

# Recording amplifier with built-in ALC for headphone stereos

## BA3641FV

The BA3641FV is an option IC developed for the purpose of adding a recording function to 1-chip playback system ICs (BA3612AKV, etc.) for headphone stereos.

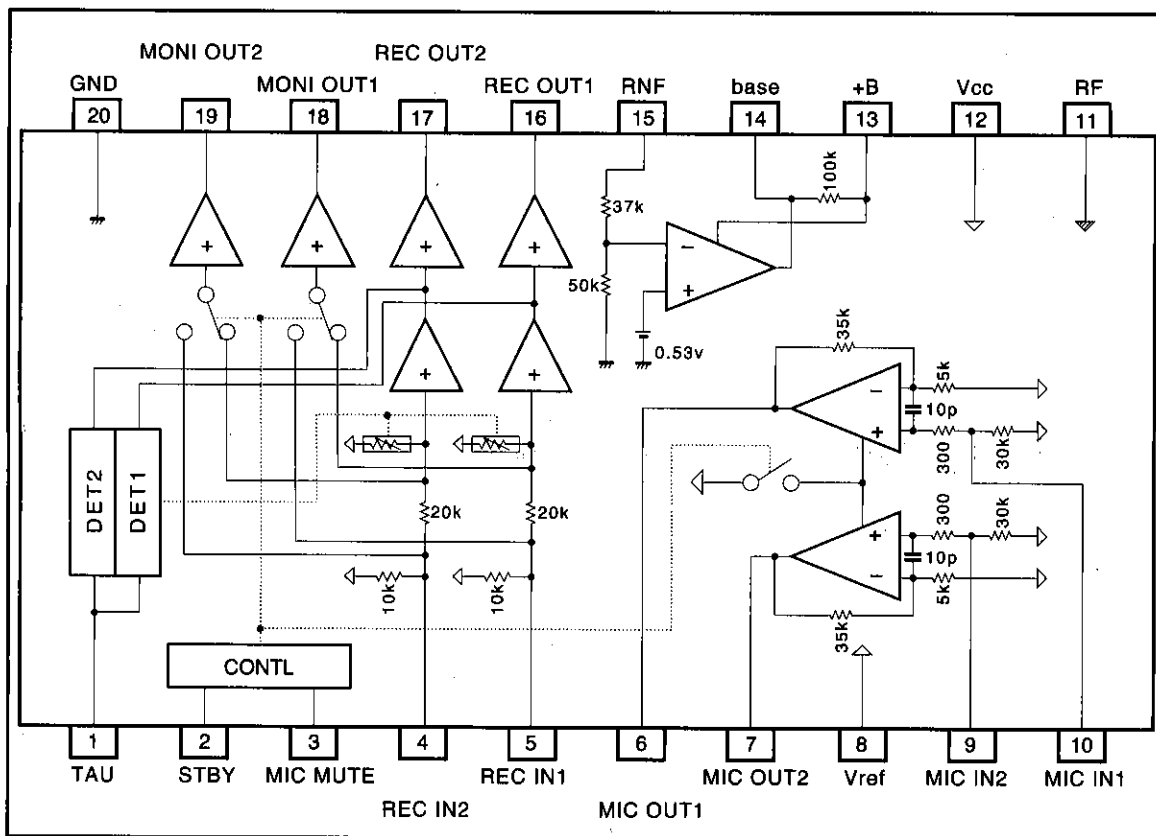
●Applications

Headphone stereos with recording function

●Features

- 1) Two built-in microphone amplifier channels.
- 2) Microphone mute function (radio / microphone switching).
- 3) Two built-in recording amplifier channels (with ALC).
- 4) Two built-in monitor output amplifier channels (radio / microphone switching).
- 5) Built-in regulators for the erase head and bias OSC circuit.

●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>	400*	mW
Operating temperature	T <sub>opr</sub>	-15~+75	°C
Storage temperature	T <sub>stg</sub>	-55~+125	°C

\* Reduced by 4.0mW for each increase in Ta of 1°C over 25°C.

