

To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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

MITSUBISHI SOUND PROCESSOR IC's

M65855FP



1 Chip Digital Echo with Microphone mixing Amplifier

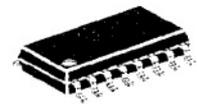
DESCRIPTION

The M65855FP is a CMOS IC built-in Digital Echo function with microphone mixing 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.

FEATURES

- Internal Input/Output low pass filter, A/D, D/A converters, microphone mixing amplifier, memory achieve a digital echo system with a single chip.
- High performance digital echo circuit thanks to 20Kbit memory
- Thanks to the improvement A/D, D/A converters, decrease the external output
- Internal echo mute circuit and echo volume achieve a mixing level control
- Built-in current control oscillation circuit for generating clocks
- Delay time = 164msec
 (Min. 15ms to max. 200 ms can be set)
- Small 16-Pin Flat package (16P2N)
- Built-in automatic reset circuit with power turned on
- 5V single power supply

Package Outline



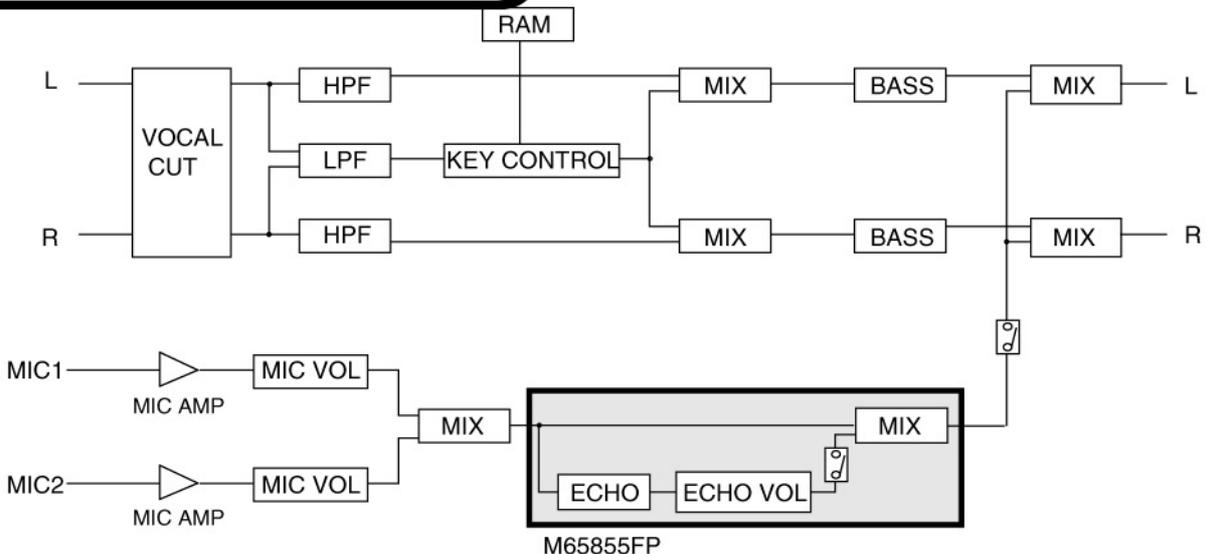
Outline 16P2N

RECOMMENDED OPERATING CONDITIONS

Supply voltage range.....Vcc=3.5~5.5V

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

SYSTEM CONFIGURATION



PRELIMINARY

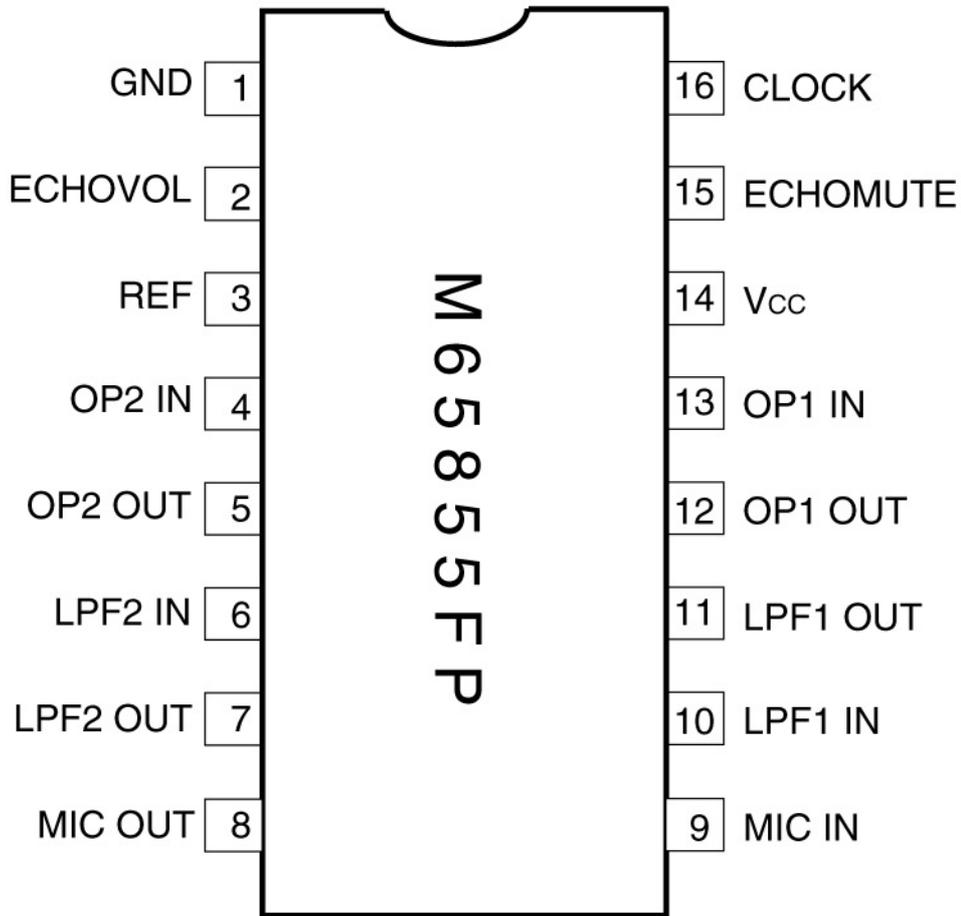
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PIN CONFIGURATION



