

Figure 1: Circuit 3

The amplitude V_x can be acquired by analyzing the results of a transient simulation.

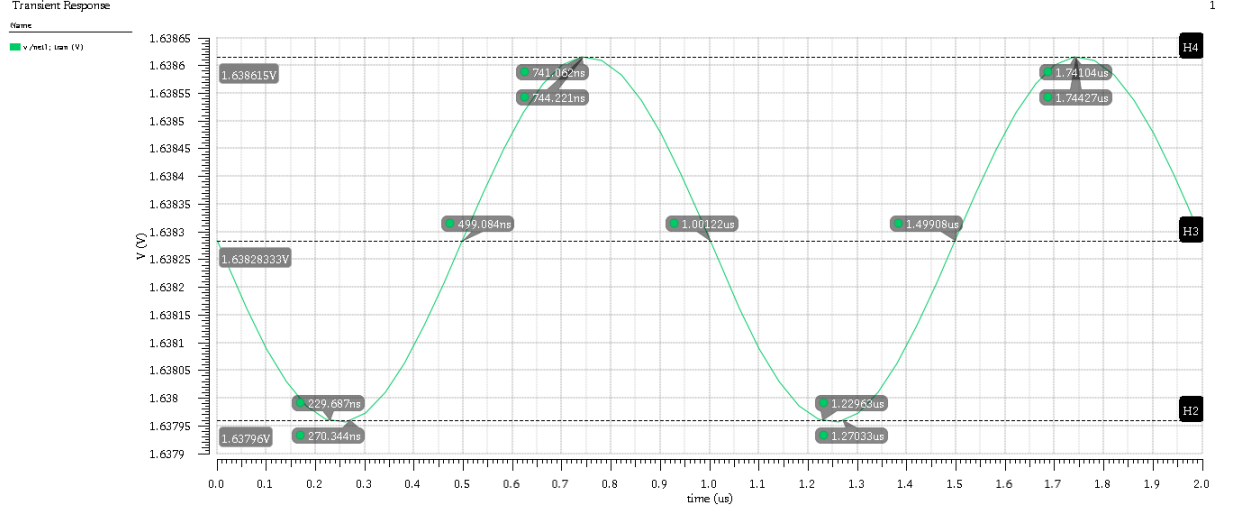


Figure 2: V_x Plot for Circuit in Figure (1)

The output resistance can be calculated simply by observing the amplitude of the waveform in figure (2), also known as V_x , and dividing it by the input current amplitude, which is $1\mu\text{A}$ in this case. The output resistance can be theoretically calculated for a common-drain amplifier using $r_{out} = R_s \parallel \frac{1}{g_m} \parallel r_o$. Here, assume r_o to be rather large. Thus, the simplified expression $r_{out} = R_s \parallel \frac{1}{g_m}$ is used for a theoretical comparison instead. Clearly, the experimental result is consistent with theory.

Table 1: r_{out} for the Common Drain Amplifier

rou t from Simulation [Ohms]	rou t from Theory [Ohms]	Error from Theory
327.50	330.40	0.88%

