To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

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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

M65849BFP

SINGLE CHIP SURROUND PROCESSOR

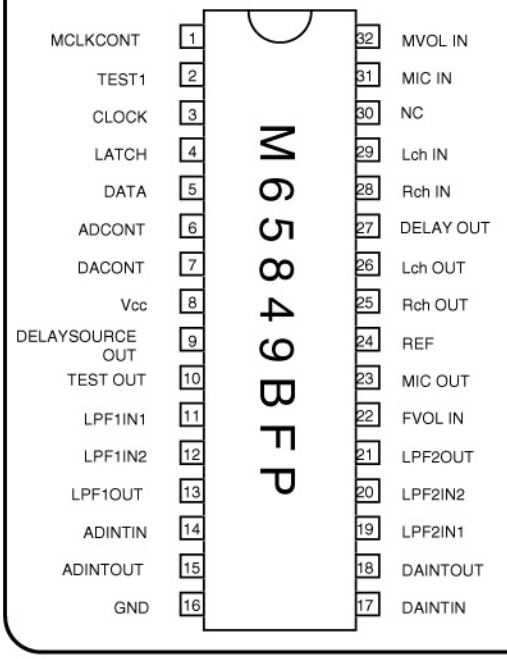
DESCRIPTION

The M65849BFP is a CMOS IC built-in Digital circuit and mixing amplifiers.
It is suitable for adding effects to Mini Stereo, CD-Radio Cassette and TV.
This COMS IC can be used dolby surround.

FEATURES

- Built-in digital delay , mixing amplifiers,input output selector achieve a surround system with a single chip .
- Delay volume , feedback volume Built-in
- ADM digital delay ,16kbit SRAM Built-in
- Selection of delay time in a range between 9.2msec and 196.6msec 8 increments.
- 32 pin SSOP package (32P2U-B)
- Built-in automatic reset circuit activated with power on
- 5V single power supply

