

PRELIMINARY
Notice: This is not a final specification.
Some parametric limits are subject to change.

MITSUBISHI SOUND PROCESSORS

M62495AFP

TONE CONTROL/VOLUME CONTROL

DESCRIPTION

The M62495AFP is a sound controller IC developed for mini-stereo set, general audio equipment. By serial data from microcomputer, it can realize sound controller of selector and 2-band tone control easily.

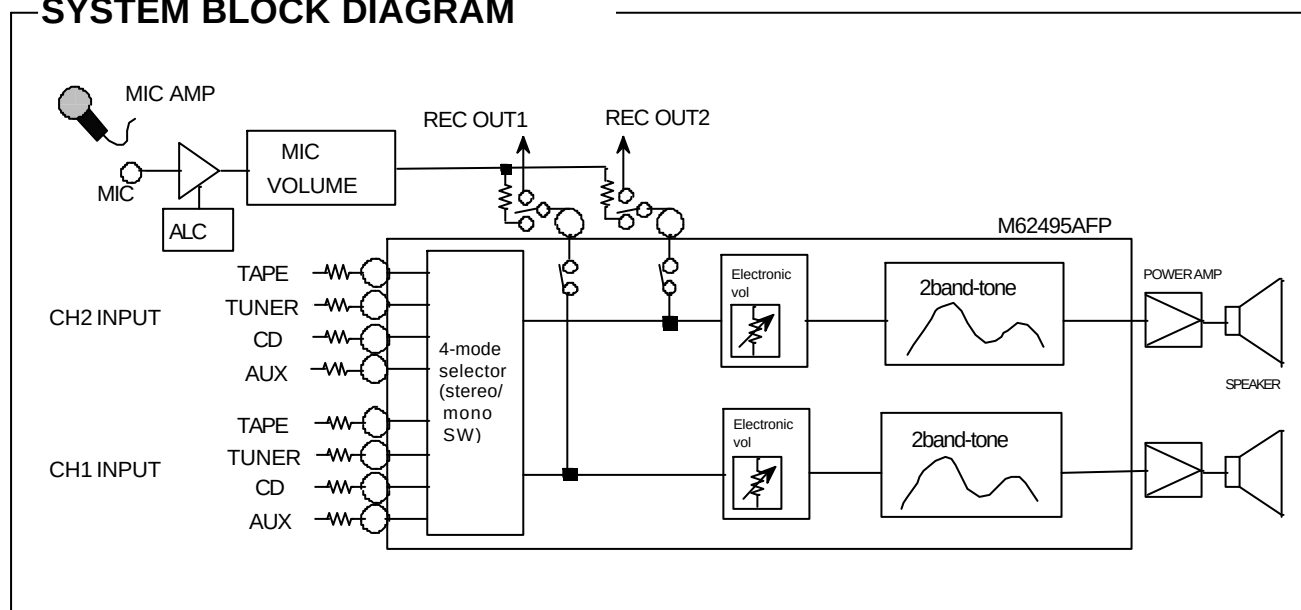
FEATURES

- Input selector (4 mode)
- Volume (0 ~ -84dB, the infinitesimal)
- REC OUT (on/off SW) or MIC mixing
- 20dB amp
- Tone control (Bass/Treble)
- Stereo/mono SW

