

Post amplifier applicable with 1-bit D/A converter

BH3561AF

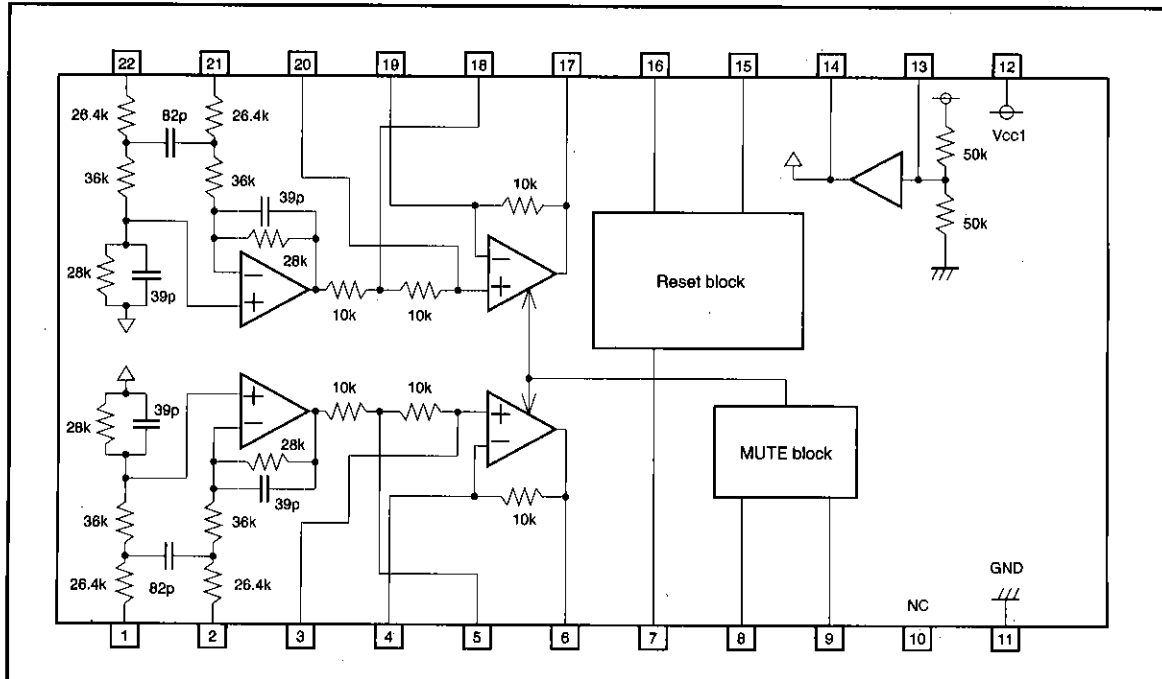
The BH3561AF is a post amplifier applicable with 1-bit D/A converter for compact disc players.

●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 _{cc}	8	V
Power dissipation	P _d	450*	mW
Operating temperature	T _{opr}	-35~85	°C
Storage temperature	T _{stg}	-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 _{cc 1}	4.5~8.0	V
Power supply voltage 2	V _{cc 2}	2.0~8.0	V

● Pin description

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 _τ	Connecting the mute time constant capacitor
9	MUTE	Mute control
10	N.C.	
11	GND	Ground
12	V _{cc 1}	Power supply
13	BIAS IN	Bias input
14	BIAS OUT	Bias output
15	V _{cc 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

