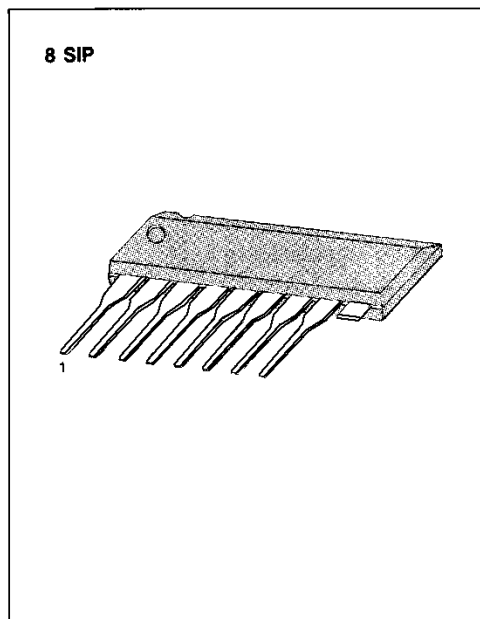


DUAL LOW NOISE EQUALIZER AMPLIFIER

The KA2221 is a monolithic integrated circuit consisting of 2-channel low noise amplifiers and regulated power supply for car stereos.

FEATURES

- Suitable for car stereos.
- Low noise amplifier.
- Voltage regulator included.
- Good ripple rejection.
- High channel separation (65dB Typ).
- Minimum number of external parts required.



ORDERING INFORMATION

Device	Package	Operating Temperature
KA2221	8 SIP	-20°C ~ +70°C

BLOCK DIAGRAM

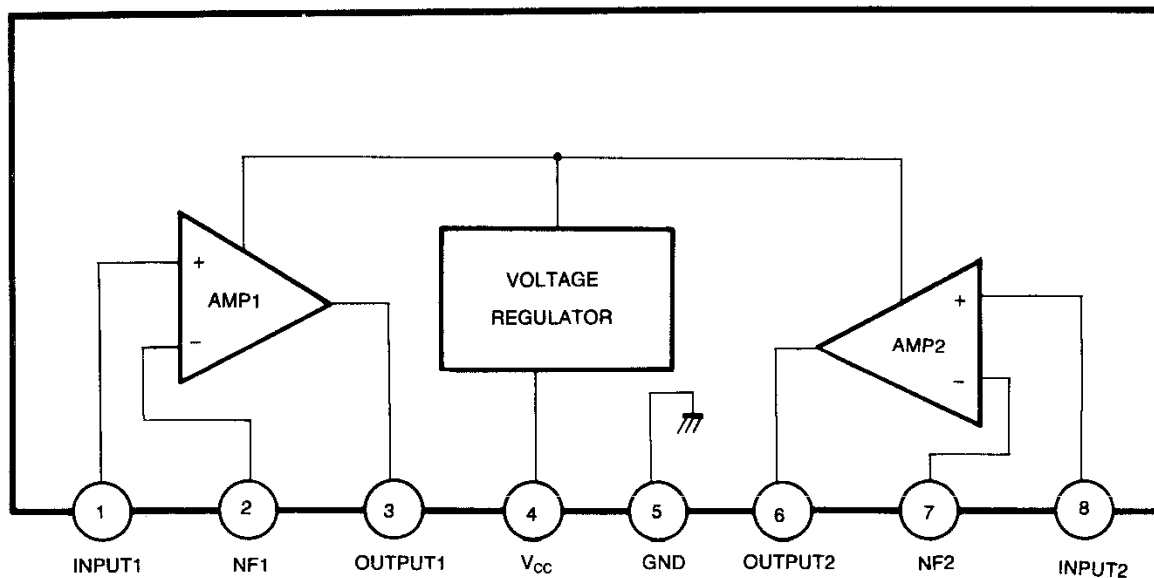


Fig. 1

ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V _{CC}	18	V
Power Dissipation	P _D	200	mW
Operating Temperature	T _{OPR}	- 20 ~ + 70	°C
Storage Temperature	T _{STG}	- 40 ~ + 125	°C

