



LA6210M

Dual Operational Amplifier

Preliminary

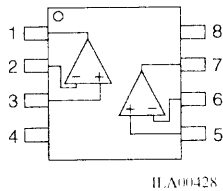
Overview

LA6210M is a low supply voltage and low saturation output voltage ($\pm 2.0V_{p-p}$ at supply voltage $\pm 2.5V$) operational amplifier. It is applicable to handy type CD, radio cassette CD, and portable DAT, that are digital audio apparatus which require the 5V single supply operation and high output voltage.

Features

- Single supply operation.
- Operating voltage. ($\pm 1.0V$ to $\pm 3.5V$)
- Low saturation output voltage.
- High slew rate. ($4.5V / \mu s$ typ.)
- Package outline. MFP8
- Bipolar technology.

Pin Configuration

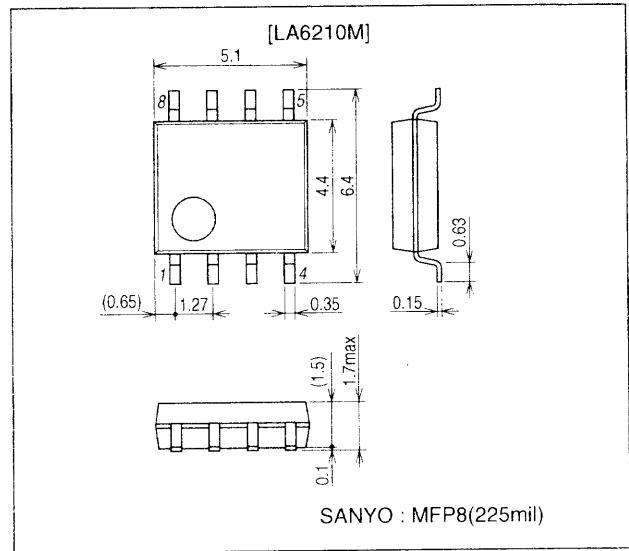


Pin function

1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. V⁻
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V⁺

Package Dimensions

unit : mm
3202C



Specifications

Absolute Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Ratings	Unit
Supply voltage	V ⁺ /V ⁻	±3.5	V
Differential input voltage	V _{ID}	±7	V
Power dissipation	P _D	300	mW
Operating temperature range	T _{opr}	-40 to +85	°C
Storage temperature range	T _{stg}	-40 to +150	°C

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Electrical Characteristics at $T_a = 25\text{ }^\circ\text{C}$, $V^+/V^- = \pm 2.5\text{V}$

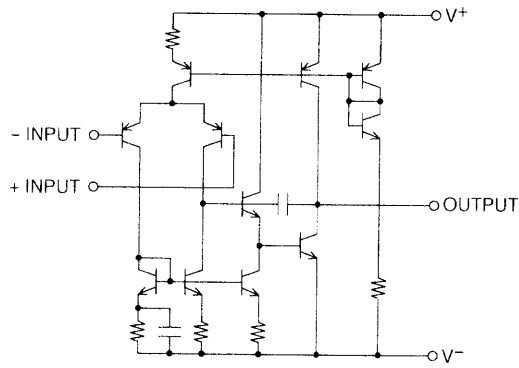
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input offset voltage	V_{IO}	$R_S \leq 10\text{k}\Omega$	-	0.3	6	mV
Input offset current	I_{IO}		-	1.5	200	nA
Input bias current	I_B		-	75	300	nA
Large signal voltage gain	A_V	$R_L \geq 10\text{k}\Omega$	60	90	-	dB
Maximum output voltage swing	V_{OM}	$R_L \geq 2.5\text{k}\Omega$	± 2	± 2.2	-	V
Input common mode voltage range	V_{ICM}		± 1.5	-	-	V
Common mode rejection ratio	CMR		60	80	-	dB
	SVR(+)		60	92	-	dB
Supply voltage rejection ratio	SVR(-)		60	72	-	dB
Operating current	I_{CC}	$V_{IN} = 0, R_L = \infty$	-	3.4	5	mA
Slew rate	SR	$A_V = 1, V_{IN} = \pm 1\text{V}$	-	4.5	-	$\text{V}/\mu\text{S}$
Gain-bandwidth product	GB		-	12	-	MHz

(Note 1) Applied circuit voltage gain is desired to be operated within the range of 3 dB to 30 dB.

