Circuit Simulation Project

https://esim.fossee.in/circuit-simulation-project

NAME: SHYAM SANKALP PATTNAIK

PROJECT GUIDE: DR. MAHESWARI R

TITLE OF THE PROJECT: Design of 2 to 1 Multiplexer in eSIM

2x1 MULTIPLEXER

1) **Theory/Description: -**

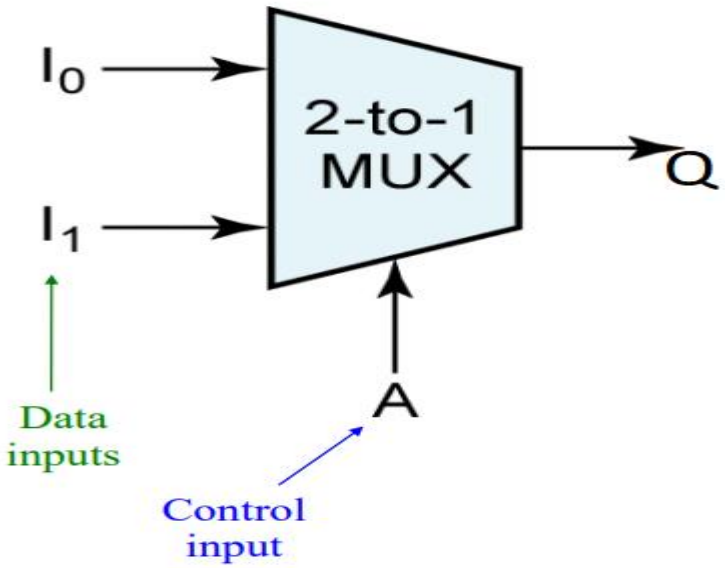
The multiplexer or MUX is a digital switch, also called as data selector. It accepts the binary information from several input lines or sources and depending on the set of select lines, a particular input line is routed onto a single output line.

Multiplexer is a combinational circuit that has maximum of 2^n data inputs, 'n' selection lines and single output line. One of these data inputs will be connected to the output based on the values of selection lines.

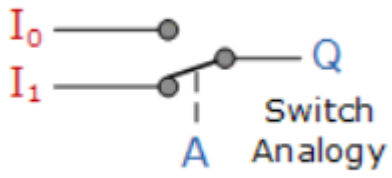
Since there are 'n' selection lines, there will be 2^n possible combinations of zeros and ones. So, each combination will select only one data input.

2) **2x1 MUX**

2x1 Multiplexer consists of two data inputs I_0 & I_1, a selection line A and an output Q.



Block Diagram of 2x1 Multiplexer



Truth Table

Inputs			
A	I_1	I_0	Q
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

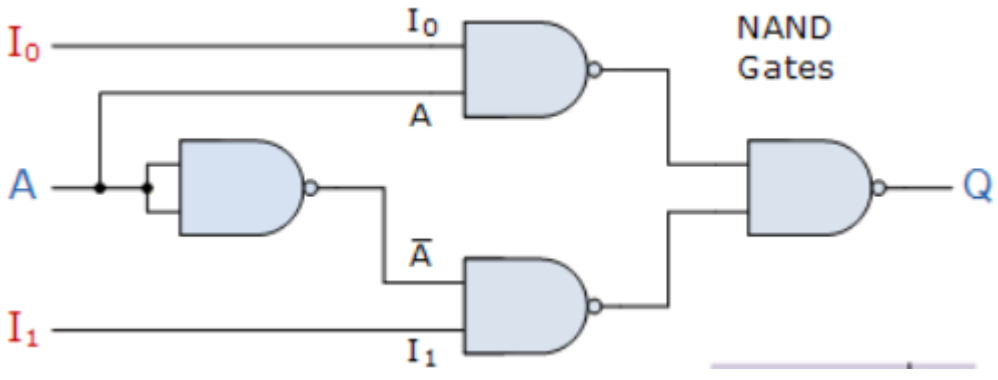
The input A of this simple 2-1 line multiplexer circuit constructed from standard NAND gates acts to control which input (I_0 or I_1) gets passed to the output at Q.

From the truth table above, we can see that when the data select input, A is LOW at logic 0, input I_1 passes its data through the NAND gate multiplexer circuit to the output, while input I_0 is blocked. When the data select A is HIGH at logic 1, the reverse happens and now input I_0 passes data to the output Q while input I_1 is blocked.

