

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 $V_{NI}=1.0\mu\text{Vrms typ.}$ ($R_g=2.2\text{k}\Omega$, FLAT)
S/N=66dB typ. ($R_g=600\Omega$, IHF-A network)
(microphone amplifier, reference input=-60dBm)
Higher S/N ratio by 10dB when compared to ordinary operational amplifiers
- High voltage $V_{CC}=\pm 25\text{V}(50\text{V})$
- Low maximum input voltage $V_i=140\text{mVrms(typ.)}$
($V_{CC}=\pm 22.5\text{V}$, $G_v=40\text{dB}$)
- High gain, low distortion
..... $G_{VO}=113\text{dB}$, THD=0.002%(typ.)
- High slew rate $SR=6.5\text{V}/\mu\text{s(yp.)}$
- High load current, high power dissipation
..... $I_{LP}=\pm 50\text{mA}$, $P_d=800\text{mW(SIP)}$
 $P_d=625\text{mW(DIP)}$, $P_d=440\text{mW(FP)}$

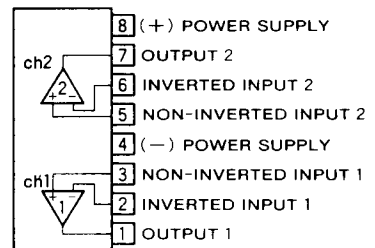
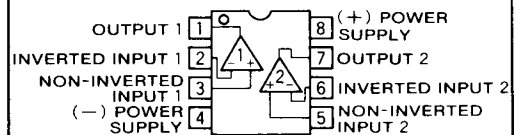
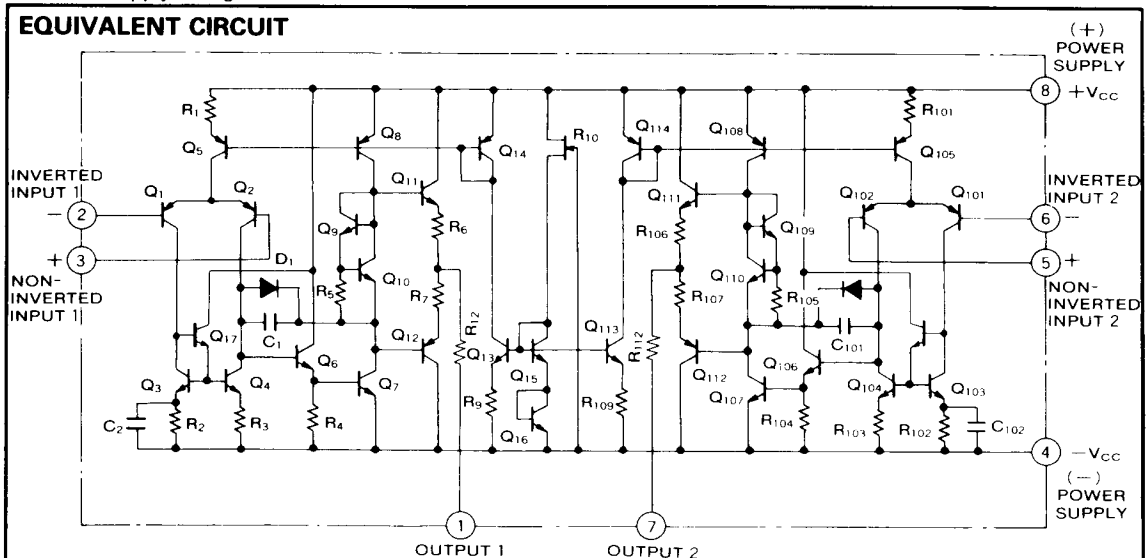
APPLICATION