RECOMMENDED OPERATING CONDITIONS

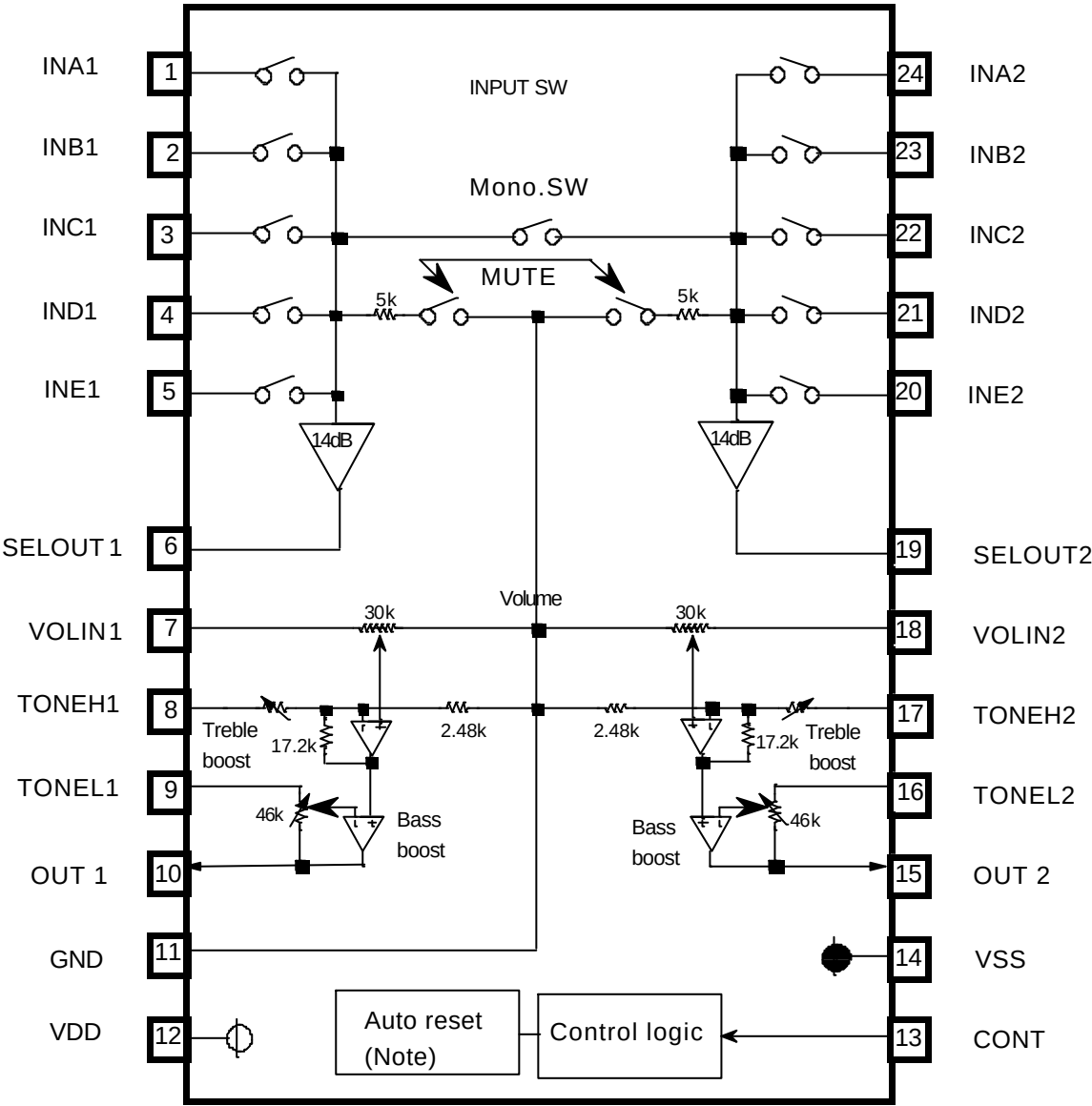
Supply voltage range _____ VDD = +2.25 ~ +2.75V (typ. +2.5V)
VSS = -2.25 ~ -2.75V (typ. -2.5V)

SYSTEM BLOCK DIAGRAM



MITSUBISHI
ELECTRIC

BLOCK DIAGRAM



(Note)When power supply voltage(VDD-VSS) under 3.3V(typ),it's fixed in a state of (2) on the page 6/11.