● Recommended supply voltage ranges (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V <sub>cc</sub>	1.7~3.6	V
	RF	1.5~3.6	V
	+B	0.9~3.6	V
	V <sub>ref</sub>	0.95~2.0	V


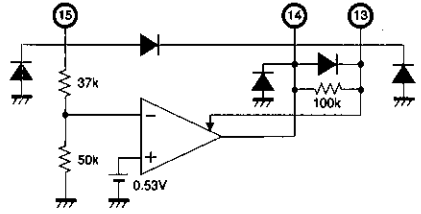
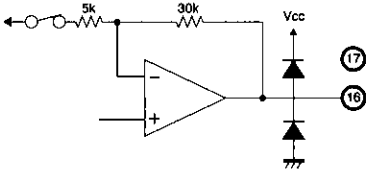
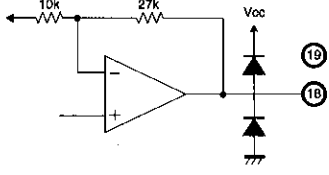
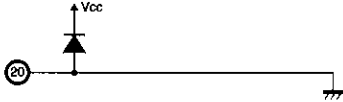
\* RF voltage must be less than V<sub>cc</sub> voltage.

● Pin description

Pin No.	Pin symbol	I/O	DC voltage	Equivalent circuit	Function
1	TAU	I/O	During detection 0.7V  Not during detection 0V		ALC detector output smoothing pin  Note : As this pin has an extremely high impedance, the characteristics do not allow using an external resistor with a high resistance.
2	STBY	I	Hi : +B LO : 0V		IC supply voltage switch pin See the switch logic table
3	MIC MUTE	I	Hi : +B LO : 0V		Microphone amp mute control pin See the switch logic table
4	REC IN2	I	Vref		Common input pin for recording amp and monitor amp
5	REC IN1				
6	MIC OUT1	I/O	Vref		Microphone amp output pin
7	MIC OUT2				
9	MIC IN2	I	Vref		Microphone amp input pin
10	MIC IN1				
8	Vref	I	Vref		Reference voltage input pin
11	RF	I	RF		Ripple filter voltage input pin

Headphone stereo recording ICs

Low-frequency amplifiers

Pin No.	Pin symbol	I/O	DC voltage	Equivalent circuit	Function
12	Vcc	I	Vcc		Supply voltage input pin
13	+B	I	+B		Battery supply voltage input pin
14	base	O	+B-0.7V		Control pin for external regulator transistor
15	RNF	I	0.92V		Regulator output feedback pin
16	REC OUT1	I/O	Vref		Recording amp output pin STBY : When low Hi-Z
17	REC OUT2				
18	MONI OUT1	I/O	Vref		Monitor amp output pin
19	MONI OUT2				
20	GND	I	0V		Ground pin (SUB pin)

- Electrical characteristics (unless otherwise indicated,  $V_{cc} = 2.3V$ ,  $R_F = 2.0V$ ,  $+B = 1.2V$ ,  $V_{ref} = 1.0V$ ,  $R_L = 5k\Omega$ ,  $f = 1kHz$ , DIN-AUDIO,  $T_a = 25^\circ C$ )

