To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

EOL Product

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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M65850P/FP

Digital Echo (Digital Delay)

REJ03F0171-0201
Rev.2.01
Jan 25, 2008

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.

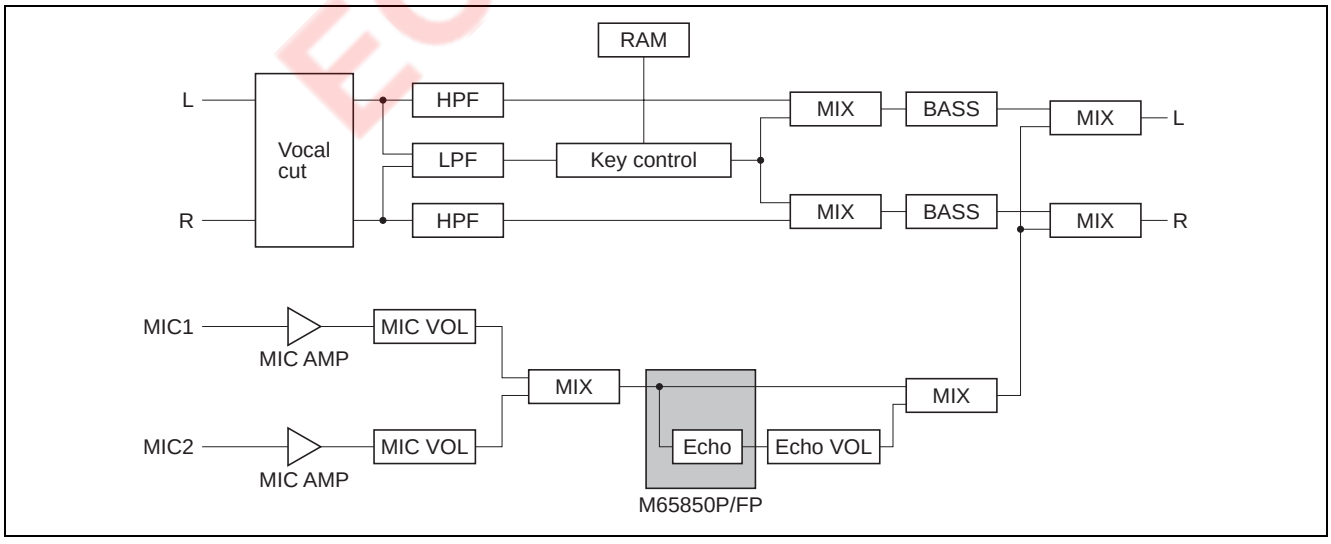
Features

- 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 1 MHz)
  (Selection of delay time in a range between 15 ms and 200 ms)
- Small package (14-pin DIP: PRDP0014AA-A (14P4), 16-pin SOP: PRSP0016DE-A (16P2N-A))
- Built-in 20 Kbit SRAM
- Built-in auto reset circuit (The IC reset as power is turned on)
- Single power supply (5 V)

Recommended Operating Condition

- Supply voltage range: V_{CC} = 3.5 to 5.5 V
- Rated supply voltage: V_{CC} = 5 V

System Configuration



Note: Dolby is the registered trademarks of Dolby Laboratories Licensing Corporation.