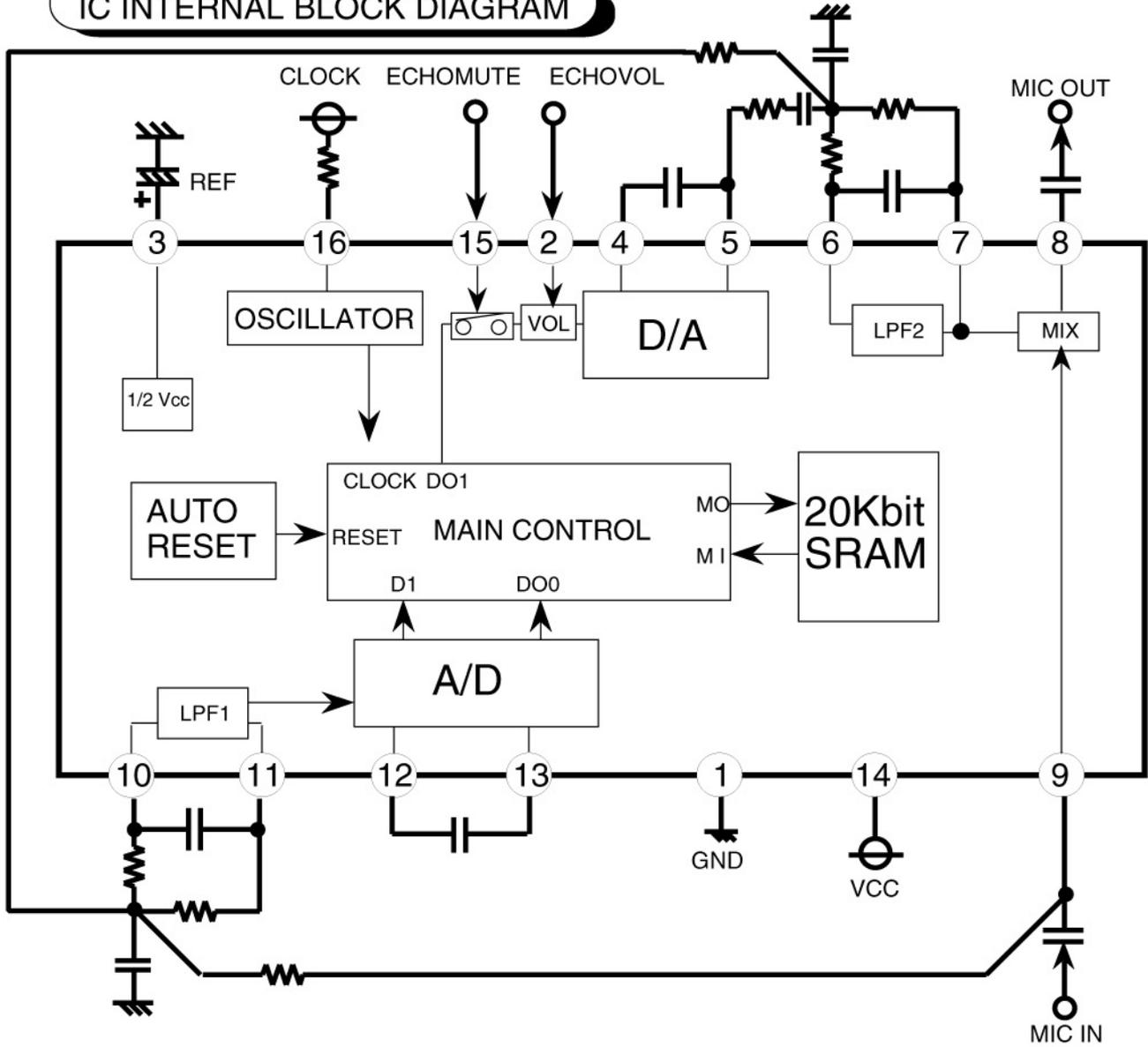
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IC INTERNAL BLOCK DIAGRAM



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PIN DESCRIPTION

Pin No.	Symbol	Name	I/O	Function
1	GND	GND	-	
2	ECHOVOL	Echo Volume control	I	Echo level control with external DC voltage (from 0 to -10,-∞ 8 steps)
3	REF	Reference	-	To connect 1/2 Vcc output and filter capacitor
4	OP2 IN	Opeamp 2 input	I	Uses external C to form an D/A conversion integrator
5	OP2 OUT	Opeamp 2 output	O	
6	LPF2 IN	Low pass filter 2 input	I	Uses external CR to form a low pass filter at the input side
7	LPF2 OUT	Low pass filter 2 output	O	
8	MIC OUT	Microphone mixing output	O	Mixing output echo output and microphone
9	MIC IN	Microphone input	I	Microphone input
10	LPF1 IN	Low pass filter 1 input	I	Uses external CR to form a low pass filter at the input side
11	LPF1 OUT	Low pass filter 1 output	O	
12	OP1 OUT	Opeamp 1 output	O	Uses external C to form an A/D conversion integrator
13	OP1 IN	Opeamp 1 input	I	
14	Vcc	Power Supply	-	Applies a voltage of 3.5V to 5.5V(Rated5V)
15	ECHOMUTE	Echo mute control	I	Echo mute control and clock stop control with external DC voltage
16	CLOCK	Clock control	I	Controls a built-in clock generation circuit with external R