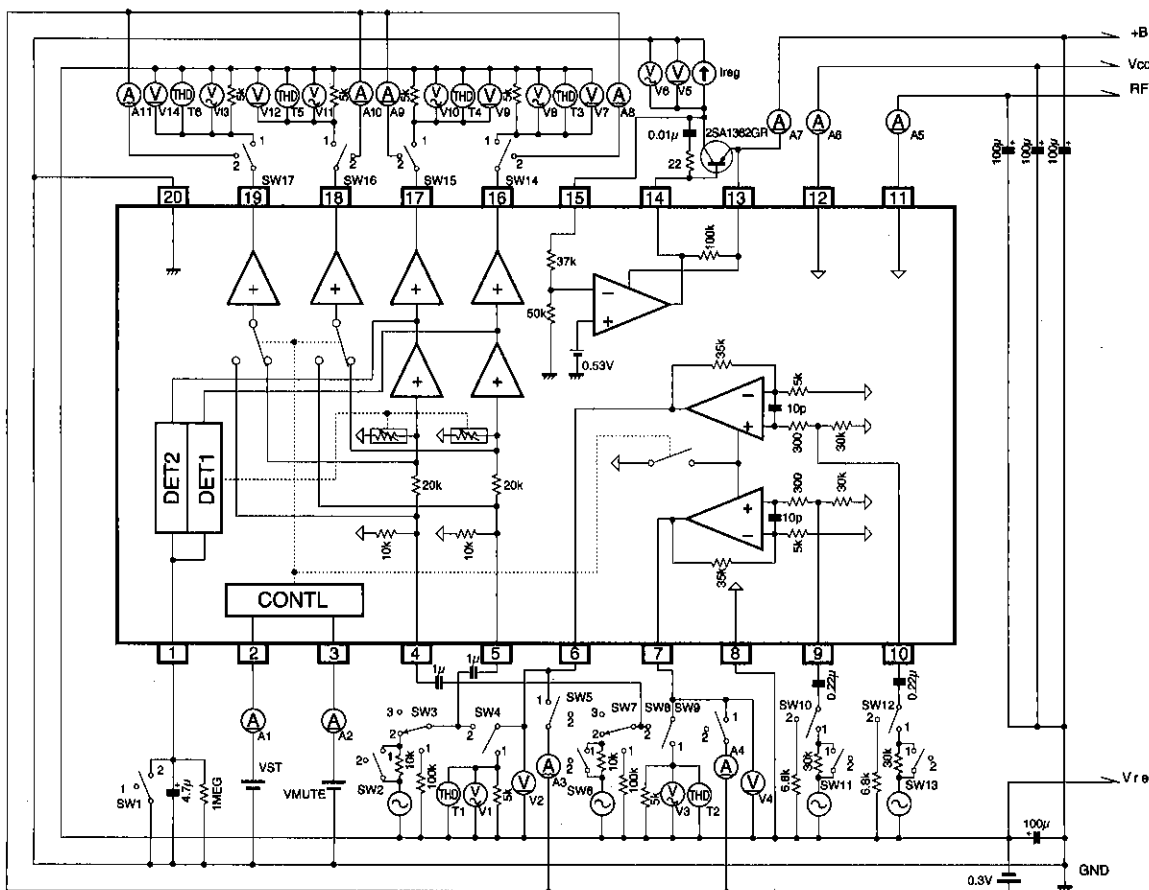
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Quiescent current 1	IQV1	1.5	2.7	4.2	mA	〈MIC—REC〉 $V_{ST} : Hi, V_{MUTE} : Lo$	
	IQR1	0.84	1.40	2.10	mA		
Quiescent current 2	IQV2	1.5	2.7	4.2	mA	〈Tuner—REC〉 $V_{ST} : Hi, V_{MUTE} : Hi$	
	IQR2	0.7	1.1	1.6	mA		
Quiescent current 3	IQV3	—	0	5	$\mu A$	〈Tuner—PLAY〉 $V_{ST} : Lo, V_{MUTE} : Hi$	
	IQR3	270	450	675	$\mu A$		
Regulator supply current	ICCB	—	4.03	4.28	mA	$V_{ST} : Hi, I_{reg}=4.0mA$	
Standby supply current	ISTV	—	0	5	$\mu A$	〈TAPE—PLAY〉 $V_{ST} : Lo, V_{MUTE} : Lo$	
	ISTR	—	0	5	$\mu A$		
	ISTB	—	0	5	$\mu A$		
Microphone amp	Closed loop voltage gain	GVC1	16	18	20	dB	$V_o = -15dBv$
	Maximum output voltage	VOM1	220	300	—	mVrms	$V_{cc}=1.7V, R_F=1.5V, THD=1\%$
	Total harmonic distortion	THD1	—	0.1	0.8	%	$V_{cc}=1.7V, R_F=1.5V, V_o = -15dBv$
	Output noise voltage	VNO1	—	14	30	$\mu Vrms$	$R_g=6.8k\Omega$
	Microphone mute attenuation	MUTE1	80	88	—	dB	$V_o = -15dBv, 1kHzBPF+DIN AUDIO$