ELECTRICAL CHARACTERISTICS

(T_a = 25°C, V_{CC} = 12V, R_L = 10KΩ, f = 1KHz, NAB, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I _{CCO}	V _I = 0		6.0	9.0	mA
Open Loop Voltage Gain	G _{VO}		65	80		dB
Closed Loop Voltage Gain	G _{VC}	V _O = 0.5V	33	35	37	dB
Output Voltage	V _O	THD = 1%	0.6	1.0		V
Total Harmonic Distortion	THD	V _O = 0.5V		0.1	0.3	%
Input Resistance	R _I			150		KΩ
Equivalent Input Noise Voltage	V _{NI}	R _G = 2.2KΩ BW (- 3dB) = 15Hz ~ 30KHz		1.0	2.0	μV
Cross Talk	CT	R _G = 2.2KΩ	50	65		dB

TEST CIRCUIT

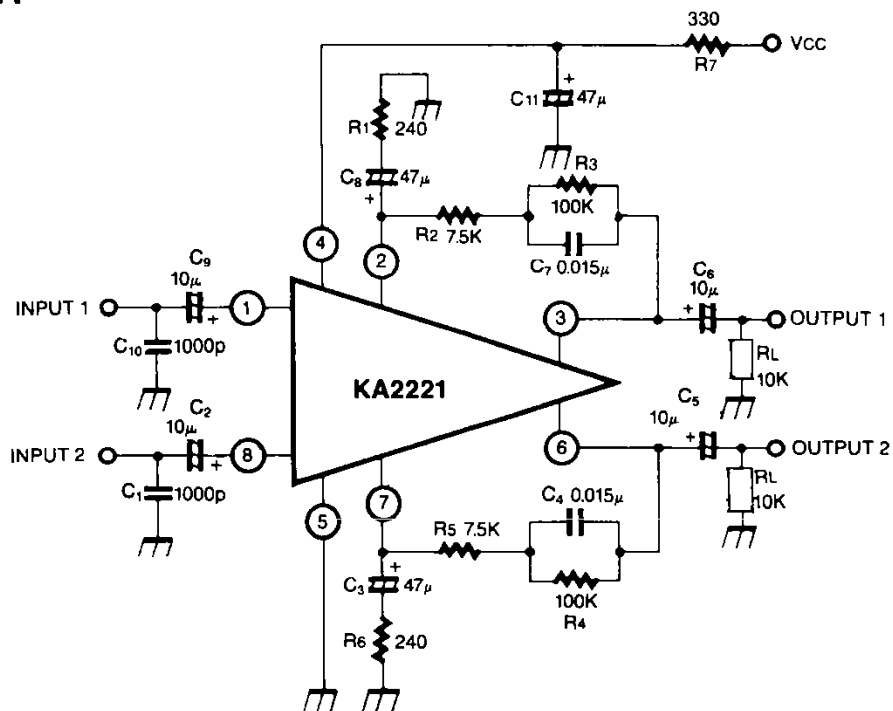
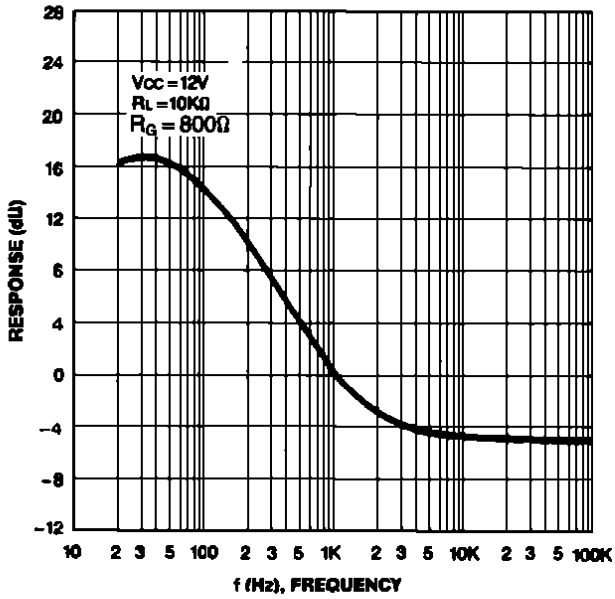
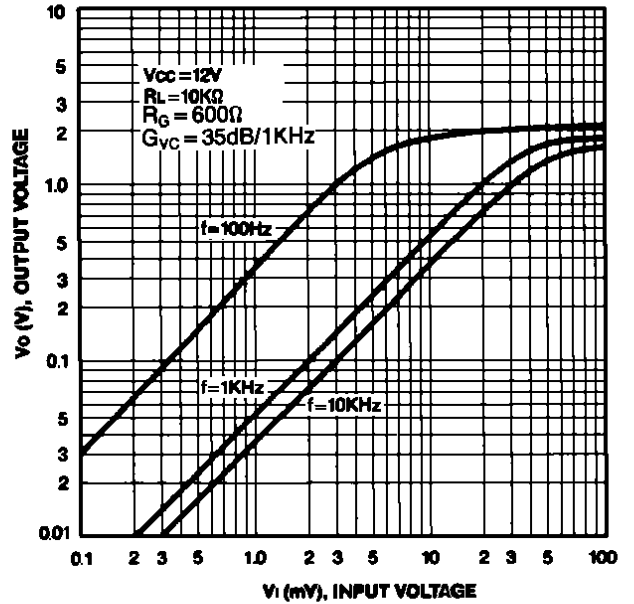


