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

M65850P/FP

DIGITAL ECHO(DIGITAL DELAY)

50 SERIES KARAOKE

DESCRIPTION

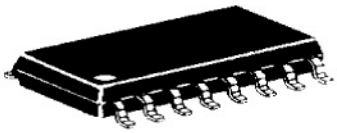
◊ The M65850P/FP is a CMOS IC for generating echo to be added to the voice through a "karaoke" microphone.
◊ It is optimal to provide the echo effect function for karaoke player, such as radio cassette recorders, mini audio components and television sets.
◊ Increased master clock frequency assures high-performance short delay,enabling the IC to be used for dolby prologic surround system.

FEATURES

- Built-in input/output filters, A-D and D-A converters,and memory realize a delay system with only a single chip.
- Built-in current control type clock oscillator circuit avoids clock affection outside,thus allowing prevention of undesired radiation.
- Delay time = 164 ms (with master clock set at 1MHz)
  (Selection of delay time in a range between 15ms and 200ms)
- Small package (14-pin DIP : 14P4,16-pin SOP:16P2N)
- Built-in 20Kbit SRAM
- Built-in auto reset circuit (The IC reset as power is turned on)
- Single power supply (5V)

PACKAGE

Outline 1 4 P 4 (P)
2.54mm pitch 300mil DIP

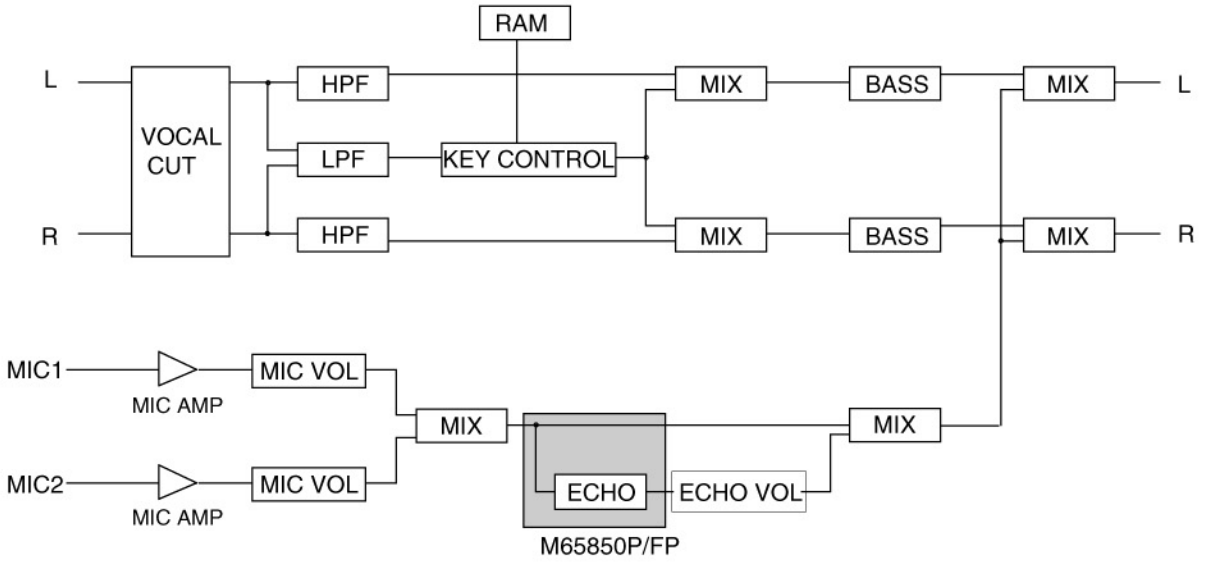


Outline 1 6 P 2 N (FP)
1.27mm pitch 300mil SOP

RECOMMENDED OPERATING CONDITION

Supply voltage range ••••• Vcc=3.5~5.5V
Rated supply voltage •••••••••• Vcc=5V

SYSTEM CONFIGURATION



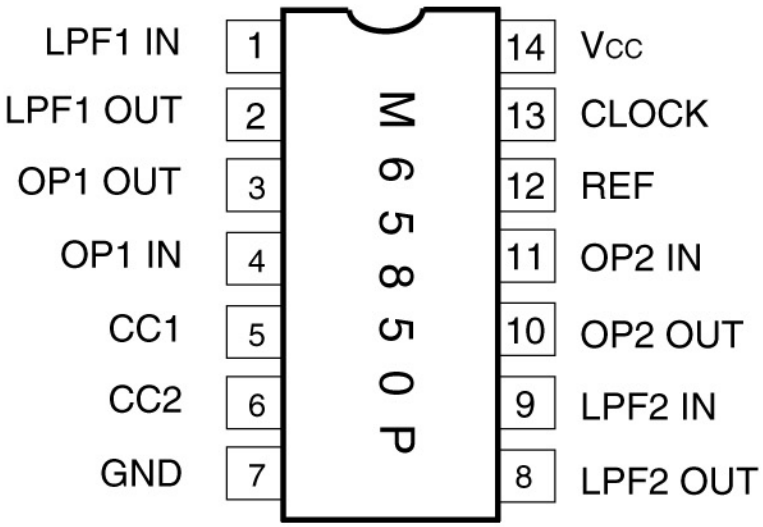
Note : Dolby is the registered trademarks of dolby laboratories licensing corporation.

M65850P/FP

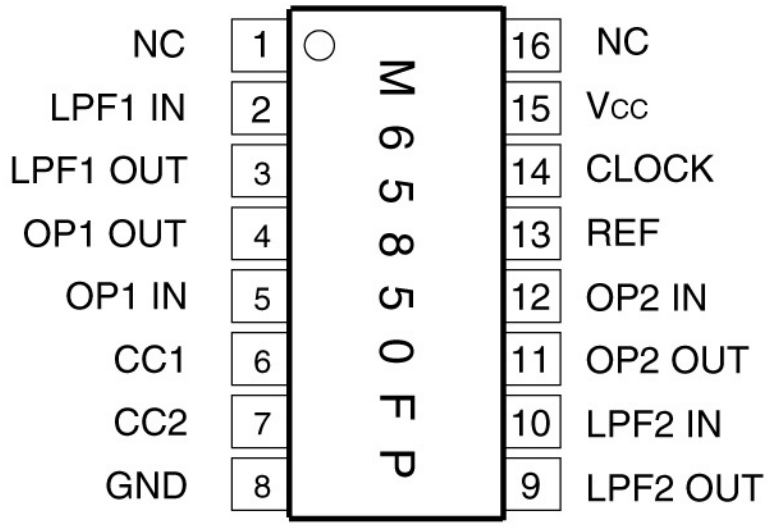
DIGITAL ECHO(DIGITAL DELAY)

