M5210L, P, FP

DUAL HIGH-VOLTAGE,HIGH S/N OPERATIONAL AMPLIFIERS (DUAL POWER SUPPLY TYPE)

DESCRIPTION

The M5210 is a semiconductor integrated circuit designed for a preamplifier in audio equipment of stereo and cassette tape decks.

Two low-noise operational amplifier circuits displaying internal phase-compensated high gain and low distortion are contained in a 8-pin (SIP, DIP), suitable for application as a microphone and tone control amplifier of stereo equipment and cassette tape decks.

The unit can also be used as a general-purpose amplifier in portable equipment such as a stereo cassette tape recorder of a single power supply type as it operates at a low supply voltage.

FEATURES

- Low noise ····· V_{NI}=1.0μVrms typ.(R_g=2.2kΩ, FLAT)
  S/N=66dB typ.(R_g=600Ω, IHF-A network)
  (microphone amplifier, fererence input=−60dBm)
  Higher S/N ratio by 10dB when compared to ordinary operational amplifiers
- High voltage ····· V_{CC}=±25V(50V)
- Low maximum input voltage ····· V_i=140mVrms(typ.)
  (V_{CC}=±22.5V, G_V=40dB)
- High gain, low distortion
  ····· G_{VO}=113dB, THD=0.002%(typ.)
- High slew rate ····· SR=6.5V/μs(typ.)
- High load current, high power dissipation
  ····· I_{LP}=±50mA, P_d=800mW(SIP)
  P_d=625mW(DIP), P_d=440mW(FP)

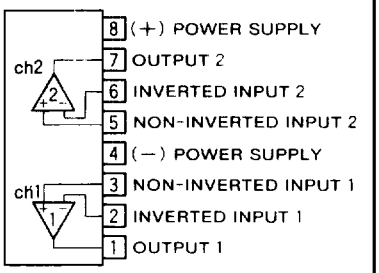
APPLICATION

General-purpose preamplifier in stereo equipment, tape decks and radio stereo cassette recorders

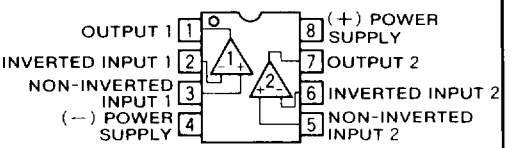
RECOMMENDED OPERATING CONDITIONS

Supply voltage range ····· ±2~±22.5V
Rated supply voltage ····· ±22.5V

PIN CONFIGURATION (TOP VIEW)