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ABSOLUTE MAXIMUM RATINGS

(Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Ratings	Unit
Vcc	Supply voltage		6.0	V
Icc	Circuit current		100	mA
Pd	Power dissipation		0.8	W
Topr	Operating temperature		-20~75	°C
Tstg	Storage temperature		-40~125	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
Vcc	Supply voltage		3.5	5	5.5	V
ViL	"L" input voltage		0.0	—	1.0	V
ViR	"Ref" input voltage		1/2Vcc-0.5	1/2 Vcc	1/2Vcc+0.5	V
ViH	"H"input voltage		Vcc-1	—	Vcc	V

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ELECTRICAL CHARACTERISTICS

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

	Symbol	Parameter	Test conditions	Limits			Unit
				Min.	Typ.	Max.	
TOTAL	Icc	Circuit current	When signal is not provided	10	25	50	mA
ECHO	Gv	Voltage gain between input and output	RL=47kΩ	-6.5	-3.5	-0.5	dB
	Vomax	Maximum output voltage	THD=10%	0.9	1.2	—	V(rms)
	THD	Output distortion	30kHz LPF	—	1.2	3.0	%
	No	Output noise voltage	JIS-A	—	-80	-60	dBV
	fck	Clock frequency	Rc=120kΩ	—	1	—	MHz
	td	Delay time	Rc=120kΩ		164		ms
MIC	Gv	Voltage gain between input and output	RL=47kΩ	-3.0	0	3.0	dB
	Vomax	Maximum output voltage	THD=10%	1.1	1.7	—	V(rms)
	THD	Output distortion	30kHz LPF	—	0.05	0.10	%
	No	Output noise voltage	JIS-A, ECHO=Mute	—	-90	-80	dBV

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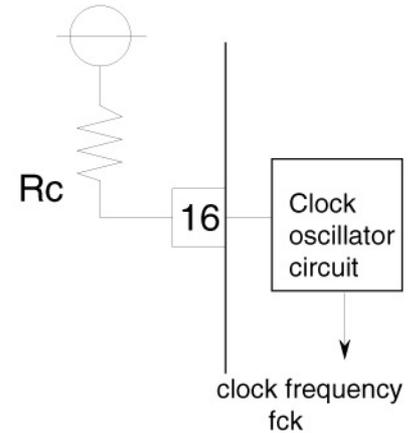
FUNCTION DESCRIPTION

(1) Clock oscillator circuit

The M65855FP incorporates a current control type clock oscillator circuit in it, thus providing circuit configuration just by connecting a resistor for current control to pin 16 CLOCK.

Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit

When $R_c=120k\Omega$ $f_{ck}=1MHz$



(2) Delay time T_d

The delay time can be calculated by the equation;

$T_d=N/f_s$ (N =The number of memory bits=20480)

when $f_{ck}=1MHz$, T_d can be set at 164ms.

<<Reference>>The M65855FP adopts ADM (adaptive Delta Modulation) system in A/D,D/A converters.

The sampling frequency can be calculated by the following equation;

$$f_s=\text{clock frequency} /8(\text{Hz})$$

For clock frequency $f_{ck}=1MHz$, the calculated sampling frequency is ;

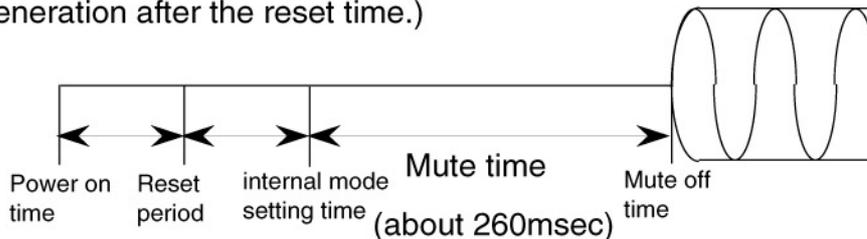
$$f_s=1MHz/8=125kHz$$

(3) Mute

1) When power is on

When power is turned on, the mute function works automatically to prevent noise generation.

