M5220L, P, FP

DUAL LOW-NOISE OPERATIONAL AMPLIFIERS(DUAL POWER SUPPLY TYPE)

DESCRIPTION

The M5220 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 or FP, suitable for application as an equalizer 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}=0.75μVrms typ.(R_g=2.2kΩ, RIAA)
  S/N=83dB typ.(Shorted input, IHF-A network, RIAA, PHONO=2.5mVrms)
- High voltage ····· V_{CC}=±25V(50V)
- Low PHONO maximum input voltage ····· V_i=235mVrms(typ.) (V_{CC}=±22.5V, f=1kHz)
- High gain, low distortion ····· G_{VO}=113dB, THD=0.001%(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)

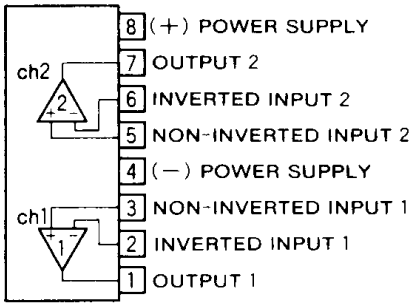
APPLICATION

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

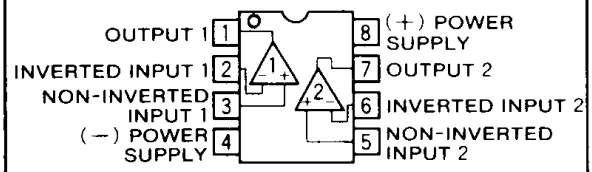
RECOMMENDED OPERATING CONDITIONS

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

PIN CONFIGURATION (TOP VIEW)

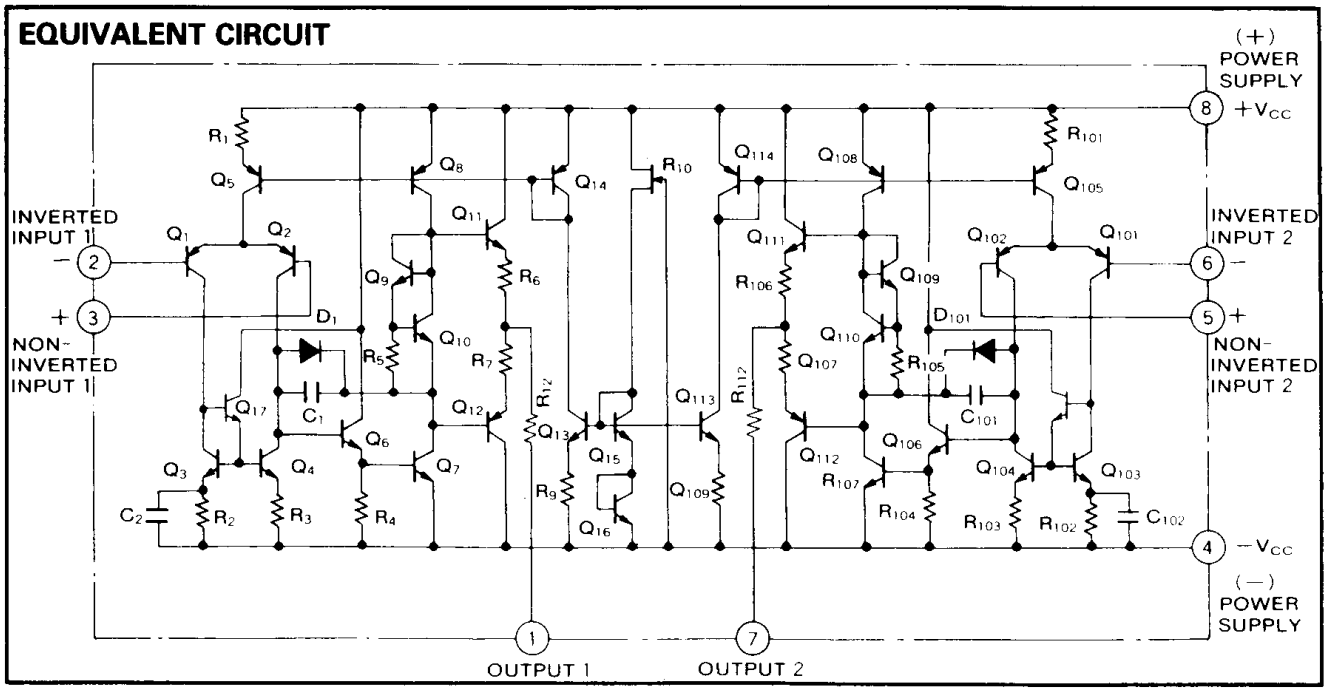


Outline 8P5 (M5220L)