Units Resistance :ohm
Capacitance: F

PIN DESCRIPTION

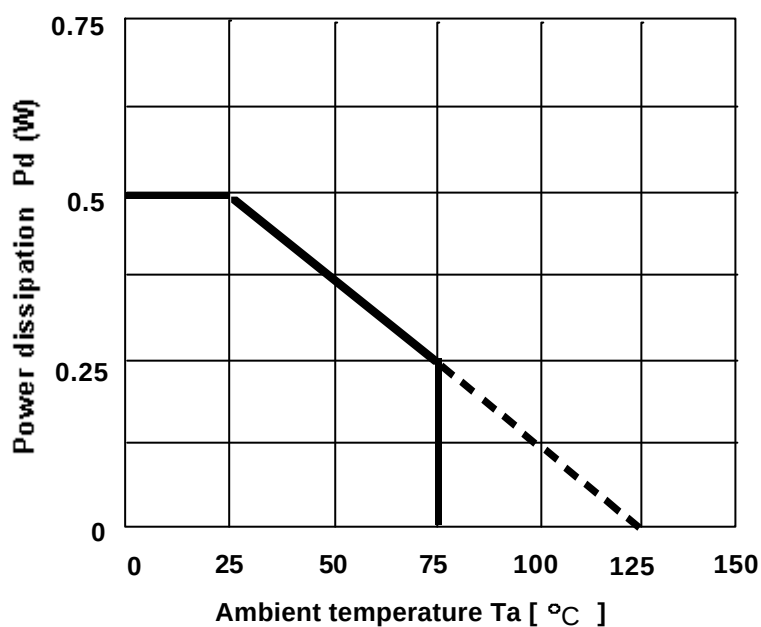
Pin No.	Name	Function
1	IN A1	INPUTs of the channel 1 The switch of INE can be controlled independently. Please set "ALL OFF" mode when the switch of E is only ON.
2	IN B1	
3	IN C1	
4	IN D1	
5	IN E1	
6	SELO1	OUTPUT of selectors 1
7	VOL1	INPUT of volume 1
8	TONEH1	Treble control adjustment of the channel 1
9	TONEL1	Bass control adjustment of the channel 1
10	OUT1	OUTPUT of the channel 1
11	GND	Ground
12	VDD	Supply voltage(+)
13	CONT	Control data input from a microcontroller
14	VSS	Supply voltage(-)
15	OUT2	OUTPUT of the channel 2
16	TONEL2	Bass control adjustment of the channel 2
17	TONEH2	Treble control adjustment of the channel 2
18	VOL2	INPUT of volume 2
19	SELO2	OUTPUT of selectors 2
20	IN E2	The switch of INE can be controlled independently. Please set "ALL OFF" mode when the switch of E is only ON. INPUTs of the channel 2
21	IN D2	
22	IN C2	
23	IN B2	
24	IN A2	

ABSOLUTE MAXIMUM RATINGS

(Ta=25 °C, unless otherwise noted)

Symbol	Parameter	Test conditions	Rating	Unit
VDD-VSS	Supply voltage		6.0	V
K _θ	Thermal derating	Note:1	5	mW/°C
Pd	Power dissipation		500	mW
Topr	Operating temperature		-20 ~ 75	°C
Tstg	Storage temperature		-40 ~ 125	°C

Thermal derating(maximum rating)



