M62495AFP

TONE CONTROL/VOLUME CONTROL

REJ03F0007-0100Z
Rev.1.00
Jul.24.2003

Description

The M62495AFP is the sound controller IC developed mini-stereo, 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 to –84 dB, the infinitesimal)
- REC OUT (on/off SW) or MIC mixing
- 20 dB amp
- Tone control (Bass/Treble)
- Stereo/mono. SW

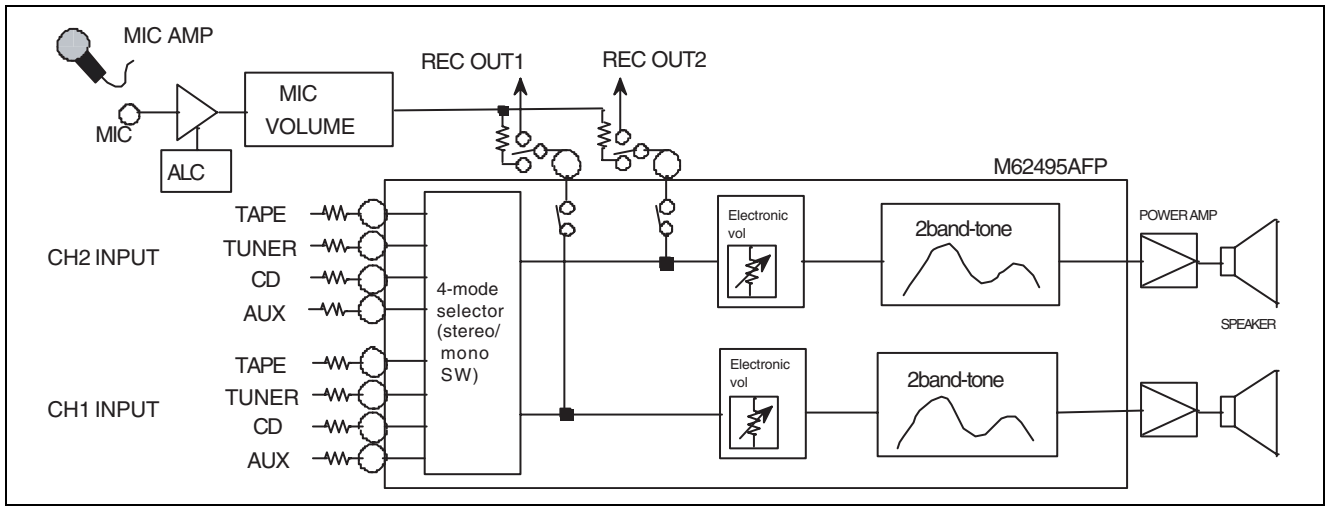
Recommended Operating Conditions

- Supply voltage range :VDD = +2.25 to +2.75 V (typ. +2.5 V)
  :VSS = –2.25 to –2.75 V (typ. –2.5 V)