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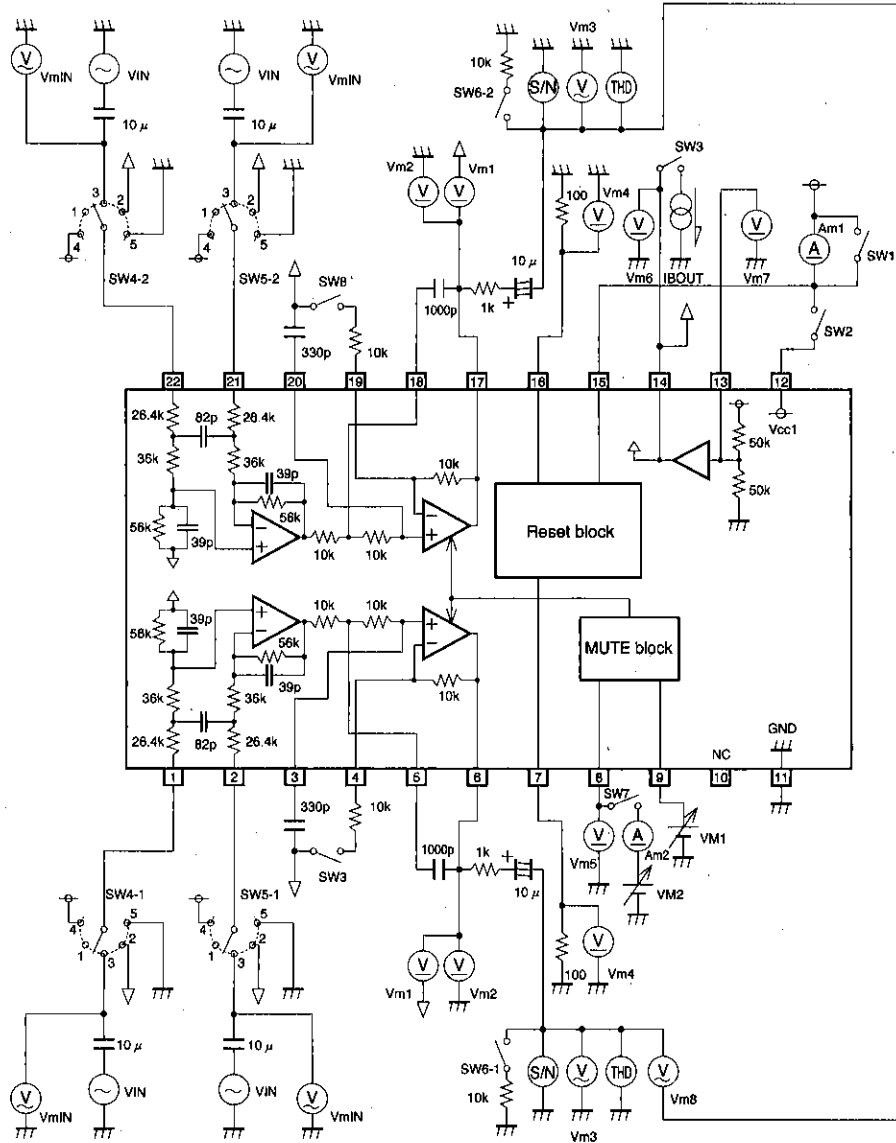
●Electrical characteristics (unless otherwise noted, Ta=25°C, Vcc1=5V, Vcc2=5V, RL=10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current 1	Iq1	3.5	5	6.5	mA	MUTE OFF, RL=∞
Quiescent current 2	Iq2	8	12	16	mA	MUTE ON, RL=∞
Standby current 1	Is1	—	0	1	μA	MUTE OFF, RL=∞, Vcc1 OFF
Standby current 2	Is2	—	0	1	μA	MUTE ON, RL=∞, Vcc1 OFF
Offset voltage 1	Voff2	−15	0	15	mV	MUTE OFF, reference BIAS OUTPUT
Offset voltage 2	Voff2	−15	0	15	mV	MUTE ON, reference BIAS OUTPUT
Bias voltage	VBO	2.3	2.5	2.7	V	
Bias voltage load regulation 1	ΔVBO1	—	—	50	mV	Ib=+5mA (source)
Bias voltage load regulation 2	ΔVBO2	—	—	50	mV	Ib=−5mA (sink)
Cτ source current	Imin	13	17	21	μA	Cτ = 1.4 V, MUTE OFF
Cτ sink current	I _{out}	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 _{inON1}	1.6	—	—	V	Verifies : output voltage is at BIAS level.
MUTE OFF voltage	V _{inOFF1}	—	—	1.2	V	Verifies : output voltage is at HIGH level.
Cτ ON voltage 1	V _{inON2}	0.7	—	—	V	Verifies : ex. mute trans. drive current is ON.
Cτ OFF voltage	V _{inOFF2}	—	—	1.3	V	Verifies : ex. mute trans. drive current in OFF.
Cτ ON voltage 2	V _{inON3}	—	—	1.10	V	Verifies : output voltage is at BIAS level.
Cτ OFF voltage 2	V _{inOFF3}	1.64	—	—	V	Verifies : output voltage is at HIGH level.
Ext. mute Tr. drive current	I _{MUTE}	1.6	2.3	3.0	mA	Converted from current at 100Ω
High-level output voltage	V _{OH}	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 _{OL}	—	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
Voltage gain (closed loop)	G _{VC}	−10.8	−7.8	−4.8	dB	V _{IN} =1kHz, 1Vrms
Frequency characteristics 1	fc1	−10.8	−7.8	−4.8	dB	V _{IN} =15kHz, 1Vrms
Frequency characteristics 2	fc2	−21	−16	−11	dB	V _{IN} =40kHz, 1Vrms
Mute attenuation	ATT	80	—	—	dB	V _{IN} =1kHz, 1Vrms
Crosstalk	CT	—	95	—	dB	V _{IN} =1kHz, 1Vrms
Total harmonic distortion	THD	—	0.01	0.02	%	V _{IN} =1kHz, 1Vrms
Signal to noise ratio	S / N	90	100	—	dB	0 dB at 1 Vrms output
L-R Channel balance 1	CB1	−1	0	1	dB	Positive phase input, V _{IN} = 1 kHz, 1 Vrms
L-R Channel balance 2	CB2	−1	0	1	dB	Negative phase input, V _{IN} = 1 kHz, 1 Vrms
Differential balance	G _{VB}	45	55	—	dB	Common mode input, V _{IN} = 1 kHz, 1 Vrms

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 (VIN) = 1 kHz sine waves.
 Note 3: Unless otherwise noted, SW8 = Off.