(Here,however,"mute" means the function which prevents noise generation after the reset time.)



(a)When power is on ($f_{ck}=1MHz$)

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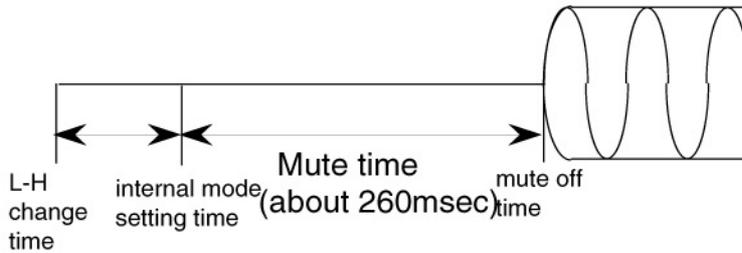


2) When mute signal input

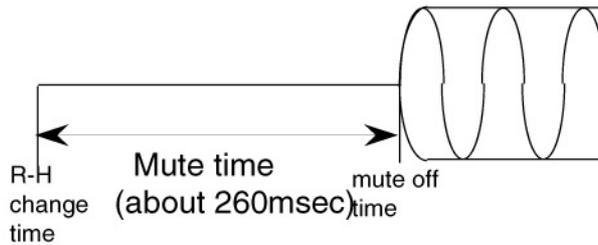
Delay output can be set the mute control from 15 pin supply voltage.
(Please refer the following)

15 pin supply voltage	Mode
H($\geq V_{cc}-1V$)	Normal mode
Ref($1/2 V_{cc} \pm 0.5V$)	Mute mode (clock stop +Microphone output mute)
L($\leq 1.0V$)	Mute(clock stop)

When the setting change from mute to normal mode, it also mute function work same time as 1) setting.



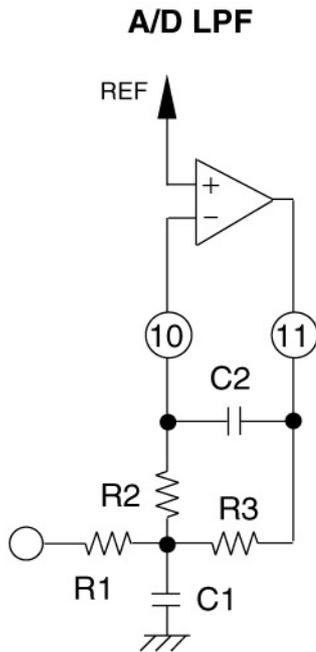
(b) Mute L → H change setting (fck=1MHz)



(c) Mute R → H change setting (fck=1MHz)

(4) Input/Output LPF

It is necessary to change the LPF setting (signal pass band;fsig)of digital echo according to the clock frequency.



$$f_{sig} = \frac{1}{2\pi \sqrt{C1 \cdot C2 \cdot R2 \cdot R3}}$$

$$G_v = 20 \log \frac{R2}{R1}$$

When, R1=20K, R2=8.2K, R3=10K, C1=0.012μF, C2=4700pF, cut off frequency and voltage gain is following.

$$f_{sig} = 2.3\text{KHz}$$

$$G_v = -6\text{dB}$$

The recommend voltage gain and the A/D ,D/A LPF signal pass band, please refer to the table below.

