

# 3V dual pre/power amplifier

## BA3516

The BA3516 is a dual pre/power amplifier designed for headphone stereo applications. It operates off a 3V supply. The preamplifier block can be direct-coupled, and the power amplifiers do not require bootstrap capacitors, and use a fixed-gain negative feedback circuit to reduce the number of external components required and allow compact and reliable set designs.

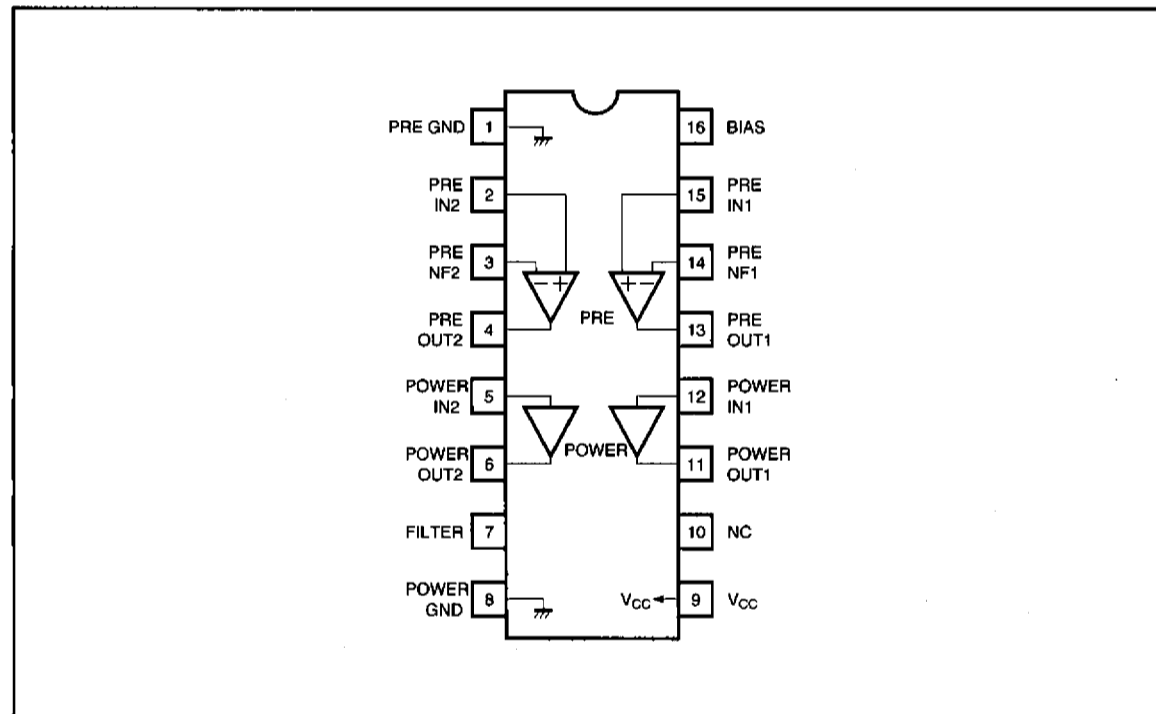
●Applications

3V headphone stereos and 3V radio cassette players.

●Features

- 1) Dual preamplifiers and power amplifiers on one chip.
- 2) Preamplifiers can be direct coupled.
- 3) Bootstrap capacitors for the power amplifiers are not required.
- 4) The preamplifiers have high gain (78dB), low noise ( $1 \mu\text{Vrms}$ ), and low distortion (0.03%).
- 5) The power amplifiers have high output ( $40\text{mW} \times 2$ ), low noise ( $80 \mu\text{Vrms}$ ), and low distortion (0.5%).

●Block diagram



● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V <sub>CC</sub>	4.5	V
Power dissipation	P <sub>d</sub>	1000*1	mW
Operating temperature	T <sub>opr</sub>	-25~75	°C
Storage temperature	T <sub>stg</sub>	-55~125	°C

\*1 Reduced by 10.0mW 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 <sub>CC</sub>	1.8	2.4	3.6	V

