

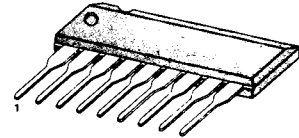
EQUALIZER AMPLIFIER WITH ALC

The KA2220 is a monolithic integrated circuit consisting of a preamplifier and ALC circuit for cassette tape recorders

FEATURES

- Low noise amplifier.
- Wide operating supply voltage range: $V_{CC} = 3.5V \sim 14V$
- High output voltage.
- Low distortion.
- Wide ALC range.
- KA2220 ST: Good ALC pair characteristic for stereo tape recorders

9 SIP



ORDERING INFORMATION

Device	Package	Operating Temperature
KA2220	9 SIP	$-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$

BLOCK DIAGRAM

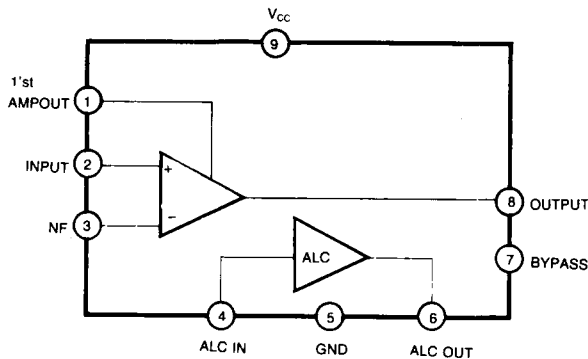


Fig. 1

ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	- 20 ~ + 70	$^\circ\text{C}$
Storage Temperature	T_{STG}	- 40 ~ + 125	$^\circ\text{C}$

3

ELECTRICAL CHARACTERISTICS

($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $R_L = 5.1\text{K}\Omega$, $R_G = 600\Omega$, $f = 1\text{KHz}$, NAB, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	$V_I = 0$, ALC OFF		1.4	2.0	mA
Open Loop Voltage Gain	G_{VO}		66	69		dB
Closed Loop Voltage Gain	G_{VC}	$V_O = 0.7\text{V}$	33	35	37	dB
Output Voltage	V_O	THD=1%	0.7	1.0		V
Total Harmonic Distortion	THD	$V_O = 0.2\text{V}$		0.1		%
Input Resistance	R_I		60	100		$\text{K}\Omega$
Equivalent Input Noise Voltage	V_{NI}	$R_G = 2.2\text{K}\Omega$, NAB BW (- 3dB) = 15Hz ~ 30KHz		1.0		μV
ALC Transistor Saturation Voltage	V_{SAT}			75	100	mV

TEST CIRCUIT

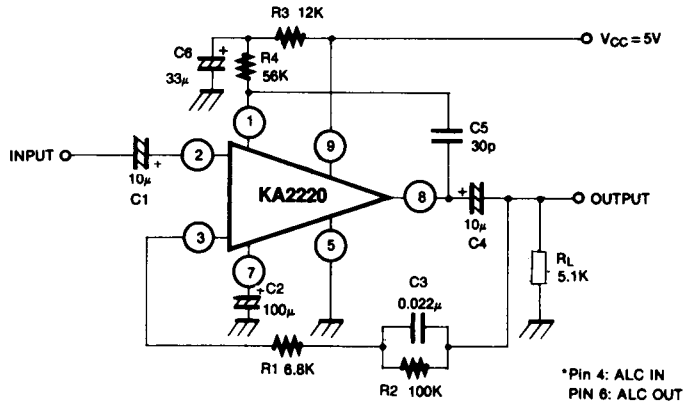
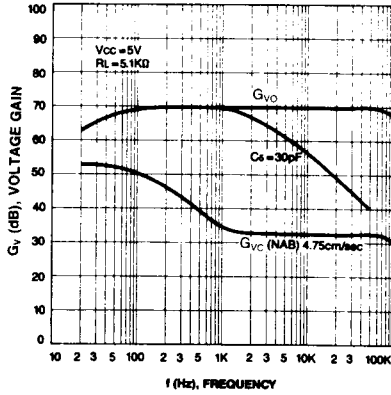
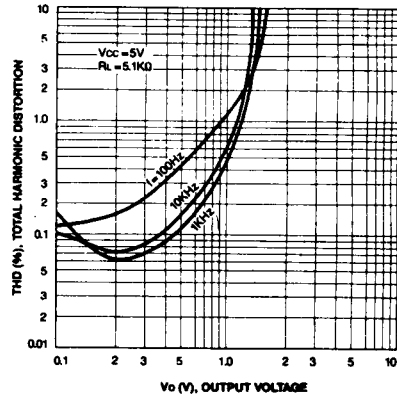