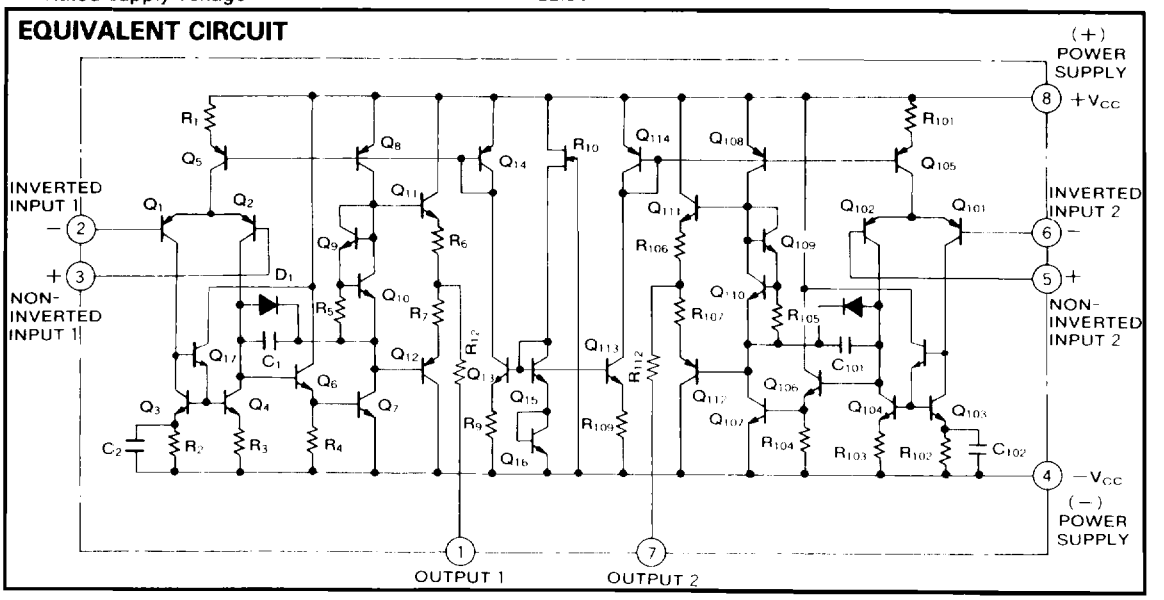


Outline 8P5 (M5210L)



Outline 8P4 (M5210P)
8P2S (M5210FP)

EQUIVALENT CIRCUIT



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ABSOLUTE MAXIMUM RATINGS (T_a=25℃, unless otherwise noted)

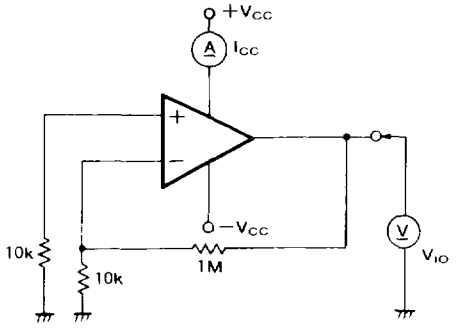
Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		±25(50)	V
I_{LP}	Load current		±50	mA
V_{id}	Differential input voltage		±30	V
V_{ic}	Common input voltage		±22.5	V
P_d	Power dissipation		800(SIP)/625(DIP)/440(FP)	mW
K_θ	Thermal derating	T_a≧25℃	8(SIP)/6.25(DIP)/4.4(FP)	mW/℃
T_{opr}	Operating temperature		−20～+75	℃
T_{stg}	Storage temperature		−55～+125	℃

ELECTRICAL CHARACTERISTICS (T_a=25℃, V_{CC}=±22.5V)

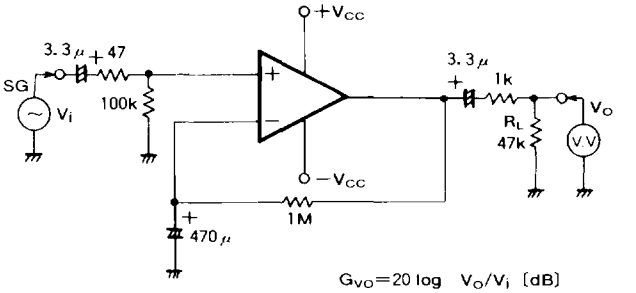
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	V_{in}=0	2.0	4.0	8.0	mA
V_{IO}	Input offset voltage	R_S≦10kΩ		0.5	6.0	mV
I_{IB}	Input bias current			0.7		μA
G_{VO}	Open loop voltage gain	f=100Hz, R_L=47kΩ, C_{NF}=470μF	90	113		dB
V_{OM}	Maximum output voltage	f=1kHz, THD=0.1%, R_L=47kΩ, FLAT	12.5	14.2		Vrms
THD	Total harmonic distortion	f=1kHz, V_O=10Vrms, R_L=47kΩ, FLAT		0.002		%
V_{NI}	Input-referred noise voltage	R_g=2.2kΩ, BW=10Hz～30kHz, FLAT		1.0	1.5	μVrms
S/N	Signal to noise ratio	R_g=600Ω, G_V=40dB, IHF-A network Reference input −60dBm (microphone)		66		dB