● Electrical characteristics (unless otherwise specified Ta = 25°C, V<sub>CC</sub> = 2.4V and f = 1kHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Quiescent circuit current	I <sub>Q</sub>	—	8	14	mA	V <sub>IN</sub> =0V <sub>rms</sub>	Fig.1
<Preamplifier> R <sub>L</sub> =10kΩ							
Open-circuit voltage gain	G <sub>VO</sub>	72	78	—	dB	V <sub>O</sub> =-10dBm	Fig.1
Maximum output voltage	V <sub>OM</sub>	200	300	—	mV <sub>rms</sub>	THD=1%	Fig.1
Total harmonic distortion	THD <sub>1</sub>	—	0.03	0.15	%	V <sub>O</sub> =0.2V <sub>rms</sub> , NAB33dB	Fig.1
Input conversion-noise voltage	V <sub>NI</sub>	—	1.0	1.8	μV <sub>rms</sub>	R <sub>g</sub> =2.2kΩ, BPF20~20kHz	Fig.1
Ripple rejection	RR <sub>1</sub>	40	47	—	dB	V <sub>RR</sub> =-20dBm, f=100Hz NAB33dB, R <sub>g</sub> =2.2kΩ	Fig.1
Input bias current	I <sub>B1</sub>	—	60	300	nA	V <sub>IN</sub> =0V <sub>rms</sub>	Fig.1
<Power amplifier> R <sub>L</sub> =16Ω							
Rated output	P <sub>OUT</sub>	30	40	—	mW	THD=10%	Fig.1
Closed-circuit voltage gain	G <sub>VC</sub>	34	36	38	dB	V <sub>IN</sub> =-40dBm	Fig.1
Total harmonic distortion	THD <sub>2</sub>	—	0.5	1.5	%	P <sub>O</sub> =1mW	Fig.1
Output noise voltage	V <sub>NO</sub>	—	80	125	μV <sub>rms</sub>	R <sub>g</sub> =0Ω, BPF20~20kHz	Fig.1
Ripple rejection	RR <sub>2</sub>	35	48	—	dB	V <sub>RR</sub> =-20dBm, f=100Hz, R <sub>g</sub> =0Ω	Fig.1
Input resistance	R <sub>IN</sub>	21.4	30	38.6	kΩ	—	Fig.1
Input bias current	I <sub>B2</sub>	—	22	80	nA	V <sub>IN</sub> =0V <sub>rms</sub> , R <sub>g</sub> =10kΩ*1	Fig.1
Channel balance	CB	—	0	0.7	dB	V <sub>O</sub> =-10dBm	Fig.1
<Preamplifier + power amplifier connection as per application example circuit>>							
Channel separation	CS <sub>L-R</sub>	27	37	—	dB	Pre-R <sub>g</sub> =2.2kΩ, V <sub>R</sub> Max.*2 Single channel Power-V <sub>O</sub> =-5dBm BPF20~20kHz	Fig.1
Leakage from preamp to power amp for signal leak V <sub>R</sub> Min.	SL	—	-63	-57	dBm	Power-R <sub>g</sub> =0Ω*3 When both channels are operating Pre V <sub>OUT</sub> =-12dBm	Fig.1

\*1  $I_{B2} = \frac{V_{B2}}{10k\Omega} \times \frac{4}{3}$

V<sub>B2</sub>: Voltage at each end of R<sub>g</sub>=10kΩ.

\*2 0dB attenuation from the preamplifier output to power amplifier input.