Fig. 2

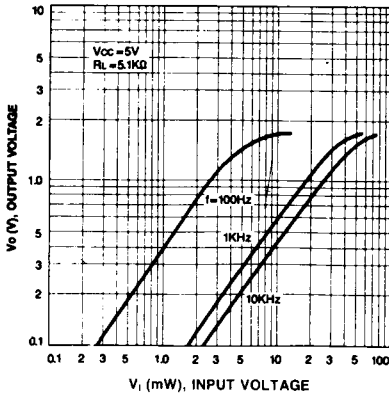
VOLTAGE GAIN-FREQUENCY



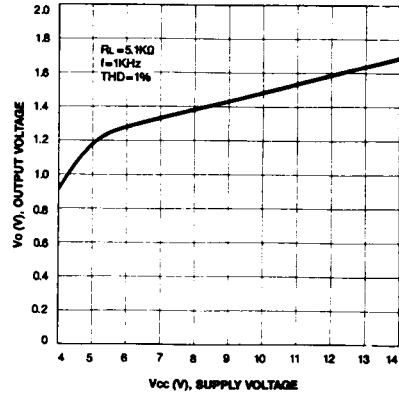
TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE



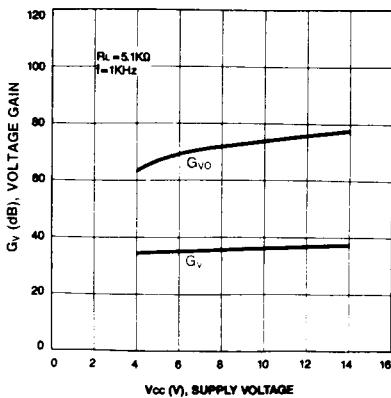
OUTPUT VOLTAGE-INPUT VOLTAGE



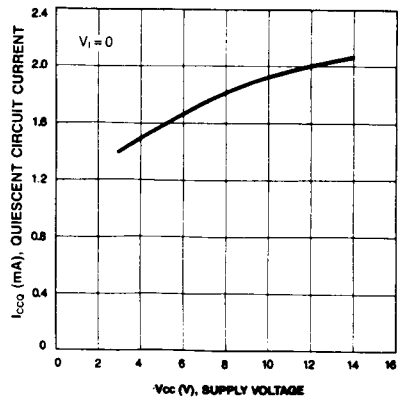
OUTPUT VOLTAGE-SUPPLY VOLTAGE

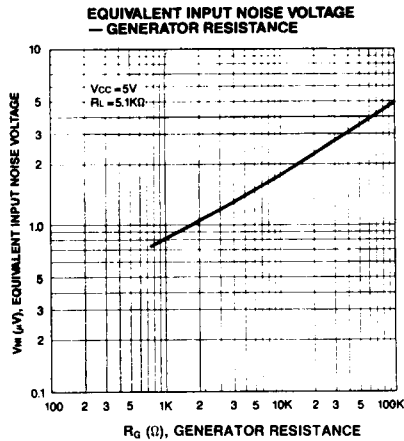


VOLTAGE GAIN-SUPPLY VOLTAGE



QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE





APPLICATION INFORMATION

ACL Grade Binning Table

Symbol	A_v (dB)		ALC Grade (dB)	
	Min	Max	Min	Max
KA2220 J	34	36	- 16.0	- 27.0
KA2220 M			- 25.0	- 34.0

External Components (Refer to test circuits)

