

# M65845AFP

## Digital Echo with Microphone Mixing Circuit

REJ03F0170-0201  
Rev.2.01  
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### 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.

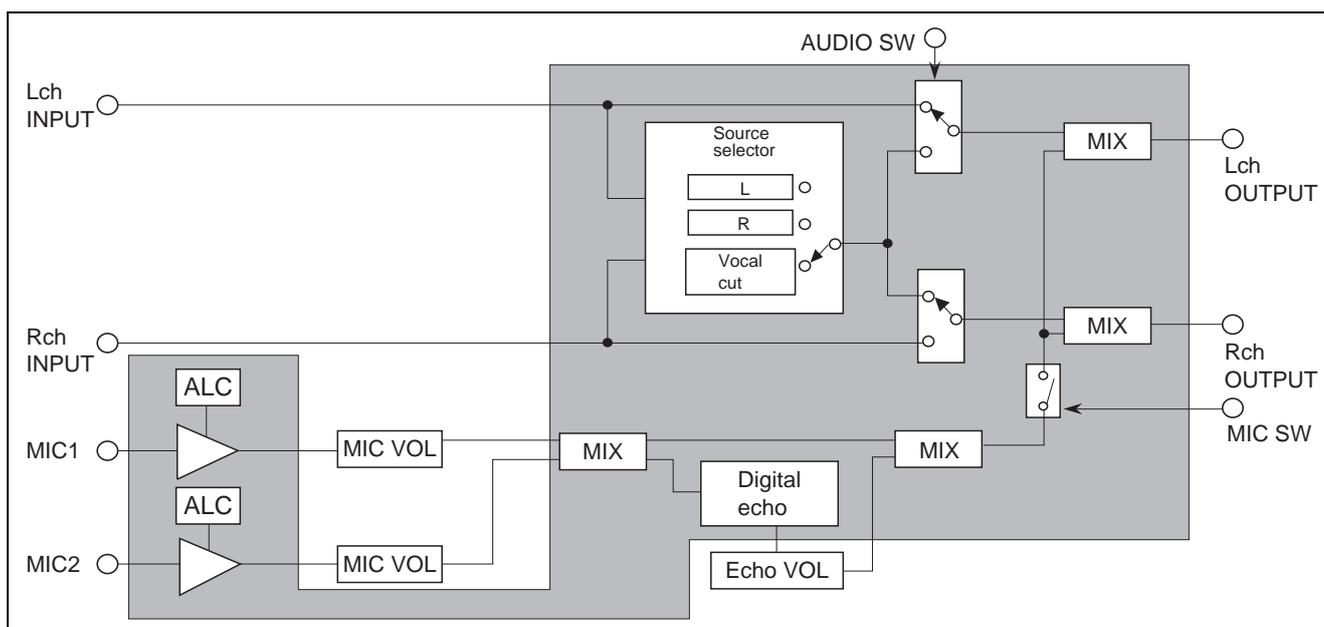
### Features

- High performance digital echo circuit thanks to 16 Kbit 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 (5 V)

