In the Name of God

Faculty of Electrical Engineering

Electronics 2
Second Semester 01-02
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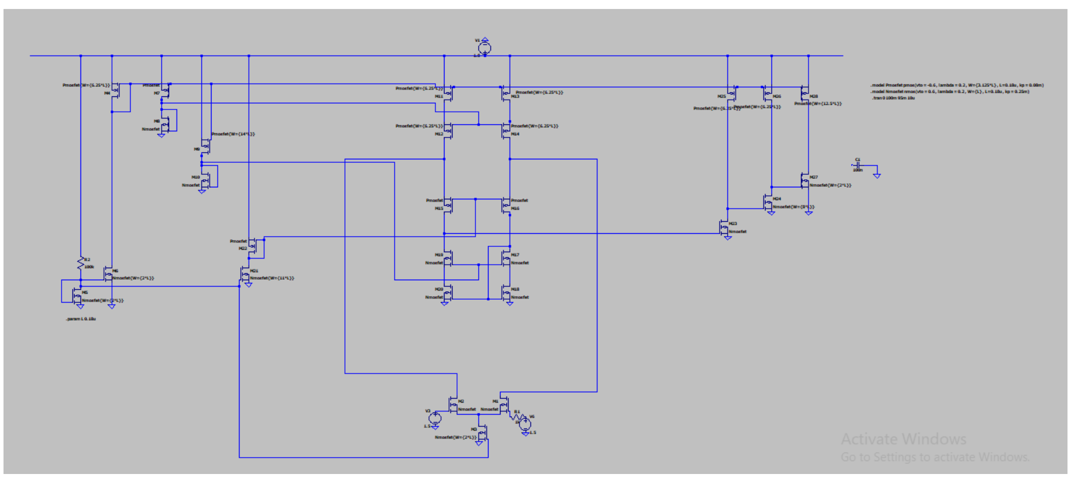
1.1 Biasing

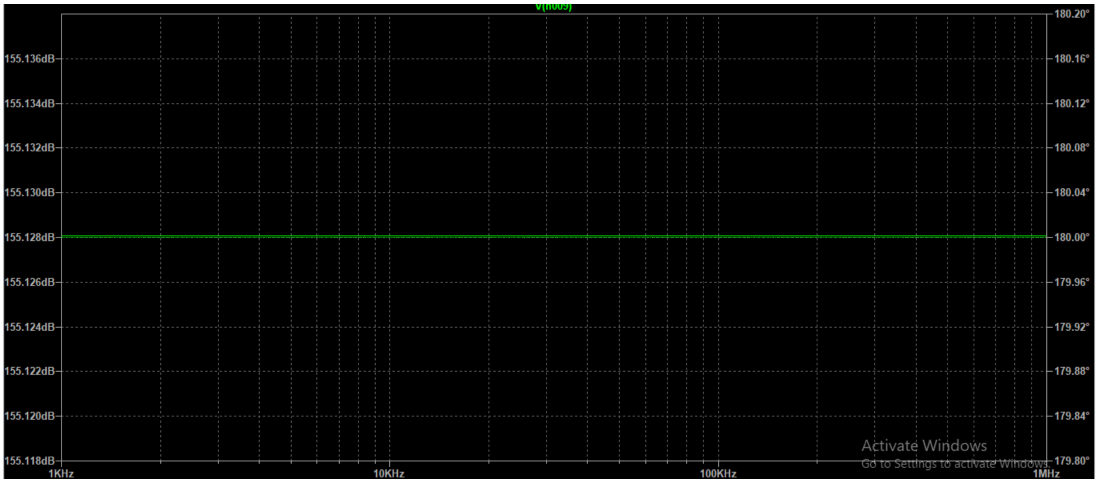
For designing such a circuit, given the power constraints, it is necessary to use low currents. It is also known that by reducing the currents in coms circuits, our gain value also increases. Therefore, biasing the circuit as shown below, and the corresponding biased values are obtained as follows:



Additionally, the information related to the operating point (op) is uploaded in a separate file. The selected values for the width of the transistors are chosen in a way that it can provide the required swing in the last stage and also, in the current mirrors, the generated current is adjusted for circuit biasing.

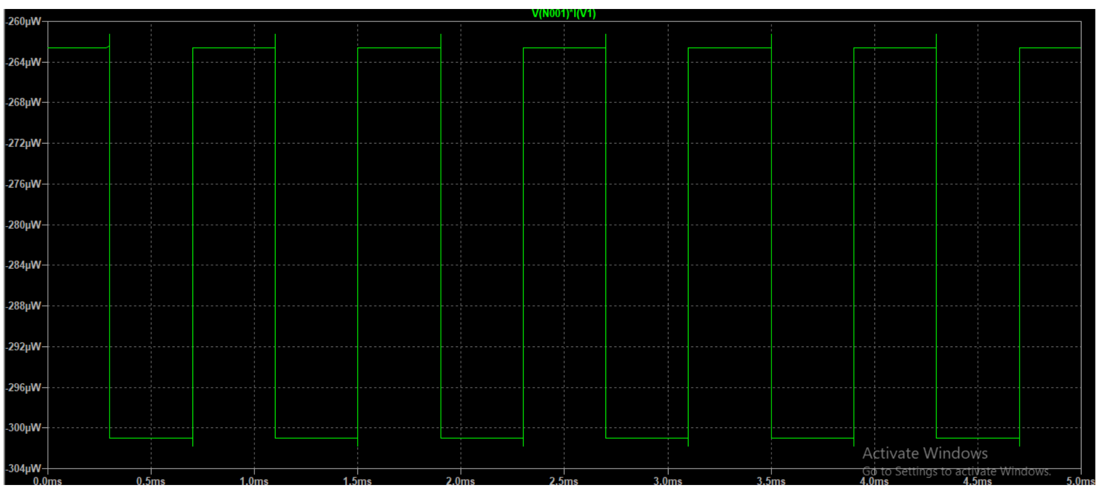
1.2 Gain

According to the Spice result, the desired gain can be obtained with the circuit. The gain is approximately 150dB.



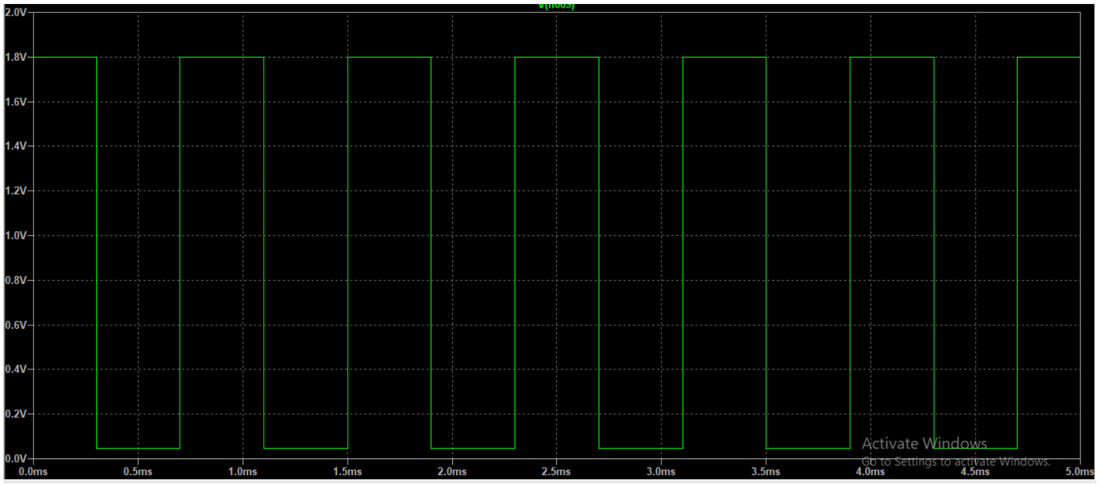
1.3 Power

We use Spice analysis to measure the power. The maximum power can go up to 300uW, and the average value is approximately 280uW.



1.4 Swing

To achieve the desired swing, initially, we need to create an average value around 0.9V at the output. This is done with a voltage source that has a longer period. Then, with another signal, we fulfill the desired value to reach the required swing.



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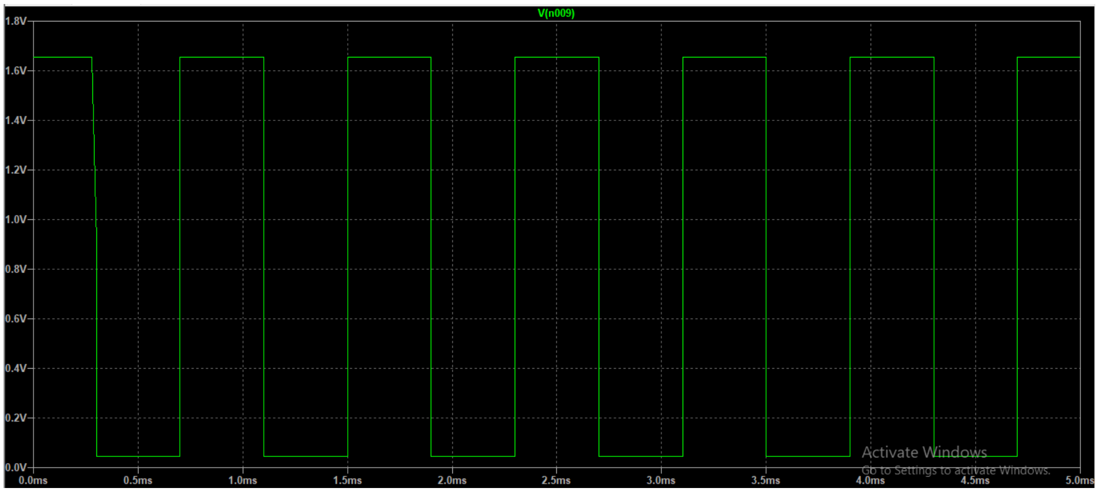
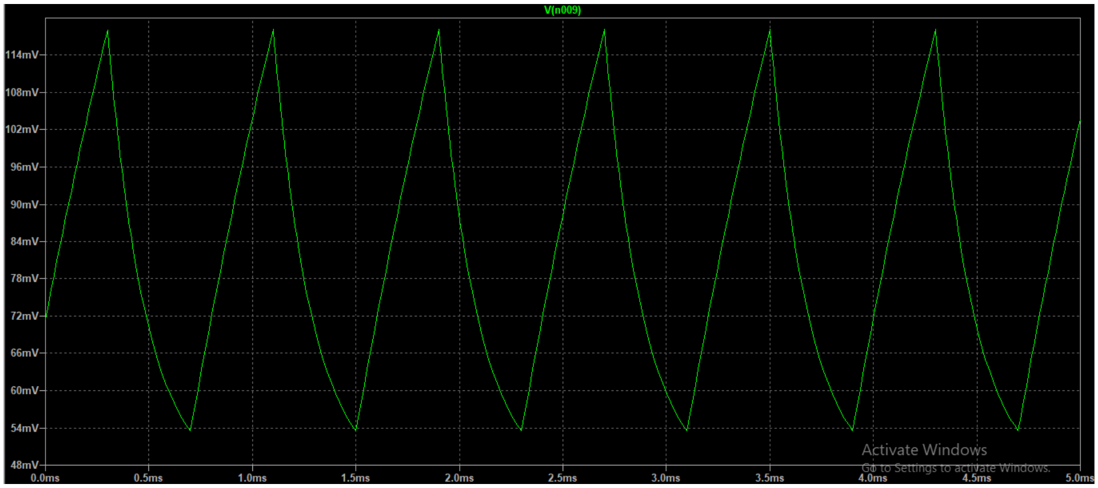
2.1

To achieve the desired signal, we modify the voltage source values so that the peak and floor of the output signal reach the desired value in the figure.



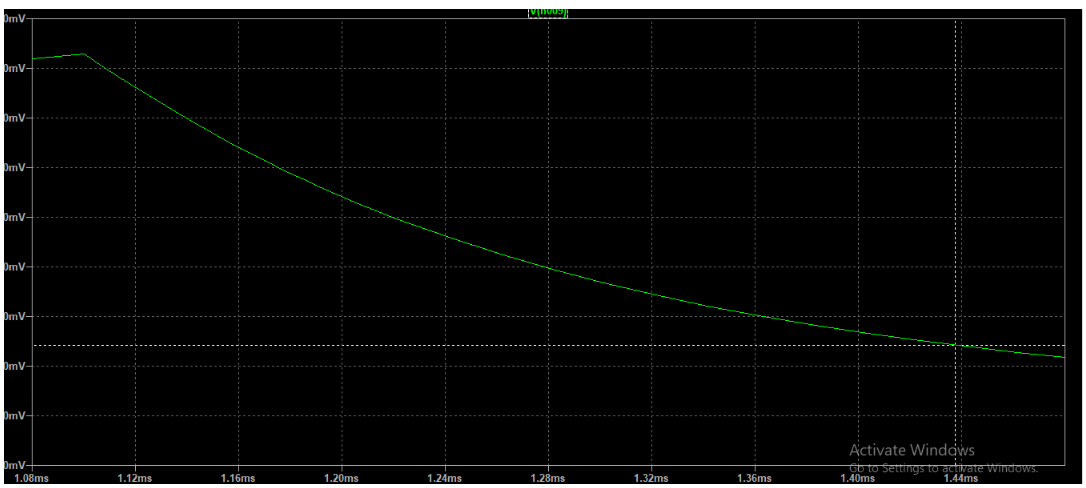
2.2

By putting a capacitive load at the output of the circuit, the output waveform will be as follows:

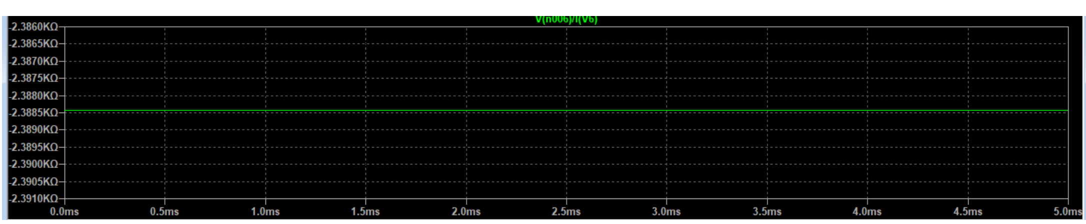


2.3

To better justify this part, we modify the waveform to reach a value of 0.368 times the peak value of the swing in the presence of the capacitive load, so that we can reach a time period equal to the product of the output resistance and the capacitance size.



We find that $\tau = 0.238m$. Now, we calculate the value of the output resistance: By zeroing the input and placing a voltage source of 0.9V, we obtain the output resistance at the operating point.



Considering the obtained value, we understand that the output waveform typifies the behavior of an RC circuit. During the direct charging of the capacitor, this circuit acts like a resistor (similar to a rectifier), and during the discharging of the capacitor, it decreases at a constant rate.