Outline 8P4 (M5220P)
8P2S (M5220FP)

EQUIVALENT CIRCUIT



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

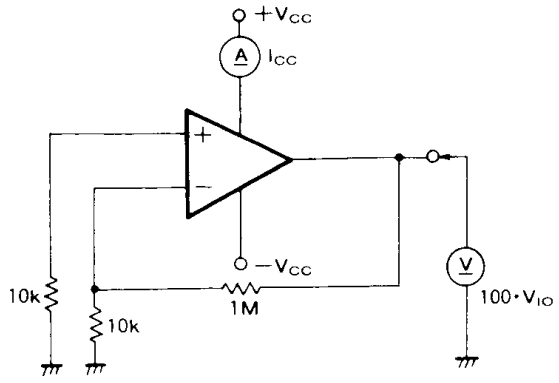
Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		±25(50)	V
I_{LP}	Load current		±50	mA
V_{id}	Differential input voltage		±30	V
V_{ic}	Common input voltage		±22.5	V
P_d	Power dissipation		800(SIP)/625(DIP)/440(FP)	mW
K_θ	Thermal derating	$T_a \geqq 25$℃	8(SIP)/6.25(DIP)/4.4(FP)	mW/℃
T_{opr}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

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

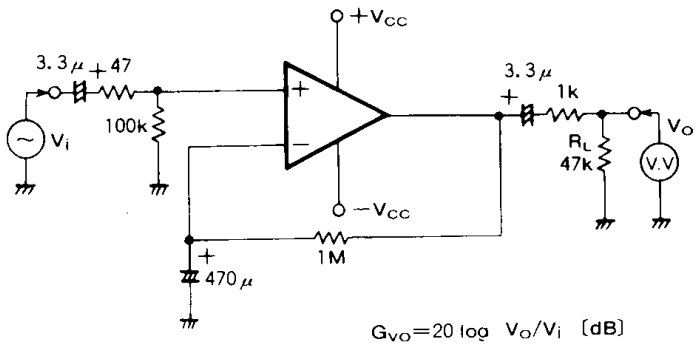
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	V_{in}=0		4.0	8.0	mA
V_{IO}	Input offset voltage	$R_S \leqq 10k\Omega$		0.5	3.0	mV
I_{IB}	Input bias current			0.7		μA
G_{VO}	Open loop voltage gain	f=100Hz, R_L=47kΩ, C_{NF}=470μF	90	113		dB
V_{OM}	Maximum output voltage	f=1kHz, THD=0.1%, R_L=47kΩ, RIAA	12.5	14.2		Vrms
THD	Total harmonic distortion	f=1kHz, V_O=5Vrms, R_L=47kΩ, RIAA		0.001	0.03	%
V_{NI}	Input referred noise voltage	Rg=2.2kΩ, BW=10Hz～30kHz, RIAA		0.75	1.8	μVrms
S/N	Signal-to-noise ratio	Shorted input (Rg=47Ω), IHF-A network PHONO=2.5mVrms, RIAA		83		dB