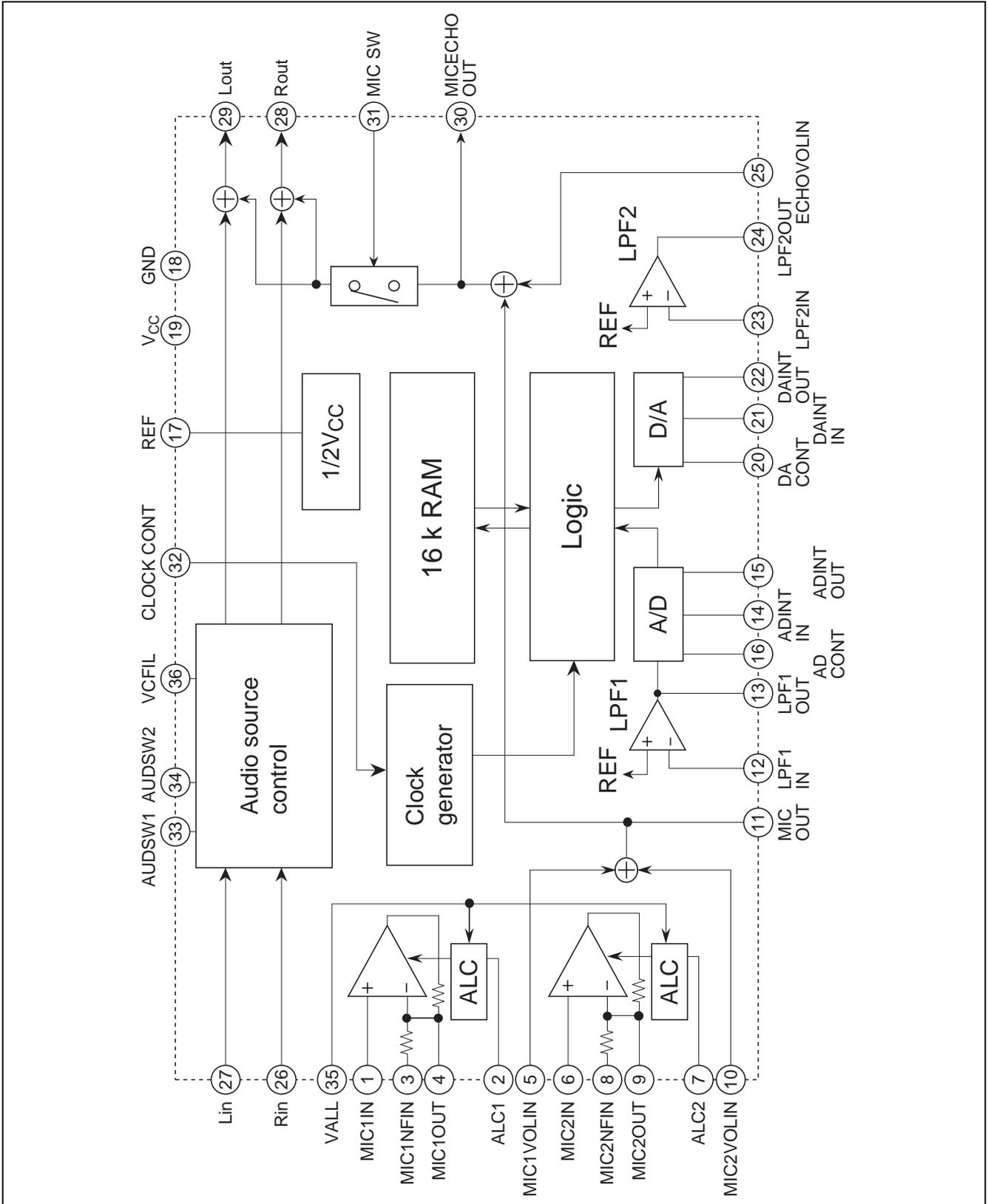
### Recommended Operating Condition

- Supply voltage range:  $V_{CC} = 4.5 \text{ V}$  to  $5.5 \text{ V}$
- Rated supply voltage:  $V_{CC} = 5 \text{ V}$