	Channel crosstalk	CT1	60	75	—	dB	$V_o = -15dBv, 1kHzBPF+DIN AUDIO$ $R_g=6.8k\Omega$
	Ripple rejection rate	RR1	70	85	—	dB	$V_{cc}=1.7V (R=-20dBv), R_F=1.5V$ 130HzBPF+DIN AUDIO $R_g=6.8k\Omega$
	Input impedance	Rin1	20	30	40	k $\Omega$	
	Output impedance for muting	Rout1(z)	32	40	48	k $\Omega$	$V_{MUTE} : Hi$
Monitor amp	Closed loop voltage gain	GVC2	10.0	11.5	13.0	dB	$V_o = -15dBv, ALC=OFF$
	Maximum output voltage	VOM2	220	300	—	mVrms	ALC=OFF $V_{cc}=1.7V, R_F=1.5V, THD=1\%$
	Total harmonic distortion	THD2	—	0.1	0.8	%	ALC=OFF $V_{cc}=1.7V, R_F=1.5V, V_o = -15dBv$
	Microphone noise voltage	VNO2M	—	18	40	$\mu Vrms$	$R_g=100k\Omega, V_{ST} : Hi, V_{MUTE} : Lo$
	Tuner noise voltage	VNO2T	—	12	30	$\mu Vrms$	$R_g=100k\Omega, V_{ST} : Hi, V_{MUTE} : Hi$
	Channel crosstalk	CT2	60	77	—	dB	$V_o = -15dBv, 1kHzBPF+DIN AUDIO$ $R_g=100k\Omega, ALC=OFF$
	Ripple rejection rate	RR2	75	85	—	dB	$V_{cc}=1.7V (R=-20dBv), R_F=1.5V$ 130HzBPF+DIN AUDIO $R_g=100k\Omega, ALC=OFF$
	Standby output impedance	Rout2(z)	25	31	37	k $\Omega$	$V_{ST} : Lo, V_{MUTE} : Lo$