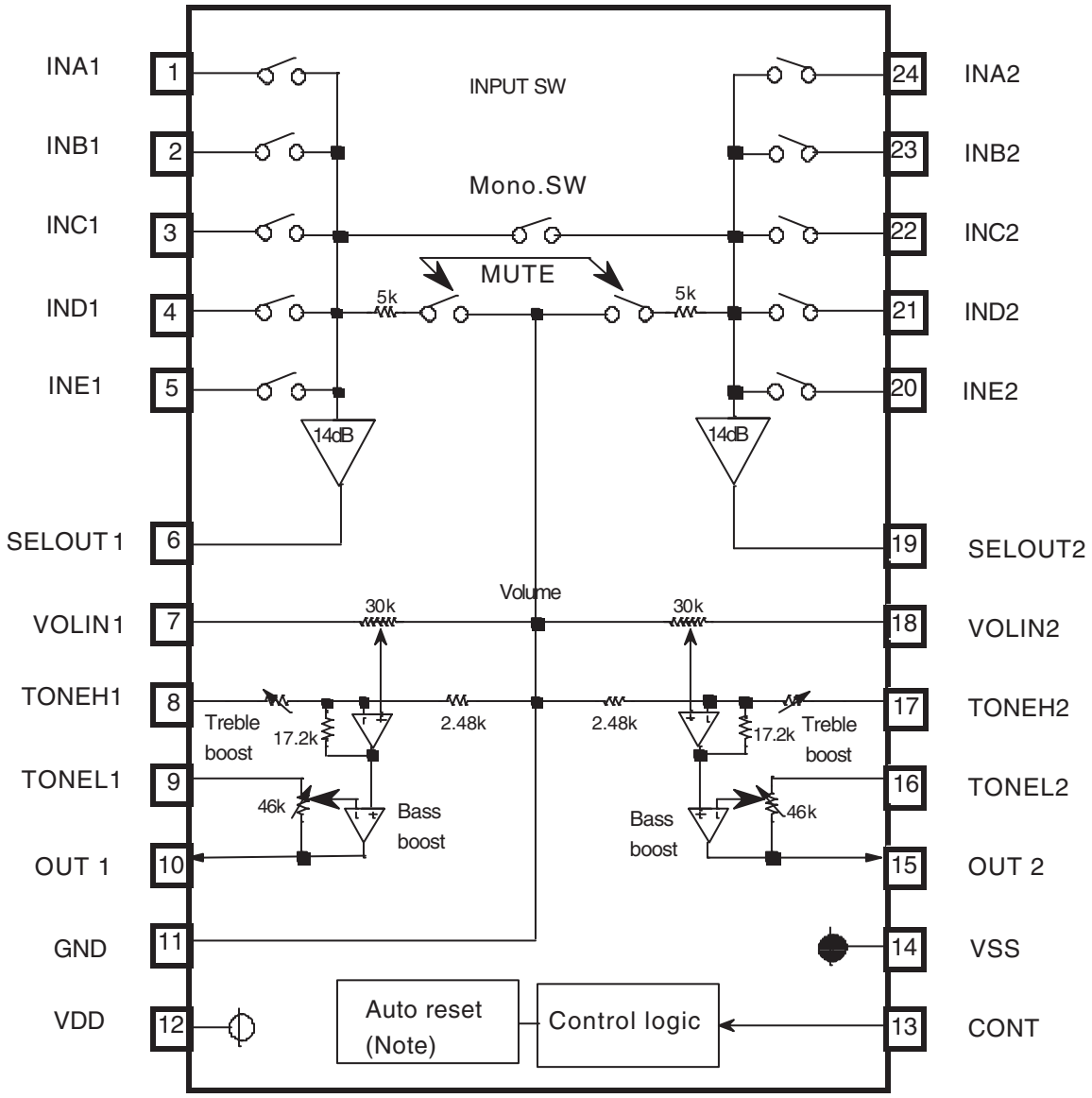
Application

- Mini-stereo Set, Audio Equipment

System Block Diagram



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

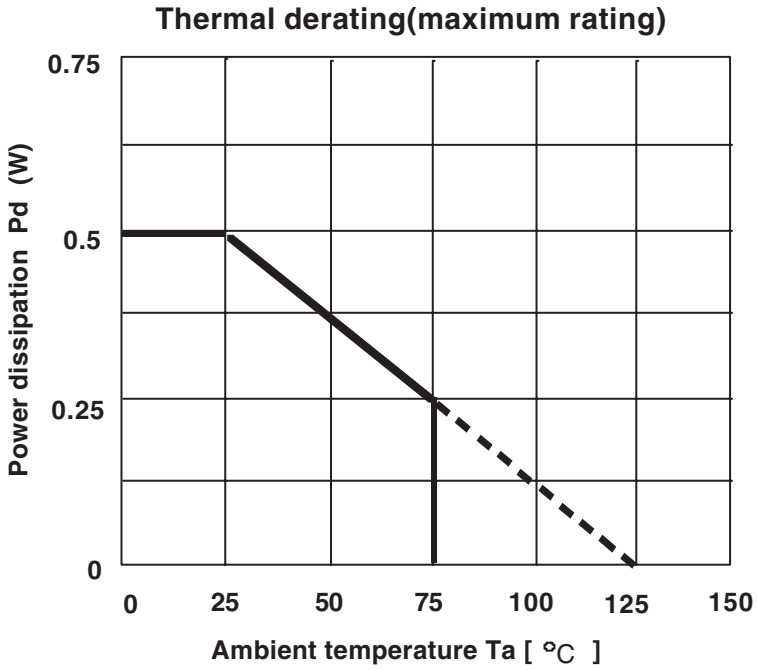
Pin Description

Pin No.	Name	Function
1	IN A1	INPUTs of the channel 1
2	IN B1	
3	IN C1	
4	IN D1	The switch of INE can be controlled independently.
5	IN E1	Please set “ALL OFF” mode when the switch of E is only ON.
6	SELO1	OUTPUT of selectors 1
7	VOLI1	INPUT of volume1
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	VOLI2	INPUT of volume2
19	SELO2	OUTPUT of selectors 2
20	IN E2	The switch of INE can be controlled independently.
21	IN D2	Please set “ALL OFF” mode when the switch of E is only ON.
22	IN C2	
23	IN B2	INPUTs of the channel 2
24	IN A2	

Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

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



Note.1 reference PC Board

Size :70mm × 70mm
Thickness:1.6mm
Material :glass epoxy

