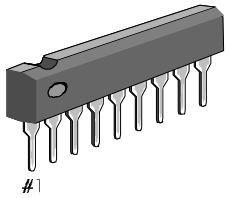
INTRODUCTION

The S1A2220X01 is a monolithic integrated circuit consisting of a pre-amplifier and an ALC circuit for cassette tape recorders.

9–SIP



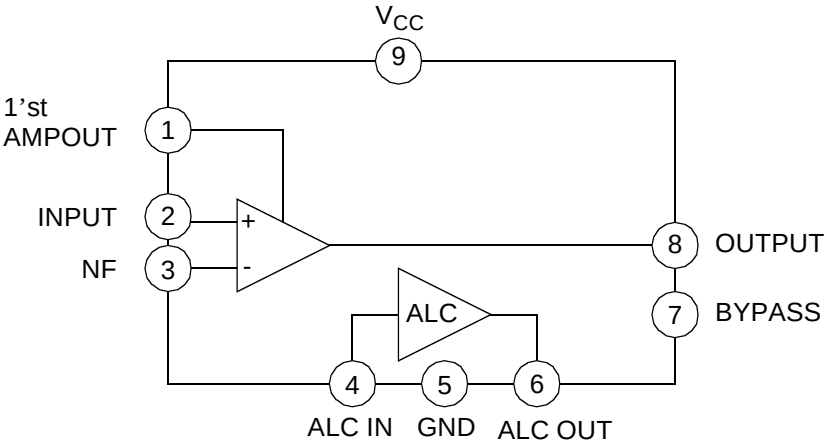
FEATURES

- Low noise amplifier
- Wide operating supply voltage range
  V_{CC} = 3.5V – 14V
- High output voltage
- Low distortion
- Wide ALC range
- Good ALC pair characteristic for stereo tape recorders

ORDERING INFORMATION

Device	Package	Operating Temperature
S1A2220X01-IAU0 S1A2220X01-IBU0	9–SIP	–20°C — +70°C

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

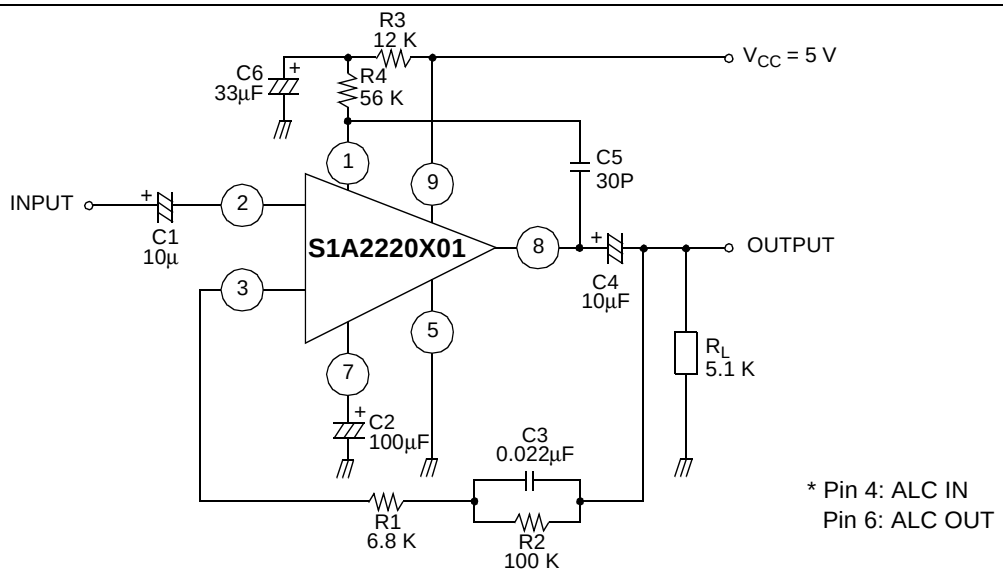
Characteristic	Symbol	Value	Unit
Supply voltage	V_{CC}	15	V
Power dissipation	P_D	200	mW
Operating temperature	T_{OPR}	– 20 — +70	°C
Storage temperature	T_{STG}	– 40 — +125	°C

ELECTRICAL CHARACTERISTICS

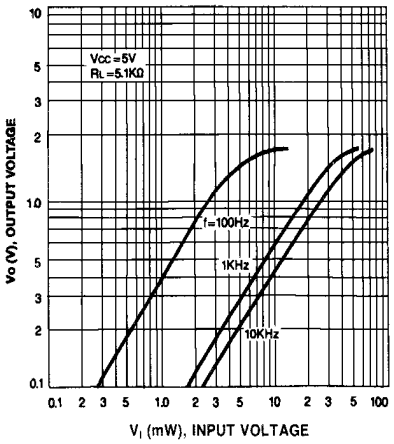
(Ta = 25°C, V_{CC} = 5V, R_L = 5.1K, R_G = 600Ω, f = 1kHz, NAB, unless otherwise specified)

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 V	33	35	37	dB
Output Voltage	V_O	THD = 1 %	0.7	1.0	–	V
Total Harmonic Distortion	THD	V_O = 0.2 V	–	0.1	–	%
Input Resistance	R_I	–	60	100	–	kΩ
Equivalent Input Noise Voltage	V_{NI}	R_G = 2.2kΩ, NAB BW (–3dB) = 15Hz – 30kHz	–	1.0	–	μV
ALC Transistor Saturation Voltage	V_{SAT}	–	–	75	100	mV

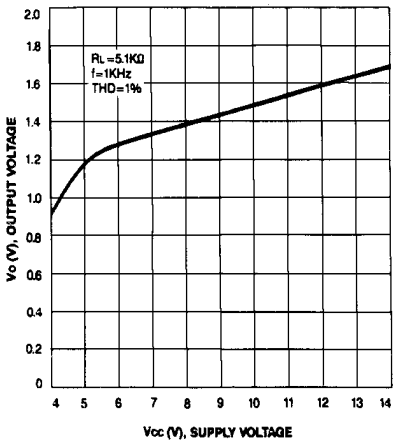
TEST CIRCUIT



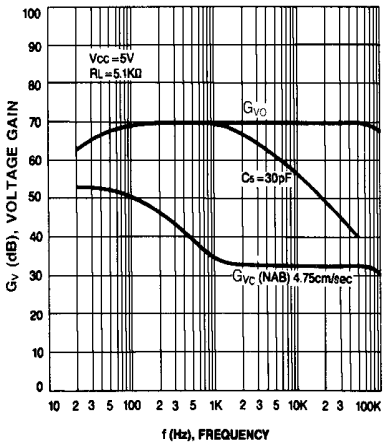
OUTPUT VOLTAGE-INPUT VOLTAGE



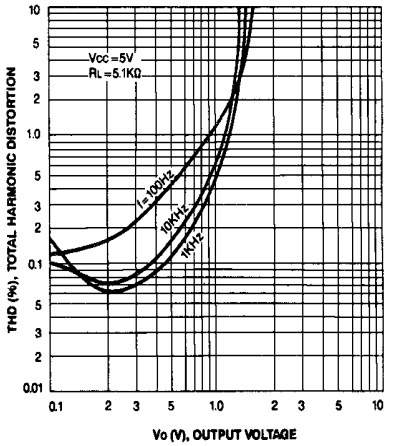
OUTPUT VOLTAGE-SUPPLY VOLTAGE



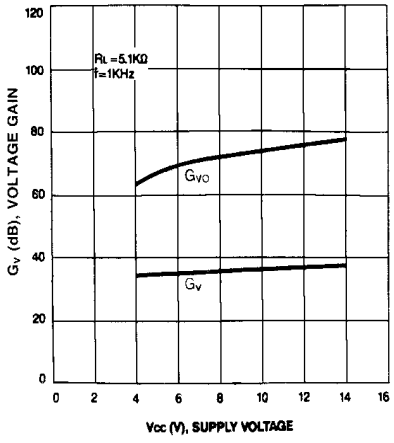
VOLTAGE GAIN-FREQUENCY



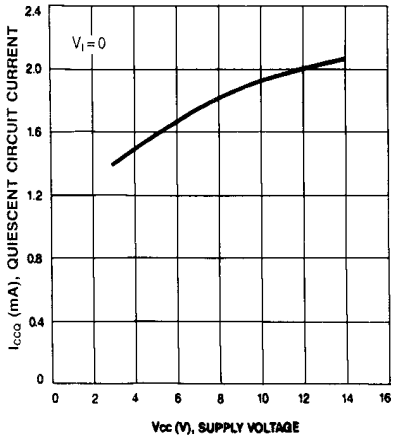
TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE

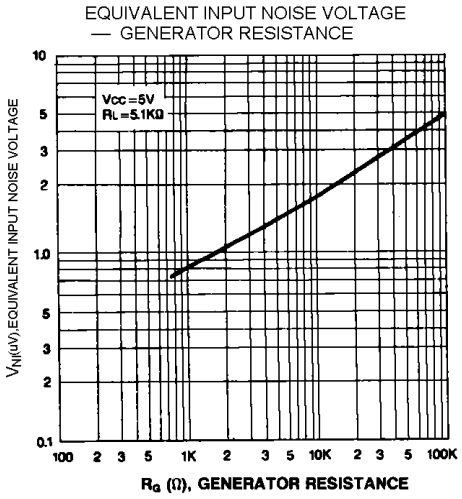


VOLTAGE GAIN-SUPPLY VOLTAGE



QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE





APPLICATION INFORMATION

ALC Grade Binning Table

Symbol	A_V (dB)		ALC Grade (dB)	
	Min.	Max.	Min.	Max.
S1A2220X01-IAU0	34	36	– 16.0	– 27.0
S1A2220X01-IBU0			– 25.0	– 34.0

External Components (Refer to test circuits)

C_1: Input coupling capacitor

The recommended value is 10 μF. 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_2: Bypass capacitor

A short emitter resistor on the AC, which prevents an AC signal from feedback from being 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.

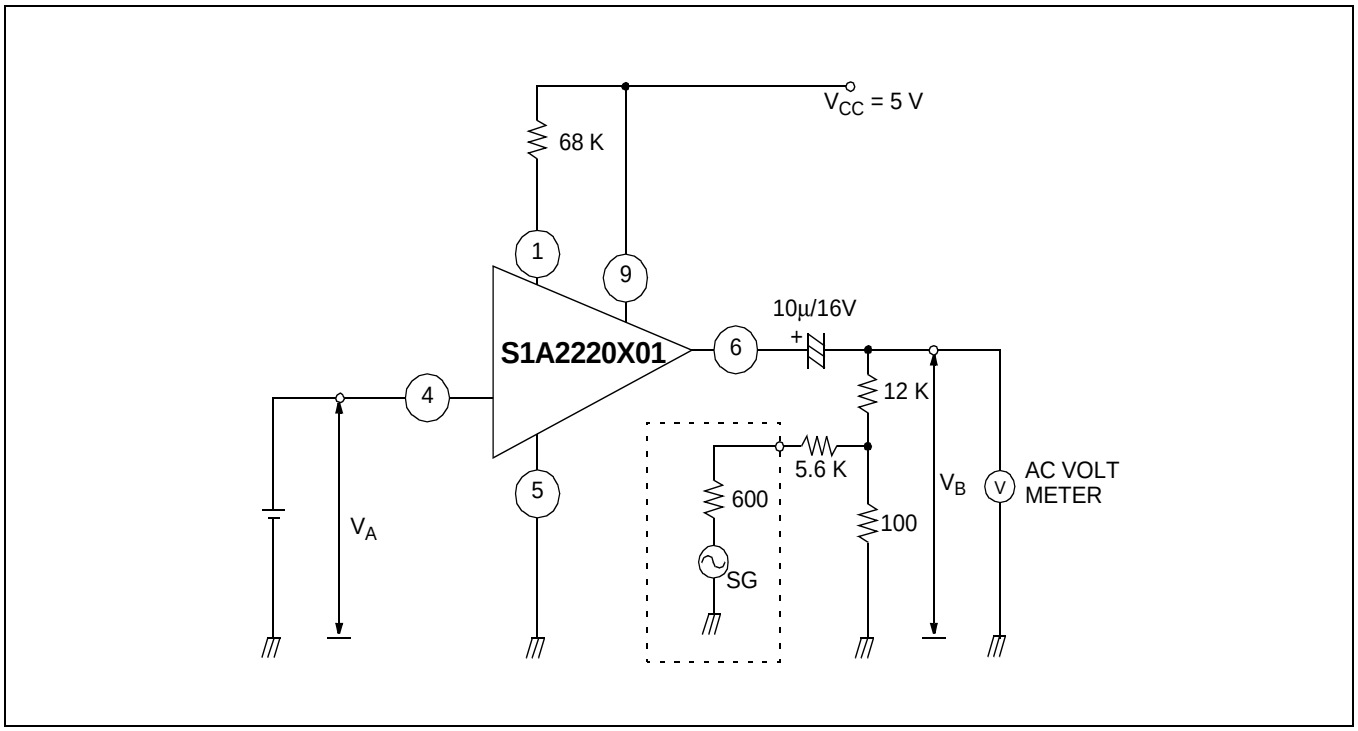
Prevents high frequency oscillation by phase error when feedback is heavy.

C_6: Ripple filter for power supply

A large value is required to get an excellent ripple characteristic under the line operation, but it 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



Test condition: S.G. output level should be adjusted to be 13.8 mV of the AC voltmeter reading (V_B) when the D.U.T. is not connected to the test circuit (V_{CC} = 5V, V_A = 1.16V, Ta = 25°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