TEST CIRCUITS

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

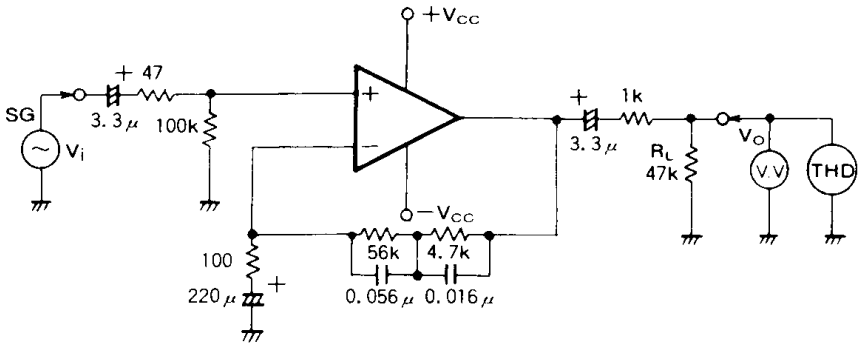


(b) G_{VO}



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

(c) V_{OM}, THD



Unit Resistance : Ω
Capacitance : F

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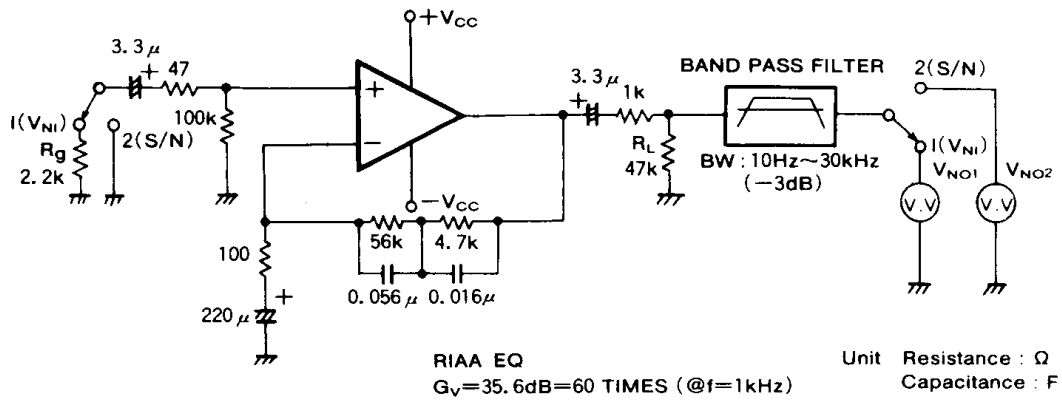
TEST CIRCUIT

(d) V_{NI}, S/N



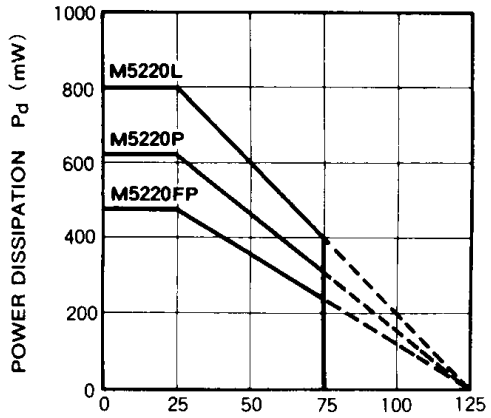
RIAA EQ
G_V=35.6dB=60 TIMES (@f=1kHz)

Unit Resistance : Ω
Capacitance : F

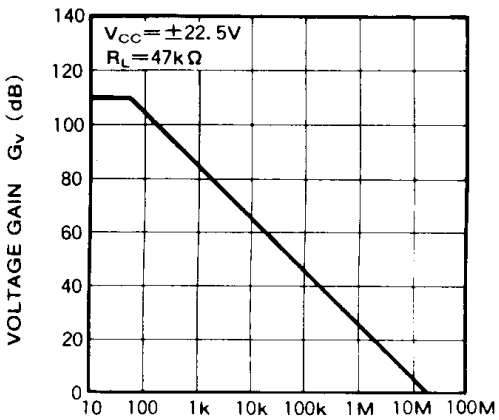
1. $V_{NI}=V_{NO1}/60(\mu Vrms)$
2. $S/N=20\log[2.5mVrms/(V_{NO2/60})]$ (dB)
   * An AC voltmeter V.V with a built-in IHF-A network filter should be used for measuring the S/N ratio.