Note.1 reference PC Board

Size :70mmX70mm

Thickness:1.6mm

Material :glass epoxy

Copper pattern dimension

Width :0.25mm

Length :25 ~ 30mm/lead

Thickness:18um

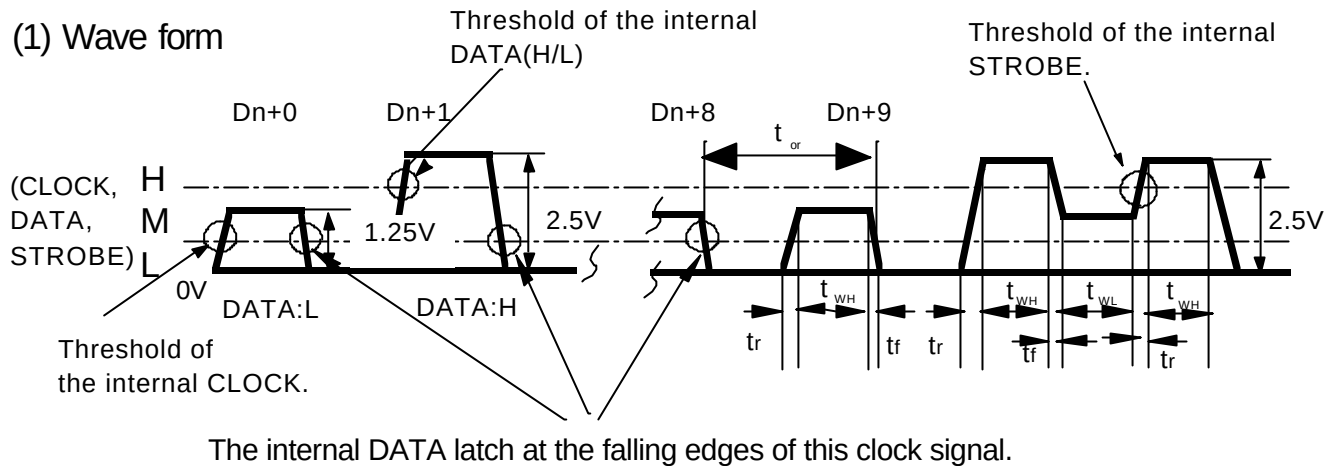
Recommended operating conditions

Symbol	Parameter	Pin No.	Condition	Limits			Unit
				min.	typ.	max.	
VDD	Supply voltage(+)	12		2.25	2.5	2.75	V
VSS	Supply voltage(-)	14		-2.75	-2.5	-2.25	
CONT	Control data input voltage	13		GND	—	VDD	



CONTROL SIGNALS SPECIFICATION

(1) Wave form



(2) Voltage control signal

Digital input signal		Condition	Limits			Unit
			min.	typ.	max.	
L signal	L	VDD=2.5V, VSS=-2.5V	GND	—	0.4	V
M signal	M	VDD=2.5V, VSS=-2.5V	1.0	1.25 (VDD/2)	1.5	
H signal	H	VDD=2.5V, VSS=-2.5V	2.1	—	VDD	

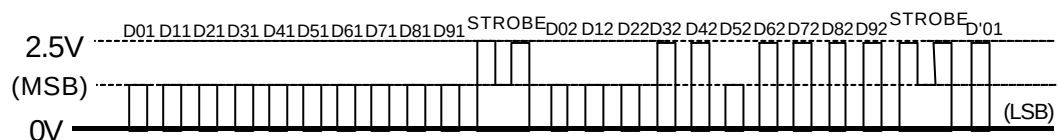
(3) Timing control signal

Symbol	Parameter	Limits			Unit
		min	typ	max	
t_{cr}	Cycle time of digital signal	4	—	—	usec
t_{WH}	Pulse width of digital signal ("H" level)	1.6	—	—	
t_{WL}	Pulse width of digital signal ("L" level)	1.6	—	—	
t_r	Rise time of digital signal	—	—	0.4	
t_f	Fall time of digital signal	—	—	0.4	

(4) Control signal example(Refer to page 6 on the control data)

An example of the mode control

INPUT :INA
 STEREO,VOLUME :0dB
 BASS :18dB
 TREBLE :6dB
 RECONT :ON
 MUTE :OFF



CONTROL DATA FORMAT

*It's necessary to set up the all control data after power on.

(1) INPUT DATA

(MSB) ← Input order

	D01	D11	D21	D31	D41	D51	D61	D71	D81	D91
Slot1	INPUT 0:IN A 1:IN B 2:IN C 3:IN D		D2 to D6:(a)Master volume condition					MUTE ON/OFF 0:OFF 1:ON (INPUT ALL OFF)	CHIP/SLOT SELECT 0:select 1:no select 2:no select 3:no select	
	D02	D12	D22	D32	D42	D52	D62	D72	D82	D92
Slot2	Mode select 0:stereo 1:mono1 only 2:mono2 only 3:mono1+2		Bass(boost) 0:0dB, 1:3dB, 2:6dB, 3:9dB, 4:12dB, 5:15dB, 6:18dB, 7:21dB			Treble(boost) 0:0dB,1:3dB 2:6dB,3:9dB		INE ON/OFF 0:OFF 1:ON	CHIP/SLOT SELECT 0:no select 1:no select 2:no select 3:select	

