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BLOCK DIAGRAM REPRESENTATION OF OP - AMP

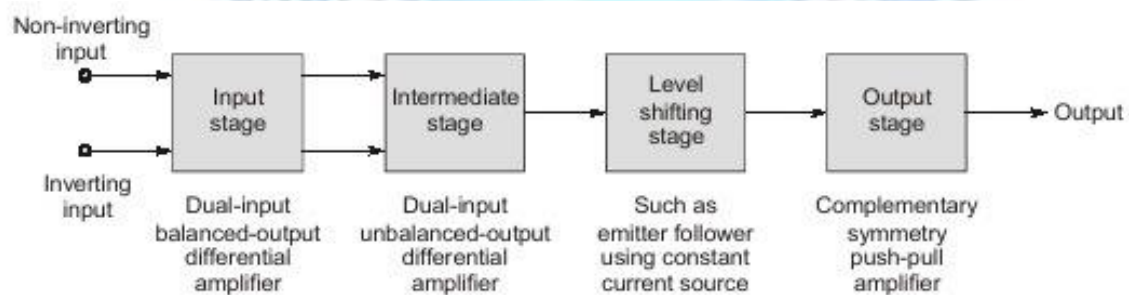


Figure: Block diagram of a typical op-amp

A block diagram of an op-amp shows its internal stages: a Differential Input Stage (dual-input, balanced output) for high gain and impedance, an Intermediate Gain Stage (voltage amplifier) for further amplification, a Level Shifter (often an emitter follower/buffer) to adjust DC level, and an Output Stage (push-pull) for delivering power to a load, resulting in a high-gain, low-output-impedance amplifier.

Here are the typical stages in a cascaded block diagram:

1. Differential Input Stage:

- **Function:** Amplifies the difference between the non-inverting (+) and inverting (-) inputs.

- **Characteristics:** High input impedance, provides most of the voltage gain, balanced output (differential).

2. Intermediate (Gain) Stage:

- **Function:** Provides significant additional voltage gain.
- **Characteristics:** High-gain voltage amplifier, often a single-ended, unbalanced output.

3. Level Shifter/Buffer Stage:

- **Function:** Shifts the DC level of the signal to center the output around zero volts and provides buffering.
- **Characteristics:** Emitter follower or similar, unity gain, high input impedance, low output impedance.

4. Output Stage:

- **Function:** Delivers sufficient current/voltage to drive a load.
- **Characteristics:** Low output impedance, often a complementary push-pull amplifier for efficiency.

Overall Operation:

An operational amplifier (op-amp) is a high-gain differential amplifier that amplifies the difference between two input signals. The block diagram of an op-amp consists of three main stages: the **input differential amplifier**, the **intermediate gain stage**, and the **output stage**. The input differential amplifier receives two inputs, the **inverting (-) input** and the **non-inverting (+) input**, and produces an output proportional to the difference between these inputs while rejecting any common-mode signal. This stage provides high input impedance and low noise.

The output of the differential amplifier is fed to the **intermediate gain stage**, which provides very high voltage gain. This stage is responsible for most of the amplification in the op-amp and usually includes frequency compensation to ensure stability and proper bandwidth control. The amplified signal is then applied to the **output stage**, which acts as a buffer and provides low output impedance. This stage allows the op-amp to drive loads without signal distortion. The op-amp is powered using positive and negative supply voltages, enabling it to amplify both positive and negative signals. Thus, by amplifying the difference between the input signals through these stages, the op-amp performs various operations such as amplification, summation, integration, and differentiation.