PIN CONFIGURATION

< M65850P >



< M65850FP >

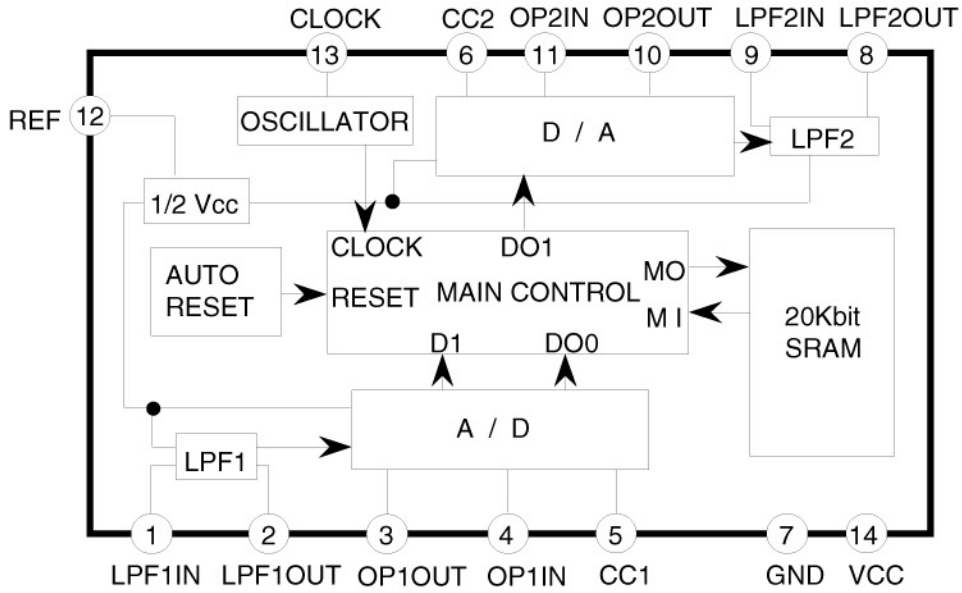


M65850P/FP

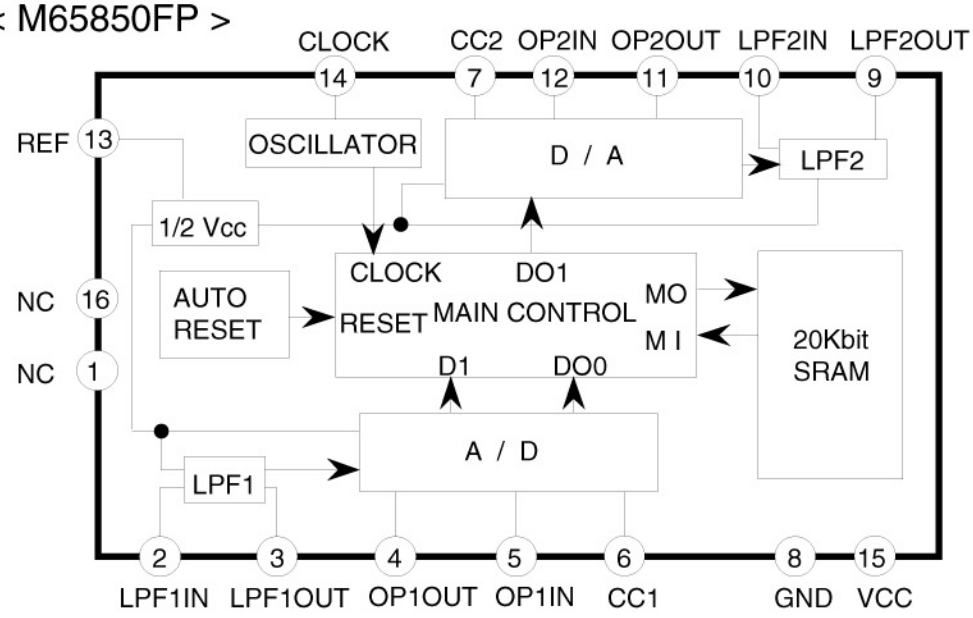
DIGITAL ECHO(DIGITAL DELAY)

IC INTERNAL BLOCK DIAGRAM

< M65850P >



< M65850FP >



M65850P/FP

DIGITAL ECHO(DIGITAL DELAY)

PIN DESCRIPTION

Pin No.		Symbol	Name	I/O	Function
P	FP				
1	2	LPF1 IN	Low pass filter 1 input	I	To form input-side low pass filter by connecting external capacitor and resistor
2	3	LPF1 OUT	Low pass filter 1 output	O	
3	4	OP1 OUT	Operational amplifier1 output	O	To form A-D conversion integrator by connecting external capacitor
4	5	OP1 IN	Operational amplifier 1 input	I	
5	6	CC1	Current control 1	-	ADM control of A-D converter
6	7	CC2	Current control 2	-	ADM control of D-A converter
7	8	GND	GND	-	
8	9	LPF2 OUT	Low pass filter 2 output	O	To form input-side low pass filter by connecting external capacitor and resistor
9	10	LPF2 IN	Low pass filter 2 input	I	
10	11	OP2 OUT	Operational amplifier 2 output	O	To form D-A conversion integrator by connecting external capacitor
11	12	OP2 IN	Operational amplifier 2 input	I	
12	13	REF	Reference	-	Analog reference voltage ≒1/2Vcc
13	14	CLOCK	Clock generator input	I	To form clock generator by connecting external resistor
14	15	V_{CC}	Supply voltage	-	To apply 3.5 ~ 5.5 V power (Rated voltage : 5 V)
-	1, 16	NC	No connection	-	

M65850P/FP

DIGITAL ECHO(DIGITAL DELAY)

ABSOLUTE MAXIMUM RATINGS

(Ta = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		6.0	V
Icc	Circuit current		100	mA
Pd	Power dissipation		800(P),550(FP)	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		3.5	5	5.5	V
fck	Clock frequency		0.8	—	11.0	MHz

