

# Post amplifier applicable with 1-bit D / A converter

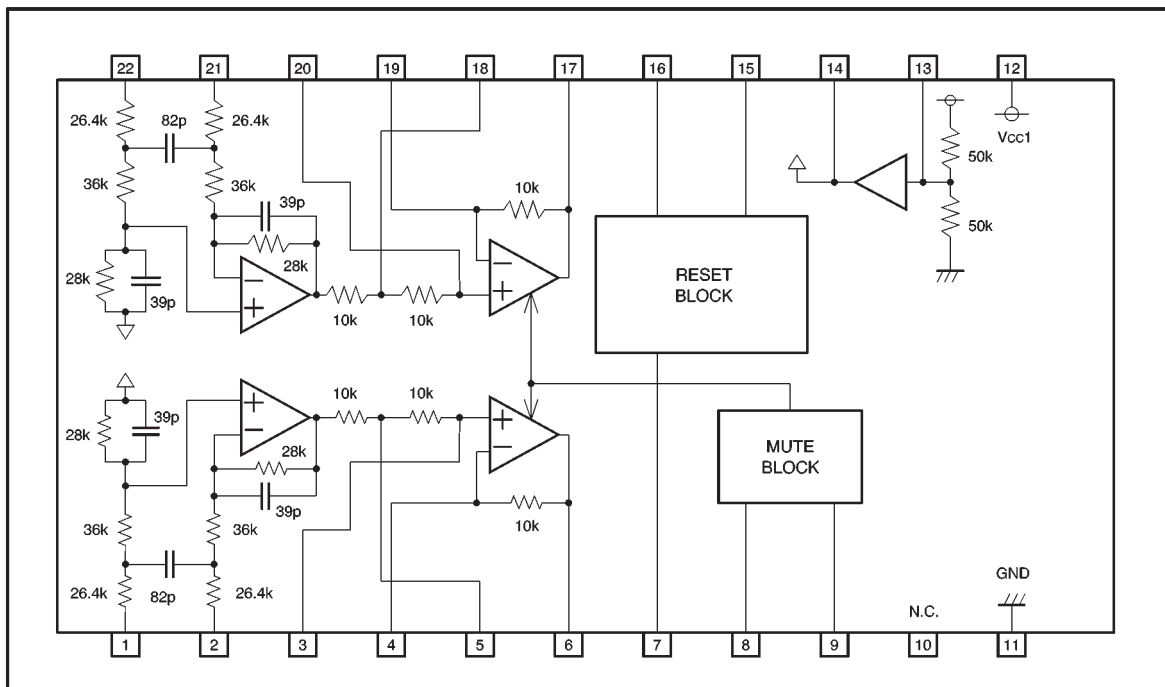
## BH3561AF

The BH3561AF is a post amplifier applicable with 1-bit D / A converter for compact disc players.

●Applications  
CD players, etc.

- Features
- 1) 2-channel analog filter IC for 1-bit D / A converters.
  - 2) Internal partial CR for two channels (left and right) LPF.
  - 3) Operates on a single power supply.

●Block diagram



● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	8	V
Power dissipation	P <sub>d</sub>	450*	mW
Operating temperature	T <sub>opr</sub>	−35~+85	°C
Storage temperature	T <sub>stg</sub>	−55~+150	°C

\* Reduced by 4.5 mW for each increase in Ta of 1°C over 25°C.

● Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage 1	V <sub>CC</sub> 1	4.5~8.0	V
Power supply voltage 2	V <sub>CC</sub> 2	2.0~8.0	V

● Pin descriptions

Pin No.	Pin name	Function
1	IN1 (+)	Channel 1 positive input
2	IN1 (−)	Channel 1 negative input
3	FILTER 1 - 1	Filter setting (1-1)
4	GAIN 1	Gain adjustment (1)
5	FILTER 2 - 1	Filter setting (2-1)
6	OUT1	Channel 1 output
7	OUTMUTE 1	Output mute transistor drive (1)
8	C $\tau$	Connecting the mute time constant capacitor
9	MUTE	Mute control
10	N.C.	—
11	GND	Ground
12	V <sub>CC</sub> 1	Power supply
13	BIAS IN	Bias input
14	BIAS OUT	Bias output
15	V <sub>CC</sub> 2	Power supply for reset block idling
16	OUTMUTE 2	Output mute transistor drive (2)
17	OUT 2	Channel 2 output
18	FILTER 2 - 2	Filter setting (2-2)
19	GAIN 2	Gain adjustment (2)
20	FILTER 1 - 2	Filter setting (1-2)
21	IN2 (−)	Channel 2 negative input
22	IN2 (+)	Channel 2 positive input