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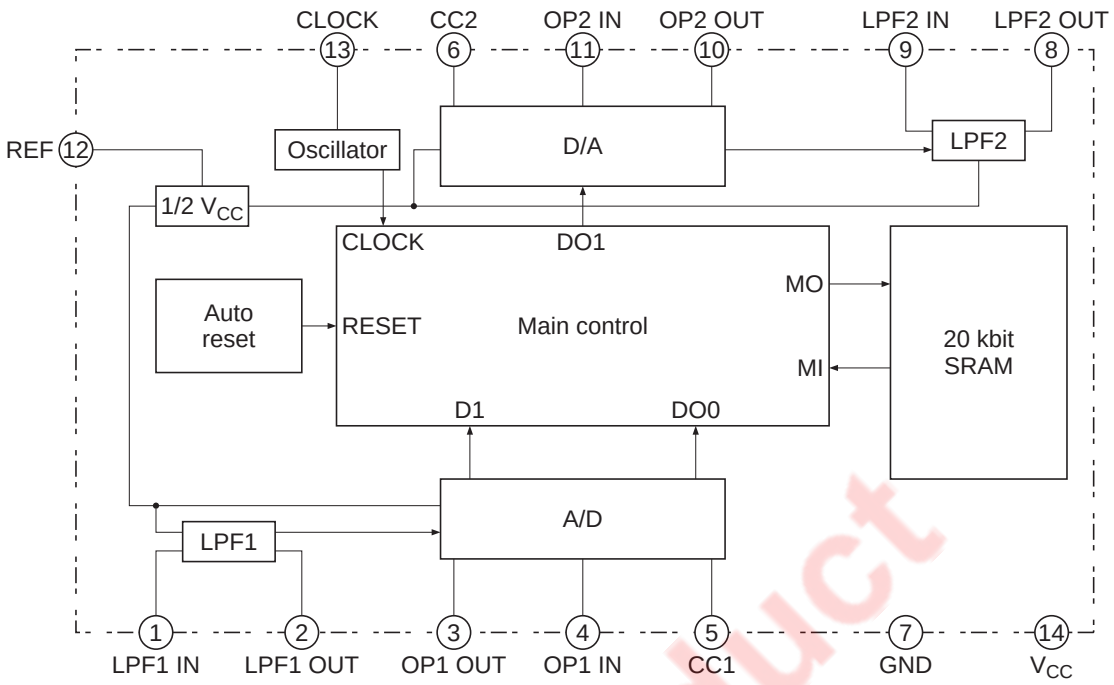
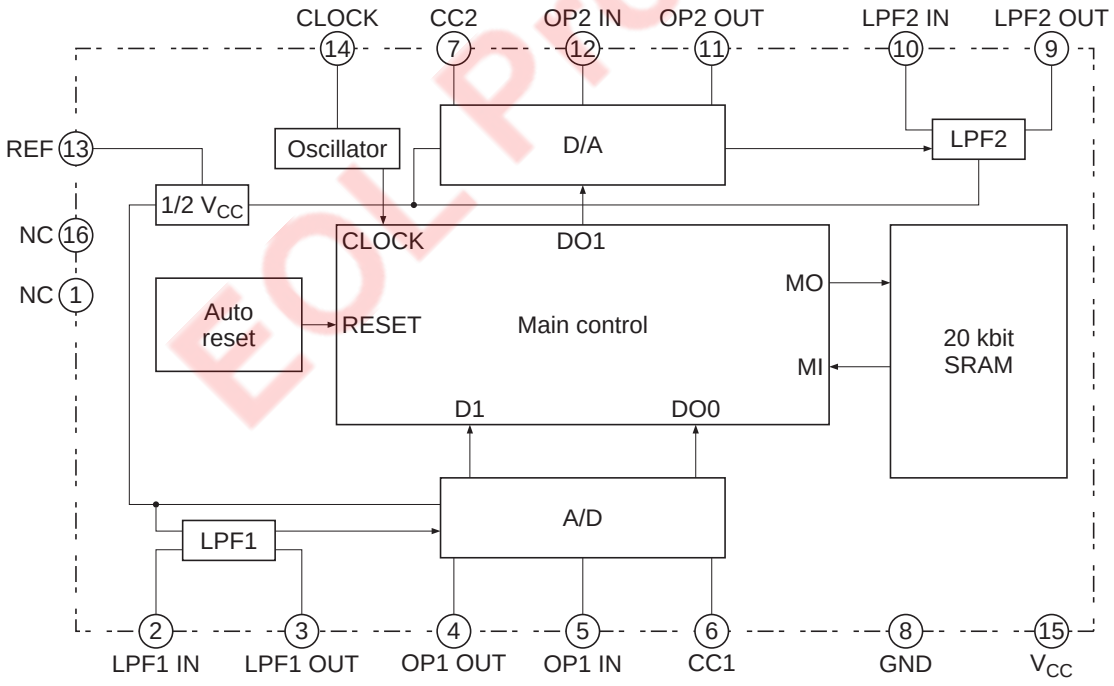
Block Diagram