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	
Icc	Circuit current	No signal input	5	13	25	mA
Gv	Voltage gain	RL=47kΩ	-3.0	0	3.0	dB
Vomax	Maximum output voltage	THD=10%	0.7	1.0	—	V(rms)
THD	Total harmonic distortion	30kHz LPF	—	1.2	3.0	%
No	Output noise voltage	DIN-AUDIO	—	-85	-70	dBV
fck	Clock frequency	Rc=120kΩ	0.85	1	1.15	MHz

M65850P/FP

DIGITAL ECHO(DIGITAL DELAY)

FUNCTION DESCRIPTION

(1) Delay time Td

The delay time can be calculated by the equation :

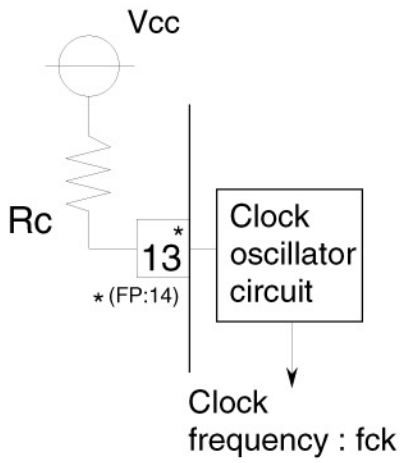
$Td=8N / fck$ (N=the number of memory bits=20480)

When fck=1MHz (fs=125kHz), Td can be set at 164ms.

« Reference »
The M65850P/FP adopts ADM (Adaptive Delta Modulation) system in A-D,D-A converters.
The sampling frequency can be calculated by the following equation :
fs=clock frequency / 8 (Hz)
For clock frequency (fck)=1MHz, the calculated sampling frequency is :
fs=1MHz / 8 =125kHz

(2) Clock oscillator circuit

The M65850P incorporates a current control type clock oscillator circuit in it, thus providing circuit configuration just by connecting a resistor for current control to pin ⑬ (FP:pin ⑭) CLOCK.
Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit.



The oscillator frequency is:
fck = 1 MHz. (Rc=120kΩ)

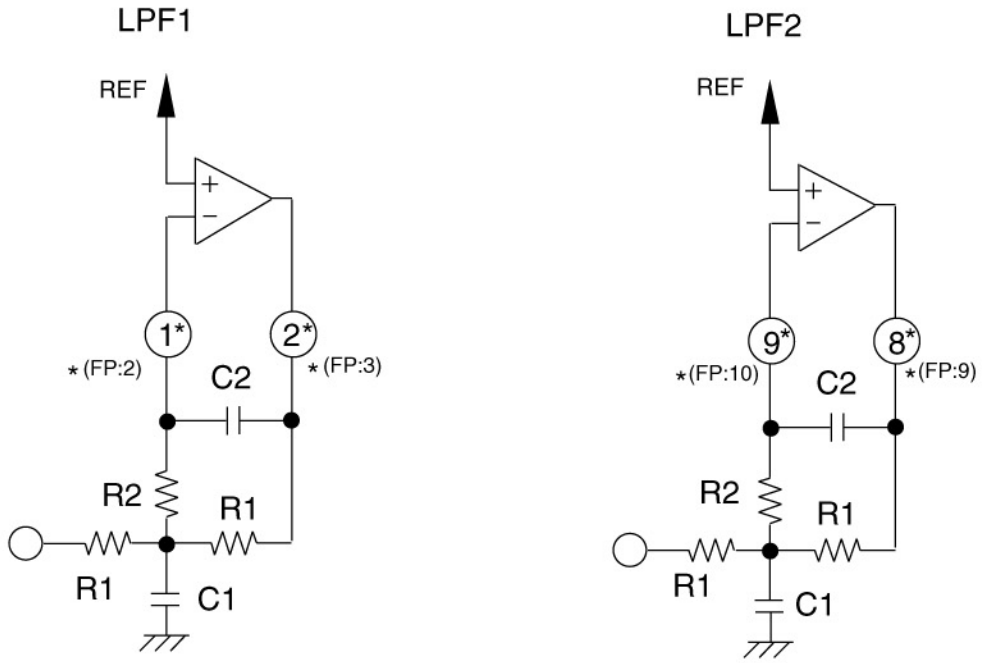
The resistor for current control can be calculated using the following equation.
Rc ≒ K/Clock frequency (fck) [Hz]

K is the coefficient, and changes according to clock frequency ,as shown below.

