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Electronics 1 Part 2 (Quickstudy: Academic)

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ELECTRONICS 1 PART 2

PART 2 of FUNDAMENTALS OF ELECTRONIC DEVICES & BASIC ELECTRONIC CIRCUITS

OPERATIONAL AMPLIFIERS

DEFINITIONS

A basic differential amplifier (see Electronics 1 Part 1) makes possible differential operation and provides a high-gain, high-impedance, low-current-dissipation device. This differential amplifier is also designated as an Operational Amplifier (Op-Amp).

An Op-Amp represents, in essence, a high-gain, electronic circuit intended to achieve the performance of the operational amplifier in a single integrated-circuit package. It is to be used in two input terminals, namely, inverting (1) and non-inverting (2) inputs (Fig. 1).

An Op-Amp constitutes a differential amplifier made up of two operational amplifiers (Op-amps) connected by a common current source (Fig. 2). The output current source (Fig. 2) is fed into a current mirror (Fig. 3) and MOSFETs can also be used as differential pairs.

IDEAL OP-AMP CHARACTERISTICS

• Non-inverting voltage gain, $A_v \rightarrow \infty$
• Input bias current, $I_{in} \rightarrow 0$
• Input impedance, $Z_{in} \rightarrow \infty$
• Output impedance is identical.
 $Z_{out} = Z_{out1} = Z_{out2}$, $I_{out} = I_{out1} = I_{out2}$
• Bandwidth (BW) $\rightarrow \infty$
• With high impedances, it may be difficult to achieve a very high-gain impedance.
• FETs and MOSFETs provide high-gain impedance relationships.

OP-AMP OPERATIONAL PARAMETERS

• Frequency response (Fig. 3) of the inverting and non-inverting (Fig. 4) modes of operational characteristics.

INPUT BIAS CURRENT This is the smaller current to be expected in the non-inverting terminal of the pair of BJT's (e.g. NPNP for TAA Op-AMP) which comes through R_2 so that $I_{in1} = 1000 \times I_{in}$.

INPUT OFFSET VOLTAGE $\rightarrow 1 \mu\text{V}$ It is required at the input as a counter voltage to offset the bias voltage due to unequal current flowing through the differential pair devices in the Op-AMP, so that this balancing gives zero output voltage.

CMRR When the Op-AMP is ideally balanced at the input bias voltage, $V_{in1} = V_{in2}$, then the circuit can reject common-mode signals due to the common-mode gain (CMR) $\rightarrow \infty$. The common-mode rejection ratio (CMRR) is, in practical Op-AMPS, $A_v \geq 10^6$ and $A_v \geq 10^6$, so, in CMRR, it is likely that the extent of balance in the Op-AMP is likely.

OUTPUT VOLTAGE SWING This is the peak output swing with reference to zero at the output. It is limited by power supply voltage and is ± 10 percent of power supply voltage ($\pm V$).

INPUT VOLTAGE SWING Input common-mode voltage swing is limited by the saturation of the differential amplifier at the input, i.e. ± 10 percent of power supply voltage ($\pm V$).

LINEAR VOLTAGE-TO-CURRENT CONVERTERS

LOGARITHMIC AMPLIFIER

CHARGE AMPLIFIER

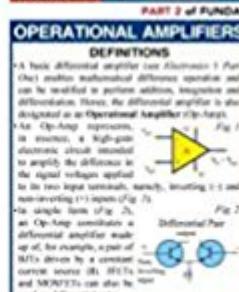
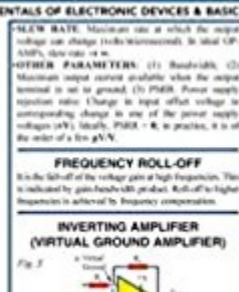
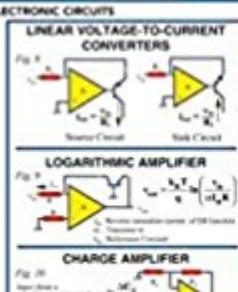
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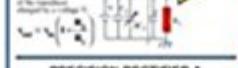
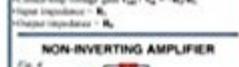
VOLTAGE FOLLOWER (UNITY GAIN AMPLIFIER)

REGULATED POWER SUPPLY

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Synopsis

Part 2 of the fundamentals of electronic devices and basic electronic circuits.

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Customer Reviews

Stashed this away for reference on projects if anything is forgotten or disputed. No longer need internet if its not available. The quality is good, but the amount of information is overwhelming. If you are going to actually be studying for a class, I recommend making your own study card in addition to buying this as there are many benefits to doing so.

husband loves them He says great learning/reference tool

Great reference!

BarCharts are a great little reference. I would not recommend them as a study aid, but as a quick reference, they are great! I have used them for Chem, Physics, Electronics and Math. They are great for what they are.

High quality and delivered on time.

Top of the Line in Electronics Reference !!!!!!!!

It's legible, convenient, durable, water proof, etc. It's a handy little cheat sheet. I keep in a binder with the documents for a TI NSpire Calculator. I was kinda hoping that it would cover microwave transmission parameters. Some of that is on the Circuit Theory/Analysis card. Still, there was not much on the cards concerning practical impedance matching circuits. You just can't cram everything on a couple or three cards. All the basics are there. You should be able to derive the rest.

I was hoping there would be more to it but, its still a good referance

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