• M65850P



• M65850FP



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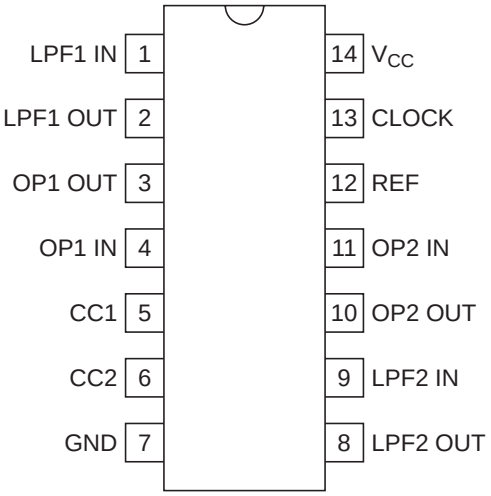
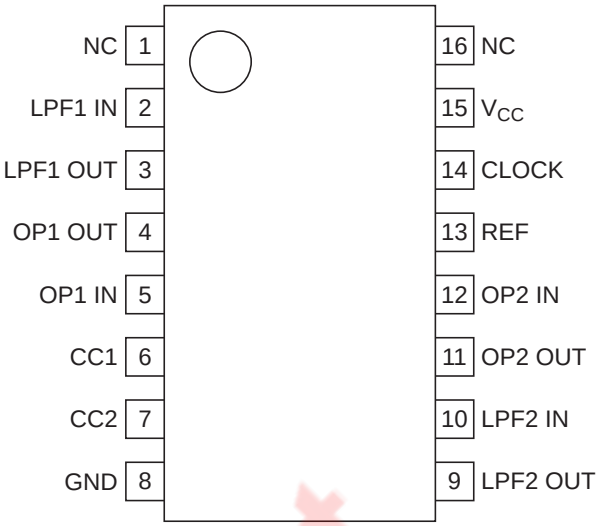
Pin Arrangement

M65850P



(Top view)
Outline: PRDP0014AA-A (14P4)

M65850FP



(Top view)
Outline: PRSP0016DE-A (16P2N-A)

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 amplifier 1 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 ≈ 1/2 V_{CC}
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 to 5.5 V power (Rated voltage: 5 V)
—	1, 16	NC	No connection	—	

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Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Ratings	Units	Conditions
Supply voltage	V_{CC}	6.0	V	
Circuit current	I_{CC}	100	mA	
Power dissipation	Pd	800 (P), 550 (FP)	mW	
Operating temperature	Topr	–20 to +75	°C	
Storage temperature	Tstg	–40 to +125	°C	

Recommended Operating Condition

Item	Symbol	Limits			Unit	Conditions
		Min	Typ	Max		
Supply voltage	V_{CC}	3.5	5	5.5	V	
Clock frequency	fck	0.8	—	11.0	MHz	

Electrical Characteristics

(V_{CC} = 5 V, f = 1 kHz, Vi = 100 mVrms, fck = 1 MHz, Ta = 25°C, unless otherwise noted)

Item	Symbol	Limits			Unit	Test Conditions
		Min	Typ	Max		
Circuit current	I_{CC}	5	13	25	mA	No signal input
Voltage gain	G_V	–3.0	0	3.0	dB	R_L = 47 kΩ
Maximum output voltage	Vomax	0.7	1.0	—	Vrms	THD = 10%
Total harmonic distortion	THD	—	1.2	3.0	%	30 kHz LPF
Output noise voltage	No	—	–85	–70	dBV	DIN-AUDIO
Clock frequency	fck	0.85	1	1.15	MHz	R_C = 120 kΩ

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

   <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= 1 MHz / 8 = 125 kHz

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.

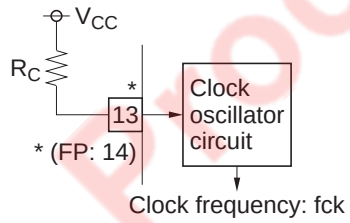
   Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit.

   The oscillator frequency is:

   fck = 1 MHz (R_C = 120 kΩ)

   The resistor for current control can be calculated using the following equation.

   Rc ≈ K / Clock frequency (fck) [Ω]



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

(V_{CC} = 5 V, Ta = 25°C)

