

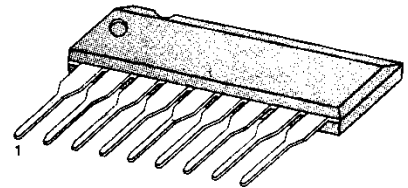
## EQUALIZER AMPLIFIER WITH ALC

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

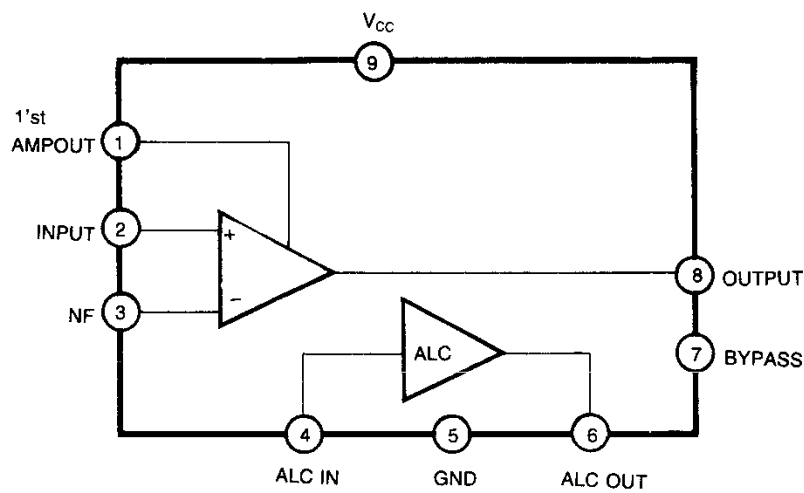


Fig. 1

## 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 | $T_{OPR}$ | $-20 \sim +70$  | $^\circ\text{C}$ |
| Storage Temperature   | $T_{STG}$ | $-40 \sim +125$ | $^\circ\text{C}$ |

## 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<br>BW ( - 3dB ) = 15Hz ~ 30KHz |     | 1.0 |     | $\mu\text{V}$    |
| ALC Transistor Saturation Voltage | $V_{SAT}$ |                                                                |     | 75  | 100 | mV               |

## TEST CIRCUIT

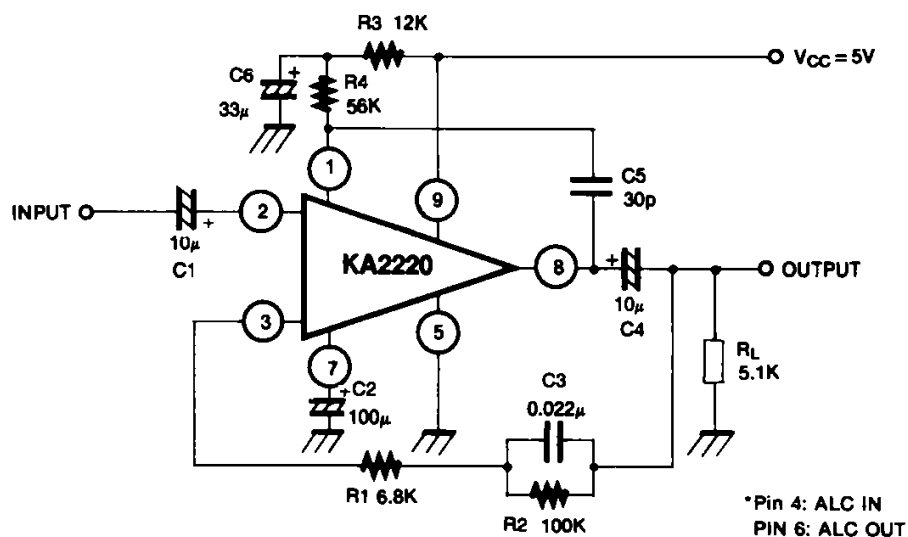
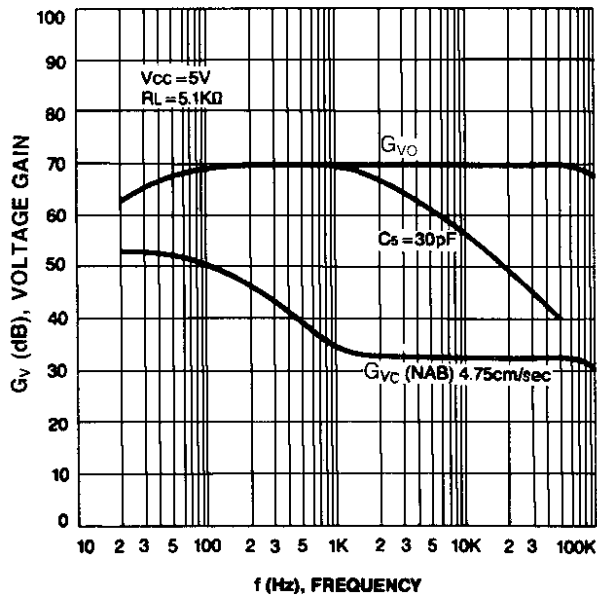
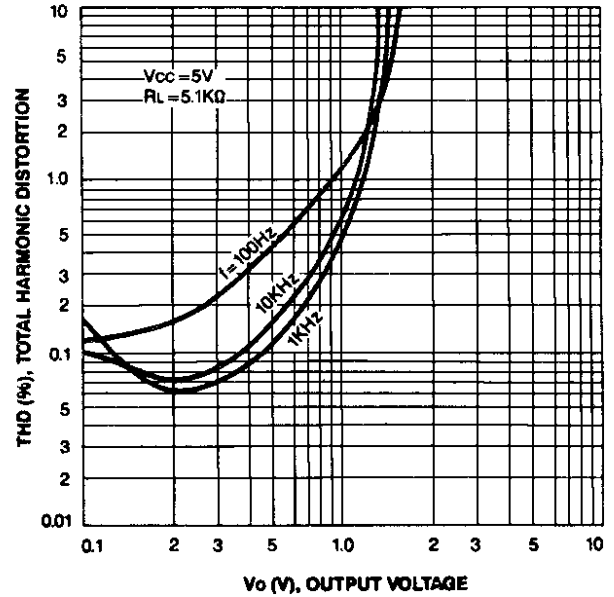