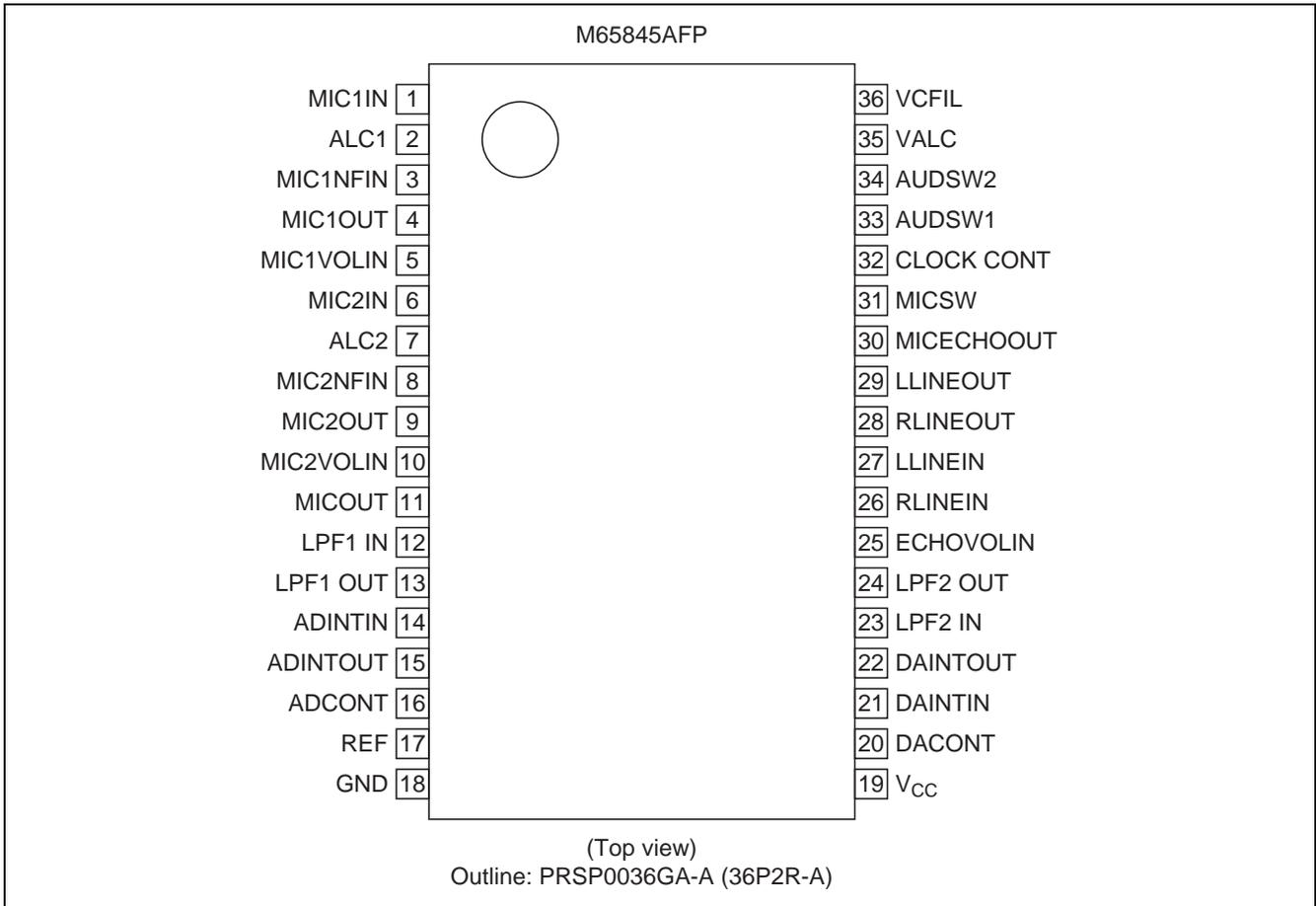
### System Configuration



Block Diagram



Pin Arrangement



## Pin Description

Pin 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 MIC2
7	ALC2	ALC2 control	Connect C which determine ALC attack, recovery time
8	MIC2NFIN	MIC2 NF input	Forms MIC2 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 MIC1 and MIC2
12	LPF1 IN	Low pass filter 1 input	Forms the front low pass filter with external CR for digital echo
13	LPF1 OUT	Low pass filter 1 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	1/2 V <sub>CC</sub> , connect filter C
18	GND	GND	
19	V <sub>CC</sub>	Power supply	
20	DACONT	D/A control	ADM A/D adaptive control
21	DAINTIN	D/A integral input	Forms integrator with external C
22	DAINTOUT	D/A integral output	
23	LPF2 IN	Low pass filter 2 input	Forms post low pass filter with external CR for digital echo
24	LPF2 OUT	Low pass filter 2 output	
25	ECHOVOLIN	Echo volume input	Connect microphone volume which turn down input signal
26	RLINEIN	Rch line input	Mixing output with line and microphone
27	LLINEIN	Lch line input	
28	RLINEOUT	Rch line output	Mixing output with microphone and echo
29	LLINEOUT	Lch line output	
30	MICECHOOOUT	MIC echo output	
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	Form ALC operation voltage with control voltage
36	VCFIL	Vocal cut filter	Through frequency under vocal level

## Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Rations	Unit	Conditions
Supply voltage	V <sub>CC</sub>	6.0	V	
Circuit current	I <sub>CC</sub>	85	mA	
Input voltage	V <sub>i</sub>	-0.3 to V <sub>CC</sub> + 0.3	V	
Power dissipation	P <sub>d</sub>	860	mW	
Operating temperature	T <sub>opr</sub>	-20 to +75	°C	
Storage temperature	T <sub>stg</sub>	-40 to +125	°C	

## Recommended Operating Condition

Item	Symbol	Limits			Unit	Conditions
		Min	Typ	Max		
Supply voltage	V <sub>CC</sub>	4.5	5	5.5	V	
L input voltage	V <sub>IL</sub>	0	—	1	V	Pin 33, 34
H input voltage	V <sub>IH</sub>	4	—	V <sub>CC</sub>	V	

## Electrical Characteristics

(V<sub>CC</sub> = 5 V, f = 1 kHz, V<sub>i</sub> = 100mVrms, f<sub>ck</sub> = 2 MHz, Ta = 25°C, unless otherwise noted)

Item		Symbol	Limits			Unit	Conditions
			Min	Typ	Max		
Total	Circuit current	I <sub>CC</sub>	25	34	70	mA	No signal
Microphone amplifier	Voltage gain	G <sub>VO</sub>	44	47	50	dB	V <sub>o</sub> = -17 dBV
	Distortion 1	THD1	—	0.5	1.5	%	V <sub>o</sub> = -17 dBV, without ALC
	Distortion 2	THD2	—	3.0	6.0	%	V <sub>i</sub> = -27 dBV, ALC operate
	ALC voltage	V <sub>OALC</sub>	-3	0	+3	dB	at -10 to +3 dBV
	ALC attack time	T <sub>ALCAT</sub>	25	40	55	ms	at C = 4.7 μF
	ALC recovery time	T <sub>ALCRE</sub>	1.0	1.5	2.0	s	at C = 4.7 μF
	Maximum output voltage	V <sub>OMAX</sub>	-1	2	—	dBV	THD = 10%
	Noise voltage	No	—	-68	-57	dBV	G <sub>v</sub> = 47 dB, JIS-A, V <sub>I</sub> = 0 Vrms
	Input impedance	Z <sub>i</sub>	5	10	20	kΩ	
Echo	Delay time	T <sub>d</sub>	167	197	226	ms	R <sub>C</sub> = 51 kΩ
	Voltage gain	G <sub>v</sub>	-3	0	+3	dB	
	Distortion	THD	—	2.0	4.0	%	
	Maximum output voltage	V <sub>OMAX</sub>	-3	+1	—	dBV	THD = 10%
	Noise voltage	No	—	-82	-67	dBV	JIS-A
Line	Voltage gain	G <sub>v</sub>	-3	0	+3	dB	
	Distortion	THD	—	0.02	0.1	%	
	Maximum output voltage	V <sub>OMAX</sub>	1	4	—	dBV	THD = 10%
	Noise voltage	No	—	-97	-88	dBV	JIS-A, MICSW = OFF
	Input impedance	Z <sub>i</sub>	10	20	40	kΩ	
Vocal cut	Noise voltage	No	—	-95	-72	dBV	JIS-A, Vocal cut ON
	Voltage gain	G <sub>v</sub>	-3	0	+3	dB	Input one side channel
	Maximum output voltage	V <sub>OMAX</sub>	1	4	—	dBV	THD = 10%
	Vocal rejection ratio	G <sub>REJ</sub>	14	18	—	dB	

