Post amplifier applicable with 1-bit D/A converter

BH3562F

The BH3562F is a post amplifier applicable with 1-bit D/A converter for compact disc players.

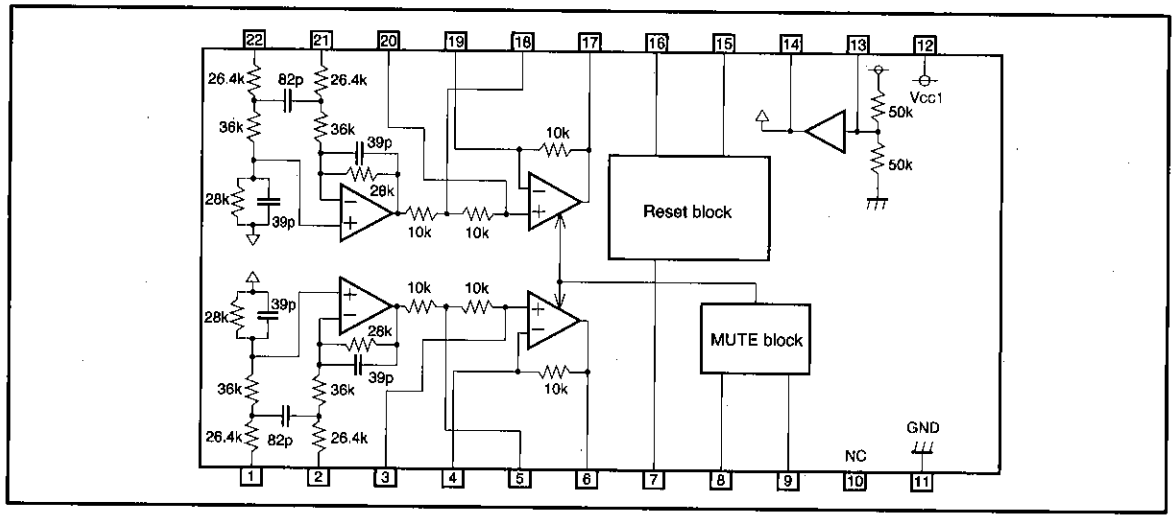
●Applications

Portable CD players, etc.

●Features

1) Two channel analog filter for 1 bit digital-audio converters.
2) Partial internal CR for two channels (L & R) LPF.
3) Operates on a single power supply.
4) Operates on a power supply voltage of up to 3.1V.

●Block diagram



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Power supply voltage	Vcc	5.5	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℃)

Parameter	Symbol	Limits	Unit
Power supply voltage 1	Vcc1	3.1~5.5	V
Power supply voltage 2	Vcc2	2.0~5.5	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	OUT 1	Channel 1 output
7	OUTMUTE 1	Output mute transistor drive (1)
8	Cτ	Attached capacitor for setting the mute time constant
9	MUTE	Mute control
10	N.C.	
11	GND	Ground
12	Vcc1	Power supply
13	BIAS IN	Bias input
14	BIAS OUT	Bias output
15	Vcc2	Reset block idling power supply
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

