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.

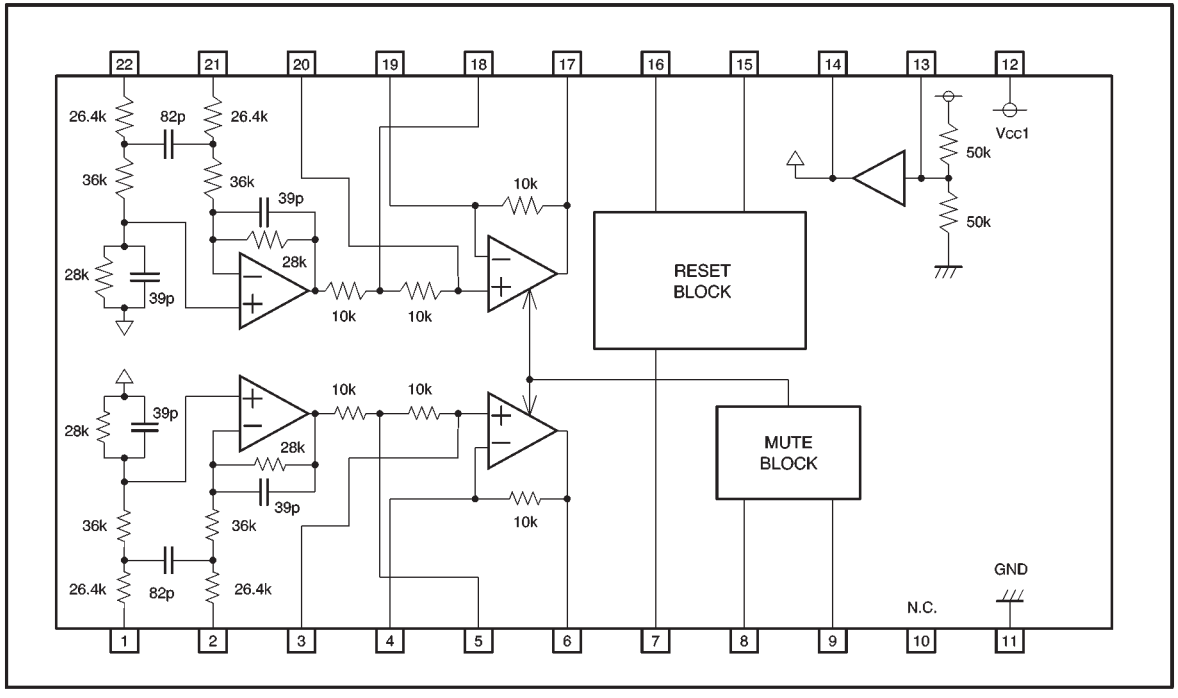
●Applications

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	Pd	450*	mW
Operating temperature	Topr	−35～+85	℃
Storage temperature	Tstg	−55～+150	℃

* Reduced by 4.5 mW for each increase in Ta of 1℃ over 25℃.

●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 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	Cτ	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