(Note 2) Special care being required for input common mode voltage range and the oscillation due to the capacitive load when operating on voltage follower.

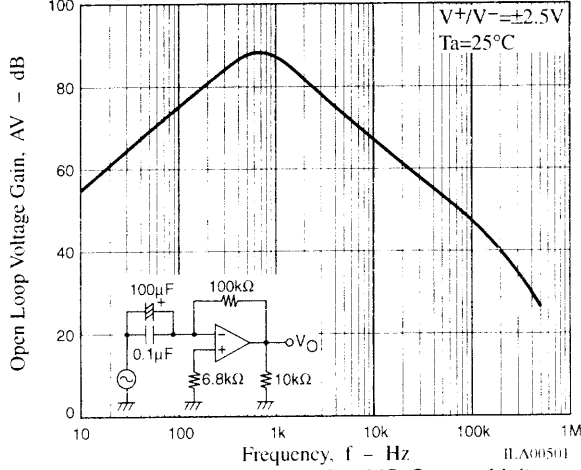
(Note 3) Special care being required for the oscillation, yet having the gain when the supply voltage is applied at more than $\pm 2.5\text{V}$ (single supply voltage 5V).

Equivalent Circuit

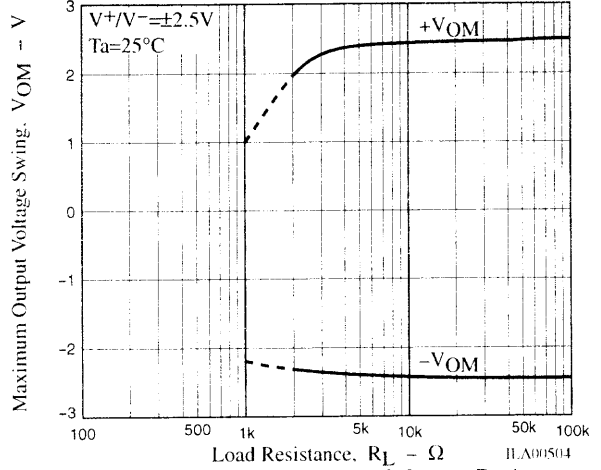


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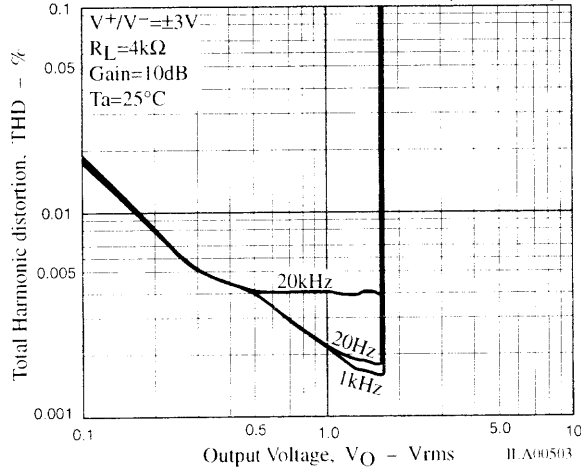
Open Loop Voltage Gain VS Frequency



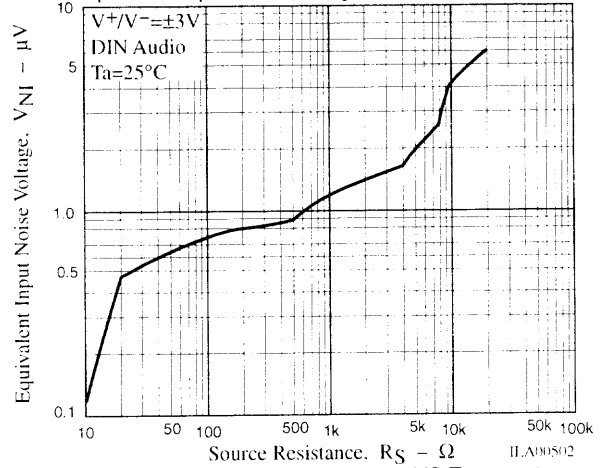
Maximum Output Voltage Swing VS Load Resistance



