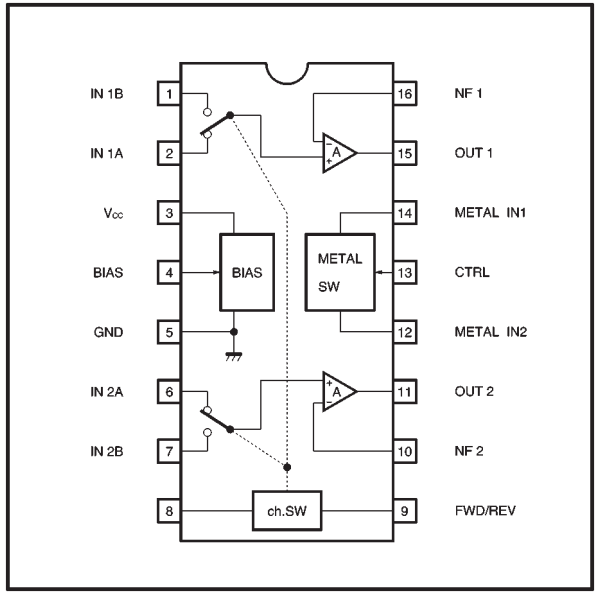
1.5V dual auto-reverse preamplifier
BA3413FS

The BA3413FS is a 1.5V dual auto-reverse preamplifier designed for playback operation only.
It includes built-in circuits for metal tape and auto-reverse applications, and its significantly streamlined component side offers a minimal requirement for external components.

●Applications
1.5V headphone stereos

●Features
1) Low noise.
2) Can be directly coupled to the tape head.
3) Supports auto-reverse.
4) Supports metal tape.
5) Good reduced voltage characteristics (0.9V Typ.).

●Block diagram



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	2.2	V
Power dissipation	Pd	650*	mW
Operating temperature	Topr	−25～+75	℃
Storage temperature	Tstg	−55～+125	℃

* When mounted on a 90mm × 50mm × 1.6mm glass epoxy board. Reduced by 6.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	0.9	1.25	2.0	V

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 1.25V, and f = 1kHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	I_Q	0.3	0.9	1.6	mA	V_{IN}=0V_{rms}
Open loop voltage gain	G_{VO}	50	65	—	dB	V_O=−20dBV
Input conversion noise voltage	V_{NIN}	—	1.2	2.0	μV_{rms}	R_g=2.2kΩ, V_{IN}=0V_{rms}
Maximum output voltage	V_{OM}	200	350	—	mV_{rms}	THD=1%
Channel separation	CS	50	60	—	dB	R_g=2.2kΩ, V_O=0.2V_{rms}
A / B crosstalk	CT_{A-B}	50	65	—	dB	R_g=2.2kΩ, V_O=0.2V_{rms}
Total harmonic distortion	THD	—	0.05	0.2	%	V_O=0.2V_{rms}
Input bias current	I_B	—	125	500	nA	V_{IN}=0V_{rms}
Metal mute level	MUTE	3.0	4.5	7.0	dB	V_O=−20dBV, f=10kHz