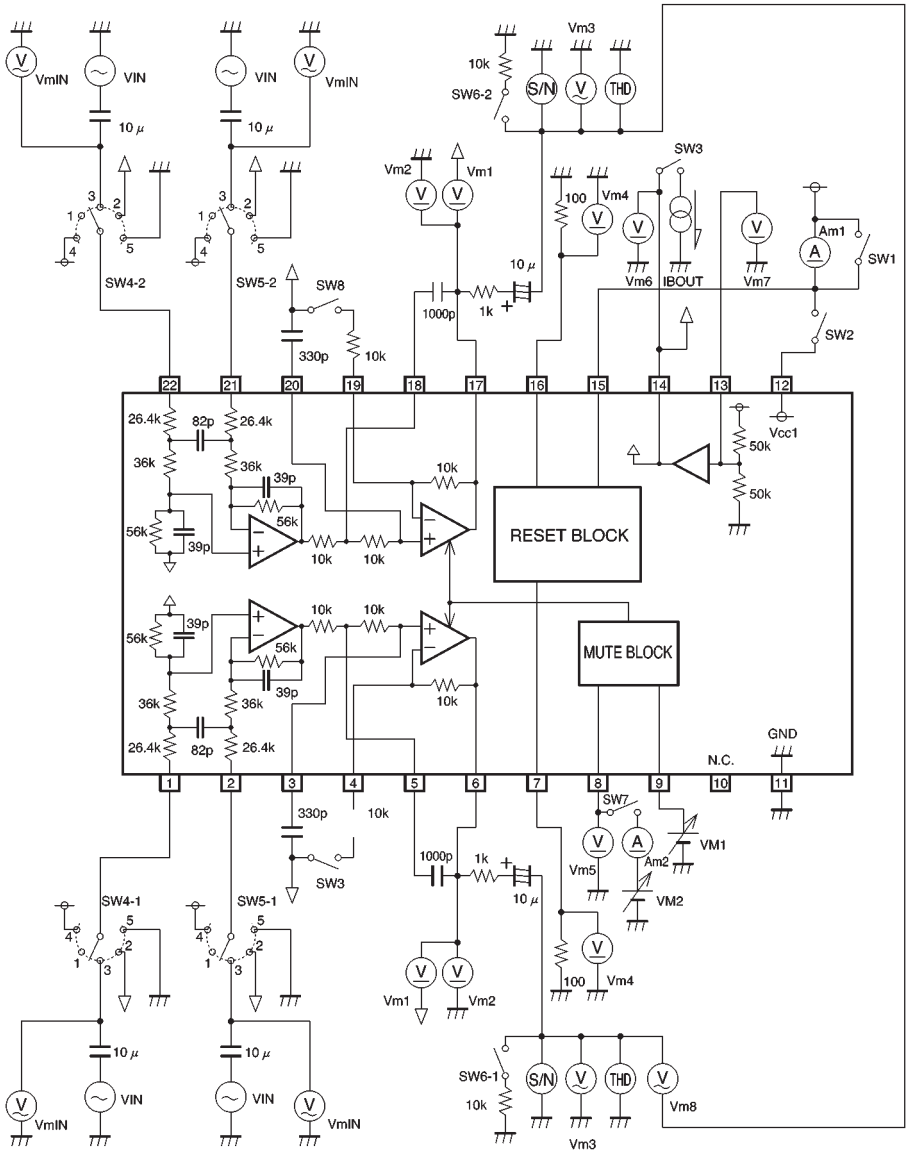
●Electrical characteristics (unless otherwise noted, Ta = 25°C, $V_{CC}1$ = 5V, $V_{CC}2$ = 5V, R_L = 10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current 1	I_{Q1}	3.5	5	6.5	mA	MUTE OFF, $R_L = \infty$
Quiescent current 2	I_{Q2}	8	12	16	mA	MUTE ON, $R_L = \infty$
Standby current 1	I_{S1}	—	0	1	μA	MUTE OFF, $R_L = \infty$, V_{CC1} OFF
Standby current 2	I_{S2}	—	0	1	μA	MUTE ON, $R_L = \infty$, V_{CC1} OFF
Offset voltage 1	V_{off2}	−15	0	15	mV	MUTE OFF,reference BIAS OUTPUT
Offset voltage 2	V_{off2}	−15	0	15	mV	MUTE ON,reference BIAS OUTPUT
Bias voltage	V_{BO}	2.3	2.5	2.7	V	
Bias voltage load regulation 1	ΔV_{BO1}	—	—	50	mV	I_B = +5mA (source)
Bias voltage load regulation 2	ΔV_{BO2}	—	—	50	mV	I_B = −5mA (sink)
C τ source current	$I_{Min.}$	13	17	21	μA	C τ = 1.4 V, MUTE OFF
C τ sink current	I_{Mout}	13	17	21	μA	C τ = 1.4 V, MUTE ON
C τ sink/source current ratio	OUT / IN	0.8	1	1.2	—	
MUTE ON voltage	V_{thON1}	1.6	—	—	V	Verifies : output voltage is at BIAS level.
MUTE OFF voltage	V_{thOFF1}	—	—	1.2	V	Verifies : output voltage is at HIGH level.
C τ ON voltage 1	V_{thON2}	0.7	—	—	V	Verifies : ex. mute trans. drive current is ON.
C τ OFF voltage 1	V_{thOFF2}	—	—	1.3	V	Verifies : ex. mute trans. drive current in OFF.
C τ ON voltage 2	V_{thON3}	—	—	1.10	V	Verifies : output voltage is at BIAS level.
C τ OFF voltage 2	V_{thOFF3}	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
Closed loop voltage gain	G_{VC}	−10.8	−7.8	−4.8	dB	V_{IN} = 1kHz, 1V_{rms}
Frequency characteristics 1	f_{C1}	−10.8	−7.8	−4.8	dB	V_{IN} = 15kHz, 1V_{rms}
Frequency characteristics 2	f_{C2}	−21	−16	−11	dB	V_{IN} = 40kHz, 1V_{rms}
Mute attenuation	ATT	80	—	—	dB	V_{IN} = 1kHz, 1V_{rms}
Crosstalk	CT	—	95	—	dB	V_{IN} = 1kHz, 1V_{rms}
Total harmonic distortion	THD	—	0.01	0.02	%	V_{IN} = 1kHz, 1V_{rms}
Signal to noise ratio	S / N	90	100	—	dB	0 dB at 1 V_{rms} output
L-R Channel balance 1	CB1	−1	0	1	dB	Positive phase input, V_{IN} = 1 kHz, 1 V_{rms}
L-R Channel balance 2	CB2	−1	0	1	dB	Negative phase input, V_{IN} = 1 kHz, 1 V_{rms}
Differential balance	G_{VB}	45	55	—	dB	Common mode input, V_{IN} = 1 kHz, 1 V_{rms}

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

◎Not designed for radiation resistance.