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

RECOMMENDED OPERATING CONDITIONS

Supply voltage range $\pm 2\sim\pm 22.5\text{V}$

Rated supply voltage $\pm 22.5\text{V}$

PIN CONFIGURATION (TOP VIEW)**Outline 8P5 (M5210L)****Outline 8P4 (M5210P)
8P2S (M5210FP)****EQUIVALENT CIRCUIT**

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

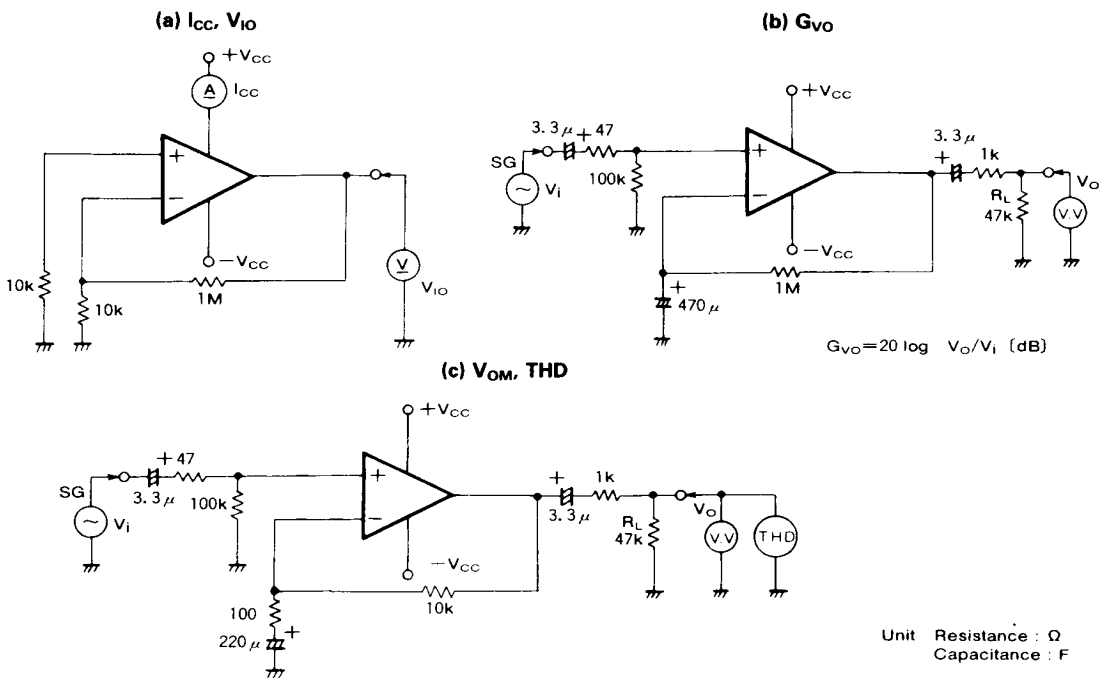
ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		$\pm 25(50)$	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	$T_a \geq 25^{\circ}\text{C}$	8(SIP)/6.25(DIP)/4.4(FP)	mW/ $^{\circ}\text{C}$
T_{opr}	Operating temperature		$-20 \sim +75$	$^{\circ}\text{C}$
T_{stg}	Storage temperature		$-55 \sim +125$	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS ($T_a=25^{\circ}\text{C}$, $V_{CC}=\pm 22.5\text{V}$)

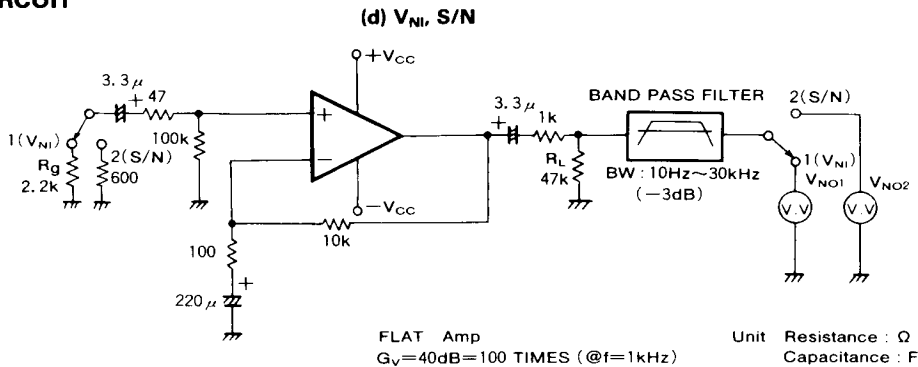
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	$V_{in}=0$	2.0	4.0	8.0	mA
V_{IO}	Input offset voltage	$R_S \leq 10\text{k}\Omega$		0.5	6.0	mV
I_{IB}	Input bias current			0.7		μA
G_{VO}	Open loop voltage gain	$f=100\text{Hz}$, $R_L=47\text{k}\Omega$, $C_{NF}=470\mu\text{F}$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