From the above Truth table, we can derive the Boolean Function for output Q as given below: -

$$Q = A'.I_1 + A.I_0$$

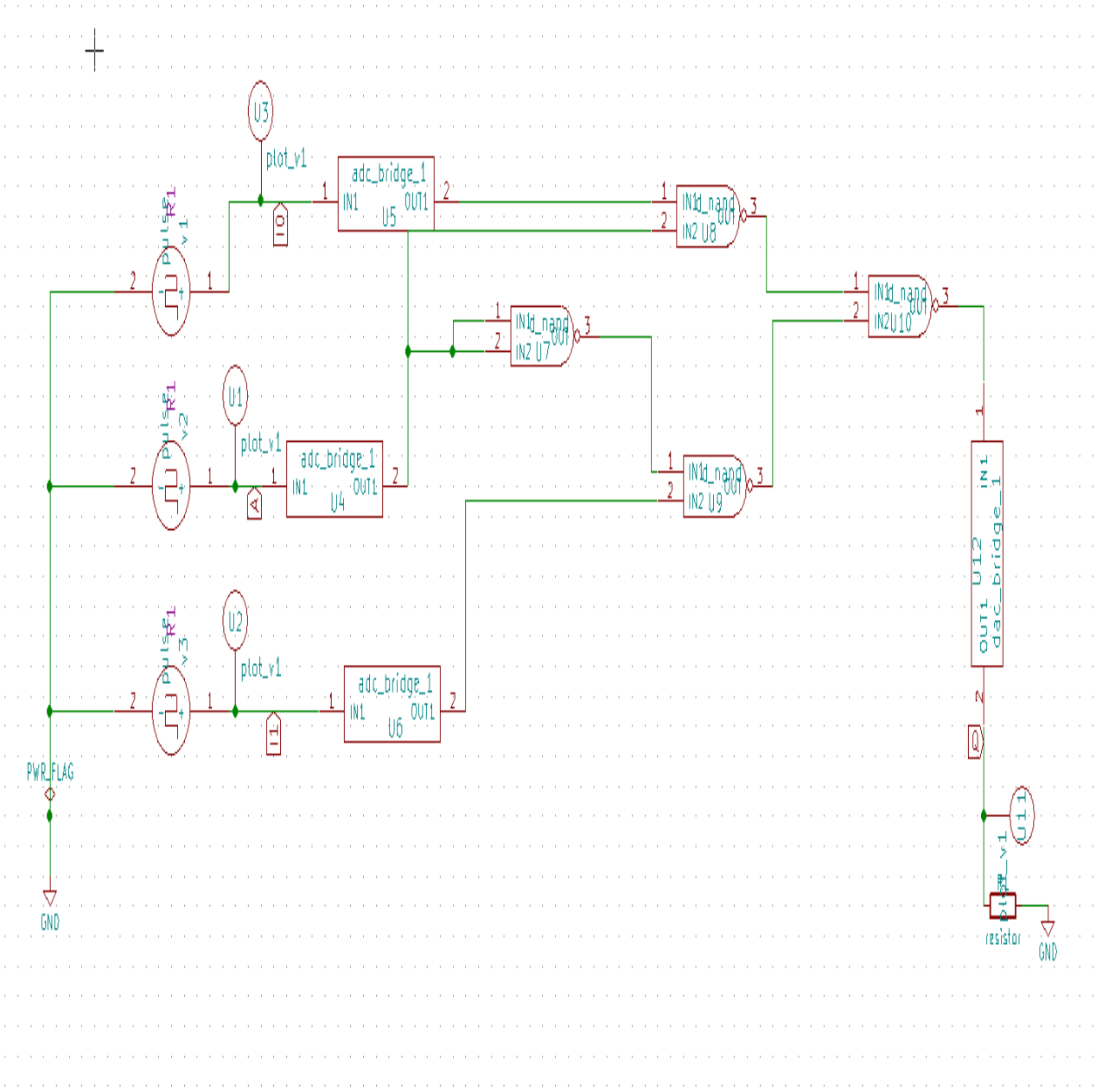
3) Logic Diagram