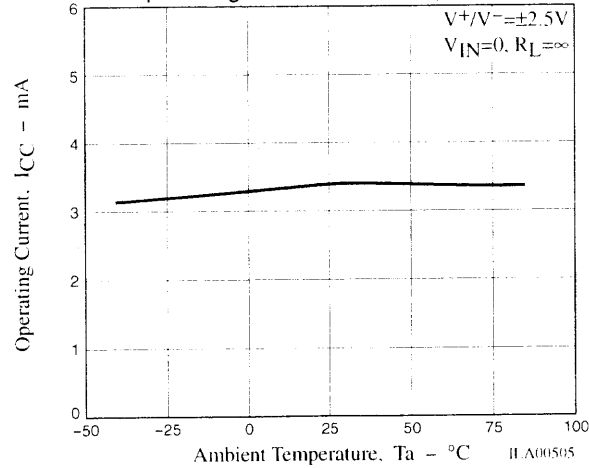
Total Harmonic Distortion VS Output Voltage



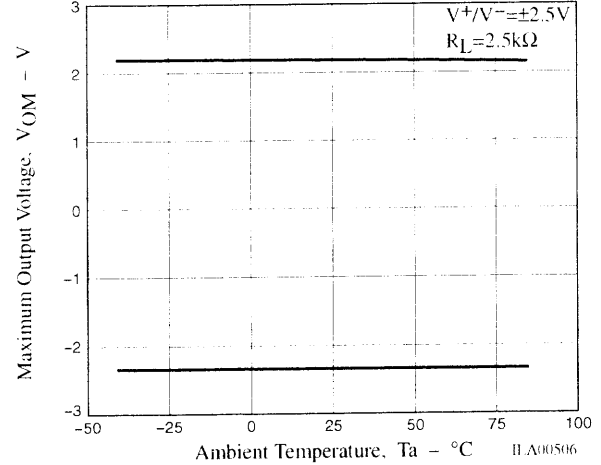
Equivalent Input Noise Voltage VS Source Resistance



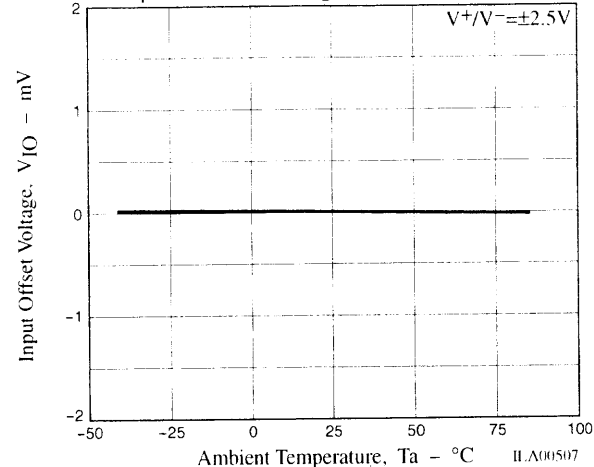
Operating Current VS Temperature



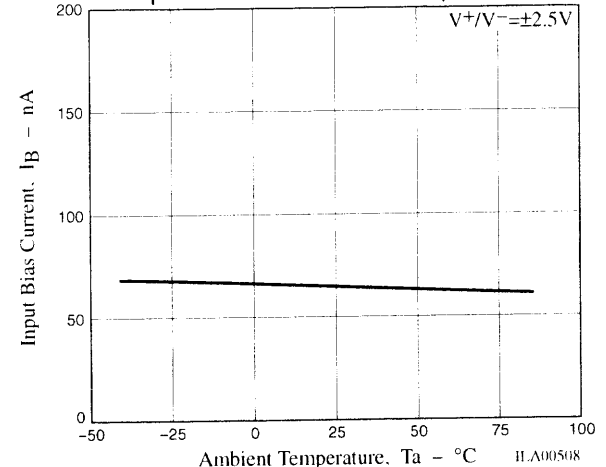
Maximum Output Voltage Swing VS Temperature