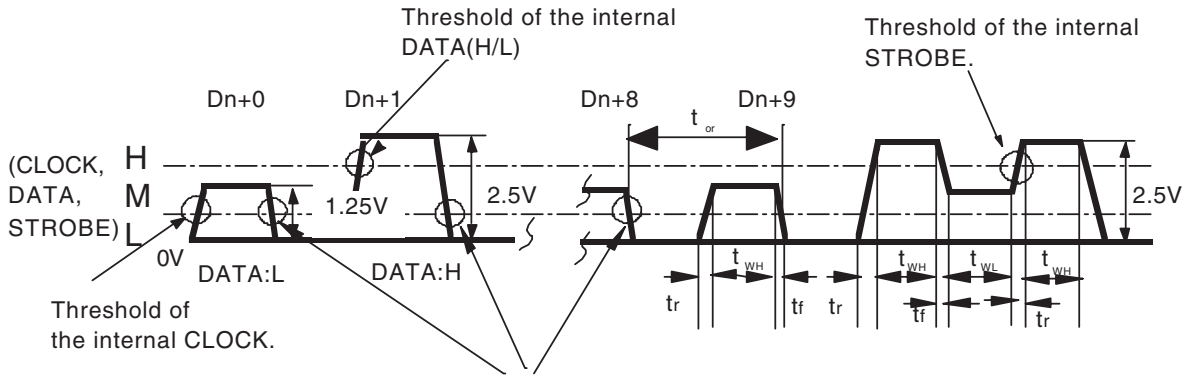
Copper pattern dimension
Width :0.25mm
Length :25 to 30mm/lead
Thickness:18µm

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 date input voltage	13		GND	—	VDD	

Control Signals Specification

(1) Wave form



The internal DATA latch at the falling edges of this clock signal.

(2) Voltage control signal

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

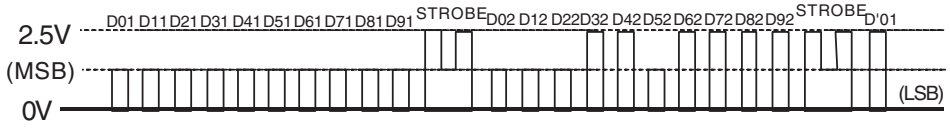
(3) Timing control signal

Symbol	Parameter	Limits			Unit
		min	typ	max	
t_{cr}	Cycle time of digital signal	8	—	—	µsec
t_{WH}	Pulse width of digital signal (“H”level)	3.6	—	—	
t_{WLC}	Pulse width of digital signal (“L”level)	3.6	—	—	
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	
Slot2	D02	D12	D22	D32	D42	D52	D62	D72	D82	D92
	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	IN E on	*	*	1	1 *1
IN A-D select		A: 0	0	0	*2 1
		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