Fig. 2

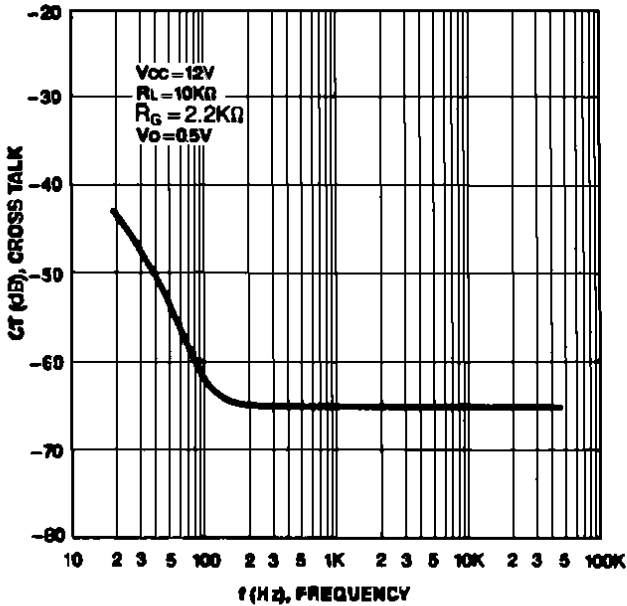
FREQUENCY RESPONSE



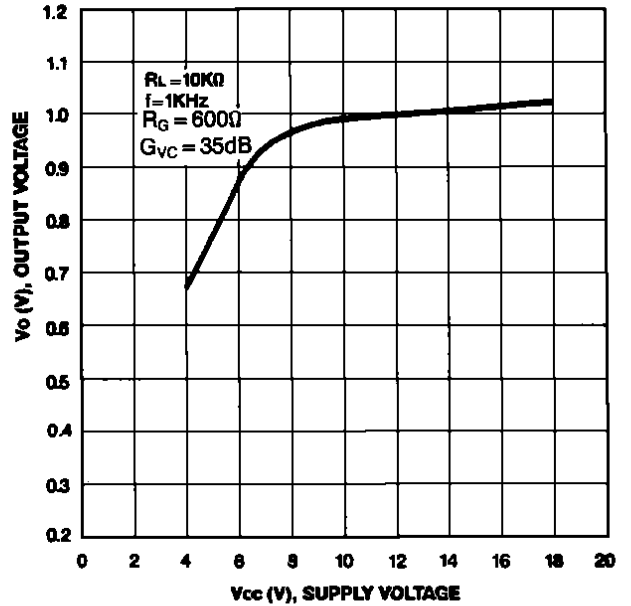
OUTPUT VOLTAGE-INPUT VOLTAGE



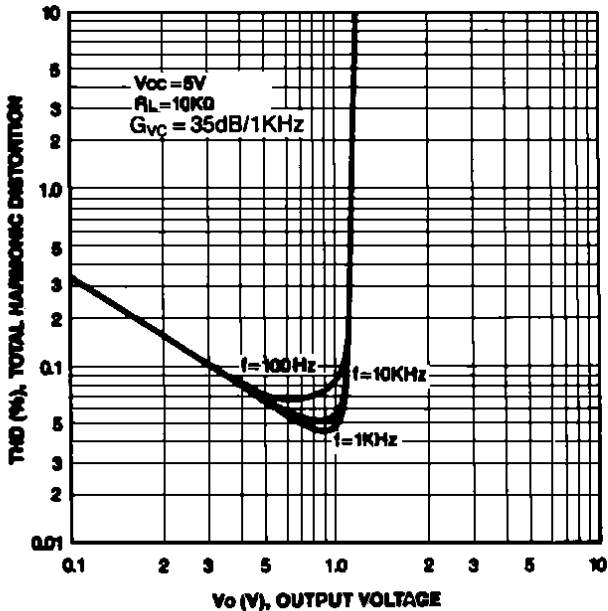
CROSS TALK-FREQUENCY



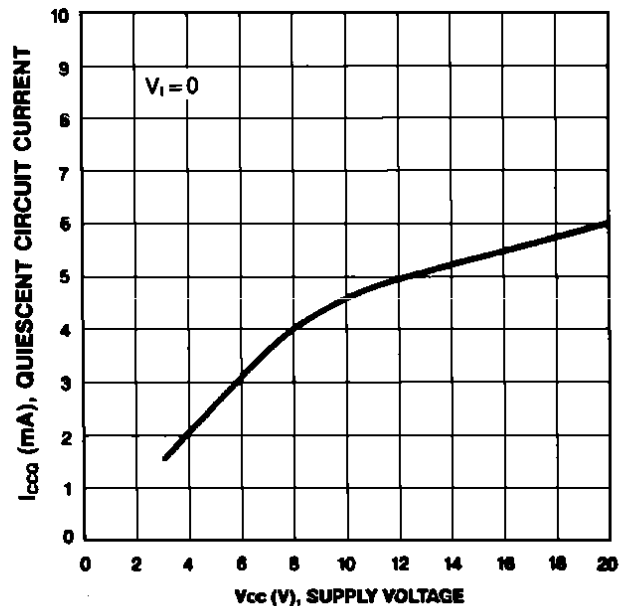
OUTPUT VOLTAGE-SUPPLY VOLTAGE



TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE



QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE



APPLICATION INFORMATION

External Components (Refer to test circuits)

C₁ (C₁₀): Noise filter

These capacitors prevent radio interference in strong electric fields. The recommended value is 1000pF.

C₂ (C₉): Input coupling capacitor

The recommended value is 10μF. If made too small, the low frequency characteristics will change for the worse, but too large a value will increase the rising time when power is applied.

C₃ (C₈): Negative feedback capacitor

