3V dual pre/power amplifier
BA3513AFS

The BA3513AFS is a dual, pre/power amplifier designed for headphone stereo applications. It has all of the basic signal circuits required for tape players, and operates off a 3V supply.
The auto-reverse-compatible preamplifier block and fixed-gain power amplifier blocks are independent to facilitate noise reduction.
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) Preamplifier suitable for auto-reverse use.
3) Transistor switch provided for metal-tape muting.
4) Power amplifier gain is optimized for noise reduction.
5) Radiation prevention pin provided.

●Absolute maximum ratings (Ta = 25℃)

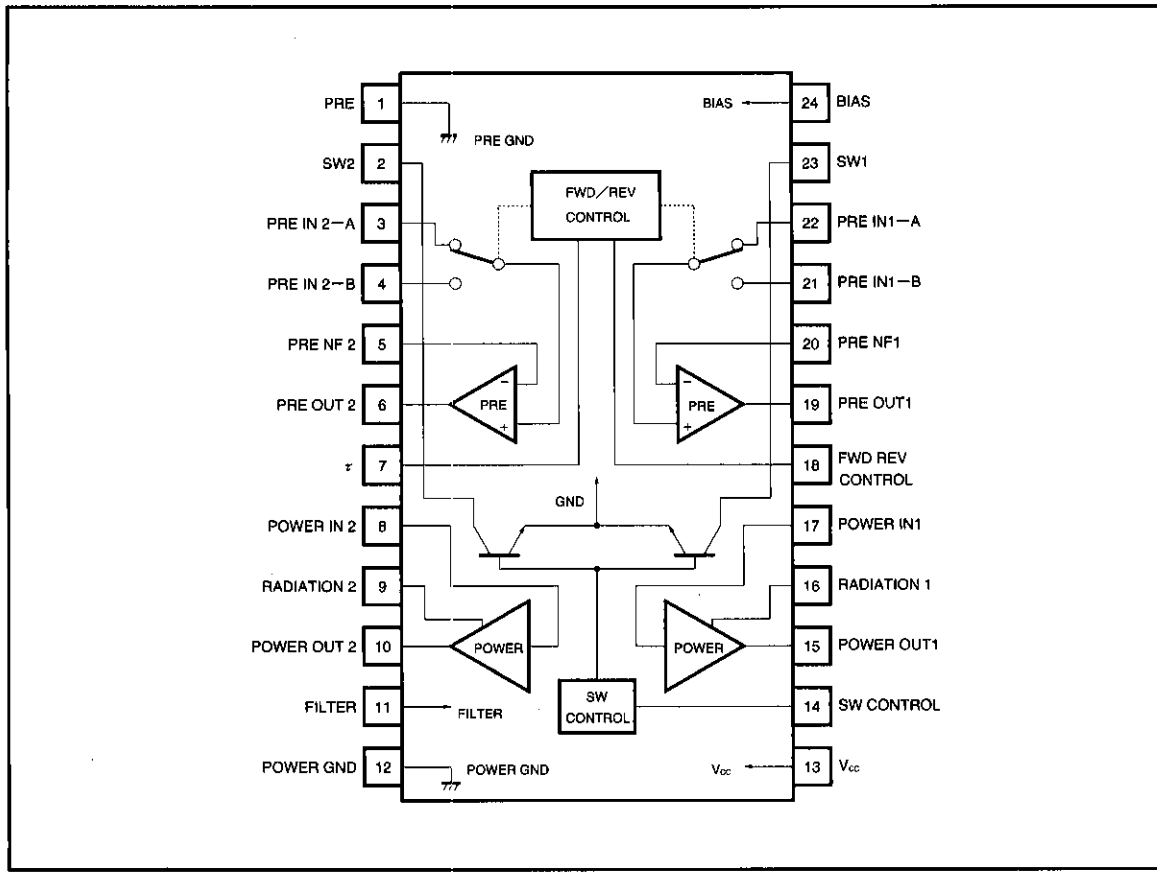
Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	4.5	V
Power dissipation	Pd	800*	mW
Operating temperature	Topr	−25~75	℃
Storage temperature	Tstg	−55~125	℃