●Measruement 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

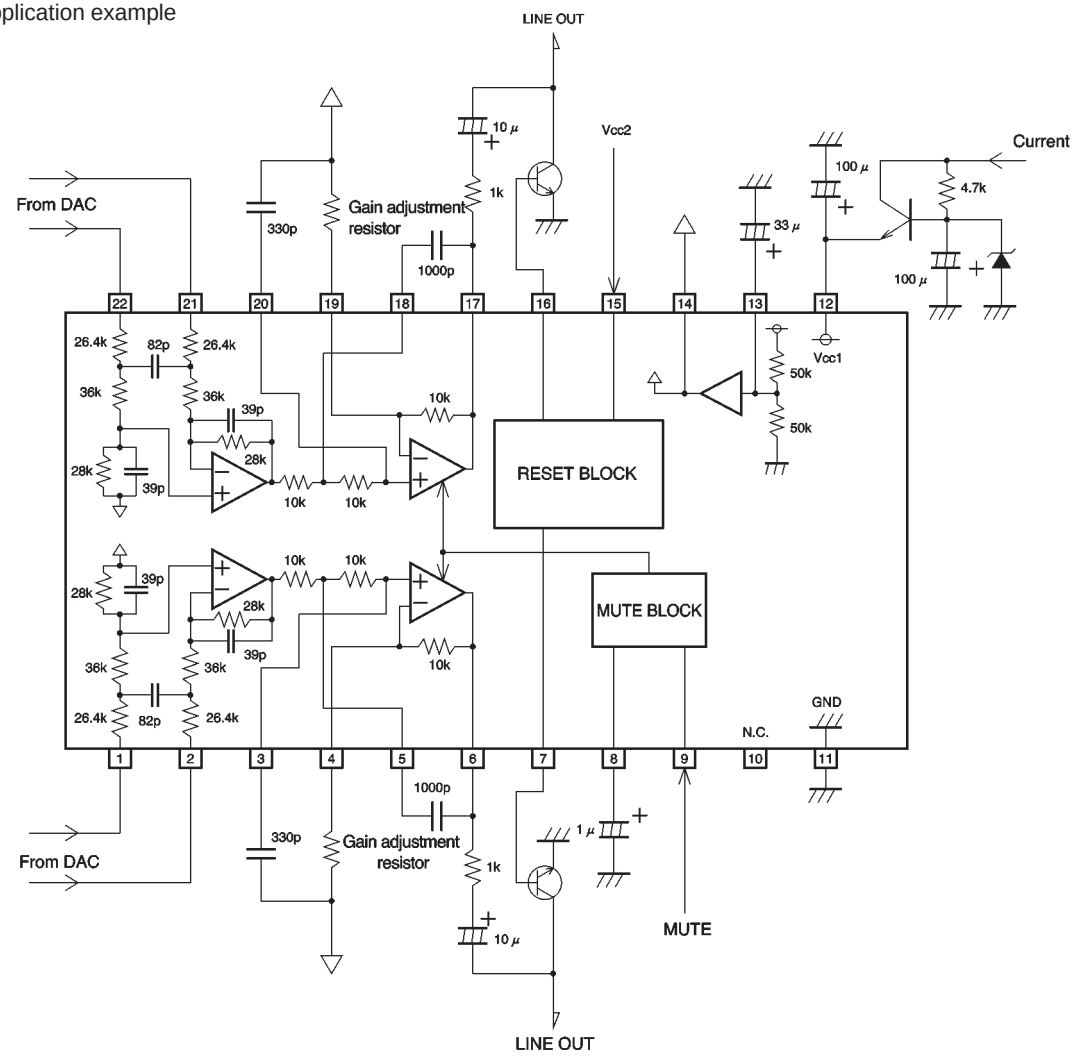


Fig. 2

●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

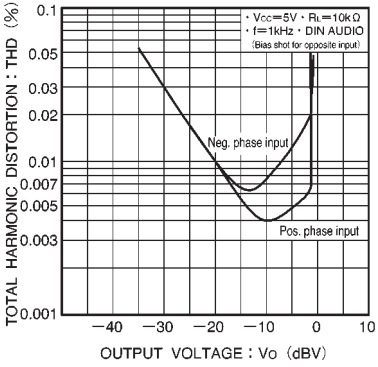
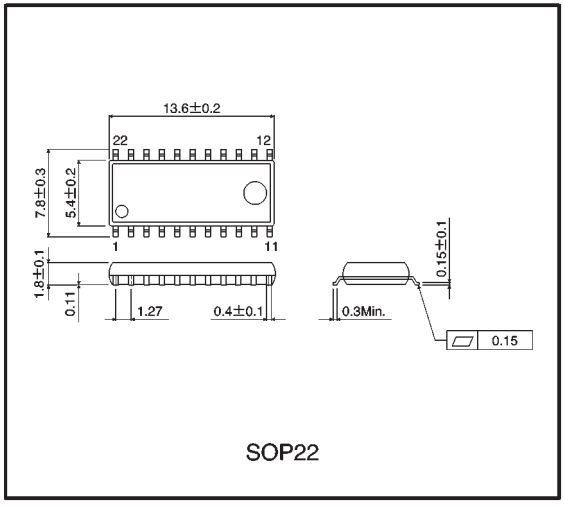


Fig. 3 Output voltage vs. distortion

●External dimensions (Units: mm)



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