## Function Description

### Microphone Amplifier

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

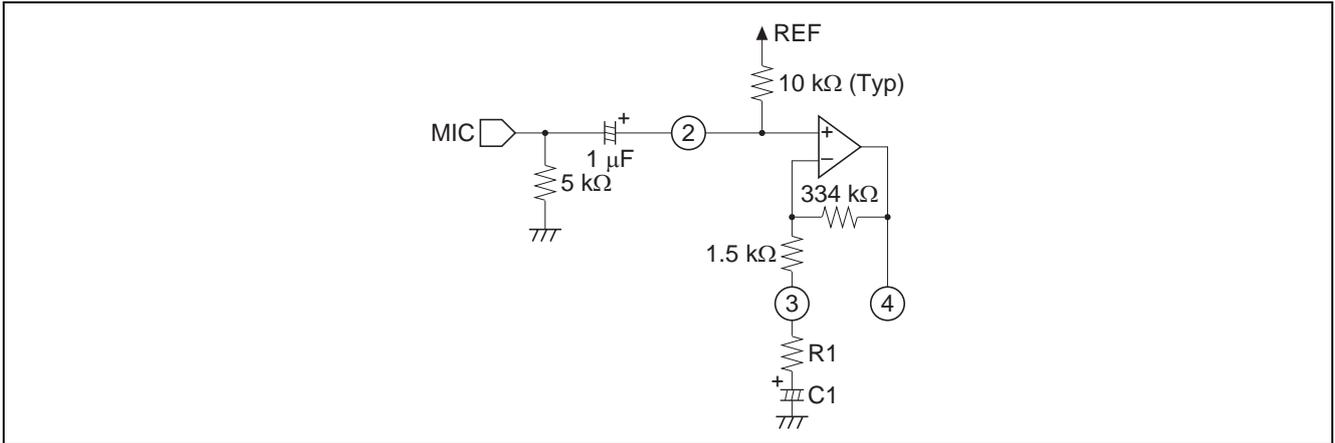
$$G_V = 20 \log \left( \frac{R1 + 1.5 \text{ k} + 334 \text{ k}}{R1 + 1.5 \text{ k}} \right) \quad f_{cl} = \frac{1}{2\pi \cdot (R1 + 1.5 \text{ k}) \cdot C1}$$

$$G_V (\text{max}) = 47 \text{ dB}, f_{cl} = 50 \text{ Hz}$$

$$R1 = 0 \ \Omega, C1 = 2.2 \ \mu\text{F}$$

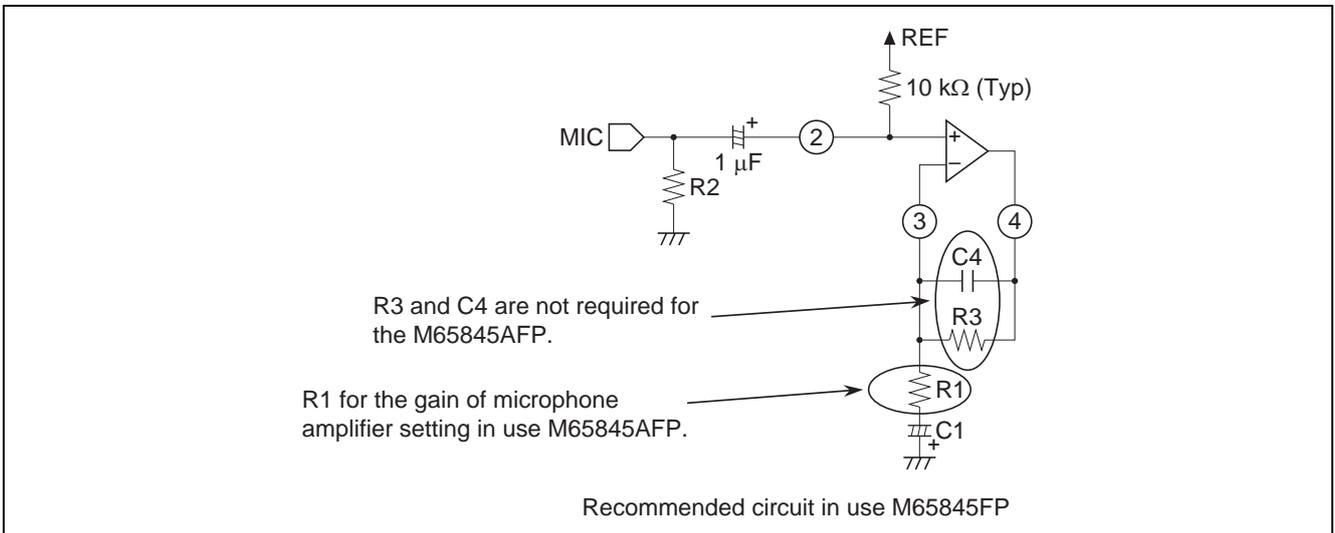
Assuming  $G_V = 37 \text{ dB}$ ,  $f_{cl} = 15 \text{ Hz}$ , for instance, the constants take the following values.