TEST CIRCUITS



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

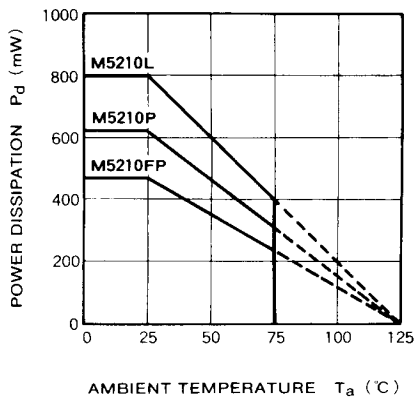
TEST CIRCUIT



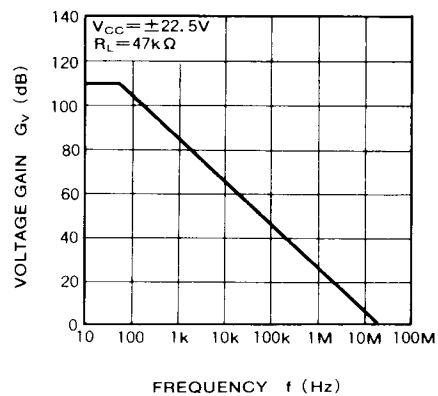
- $V_{NI} = V_{NO1} / 100 (\mu\text{Vrms})$
 - $S/N = 20 \log [775 \mu\text{Vrms} / (V_{NO2} / 100)] \text{ (dB)}$ $775 \mu\text{Vrms} = -60\text{dBm}$ (microphone reference input voltage)
- * An AC voltmeter V.V with a built-in IHF-A network filter should be used for measuring the S/N ratio.

TYPICAL CHARACTERISTICS

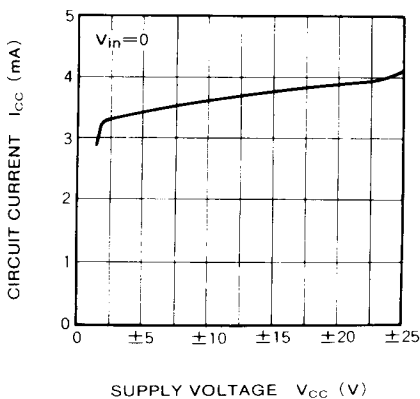
**THERMAL DERATING
 (MAXIMUM RATING)**



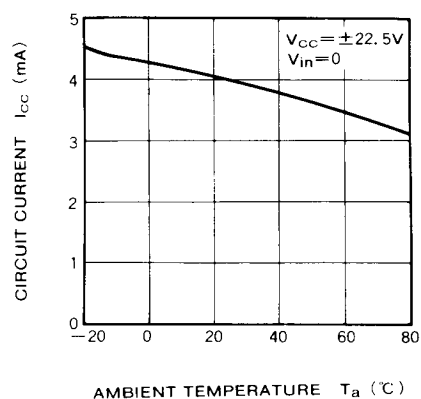
**VOLTAGE GAIN VS.
 FREQUENCY RESPONSE**



**CIRCUIT CURRENT VS.
 SUPPLY VOLTAGE**



**CIRCUIT CURRENT VS.
 AMBIENT TEMPERATURE**

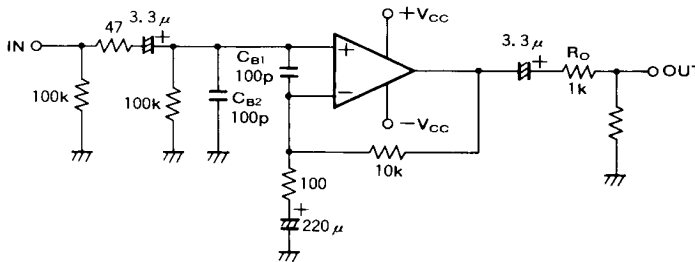


M5210L, P, FP

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

APPLICATION EXAMPLES

(1) Stereo FLAT (microphone) amplifier circuit



Units Resistance : Ω
Capacitance : F

TYPICAL CHARACTERISTICS ($V_{CC} = \pm 22.5V$, FLAT)

- $G_V = 40dB$ ($f = 1kHz$)
- $V_{NI} = 1.0 \mu V_{rms}$ ($R_g = 2.2k\Omega$, $BW = 10Hz \sim 30kHz$)
- $S/N = 66dB$ (IHF-A network, $R_g = 600\Omega$, $-60dBm$ input sensitivity)
- $THD = 0.002\%$ ($f = 1kHz$, $V_O = 10V_{rms}$)

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.