Fig. 2

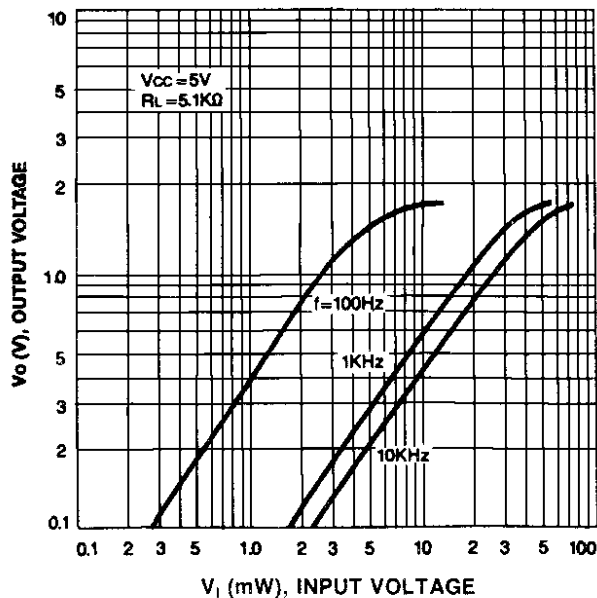
VOLTAGE GAIN-FREQUENCY



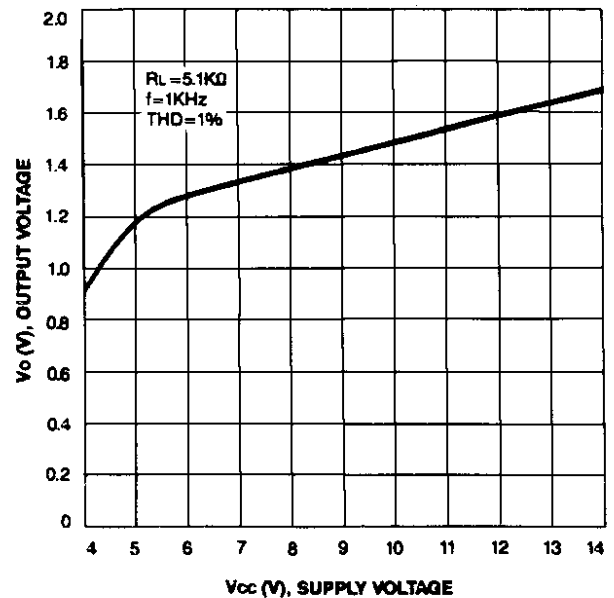
TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE



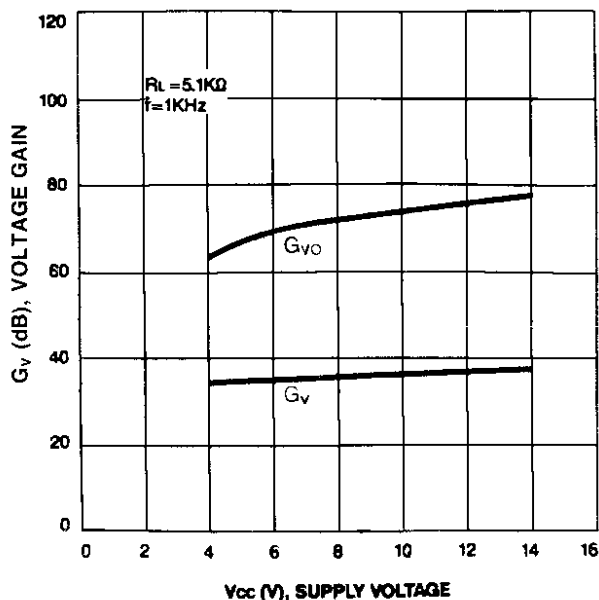
OUTPUT VOLTAGE-INPUT VOLTAGE



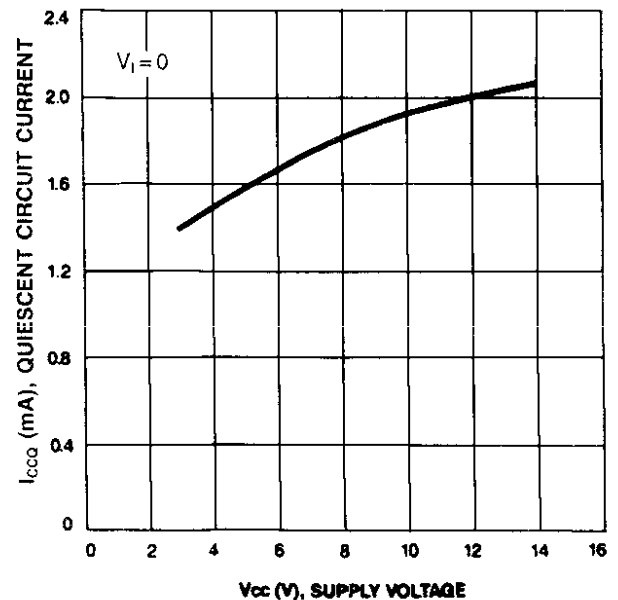
OUTPUT VOLTAGE-SUPPLY VOLTAGE

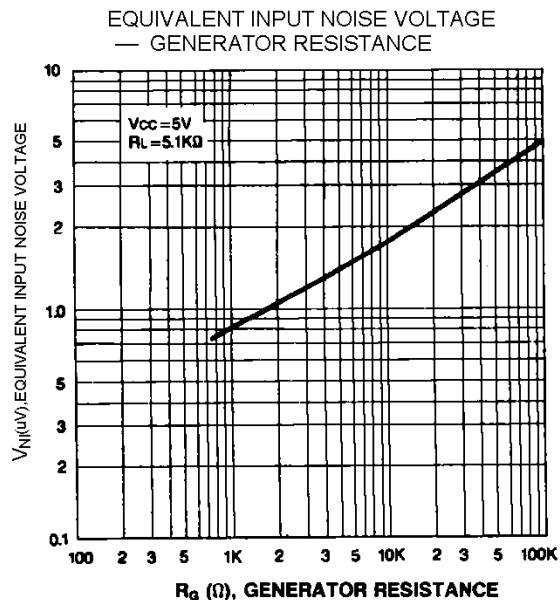


VOLTAGE GAIN-SUPPLY VOLTAGE



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<sub>1</sub>:** 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 rising time when power is applied.

**C<sub>2</sub>:** Bypass capacitor

Short emitter resistor on the AC and prevents an AC signal from feedback to input.

**C<sub>3</sub>, R<sub>1</sub>, R<sub>2</sub>:** Equalizer network

The closed loop voltage gain is determined by these components in relation to the internal resistance at Pin 3.

**C<sub>4</sub>:** Output coupling capacitor

C<sub>2</sub> 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<sub>5</sub>:** Phase compensation capacitor.

Prevents high frequency oscillation by phase error when feedback is heavy.

**C<sub>6</sub>:** 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<sub>3</sub>:** Filter resistance.

**R<sub>4</sub>:** Collector resistor of first stage transistor of the IC

Low voltage characteristic can be improved by adjusting this resistance.

## ALC GRADE BINNING TEST CIRCUIT