$$R1 = 3.3 \text{ k}\Omega, C1 = 2.2 \ \mu\text{F}$$

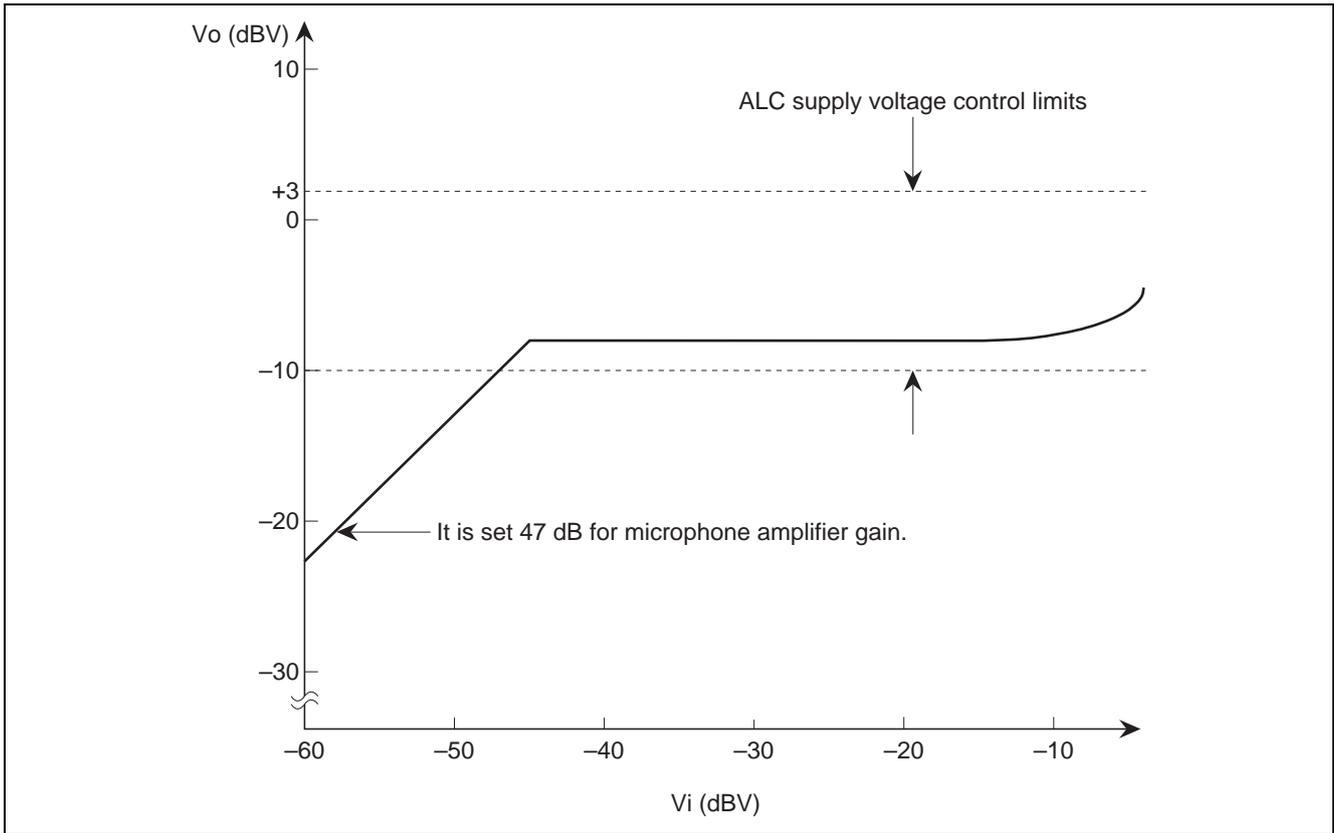


<Attention point when M65845FP is replaced with M65845AFP>

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.