* When mounted on a 90mm x 50mm x 1.6mm glass-epoxy PCB, reduced by 8.0mW for each increase in Ta of 1°C over 25°C

●Recommended operating conditions (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	1.8	2.4	3.6	V

●Block diagram



●Electrical characteristics (unless otherwise specified Ta = 25℃, V_{CC} = 2.4V and f = 1kHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Quiescent circuit current	I_Q	—	8	14	mA	V_{IN}=0V_{rms}, 14, 18pin Open	Fig.7
〈Preamplifier〉 R_L=10kΩ							
Open-circuit voltage gain	G_{VO}	72	78	—	dB	V_O=−10dBm	Fig.7
Maximum output voltage	V_{OM}	200	300	—	mVrms	THD=1%	
Total harmonic distortion	THD_1	—	0.03	0.15	%	V_O=0.2V_{rms}, NAB33dB	
Input conversion-noise voltage	V_{NIN}	—	1.0	1.8	μVrms	R_g=2.2kΩ, BPF20~20kHz	
Ripple rejection	RR_1	40	47	—	dB	V_{RR}=−20dBm, f=100Hz NAB33dB, Rg=2.2kΩ	
Forward-reverse crosstalk	CT_{F-R}	65	75.5	—	dB	Single channel Vo = -10dBm R_g=2.2kΩ, BPF20~20kHz	
Input bias current	I_{B1}	—	60	300	nA	V_{IN}=0V_{rms}	
〈Power amplifier〉 R_L=16kΩ							
Rated output	P_{OUT}	30	40	—	mW	THD=10%	Fig.7
Closed-circuit voltage gain	G_{VC}	24.7	26.7	28.7	dB	V_{IN}=−40dBm	
Total harmonic distortion	THD_2	—	0.2	1.0	%	P_O=1mW	
Output noise voltage	V_{NO}	—	30	39	μVrms	R_g=0Ω, BPF20~20kHz	
Ripple rejection	RR_2	45	58	—	dB	V_{RR}=−20dBm, f=100Hz, R_g=0Ω	
Input resistance	R_{IN}	21.4	30	38.6	kΩ	—	
Input bias current	I_{B2}	—	22	80	nA	V_{IN}=0V_{rms}, R_g=10kΩ *1	
Channel balance	CB	—	0	0.7	dB	V_O=−10dBm	
Switching transistor ON resistance	R_{TR}	—	6.0	18	Ω	14pin GND, 2pin, 23pin	
Preamplifier + power amplifier (connection as per application example circuit)							
Channel separation	CS	37	47	—	dB	P_{re}-R_g=2.2kΩ, VR Max.*2 Single channel Power-Vo = -5dBm BPF20~20kHz	Fig.7
Leakage from preamp to power amp for signal leak VR Min.	SL	—	−63	−57	dBm	P_{re}-V_O=−12dBm VR Min.*3, When both channels are operating	

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

V_{B2}: Voltage at each end of Rg (10Ω).

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

*3 Power amplifier signal source impedance is 0Ω.