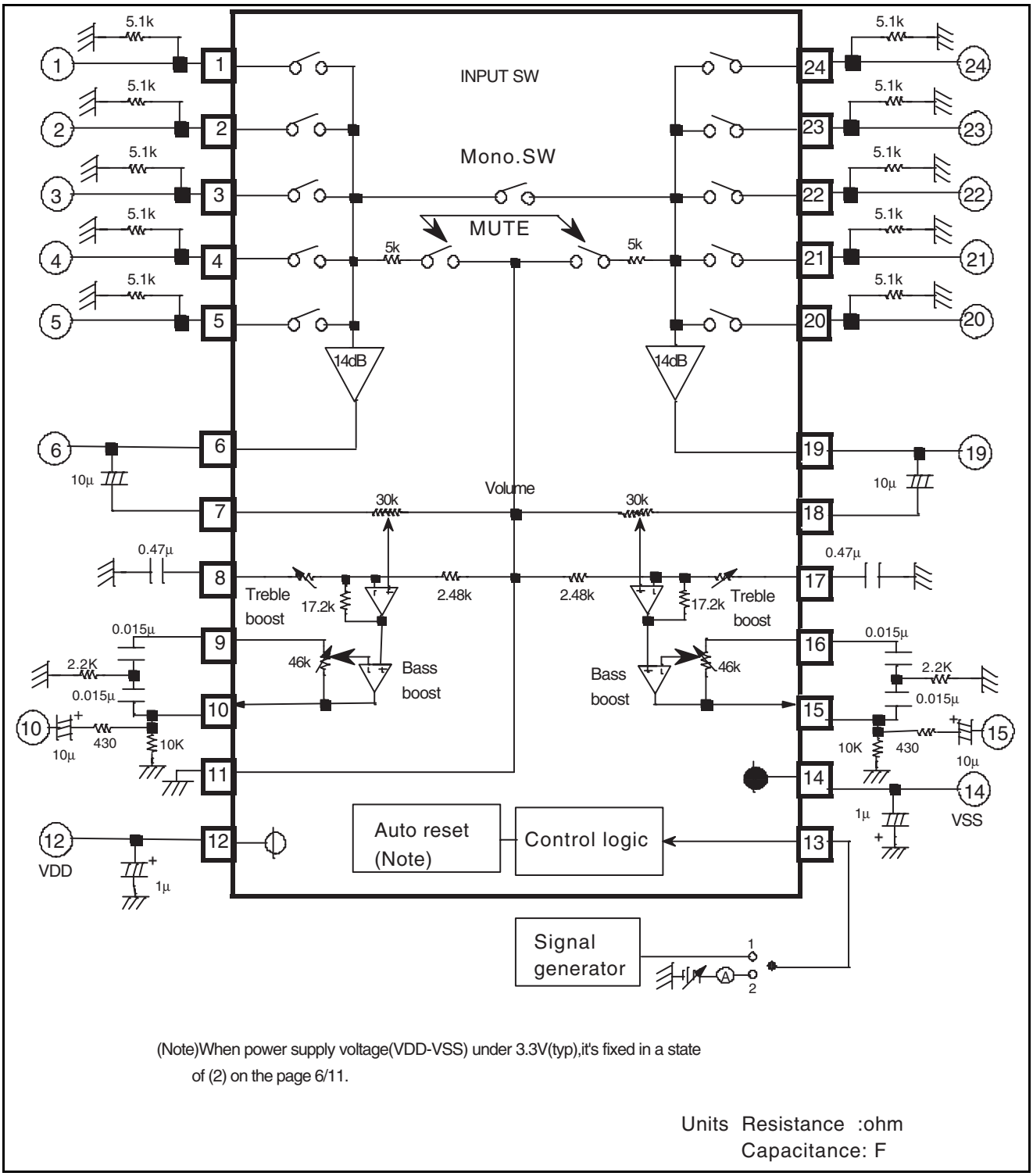
Chip/Slot	D81	D91
slot1	0	0
no select	1	0
no select	0	1
slot2	1	1