Fig. 1

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● Application example

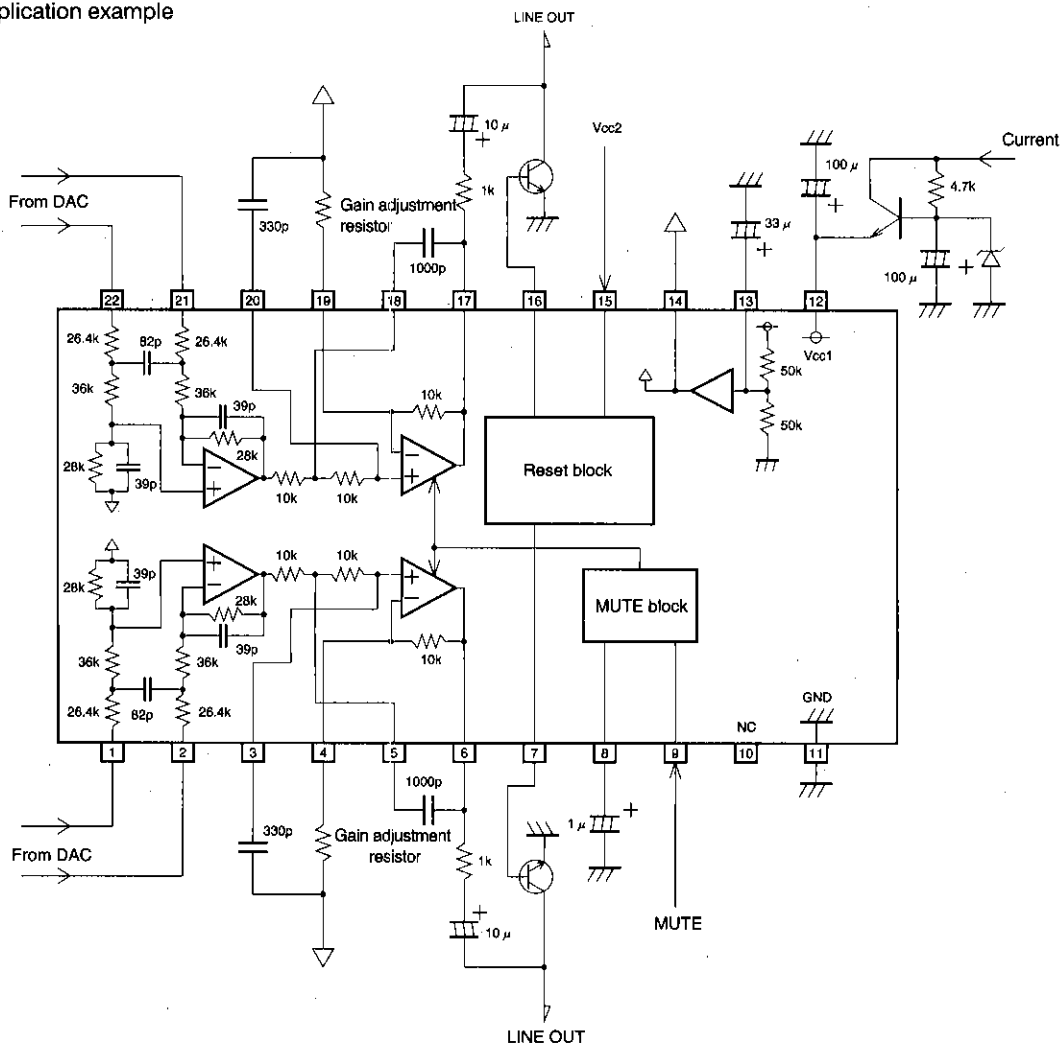


Fig. 2

● Operation notes

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

● Electrical characteristic curve

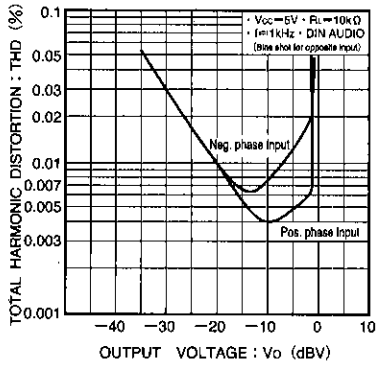
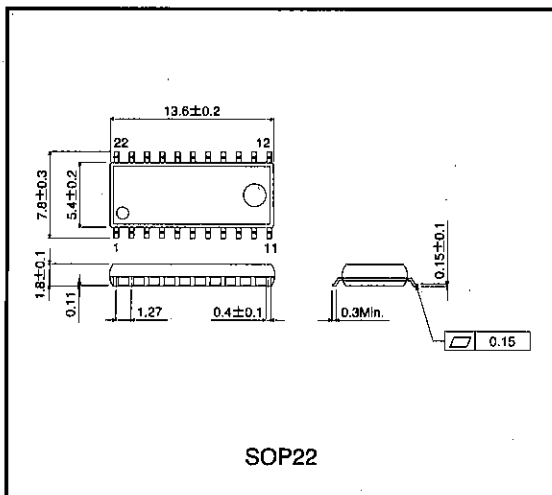


Fig. 3 Output voltage vs. distortion characteristic

● External dimensions (Units: mm)



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