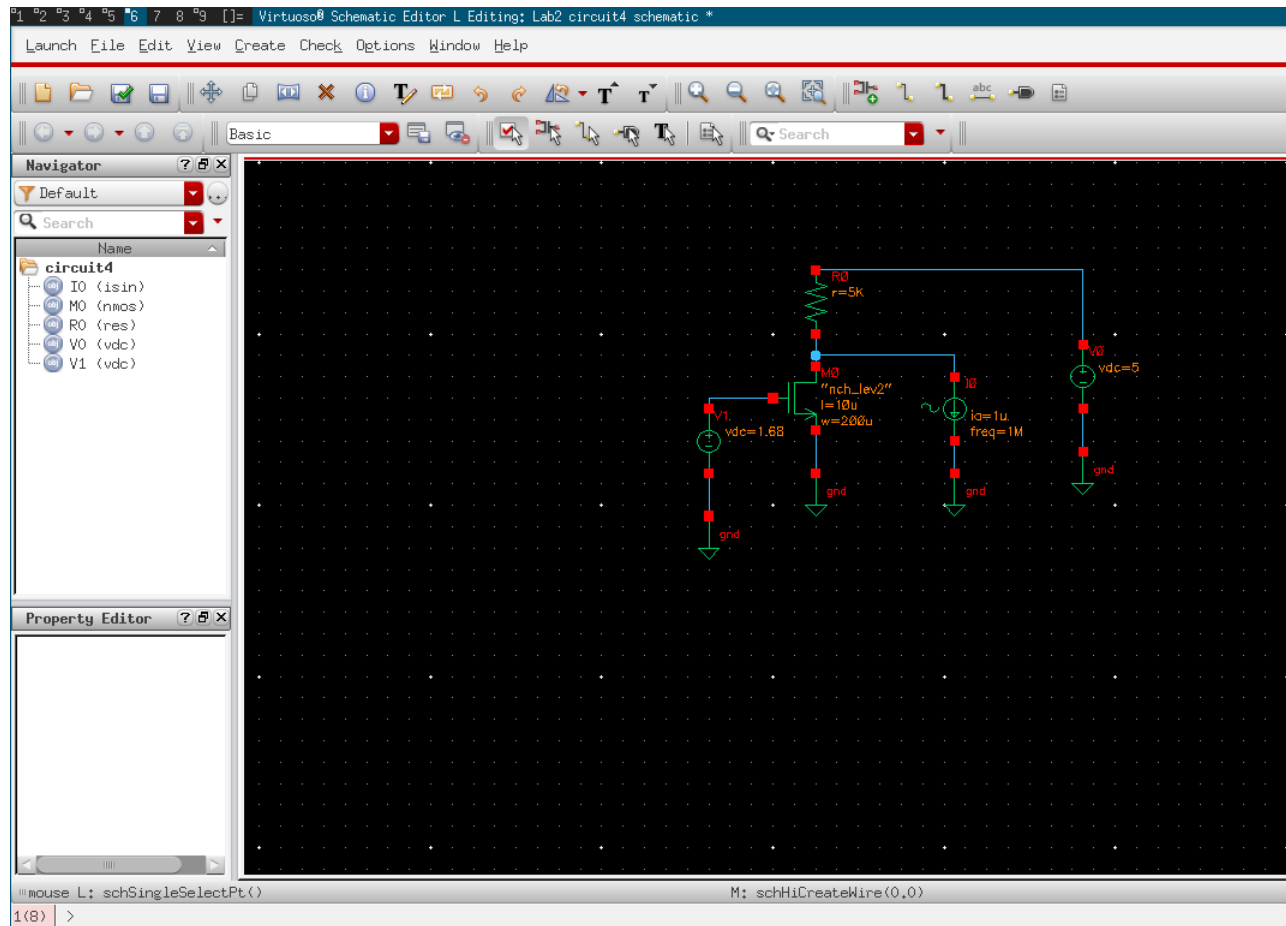


Figure 3: Circuit 4

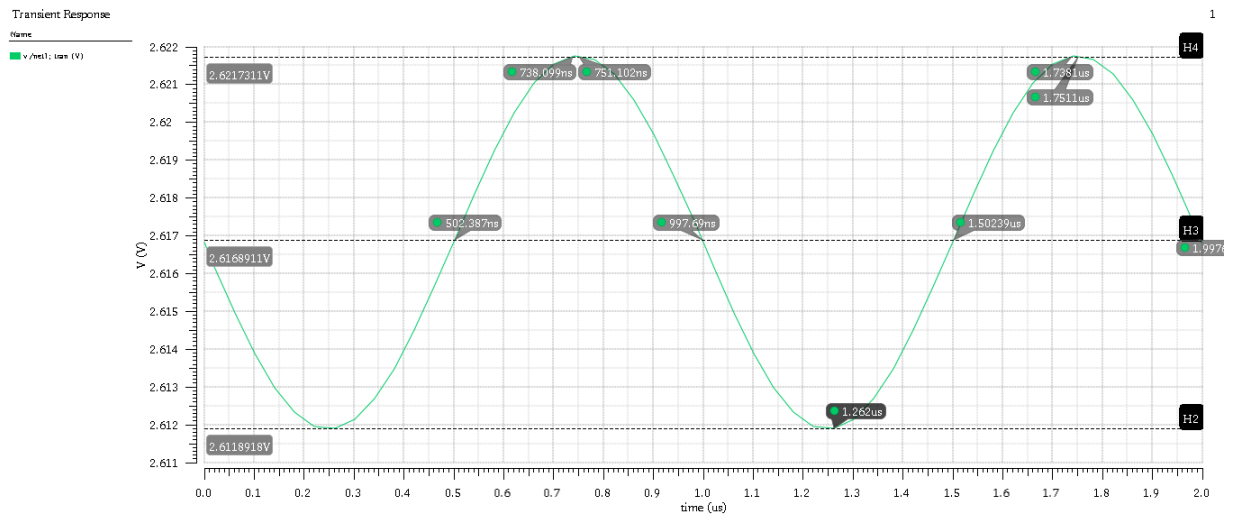


Figure 4: V_x Plot for Circuit in Figure (1)

Table 2: r_{out} for the Common Drain Amplifier

rou from Simulation [Ohms]	rou from Theory [Ohms]	Error from Theory
4919.65	4941.13	0.43%

From these results, it is clear that the common-drain amplifier has a much lower output resistance.