Ideal and practical OpAmp

An ideal **Operational Amplifier** is basically a 3-terminal device that consists of two high impedance inputs, one an **Inverting input** marked with a negative sign, ("-") and the other a **Non-inverting input** marked with a positive plus sign ("+").The amplified output signal of an Operational Amplifier is the difference between the two signals being applied to the two inputs.

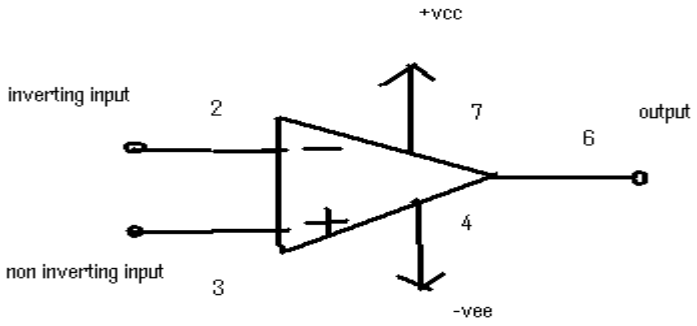

Figure 1.4

An ideal op-amp having following electrical characteristics.

1. Infinite voltage gain.
2. Infite input resistance Ri so that almost any source can drive it.
3. Zero output resistance Ro so that output can drive any no. of devices.
4. Zero output voltage when input voltage is zero.
5. Infite band width.
6. Infinite CMMR
7. Infinite slew rate.

Idealized Characteristics.

PARAMETER	IDEALIZED CHARACTERISTIC
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Voltage Gain, (A)	**Infinite** - The main function of an operational amplifier is to amplify the input signal and the more open loop gain it has

	the better, so for an ideal amplifier the gain will be infinite.
Input impedance, (Z_{in})	**Infinite** - Input impedance is assumed to be infinite to prevent any current flowing from the source supply into the amplifiers input circuitry.
Output impedance, (Z_{out})	**Zero** - The output impedance of the ideal operational amplifier is assumed to be zero so that it can supply as much current as necessary to the load.
Bandwidth, (BW)	**Infinite** - An ideal operational amplifier has an infinite Frequency Response and can amplify any frequency signal so it is assumed to have an infinite bandwidth.
Offset Voltage, (V_{io})	**Zero** - The amplifiers output will be zero when the voltage difference between the inverting and non-inverting inputs is zero.

From these "idealized" characteristics above, we can see that the input resistance is infinite, so **no current flows into either input terminal** (the current rule) and that the **differential input offset voltage is zero** (the voltage rule). It is important to remember these two properties as they help understand the workings of the amplifier with regards to analysis and design of operational amplifier circuits.

Practical op-amp

In practice, none of these ideals can be realized, and various shortcomings and compromises have to be accepted. Depending on the parameters of interest, a real op-amp may be modeled to take account of some of the non-infinite or non-zero parameters using equivalent resistors and capacitors in the op-amp model. The designer can then include the effects of these undesirable, but real, effects into the overall performance of the final circuit. Some parameters may turn out

to have negligible effect on the final design while others represent actual limitations of the final performance that must be evaluated

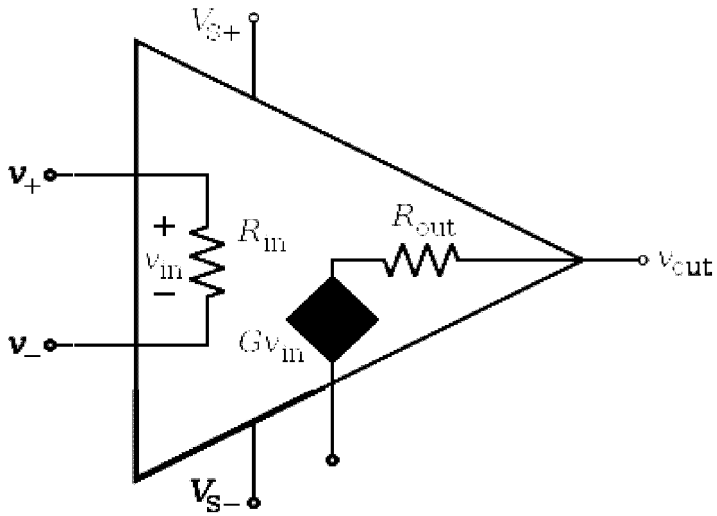

Figure 1.5