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Title of the experiment

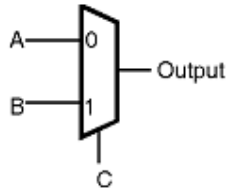
2:1 MUX Using Transmission Gate (using 0.5um Technology)

Theory:

A 2:1 multiplexer is shown in Figure below. This gate selects either input A or B on the basis of the value of the control signal 'C'. When control signal C is logic low the output is equal to the input A and when control signal C is logic high the output is equal to the input B.

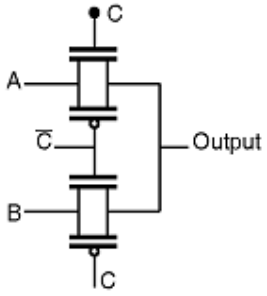
A 2:1 multiplexer can be implemented using transmission gates. Figure below shows the connection diagram of the 2:1 multiplexer using transmission gates. The 2:1 MUX selects either A or B depending upon the control signal C.

When the control signal C is high then the upper transmission gate is ON and it passes A through it so that output = A.



2 : 1 MUX

When the control signal C is low then the upper transmission gate turns OFF and it will not allow A to pass through it, at the same time the lower transmission gate is 'ON' and it allows B to pass through it so the output = B.



2 : 1 MUX using transmission gate

Schematic diagram:

The circuit schematic of the 2:1 MUX Using Transmission Gate (using 0.5um Technology) in eSim is as shown below:

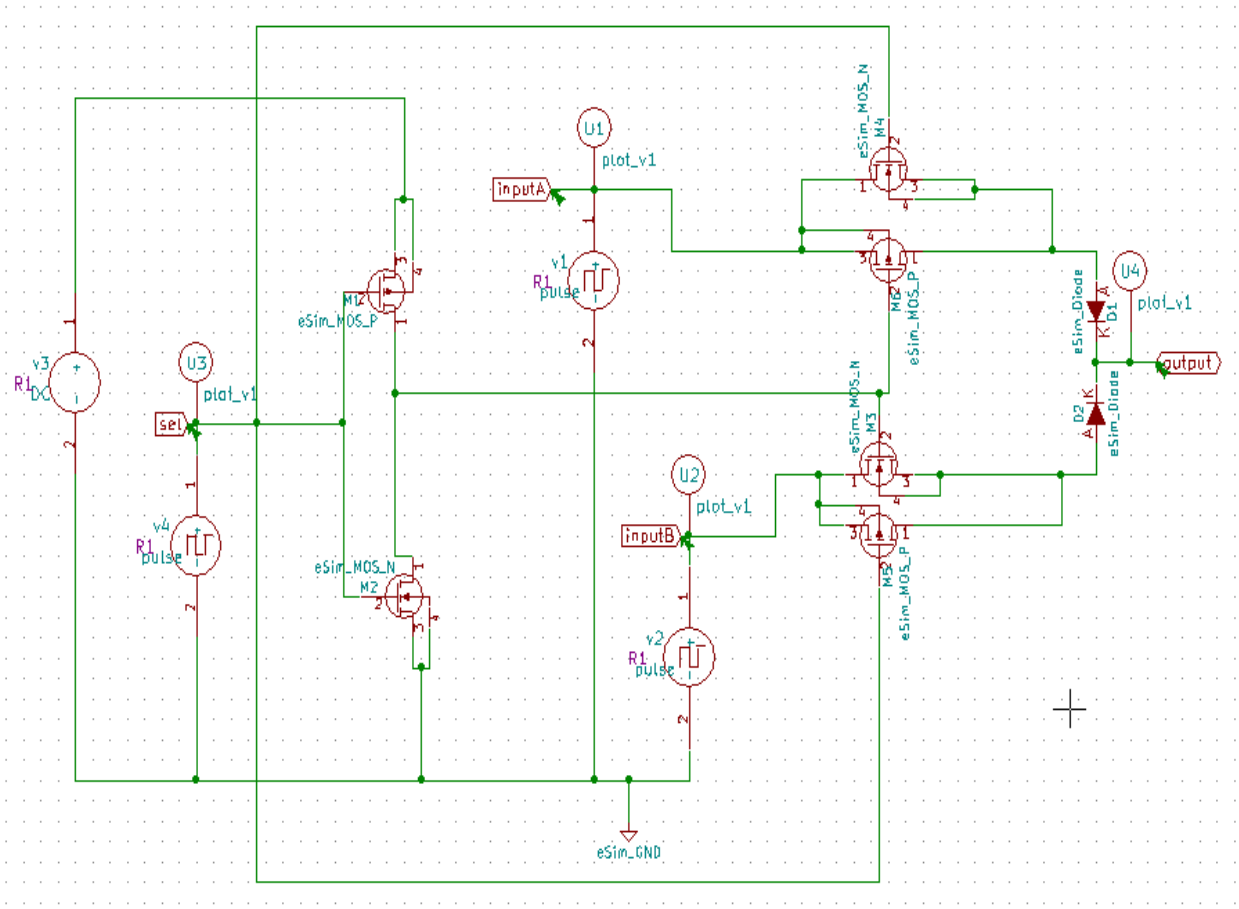


Figure 1: 2:1 MUX Using Transmission Gate (using 0.5um Technology)

Simulation Results:

1.Ngspice Plots-

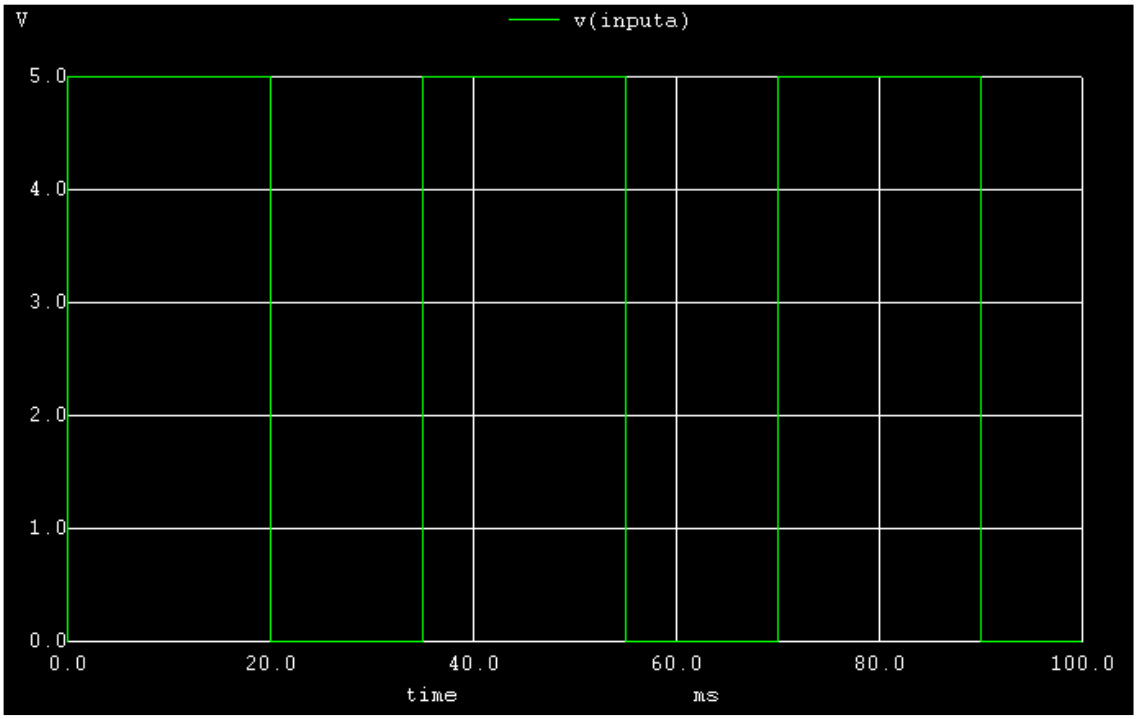


Figure 2: Ngspice Input A Plot

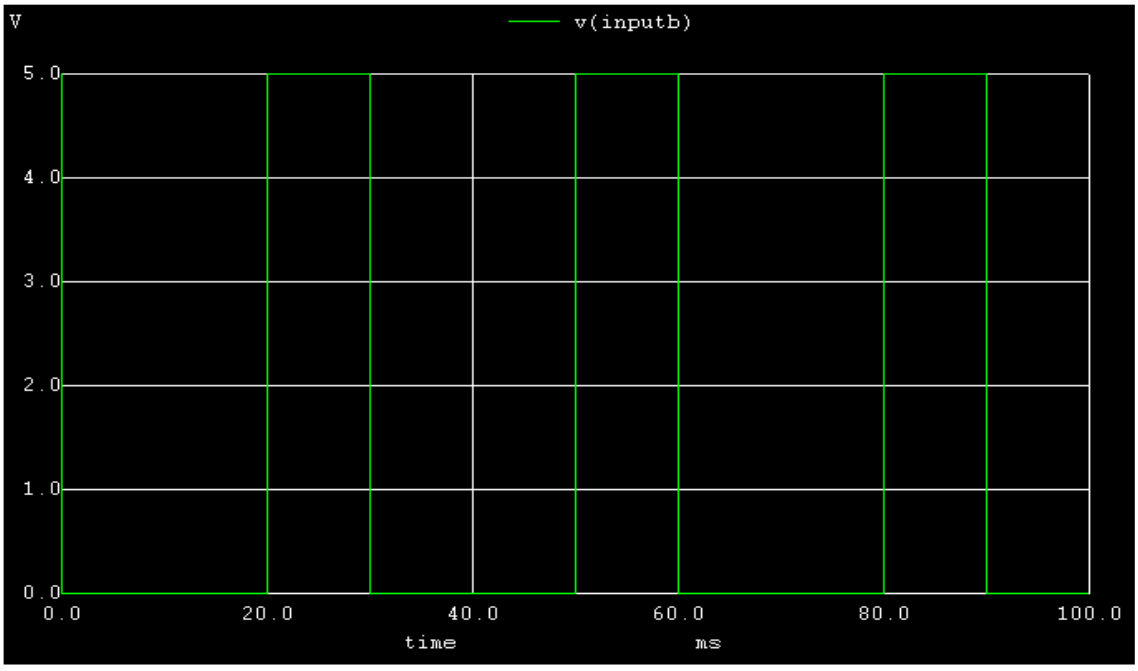


Figure 3: Ngspice Input B Plot

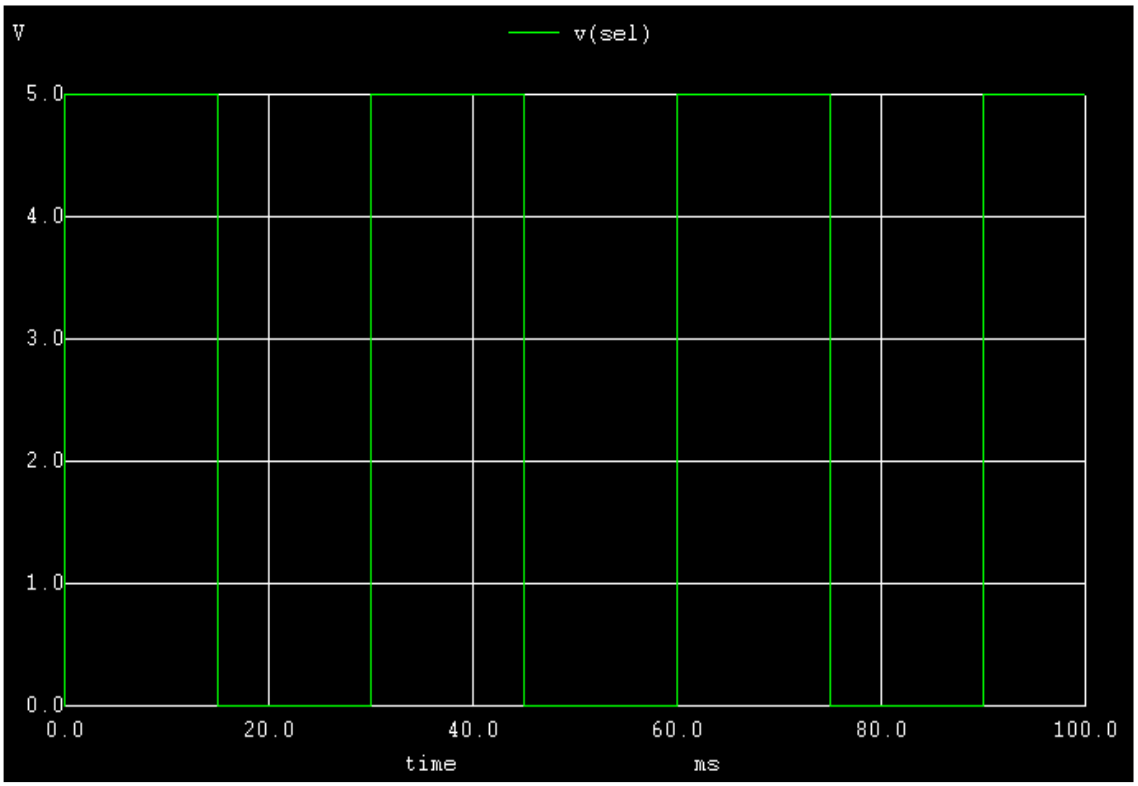