The lower cut-off frequency depends on the value of these capacitors and is determined as follows:

$$C_3 (C_8) = \frac{1}{2\pi f_L \cdot R_1 (R_6)}$$

f_L: Low cut-off frequency

If the value of these capacitors is made larger, the starting time of amplifier is delayed further.

C₅ (C₆): Output coupling capacitor

The recommended value is 10μF.

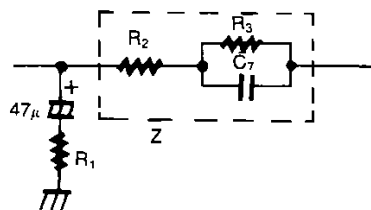
R₂, R₃, C₇ (R₄, R₅, C₄): Equalizer network

The time constants of standard NAB characteristic are follow.

Tape speed	9.5cm/sec	4.75cm/sec
C ₇ (R ₂ + R ₃)	3180μsec	1590μsec
R ₂ , C ₇	90μsec	120μsec

R₁ (R₆): Feedback component

The closed loop gain is determined approximately by the following relationship.



$$G_{VC} = 20 \log \frac{Z + R_1}{R_1} \quad (\text{dB})$$

$$Z = R_2 + R_3 // C_7$$

* Choose R₂, R₃, (DC resistance of NAB element) as 100KΩ approximately.