

# NMOS Differential Amplifier

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## Abstract

This paper elaborates about the designing of double ended differential amplifier. It is a very popular connection used in integrated circuits i.e. IC units. In IC's for the designing of input stage and intermediate stage we used differential amplifier. So it is the basic building block in IC circuit design. The differential amplifier is a direct coupled high gain amplifier. The purpose of differential amplifier is to provide the high gain. It is a DC amplifier therefore it can amplify both DC and AC signals such as cascode amplifier, darlington pair etc are the examples of differential amplifier.

## 1 Circuit Details

The below circuit consists of double ended NMOS differential amplifier. The designing of NMOS differential amplifier can understand in a way that two common source are connected together. If we apply input signals with same polarity then it is called common mode of operation and if we apply input with two opposite polarity then the operation is called double ended differential amplifier. Here in this circuit AC signals are used for amplification. In this operation after applying two input signals with opposite polarity the output can be obtained from the collectors of the individual circuits i.e. VO1 and VO2 and the difference of both the output is the total output of the differential amplifier circuit. So we can say the working of differential amplifier is the amplification of the difference of any two input signals and it rejects any two common signals. In case of the differential mode resultant output is high and in case of common mode resultant output is zero. So the common mode rejection ratio of differential amplifier is high. The other important characteristics of differential amplifier are high input impedance, low input bias current and low offset voltage. The output obtained in each case is 180 degree phase shift with the input applied as it follows the operation of basic common source amplifier. The basic circuit diagram and the waveforms of differential amplifier are shown below.

## 2 Implemented Circuit

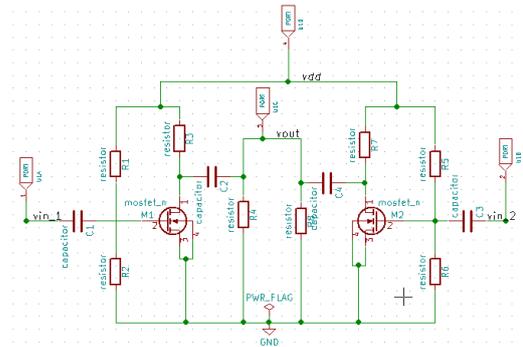


Figure 1: Implemented circuit diagram.

## 3 Implemented Waveforms

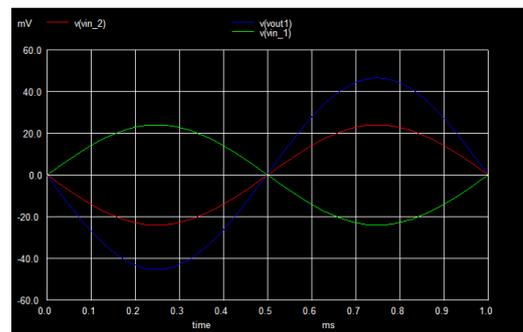


Figure 2: Implemented waveform.

## References

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