●Electrical characteristics curves

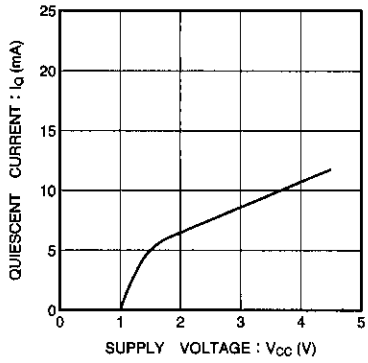


Fig. 1 Quiescent current vs. supply voltage

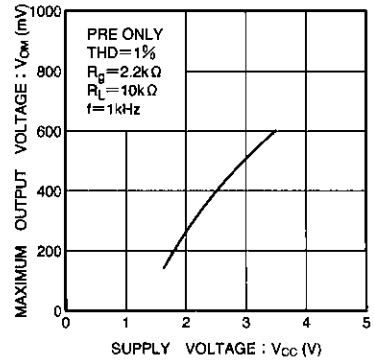


Fig. 2 Maximum output power vs. supply voltage

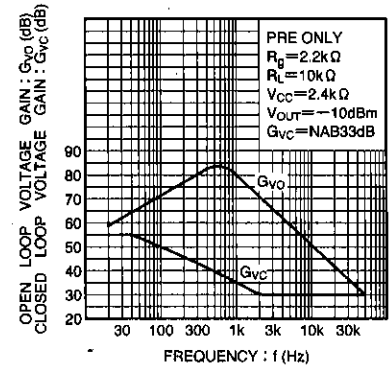


Fig. 3 Voltage gain vs. frequency

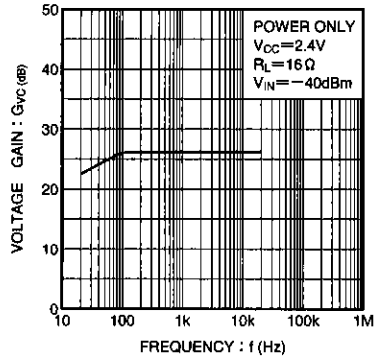


