TRINITY COLLEGE FOR WOMEN
NAMAKKAL
Department of Physics

DIGITAL ELECTRONICS

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OPERATIONAL AMPLIFIERS

INTRODUCTION

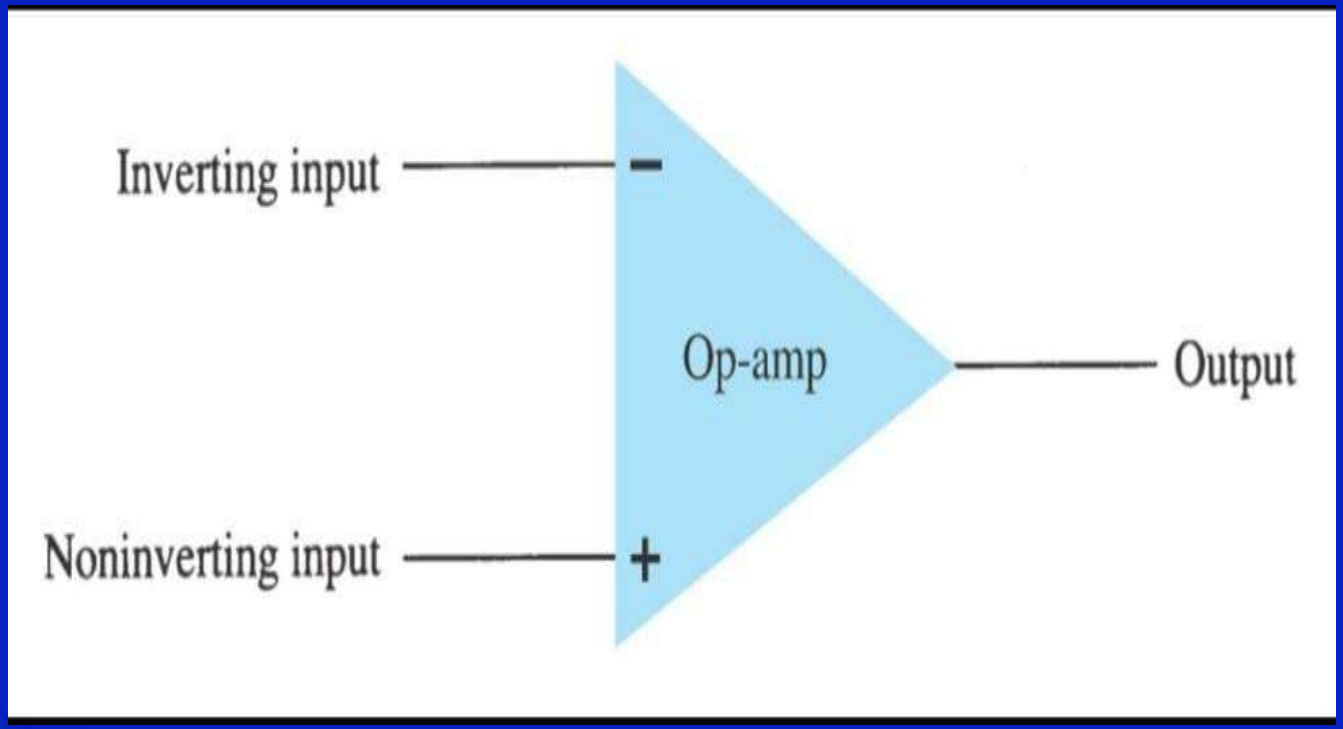
Typical IC packages

IC packages placed on circuit board

USES OF OP-AMP

- To provide voltage amplitude changes
- Comparators
- Oscillators
- Filter circuits
- Instrumentation circuits