Delay Time (ms)	Clock Frequency (Hz)	K value	Rc (Ω)
15~30	11.0M~5.5M	0.8×10^{11}	7.5k~15k
31~100	5.3M~1.64M	1.0×10^{11}	18k~62k
101~200	1.62M~800K	1.2×10^{11}	75k~150k

(3) Input/output LPF

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



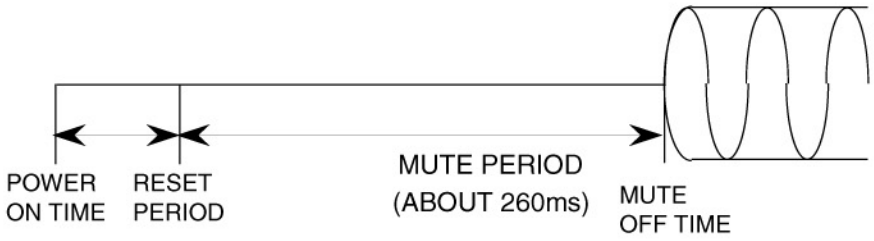
$$\therefore \text{fsig} = \frac{1}{2\pi \sqrt{C1 \bullet C2 \bullet R1 \bullet R2}}$$

Delay time (ms)	Clock frequency(Hz)	signal pass band (Hz)	LPF				Distortion (Reference value) (%)
			R1(Ω)	R2 (Ω)	C1 (F)	C2 (F)	
15~30	11.0M ~ 5.5M	7k	15k	15k	3300p	680p	0.2% (Td=20ms)
31~100	5.3M ~ 1.64M	5k	13k	13k	4700p	1000p	0.3% (Td=50ms)
101~200	1.62M ~ 800k	3k	16k	16k	6800p	1500p	1.2% (Td=160ms)

•Test Condition is Vcc=5V,Vi=100mV(rms),f=1kHz,Ta=25°C

(4) Mute

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.)



WHEN POWER IS ON (fck=1MHz)

TEST CONDITIONS

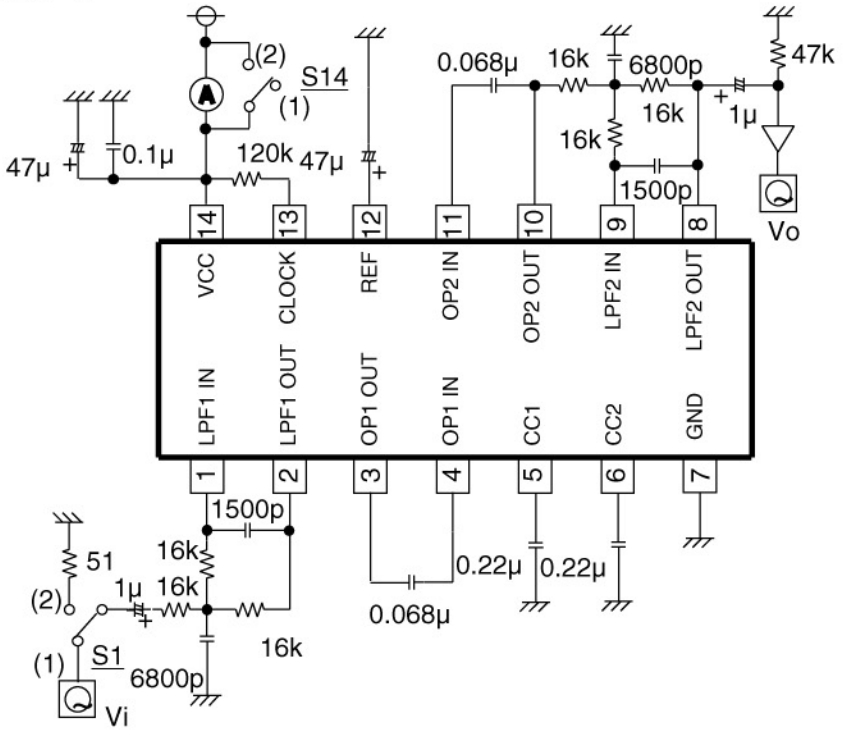
Symbol	Parameter	S 1	S 1 4	Remarks
Icc	Circuit current	2	2	No-signal time
Gv	Voltage gain between input and output	1	1	RL=47kΩ
Vomax	Maximum output voltage	1	1	THD=10%
THD	Output distortion	1	1	30kHz LPF
No	Output noise voltage	2	1	DIN-AUDIO