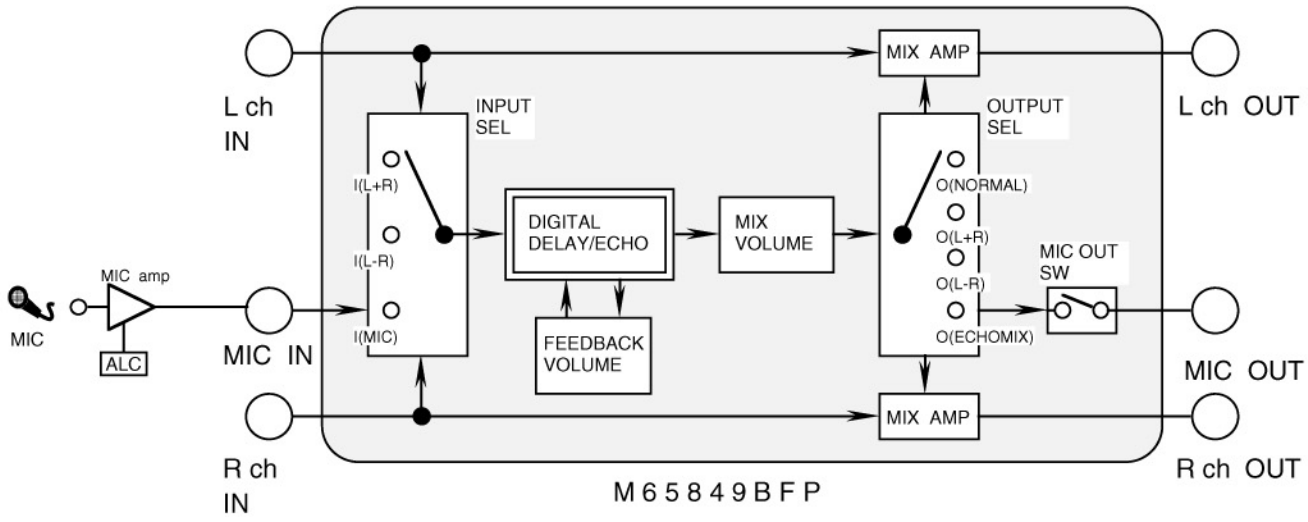
PIN CONFIGURATION



RECOMMENDED OPERATING CONDITION

- Supply voltage range.....Vcc=4.5 ~ 5.5V
  Rated supply voltage.....Vcc=5V

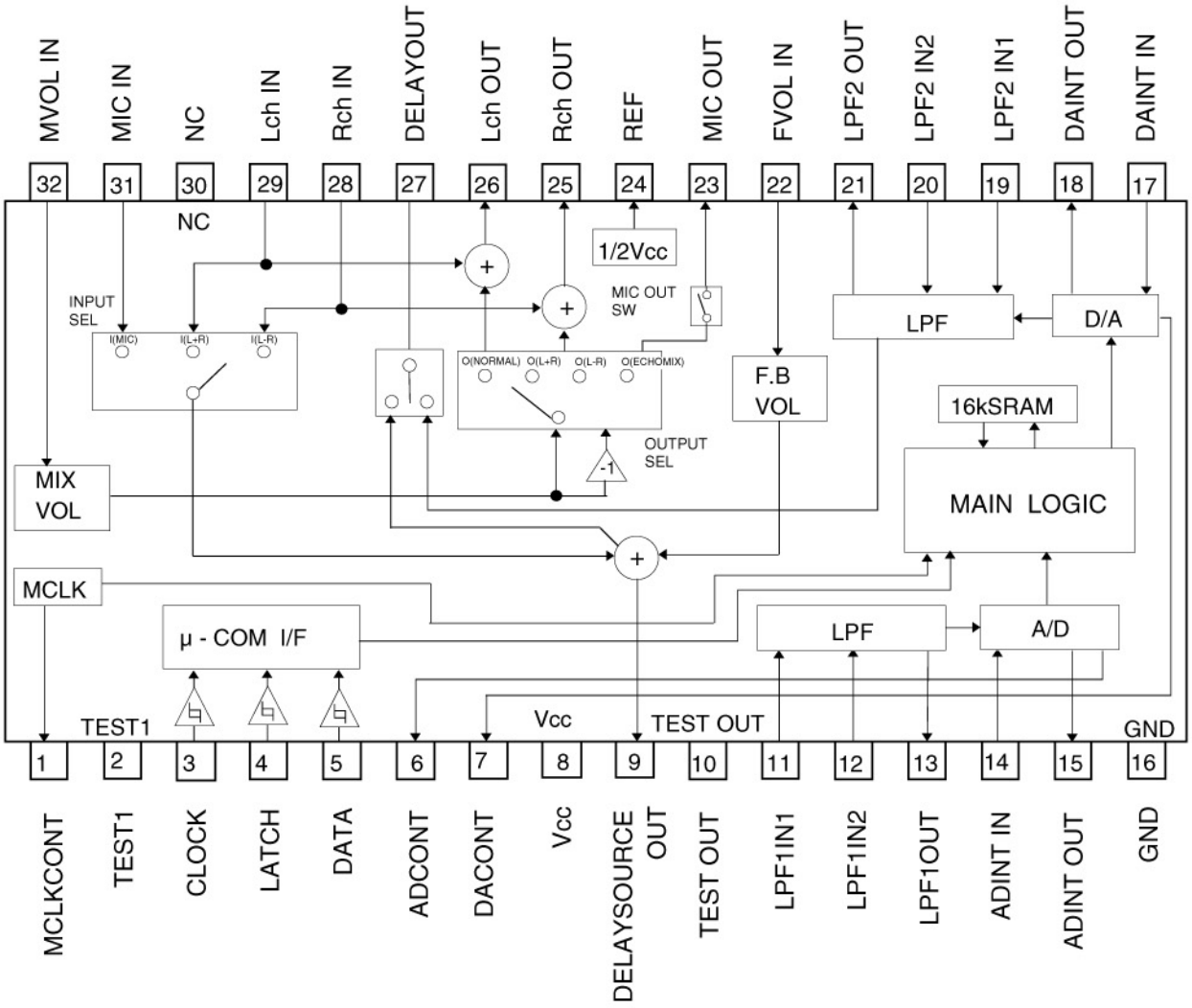
SYSTEM CONFIGURATION



M65849BFP

SINGLE CHIP SURROUND PROCESSOR

Block Diagram



△ :Schmitt Trigger Buffer

NC :Nonconnect(This terminal can use relay terminal)