TEST CIRCUITS

(a) I_{CC}, V_{IO}

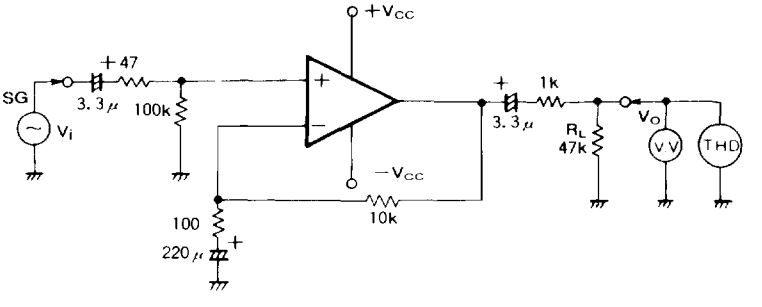


(b) G_{VO}



G_{VO}=20 log V_O/V_i [dB]

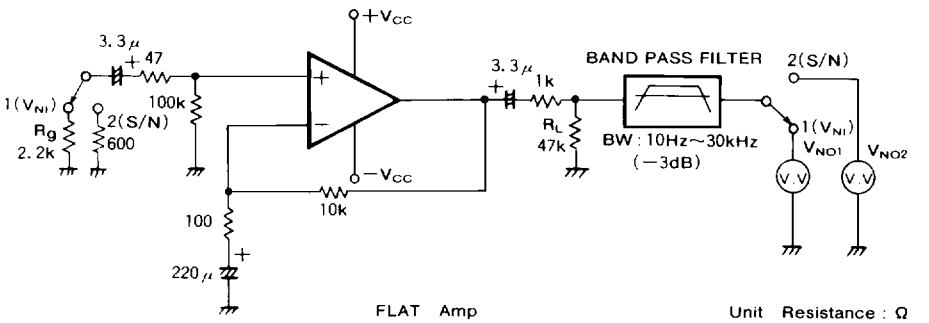
(c) V_{OM}, THD



Unit Resistance : Ω
Capacitance : F

TEST CIRCUIT

(d) V_{NI}, S/N



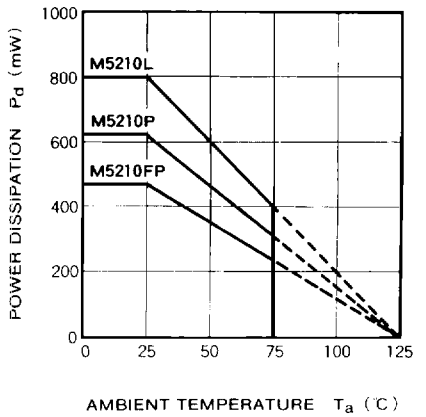
FLAT Amp
G_V=40dB=100 TIMES (@f=1kHz)

Unit Resistance : Ω
Capacitance : F

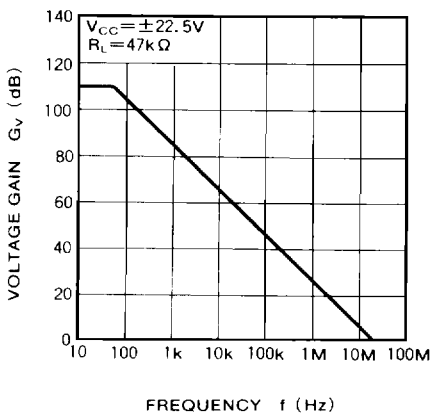
1. $V_{NI}=V_{NO1}/100$ (μVrms)
2. S/N=20 log {775μVrms/(V_{NO2}/100)} (dB) 775μVrms=−60dBm(microphone reference input voltage)
   * An AC voltmeter V.V with a built-in IHF-A network filter should be used for measuring the S/N ratio.