Electrical Characteristics

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

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

Test Circuit

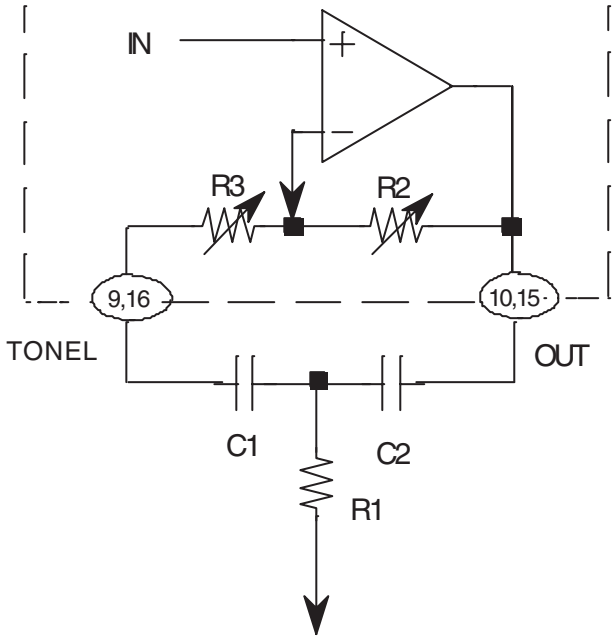


(Note)When power supply voltage(VDD-VSS) under 3.3V(typ),it's fixed in a state of (2) on the page 6/11.

Units Resistance :ohm
Capacitance: F

Function Description

(1) Equivalent circuit of the bass boost



$$Fo = \frac{1}{2\pi\sqrt{R1(R2+R3)C1C2}} \quad (Hz)$$

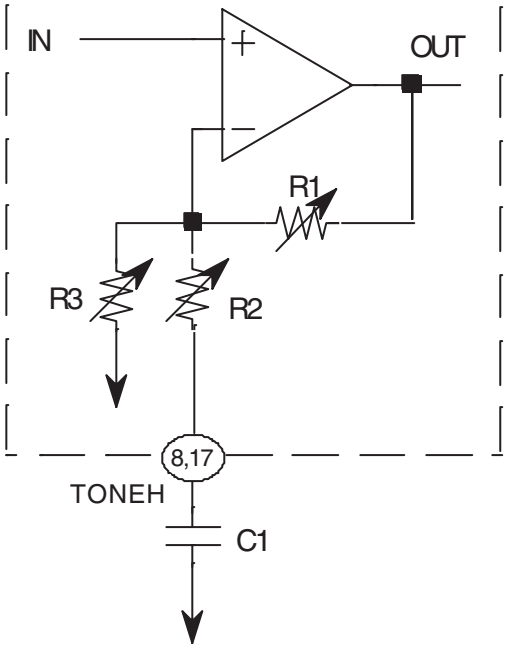
$$Q \fallingdotseq \frac{1}{C1+C2}\sqrt{\frac{C1C2R2}{R1}}$$

$$(C1 = C2) \quad Gv = 20\log \frac{\frac{R2+R3}{R1}+2}{\frac{R3}{R1}+2} \quad (dB)$$

R2,R3 (typical)

Bass boost		3dB	6dB	9dB	12dB	15dB	18dB	21dB
Resistor (k)	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