Pin Description

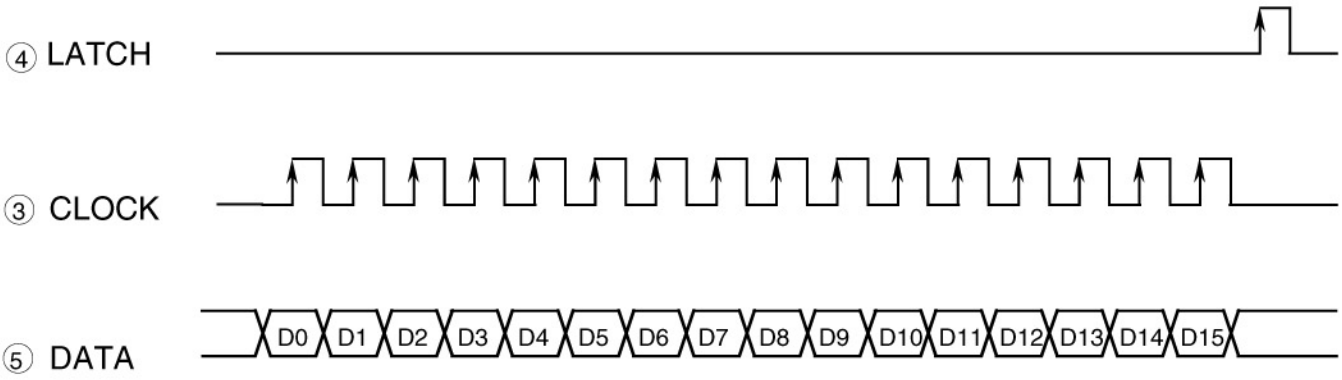
No.	Symbol	Name	I/O	Function
1	MCLKCONT	Oscillator Input	I	Controls builts-in clock generation circuit with external R
2	TEST1	Test pin	I	Test mode change "H" Normal / "L" Test (Be sure connect to Vcc at Normal mode)
3	CLOCK	CLOCK	I	Clock input via serial bas
4	LATCH	LATCH	I	Latch input via serial bas
5	DATA	DATA	I	Data input via serial bas
6	AD CONT	A/D Control	—	Decide the time constant of A/D
7	DA CONT	D/A Control	—	Decide the time constant of D/A
8	Vcc	Power Supply	—	
9	DELAYSOURCE OUT	Delay source output	O	(L+R) or(L-R) or (MIC) signal Output
10	TEST OUT	Test output	O	Memory /Mute /Sampling Data Output (Test mode) (Be sure to open at Normal mode)
11	LPF1 IN 1	Low Pass Filter 1 Input 1	I	Prefilter placed before A/D convertor for digital delay
12	LPF1 IN 2	Low Pass Filter 1 Input 2	I	
13	LPF1 OUT	Low Pass Filter 1 Output	O	
14	AD INT IN	A/D Integrator Input	I	To form D/A convertor Integrator by connecting external capacitor
15	AD INT OUT	A/D Integrator Output	O	
16	GND	GND	—	

No.	Symbol	Name	I/O	Function
17	DAINT IN	D/A Integrator Input	I	Form Integrator With External C
18	DAINT OUT	D/A Integrator Output	O	
19	LPF 2 IN 1	Low Pass Filter 2 Input1	I	Form Low Pass Filter With External C,R
20	LPF 2 IN 2	Low Pass Filter 2 Input 2	I	
21	LPF 2 OUT	Low Pass Filter 2 Output	O	
22	FVOL IN	Feedback Volume Input	I	Feedback Volume Input
23	MIC OUT	Microphone Output	O	Microphone Output
24	REF	Reference	—	1/2 Vcc Output , Connect External C
25	Rch OUT	Rch Output	O	Rch Mixing Output
26	Lch OUT	Lch Output	O	Lch Mixing Output
27	DELAYOUT	DELAY Output	O	Delay Signal Output
28	Rch IN	Rch Input	I	Rch Input
29	Lch IN	Lch Input	I	Lch Input
30	NC	Nonconnect	—	This terminal can use relay terminal for external
31	MIC IN	Microphone Input	I	Microphone Input
32	MVOL IN	Mix Volume Input	—	Mix Volume Input

Operation Mode Settings.

Operation mode is controlled by the 16-bit serial data inputted in accordance with the following timing.

- The (DATA is reading at the rising edge of the CLOCK and the last 16-bits are loaded at the rising edge of the LATCH.



Data No.	Control Block	Control Explanation
D0	DELAY TIME	There are 8 kinds of Delay Time which are from 9.2ms to 196.6ms.
D1		
D2		
D3	INPUT SELECTOR	This is the input selector which selects (CLOCKOFF),(L+R), (L-R) or(MIC).
D4		
D5	OUTPUT SELECTOR	This is the output selector which selects (L+R),(L-R), (ECHOMIX) or (NORMAL).
D6		
D7	MICOUT SW	This is the ON/OFF switch for the Microphone signal.
D8	MIX VOL	There are 8 kinds of ATT. level which are from +3dB to -15dB,-∞dB(3dB step).
D9		
D10		
D11	FEED BACK Vcc	There are 8 kinds of ATT. level which are from -3dB to -15dB,-∞dB(2dB step).
D12		
D13		
D14	ADDRESS	D14=(L),D15=(H)DATA Load,the others cancel.
D15		

Description of Control

Delay Time Control

CONTROL DATA			DELAY TIME	The Cut Off Frequency of LPF
D0	D1	D2		
L	L	L	9.2msec	7.3kHz
H	L	L	15.4msec	
L	H	L	21.5msec	
H	H	L	28.7msec	
L	L	H	49.2msec	
H	L	H	98.3msec	3.1kHz
L	H	H	147.5msec	
H	H	H	196.6msec	

Input Selector Control

Control Data		INPUT SELECTOR
D3	D4	
L	L	I(L+R)
H	L	I(L-R)
L	H	I(MIC)
H	H	I(CLKOFF)

Output Selector Control

Control Data		OUTPUT SELECTOR
D5	D6	
L	L	O(L+R)
H	L	O(L-R)
L	H	O(ECHOMIX)
H	H	O(NORMAL)

Microphone Output Switch Control

Control Data D7	MICOUT SWITCH
L	SW OFF
H	SW ON

Mix volume Control

Control Data			MIX VOLUME
D8	D9	D10	
L	L	L	+3dB
H	L	L	0dB
L	H	L	-3dB
H	H	L	-6dB
L	L	H	-9dB
H	L	H	-12dB
L	H	H	-15dB
H	H	H	-∞

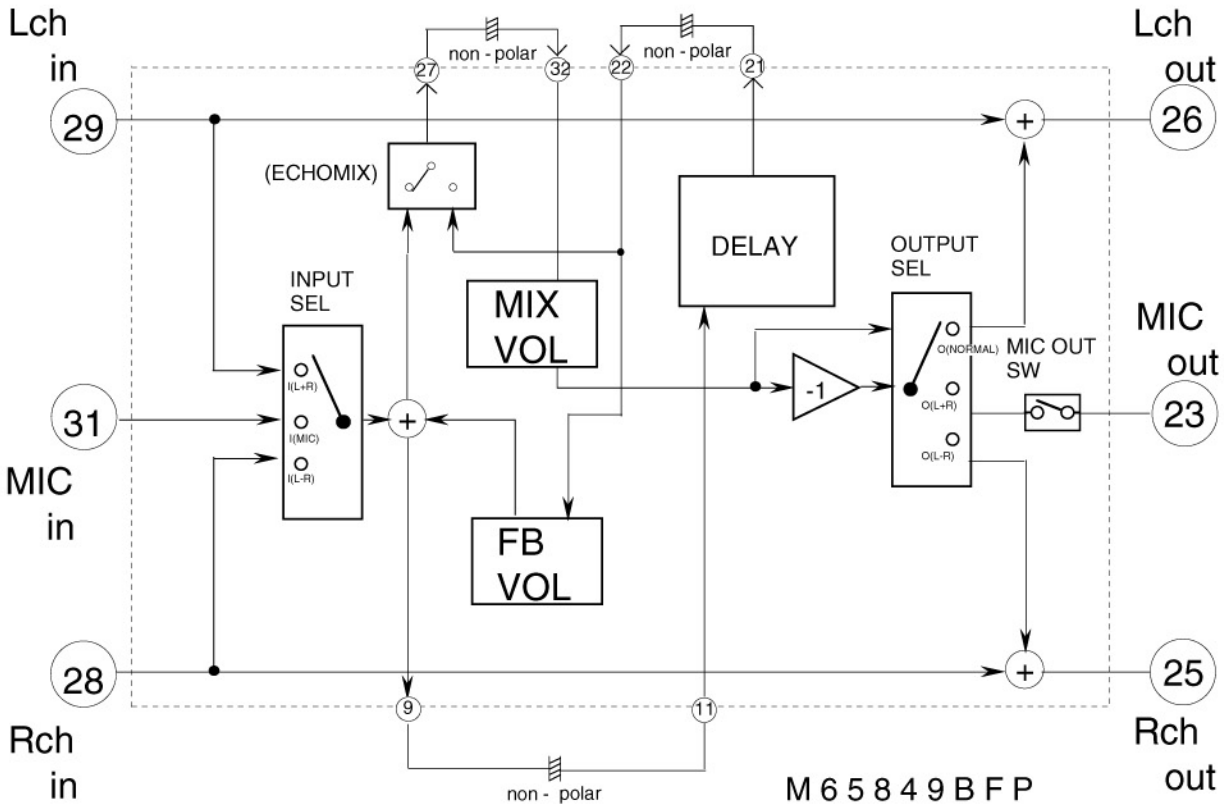
Feedback volume Control

Control Data			FEEDBACK VOLUME
D11	D12	D13	
L	L	L	-3dB
H	L	L	-5dB
L	H	L	-7dB
H	H	L	-9dB
L	L	H	-11dB
H	L	H	-13dB
L	H	H	-15dB
H	H	H	-∞

Address Control

Control Data		ADDRESS
D14	D15	
L	L	DATA CANCEL
H	L	
L	H	DATA LOAD
H	H	DATA CANCEL

Construction of Diagram



•DELAY TIME

There are 8 kinds of Delay Time which are from 9.6ms to 196.6ms.