Figure 4: Ngspice Input Select Line Plot

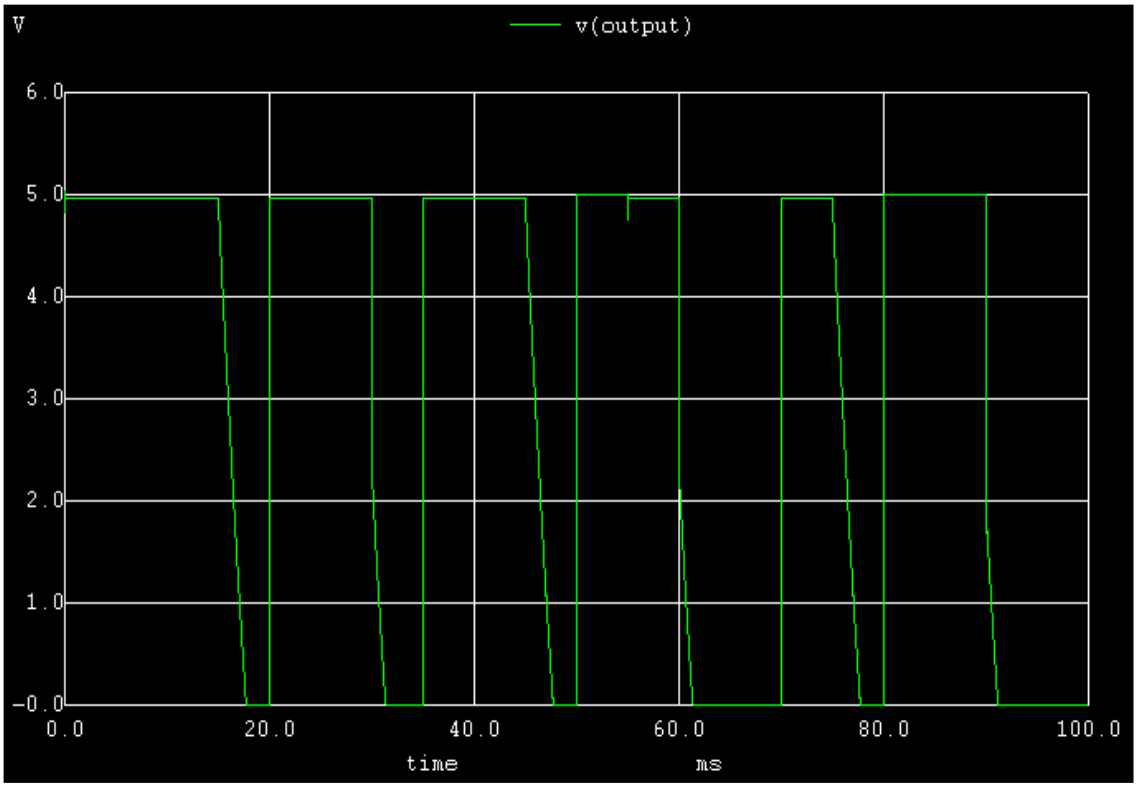


Figure 5: Ngspice Output Plot

2.Python Plots-

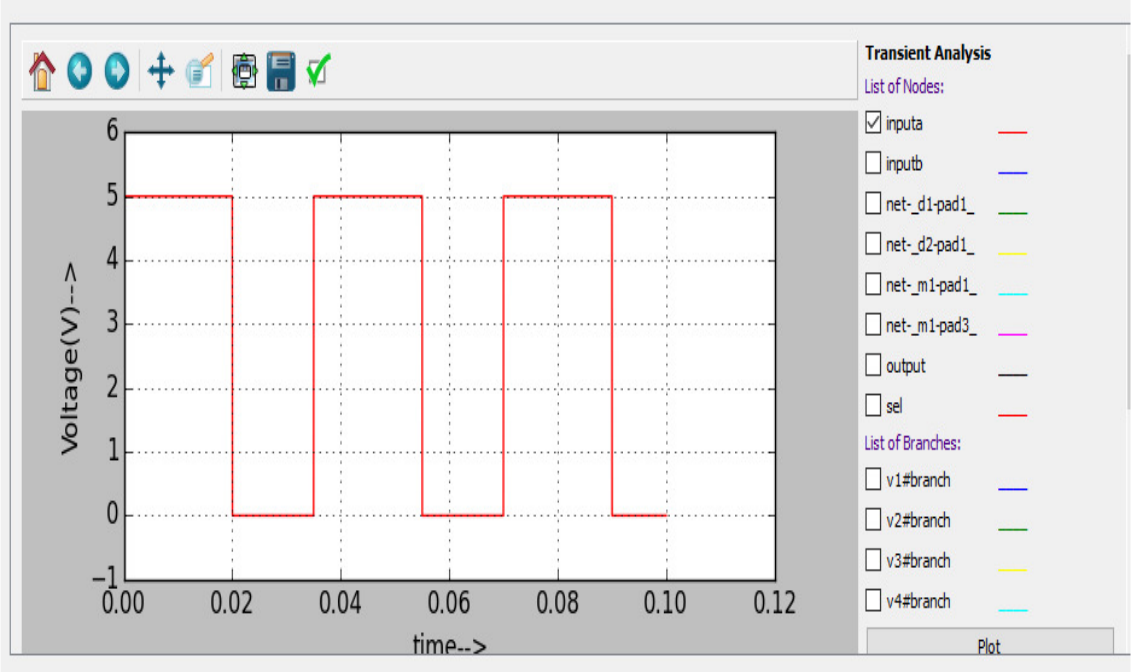


Figure 6: Python Input A Plot

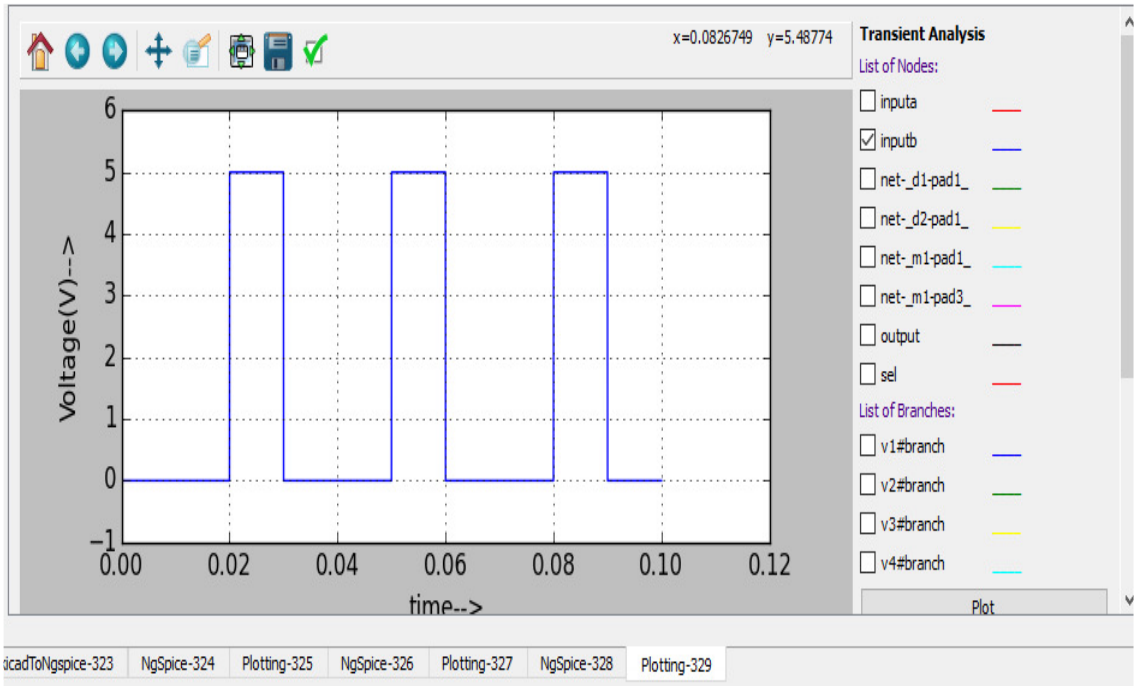


