

Preset graphic equalizer for headphone stereos

BA3840KV

The BA3840KV is a preset graphic equalizer IC for headphone stereos. It combines two equalizer circuit channels on a single chip, and also includes a dynamic sound leak reduction circuit.

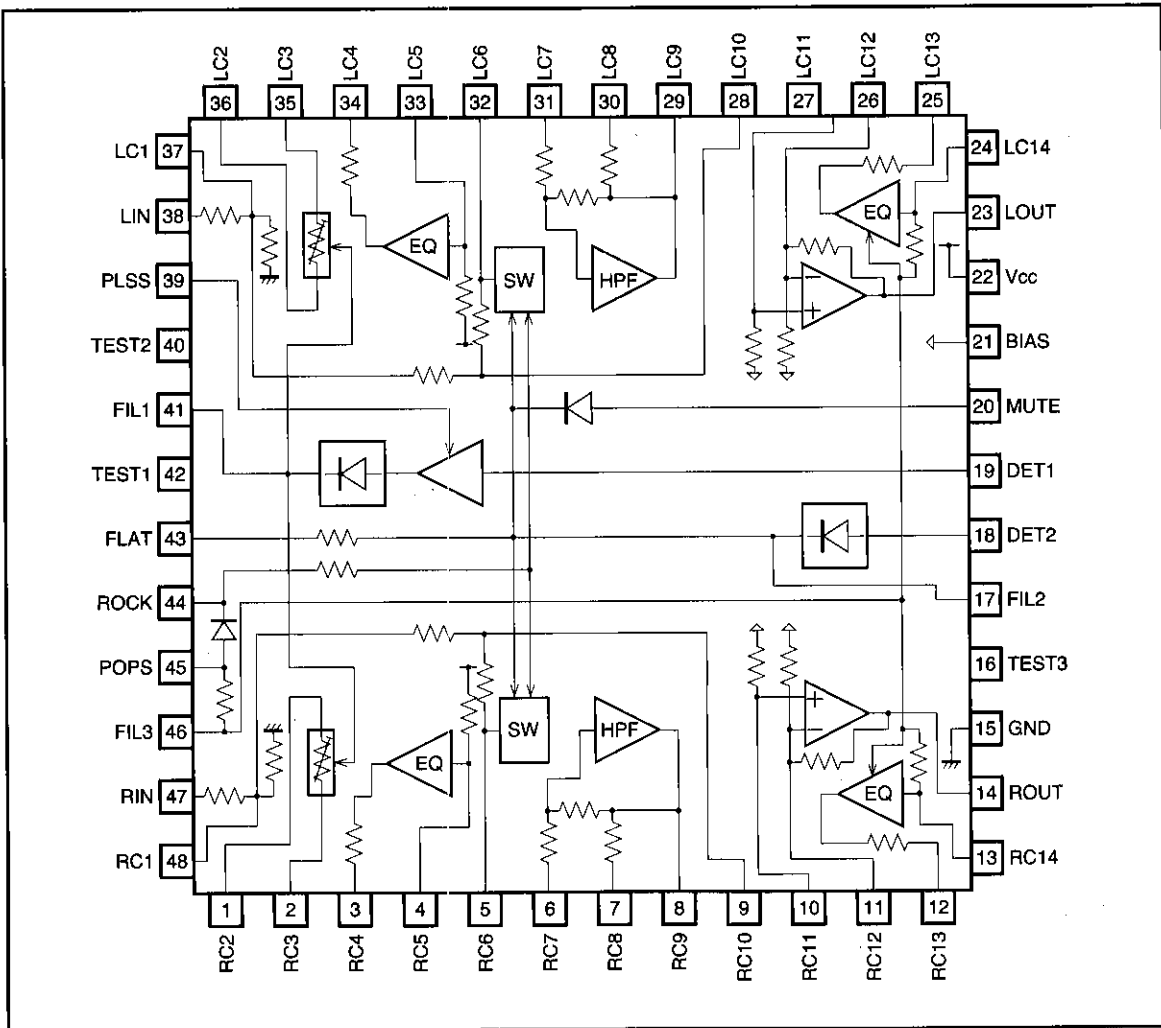
●Applications

Headphone stereos
Portable CD players

●Features

- 1) Four sound quality settings are possible by DC control.
- 2) High-frequency sounds can be cut off based on the volume.
- 3) The sound leak reduction circuit can be turned on and off by DC control.

● Block diagram



● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Applied voltage	V _{cc}	4.5	V
Power dissipation	P _d	400*	mW
Operating temperature	T _{opr}	-10~55	°C
Storage temperature	T _{stg}	-55~125	°C

* Reduced by 4mW for each increase in Ta of 1°C over 25°C.

● Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V _{cc}	1.7	—	3.6	V

● Pin description

Pin No.	Pin Name	Function	Input/output circuit schematic	
38 (47)	LIN (RIN)	Audio signal input		
37 (48)	LC1 (RC1)	Primary signal path Connects to capacitor to set sound leak reduction frequency		
36 (1)	LC2 (RC2)			
35 (2)	LC3 (RC3)			
34 (3)	LC4 (RC4)			
33 (4)	LC5 (RC5)			
32 (5)	LC6 (RC6)	Connects to capacitor to set low boost frequency Primary signal path		
31 (6)	LC7 (RC7)			
30 (7)	LC8 (RC8)			
29 (8)	LC9 (RC9)	Connects to capacitor to set high boost frequency		
28 (9)	LC10 (RC10)	Connects to coupling capacitor		
27 (10)	LC11 (RC11)			
26 (11)	LC12 (RC12)	Connects to capacitor to set mid-range boost frequency		
25 (12)	LC13 (RC13)			
24 (13)	LC14 (RC14)			
23 (14)	LOUT (ROUT)	Audio signal output		

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Pin No.	Name	Function	Input/output circuit schematic
20	MUTE	Mute signal input	
18	DET2	Detector 2 input	
17	FIL2	Connects to filter capacitor for detector 2	
43	FLAT	Flat position on/off control	
19	DET1	Detector 1 input	
39	PLSS	On/off control for sound leak reduction circuit	
40	TEST2	Test pin Leave open normally	
41	FIL1	Connects to filter capacitor for sound leak reduction circuit	
42	TEST1	Test pin Leave open normally	
44	ROCK	Rock position on/off control	
45	POPS	Pop position on/off control	
46	FIL3	Connects to filter capacitor for pop position	

Pin No.	Name	Function	Input/output circuit schematic
16	TEST3	Test pin Leave open normally	
22	Vcc	Voltage supply	
21	BIAS	Connects to bypass capacitor for reference voltage	
15	GND	Ground substrate	

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- Electrical characteristics (unless otherwise indicated, $T_a = 25^\circ\text{C}$, $V_{CC} = 2\text{V}$, $f = 1\text{kHz}$, $V_{IN} = 100\text{mVrms}$, flat position on, sound leak reduction circuit off)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current 1	I_{CC1}	1.6	2.2	2.8	mA	Flat position off, jazz position on
Supply current 2	I_{CC2}	1.75	2.5	3.25	mA	
Supply current 3	I_{CC3}	1.9	2.7	3.5	mA	Sound leak reduction circuit on
Voltage gain	G_V	-17	-14	-11	dB	
Total harmonic distortion	THD	—	0.11	1	%	
Output noise voltage	V_{NO}	—	14	60	μVrms	$R_g=0\Omega$ DIN AUDIO
Low range boost level 1	Bst1	17.5	20	22	dB	$f=70\text{Hz}$ Jazz position on
Low range boost level 2	Bst2	5.2	7.2	9.2	dB	$f=70\text{Hz}$ Rock position on
Mid-range boost level	Bst3	4.7	6.7	8.7	dB	$f=1.5\text{kHz}$ Pop position on
High range cutoff level 1	Cut1	6	8	10	dB	$f=5\text{kHz}$ Sound leak reduction circuit on $V_{DET1}=100\text{mVrms}$
High range cutoff level 2	Cut2	5	7	9	dB	$f=5\text{kHz}$ Sound leak reduction circuit on $V_{DET1}=10\text{mVrms}$
High range cutoff level 3	Cut3	—	3	5	dB	$f=5\text{kHz}$ Sound leak reduction circuit on $V_{DET1}=1\text{mVrms}$

● Measurement circuit

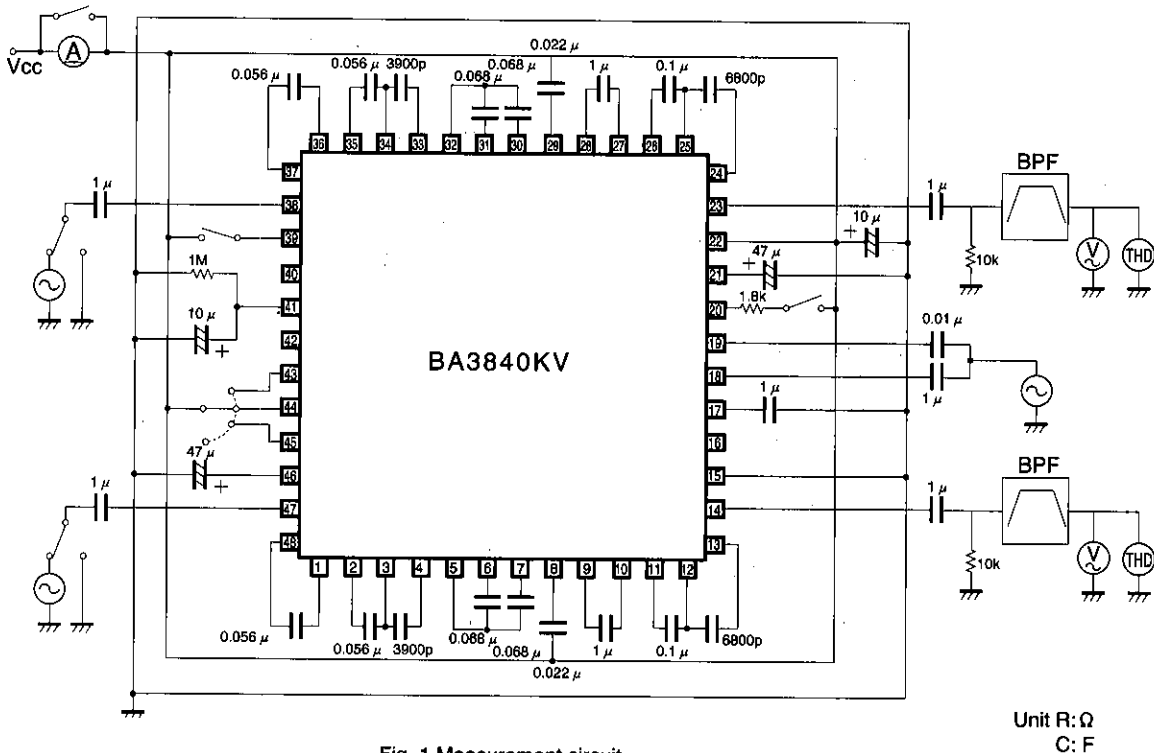


Fig. 1 Measurement circuit

Unit R: Ω
C: F

● Circuit operation

1. Preset graphic equalizer

- A. Flat position
By pulling up the FLAT pin to V_{cc} , frequency characteristics become flat.
- B. Rock position
By pulling up the ROCK pin to V_{cc} , low frequencies are boosted by about 7dB. High frequencies are also adjusted to balance the subjectively heard sound.
- C. Pop position
By pulling up the POPS pin to V_{cc} , mid-range frequencies are boosted by about 6dB and combined with the rock position characteristics.
- D. Jazz position
By open-circuiting the above three pins, low frequencies are boosted by 14dB. High frequencies are also adjusted to balance the subjectively heard sound.

2. Sound leak reduction circuit

If the stereo output signal from the power amplifier is mixed and input to the DET 1 pin and the PLSS pin pulled up to V_{cc} , the sound frequencies close to 5kHz that leak easily will be cut off in accordance with the volume.

3. MUTE pin

If the MUTE pin is pulled up to V_{cc} , the effective graphic equalizer position will be FLAT regardless of the selected position. (However, if the pop position has been selected, the mid-range boost will be maintained.)

4. DET 2 pin

If the stereo output signal from the power amplifier is mixed and input to the DET 2 pin, the effective graphic equalizer position will be FLAT during high level output regardless of the selected position. (However, if the pop position has been selected, the mid-range boost will be maintained.)

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● Example of application circuit

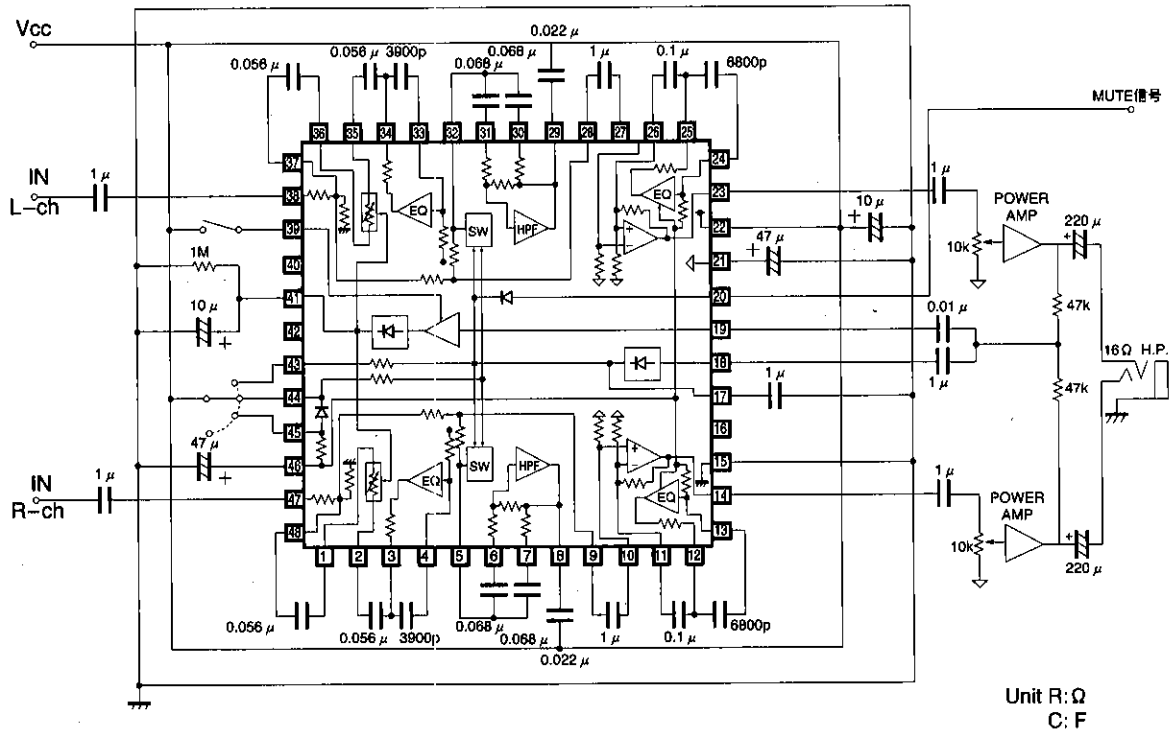


Fig. 2 Example of application circuit

● Operation notes

1. Graphic equalizer positions

When selecting a position, be sure to open-circuit the non-selected pins.

If any are pulled down to ground, over-current can result.

2. Test pins

The test pins are all connected to internal circuits. They are not NC pins, therefore open-circuit them, do not ground them.

3. Recommended operating conditions

Furthermore, if a condition for an electrical characteristic is not satisfied while within the ambient operating temperature range, the standard value for that electrical characteristic cannot be guaranteed. Despite this, however, no abrupt changes to the electrical characteristic will occur.

● Electrical characteristic curves

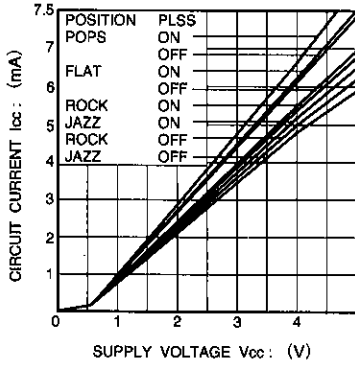


Fig. 3 Supply current vs. supply voltage

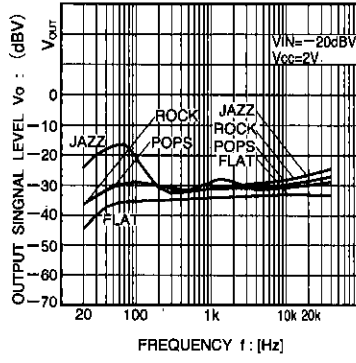


Fig. 4 Output voltage level vs. frequency (1)

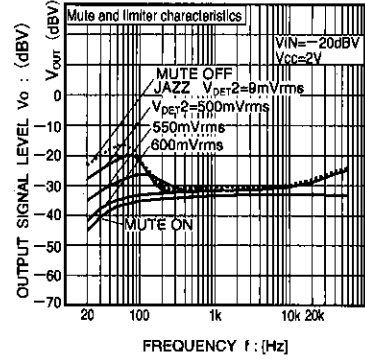


Fig. 5 Output signal level vs. frequency (2)

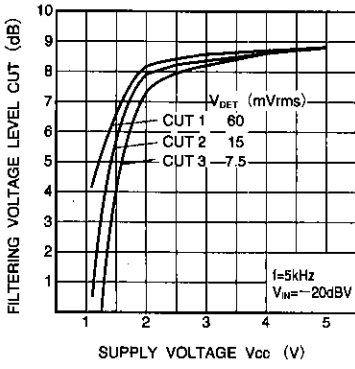
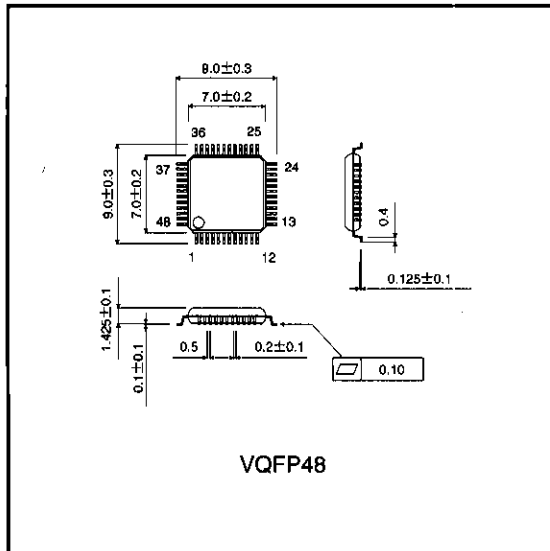


Fig. 6 Sound leak reduction vs. supply voltage

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● External dimensions (Unit: mm)



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