(Delay time 164msec (When Master clock 1MHz))

A/D LPF		D/A LPF	
Signal pass band	Gain	Signal pass band	Gain
3KHz	-6dB	3KHz	+3dB

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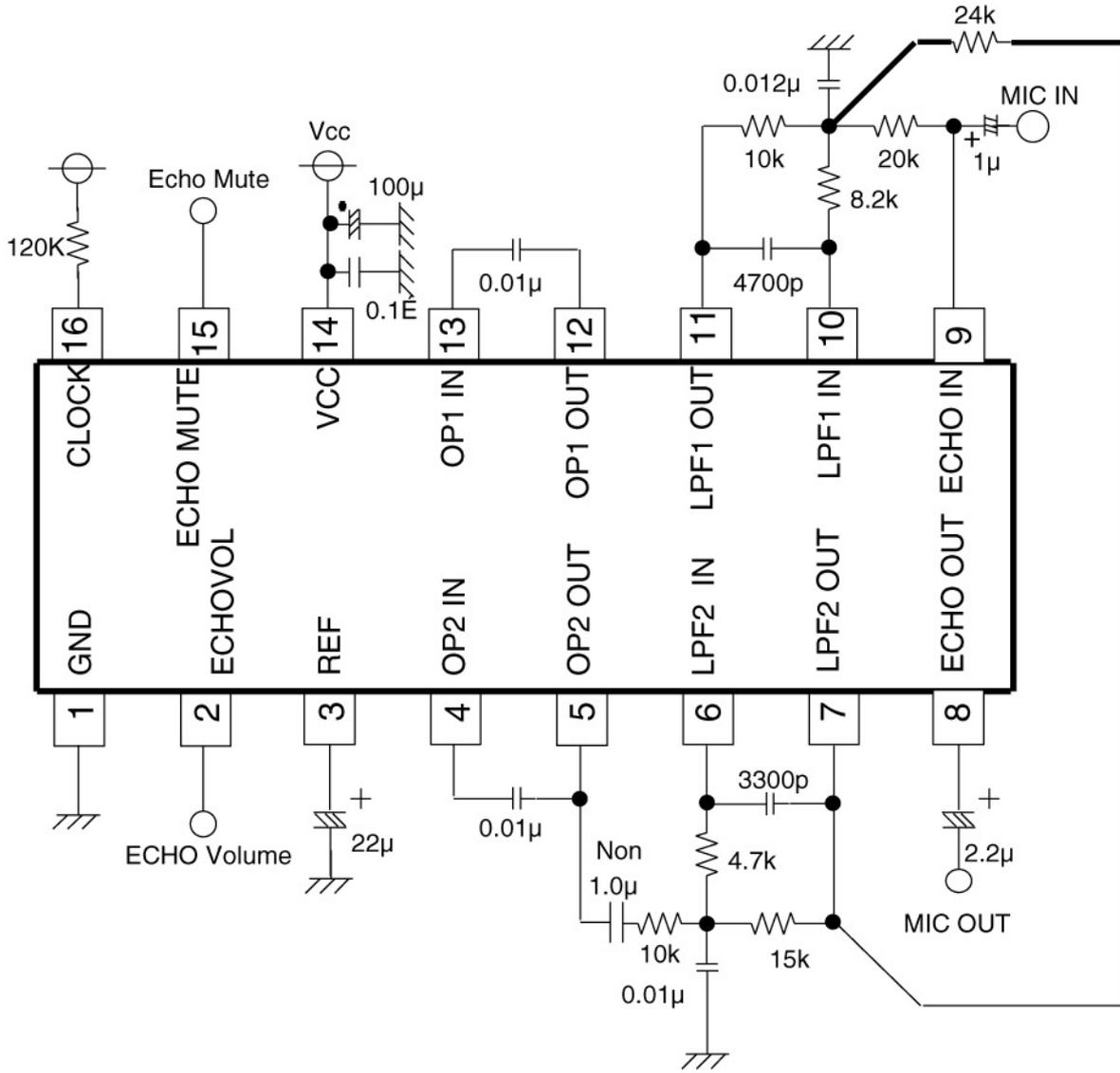
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APPLICATION EXAMPLE



Unit
Resistance:Ω
Capacitor:F