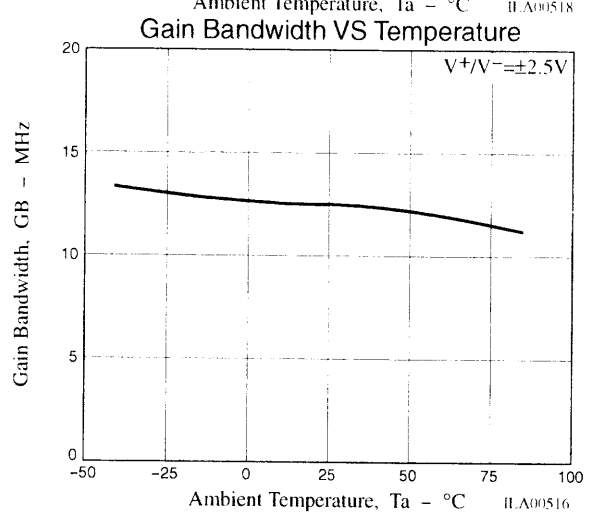
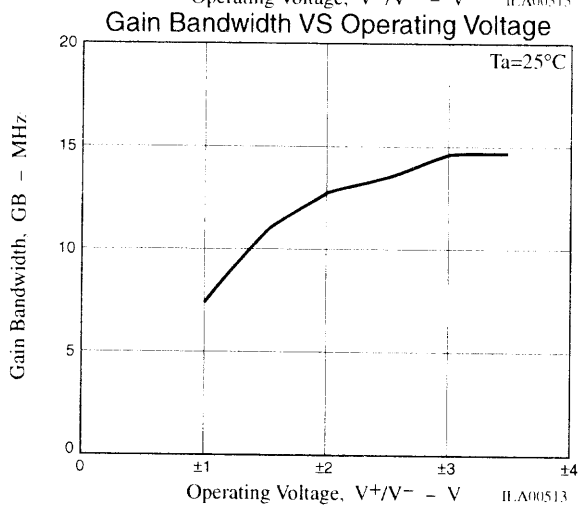
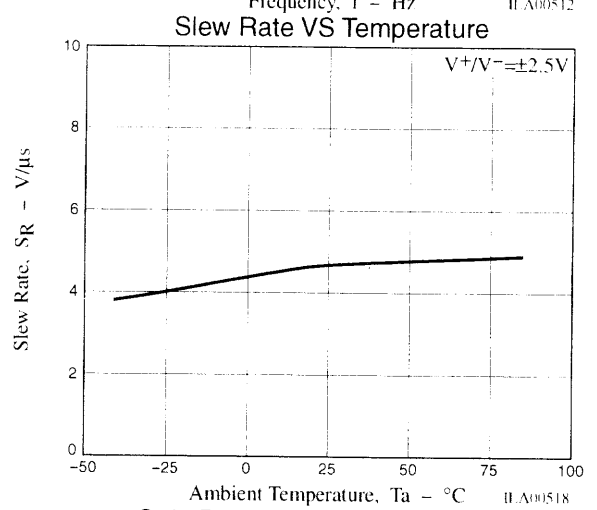
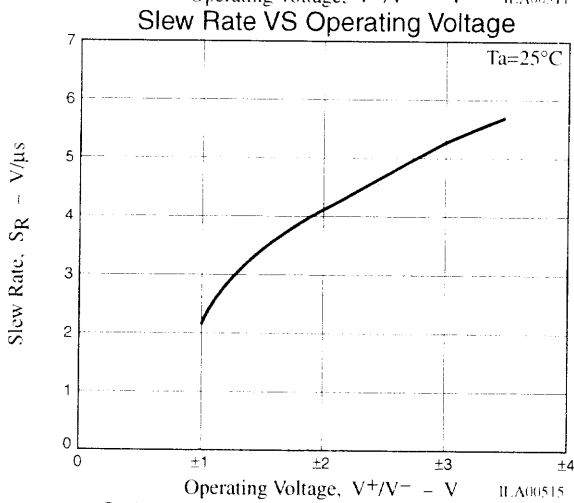