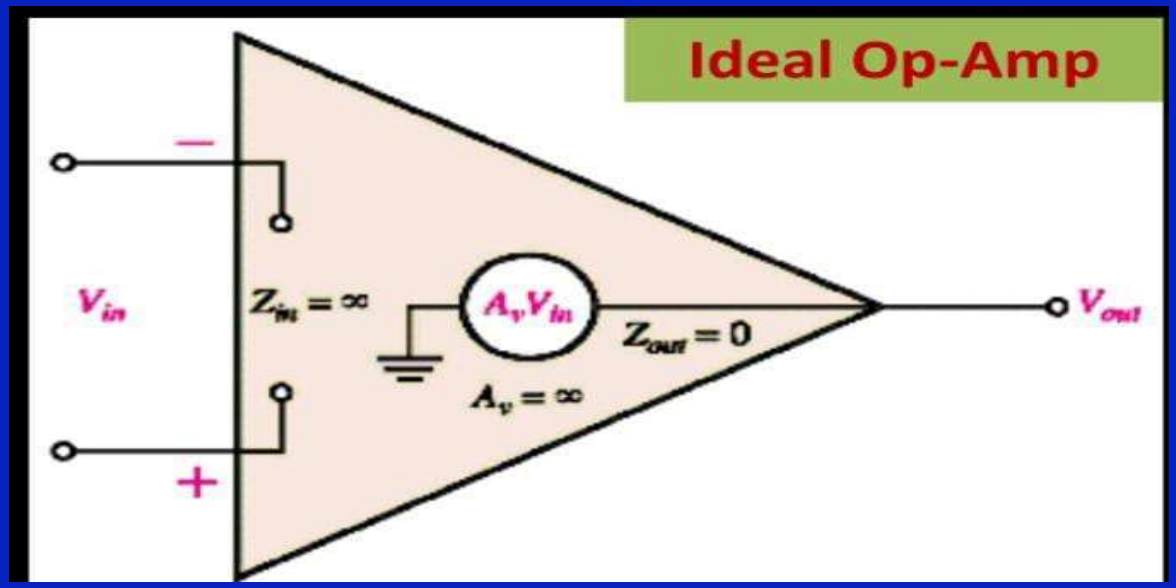
OP-AMP BASICS



DEFINITION

- The operational amplifier is a circuit of components integrated into one chip.
- Op-amps were used to model the basic mathematical operations: addition, subtraction, integration, differentiation, and etc in electronic analog computers.
- A typical op-amp is powered by two dc voltages (+V and –V) and has an inverting (-) and a non-inverting input(+) and an output.

IDEAL / PRACTICAL OP-AMP



- Voltage gain (Av) = Infinite
- Bandwidth = Infinite
- Input impedence (Zin) = Infinite
- Output impedence (Zout) = Zero

PROPERTIES

Ideal Op-Amp

- Infinite input impedance
- Zero output impedence
- Infinite open-loop gain
- Infinite bandwidth
- Zero noise contribution
- Both differential inputs stick together

Practical Op-Amp

Input impedance 500k-2M

Output impedance 20-100

Open loopgain (20kto200k)

Noise contribution

Non-zero DC output offset

INPUT IMPEDANCE

- Input impedance (Zin) is measured across the input terminals.
- It is the Thevenin resistance of the internal connection between the two input terminals.
- Input impedance (Zin) is the ratio of input voltage (Vin) to input current (Iin).
- When Zin= infinite, the input current (Iin)=0.
- So any current will neither flowing from the source supply into the amplifiers input circuitry, nor will accept current from any external circuit.
- In real, the resistance is 500k to 2M.

OUTPUT IMPEDANCE

- The internal resistance of the op-amp is op-amp output impedance Zout.
- This internal resistance is in series with the load reducing, the output voltage available to the load.
- The output impedance of the ideal operational amplifier is assumed to be zero acting as a perfect internal voltage source with no internal resistance, so that it can supply as much current as necessary to the load.
- Real op-amps have output impedance in the range 20-100

Open-Loop Gain (A01)

- Open-Loop gain, A01 is the gain of the op-amp without feedback.
- In the ideal op-amp, A01 is infinite.
- In the real op-amp is (20k to 200k).

THANK YOU

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