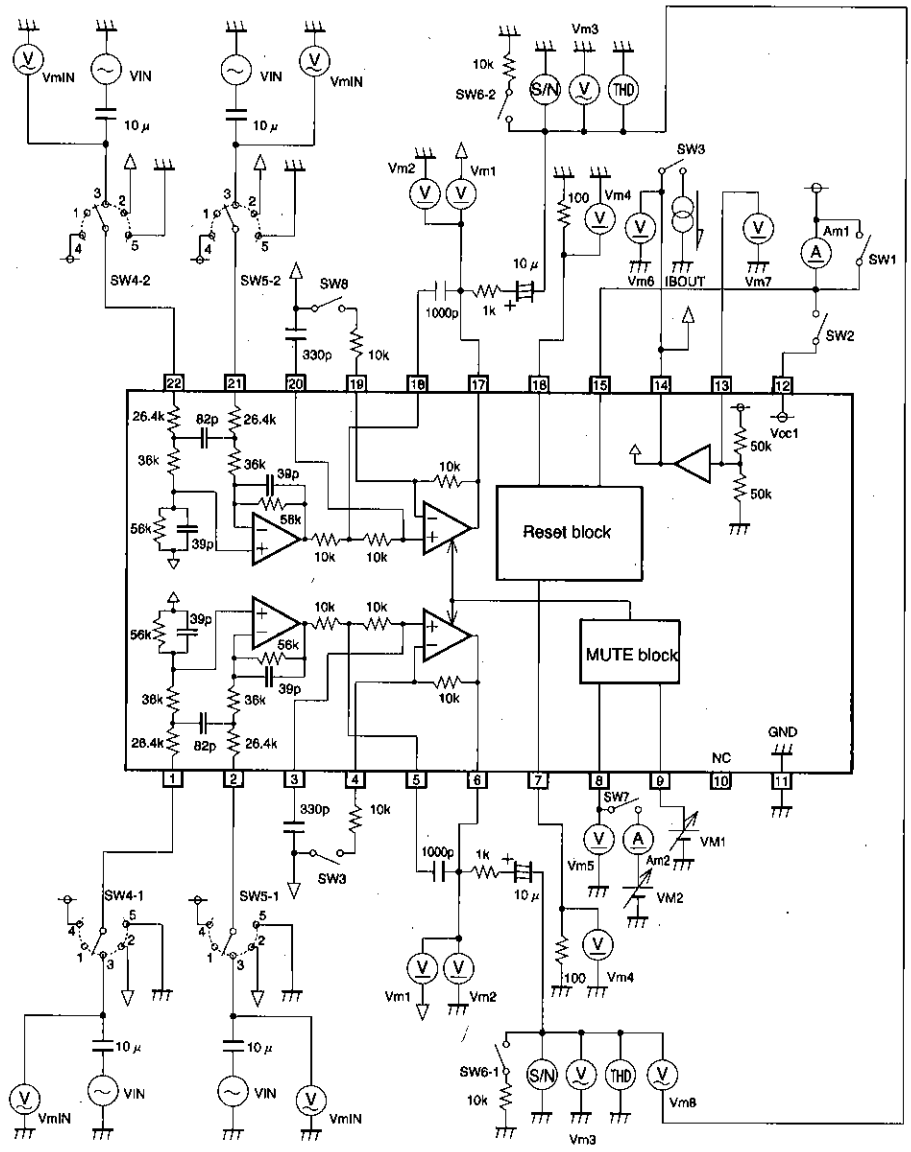
●Electrical characteristics (unless otherwise noted, Ta=25℃, $V_{CC}1$=25℃, $V_{CC}2$=3.5V, R_L=10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current (1)	I_{Q1}	3.0	4.5	6.0	mA	MUTE OFF, R_L=∞
Quiescent current (2)	I_{Q2}	7	10	13	mA	MUTE ON, R_L=∞
Standby current (1)	I_{S1}	—	0	1	μA	MUTE OFF, R_L=∞, V_{CC1} OFF
Standby current (2)	I_{S2}	—	0	1	μA	MUTE ON, R_L=∞, 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}	1.60	1.75	1.90	V	
Bias voltage, load regulation 1	ΔV_{BO1}	—	—	50	mV	I_B=+5mA (discharge)
Bias voltage, load regulation 2	ΔV_{BO2}	—	—	50	mV	I_B=−5mA (intake)
C τ source current	$I_{Min.}$	10.5	14.0	17.5	μA	C τ = 1.4 V, MUTE OFF
C τ sink current	I_{Mout}	10.5	14.0	17.5	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 : ext. mute trans. drive current is ON.
C τ OFF voltage (1)	V_{thOFF2}	—	—	1.3	V	Verifies : ext. 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 voltage (2)	V_{thOFF3}	1.64	—	—	V	Verifies : output voltage is at HIGH level.