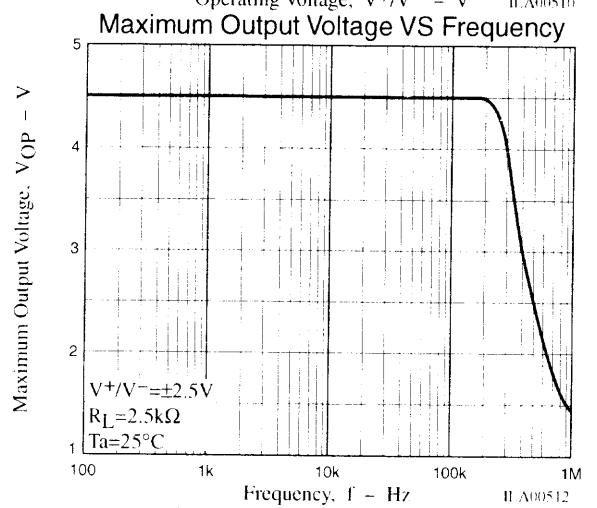
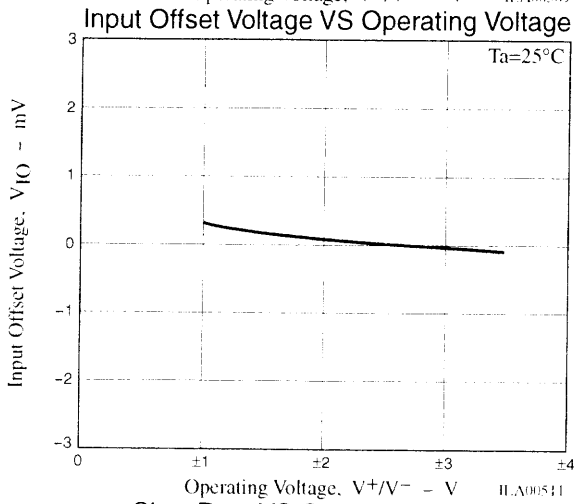
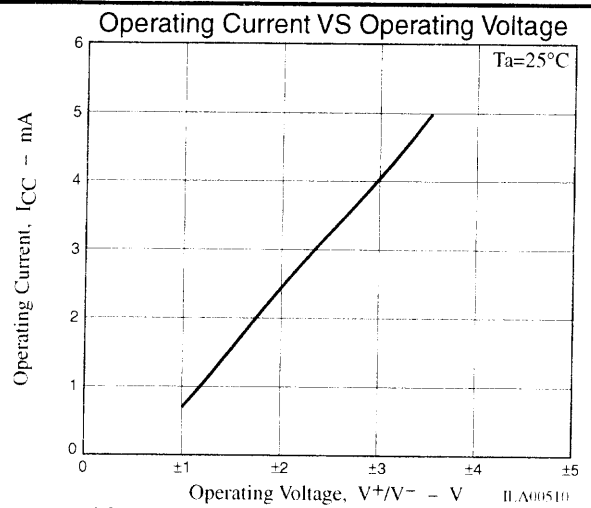
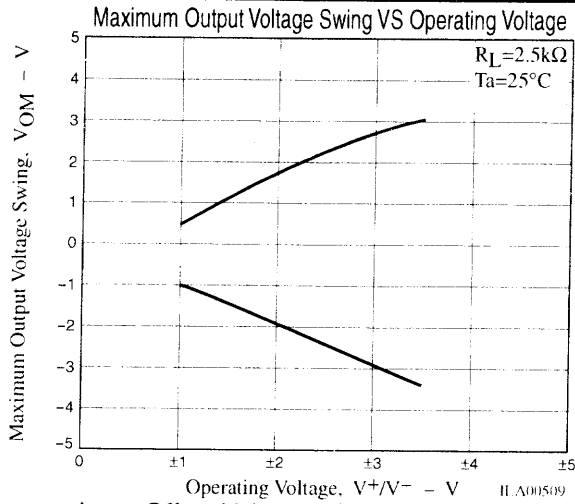