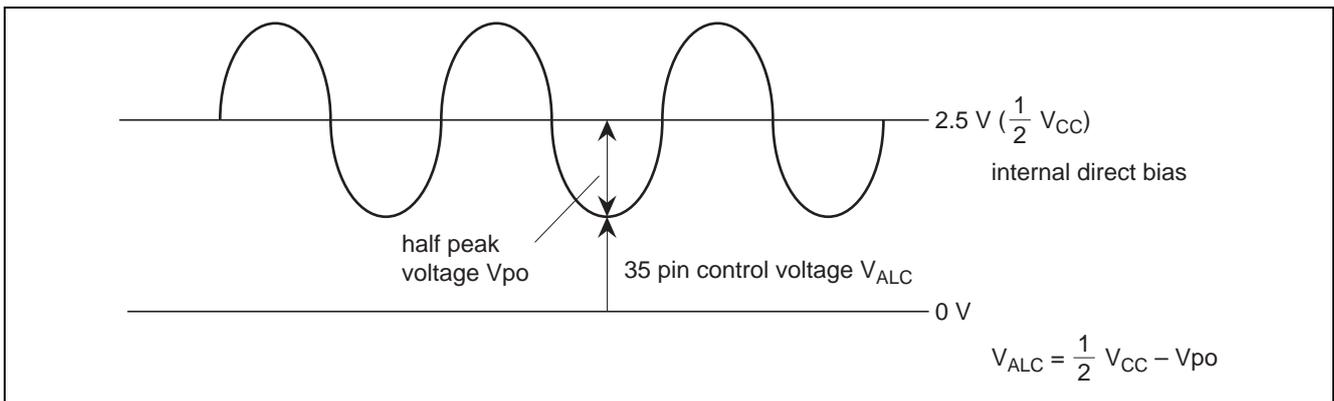
**ALC Level Block Diagram**



**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 pin 35.

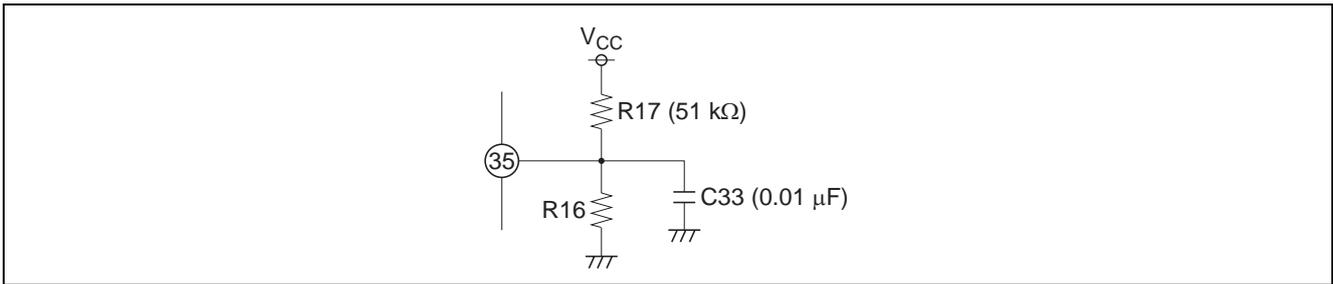
(Setting up forms)



When ALC operation voltage is -5 dBV (at  $V_{CC} = 5\text{ V}$ )  
 $-5\text{ dBV} = 0.56\text{ V}_{rms} = 1.59\text{ V}_{p-p} = 0.80\text{ V}_{p-o}$   
 $V_{ALC} = 2.5 - 0.8 = 1.7\text{ V}$

are concerned.

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



at  $V_{CC} = 5\text{ V}$

ALC Operation Voltage (dBV)	Pin 35 Control Voltage VALC (V)	Resistance R16 (Ω)
+3	0.50	5.6 k
0	1.09	15 k
-2	1.38	20 k
-4	1.61	24 k
-6	1.79	27 k
-8	1.94	33 k
-10	2.05	36 k

### MIC SW

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

Pin 31 (MIC SW)	MIC SW	Echo Signal Output
H or Open	On	On
L	Off	Mute

### Audio Source Select

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

Pin 33 AUDSW1: D1	Pin 34 AUDSW2: D2	Movements
L	L	Stereo
L	H	Lch monaural
H	L	Rch monaural
H	H	Vocal cut

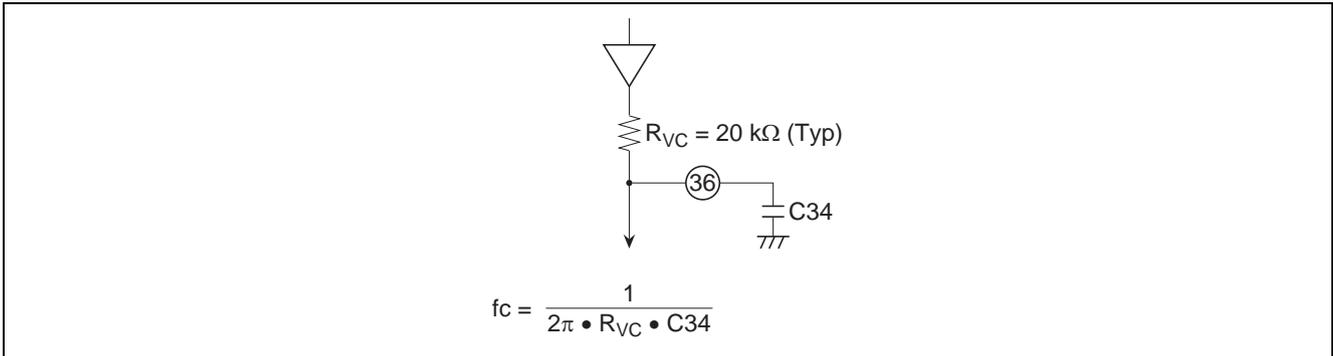
1. Stereo  
Under the conditions usual 2ch are played back to each outputs.
2. Lch monaural  
Under the conditions Lch source is played back to 2ch outputs and suitable for Karaoke reproduction of multiple Karaoke soft and main sound reproduction of laser disks.
3. Rch monaural  
Under the conditions 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.

4. Vocal cut

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

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

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



at  $f_c = 50$  Hz,  $C34 = 0.15$   $\mu$ F is determined.

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

**Digital Echo**

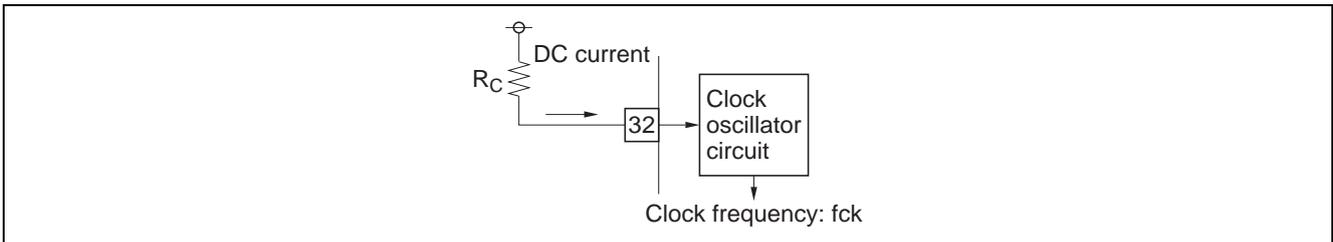
1. Clock oscillator circuit

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.

$$f_{ck} = 2 \text{ MHz (} R_C = 51 \text{ k}\Omega \text{)}$$



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)

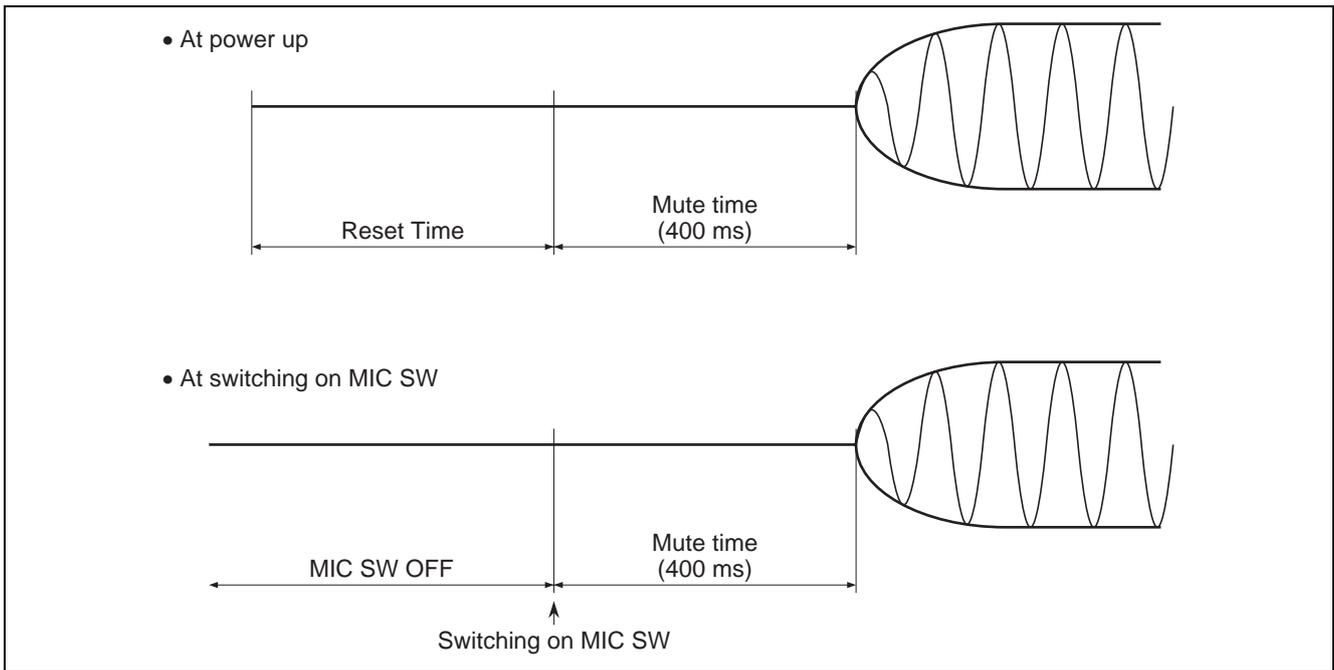
$f_{ck} = 2$  MHz ( $R_c = 51$  k $\Omega$ ): Delay time = 197 ms

$f_{ck} = 2.6$  MHz ( $R_c = 39$  k $\Omega$ ): Delay time = 150 ms

$f_{ck} = 3.9$  MHz ( $R_c = 24$  k $\Omega$ ): Delay time = 100 ms

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.



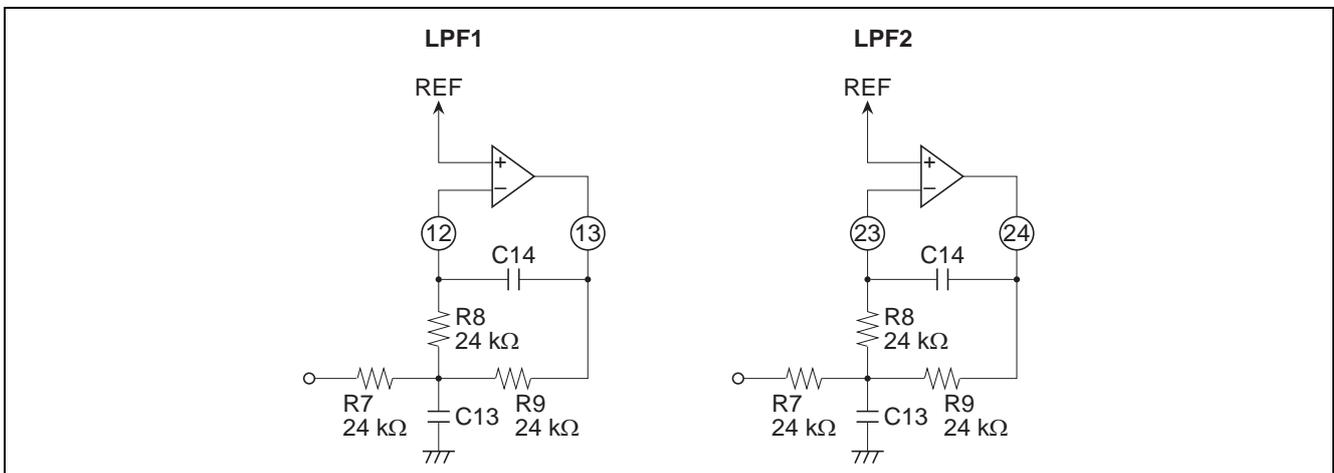
3. Input and output LPF

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.