(a) Master volume

ATT	D21	D31	D41	D51	D61
-0.0dB	0	0	0	0	0
-2.0dB	1	0	0	0	0
-4.0dB	0	1	0	0	0
-6.0dB	1	1	0	0	0
-8.0dB	0	0	1	0	0
-10.0dB	1	0	1	0	0
-12.0dB	0	1	1	0	0
-14.0dB	1	1	1	0	0
-16.0dB	0	0	0	1	0
-18.0dB	1	0	0	1	0
-20.0dB	0	1	0	1	0
-22.0dB	1	1	0	1	0
-24.0dB	0	0	1	1	0
-26.0dB	1	0	1	1	0
-28.0dB	0	1	1	1	0
-30.0dB	1	1	1	1	0
-32.0dB	0	0	0	0	1
-34.0dB	1	0	0	0	1
-36.0dB	0	1	0	0	1
-40.0dB	1	1	0	0	1
-44.0dB	0	0	1	0	1
-48.0dB	1	0	1	0	1
-52.0dB	0	1	1	0	1
-56.0dB	1	1	1	0	1
-60.0dB	0	0	0	1	1
-64.0dB	1	0	0	1	1
-68.0dB	0	1	0	1	1
-72.0dB	1	1	0	1	1
-76.0dB	0	0	1	1	1
-80.0dB	1	0	1	1	1
-84.0dB	0	1	1	1	1
the infinitesimal	1	1	1	1	1

(b) Input select

Input select		D01	D11	D71	D72
IN A	IN E off	0	0	0	0
IN B		1	0		
IN C		0	1		
IN D		1	1		
IN A to D all OFF		*	*	1	1 *1
IN A-D select	IN E on	A: 0	0	0	1 *2
		B: 1	0		
		C: 0	1		
		D: 1	1		

*1) The input impedance is about 5k as input INE.

*2) INE can be controlled independently.
It can be used as Rec output.

(d) Mode control

Mode	D02	D12
stereo	0	0
mono1 only	1	0
mono2 only	0	1
mono1+2	1	1

(e) Treble control

Treble	D52	D62
0dB	0	0
3dB	1	0
6dB	0	1
9dB	1	1

(f) Bass control

Bass	D22	D32	D42
0dB	0	0	0
3dB	1	0	0
6dB	0	1	0
9dB	1	1	0
12dB	0	0	1
15dB	1	0	1
18dB	0	1	1
21dB	1	1	1

(2) Power-on condition

Parameter	Condition
Input select	ALL OFF
Master volume	the infinitesimal
MUTE	ON(Input ALLOFF)
Mode select	stereo
Bass	0dB
Treble	0dB
IN E	ON