●Measurement circuit

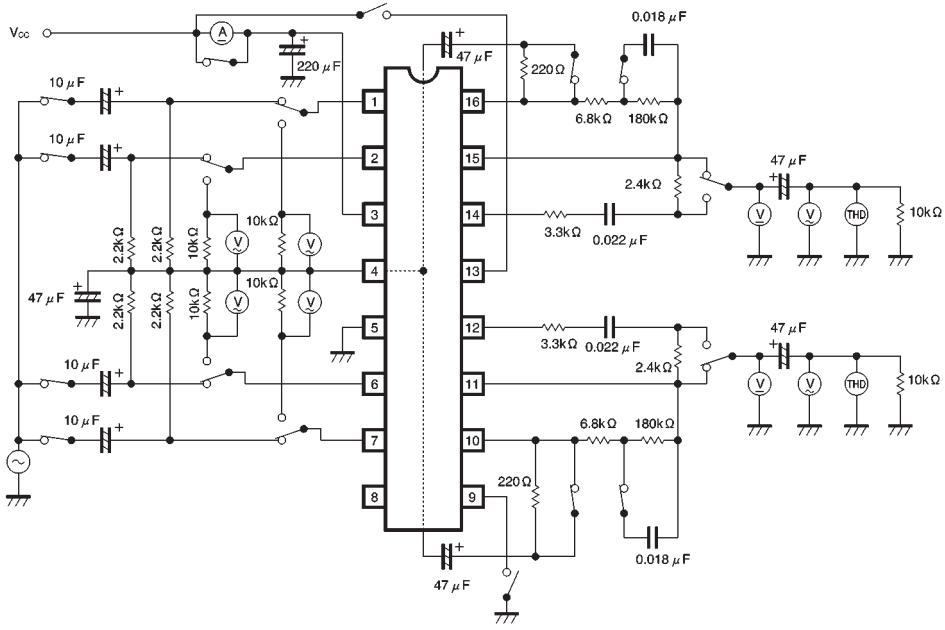


Fig.1

●Application example

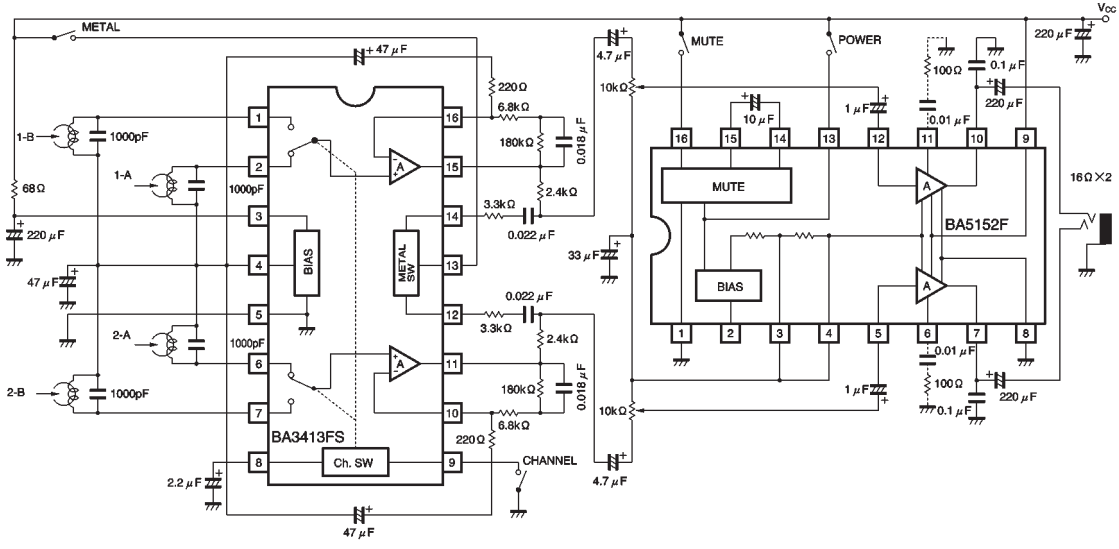


Fig.2

●Circuit operation

(1) Input stage

At the input stage the pin 4 bias is the input and the negative feedback virtual earth, and the bias for the input stage transistor is taken from pin 4. This allows direct head coupling. Connect a 1000pF capacitor in parallel with the tape head to prevent high-frequency interference.

(2) Input switching

The auto-reverse switching circuit switches the constant current supply for the first-stage transistor, and responds depending on whether pin 9 is open circuit or connected to GND. The reverse timing can be adjusted by changing the value of the capacitor connected to pin 8 (see Fig. 3).

(3) Equalizer

The equalizer is based on a NAB120μS NF-type equalizer, and has 70μS muting added for metal tape applications. The equalizer constants can be changed by switching pin 13 between open circuit and V_{CC} (see Fig. 4).

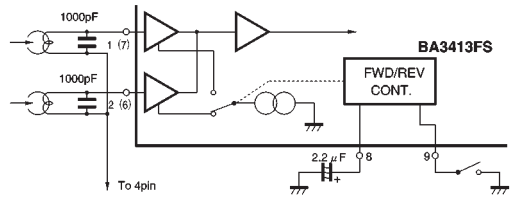


Fig. 3

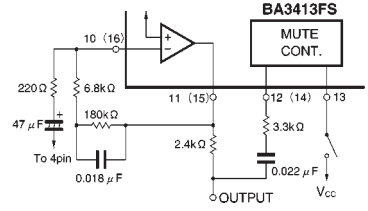


Fig. 4

●Electrical characteristics curves (Ta = 25°C)