Headphone stereo recording ICs

Low-frequency amplifiers

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
Recording amp	Closed loop voltage gain	GVC3	34	36	38	dB	$V_o = -10\text{dBv}$ , ALC=OFF
	Maximum output voltage	VOM3	400	450	—	mVrms	ALC=OFF $V_{cc}=1.75\text{V}$ , $R_F=1.5\text{V}$ , THD=1%
	Total harmonic distortion	THD3	—	0.2	0.8	%	ALC=OFF $V_{cc}=1.7\text{V}$ , $R_F=1.5\text{V}$ , $V_o = -10\text{dBv}$
	Output noise voltage	VNO3	—	350	500	$\mu\text{Vrms}$	$R_g=100\text{k}\Omega$ , $V_{MUTE} : \text{Hi}$
	Channel crosstalk	CT3	50	65	—	dB	$V_o = -15\text{dBv}$ , 1kHzBPF+DIN AUDIO $R_g=100\text{k}\Omega$ , ALC=OFF
	Ripple rejection rate	RR3	55	65	—	dB	$V_{cc}=1.7\text{V}$ ( $R = -20\text{dBv}$ ), $R_F=1.5\text{V}$ 130HzBPF+DIN AUDIO $R_g=100\text{k}\Omega$ , ALC=OFF
	Input impedance	Rin3	6.4	8.0	9.6	$\text{k}\Omega$	ALC=OFF
	Output impedance for muting	Rout3(z)	1.0	—	—	$\text{M}\Omega$	$V_{ST} : \text{Lo}$ , $V_{MUTE} : \text{Lo}$
Microphone amp and recording amp	REC OUT ALC characteristics	VALC1	-18.0	-16.0	-14.0	dBv	$V_{in} = -70\text{dBv}$
		VALC2	-9.4	-7.8	-6.5	dBv	$V_{in} = -60\text{dBv}$
		VALC3	-10.2	-8.2	-6.7	dBv	$V_{in} = -30\text{dBv}$
	REC OUT total harmonic distortion	THD-R2	—	0.4	0.9	%	$V_{in} = -60\text{dBv}$
		THD-R3	—	0.4	0.9	%	$V_{in} = -30\text{dBv}$
	ALC channel balance	G <sub>CB</sub>	-1.0	0.0	+1.0	dB	$V_{in} = -45\text{dBv}$
	Output noise voltage	VNO4	—	1000	1700	$\mu\text{Vrms}$	$R_g=6.8\text{k}\Omega$
	Channel crosstalk	CT4	45	52	—	dB	$V_o = -15\text{dBv}$ , 1kHzBPF+DIN AUDIO $R_g=6.8\text{k}\Omega$
Ripple rejection rate A REC OUT	RR4	48	54	—	dB	$V_{cc}=1.7\text{V}$ ( $R = -20\text{dBv}$ ), $R_F=1.5\text{V}$ 130HzBPF+DIN AUDIO $R_g=6.8\text{k}\Omega$	
Ripple rejection rate B MONI OUT	RR5	70	77	—	dB	$V_{cc}=1.7\text{V}$ ( $R = -20\text{dBv}$ ), $R_F=1.5\text{V}$ 130HzBPF+DIN AUDIO $R_g=6.8\text{k}\Omega$	
Regulator	Output voltage	Vreg	0.87	0.92	0.96	V	$I_{reg}=50\text{mA}$
	Load regulation	$\Delta V_{reg}$	—	5	30	mV	$I_{reg}=40\text{mA} \sim 60\text{mA}$
	Ripple leak	V <sub>RR</sub>	—	-90	-70	dBv	$V_{cc}=1.7\text{V}$ ( $R = -20\text{dBv}$ ), $R_F=1.5\text{V}$ $+B=1.2\text{V}$ ( $R = -30\text{dBv}$ ), $I_{reg}=50\text{mA}$ 130HzBPF+DIN AUDIO
Switch	High level voltage conditions	VinH	0.77	—	6.00	V	
	Low level voltage conditions	VinL	-0.30	—	0.30	V	
	Input resistance	RINS	80	100	120	$\text{k}\Omega$	$V_{in}=0.3\text{V}$