(c) Chip/Slot control

Chip/Slot	D81	D91
slot1	0	0
no select	1	0
no select	0	1
slot2	1	1



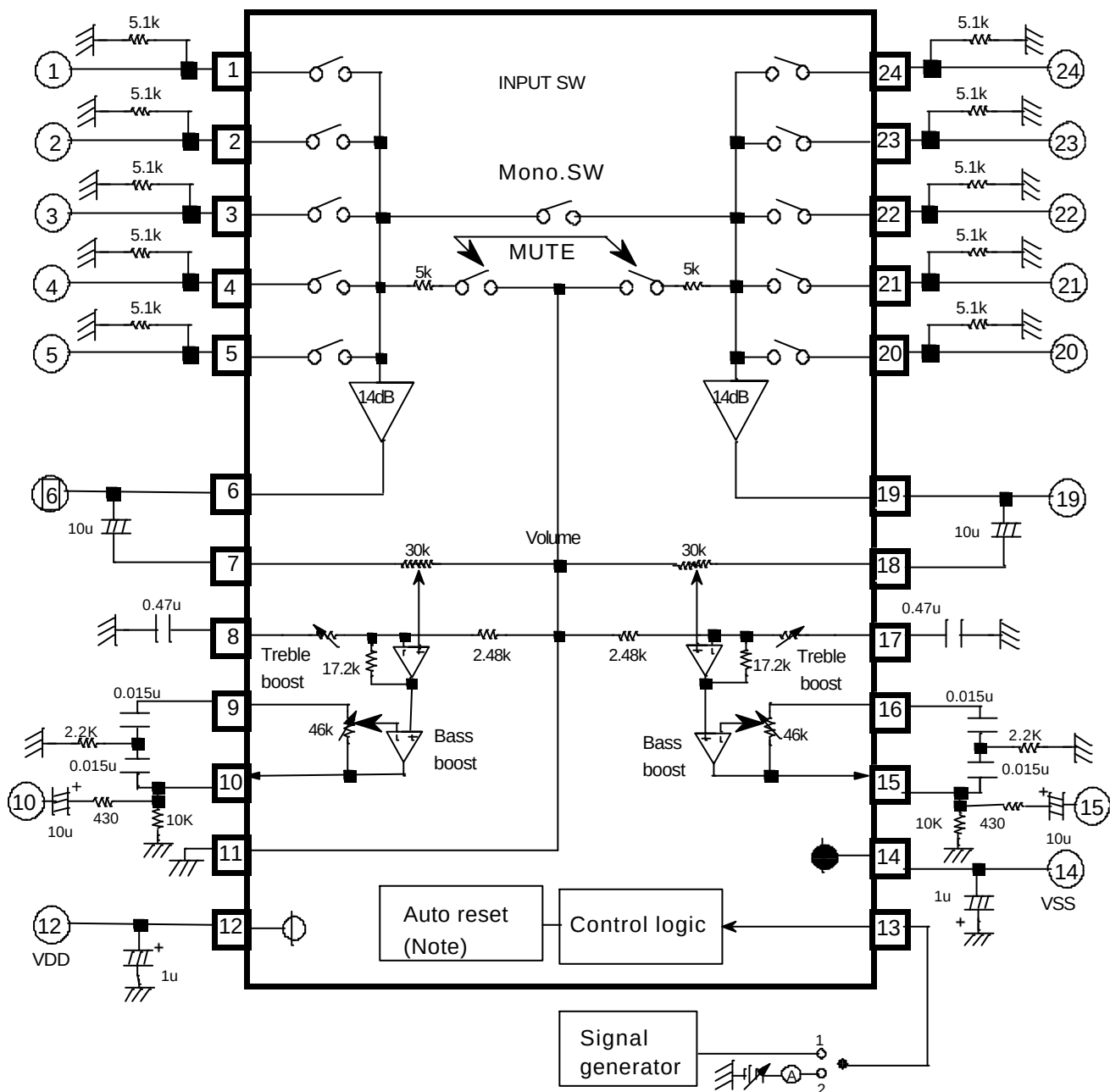
ELECTRICAL CHARACTERISTICS

(VDD=2.5V,VSS=-2.5V,f=1kHz,RL=10K,Vi=20mV(rms),Ta=25°C,unless otherwise noted)

Symbol	Parameter	Condition	Limits			Unit	
			min.	typ.	max.		
IDD	Circuit current of positive power supply	Quiescent	—	14	30	mA	
ISS	Circuit current of negative power supply	Quiescent	—	-14	-30	mA	
Gv1	Voltage gain (selector)	1-5pin - 10pin gain RL=10k 24-20pin - 19pin gain	12	14	16	dB	
Gv2	Voltage gain (output,tone,bass boost)	7pin - 10pin gain RL=10k 18pin - 19pin gain	16	18	20	dB	
Vomax	Maximum output voltage	RL=10k,THD=1%	1.2	1.6	—	Vrms	
THD	Total harmonic distortion	BW=400 ~ 30kHz	—	0.02	0.08	%	
No1	Output noise voltage	JIS-A,Rg=5.1k	—	72	180	uVrms	
No2		JIS-A, 7pin 18pin Rg=0	—	15	38	uVrms	
ATTmax	Maximum attenuation	Output referencelevel(Vo=1Vrms), ATT= the infinitesimal ,JIS-A	—	-95	-90	dB	
GB1	Bass boost	3dB	f=1kHz, Vo=80mVrms	1.5	3	4.5	dB
GB2		6dB		4.5	6	7.5	
GB3		9dB		7.5	9	10.5	
GB4		12dB		10.5	12	13.5	
GB5		15dB		13.5	15	16.5	
GB6		18dB		16.5	18	19.5	
GB7		21dB		19.5	21	22.5	
GT1	Treble boost	3dB	f=1kHz, Vo=80mVrms	1.5	3	4.5	
GT2		6dB		4.5	6	7.5	
GT3		9dB		7.5	9	10.5	