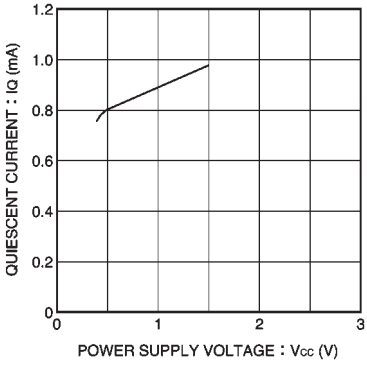


Fig. 5 Quiescent current vs. power supply voltage

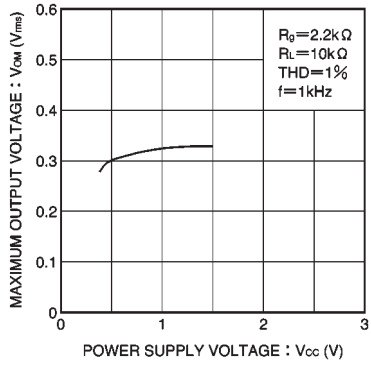


Fig. 6 Maximum output voltage vs. power supply voltage

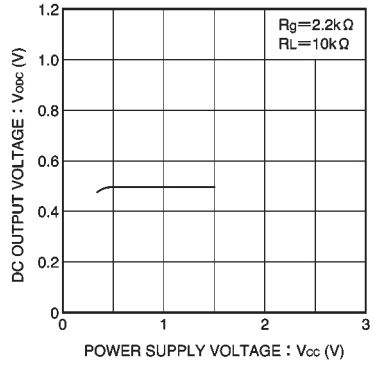


Fig. 7 DC output voltage vs. power supply voltage

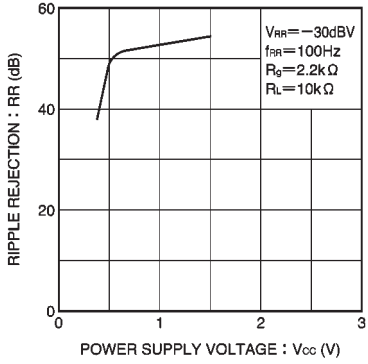


Fig. 8 Ripple rejection ratio vs. power supply voltage

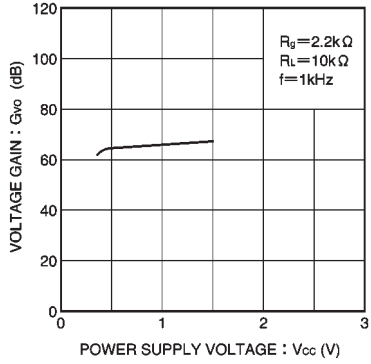


Fig. 9 Voltage gain vs. power supply voltage

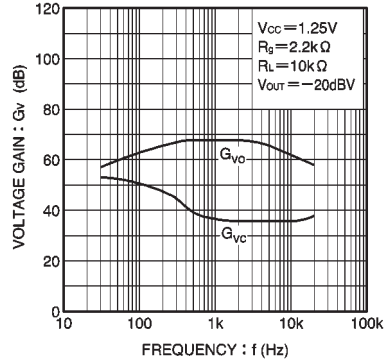


Fig. 10 Voltage gain vs. frequency

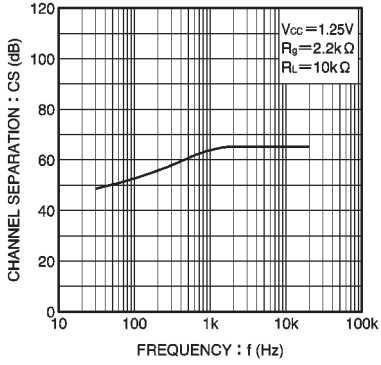


Fig. 11 Crosstalk vs. frequency

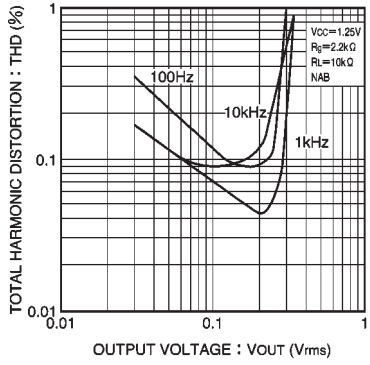


Fig. 12 Total harmonic distortion vs. output voltage

●External dimensions (Units: mm)