•FEEDBACK VOLUME

There are 8 kinds of ATT. level which are from -3dB to -15dB,- ∞dB.

•MIX VOLUME

There are 8 kinds of ATT. level which are from +3dB to -15dB,- ∞dB.

•INPUT SELECTOR

This is the input selector which selects (CLOCKOFF),(L+R),(L-R)or (MIC).

•OUTPUT SELECTOR

This is the output selector which selects (L+R),(L-R),(ECHOMIX), (NORMAL).

•MIC SWITCH

This is the ON/OFF switch for the Microphone signal.

The Power On Reset

When the IC is supplied Vcc, the reset circuit is on and after about 120ms (Vcc=5V C (24) =47μF) the reset circuit is off automatically. *1

The conditions are as follows.

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15
L	L	L	L	H	L	L	L	H	H	H	H	H	H	L	H
9.2ms			I(L+R)		NORMAL		MICSW OFF	-∞			-∞			DATA LOAD	

*1 The Reset Time

The reset time depends on the external C of (24) pin and the time can be calculated as follows.

The Reset Time (mS)=2.5 x c (mS)

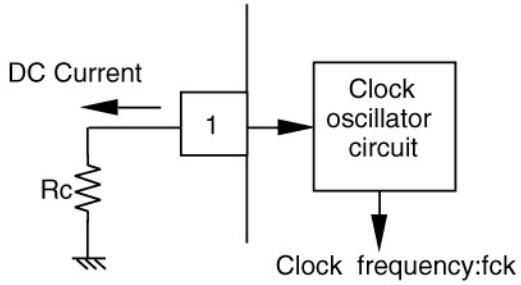
Ex.) In The Case Of c=47μF

The Reset Time=2.5 x 47=117.5 (mS)

Clock oscillator circuit

This IC incorporates a current control type clock oscillator circuit in it, thus providing circuit configuration just by connecting an Rc for current control pin (1) (MCLKCONT).
Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit.
The oscillator frequency fck is following.

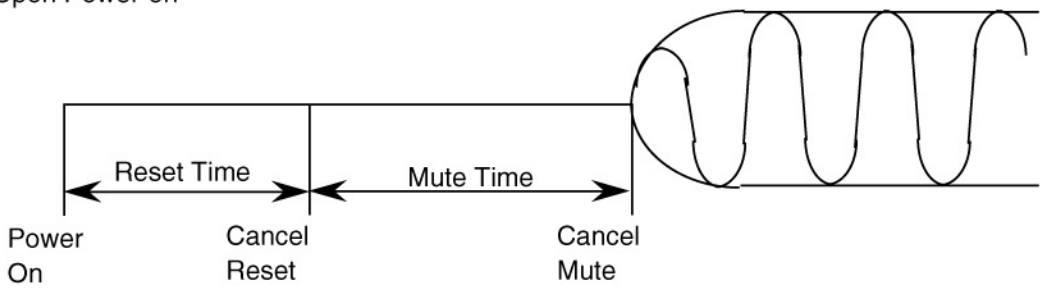
fck=4MHz(Rc=22kΩ)



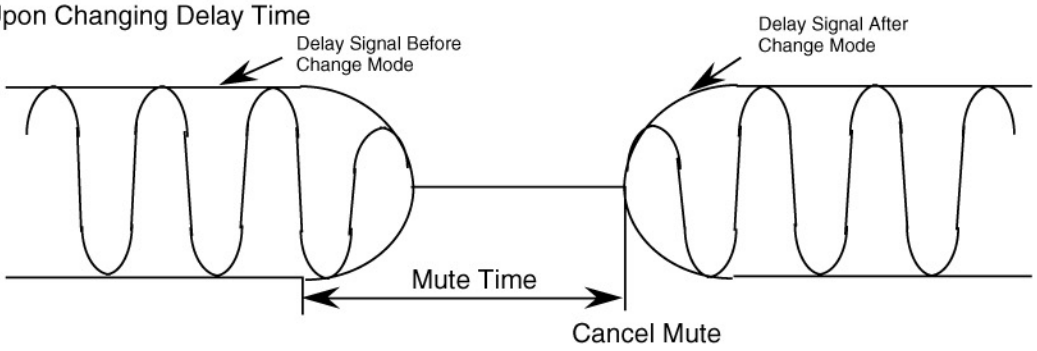
The Auto Muting

The auto muting is active upon the power-on and the changing delay time for rejecting the shock noise.