Figure 7: Python Input B Plot

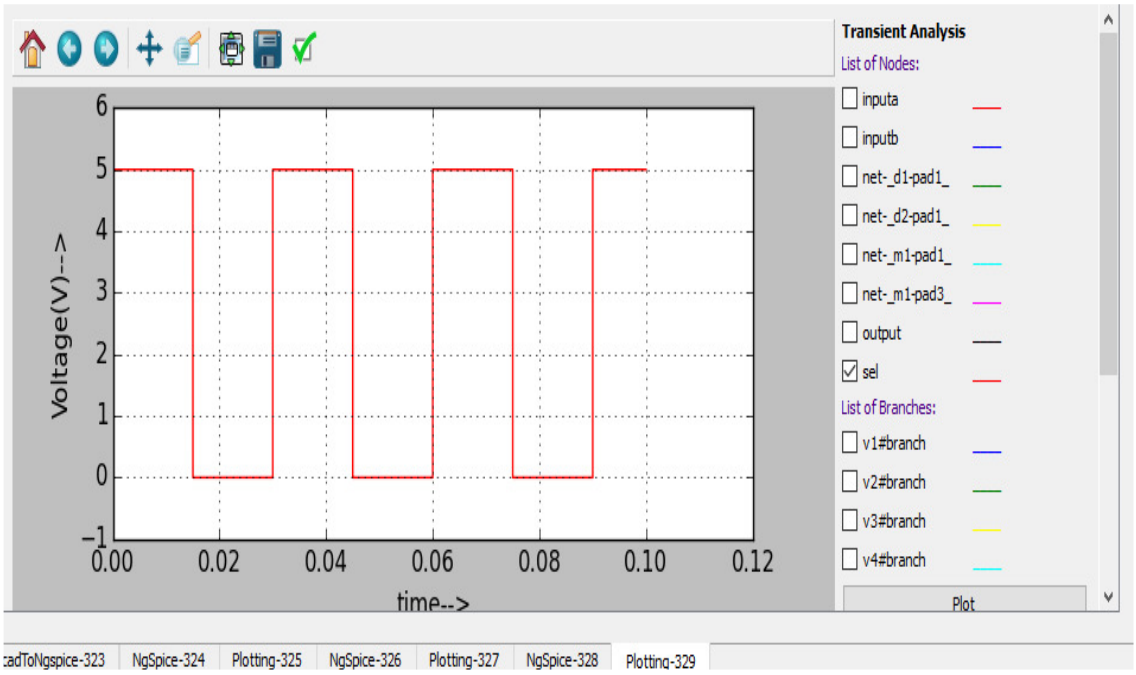


Figure 9: Python Input Select Line(sel) Plot

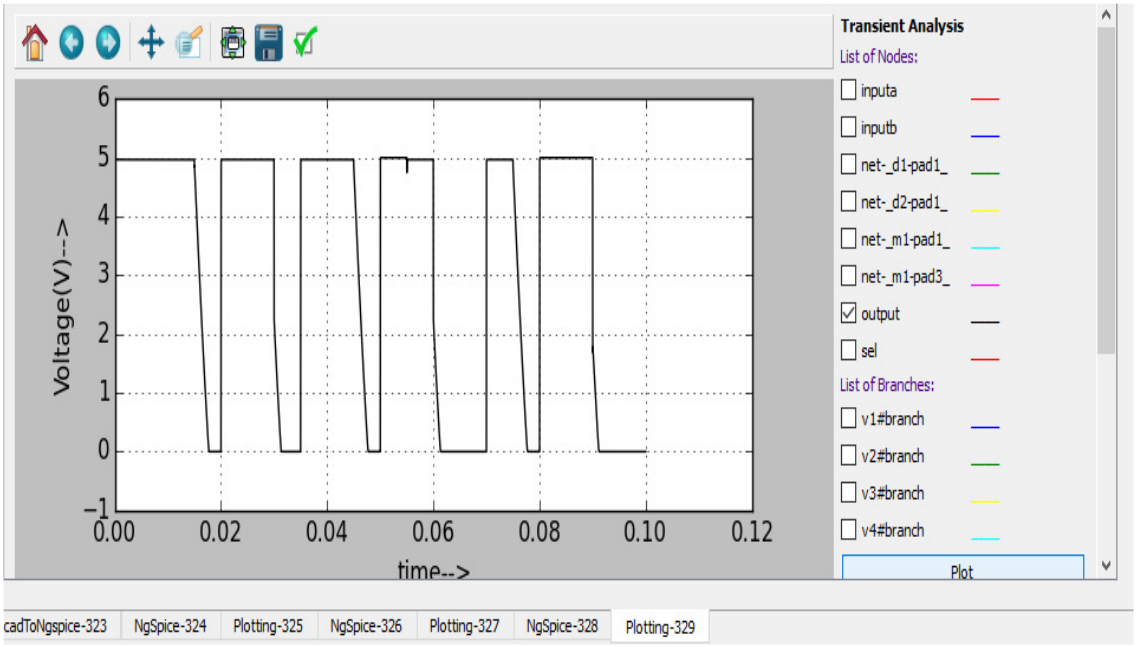


Figure 10: Python Output Plot

Conclusion:

Thus, we have studied 2:1 MUX Using Transmission Gate (using 0.5um Technology) and the simulation plot of ngspice and python plot obtained in eSim.

References:

1) https://www.electronics-tutorial.net/Digital-CMOS-Design/Pass-Transistor-Logic/2-1-MUX-using-transmission-gate/
2) https://www.allaboutcircuits.com/technical-articles/implementing-multiplexers-with-pass-transistor-logic/
3) http://vlsi-iitg.vlabs.ac.in/Multiplexer_theory.html