

DIFFERENTIAL AMPLIFIER

Aim :

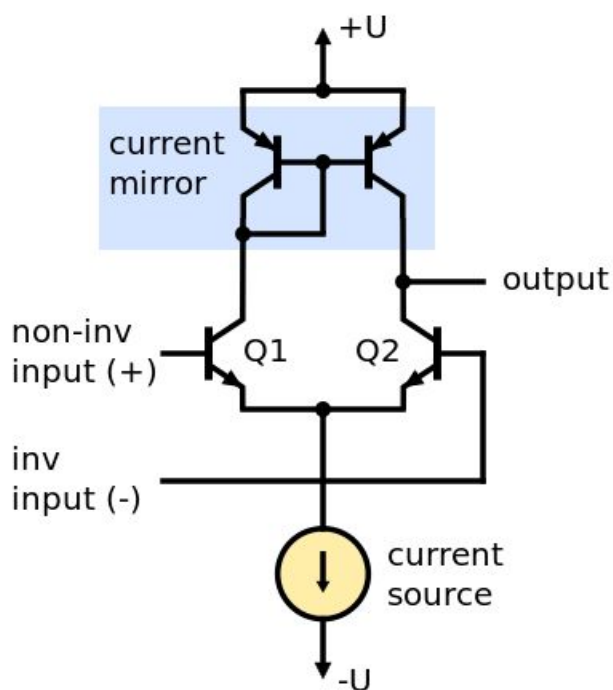
Theory : A **differential amplifier** is a type of electronic amplifier that amplifies the difference between two input voltages but suppresses any voltage common to the two inputs.

$$V_{\text{out}} = A (V_{\text{in}+} - V_{\text{in}-})$$

where A is the gain of the amplifier.

In practice, however, the gain is not quite equal for the two inputs. This means, for instance, that if $V_{\text{in}+}$ and $V_{\text{in}-}$ are equal, the output will not be zero, as it would be in the ideal case. A more realistic expression for the output of a differential amplifier thus includes a second term.

$$V_{\text{out}} = A (V_{\text{in}+} - V_{\text{in}-}) + A_c (V_{\text{in}+} + V_{\text{in}-})/2$$



Specifications :

Gain = 53 dB

Power Dissipation = 0.36 mW

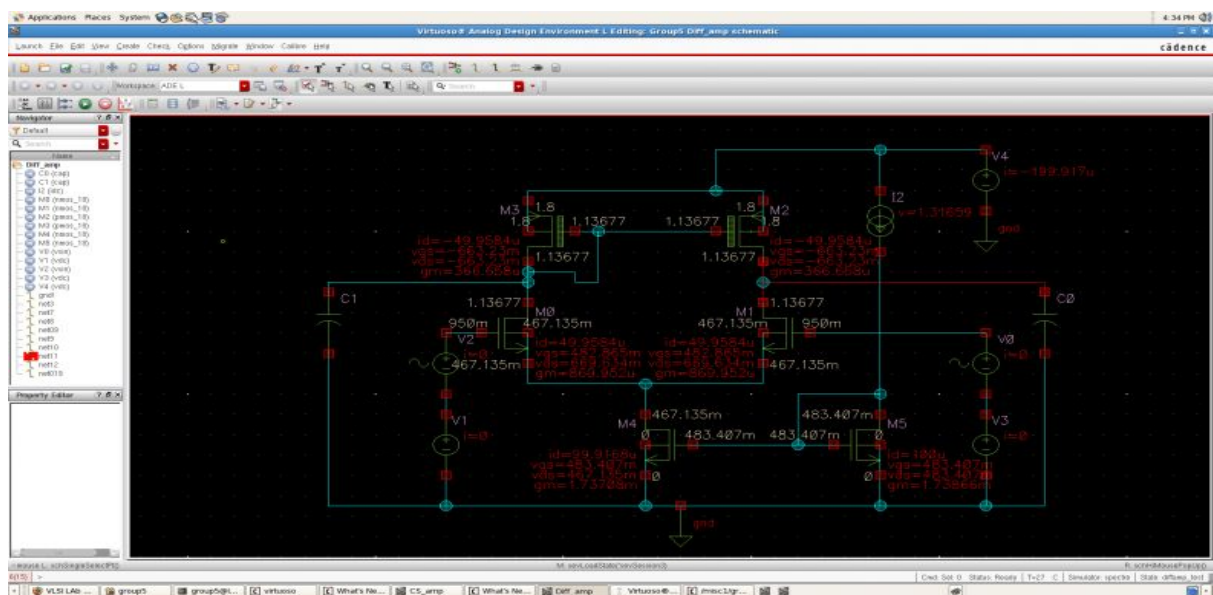
Gain BandWidth Product (GBP) = 16MHz

THD = 4.8

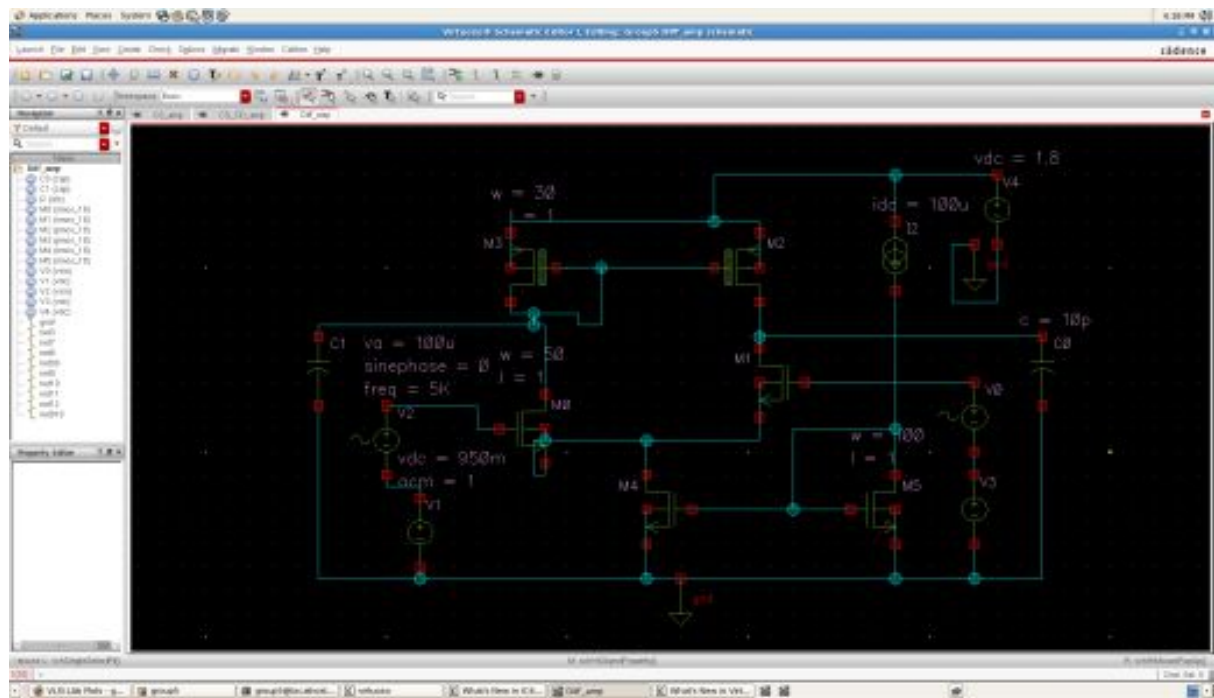
ICMR+=0.6

ICMR-=1.6

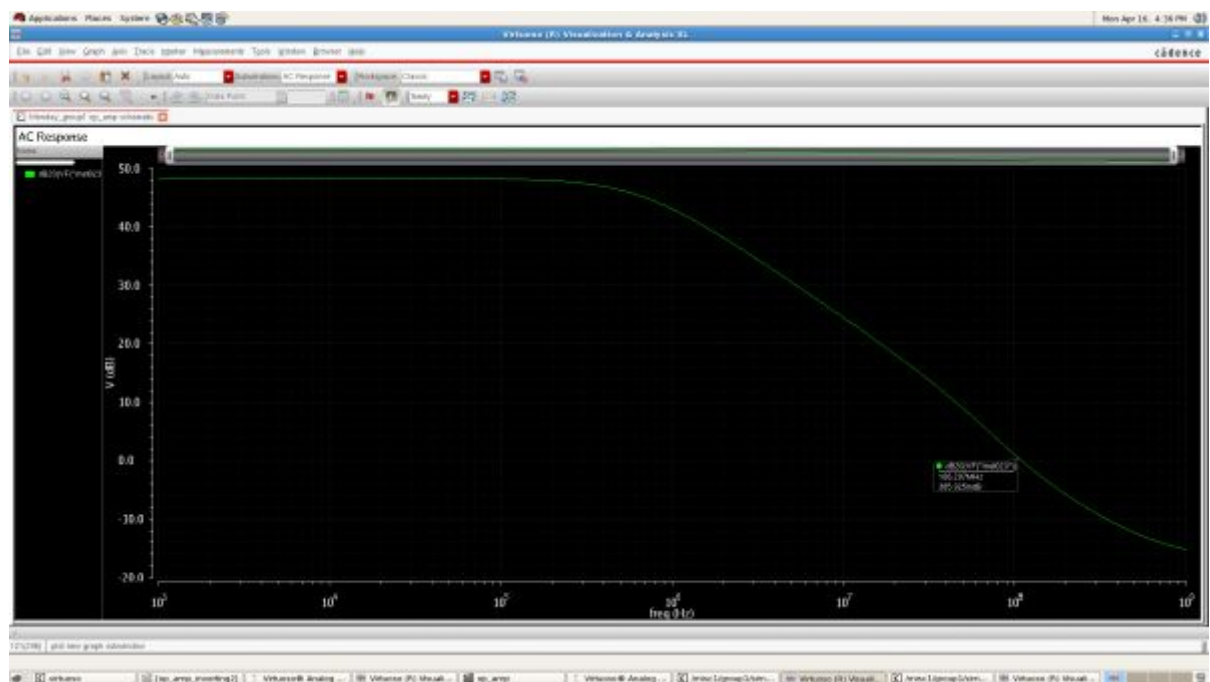
DC Operating Points



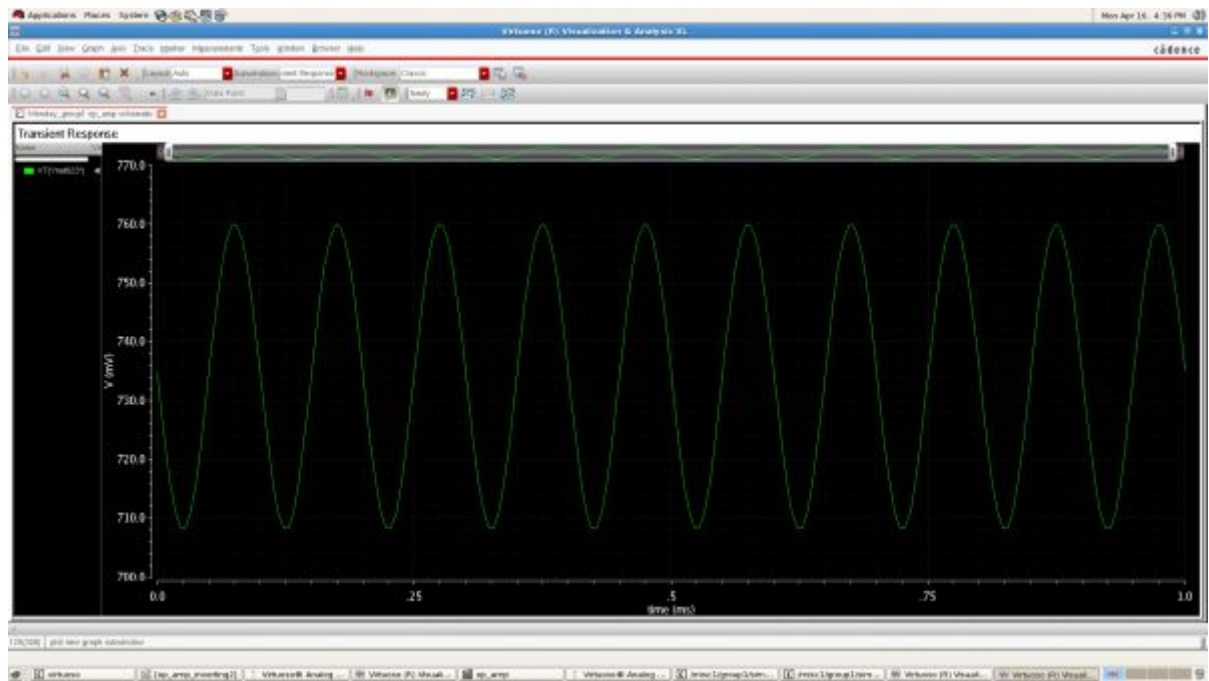
W/L Ratios



Frequency Response:



Transient Response:

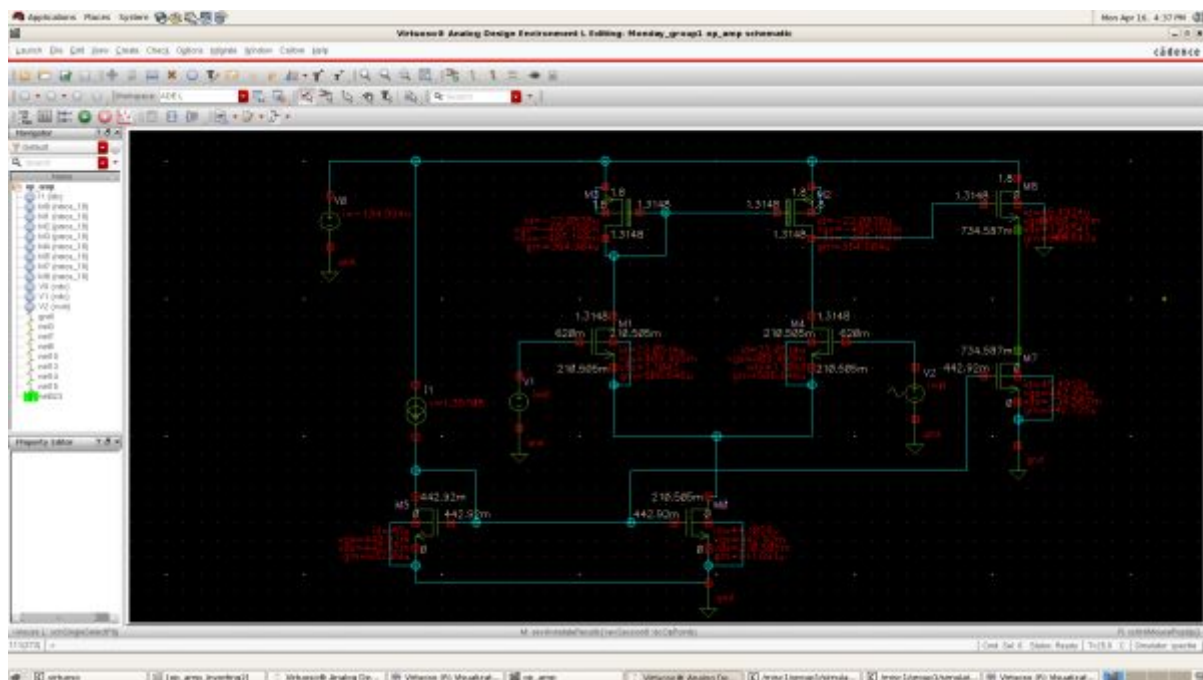


VLSI Assignment

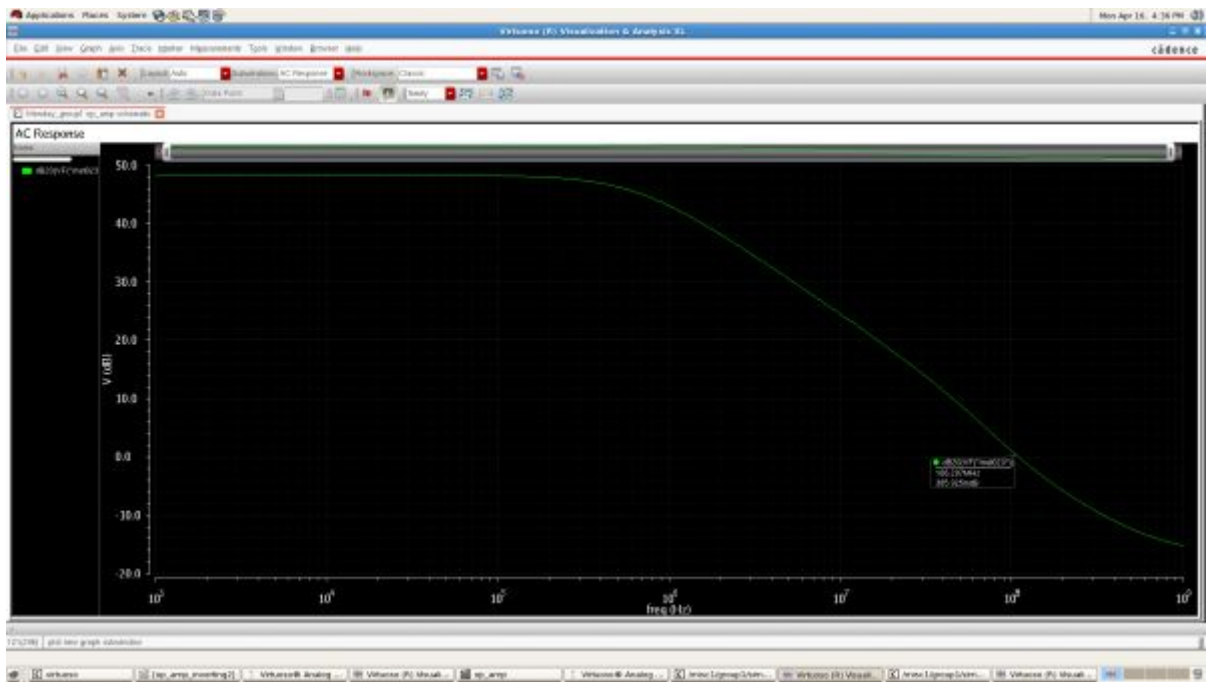
Differential Amplifier with common drain buffer stage :

The addition of a common drain stage reduces the output impedance drastically . Therefore it increases the bandwidth of circuit as well as reduces the loading effect of consequent stages .It also converts it to a voltage amplifier .

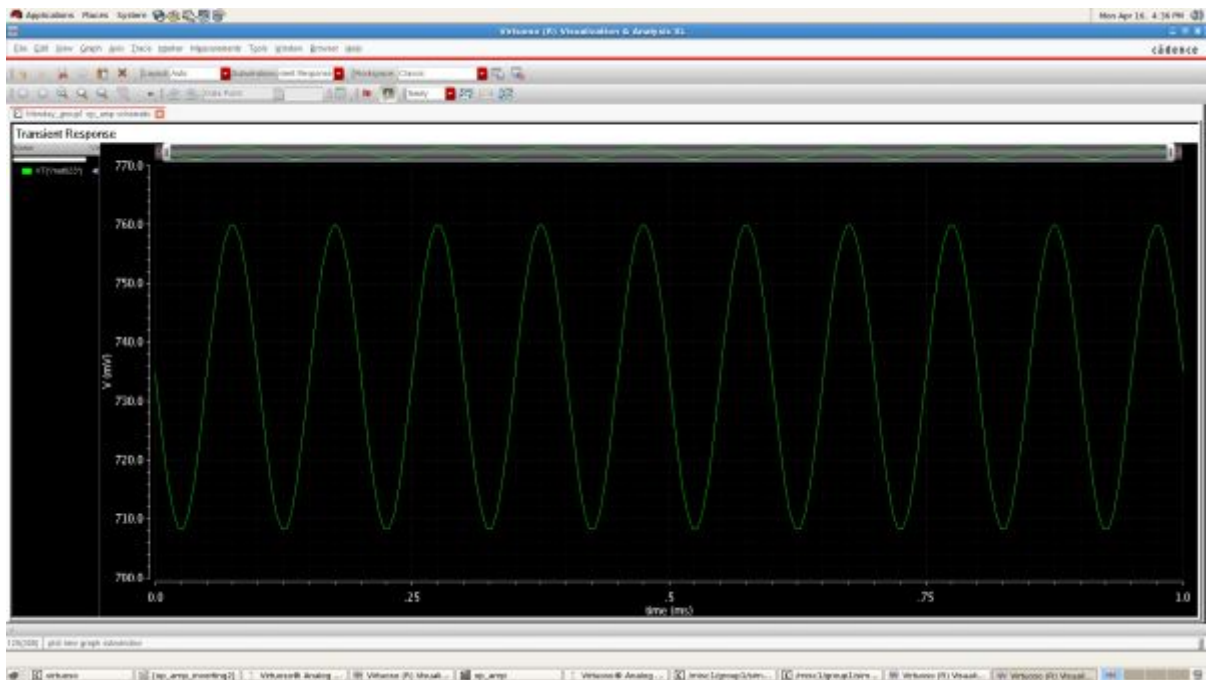
Schematic :



Frequency Response :



Transient response :



2)

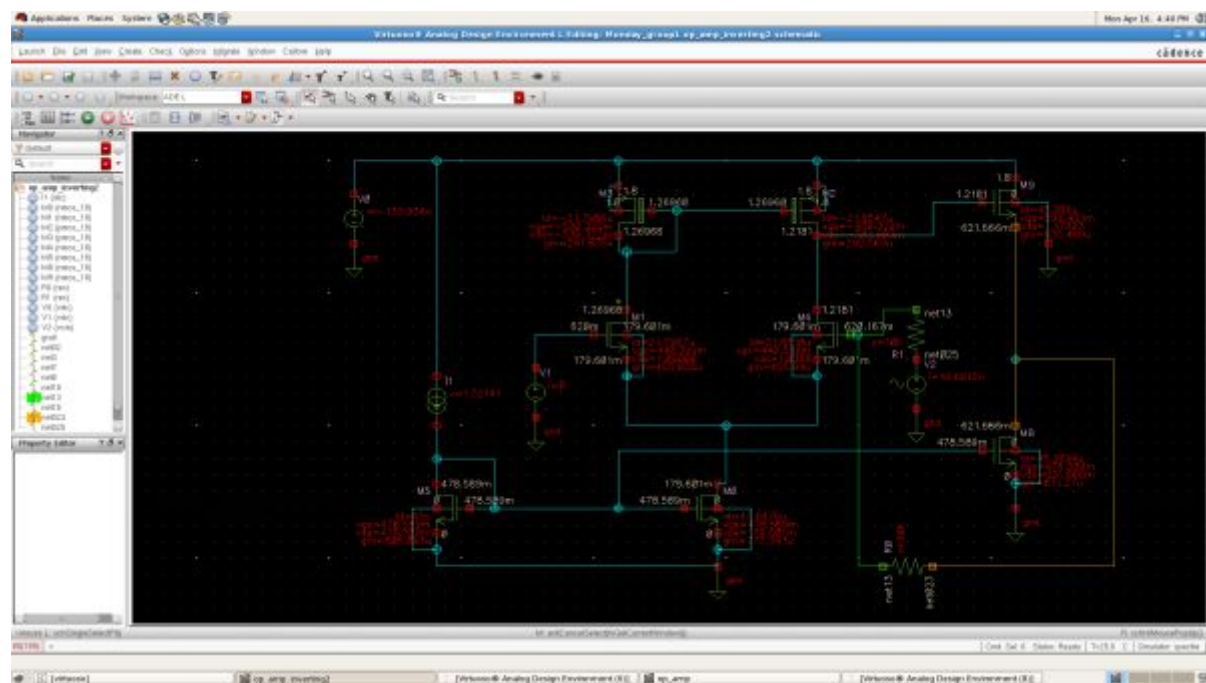
An operational amplifier, or op-amp, is a differential amplifier with very high differential-mode gain, very high input impedance, and low output impedance. An op-amp differential amplifier can be built with predictable and stable gain by applying *negative* feedback .

Since the gain of the differential amp is a dependent on process variation . We use negative feedback to get a suitable gain as well as get a higher bandwidth .