Fig. 4 Voltage gain vs. frequency

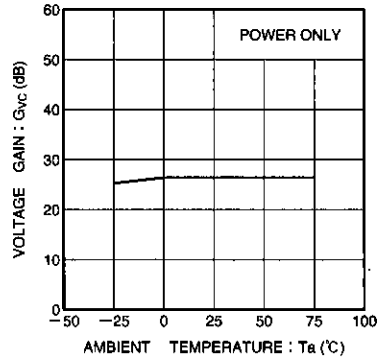


Fig. 5 Voltage gain vs. ambient temperature

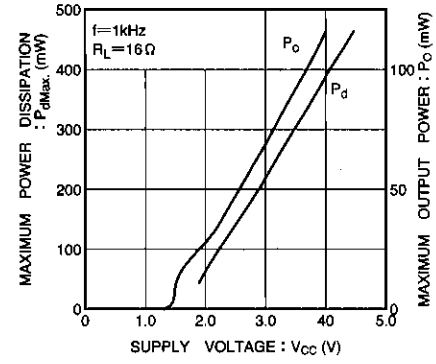


Fig. 6 Maximum power dissipation and output power vs. supply voltage

●Measurement circuit

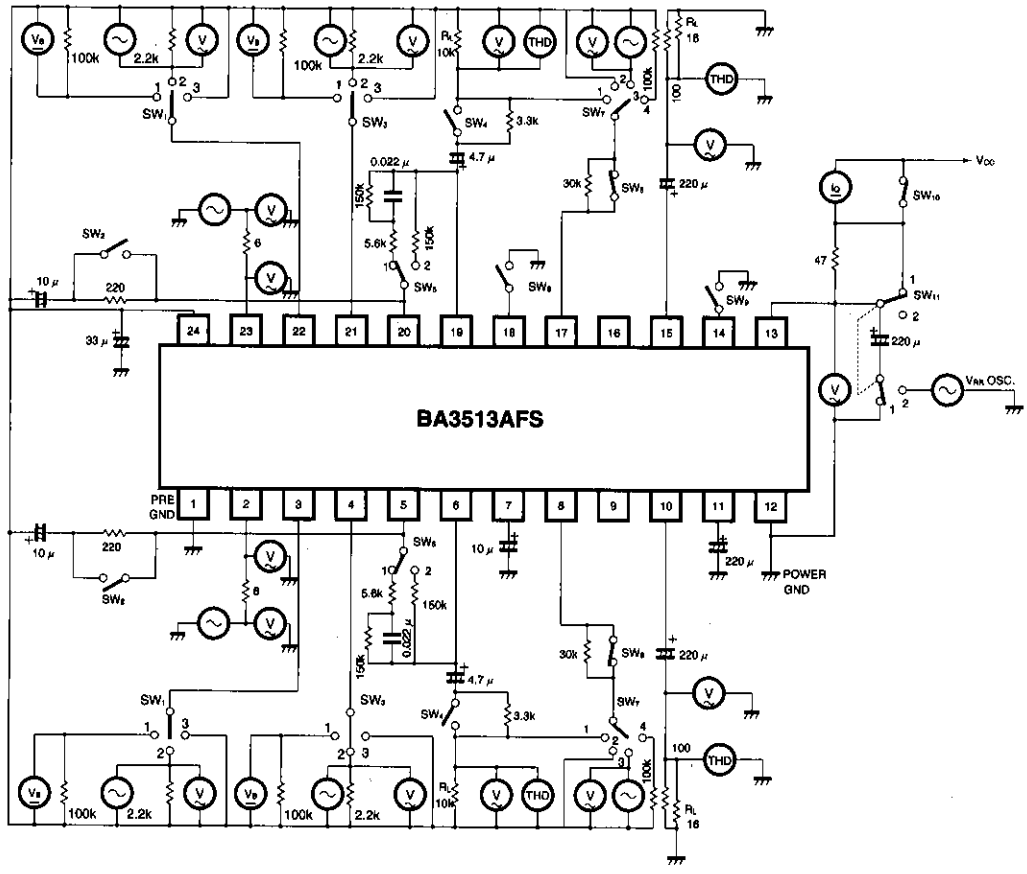
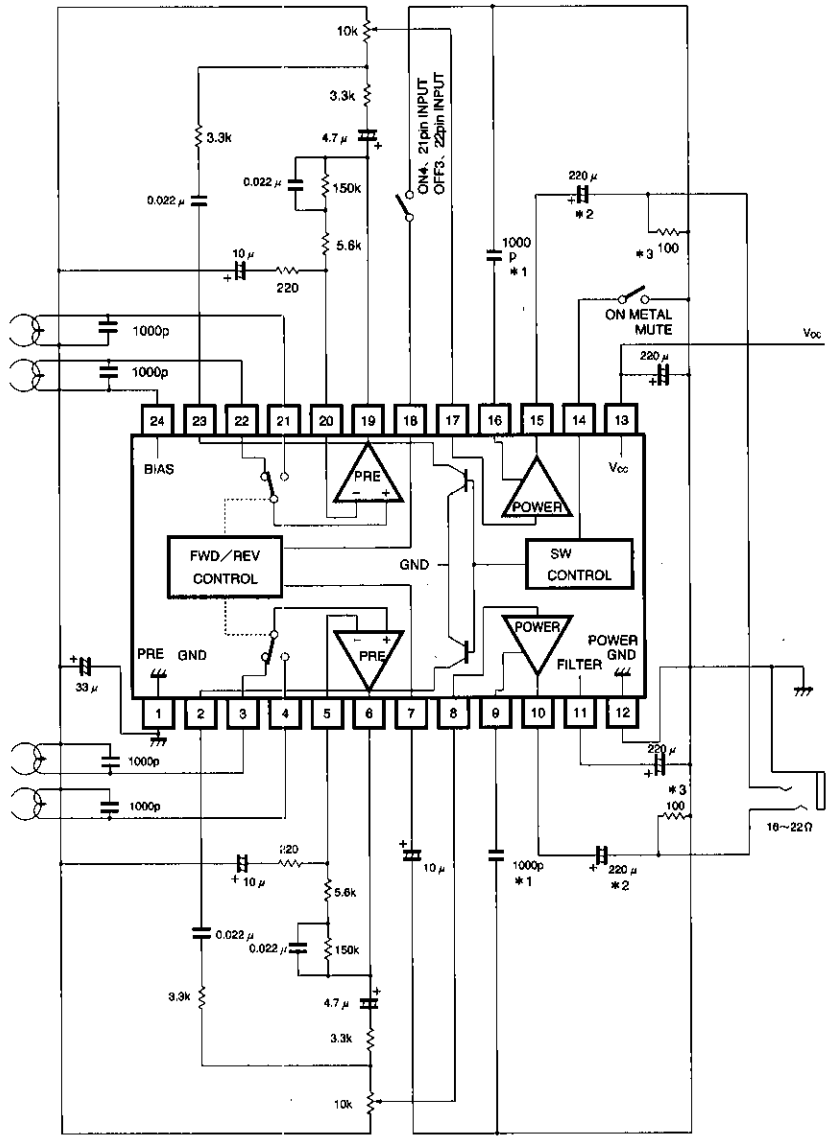