M65850P/FP

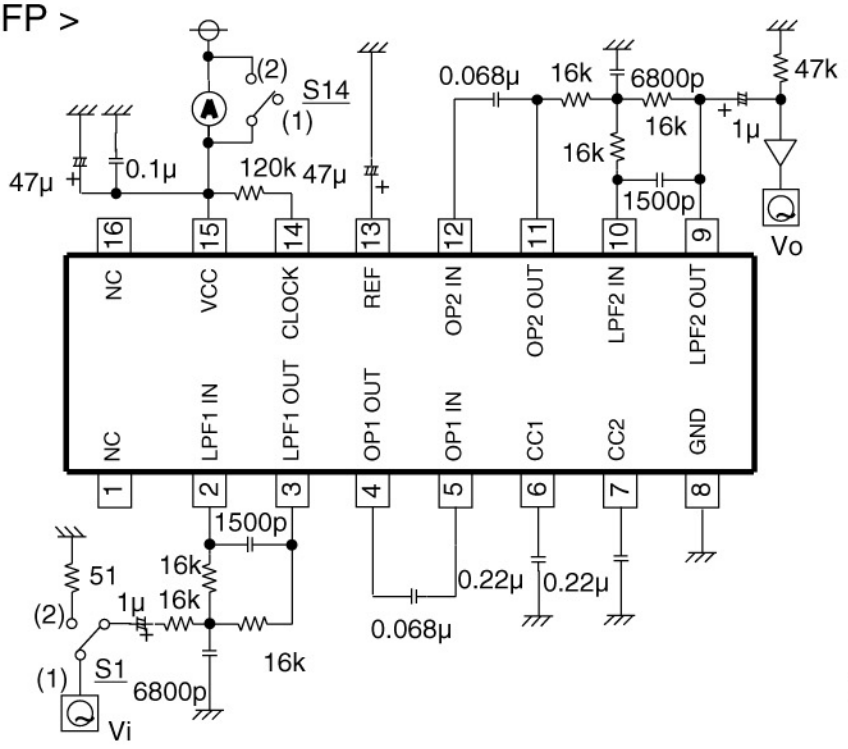
DIGITAL ECHO(DIGITAL DELAY)