TYPICAL CHARACTERISTICS

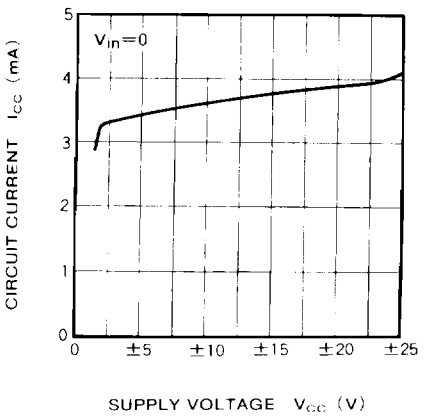
THERMAL DERATING (MAXIMUM RATING)



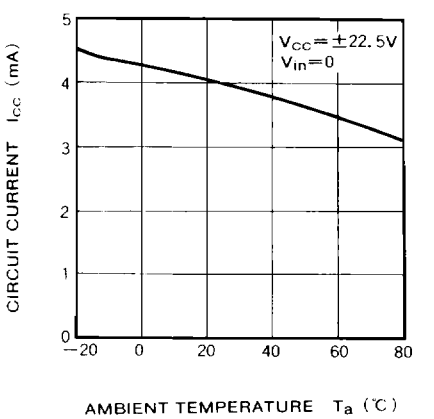
VOLTAGE GAIN VS. FREQUENCY RESPONSE



CIRCUIT CURRENT VS. SUPPLY VOLTAGE



CIRCUIT CURRENT VS. AMBIENT TEMPERATURE



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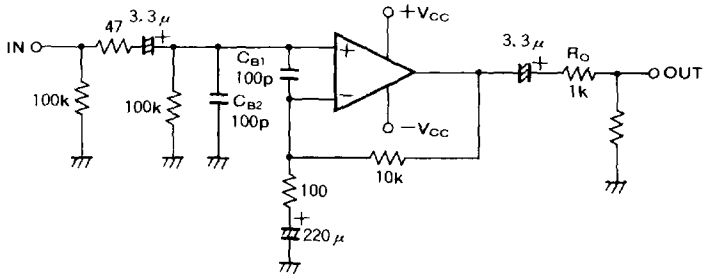
APPLICATION EXAMPLES

(1) Stereo FLAT (microphone) amplifier circuit



Units Resistance : Ω
Capacitance : F

TYPICAL CHARACTERISTICS (V_{CC}=±22.5V, FLAT)

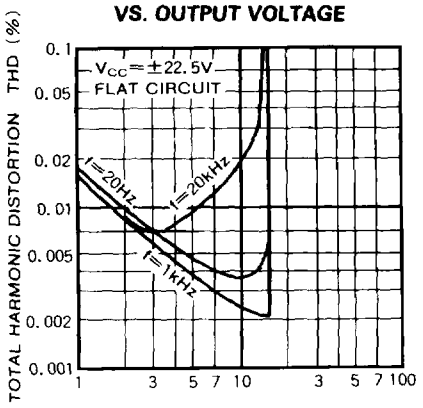
- G_V=40dB (f=1kHz)
- V_{NI}=1.0μVrms(R_g=2.2kΩ, BW=10Hz~30kHz)
- S/N=66dB (IHF-A network, R_g=600Ω, −60dBm input sensitivity)
- THD=0.002%(f=1kHz, V_O=10Vrms)

Left channel circuit constants are identical to those of right channel

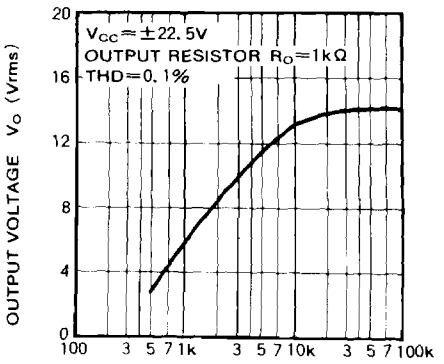
C_{B1}, C_{B2} : Capacitors for buzz prevention, use if required.

R_O : Resistor used to prevent parasitic oscillation for capacitive loads and current limiting with shorted and other abnormal load conditions.

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



OUTPUT NOISE VOLTAGE VS. LOAD RESISTANCE



SIGNAL-TO-NOISE RATIO VS. SIGNAL SOURCE RESISTANCE