● Measurement circuit



Headphone stereo recording ICs

Low-frequency amplifiers

Fig. 1 Measurement circuit

- Unit
- Resistors : Ω (±1%)
- Ceramic capacitors : F (±1%)
- Electrolytic capacitors : F (±5%)

● Switch logic table

MIC MUTE \ STBY	High	Low (open)
High	(Tuner-REC) MIC-AMP OFF MONI-AMP ON (ALC : OFF) REC-AMP ON (ALC : ON) Regulator ON	(Tuner-PLAY) MIC-AMP OFF MONI-AMP ON (ALC : OFF) REC-AMP OFF (Hi-Zo) Regulator OFF
Low (open)	(MIC-REC) MIC-AMP ON MONI-AMP ON (ALC : ON) REC-AMP ON (ALC : ON) Regulator ON	(TAPE-PLAY) MIC-AMP OFF MONI-AMP OFF REC-AMP OFF (Hi-Zo) Regulator OFF

●Application circuit

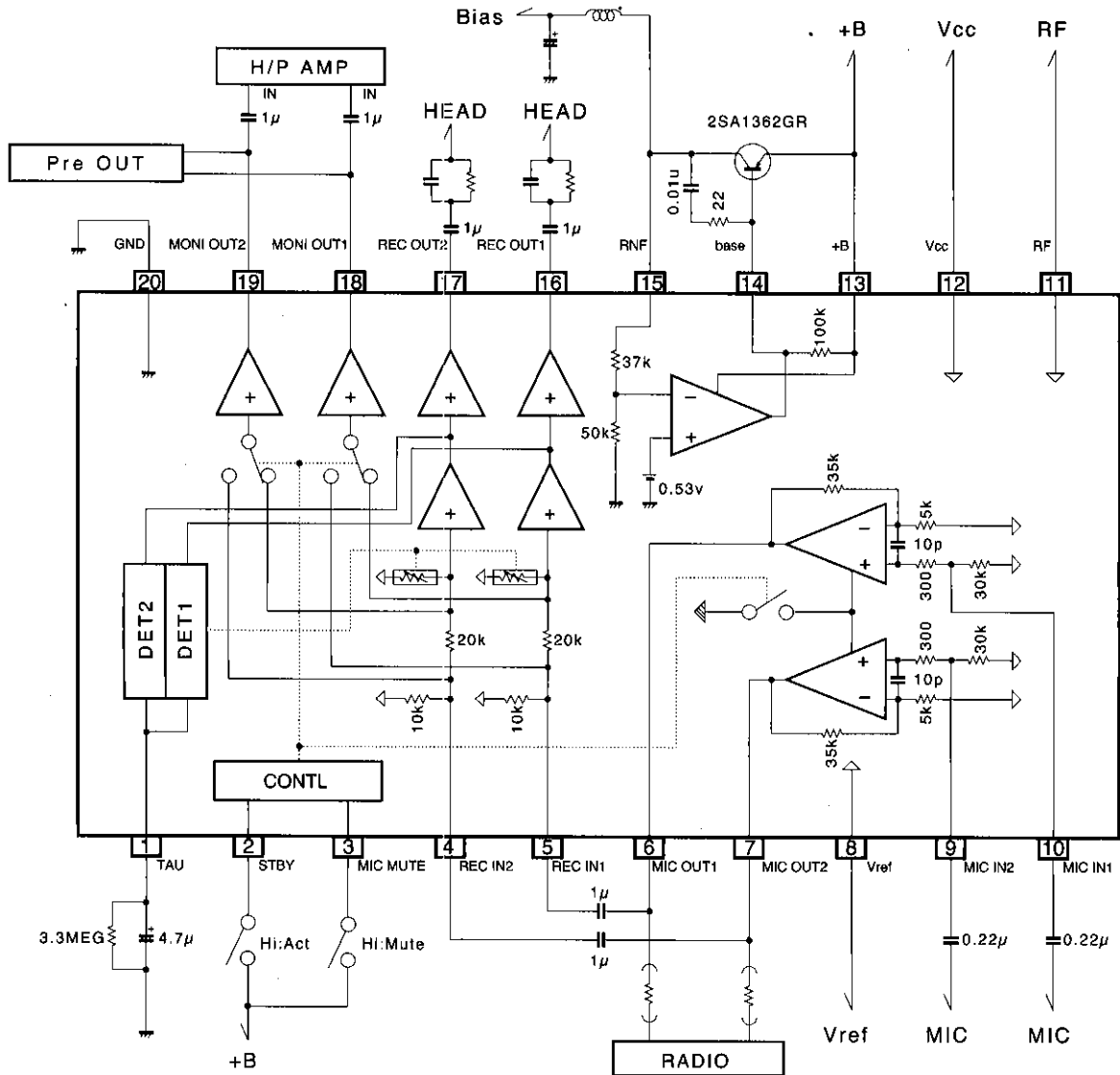


Fig. 2 Application circuit example

- Unit  
 Resistors : Ω (±5%)  
 Ceramic capacitors : F (±10%)  
 Electrolytic capacitors : F (±20%)