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

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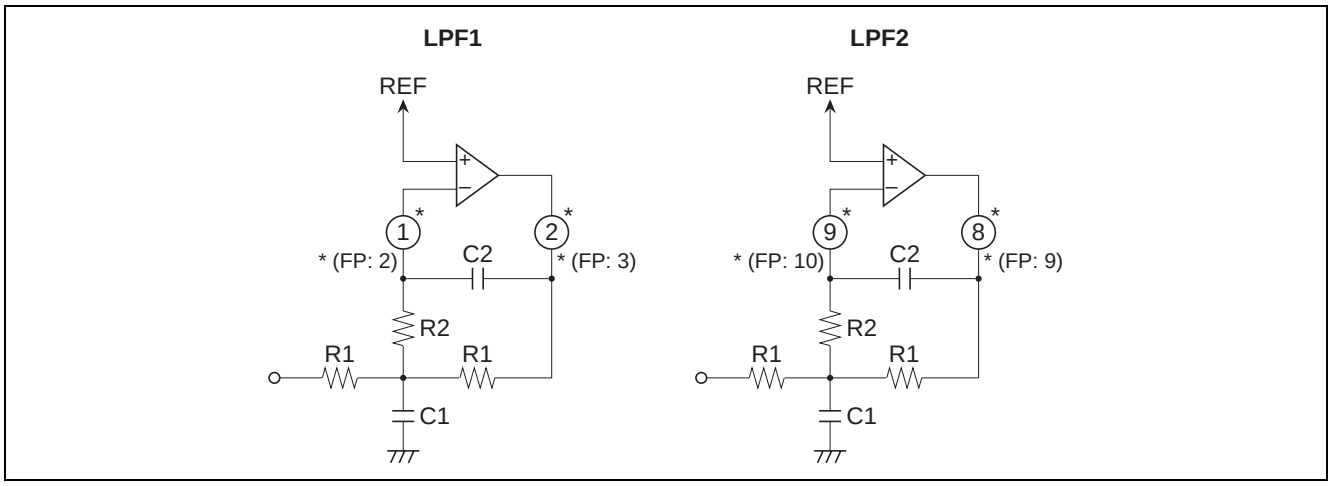
3. Input/output LPF

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)



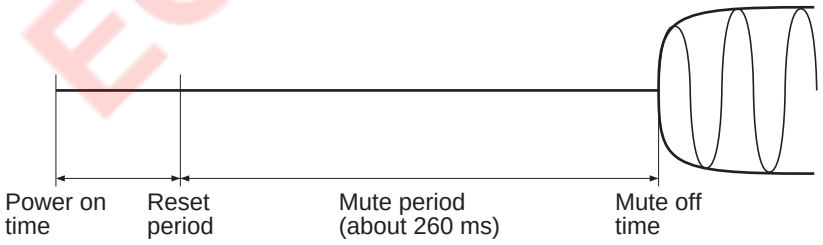
$$\therefore \text{fsig} = \frac{1}{2\pi\sqrt{C1 \bullet C2 \bullet R1 \bullet R2}}$$

(V_{CC} = 5 V, Vi = 100mVrms, f = 1 kHz, Ta = 25°C)

Delay Time (ms)	Clock Frequency (Hz)	Signal Pass Band (Hz)	LPF				Distortion (Reference Value) (%)
			R1 (Ω)	R2 (Ω)	C1 (F)	C2 (F)	
15 to 30	11.0 M to 5.5 M	7 k	15 k	15 k	3300 p	680 p	0.2% (Td = 20 ms)
31 to 100	5.3 M to 1.64 M	5 k	13 k	13 k	4700 p	1000 p	0.3% (Td = 50 ms)
101 to 200	1.62 M to 800 k	3 k	16 k	16 k	6800 p	1500 p	1.2% (Td = 160 ms)

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 = 1 MHz)

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Test Conditions

Item	Symbol	S1	S14	Remarks
Circuit current	I_{CC}	2	2	No-signal time
Voltage gain between input and output	G_V	1	1	R_L = 47 kΩ
Maximum output voltage	Vomax	1	1	THD = 10%
Output distortion	THD	1	1	30 kHz LPF
Output noise voltage	No	2	1	DIN-AUDIO

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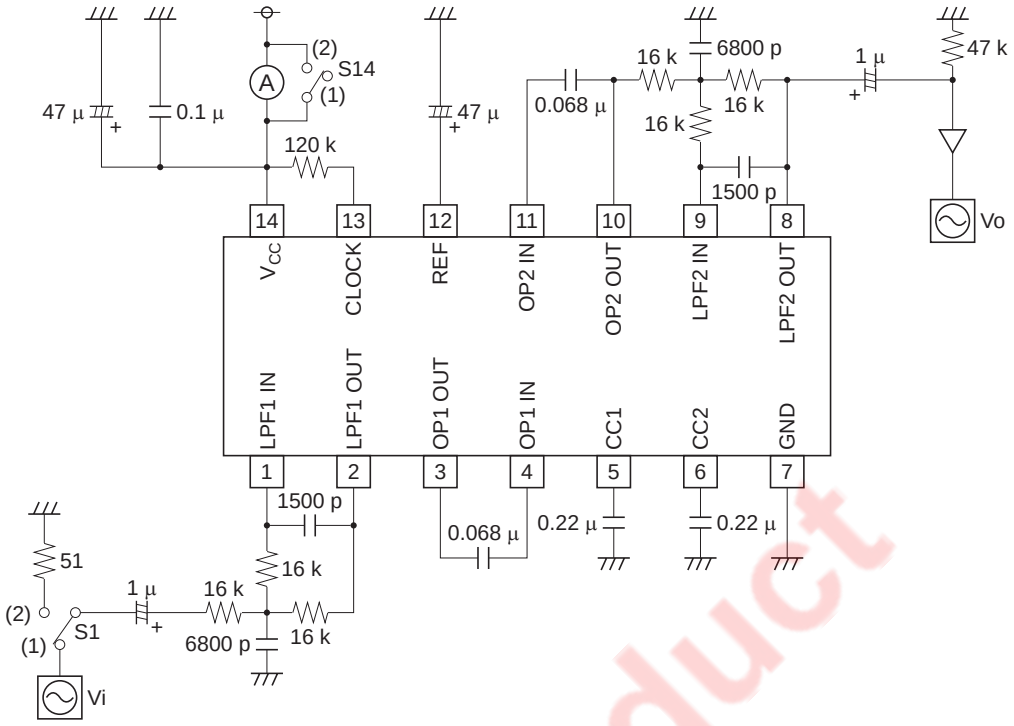
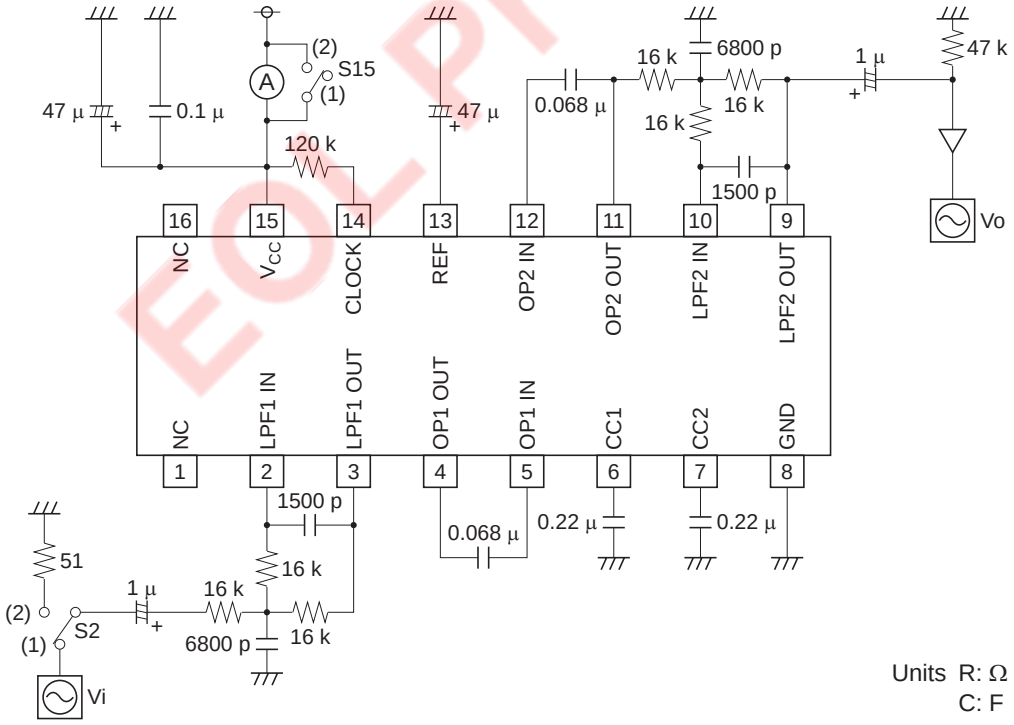
Test Circuit