TEST CIRCUIT

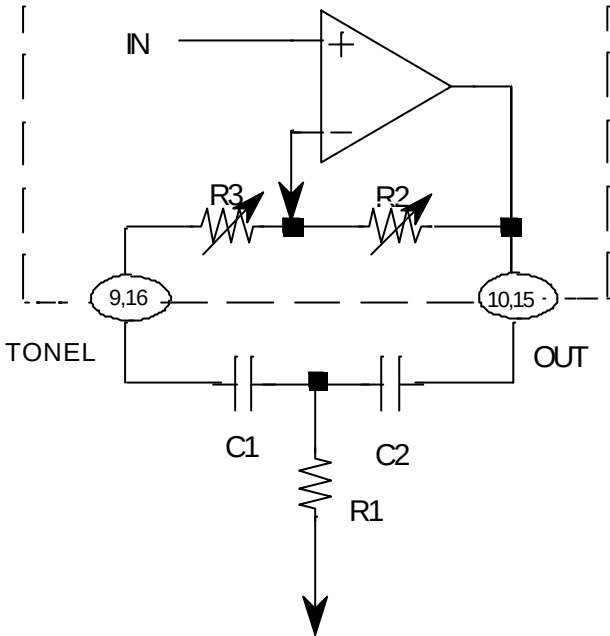


(Note) When power supply voltage (VDD-VSS) is under 3.3V (typ), it's fixed in a state of (2) on the page 6/11.

Units Resistance :ohm
Capacitance: F

FUNCTION DESCRIPTION

(1) Equivalent circuit of the bass boost



$$F_0 = \frac{1}{2\pi \sqrt{R_1(R_2+R_3)C_1C_2}} \quad (\text{Hz})$$

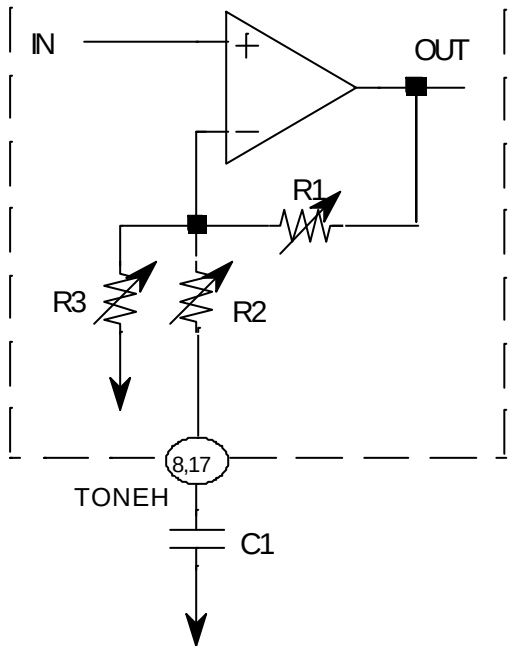
$$Q = \frac{1}{C_1+C_2} \sqrt{\frac{C_1C_2R_2}{R_1}}$$

$$G_v = 20 \log \left(\frac{R_2+R_3}{R_1} + 2 \right) \quad (\text{dB})$$

(C1=C2)

Bass boost		3dB	6dB	9dB	12dB	15dB	18dB	21dB
Resistor	R2	15.4	25.7	32.9	38.7	41.6	44.2	46
	R3	30.6	20.3	13.1	7.3	4.4	1.8	0

(2) Equivalent circuit of the treble boost



$$F_c = \frac{1}{2\pi R_2 C_1} \quad (\text{Hz})$$

$$G_v = 20 \log \left(\frac{R_1 + \{(R_2+Z_c)/R_3\}}{(R_2+Z_c)/R_3} \right) \quad (\text{dB})$$

