## 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.

8 SIP

3
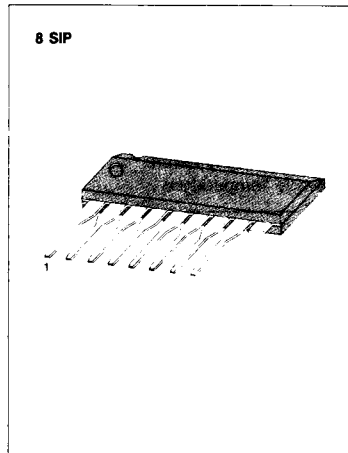
ORDERING INFORMATION

Device	Package	Operating Temperature
KA2221	8 SIP	$-20°C \sim +70°C$

BLOCK DIAGRAM
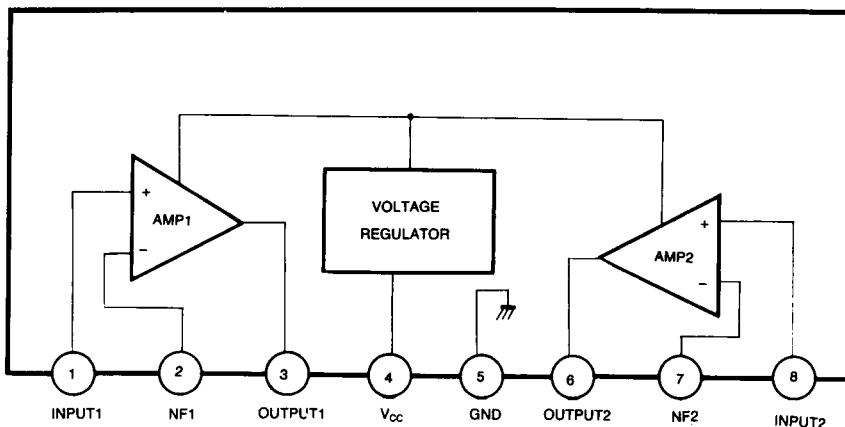
Fig. 1

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}	$-20 \sim +70$	°C
Storage Temperature	T_{STG}	$-40 \sim +125$	°C

ELECTRICAL CHARACTERISTICS

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

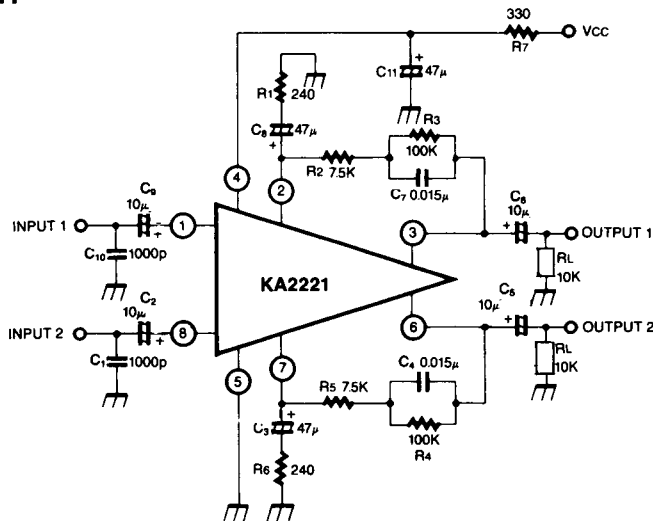| Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	$V_I = 0$		6.0	9.0	mA
Open Loop Voltage Gain	G_{VO}		65	80		dB
Closed Loop Voltage Gain	G_{VC}	$V_O = 0.5V$	33	35	37	dB
Output Voltage	V_O	THD=1%	0.6	1.0		V
Total Harmonic Distortion	THD	$V_O = 0.5V$		0.1	0.3	%
Input Resistance	R_I			150		$K\Omega$
Equivalent Input Noise Voltage	V_{NI}	$R_G = 2.2K\Omega$ BW $(-3dB) = 15Hz \sim 30KHz$		1.0	2.0	μV
Cross Talk	CT	$R_G = 2.2K\Omega$	50	65		dB

TEST CIRCUIT

Fig. 2

FREQUENCY RESPONSE

Vcc = 12V
RL = 10KΩ
RG = 800Ω

Y-axis: RESPONSE (dB)
X-axis: f (Hz), FREQUENCY
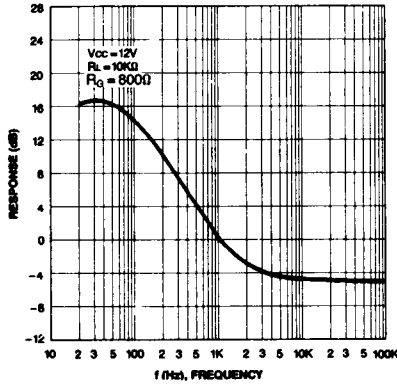
OUTPUT VOLTAGE-INPUT VOLTAGE