• M65850P



• M65850FP



Units R: Ω
C: F

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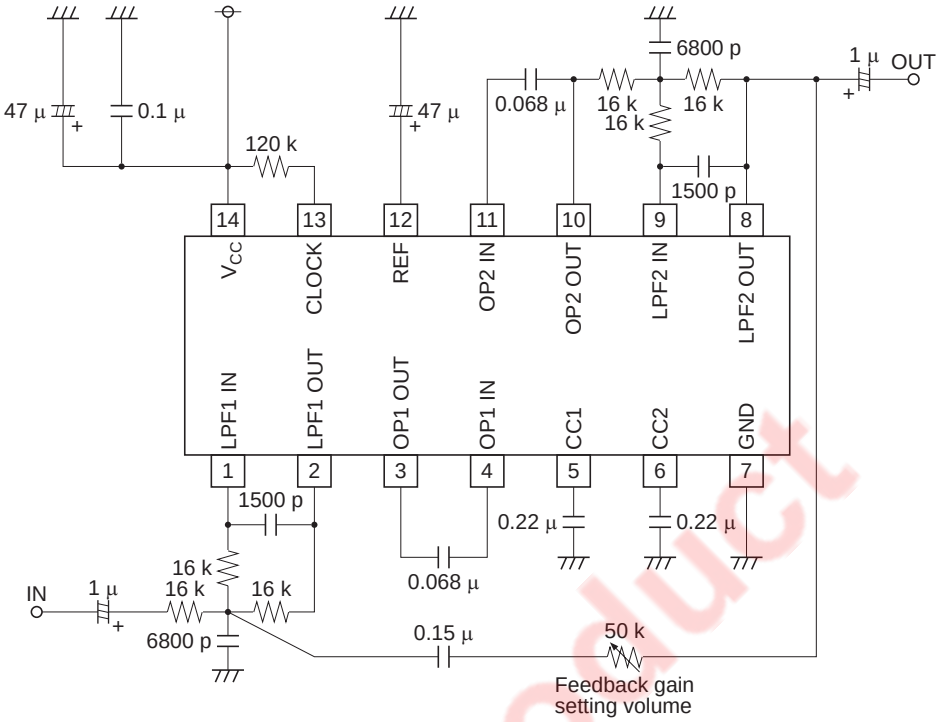
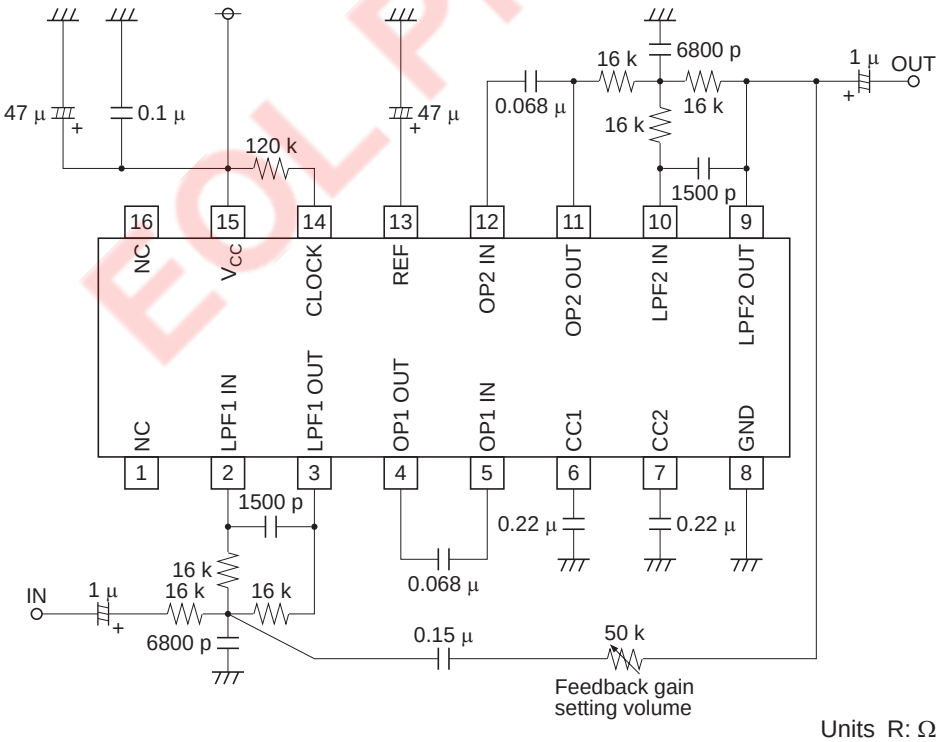
Application Example

1. Echo
   Delay time 164 ms (Signal pass band 3 kHz)

• M65850P



• M65850FP



Units R: Ω
C: F

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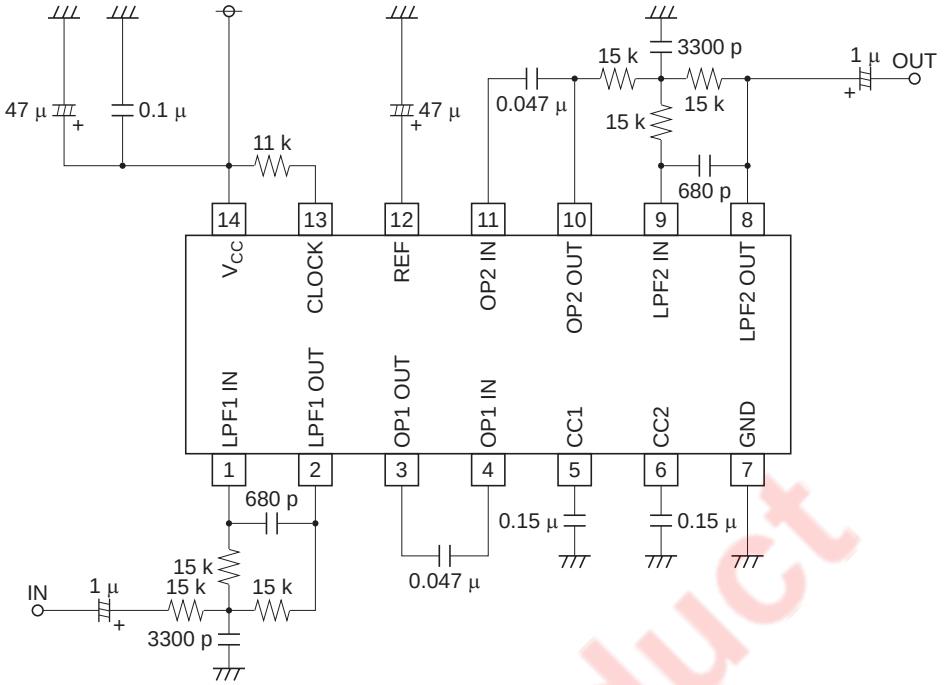
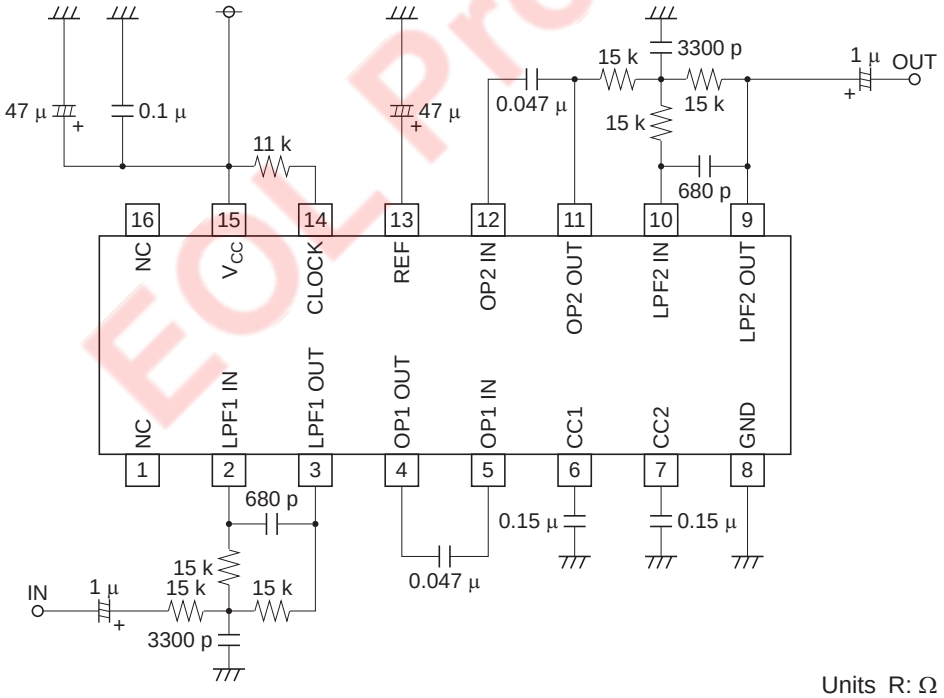
2. Surround
   Delay time 20 ms (Signal pass band 7 kHz)

• M65850P



• M65850FP



Units R: Ω
C: F

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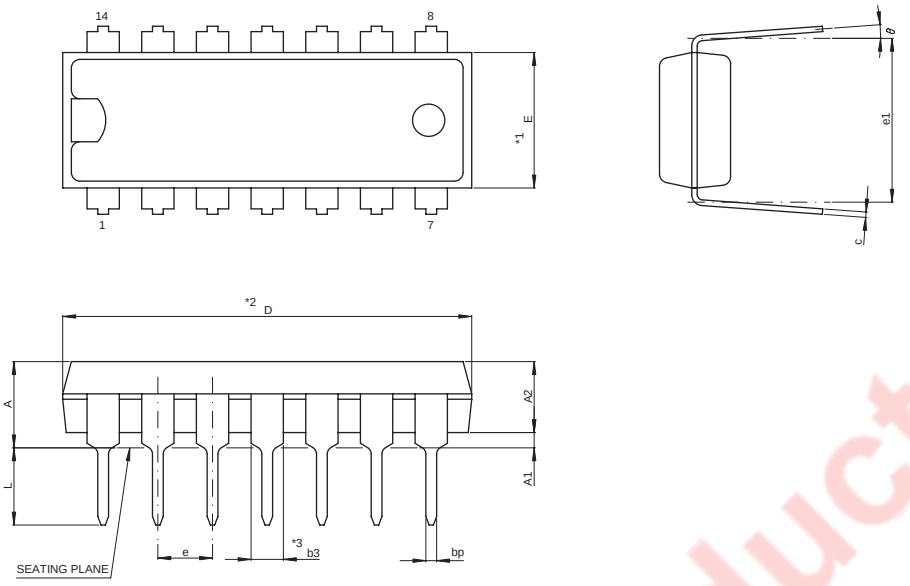
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP14-6.3x19-2.54	PRDP0014AA-A	14P4	1.0g



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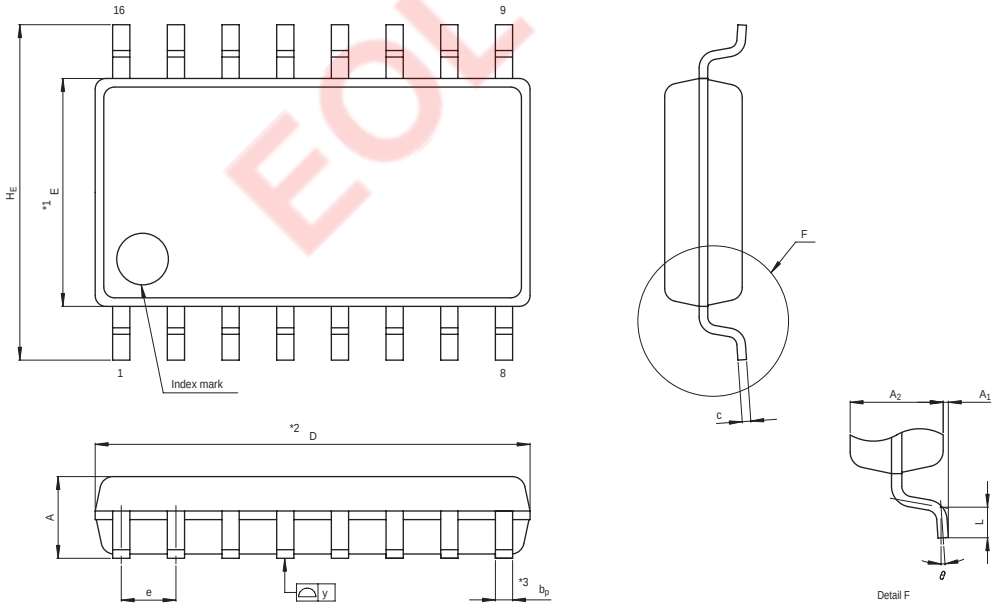
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	7.32	7.62	7.92
D	18.8	19.0	19.2
E	6.15	6.3	6.45
A	—	—	4.5
A_1	0.51	—	—
A_2	—	3.3	—
b_p	0.4	0.5	0.6
b_3	1.4	1.5	1.8
c	0.22	0.27	0.34
θ	0°	—	15°
e	2.29	2.54	2.79
L	3.0	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.3x10.1-1.27	PRSP0016DE-A	16P2N-A	0.2g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	10.0	10.1	10.2
E	5.2	5.3	5.4
A_2	—	1.8	—
A_1	0	0.1	0.2
A	—	—	2.1
b_p	0.35	0.4	0.5
c	0.18	0.2	0.25
θ	0°	—	8°
H_E	7.5	7.8	8.1
e	1.12	1.27	1.42
y	—	—	0.1
L	0.4	0.6	0.8

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