TYPICAL CHARACTERISTICS

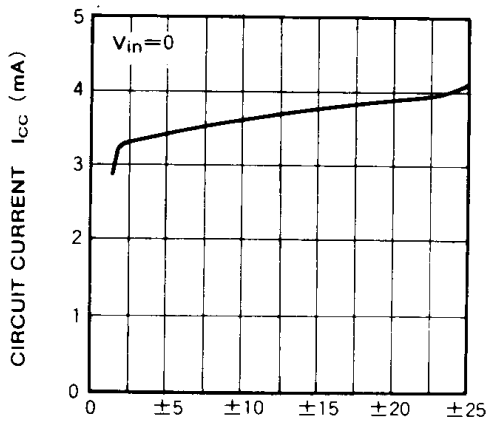
THERMAL DERATING (MAXIMUM RATING)



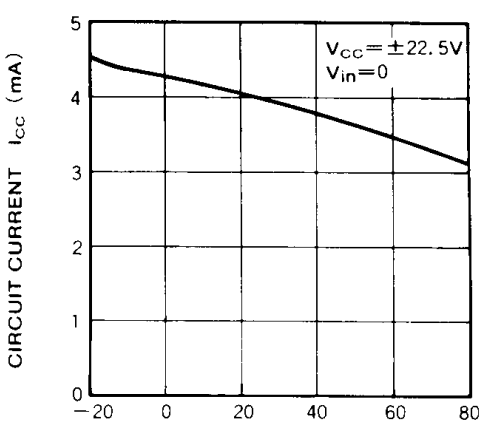
VOLTAGE GAIN VS. FREQUENCY RESPONSE



CIRCUIT CURRENT VS. SUPPLY VOLTAGE



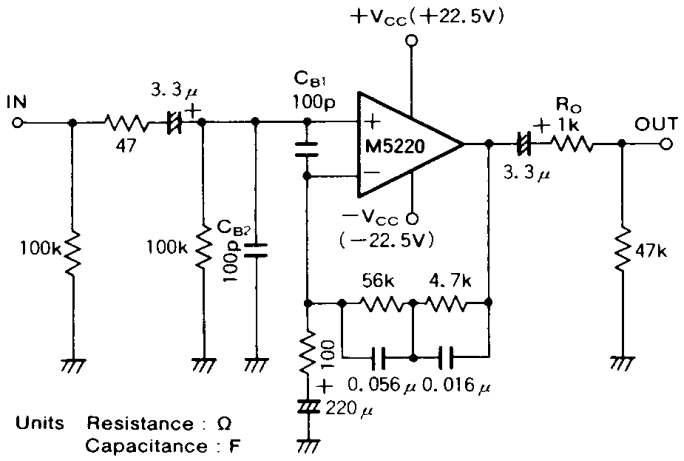
CIRCUIT CURRENT VS. AMBIENT TEMPERATURE



DUAL LOW-NOISE OPERATIONAL AMPLIFIERS(DUAL POWER SUPPLY TYPE)

APPLICATION EXAMPLES

(1) Stereo equalizer amplifier circuit

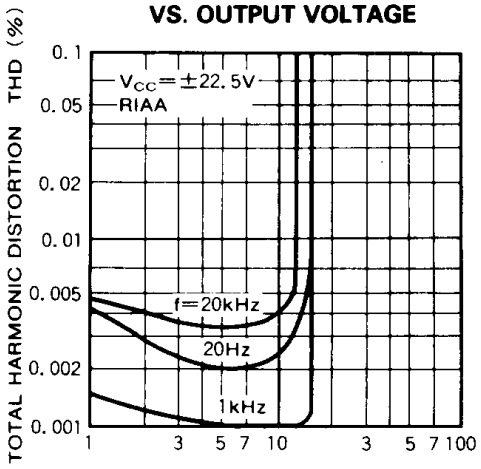


TYPICAL CHARACTERISTICS (V_{CC}=±22.5V, RIAA)

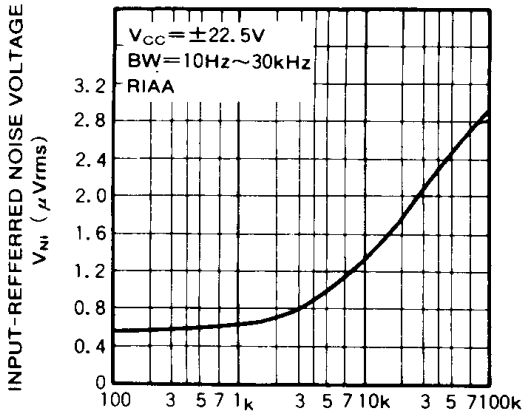
- G_V=35.6dB(f=1kHz)
- V_{NI}=0.75μVrms(R_g=2.2kΩ, BW=10Hz~30kHz)
- S/N=83dB (IHF-A network, shorted input, 2.5mVrms input sensitivity)
- THD=0.001%(f=1kHz, V_O=5Vrms)

L_{ch} circuit constants are identical to those of R_{ch}
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.