TEST CIRCUIT

< M65850P >



< M65850FP >



Units
Resistance : Ω
Capacitance:F

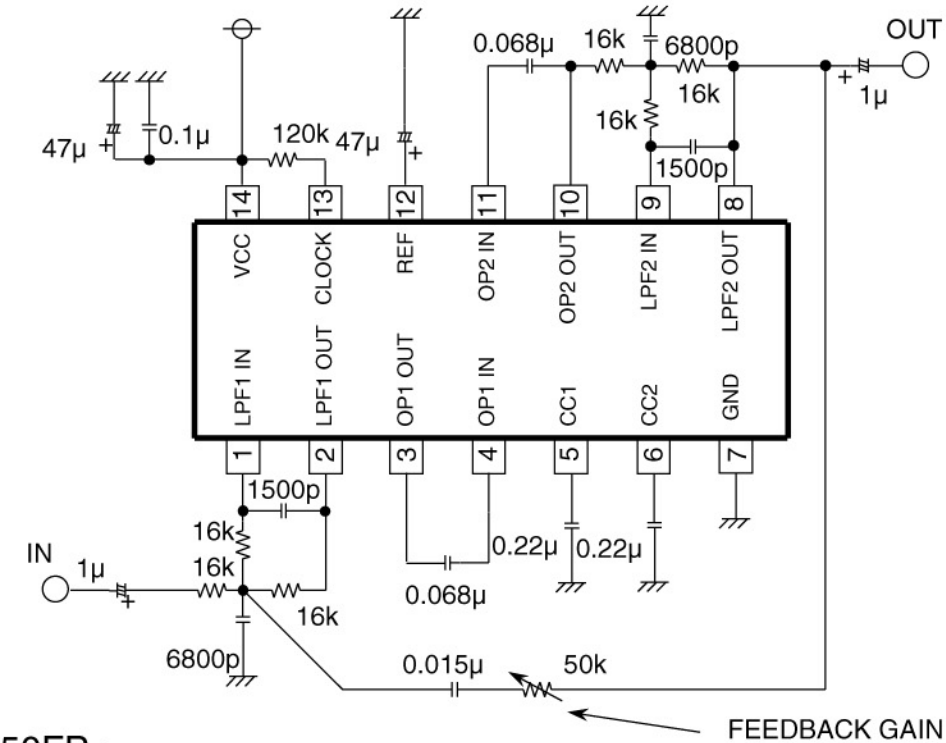
M65850P/FP

DIGITAL ECHO(DIGITAL DELAY)

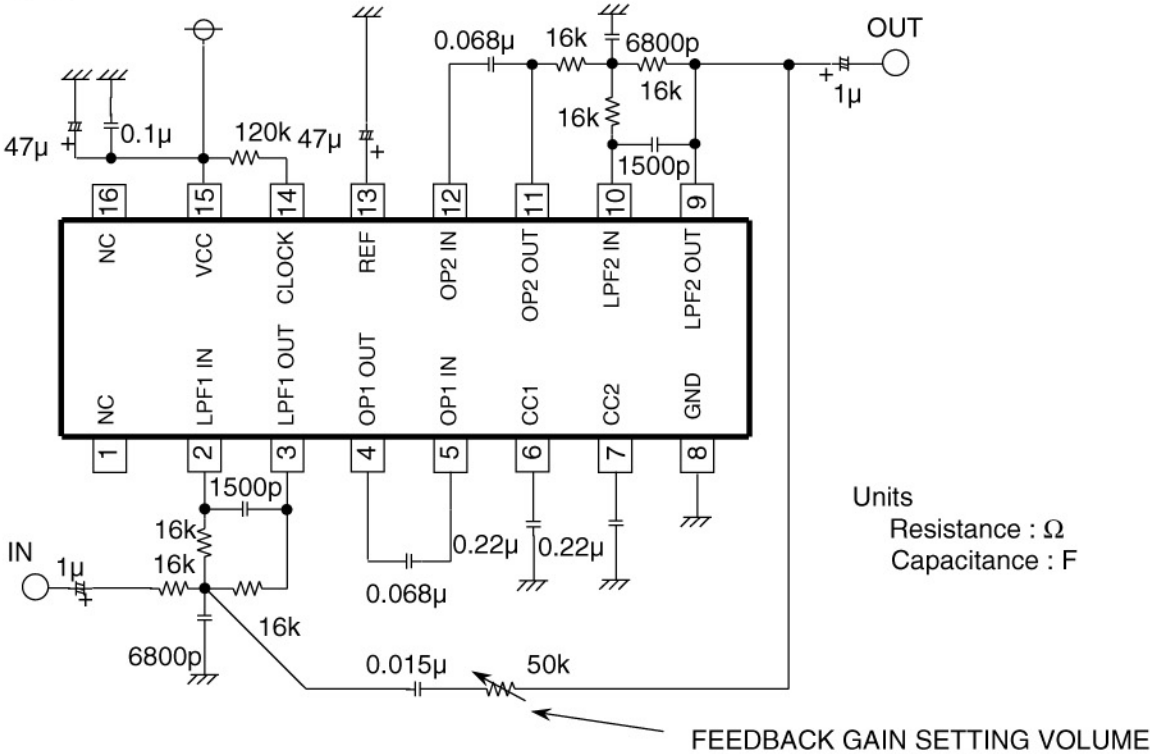
APPLICATION EXAMPLE

• ECHO Delay time 164ms (Signal pass band 3kHz)