$$Fc \fallingdotseq \frac{1}{2\pi \bullet R2 \bullet C1} \quad (Hz)$$

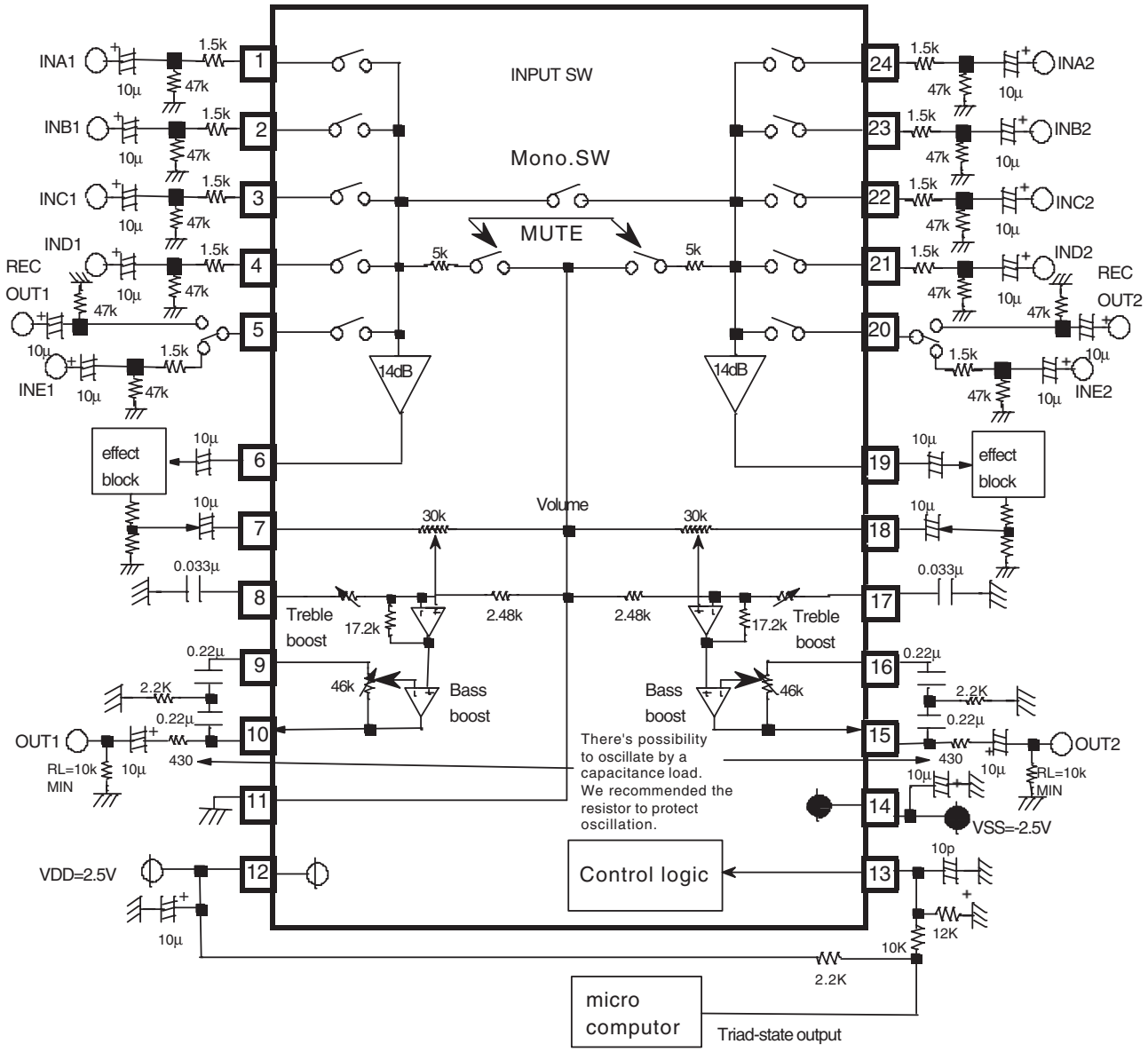
$$Gv = 20\log \frac{R1+\{(R2+Zc)//R3\}}{(R2+Zc)\ //\ R3} \quad (dB)$$

$$Zc = \frac{1}{j\omega C1} \quad (ohm)$$

R2 (typical)