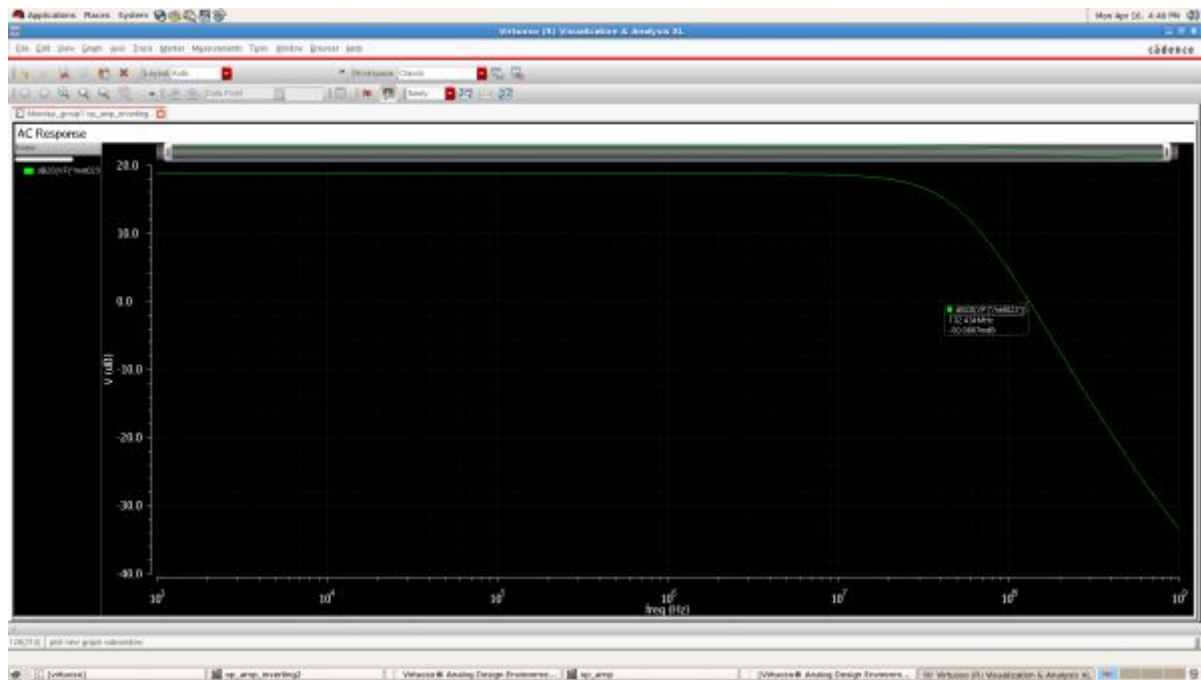
Specification :

Gain :10

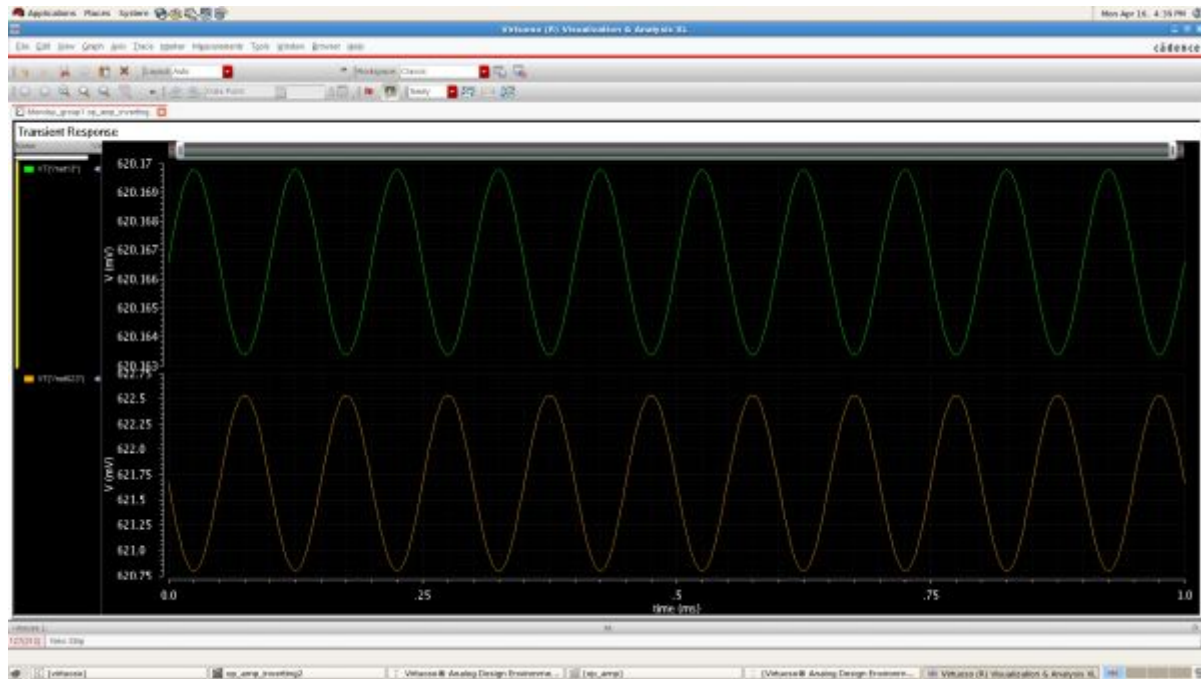
Schematic :



Frequency Response :



Inverting transient response (phase diff 180 degree):



Non inverting transient response :