● Electrical characteristic curves

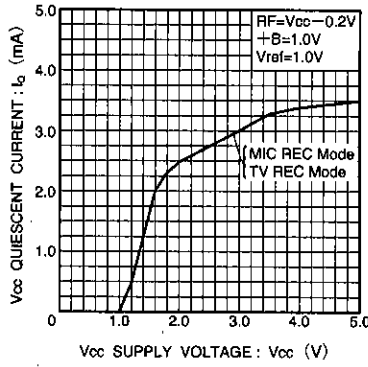


Fig. 3 VCC quiescent current vs. supply voltage

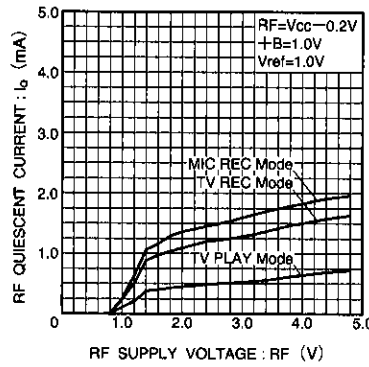


Fig. 4 RF quiescent current vs. supply voltage

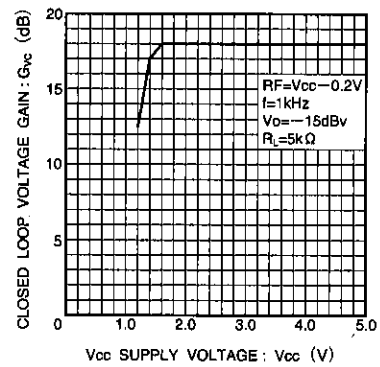


Fig. 5 Microphone amp voltage gain vs. supply voltage

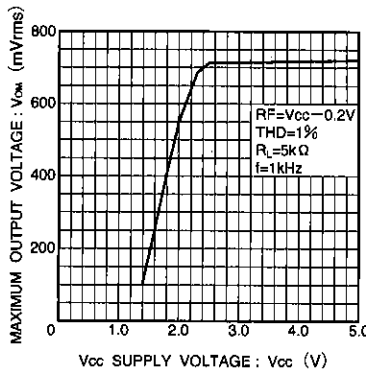


Fig. 6 Maximum microphone amp output voltage vs. supply voltage

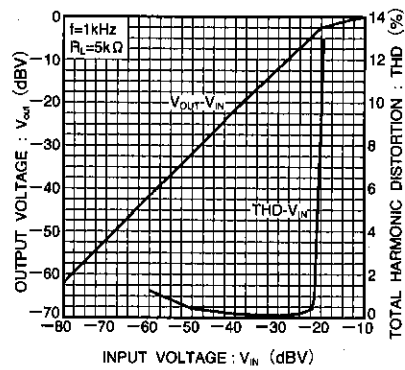


Fig. 7 Microphone amp input/output linearity

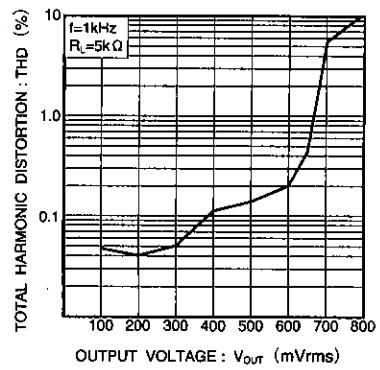


Fig. 8 Microphone amp total harmonic distortion vs. output voltage

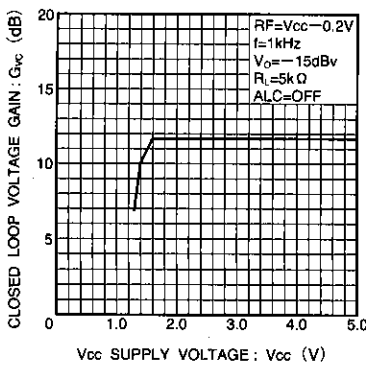


Fig. 9 Monitor amp voltage gain vs. supply voltage

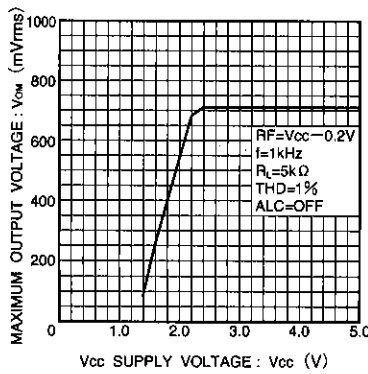


Fig. 10 Maximum monitor amp output voltage vs. supply voltage

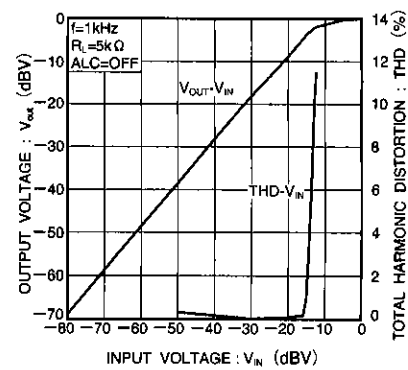


Fig. 11 Monitor amp input/output linearity

Headphone stereo recording ICs