\*3 Power amplifier signal source impedance is 0Ω

Pre/power amplifiers for headphone stereos  
Low-frequency amplifiers

● Measurement circuit

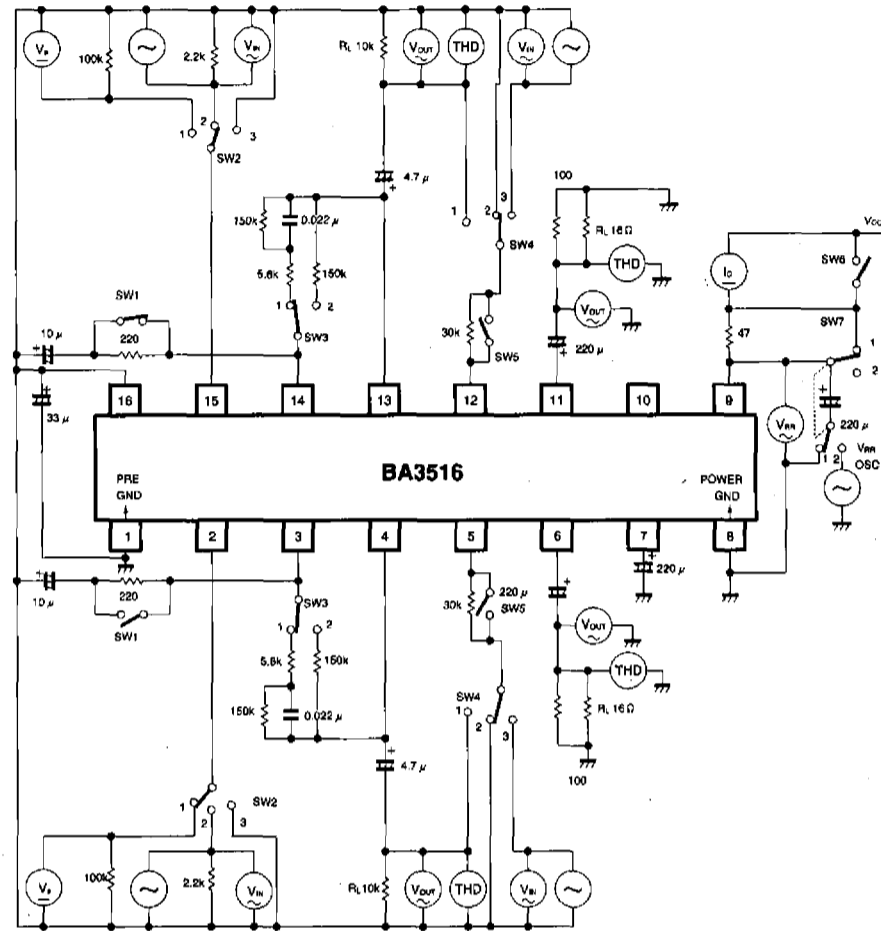


Fig. 1

● Application example

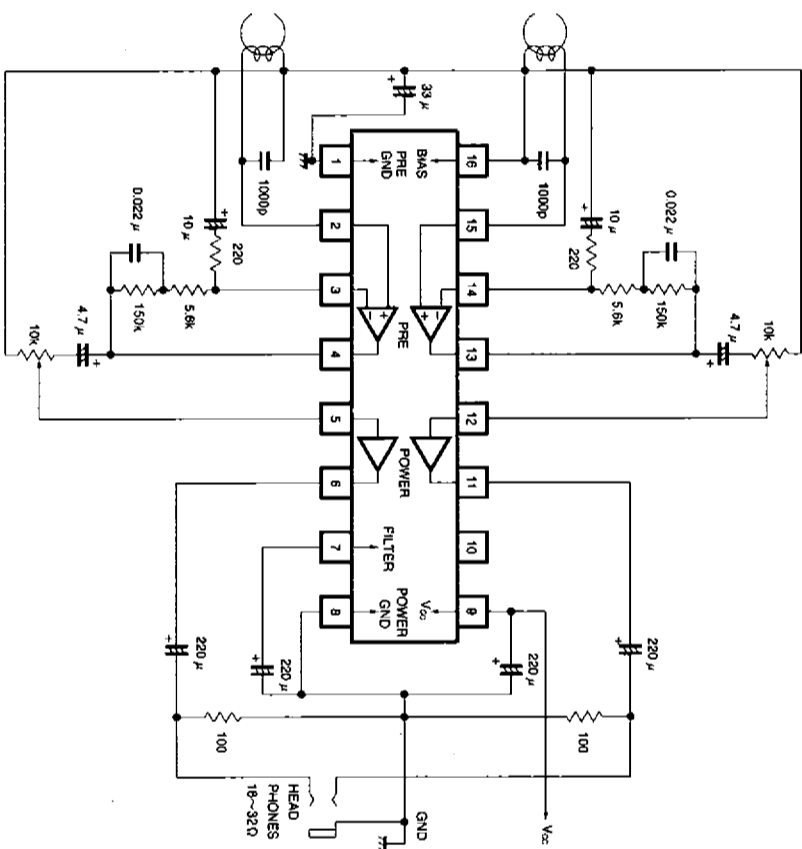
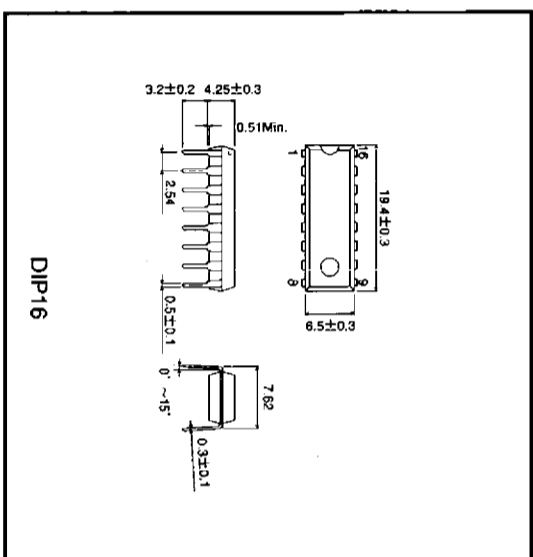


Fig. 2

● External dimensions (Unit: mm)



Low-frequency amplifiers Pre/power amplifiers for headphone stereos