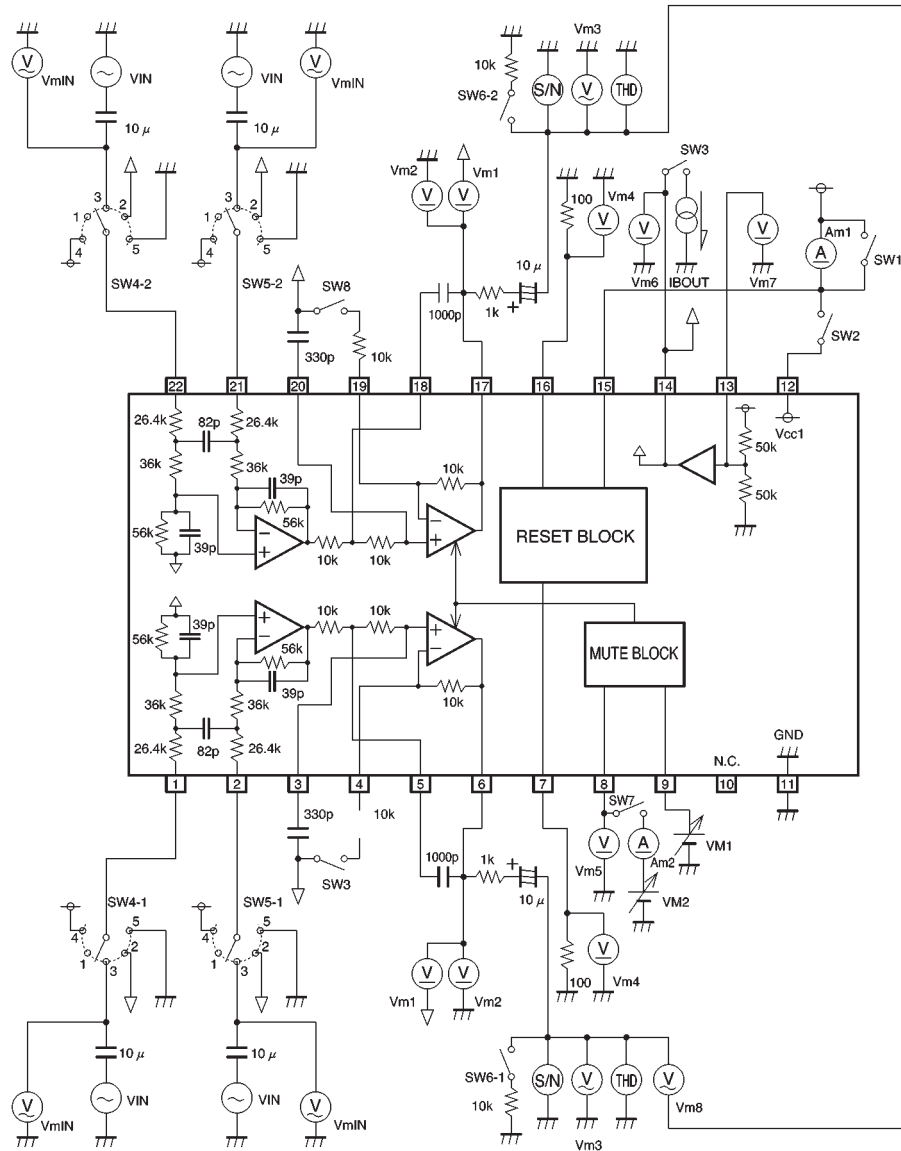
●Electrical characteristics (unless otherwise noted, Ta = 25°C, V<sub>CC1</sub> = 5V, V<sub>CC2</sub> = 5V, R<sub>L</sub> = 10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current 1	I <sub>Q1</sub>	3.5	5	6.5	mA	MUTE OFF, R <sub>L</sub> = ∞
Quiescent current 2	I <sub>Q2</sub>	8	12	16	mA	MUTE ON, R <sub>L</sub> = ∞
Standby current 1	I <sub>S1</sub>	—	0	1	μA	MUTE OFF, R <sub>L</sub> = ∞, V <sub>CC1</sub> OFF
Standby current 2	I <sub>S2</sub>	—	0	1	μA	MUTE ON, R <sub>L</sub> = ∞, V <sub>CC1</sub> OFF
Offset voltage 1	V <sub>off2</sub>	−15	0	15	mV	MUTE OFF, reference BIAS OUTPUT
Offset voltage 2	V <sub>off2</sub>	−15	0	15	mV	MUTE ON, reference BIAS OUTPUT
Bias voltage	V <sub>BO</sub>	2.3	2.5	2.7	V	
Bias voltage load regulation 1	ΔV <sub>BO1</sub>	—	—	50	mV	I <sub>B</sub> = +5mA (source)
Bias voltage load regulation 2	ΔV <sub>BO2</sub>	—	—	50	mV	I <sub>B</sub> = −5mA (sink)
Cτ source current	I <sub>Min.</sub>	13	17	21	μA	Cτ = 1.4 V, MUTE OFF
Cτ sink current	I <sub>Mout</sub>	13	17	21	μA	Cτ = 1.4 V, MUTE ON
Cτ sink/source current ratio	OUT / IN	0.8	1	1.2	—	
MUTE ON voltage	V <sub>thON1</sub>	1.6	—	—	V	Verifies : output voltage is at BIAS level.
MUTE OFF voltage	V <sub>thOFF1</sub>	—	—	1.2	V	Verifies : output voltage is at HIGH level.
Cτ ON voltage 1	V <sub>thON2</sub>	0.7	—	—	V	Verifies : ex. mute trans. drive current is ON.
Cτ OFF voltage 1	V <sub>thOFF2</sub>	—	—	1.3	V	Verifies : ex. mute trans. drive current in OFF.