•Upon Power-on



•Upon Changing Delay Time

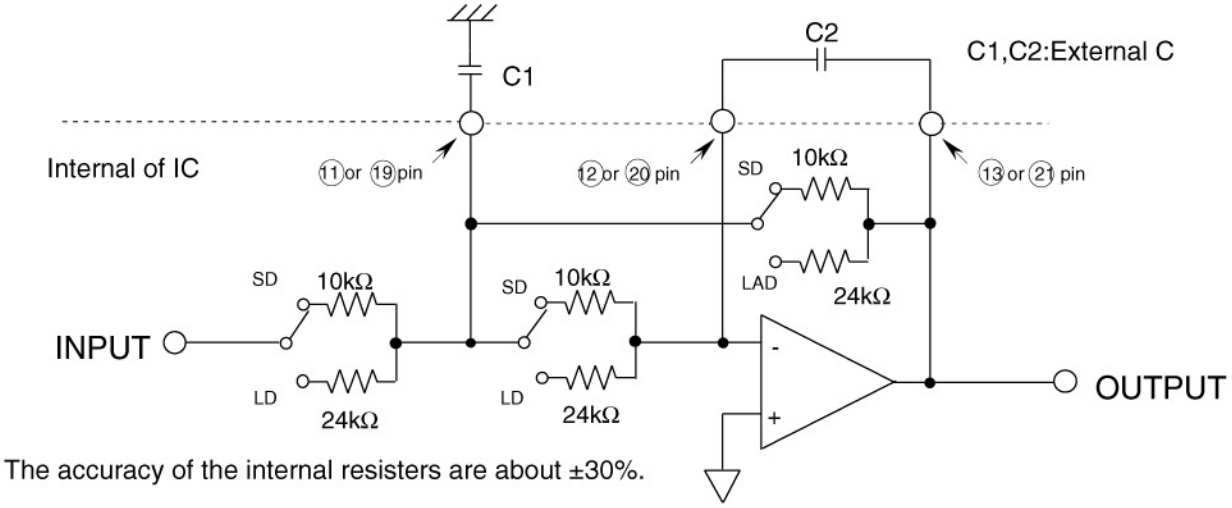


The Mute Time is set by Delay Time as follows.

DELAY TIME	MUTE TIME
	Typ.
9.2 ~ 196.6 ms	410 ms

The LPF Of The Input & Output Stage Of The Digital Delay

The circuit of the LPF is as follows.



The accuracy of the internal resisters are about ±30%.

DELAY TIME	S W
9.2 ~ 49.2 ms	SD (SHORT DELAY)
98.3 ~ 196.6 ms	LD (LONG DELAY)

* The cut off frequency is calculated by the following formulas.

•Surround

$$fc = \frac{1}{2\pi \times 10k\Omega \times \sqrt{C1 \times C2}}$$

•Echo

$$fc = \frac{1}{2\pi \times 24k\Omega \times \sqrt{C1 \times C2}}$$

The quality factor (Q) is as follows under the conditions of both Short Delay & Long Delay.

$$Q = \frac{1}{3}\sqrt{\frac{C1}{C2}}$$

At all the cut off frequency is decided by the external C.
We recommend C1=0.0047μF and C2=0.001μF.
Under this condition, fc and Q are as follows.
Surround fc=7.3kHz Q=0.72
Echo fc=3.1kHz

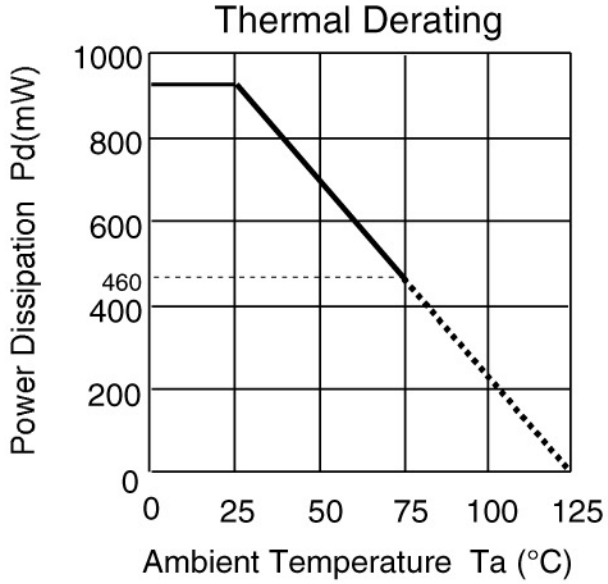
* The Cut Off Frequency of LPF means the cut off frequency of the each stage (A/D & D/A) and doesn't mean the total cut off frequency.