Low-frequency amplifiers

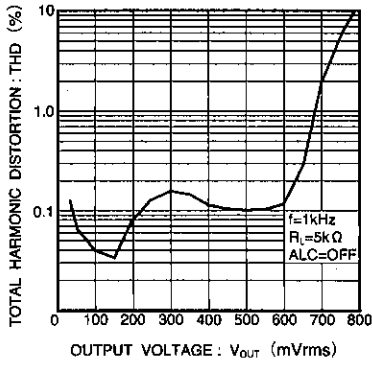


Fig. 12 Monitor amp total harmonic distortion vs. output voltage

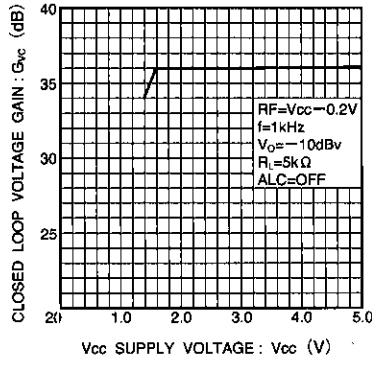


Fig. 13 Recording amp voltage gain vs. supply voltage

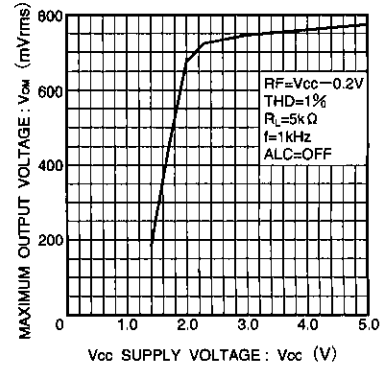


Fig. 14 Maximum recording amp output voltage vs. supply voltage

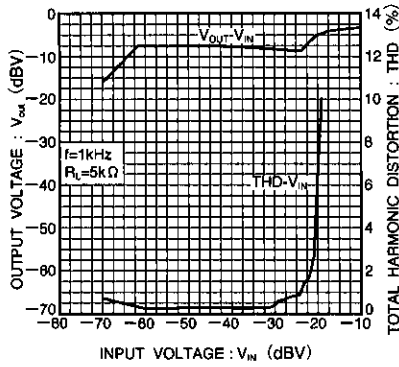


Fig. 15 ALC input/output characteristics of microphone and recording amps

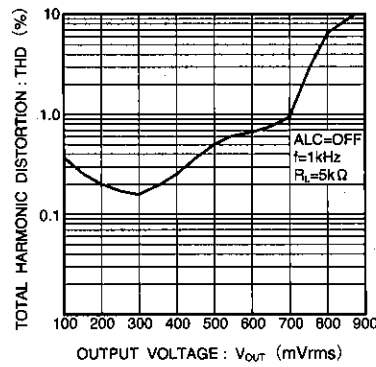


Fig. 16 Recording amp total harmonic distortion vs. output voltage

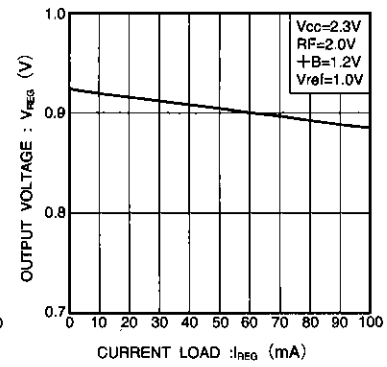


Fig. 17 Regulator output voltage vs. load current

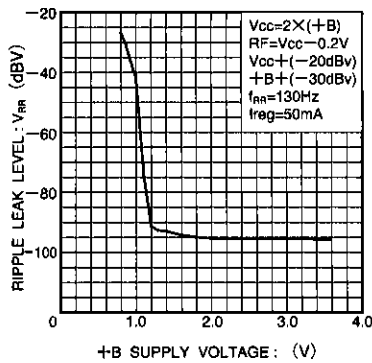
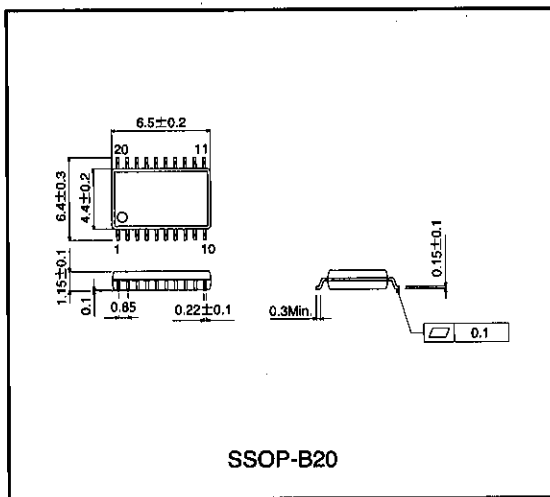


Fig. 18 Regulator ripple level vs. supply voltage

● External dimensions (Unit: mm)



Headphone stereo recording ICs

Low-frequency amplifiers

## 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.