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

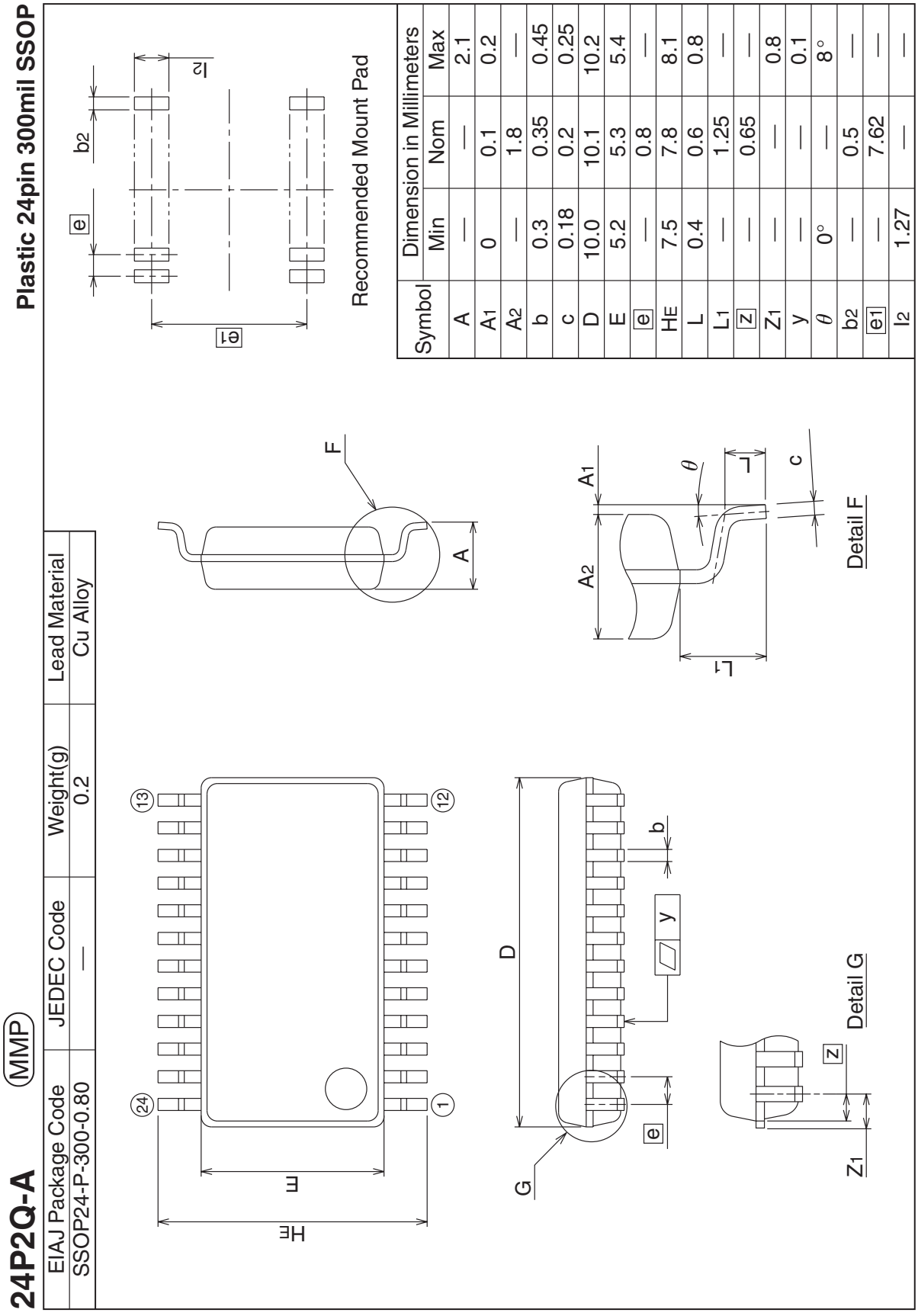
Application Example



(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 :ohm
Capacitance: F

Package Dimensions



Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	2.1
A1	0	0.1	0.2
A2	—	1.8	—
b	0.3	0.35	0.45
c	0.18	0.2	0.25
D	10.0	10.1	10.2
E	5.2	5.3	5.4
e	—	0.8	—
HE	7.5	7.8	8.1
L	0.4	0.6	0.8
L1	—	1.25	—
Z	—	0.65	—
Z1	—	—	0.8
y	—	—	0.1
θ	0°	—	8°
b2	—	0.5	—
e1	—	7.62	—
l2	1.27	—	—

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