Absolute Maximum Ratings

No.	Parameter	Conditions	Ratings	Units
Vcc	Supply voltage		6.5	V
Icc	Circuit Current		50	mA
Pd	Power dissipation		325	mW
Topr	Operating Temperature		-20 ~ +75	°C
Tstg	Storage temperature		-40 ~ +125	°C

Recommended Operating Conditions

No.	Parameter	conditions	Limits			Units
			Min.	Typ.	Max.	
Vcc	Supply Voltage		4.5	5.0	5.5	V
V_{IH}	High Input Voltage	③④⑤	2.4	—	Vcc	V
V_{IL}	Low Input Voltage	③④⑤	0	—	0.8	V
fck	CLOCK Frequency		3	4	5	MHz



Electrical Characteristics

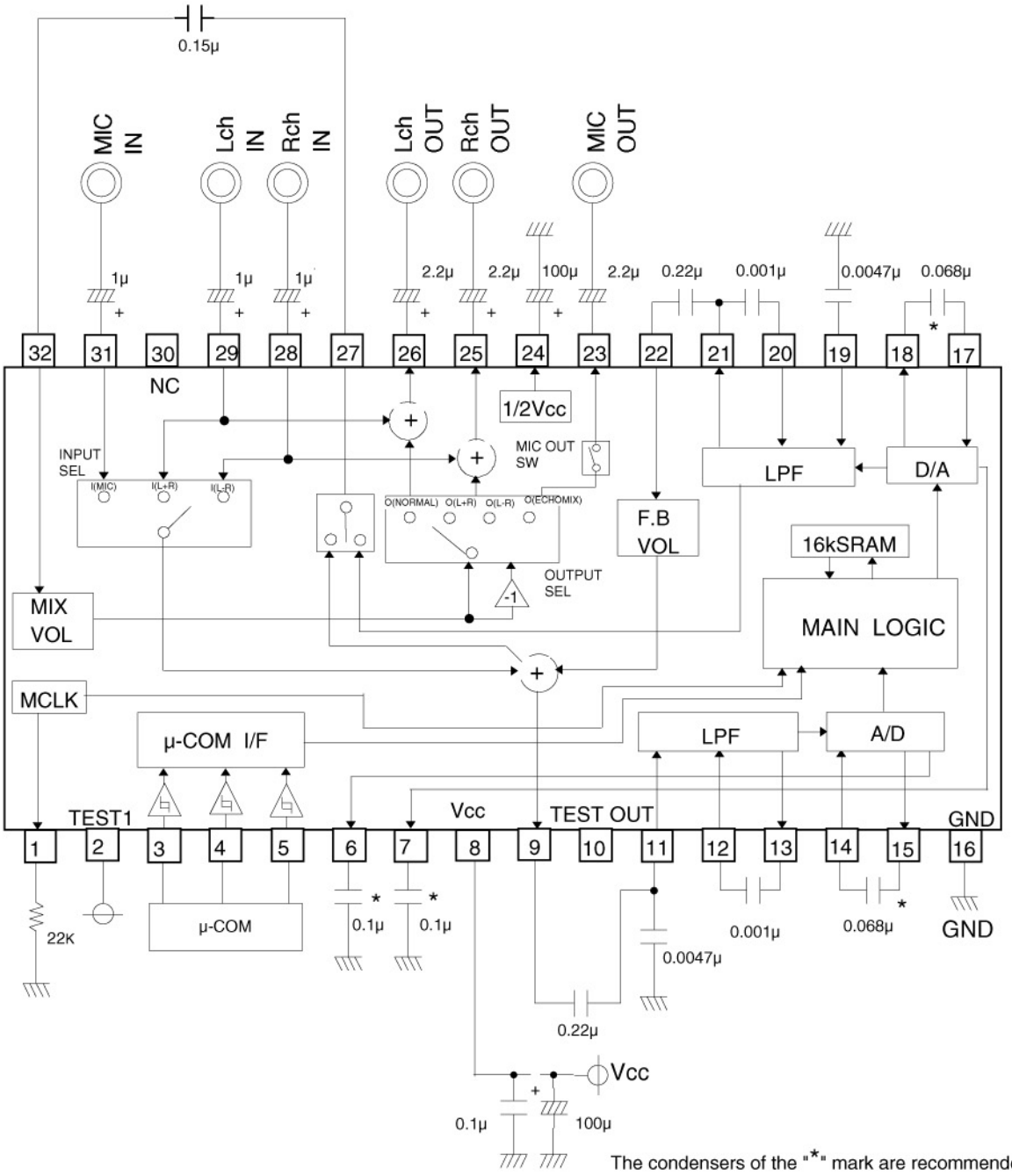
(Ta=25°C,Vcc=5V,f=1kHz,Vi=200mVrms,fck=4MHz Unless Otherwise Noted)