- C_1 : Input coupling capacitor
The recommended value is $10\mu F$. If made too small the low frequency characteristics will change for the worse, and too large a capacitance value will increase the resting time when power is applied.
- C_2 : Bypass capacitor
Short emitter resistor on the AC and prevents an AC signal from feedback to input.
- C_3, R_1, R_2 : Equalizer network
The closed loop voltage gain is determined by these components in relation to the internal resistance at Pin 3.
- C_4 : Output coupling capacitor
 C_2 is determined as follows:
- $$C_4 = \frac{1}{2\pi \cdot f_L \cdot R_L}$$
- f_L : low cut-off frequency
 R_L : load resistance
- C_5 : Phase compensation capacitor.
Prevents high frequency oscillation by phase error when feedback is heavy.
- C_6 : Ripple filter for power supply
A large value is required to get an excellent ripple characteristic under the line operation, but must be made smaller to shorten the starting time.
- R_3 : Filter resistance.
- R_4 : Collector resistor of first stage transistor of the IC
Low voltage characteristic can be improved by adjusting this resistance.

ALC GRADE BINNING TEST CIRCUIT

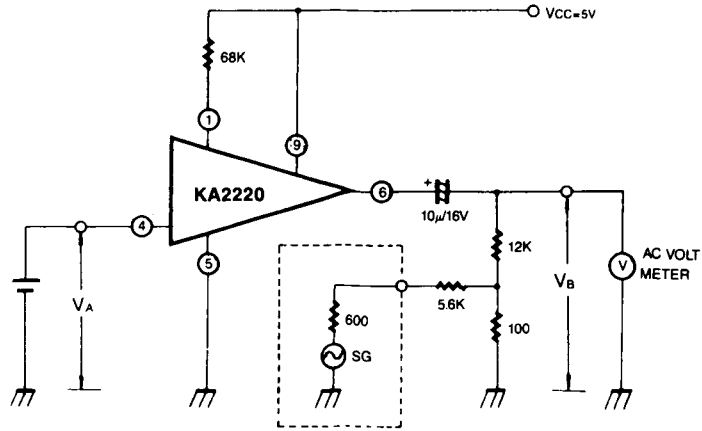


Fig. 3

Test condition: SG output level should be adjusted to be 13.8mV of the AC voltmeter reading (V_B) when the D.U.T is not connected from the test circuit ($V_{CC}=5V$, $V_A=1.16V$, $T_a=25^\circ C$)

ALC RANK is defined as $ALC-G.R=20\log V_{B2}/V_{B1}$
 where

V_{B1} : AC voltmeter reading when the D.U.T is not connected

V_{B2} : AC voltmeter reading when the D.U.T is connected

APPLICATION CIRCUIT

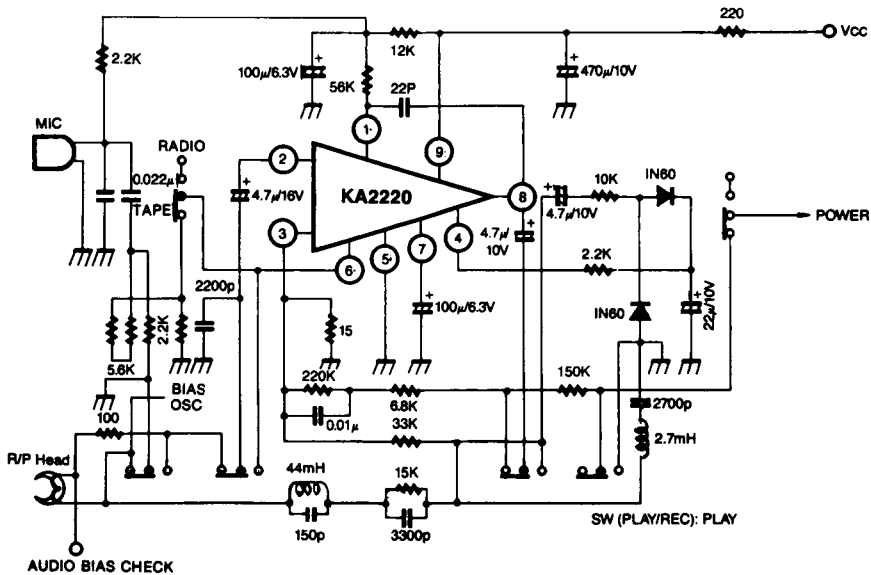


Fig. 4