Fig. 7

Units:
Resistance: Ω (±1%)
Capacitance (film): F (±1%)
Capacitance (electrolytic): F (±5%)

●Application example



Units:
Resistance: Ω (±5%)
Capacitance (film): F (±10%)
Capacitance (electrolytic): F (±20%)

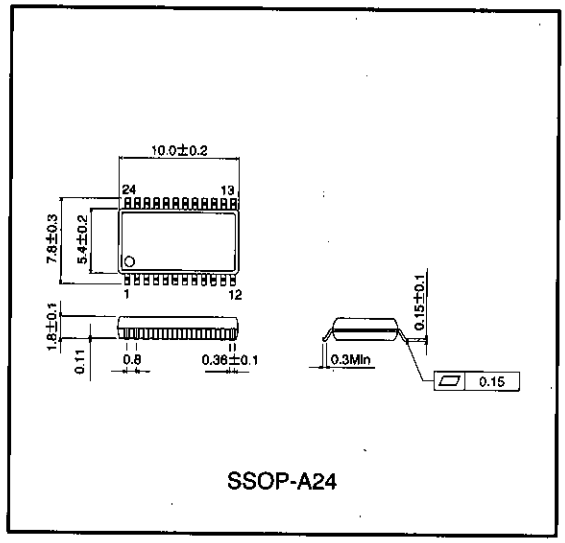
*1 Connect a 1000pF capacitor as a countermeasure against RF noise. Normally not required.

*2 220 μF for 16Ω headphones.
100 μF for 32Ω headphones.

*3 Depending on the headphones, connect a 47Ω resistor and 0.01 μF capacitor between pin 10 (pin15) and GND.

Fig. 8

●External dimensions (Unit: mm)



SSOP-A24

Notes

- The contents described in this catalogue are correct as of March 1997.
- No unauthorized transmission or reproduction of this book, either in whole or in part, is permitted.
- The contents of this book are subject to change without notice. Always verify before use that the contents are the latest specifications. If, by any chance, a defect should arise in the equipment as a result of use without verification of the specifications, ROHM CO., LTD., can bear no responsibility whatsoever.
- Application circuit diagrams and circuit constants contained in this data book are shown as examples of standard use and operation. When designing for mass production, please pay careful attention to peripheral conditions.
- Any and all data, including, but not limited to application circuit diagrams, information, and various data, described in this catalogue are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO., LTD., disclaims any warranty that any use of such device shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes absolutely no liability in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices; other than for the buyer's right to use such devices itself, resell or otherwise dispose of the same; no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by ROHM CO., LTD., is granted to any such buyer.
- The products in this manual are manufactured with silicon as the main material.
- The products in this manual are not of radiation resistant design.

The products listed in this catalogue are designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys). Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers, or other safety devices) please be sure to consult with our sales representatives in advance.

- Notes when exporting
  - It is essential to obtain export permission when exporting any of the above products when it falls under the category of strategic material (or labor) as determined by foreign exchange or foreign trade control laws.
  - Please be sure to consult with our sales representatives to ascertain whether any product is classified as a strategic material.