	Symbol	Parameter	Conditions	Limits			Units
				Min.	Typ.	Max.	
Total	Icc	Circuit Current	No Signal	—	32	70	mA
Digital Delay	Td	Delay Time	Refer to Delay time Control	7.8	9.2	10.6	ms
				13.1	15.4	17.7	
				18.3	21.5	24.7	
				24.5	28.7	33.0	
				41.8	49.2	56.6	
				83.6	98.3	113.0	
				125.4	147.5	169.6	
				167.1	196.6	226.1	
	Gv	Voltage Gain		-3	0	3	dB
	THD	Output Distortion	Td = 9.2ms 30kHz LPF	—	0.3	0.6	%
			Td = 15.4ms 30kHz LPF	—	0.3	0.6	
			Td = 21.5ms 30kHz LPF	—	0.3	0.6	
			Td = 28.7ms 30kHz LPF	—	0.5	1.0	
			Td = 49.2ms 30kHz LPF	—	0.7	1.4	
			Td = 98.3ms 30kHz LPF	—	1.0	2.0	
			Td =147.5ms 30kHz LPF	—	1.5	3.0	
			Td = 196.6ms 30kHz LPF	—	2.0	4.0	
	Vo max	Maximum Output Voltage	30kHz LPF THD = 10 %	0.7	1.0	—	Vrms
	No	Output Noise Voltage	Td = 9.2ms Vi = 0mVrms Rg=620Ω JIS-A	—	-92	-80	dBV
			Td = 15.4ms Vi = 0mVrms Rg=620Ω JIS-A	—	-92	-80	
			Td = 21.5ms Vi = 0mVrms Rg=620Ω JIS-A	—	-92	-80	
			Td = 28.7ms Vi = 0mVrms Rg=620Ω JIS-A	—	-90	-75	
			Td = 49.2ms Vi = 0mVrms Rg=620Ω JIS-A	—	-90	-75	
			Td = 98.3ms Vi = 0mVrms Rg=620Ω JIS-A	—	-87	-72	
			Td =147.5ms Vi = 0mVrms Rg=620Ω JIS-A	—	-82	-70	
			Td =196.6ms Vi=0mVrms Rg=620Ω JIS-A	—	-77	-62	

(Ta=25°C,Vcc=5V,f=1kHz,Vi=200mVrms,fck=4MHz Unless Otherwise Noted)

	No.	Parameter	Conditions	Limits			Units
				Min.	Typ.	Max.	
MIX VOLUME FEEDBACK VOLUME	Gv	Voltage Gain	Volume max	FB_{VOL} -6	-3	0	dB
				Mix_{VOL} 0	3	6	
	ATTMAX	Maximum ATT.	Volume min JIS-A	—	-70	-60	dB
	THD	Output Distortion	Volume max 30kHz LPF RL=47kΩ	—	0.15	0.30	%
	Vomax	Maximum Output Voltage	Volume max 30kHz LPF THD=10% RL=47kΩ	1.1	1.4	—	Vrms
	No	Output Noise Voltage	Volume max JIS-A Rg=620Ω	—	-98	-90	dBV
	Voff	Offset Voltage	Mix Volume +3dB-0dB voltage (3dB,0dB)	—	—	±1.6	mV
LINE AMPLIFIER	Gv	Voltage Gain		-3	0	3	dB
	THD	Output Distortion	30kHz LPF	—	0.01	0.03	%
	Vomax	Maximum Output Voltage	30kHz LPF RL = 10kΩ THD=10 %	1.2	1.8	—	Vrms
	No	Output Noise Voltage	DELAYOFF MODE JIS-A Rg=620Ω	—	-98	-90	dBV
	CS	Channel Separation	DMIXSW OFF LchIN RchOUT f=400Hz JIS-A	—	-90	-60	dB
	Zi	Input Impedance		21	30	—	kΩ

The Application Example



The condensers of the "*" mark are recommended less than ±5% relative accuracy.

Units: Resistor:Ω
Condenser:F