Vcc = 12V
RL = 10KΩ
RG = 600Ω
GVC = 35dB/1KHz

f = 100Hz
f = 1KHz
f = 10KHz

Y-axis: Vo (V), OUTPUT VOLTAGE
X-axis: VI (mV), INPUT VOLTAGE

CROSS TALK-FREQUENCY

Vcc = 12V
RL = 10KΩ
RG = 2.2KΩ
Vo = 0.5V
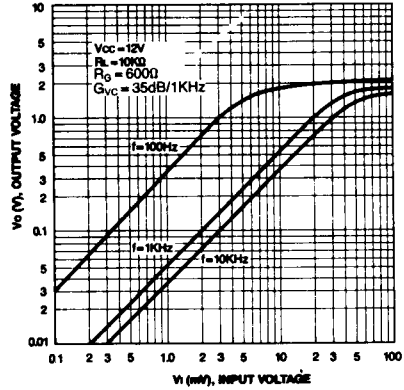
Y-axis: CT (dB), CROSS TALK
X-axis: f (Hz), FREQUENCY
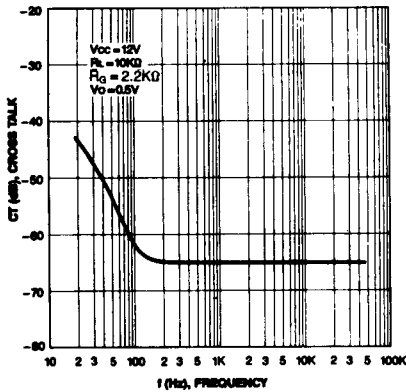
OUTPUT VOLTAGE-SUPPLY VOLTAGE

RL = 10KΩ
f = 1KHz
RG = 600Ω
GVC = 35dB

Y-axis: Vo (V), OUTPUT VOLTAGE
X-axis: Vcc (V), SUPPLY VOLTAGE
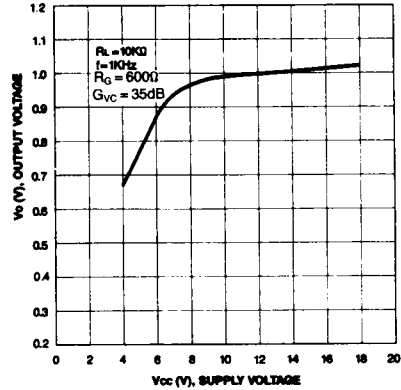
TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE

Vcc = 6V
RL = 10KΩ
GVC = 35dB/1KHz

f = 100Hz
f = 10KHz
f = 1KHz

Y-axis: THD (%), TOTAL HARMONIC DISTORTION
X-axis: Vo (V), OUTPUT VOLTAGE
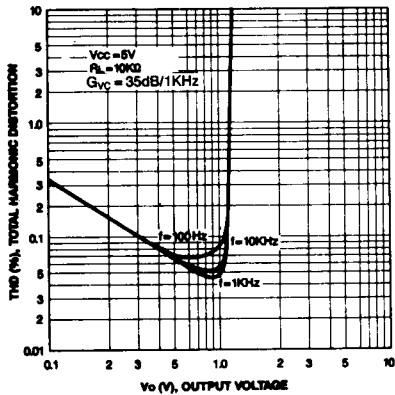
QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE

VI = 0

Y-axis: ICCO (mA), QUIESCENT CIRCUIT CURRENT
X-axis: Vcc (V), SUPPLY VOLTAGE

SAMSUNG
Electronics
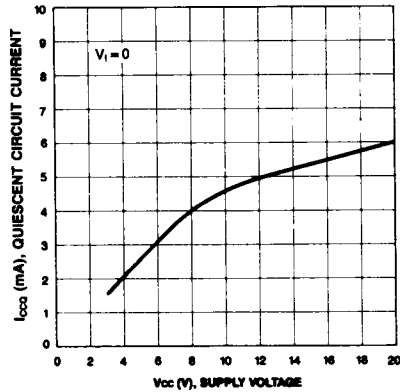
APPLICATION INFORMATION

External Components (Refer to test circuits)

C_1 (C_{10}): Noise filter
These capacitors prevent radio interference in strong electric fields. The recommended value is 1000pF.

C_2 (C_9): Input coupling capacitor
The recommended value is $10\mu F$. 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.

C_3 (C_8): 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.

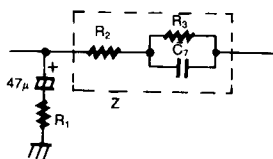C_5 (C_6): Output coupling capacitor
The recommended value is $10\mu F$.

R_2, R_3, C_7 (R_4, R_5, C_4): Equalizer network
The time constants of standard NAB characteristic are follow.

Tape speed	9.5cm/sec	4.75cm/sec
C_7 ($R_2 + R_3$)	$3180\mu sec$	$1590\mu sec$
R_2, C_7	$90\mu sec$	$120\mu sec$

R_1 (R_6): Feedback component
The closed loop gain is determined approximately by the following relationship.

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

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

* Choose R_2, R_3, (DC resistance of NAB element) as $100K\Omega$ approximately.