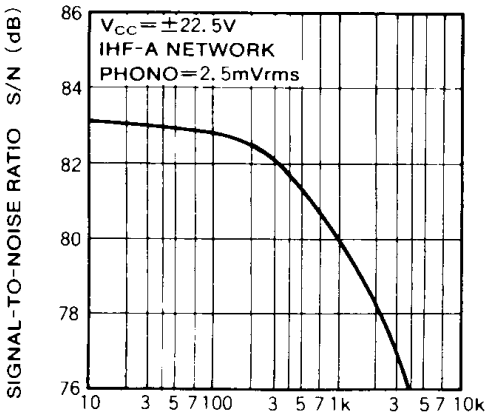
TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



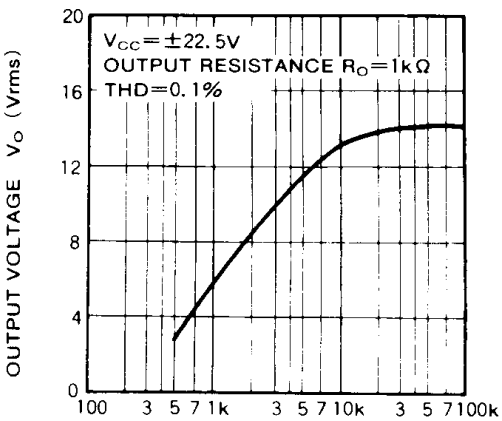
INPUT-REFERRED NOISE VOLTAGE VS. SIGNAL SOURCE RESISTANCE



SIGNAL-TO-NOISE RATIO VS. SIGNAL SOURCE RESISTANCE



OUTPUT VOLTAGE VS. LOAD RESISTANCE



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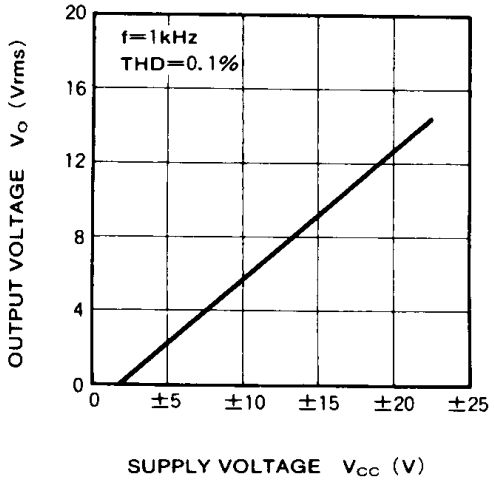
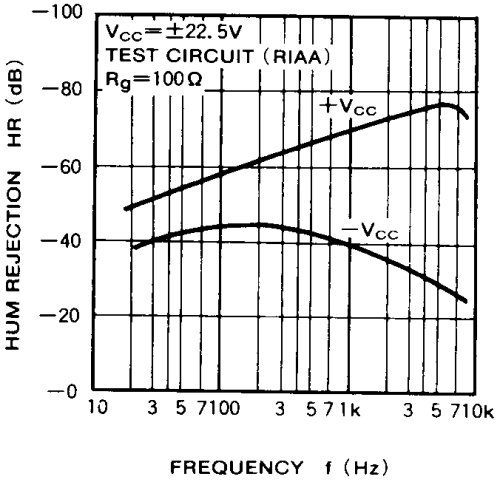
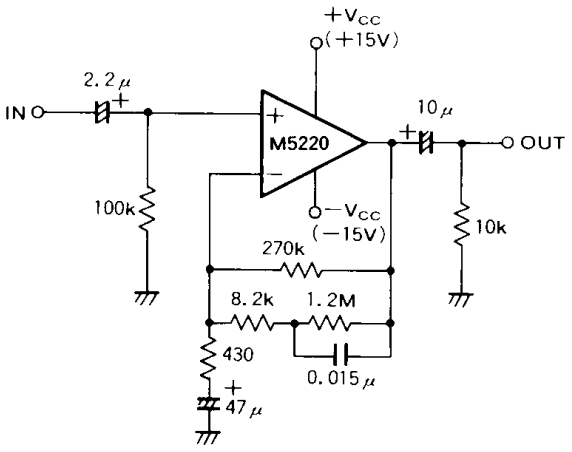
OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



