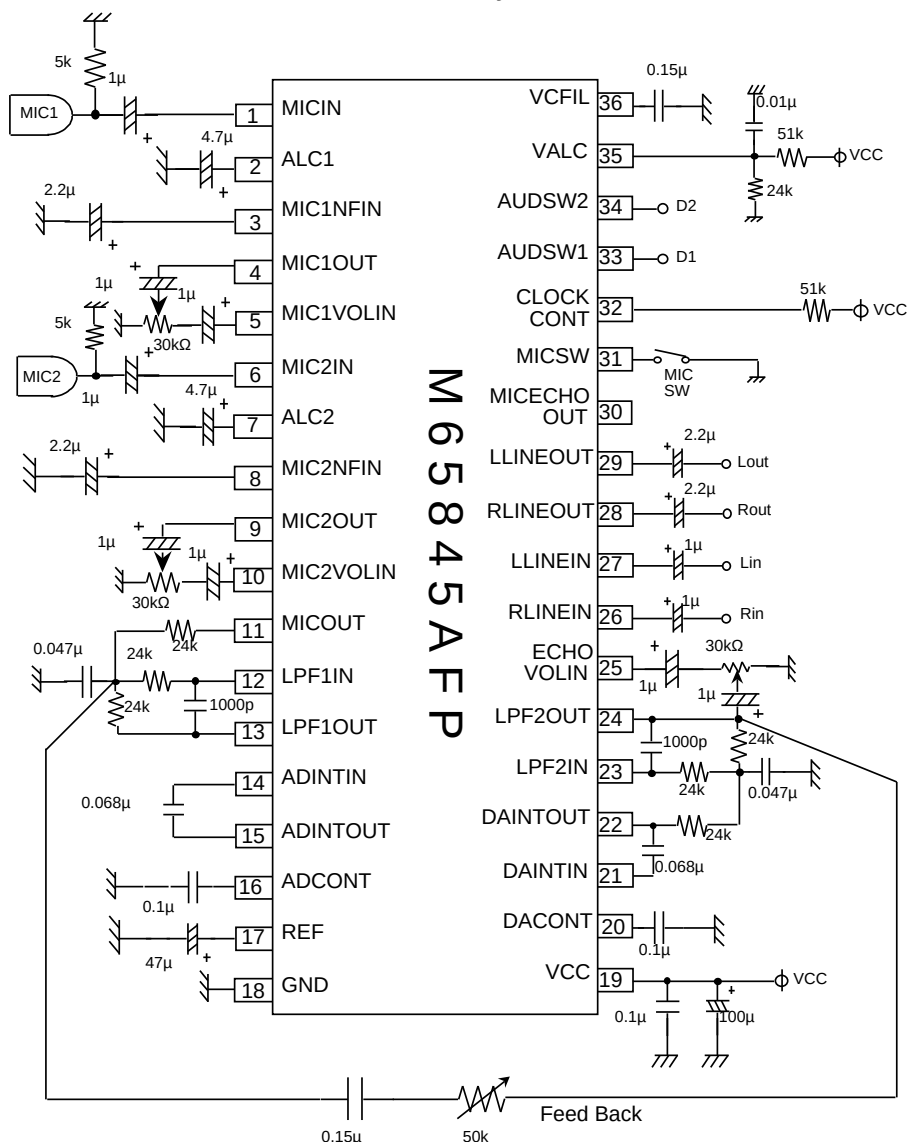
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APPLICATION EXAMPLE

Microphone amplifier : $G_v=47\text{dB}$, $f_{cl}=50\text{Hz}$
 ALC operating voltage -4dBV
 ECHO : Delay time 197ms ($f_s=83.3\text{kHz}$)
 Cut-off frequency 3.1kHz



Units Resistance :Ω
 Capacitance:F