External mute transistor current	I_{MUTE}	1.0	1.5	2.0	mA	Converted from current at 100Ω
High-level output voltage	V_{OH}	2.55	2.70	—	V	GAIN = 6 dB UP (10 kΩ external) Pos. phase input =3.5 V, neg. phase input 0 V Opposite side = BIAS OUT
Low-level output voltage	V_{OL}	—	0.75	0.90	V	GAIN = 6 dB UP (10 kΩ external) Pos. phase input =0 V, neg. phase input 3.5 V Opposite side = BIAS OUT
Voltage gain (closed load)	G_{VC}	−10.8	−7.8	−4.8	dB	V_{IN}=1kHz, 0.5Vrms
Frequency characteristics (1)	f_{C1}	−10.8	−7.8	−4.8	dB	V_{IN}=15kHz, 0.5Vrms
Frequency characteristics (2)	f_{C2}	−21	−16	−11	dB	V_{IN}=40kHz, 0.5Vrms
Mute attenuation	ATT	80	—	—	dB	V_{IN}=1kHz, 0.5Vrms
Crosstalk	CT	—	90	—	dB	V_{IN}=1kHz, 0.5Vrms
Total harmonic distortion	THD	—	0.01	0.02	%	V_{IN}=1kHz, 0.5Vrms
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, 0.5 Vrms
L-R Channel balance (2)	CB2	−1	0	1	dB	Negative phase input, V_{IN} = 1 kHz, 0.5 Vrms
Differential balance	G_{VB}	45	55	—	dB	Common mode input, V_{IN} = 1 kHz, 0.5 Vrms