< M65850P >



< M65850FP >



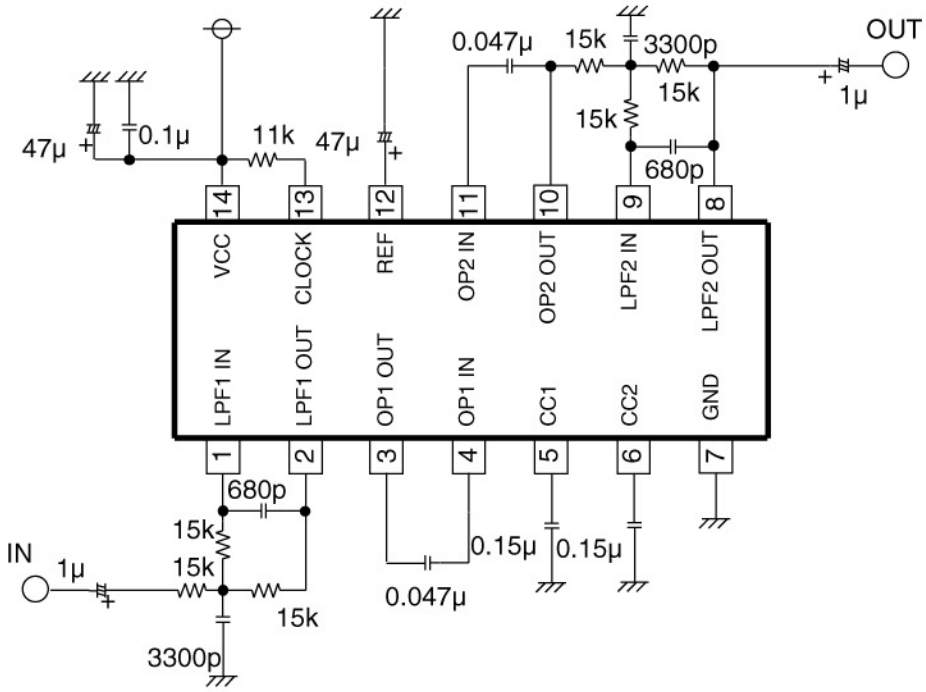
Units
Resistance : Ω
Capacitance : F

M65850P/FP

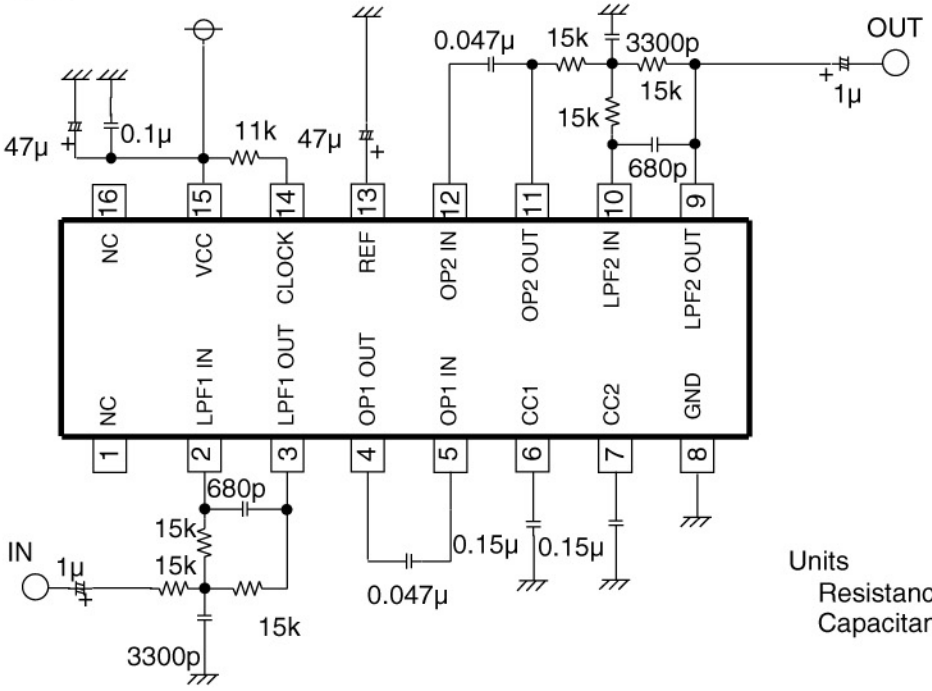
DIGITAL ECHO(DIGITAL DELAY)

• SURROUND Delay time 20ms (Signal pass band 7kHz)

< M65850P >



< M65850FP >



Units
Resistance : Ω
Capacitance : F