Input Offset Voltage VS Temperature

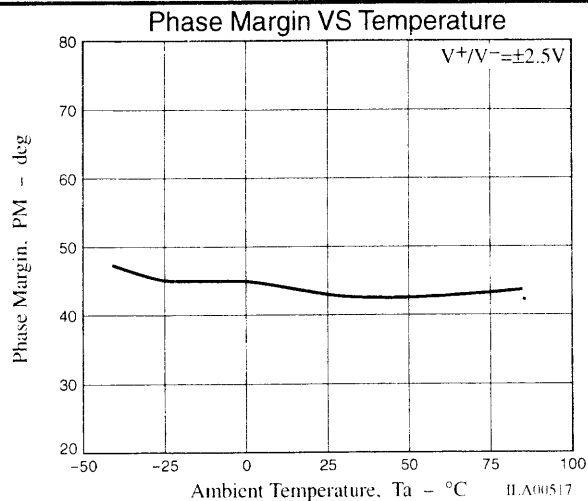
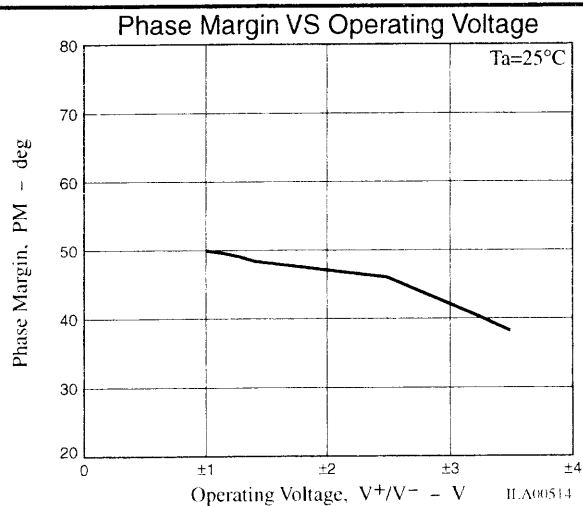


Input Bias Current VS Temperature



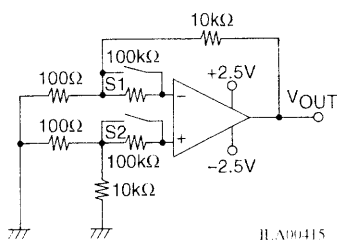


LA6210M



Test Circuits (V±=2.5V, Ta=25°C, TYP) :

Input Offset Voltage / Input Offset Current / Input Bias Current



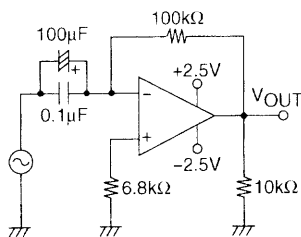
S1	S2	VOUT
on	on	VO1
off	off	VO2
on	off	VO3
off	on	VO4

$$V_{IO} = \frac{V_{O1}}{\text{Gain}}$$

$$I_{IO} = \frac{|V_{O2} - V_{O1}|}{100k\Omega \times \text{Gain}}$$

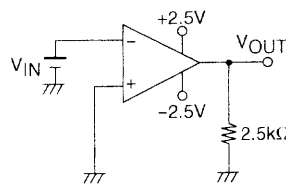
$$I_B = \frac{|V_{O3} - V_{O4}|}{2 \times 100k\Omega \times \text{Gain}}$$