2X1 MUX using NAND gates

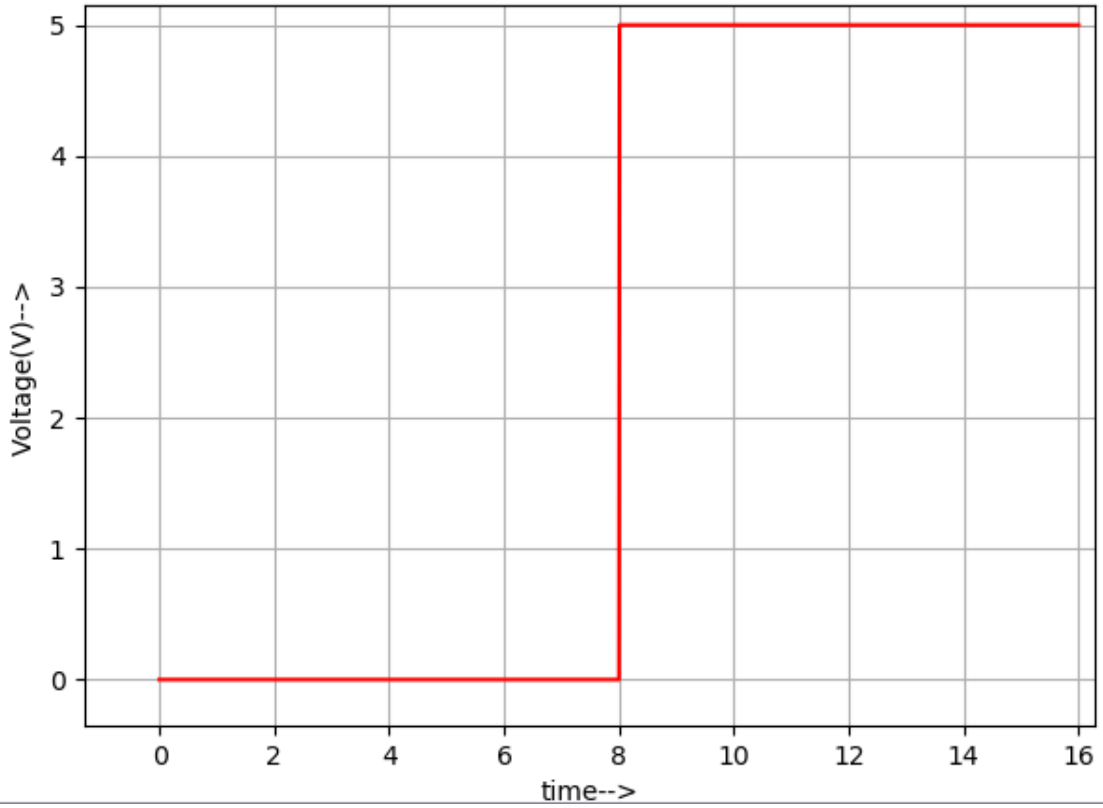
eSIM SIMULATIONS AND CIRCUITS

1) CIRCUIT DIAGRAM

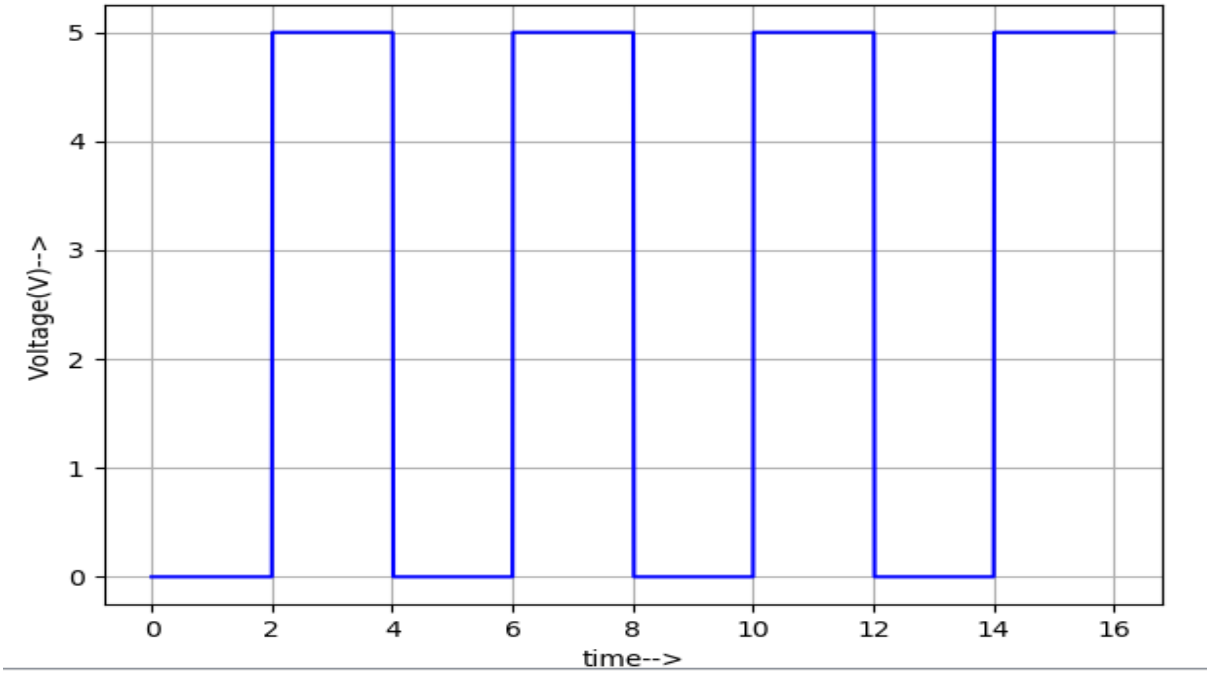


2) WAVEFORMS: -