HUM REJECTION VS. FREQUENCY



(2) Tape deck equalizer amplifier circuit



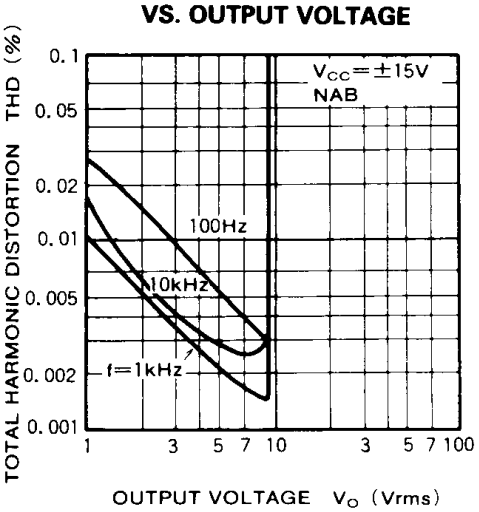
Units Resistance : Ω
Capacitance : F

L_{ch} circuit constants are identical to those of R_{ch}.

TYPICAL CHARACTERISTICS (V_{CC}=±15V, NAB)

- G_V=29.9dB(f=1kHz)
- V_{NI}=1.0μVrms(R_g=2.2kΩ, BW=20Hz~15kHz) (−120dBv)

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



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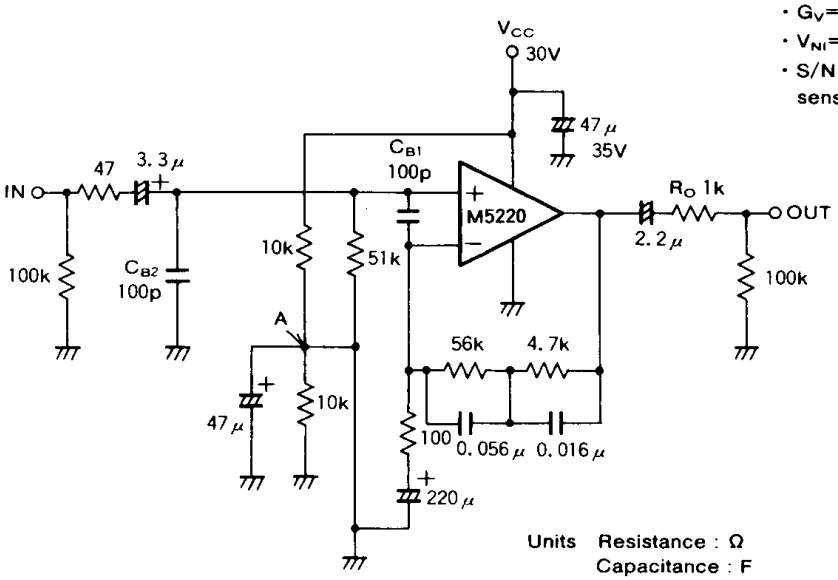
(3) Typical single power supply application

PHONO EQUALIZER AMPLIFIER (RIAA)



- → Point A is the $V_{CC}/2$ point in DC terms (virtual ground) when the device is used as a single power supply type.
- C_{B1}, C_{B2} : Capacitor for buzz prevention, used if required.
- R_O : Resistor used to prevent parasitic oscillation for capacitive loads and current limiting with shorted and other abnormal conditions.

TYPICAL CHARACTERISTICS (V_{CC}=+30V, RIAA)

- G_V=35.6dB(f=1kHz)
- V_{NI}=0.75 μVrms(R_g=2.2kΩ, BW=10Hz~30kHz)
- S/N=83dB (IHF-A network, shorted input, 2.5 μVrms input sensitivity)

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE