

Conpact Headphone Amplifiers

Standard Headphone Amplifiers

No.11102EBT02

BH3544F,BH3547F,BH3548F

Description

BH3544F, BH3547F, BH3548F are headphone amplifiers suitable for portable products. BH3544F, BH3547F, BH3548F has a fixed gain of 6 dB. External resistors for gain setting are not needed. Package of BH3544F, BH3547F, BH3548F is pin-to-pin compatible (SOP8), enable to replace each other easily.

BH3544F, BH3547F, BH3548F also has mute functions that make it easy to prevent pop noise when power supply turns on/off. Moreover, thermal shutdown function is built-in.BH3544F, BH3547F can drive $16/32\Omega$ load, BH3548F can drive $8/16/32\Omega$. So, BH3548F is suitable for 8Ω receiver.

Features

- 1) Built-in mute function for preventing pop noise when power supply turns on/off
- 2) Built-in thermal shutdown function
- 3) BH3544F, BH3547F, BH3548F are pin-to-pin compatible
- 4) SOP8 small package

Applications

TV, Desktop PC, Notebook PC, Camcorder and other equipment having headphone output

●Line up

Part No.	BH3544F	BH3547F	BH3548F	Unit
Supply voltage	+2.8 ~ +6.5	+4.5 ~ +5.5	+4.0 ~ +5.5	V
Quiescent current	7.0	3.7	6.5	mA
Amplifier gain		6		dB
Output [R∟=16Ω]	62	77	62	mW
load impedance	16 /	/ 32	8/16/32	Ω
Operating temperature range	perating temperature range $-25 \sim +75$ $-40 \sim +8$		-40 ~ +85	°C

Absolute maximum ratings(Ta=25°C)

Deremeter	Symbol	Ratings	Lloit
Falameter	Symbol	BH3544F,BH3547F,BH3548F	
Applied voltage	VCC	7.0	V
Power dissipation	Pd	550 ^{*1}	mW
Storage temperature	Tstg	-55~+125	°C

*1 Derating is done at 5.5mW/°C above Ta=25°C. (When mounted on a 70mm×70mm×1.6mm PCB board, FR4)

Operating conditions (Ta=25°C)

Decemeter	Symbol	Limits			
Parameter	Symbol	BH3544F	BH3547F	BH3548F	Unit
Supply voltage	VCC	+2.8 ~ +6.5	+4.5 ~ +6.5	+4.0 ~ +5.5	V
Temperature Range	Topr	-25~	~ +75	-40 ~ +85	°C

* These product are not designed for protection against radioactive rays.

Electrical characteristics (Unless otherwise noted, Ta=25°C, VCC=5V, RL=32Ω, f=1kHz, BW=400~30kHz, VIN =-6dBV)

Deremeter	Sympol	Limits(TYP.)			Linit	Conditions	
Parameter	Symbol	BH3544F	BH3547F BH3548F		Unit	Conditions	
Quiescent current	lq	7	3.7	6.5	mA	VIN=0Vrms	
Mute pin control voltage H	Vтмн		1.6<		V	Mute OFF	
Mute pin control voltage L	VTML		<0.3		V	Mute ON	
Gain	Gvc		6		dB	-	
Gain difference between channels	ΔGvc		0		dB	-	
Total harmonic distortion	THD	0.02	0.05	0.02	%	BW=20~20kHz	
Rated output 1	Po1	31	46	31	mW	RL=32Ω,THD<0.1% (BH3544F,BH3548F) RL=32Ω,THD<0.3% (BH3547F)	
Rated output 2	Po2	62	77	62	mW	RL=16Ω,THD<0.1% (BH3544F,BH3548F) RL=16Ω,THD<0.5% (BH3547F)	
Rated output 3	Роз		-	120	mW	RL=8Ω,THD<0.25% (BH3548F)	
Output noise voltage	Vno		-93		dBV	BW=20~20kHz,Rg=0Ω	
Channel separation	CS	-90	-87	-90	dB	Rg=0Ω	
Mute attenuation	ATT		-80		dB	Rg=0Ω	
Ripple rejection	RR		-57		dB	frr=100Hz,Vrr=-20dBV	
Input resistance	Rin		90		kΩ	-	

Reference data







Reference data (Continued)



Fig. 4 Voltage gain vs. frequency

BH3544F



Fig. 5 Total harmonic distortion vs. output voltage (1)

BH3544F



Fig. 6 Total harmonic distortion vs. output voltage (2)







Fig. 8 Total harmonic distortion vs. output voltage (4)





Fig. 10 MUTE attenuation vs. frequency



Fig. 11 Ripple rejection vs. frequency



Block diagram





Measurement circuit



Fig. 14

Terminal Equivalent Circuit / Description

Pin	Pin		Dia walta aa	Equivale	Function	
No.	Name	1/0	Pin voltage	BH3544F, BH3548F		
1 7	OUT1 OUT2	0	2.1V (VCC=5V)			Output pin
2	MUTE	I	0.1V (When open)			Mute control pin Mute on:Hi Mute off:Lo (open)
3 5	IN1 IN2	I	2.1V (VCC=5V)	3 5 BIAS	3 5 BIAS	Input pin
6	BIAS	I/O	2.1V (VCC=5V)	G G H H H H H H H H H H H H H H H H H H	6 6 6 6 6 4 8 1AS	Bias pin (Since the 47 µF externally attached capacitor also serves as the time constant for pop noise countermeasures, evaluate adequately when changing it.)
4	GND	I	-	-	-	GND pin
8	VCC	I	-	-	-	Power supply pin

%The figure in the pin explanation and input/output equivalent circuit is reference value, it doesn't guarantee the value.

•Application circuit





Description of external components

1) Input coupling capacitors (C3, C5)

These are determined according to the lower cutoff frequency fc. Moreover, since lowering the capacitance can cause the occurrence of pop noise, when changing this, determine it after adequate checking.

Since the input impedance is $90k\Omega$, these are found by the expressions below, although drift, temperature characteristics, and other considerations are necessary. (Layered ceramic capacitors are recommended.)

 $C3(C5)=1/(2 \pi \times 90 k\Omega \times fc)$

2) Bias capacitor (C6)

When VCC=5V, 47µF is recommended. Since lowering the capacitance too much can cause worsening of electrical characteristics or the occurrence of pop noise, when changing this, determine it after checking this adequately.

3) Mute pin pop noise countermeasures (R2, C2)

Since BH3544F,BH3548F have an impedance of $190k\Omega$ against GND and the BH3547F has $200k\Omega$, it may be impossible to cancel mute mode if R2 is made too large.

4) Output coupling capacitors (C1, C7)

These are determined by the lower cutoff frequency. If RL is the output load resistance (assuming a resistance Rx is put in for output protection or current restriction), these are found by the expression below.

 $C1(C7)=1/(2 \pi \times (RL+R \times) \times fc)$

- 5) Input gain adjustment resistances (R3, R5)
- Externally attached resistances (R3, R5) make input gain adjustment possible. The gain found by the expression below can be set.

Gvc=6+20log(90kΩ/(90kΩ+R3[R5])) [dB]

When input gain is not accommodated, these resistors have no use.

Notes for use

- 1) Numbers and data in entries are representative design values and are not guaranteed values of the items.
- 2) Although we are confident in recommending the sample application circuits, carefully check their characteristics further when using them. When modifying externally attached component constants before use, determine them so that they have sufficient margins by taking into account variations in externally attached components and the Rohm LSI, not only for static characteristics but also including transient characteristics.
- 3) Absolute maximum ratings If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you think of a case in which absolute maximum ratings are exceeded, enforce fuses or other physical safety measures and investigate how not to apply the conditions under which absolute maximum ratings are exceeded to the LSI.

4) GND potential

Make the GND pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the GND pin, including transient phenomena.

5) Thermal design

Perform thermal design in which there are adequate margins by taking into account the allowable power dissipation in actual states of use.

- 6) Shorts between pins and misinstallation When mounting the LSI on a board, pay adequate attention to orientation and placement discrepancies of the LSI. If it is misinstalled and the power is turned on, the LSI may be damaged. It also may be damaged if it is shorted by a foreign substance coming between pins of the LSI or between a pin and a power supply or a pin and a GND.
- 7) Operation in strong magnetic fields
- Adequately evaluate use in a strong magnetic field, since there is a possibility of malfunction.
- Pop noise countermeasures
 In order to prevent the pop noise that occurs when the power supply turns ON or OFF, make the rise and fall with
 reference to the timing diagram shown below.

1)BH3544F/BH3548F



(A):Mute period (Use as pop noise countermeasure when power supply turns ON/OFF by makingVMUTE=Lo.) (B):Mute cancellation period (This has a time constant because it is used by the externally attached C2 and R2 as

a pop noise countermeasure on mute cancellation, so be careful of the timing.)

(C):Mute start time (As on cancellation, this has a time constant.)

2)BH3547F



Fig. 17

(A):Before VCC rise (or at the same time as VCC) make mute cancelled (VMUTE=Hi). (B):Soft mute period (This time can be set by externally attached R2 and C2) 7 6 5 A A A

4.4±0.2

1.5±0.1

0.11

0.595

6.2±0.3

0.9±0.15

(Unit : mm)

0.3MIN

0.17 +0.1

S

□ 0.1 S

0.42±0.1

Ordering part number



Direction

of feed

E2

`Reel

(The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand

 \overline{O}

0 0

*Order quantity needs to be multiple of the minimum quantity.

C

Direction of feed

С

C

1pin

O C



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