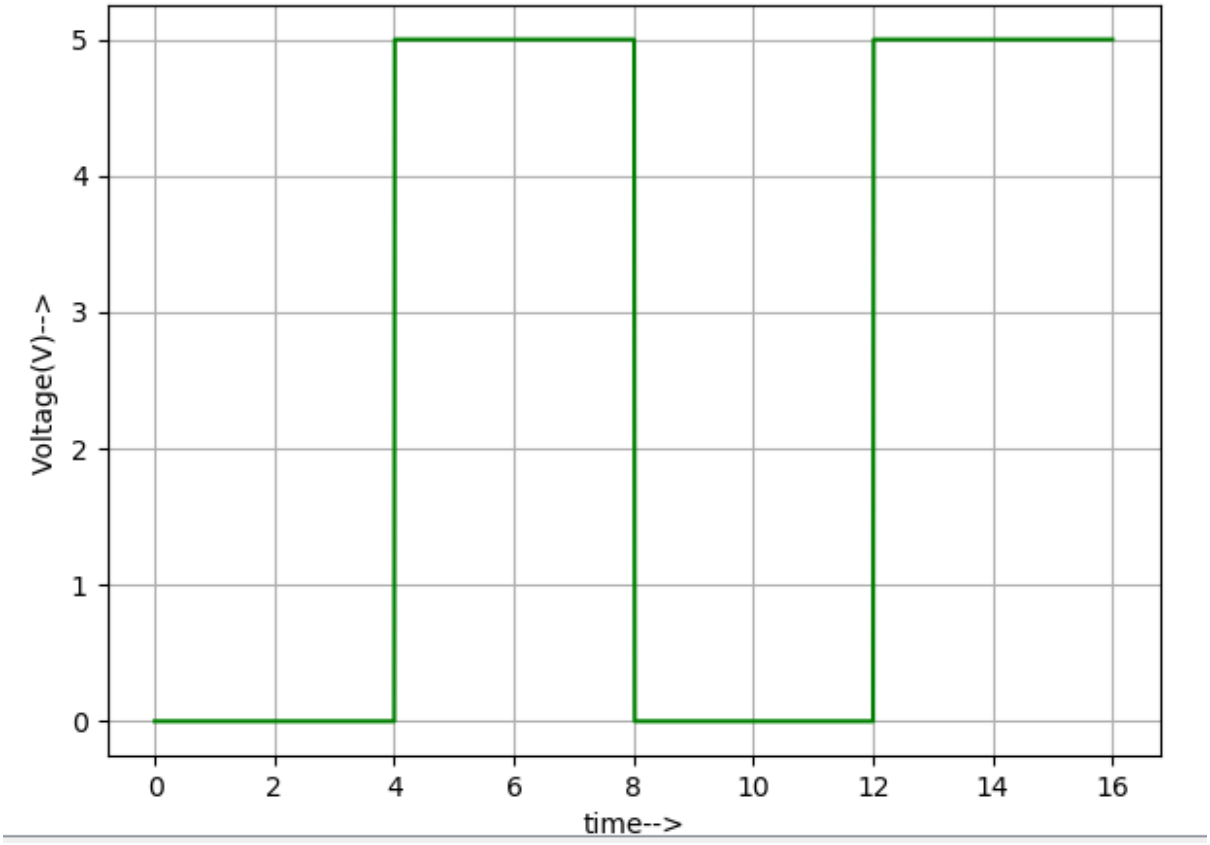
A) SELECTION LINE, A



B) DATA INPUTS, I_0 & I_1

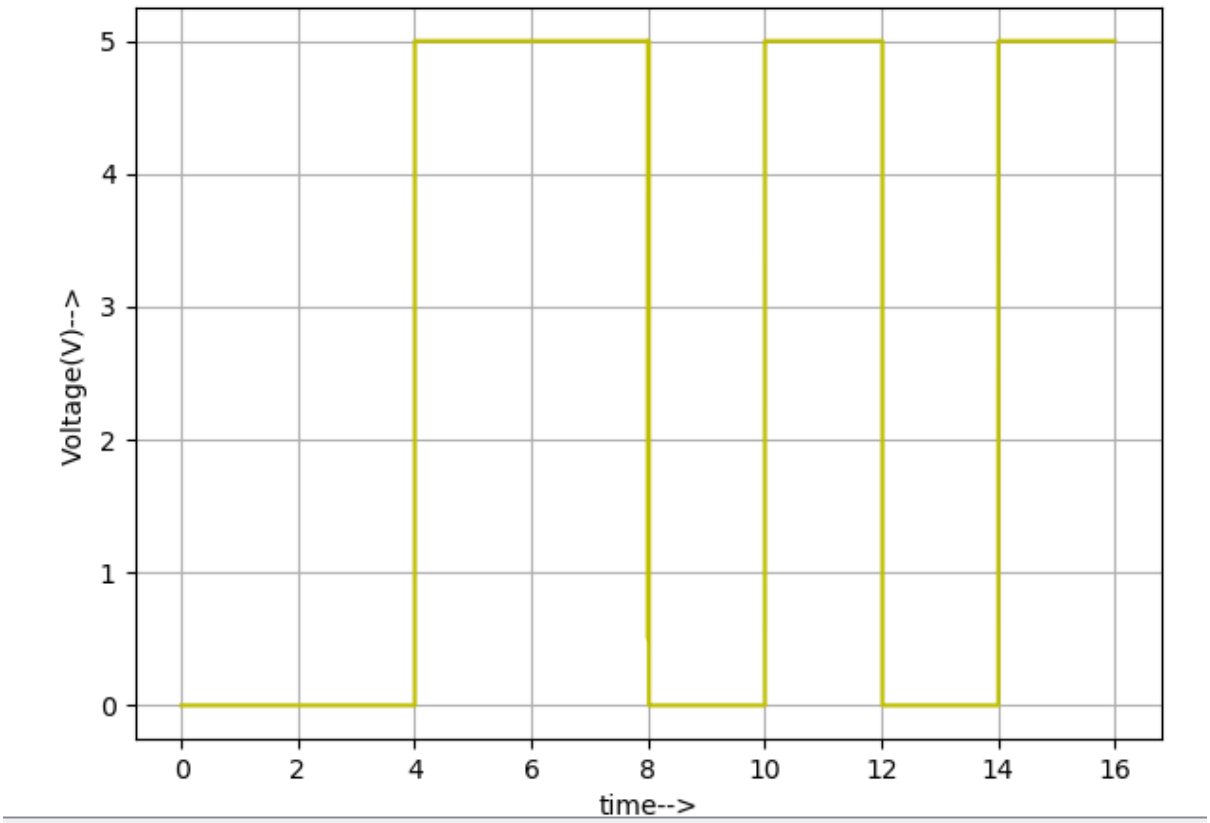


I_0



I_1

C) OUTPUT, Q



REFERENCES: -

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2) https://www.electronicshub.org/multiplexerandmultiplexing/
3) https://www.electronics-tutorials.ws/combination/comb_2.html