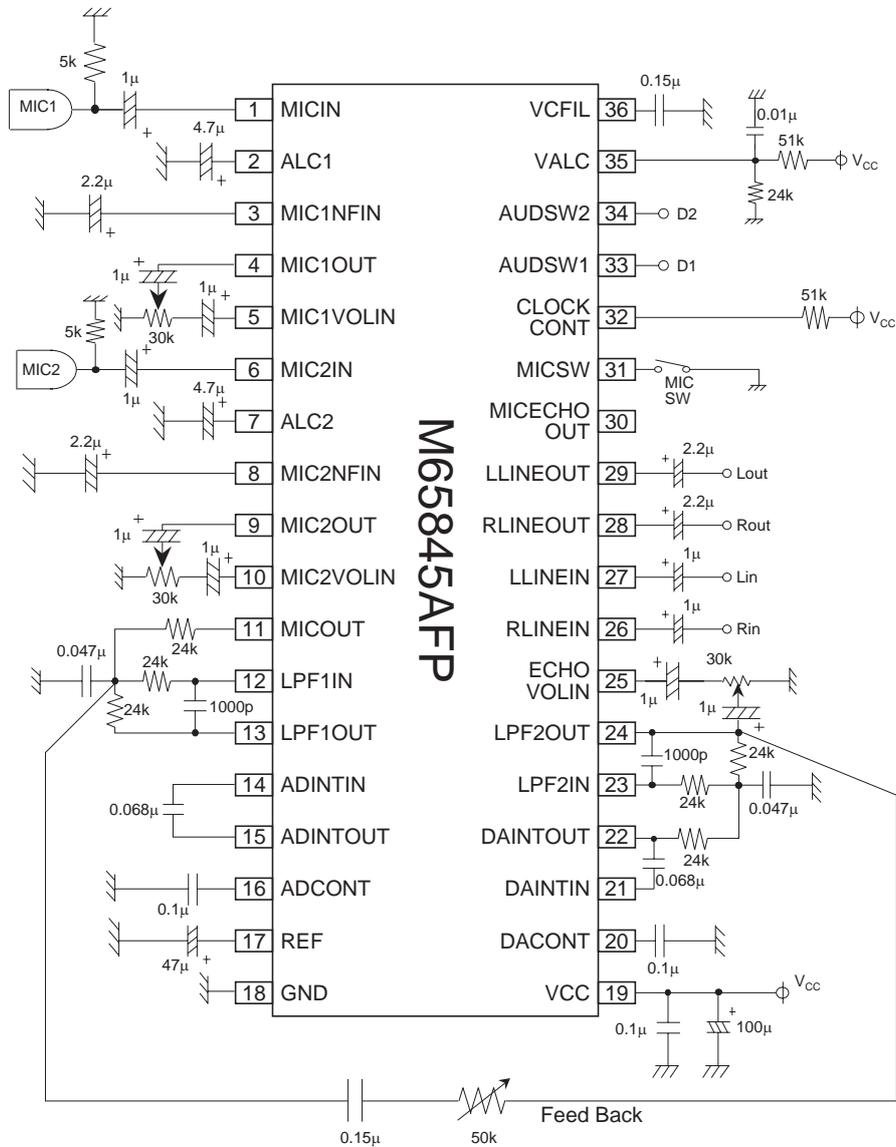
$$f_{sig} = \frac{1}{2\pi \sqrt{R8 \cdot R9 \cdot C13 \cdot C14}}$$





Application Example

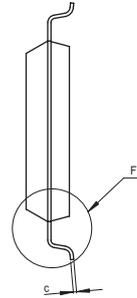
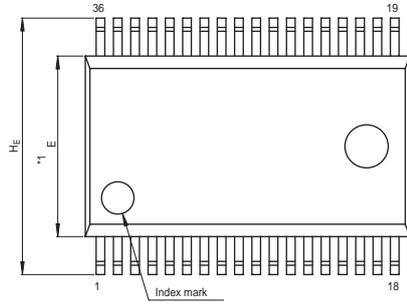
Microphone amplifier :  $G_V = 47 \text{ dB}$ ,  $f_{cl} = 50 \text{ Hz}$   
 ALC operating voltage  $-4 \text{ dBV}$   
 ECHO : Delay time  $197 \text{ ms}$  ( $f_s = 83.3 \text{ kHz}$ )  
 Cut-off frequency  $3.1 \text{ kHz}$



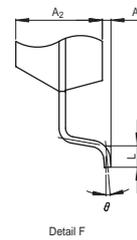
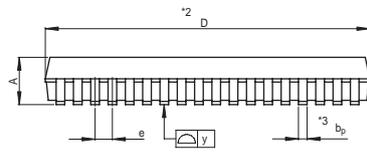
Units R:  $\Omega$   
 C: F

### Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP36-8.4x15-0.80	PRSP0036GA-A	36P2R-A	0.5g



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	14.8	15.0	15.2
E	8.2	8.4	8.6
A <sub>2</sub>	—	2.0	—
A	—	—	2.4
A <sub>1</sub>	0.05	—	—
b <sub>p</sub>	0.35	0.4	0.5
c	0.13	0.15	0.2
θ	0°	—	10°
H <sub>E</sub>	11.63	11.93	12.23
e	0.65	0.8	0.95
y	—	—	0.15
L	0.3	0.5	0.7

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