M61518FP

Audio Signal Processor with Rec/Play Back Amplifier

REJ03F0205-0201
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Description

The M61518FP is an audio signal processor suitable for the mini component system with the cassette tape.

The circuit includes Selector for selecting input source, REC/Play back amp., Tone control and 2ch Electronic Volume.

Features

- Input selector
  Built-in 3 Input selector + Tape Input
- Play Back Amp.
  Built-in Low noise P. B Amp
- REC Amp.
  Built-in Low noise REC Amp (Mute function built-in)
- Tone Control
  Bass/Mid/Treble –10 to +10 dB/2 dB step
- Electronic Volume with high voltage transistor
  0 to –86 dB, –∞ dB
  (Input Vol: 0 to –70 dB, –∞ dB)
  (Output Vol: +18 to +2 dB)

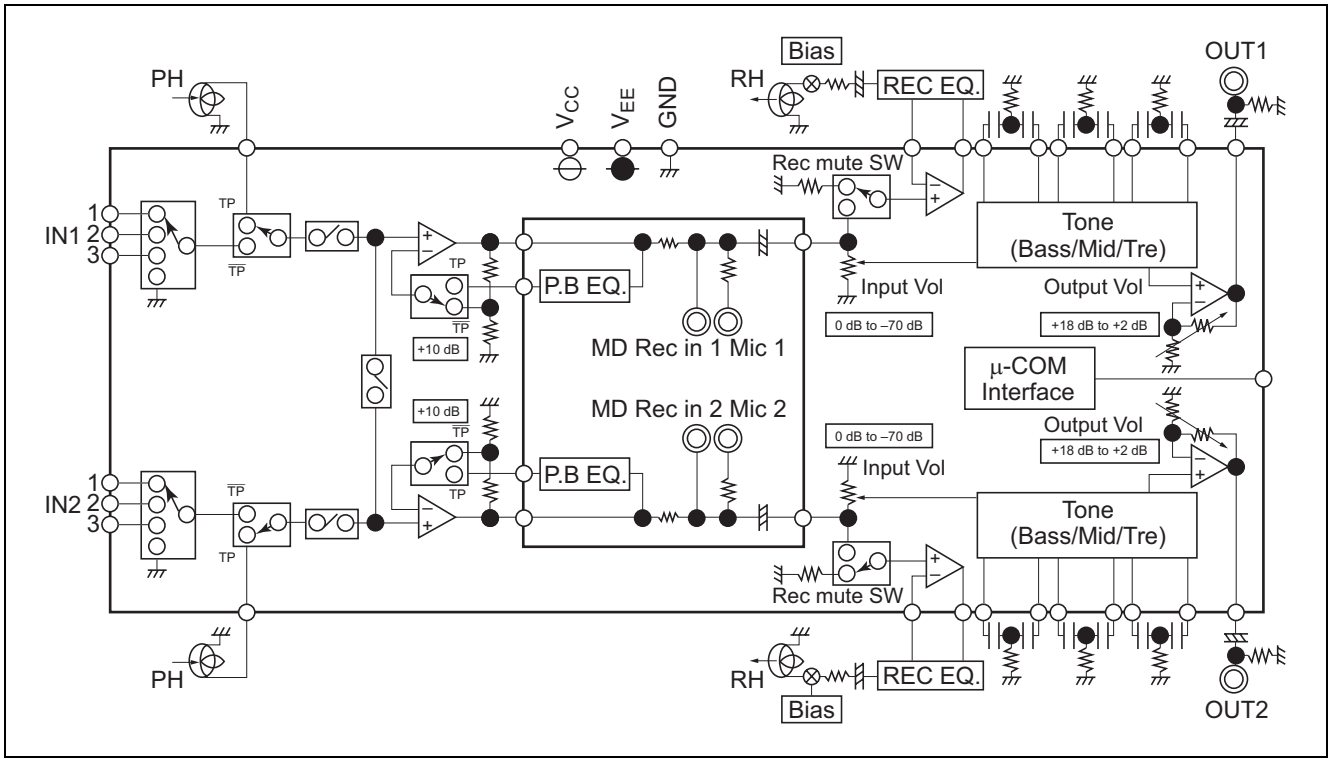
Application

Mini Stereo, Receiver, etc.

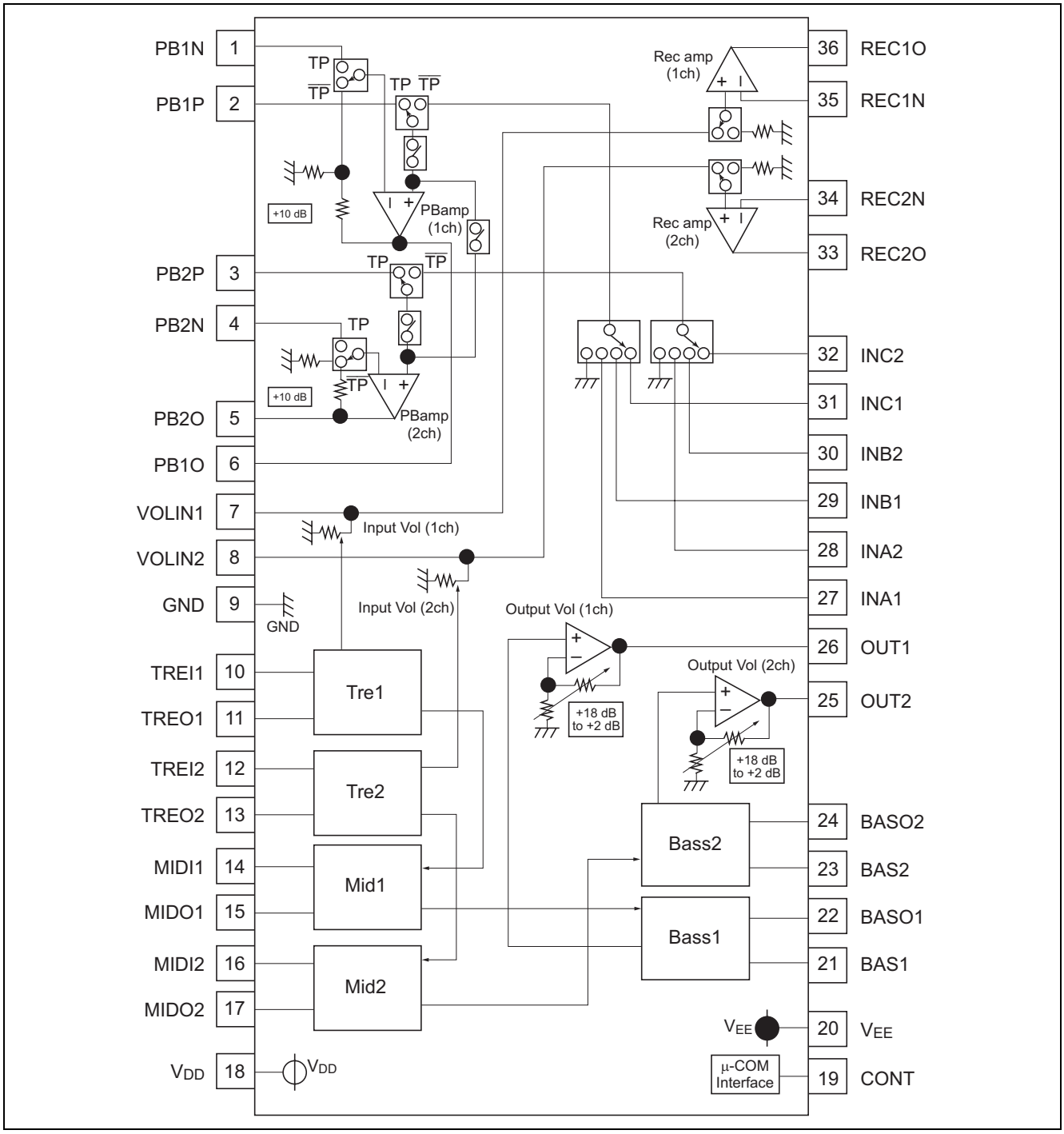
Recommended Operating Conditions

Recommended supply voltage: V_{CC} = 4.5 V (Typ), V_{EE} = –4.5 V (Typ)

System Block Diagram



Block Diagram And Pin Configuration (Top View)



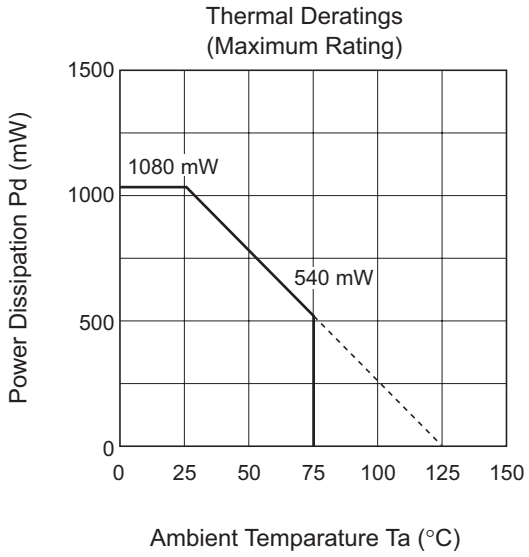
Pin Description

Pin No.	Name	Function
1, 4	PB1N, PB2N	Input pin of PB amp (Negative)
2, 3	PB1P, PB2P	Input pin of PB amp (Positive)
5, 6	PB1O, PB2O	Output pin of PB amp
7, 8	VOLIN1, VOLIN2	Input pin of volume
9	GND	GND pin
10, 11, 12, 13	TREI, TREO	Frequency setting pin in the tone control (Tre)
14, 15, 16, 17	MIDI, MIDO	Frequency setting pin in the tone control (Mid)
18	VDD	Positive power supply
19	CONT	Microcomputer data Input pin
20	VEE	Negative supply pin
21, 22, 23, 24	BASI, BASO	Frequency setting pin in the tone control (Bass)
25, 26	OUT1, OUT2	Output pin
27, 28	INA1, INA2	Selector A Input pin
29, 30	INB1, INB2	Selector B Input pin
31, 32	INC1, INC2	Selector C Input pin
33, 34	REC1O, REC2O	Output pin of REC amp
35, 36	REC1N, REC2N	Input pin of REC amp

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Condition
Plus and minus power supply difference	VDD-VEE	+10.5	V	
Power dissipation	Pd	1080	mW	Ta ≤ 25°C
Thermal derating	Kθ	10.8	mW/°C	Ta > 25°C* Circuit board
Operating temperature	Topr	–20 to +75	°C	
Storage temperature	Tstg	–40 to +125	°C	

Note: Circuit board
Print circuit board size: 70 mm × 70 mm
Print circuit board thickness: 1.6 mm
Print circuit board quality of the material: Glass epoxy
Single Cu pattern
Thickness of Cu: 18 μm
Pattern size of Cu: 0.25 mm (Width) × 25 mm (Length) / Lead



Recommended Operating Conditions

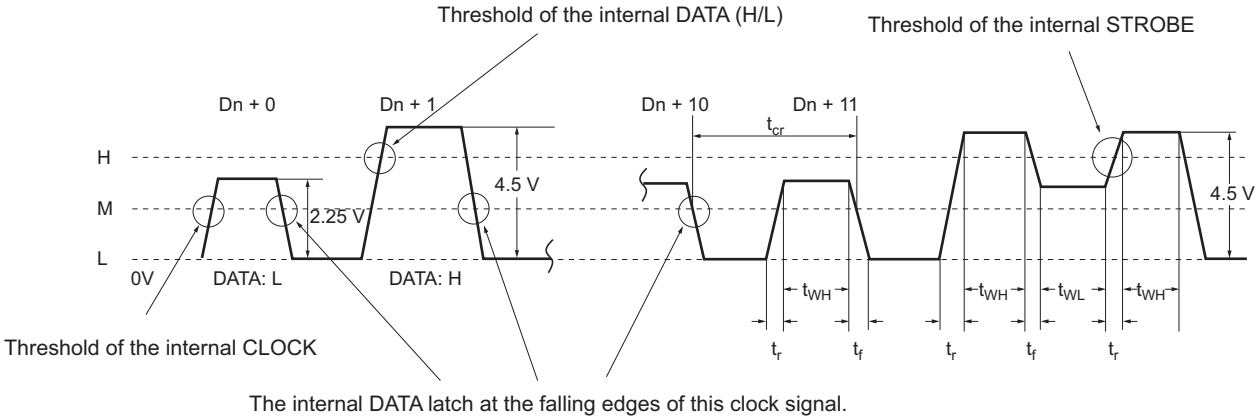
(Ta = 25°C unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit
Positive supply voltage	VDD	4.25	4.5	4.75	V
Negative supply voltage	VEE	–4.75	–4.5	–4.25	V

Serial Data Control Format

(1) Signal wave shape

(CLOCK, DATA, STROBE)



(2) Control signal voltage regulation

Digital signal		Condition	Limits			Unit
			Min	Typ	Max	
L signal	L	VDD = 4.5 V, VEE = –4.5 V	GND	—	0.2 × VDD	V
M signal	M	VDD = 4.5 V, VEE = –4.5 V	0.3 × VDD	0.5 × VDD	0.7 × VDD	
H signal	H	VDD = 4.5 V, VEE = –4.5 V	0.8 × VDD	—	VDD	

(3) Control signal timing regulation

Item	Symbol	Limits			Unit
		Min	Typ	Max	
Cycle time of the digital signal	t_{cr}	4	—	—	µs
Pulse width of the digital signal ("H" level)	t_{WH}	1.6	—	—	
Pulse width of the digital signal ("L" level)	t_{WL}	1.6	—	—	
Rising time of digital signal	t_r	—	—	0.4	
Falling time of digital signal	t_f	—	—	0.4	

Data Control Specification

(1) Data input address

Notes: 1. The interval of data transmission from the micro controller is over 0.1 s.
This is waiting time for soft-switching to reduce the shock noise.
2. Input only the control data at slot0 (slot1).

(MSB) ← Input direction

D140	D130	D120	D110	D100	D90	D80	D70	D60	D50	D40	D30	D20	D10	D00	
Selector			Karaoke		Input volume					Output volume				0	slot0

D141	D131	D121	D111	D101	D91	D81	D71	D61	D51	D41	D31	D21	D11	D01	
Tone control Bass				Tone control Mid				Tone control Treble				REC Mute	0	1	slot1

Initial setting

Output Volume Control

	D40	D30	D20	D10
+18 dB	0	0	0	0
+16 dB	0	0	0	1
+14 dB	0	0	1	0
+12 dB	0	0	1	1
+10 dB	0	1	0	0
+8 dB	0	1	0	1
+6 dB	0	1	1	0
+4 dB	0	1	1	1
+2 dB	1	0	0	0

Note: Do not input other date than the above.

Input Volume Control

	D90	D80	D70	D60	D50
0 dB	0	0	0	0	0
–2 dB	0	0	0	0	1
–4 dB	0	0	0	1	0
–6 dB	0	0	0	1	1
–8 dB	0	0	1	0	0
–10 dB	0	0	1	0	1
–12 dB	0	0	1	1	0
–14 dB	0	0	1	1	1
–16 dB	0	1	0	0	0
–18 dB	0	1	0	0	1
–20 dB	0	1	0	1	0
–22 dB	0	1	0	1	1
–26 dB	0	1	1	0	0
–30 dB	0	1	1	0	1
–34 dB	0	1	1	1	0
–38 dB	0	1	1	1	1
–42 dB	1	0	0	0	0
–46 dB	1	0	0	0	1
–50 dB	1	0	0	1	0
–54 dB	1	0	0	1	1
–58 dB	1	0	1	0	0
–62 dB	1	0	1	0	1
–66 dB	1	0	1	1	0
–70 dB	1	0	1	1	1
–∞ dB	1	1	1	1	1

Note: Do not input other date than the above.

Karaoke Control

	D110	D100
Stereo	0	0
Mono 1	0	1
Mono 2	1	0
Mono 1 + 2	1	1

Selector Control

Selector	D140	D130	D120
TP	0	0	0
IN A	0	0	1
IN C	0	1	0
IN B	0	1	1
IN mute	1	1	1
Supply OFF	1	1	0

Note: Do not input other date than the above.

REC Mete Control

REC MUTE	D21
OFF	0
ON	1

Tone Control

Bass	D141	D131	D121	D111
Mid	D101	D91	D81	D71
Treble	D61	D51	D41	D31
+10 dB	0	1	0	1
+8 dB	0	1	0	0
+6 dB	0	0	1	1
+4 dB	0	0	1	0
+2 dB	0	0	0	1
0 dB	0	0	0	0
–2 dB	1	0	0	1
–4 dB	1	0	1	0
–6 dB	1	0	1	1
–8 dB	1	1	0	0
–10 dB	1	1	0	1

Note: Do not input other date than the above.

Power Off Setting Data

It's necessary to set up the Power off setting data when power off before 0.1 s.

Power off setting data reduce the power off shock noise.

Power off setting data

(MSB) ← Input direction

D140	D130	D120	D110	D100	D90	D80	D70	D60	D50	D40	D30	D20	D10	D00	
1	1	0	*		1	1	1	1	1	*				0	slot0
Selector			Karaoke		Input volume (–∞ dB)					Output volume					

Note: Karaoke is same data before the Power off setting.
Output volume is same data before the Power off setting.

Selector Control

Selector	D140	D130	D120
TP	0	0	0
IN A	0	0	1
IN C	0	1	0
IN B	0	1	1
IN mute	1	1	1
Supply off	1	1	0

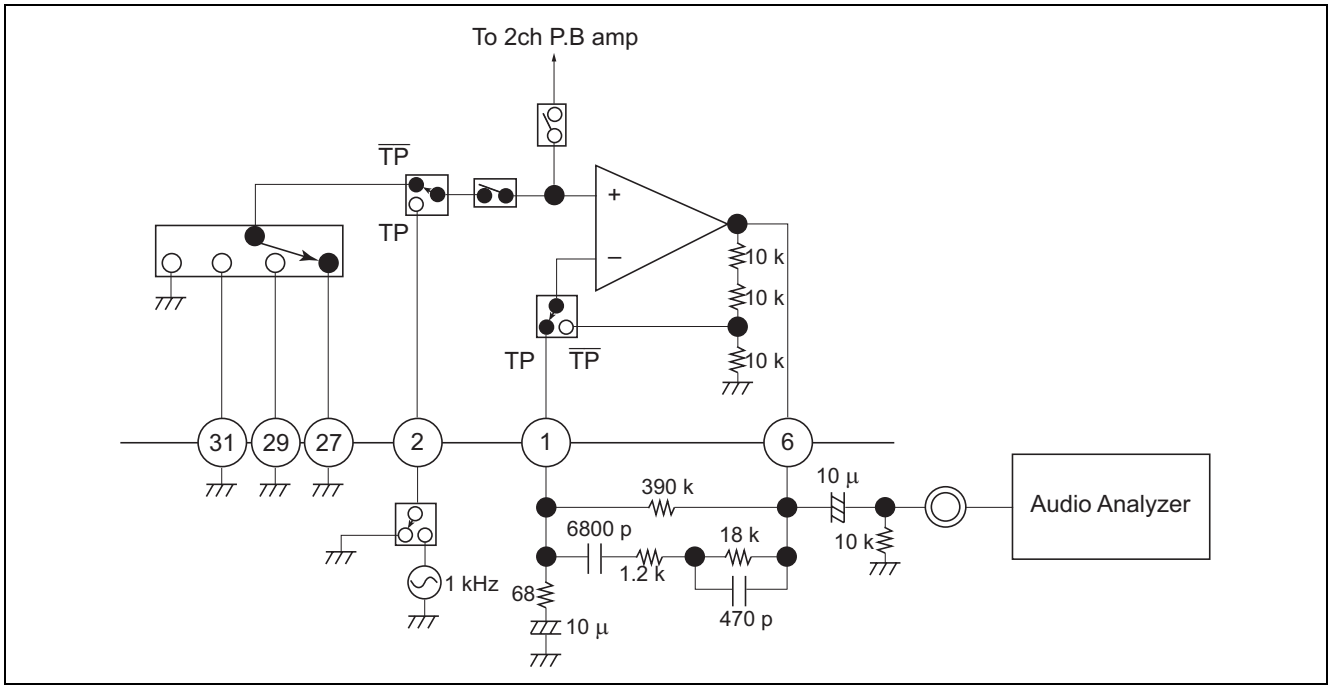
Note: Do not input other date than the above.

Electrical Characteristics

Ta = 25°C, VDD = 4.5 V, VEE = –4.5 V, f = 1 kHz, Vi = 100 mVrms, Input Vol = 0 dB, Output Vol = 18 dB, Bass = 0 dB, Mid = 0 dB, Treble = 0 dB, RL = 10 kΩ unless otherwise noted.

Item	Symbol	Limits			Unit	Condition
		Min	Typ	Max		
Positive power current	IDD	—	10	20	mA	No Input signal
Negative power current	IEE	–20	–10	—	mA	No Input signal
Pass gain	Gv1	8	10	12	dB	INA/B/C (Pin 27 to 32) → PBP (Pin 5, 6)
	Gv2	16	18	20	dB	VOLIN (Pin 7, 8) → OUT (Pin 25, 26)
Maximum output voltage	VOM1	2.2	2.4	—	Vrms	OUT (Pin 25, 26), THD = 1%
	VOM2	2.2	2.4	—	Vrms	RECO (Pin 33, 36), THD = 1 %
	VOM3	1.4	1.6	—	Vrms	PBO (Pin 5, 6), THD = 1%
Distortion	THD	—	0.02	0.08	%	INA/B/C (Pin 27 to 32) → OUT (Pin 25, 26), Vo = 0.5 Vrms, BW = 400 to 30 kHz
Output noise voltage	VON1	—	6	15	μVrms	VOLIN (Pin 7, 8) → OUT (Pin 25, 26) Input VOL = –∞ dB, Output VOL = 2 dB, JIS-A, Rg = 0 Ω
	VON2	—	35	70	μVrms	VOLIN (Pin 7, 8) → RECO (Pin 33, 36) JIS-A, Rg = 0 Ω
Input conversion noise voltage	VIN	—	1.0	1.9	μVrms	PB1P/2P (Pin 2, 3) → PBO (Pin 5, 6) JIS-A, Rg = 0 Ω
Channel cross talk	CT	—	–70	–60	dB	INA/B/C (Pin 27 to 32) → OUT (Pin 25, 26), Vo = 2 Vrms, JIS-A, Rg = 0 Ω
Input impedance	Rvin	14	20	26	kΩ	VOLIN (Pin 7, 8)
Maximum attenuation	Volmin	—	–95	–90	dB	VOLIN (Pin 7, 8) → OUT (Pin 25, 26), JIS-A, Input VOL = –∞ dB, Output VOL = 2 dB, Vo = 2 Vrms
Boost amount (Bass)	GBB	7	10	13	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Bass: 0 dB), Bass: 10 dB, f = 100 Hz
Cut amount (Bass)	GBC	–13	–10	–7	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Bass: 0 dB), Bass: –10 dB, f = 100 Hz
Boost amount (Mid)	GMB	7	10	13	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Mid: 0 dB), Mid: 10 dB, f = 1 kHz
Cut amount (Mid)	GMC	–13	–10	–7	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Mid: 0 dB), Mid: –10 dB, f = 1 kHz
Boost amount (Treble)	GTB	7	10	13	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Tre: 0 dB), Tre: 10 dB, f = 10 kHz
Cut amount (Treble)	GTC	–13	–10	–7	dB	OUT (Pin 25, 26), Vo = 0.5 Vrms (Tre: 0 dB), Tre: –10 dB, f = 10 kHz

P. B. Amp Measurement Circuit Figure



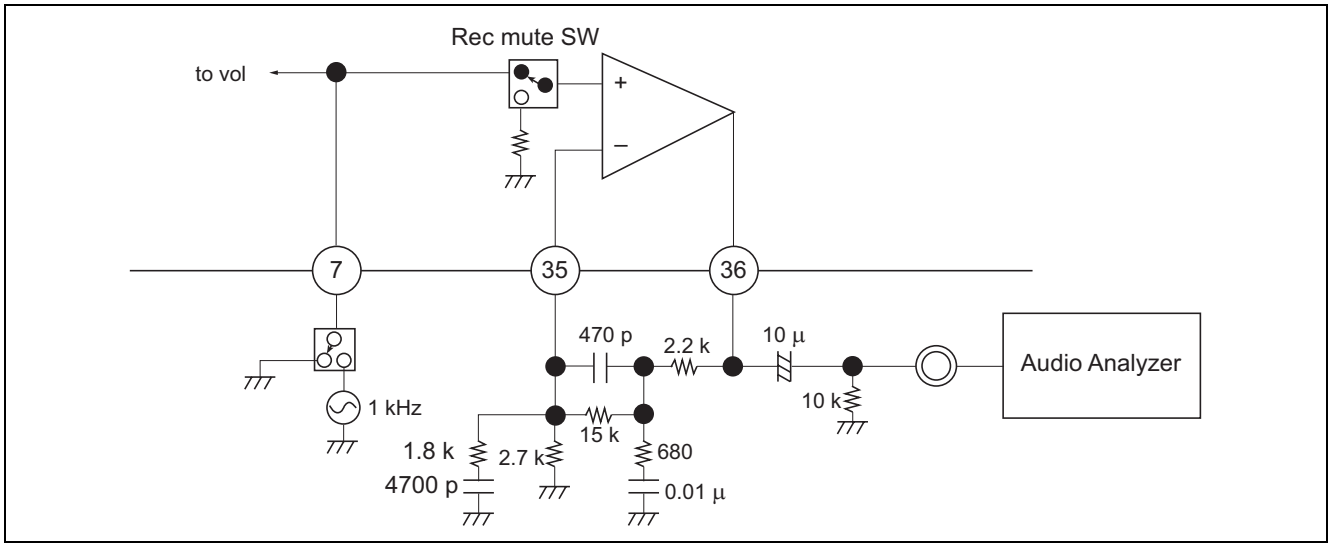
Input Conversion Noise Voltage

- Limits
  Typ: 1.0 µVrms (JIS-A)
  Max:1.9 µVrms (JIS-A)
- Measurement method
  (1) Input signal (1 kHz) to PB1P (pin2) and measure output gain of PB1O (pin6).
  (2) Measure output noise voltage of PB1O (pin6) and convert Input conversion noise voltage from output noise voltage.

Maximum Output Voltage

- Limits
  Min: 1.4 Vrms (THD = 1%)
  Typ: 1.6 Vrms (THD = 1%)
- Measurement method
  Input signal (1 kHz) to PB1P (pin2) and measure output gain of PB1O (pin6) when output THD is 1%.

Rec Amp Measurement Circuit Figure



Output noise voltage

- Limits
  Typ: 35 µVrms (JIS-A)
  Max:70 µVrms (JIS-A)
- Measurement method
  Measure output noise voltage of REC1O (pin36) when VOLIN1 (pin7) is GND.

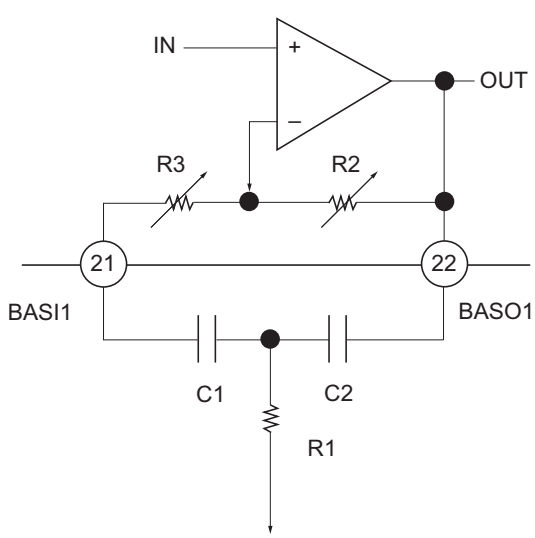
Maximum output voltage

- Limits
  Min: 2.2 Vrms (THD = 1%)
  Typ: 2.4 Vrms (THD = 1%)
- Measurement method
  Input signal (1 kHz) to VOLIN1 (pin7) and measure output gain of REC1O (pin36) when output THD is 1%.

Tone Control Equivalent Circuit

Bass, Mid, Treble Circuit composition is common

(1) Boost equivalent circuit



$$f0 = \frac{1}{2\pi\sqrt{R1\,(R2 + R3)\,C1C2}} \quad (Hz)$$

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

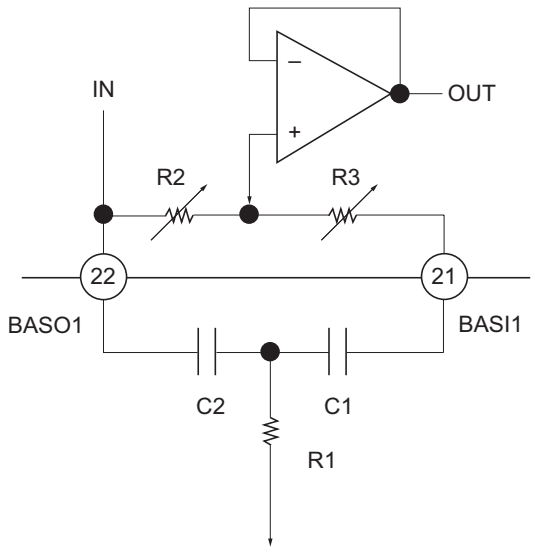
(In the case of C1 = C2)

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

R2, R3 Standard value (Reference)

Gain		2 dB	4 dB	6 dB	8 dB	10 dB
Resistance (kΩ)	R2	10.46	18.77	25.36	30.61	34.77
	R3	26.79	18.48	11.89	6.64	2.48

(2) Cut equivalent circuit



$$f0 = \frac{1}{2\pi\sqrt{R1\,(R2 + R3)\,C1C2}} \quad (Hz)$$

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

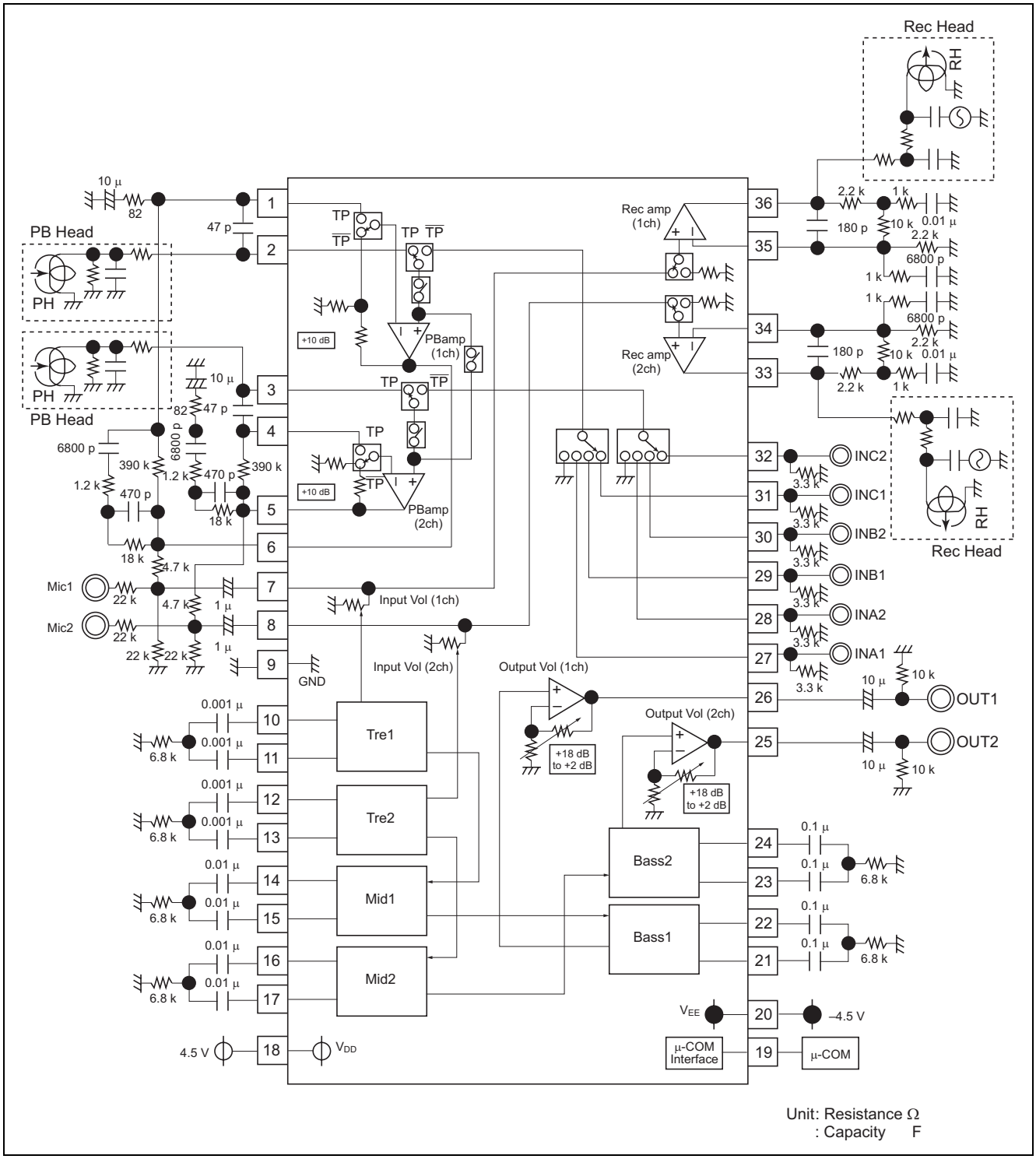
(in the case of C1 = C2)

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

R2, R3 Standard value (Reference)

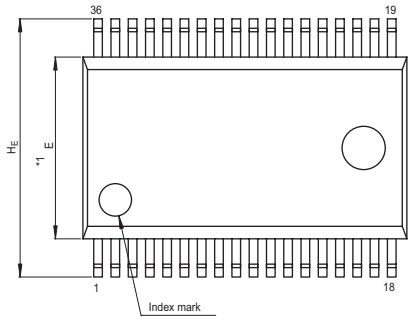
Gain		–2 dB	–4 dB	–6 dB	–8 dB	–10 dB
Resistance (kΩ)	R2	10.46	18.77	25.36	30.61	34.77
	R3	26.79	18.48	11.89	6.64	2.48

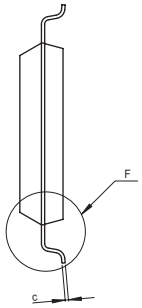
Application Example

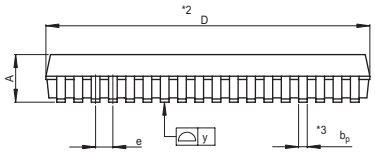


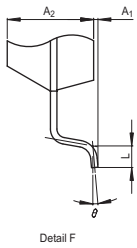
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SSOP36-8.4x15-0.80	PRSP0036GA-B	36P2R-D	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_2	—	2.05	—
A	—	—	2.35
A_1	0	0.1	0.2
b_p	0.3	0.35	0.45
c	0.18	0.2	0.25
θ	0°	—	8°
H_E	11.63	11.93	12.23
e	0.65	0.8	0.95
y	—	—	0.10
L	0.3	0.5	0.7

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