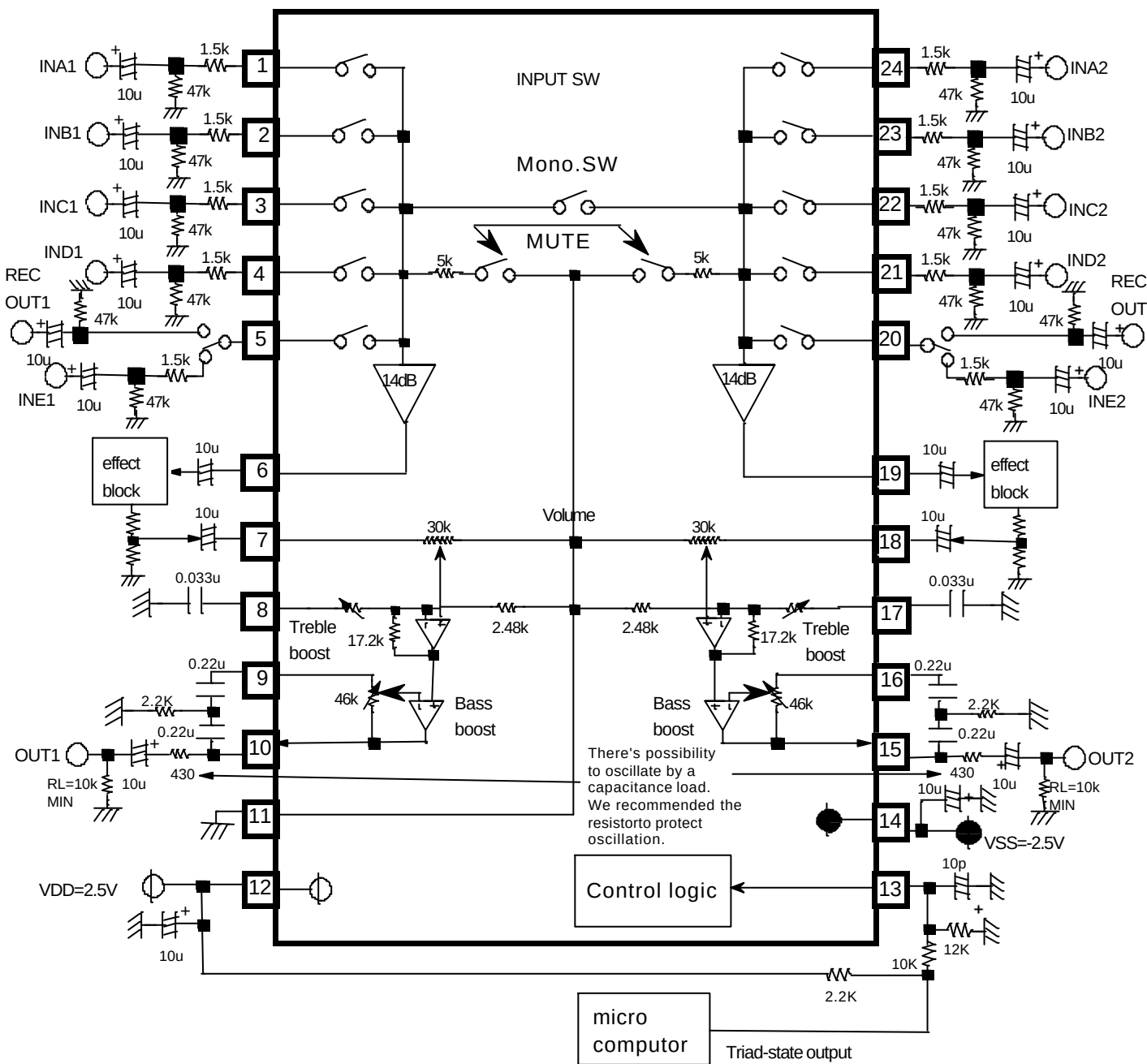
$$Z_c = \frac{1}{j\omega C_1} \quad (\text{ohm})$$

R2 (typical)

Treble boost		3dB	6dB	9dB
R2 (k)		5.3	2.2	1.2



APPLICATION EXAMPLE



(Note) When power supply voltage (VDD-VSS) under 3.3V (typ), it's fixed in a state of (2) on the page 6/11.

Units Resistance : Ω hm
Capacitance: F

OUTLINE