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

◎ Not designed for radiation resistance.

●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

●Application examples

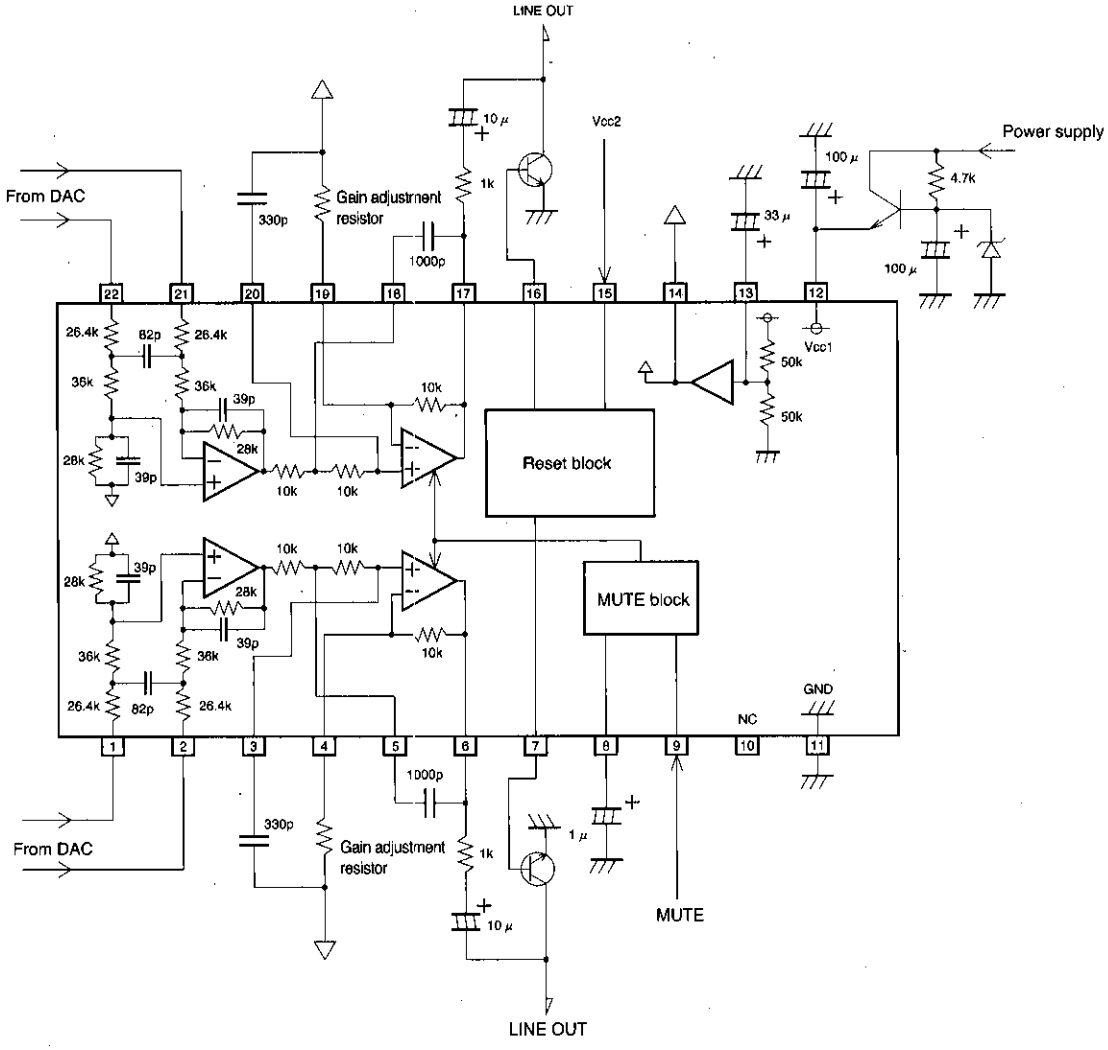


Fig. 2

●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 (20 pin) or pin 5 (18 pin).
- Gain can be changed by attaching a resistor to pin 4 (19 pin).
- Attach a transistor to pin 7 (16 pin) 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, attach a ripple filter.
- To prevent popping sounds due to sudden changes in the mute pin voltage, connect pin 8 to 1 μF.
- To attach a by-pass capacitor (approx. 0.1 μF) at the base of the IC between the power supply.

●Electrical characteristic curves

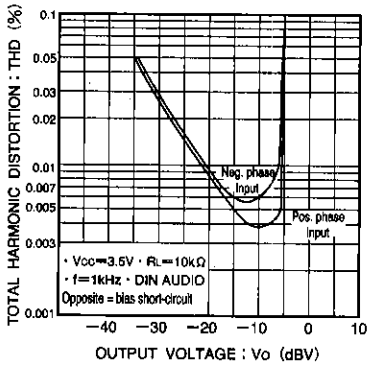
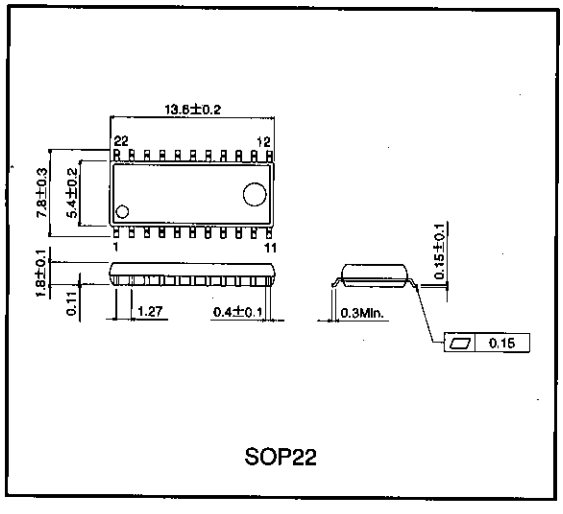


Fig. 3 Output voltage vs. distortion characteristics

●External dimensions (Units: mm)



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