Large Signal Voltage Gain



II.A00416

Maximum Output Voltage Swing

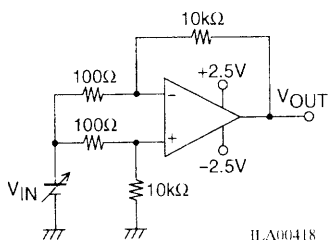


$$V_{OM(+)} : V_{IN} = -1V$$

$$V_{OM(-)} : V_{IN} = 1V$$

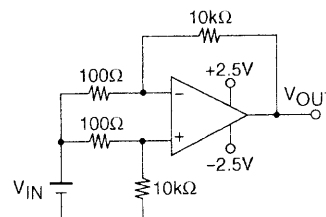
II.A00417

Input Common Mode Voltage Range



II.A00418

Common Mode Rejection Ratio

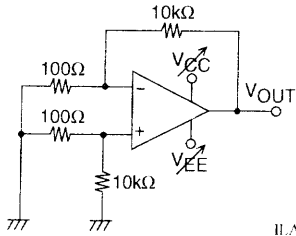


II.A00419

$$V_{IN} = \pm 1V$$

$$CMR = 20 \log \left| \frac{\Delta V_{IN} \times \text{Gain}}{\Delta V_{OUT}} \right|$$

Supply Voltage Rejection Ratio

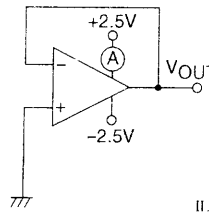


II.A00420

SVR(+): $V_{CC}=1.25V, V_{EE}=-2.5V$
 SVR(-): $V_{CC}=2.5V, V_{EE}=-1.25V$

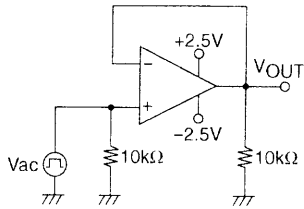
$$SVR=20 \log \left| \frac{\text{Gain} \times \Delta V_{SUP}}{\Delta V_{OUT}} \right|$$

Operating Current

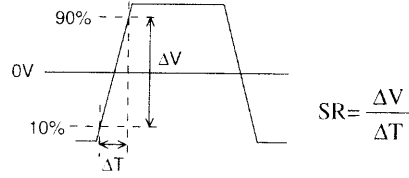


II.A00421

Slew Rate



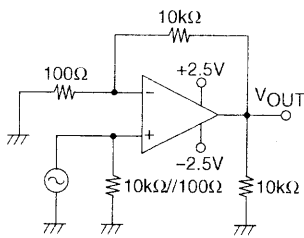
II.A00422



$$SR = \frac{\Delta V}{\Delta T}$$

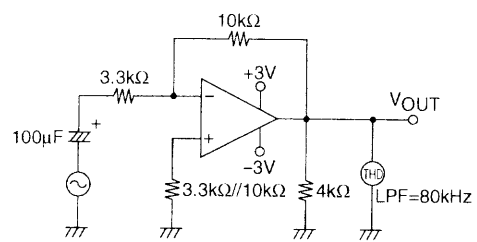
II.A00423

Gain Bandwidth Product



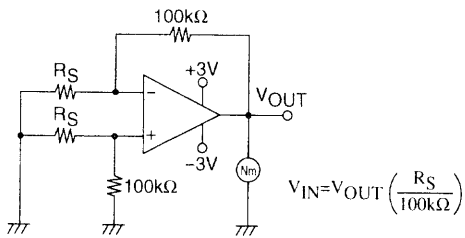
II.A00424

Total Harmonic Distortion



II.A00425

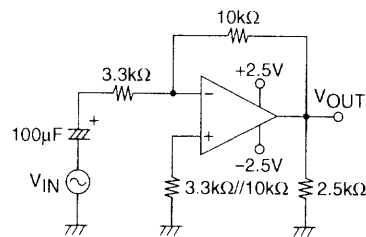
Equivalent Input Noise Voltage



II.A00426

$$V_{IN} = V_{OUT} \left(\frac{R_S}{100k\Omega} \right)$$

Maximum Output Voltage vs. Frequency



Set V_{IN} level when output is 10% THD at 1kHz.

II.A00427

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