Cτ ON voltage 2	V <sub>thON3</sub>	—	—	1.10	V	Verifies : output voltage is at BIAS level.
Cτ OFF voltage 2	V <sub>thOFF3</sub>	1.64	—	—	V	Verifies : output voltage is at HIGH level.
Ext. mute Tr. drive current	I <sub>MUTE</sub>	1.6	2.3	3.0	mA	Converted from current at 100 Ω
High-level output voltage	V <sub>OH</sub>	4.0	4.2	—	V	GAIN = 6 dB UP (10 kΩ EXTERNAL) Positive phase input = 5 V, negative phase input = 0 V Opposite side = bias OUT
Low-level output voltage	V <sub>OL</sub>	—	0.8	1.0	V	GAIN = 6 dB UP (10 kΩ EXTERNAL) Positive phase input = 0 V, negative phase input = 5 V Opposite side = BIAS OUT
Closed loop voltage gain	G <sub>VC</sub>	−10.8	−7.8	−4.8	dB	V <sub>IN</sub> = 1kHz, 1V <sub>rms</sub>
Frequency characteristics 1	f <sub>c1</sub>	−10.8	−7.8	−4.8	dB	V <sub>IN</sub> = 15kHz, 1V <sub>rms</sub>
Frequency characteristics 2	f <sub>c2</sub>	−21	−16	−11	dB	V <sub>IN</sub> = 40kHz, 1V <sub>rms</sub>
Mute attenuation	ATT	80	—	—	dB	V <sub>IN</sub> = 1kHz, 1V <sub>rms</sub>
Crosstalk	CT	—	95	—	dB	V <sub>IN</sub> = 1kHz, 1V <sub>rms</sub>
Total harmonic distortion	THD	—	0.01	0.02	%	V <sub>IN</sub> = 1kHz, 1V <sub>rms</sub>
Signal to noise ratio	S / N	90	100	—	dB	0 dB at 1 V <sub>rms</sub> output
L-R Channel balance 1	CB1	−1	0	1	dB	Positive phase input, V <sub>IN</sub> = 1 kHz, 1 V <sub>rms</sub>
L-R Channel balance 2	CB2	−1	0	1	dB	Negative phase input, V <sub>IN</sub> = 1 kHz, 1 V <sub>rms</sub>
Differential balance	G <sub>VB</sub>	45	55	—	dB	Common mode input, V <sub>IN</sub> = 1 kHz, 1 V <sub>rms</sub>

Note: A weighing filter is used when measuring AC parameters (excluding frequency characteristics).

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## ● Measurement circuit



Note 1: Arrows indicate the positive current direction.

Note 2: Unless otherwise noted, AC input ( $V_{IN}$ ) = 1 kHz sine waves.

Note 3: Unless otherwise noted, SW8 = Off.

Fig. 1

## ●Application example

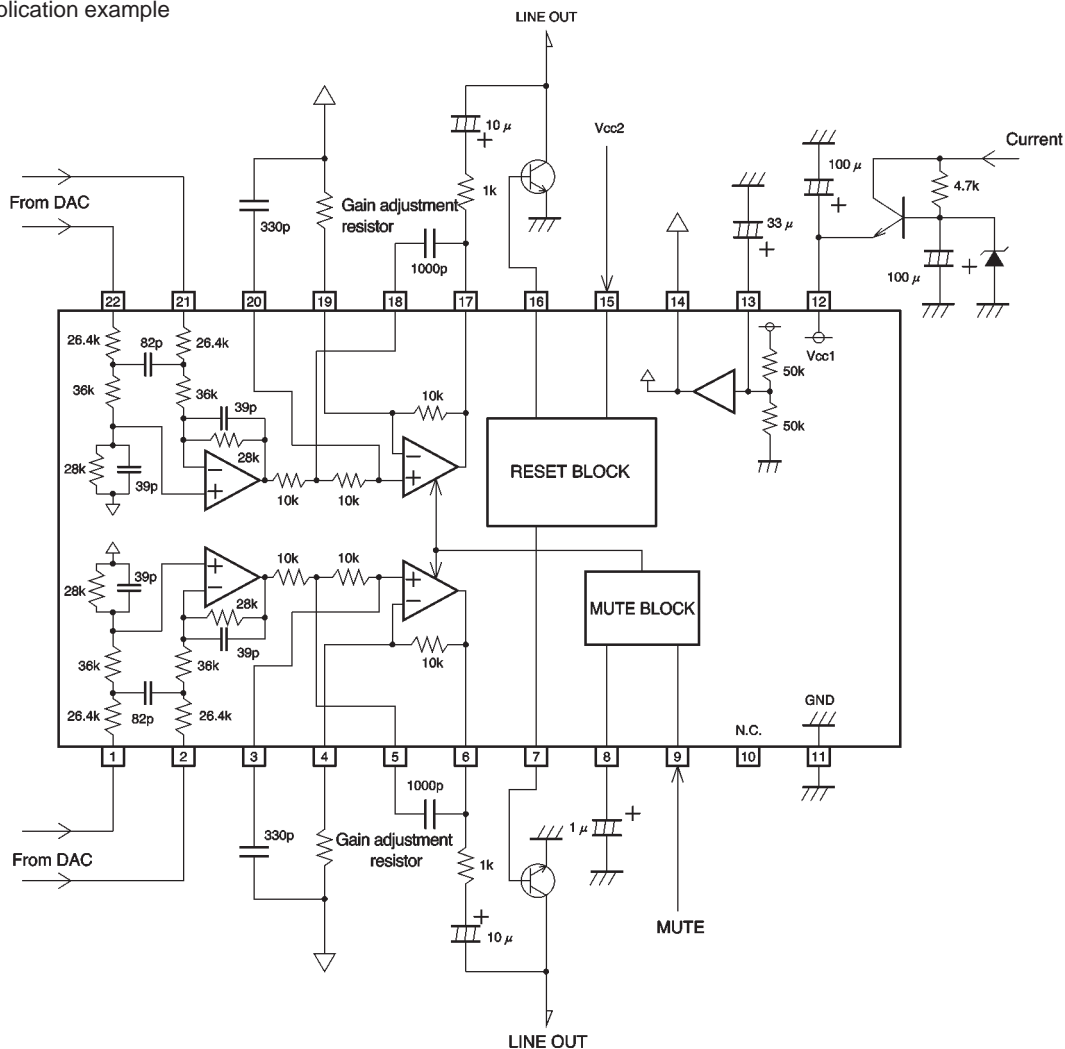


Fig. 2

## ●Operation notes

- (1) When the MUTE pin voltage reaches 1.5V or higher, the output voltage is muted and the bias level is output.
- (2) Frequency characteristics can be changed by adjusting the capacitor attached to pin 3 (pin 20) or pin 5 (pin 18).
- (3) Gain can be changed by attaching a resistor to pin 4 (pin 19).
- (4) Attach a transistor to pin 7 (pin 16) to mute popping sounds. Recommended transistor : 2SD1781K
- (5) The reset block idling power supply for pin 15 should be left on as it prevents popping sounds.
- (6) To prevent popping sounds due to sudden fluctuation in the power supply voltage, configure a ripple filter.
- (7) To prevent popping sounds due to sudden changes in the mute pin voltage, connect pin 8 to a 1μF (approx.) capacitor.
- (8) Attach a by-pass capacitor (approx. 0.1μF) at the base of the IC between the power supply.

## ●Electrical characteristic curve

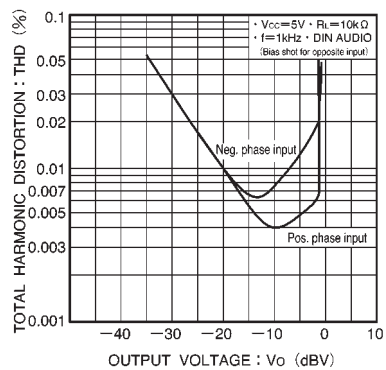


Fig. 3 Output voltage vs. distortion

## ●External dimensions (Units: mm)

