Experiment-5

Aim: a) Implement master slave based negative edge triggered flip flop using 2x1 MUX as an element designed using transmission gate.

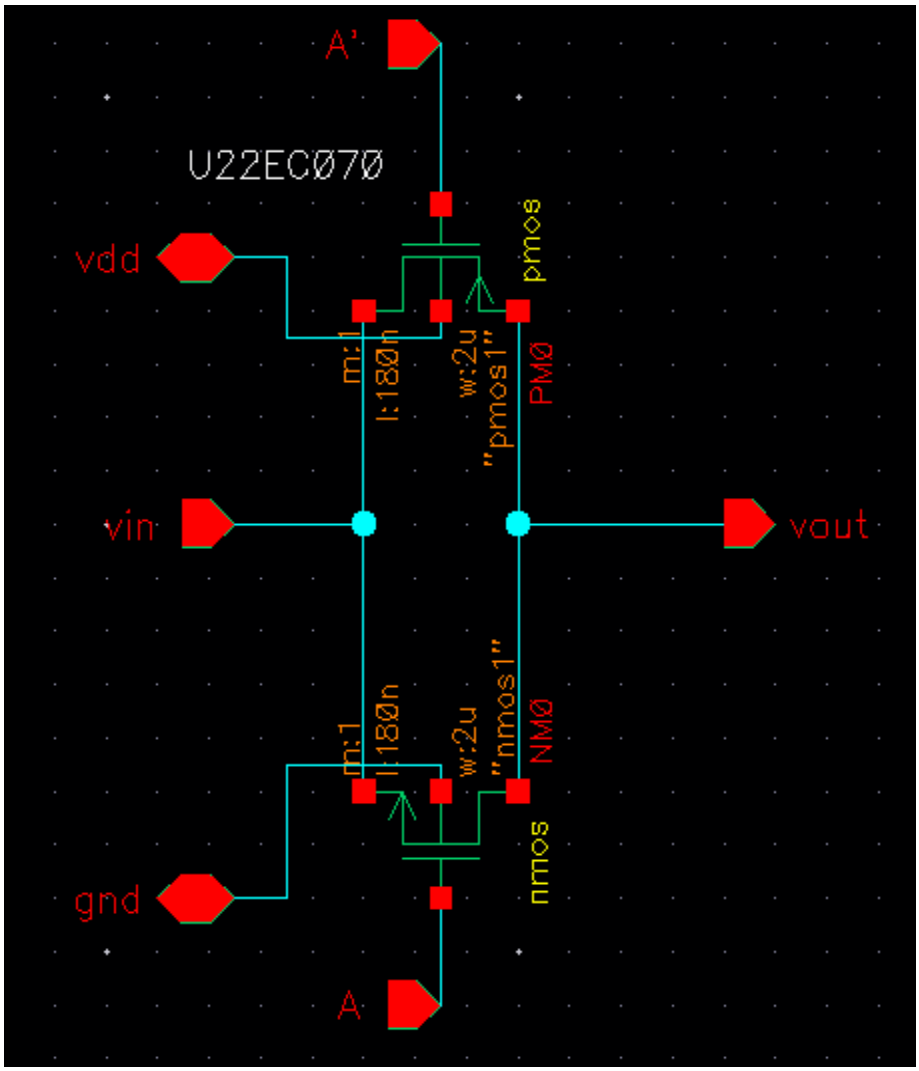
b) Implement dynamic positive edge triggered flip flop using transmission gate.

Also, do above by using two phase clock generator and compare both.

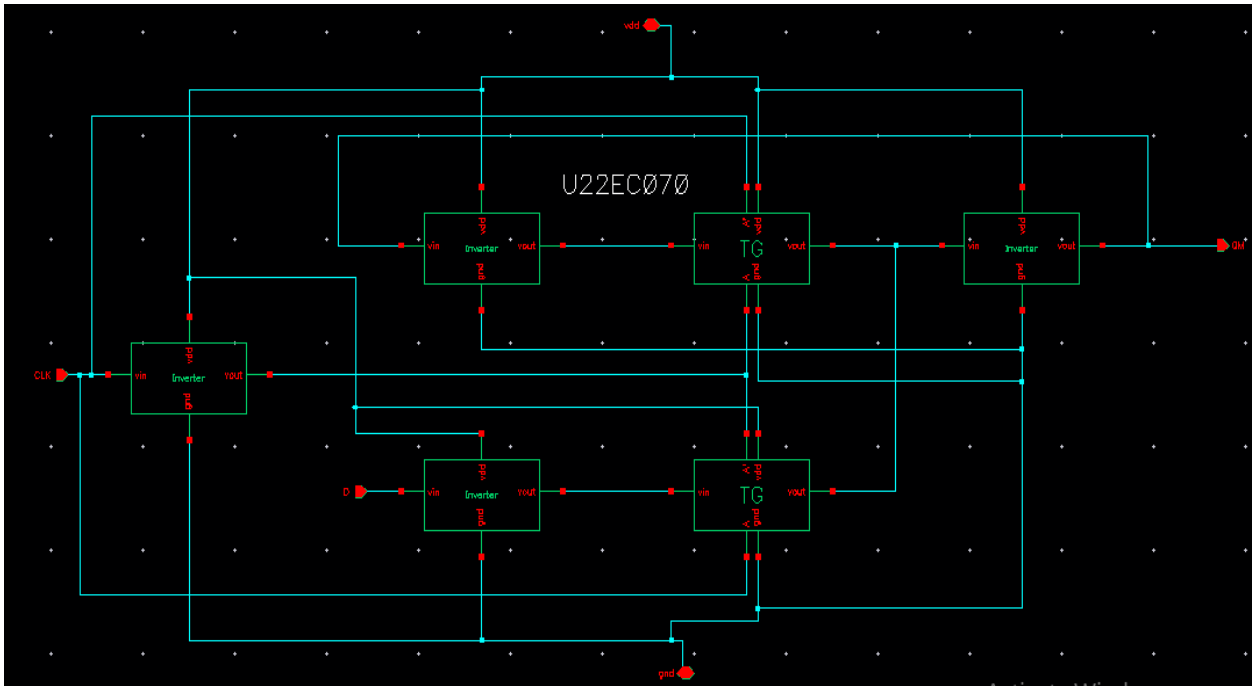
Apparatus: Cadence Virtuoso Software

Schematic:

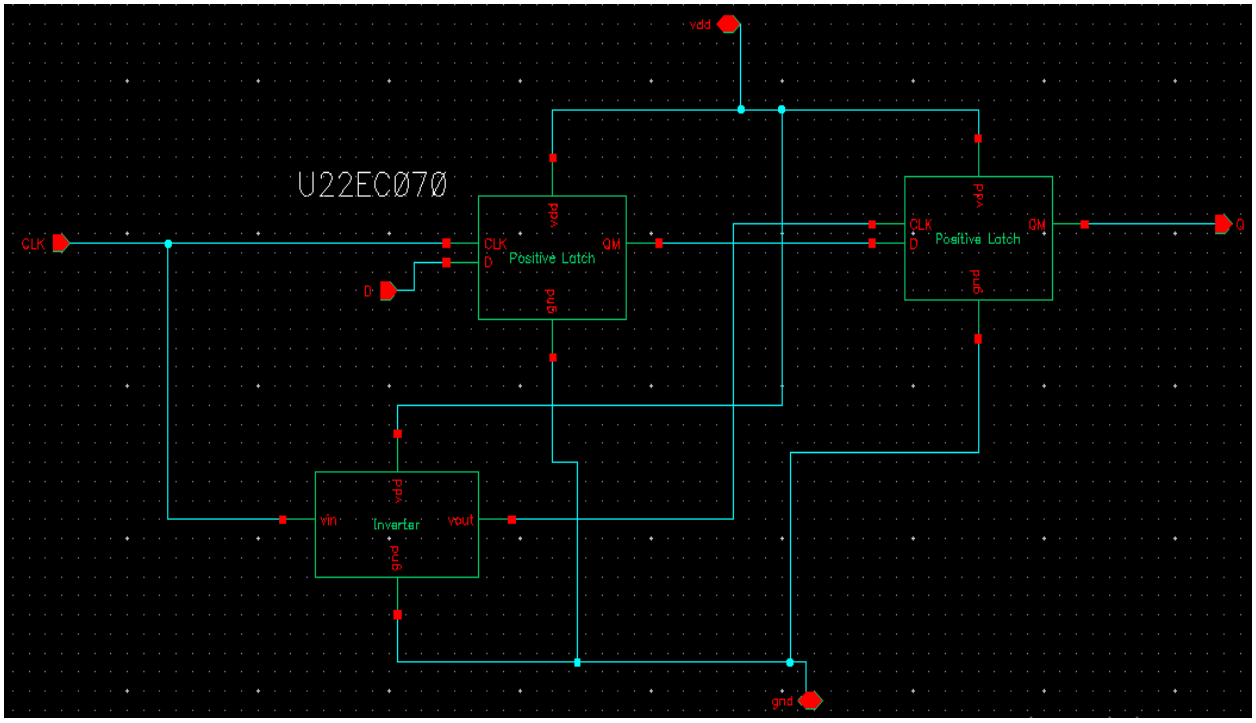
Transmission gate schematic:



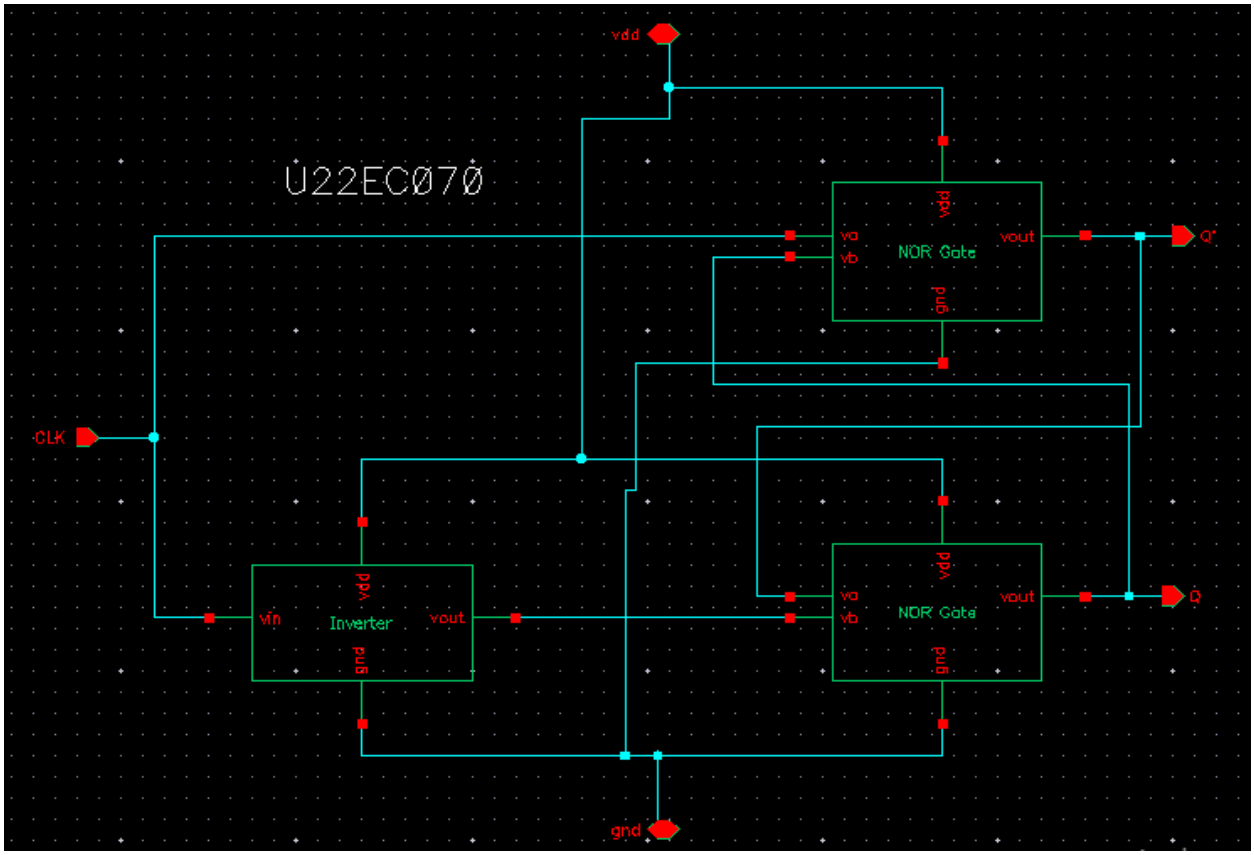
Positive latch:



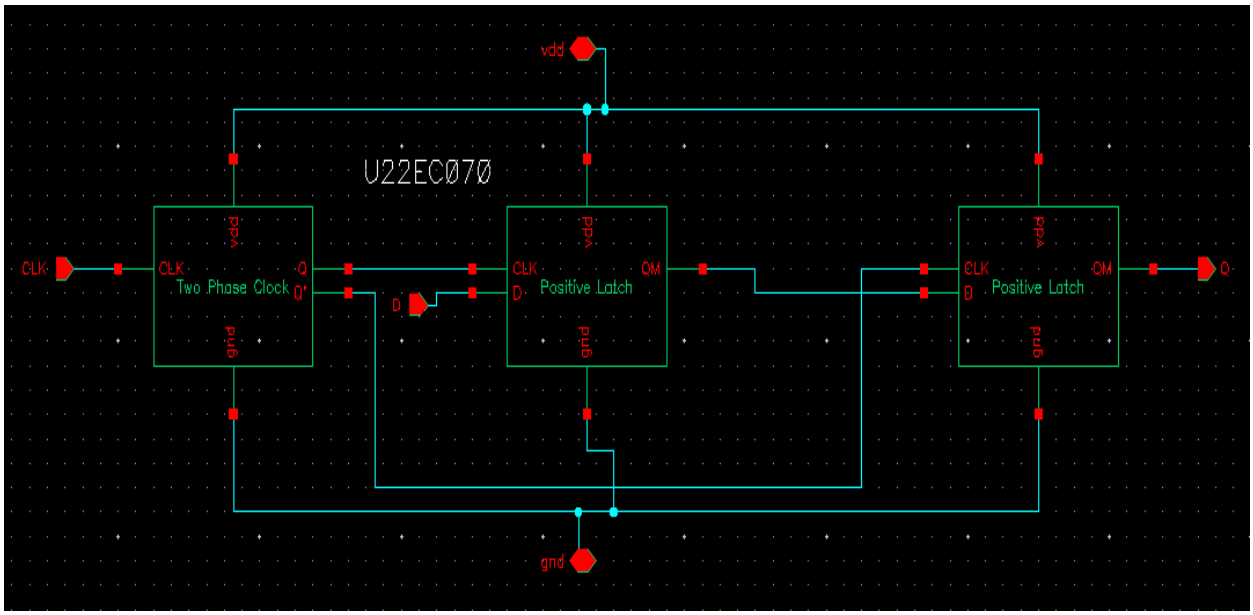
Master slave based edge triggered flip flop without using two phase clock generator:



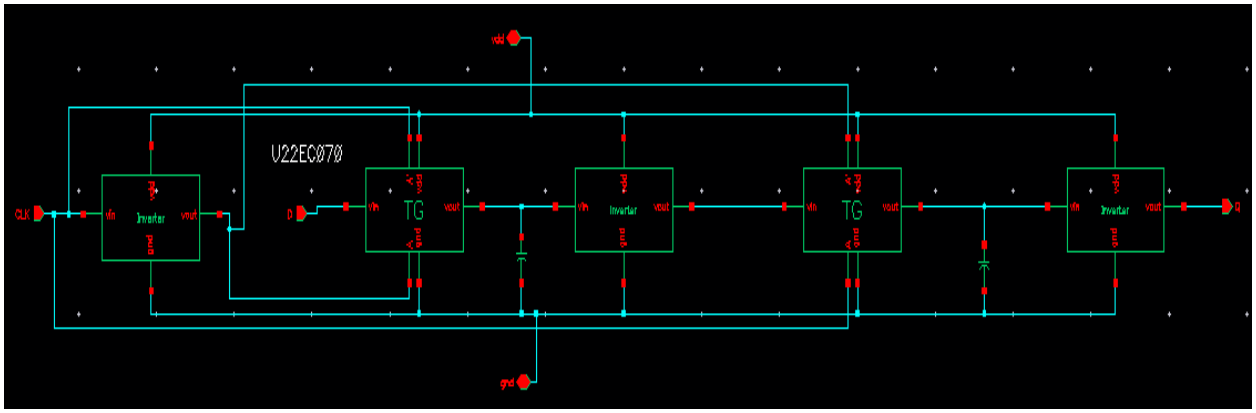
Two phase clock generator:



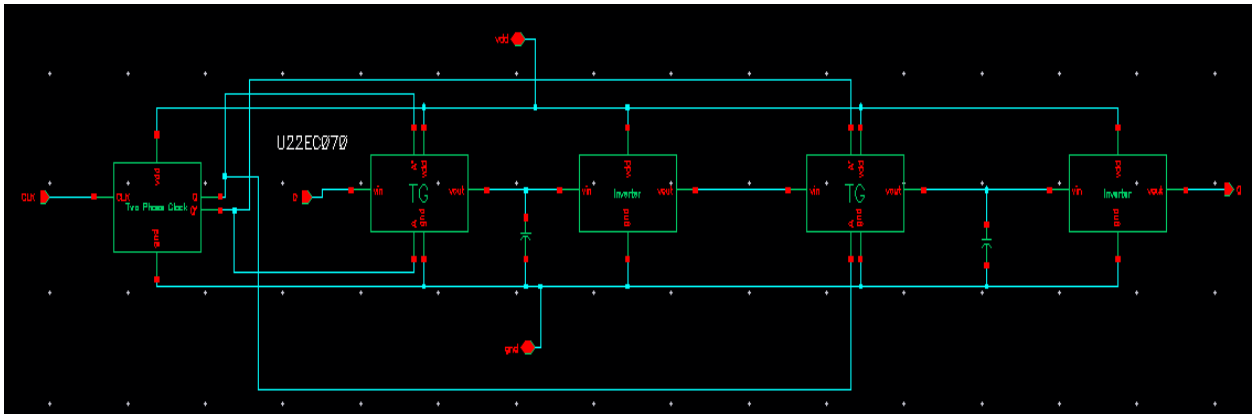
Master slave based edge triggered flip flop using two phase clock generator:



Dynamic edge triggered flip flop without using two phase clock generator:

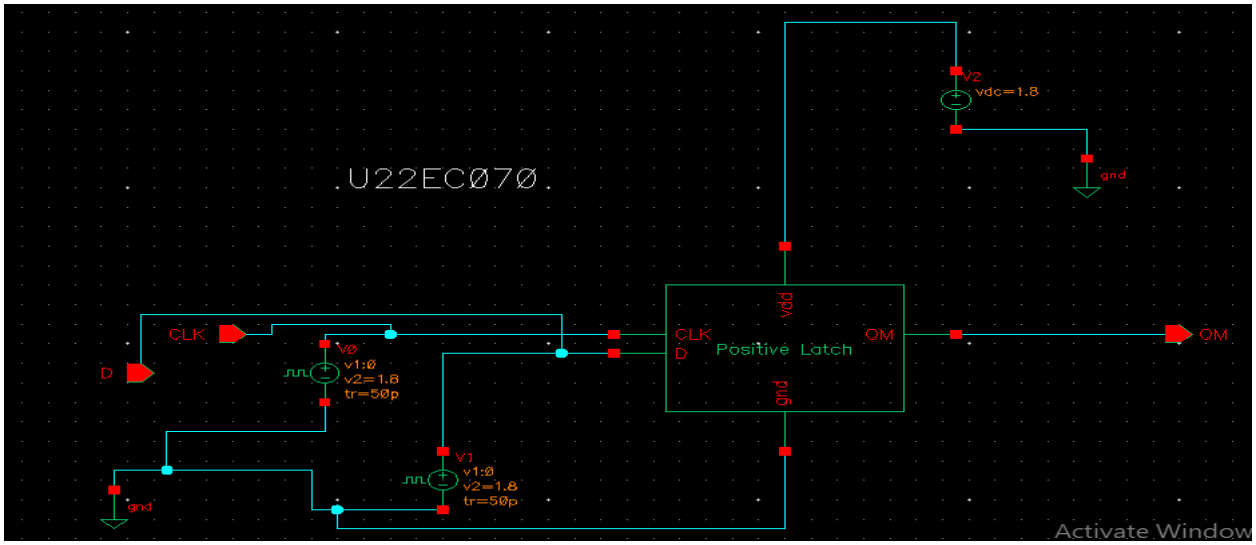


Dynamic edge triggered flip flop using two phase clock generator:

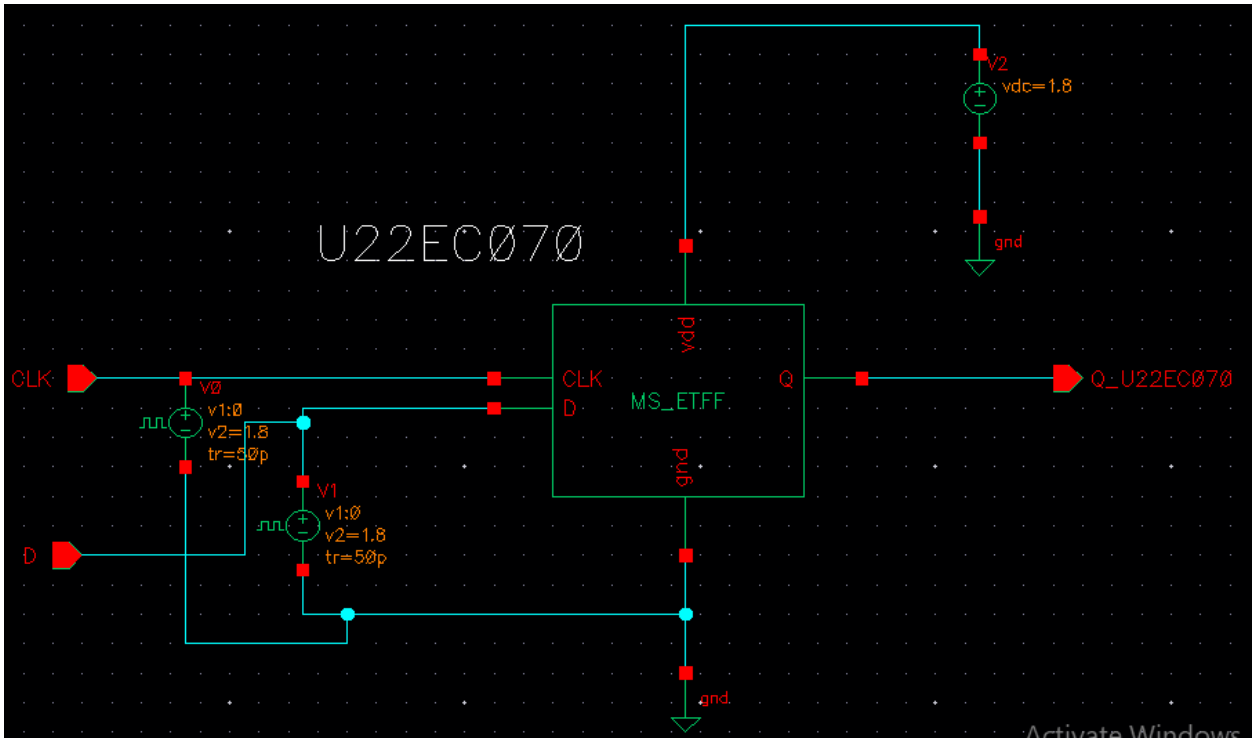


Testbench:

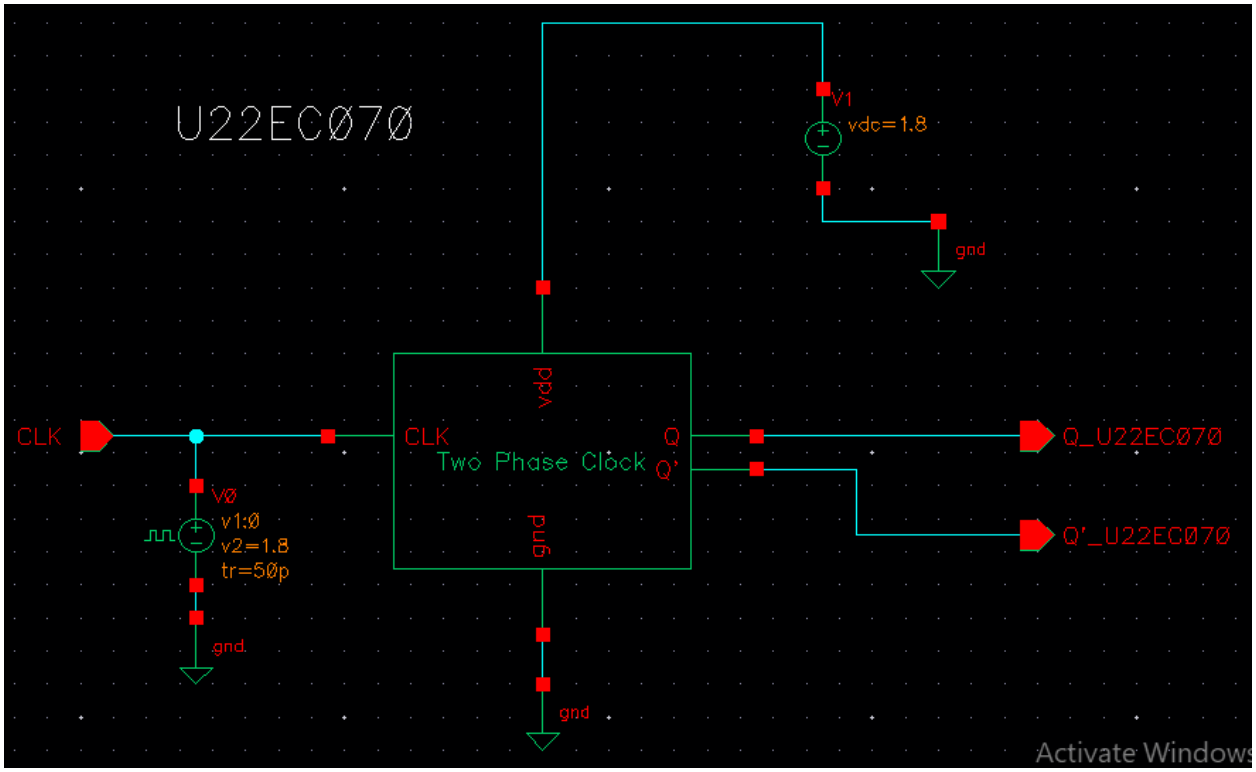
Positive latch:



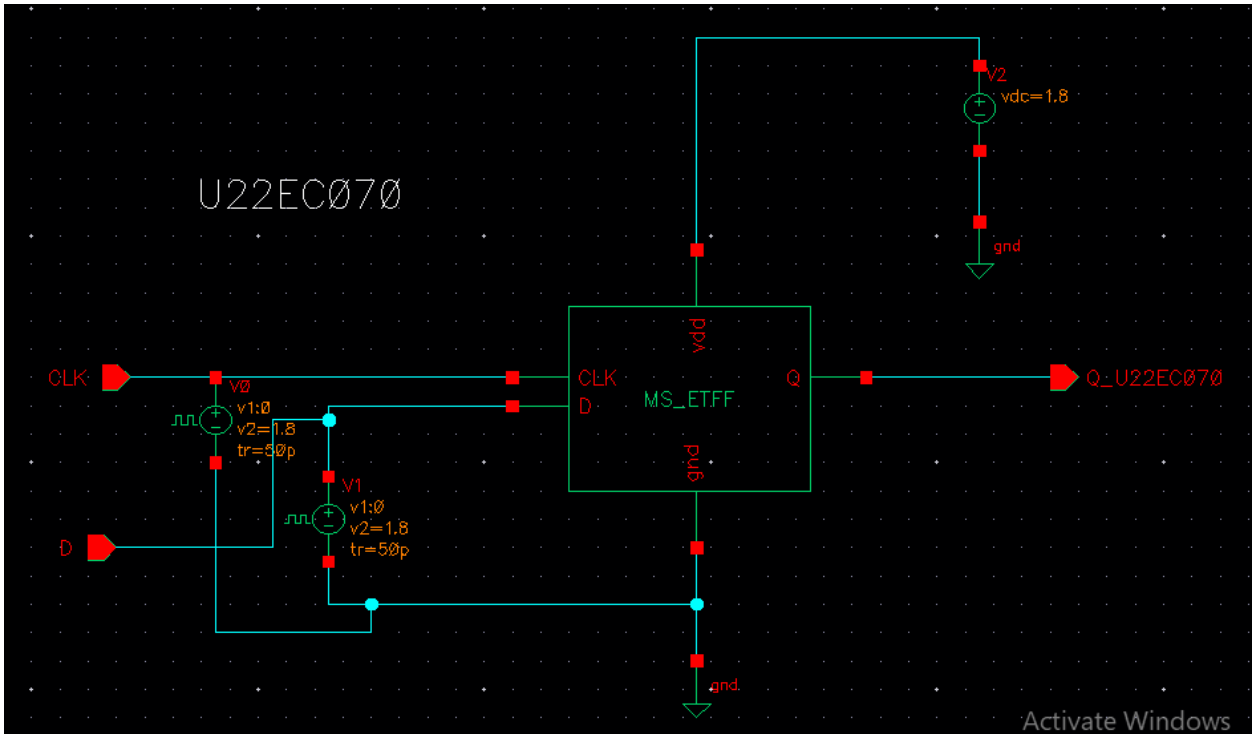
Master slave based edge triggered flip flop without using two phase clock generator:



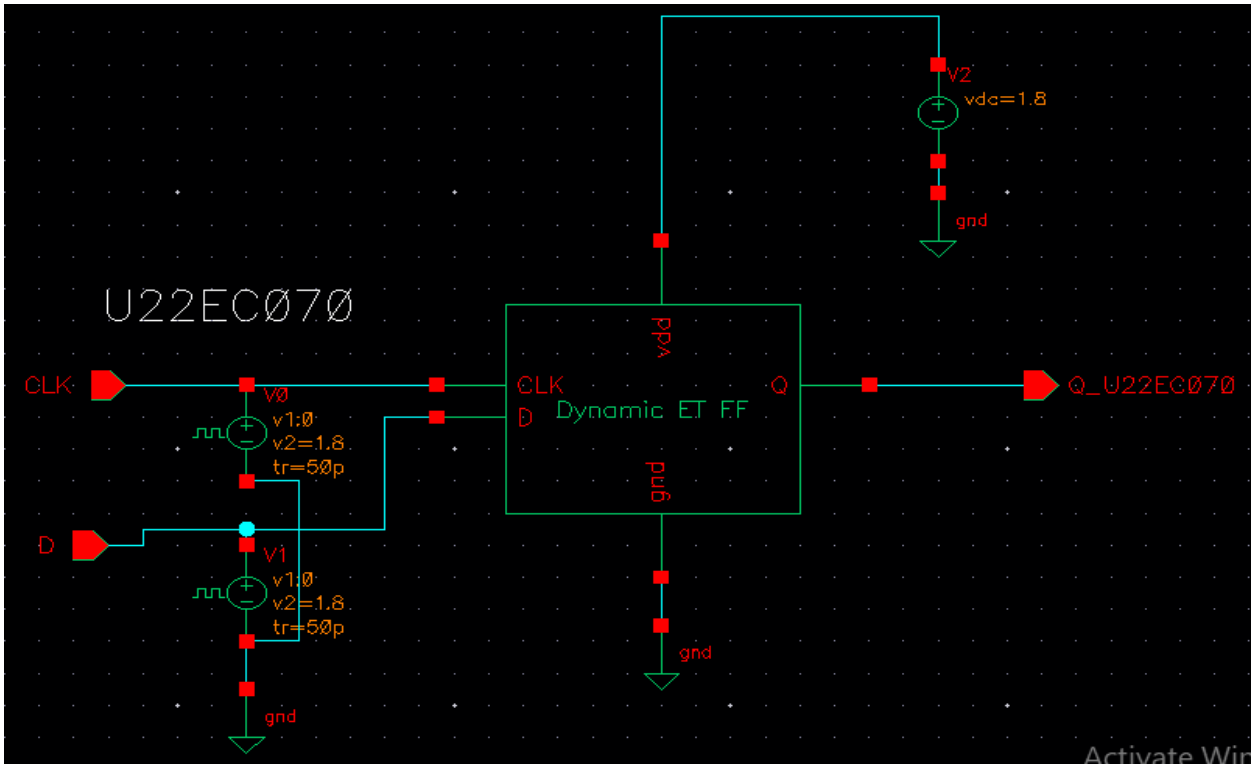
Two phase clock generator:



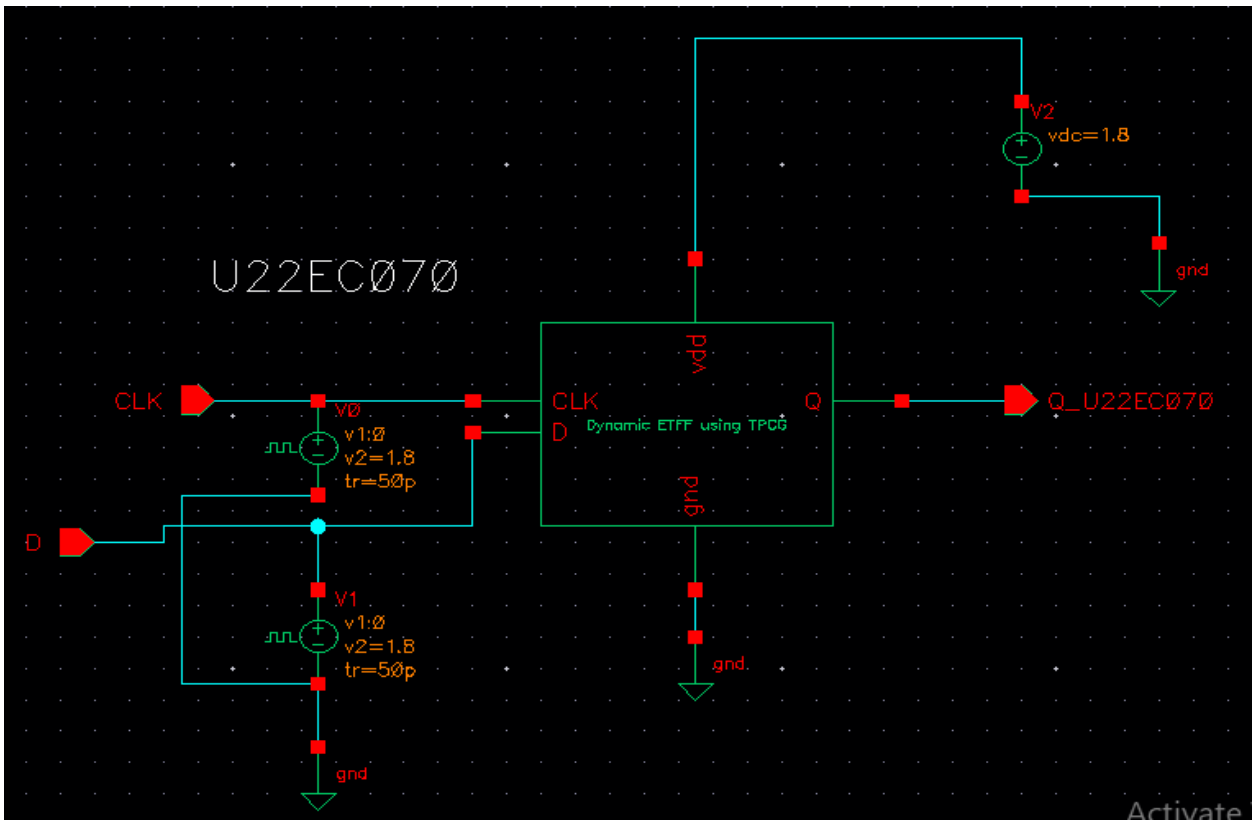
Master slave based edge triggered flip flop using two phase clock generator:



Dynamic edge triggered flip flop without using two phase clock generator:

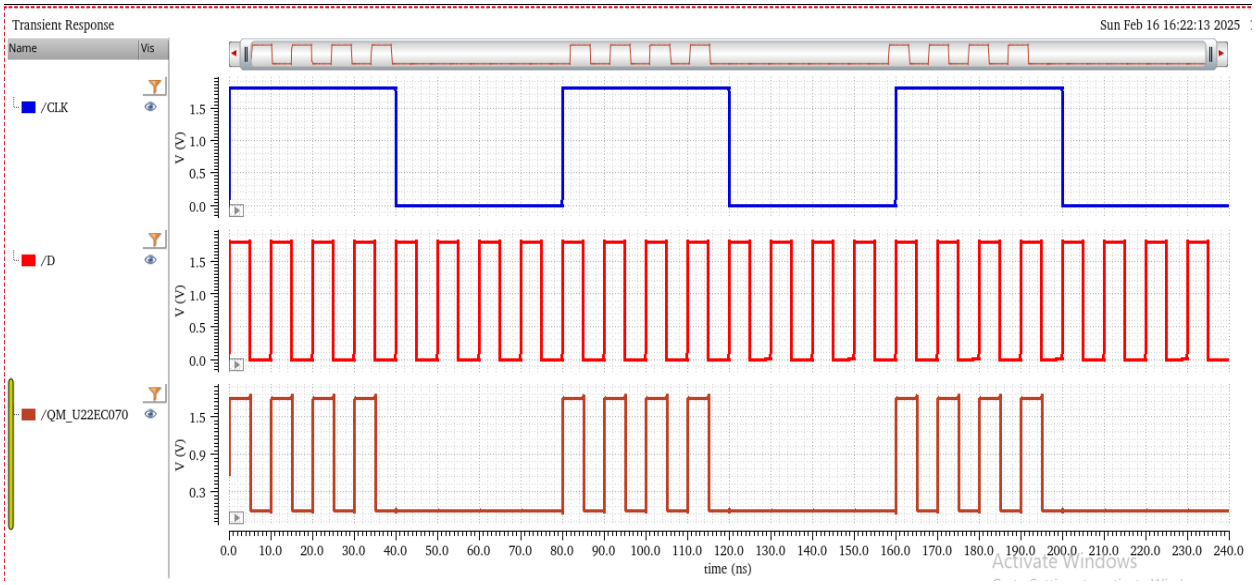


Dynamic edge triggered flip flop using two phase clock generator:

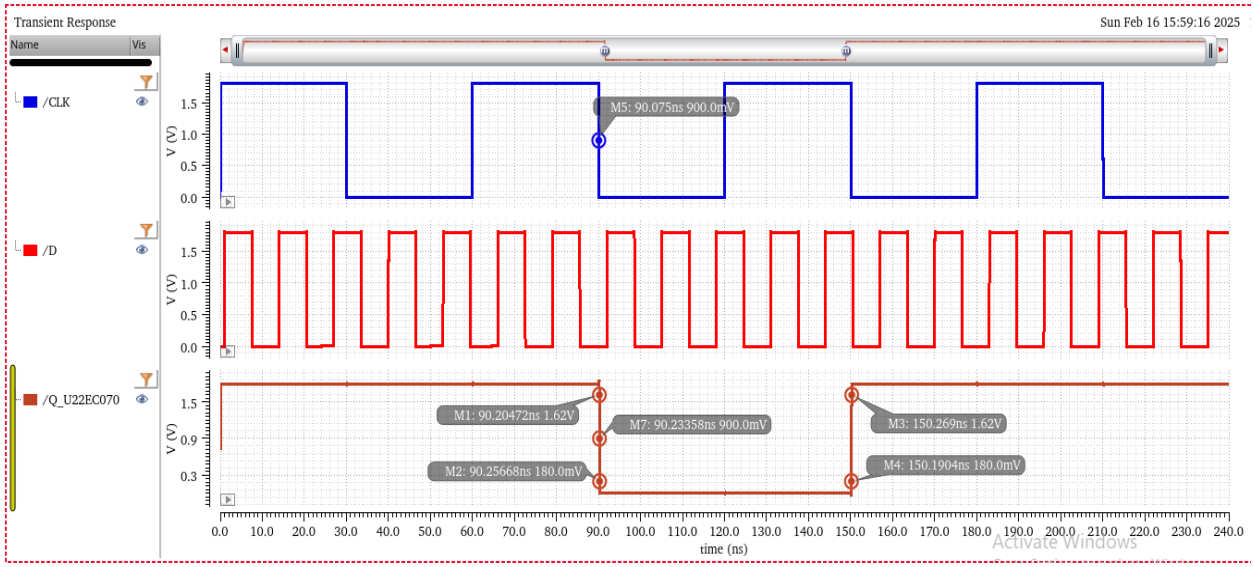


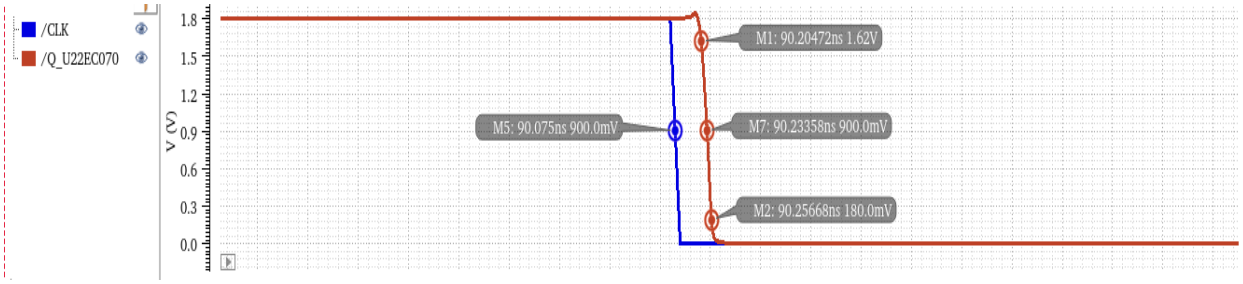
Outputs:

Positive latch:

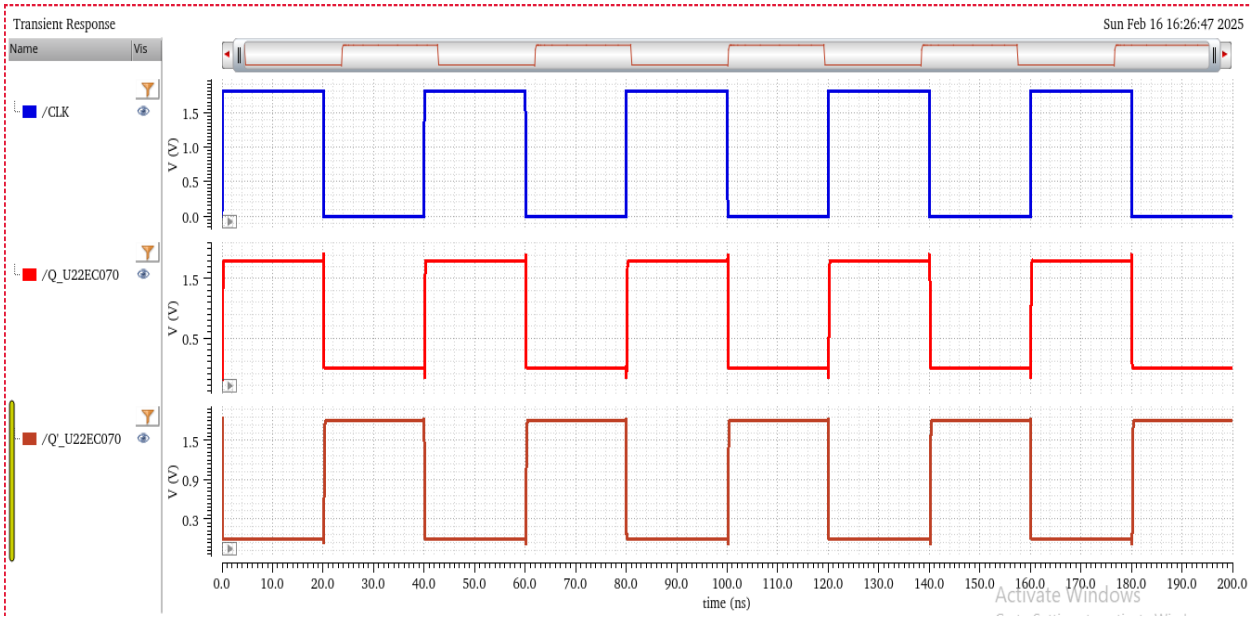


Master slave based edge triggered flip flop without using two phase clock generator:

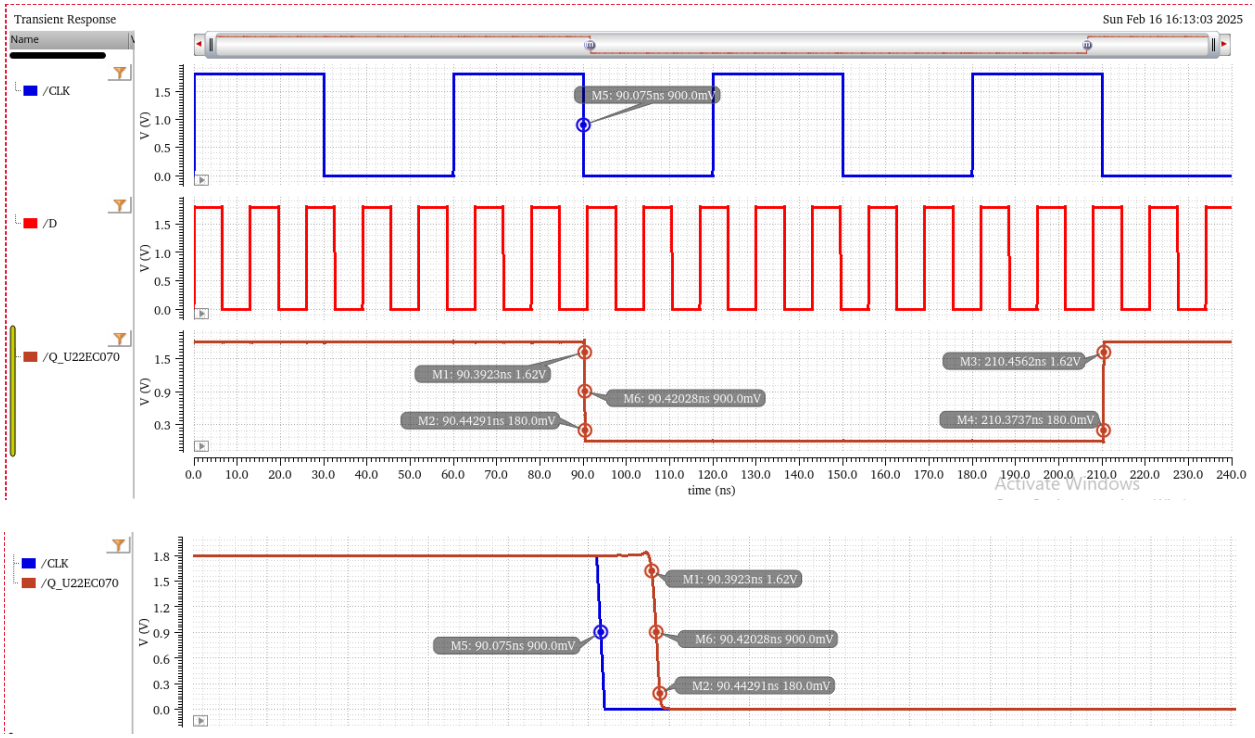




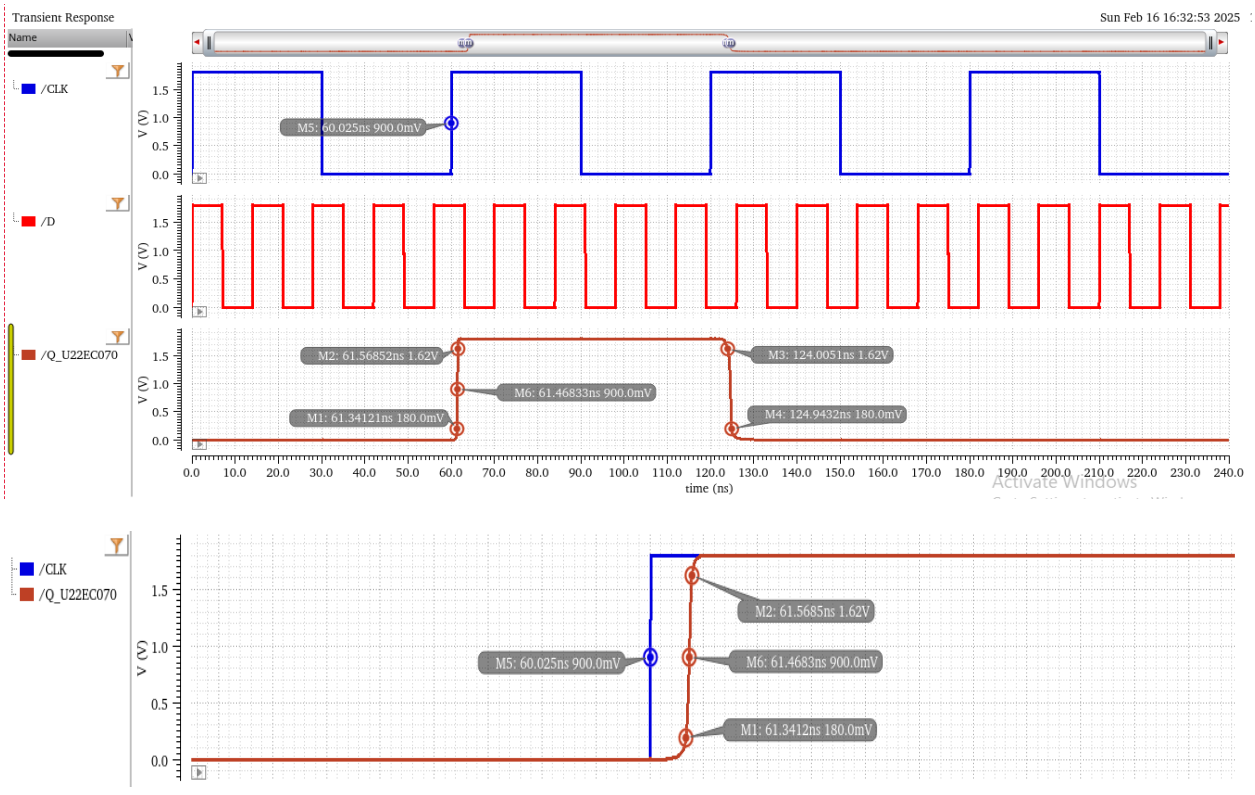
Two phase clock generator:



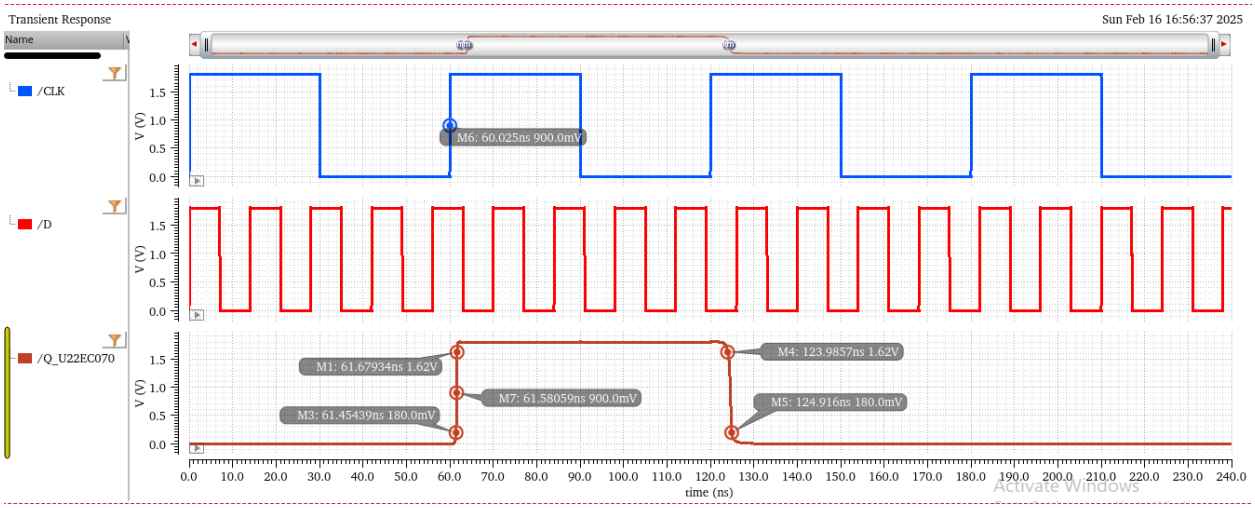
Master slave based edge triggered flip flop using two phase clock generator:

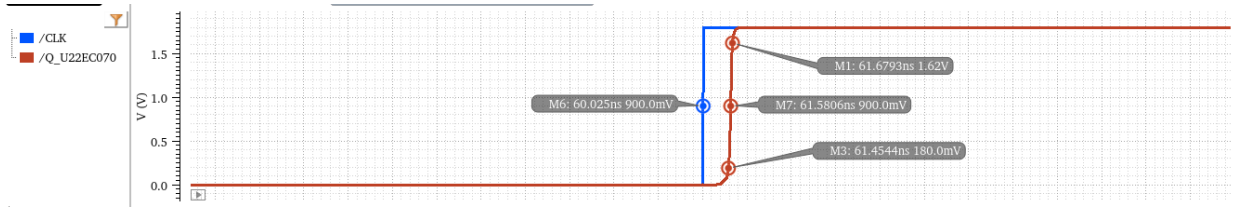


Dynamic edge triggered flip flop without using two phase clock generator:



Dynamic edge triggered flip flop using two phase clock generator:





Calculations:

Conclusion:

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Assignment-5

Part-A

Aim: a) Implement layout of master slave based negative edge triggered flip flop using 2x1 MUX as an element designed using transmission gate.

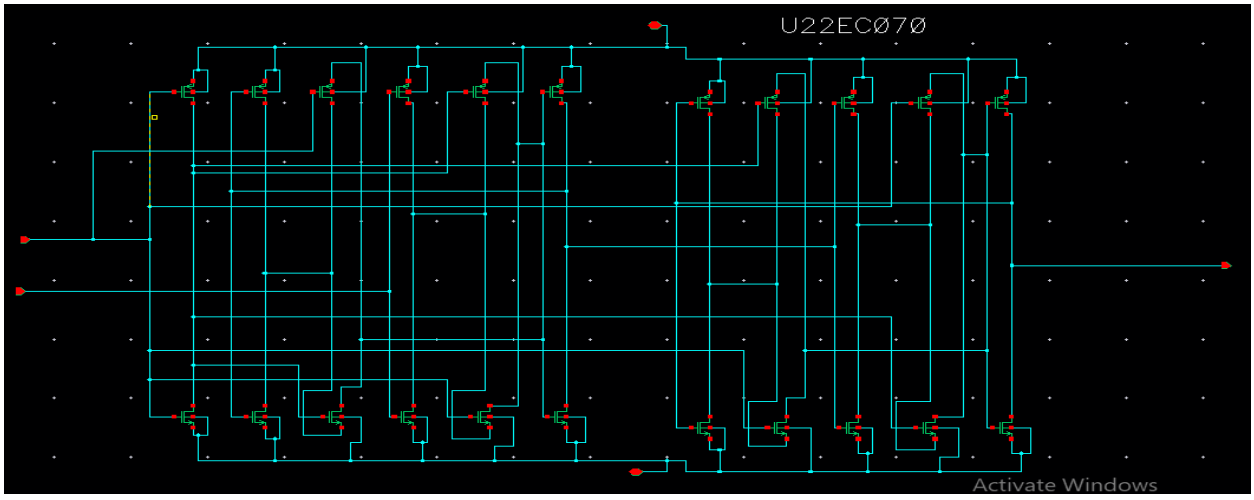
b) Implement layout of dynamic positive edge triggered flip flop using transmission gate.

Consider sea of gate structure in both part a) and b).

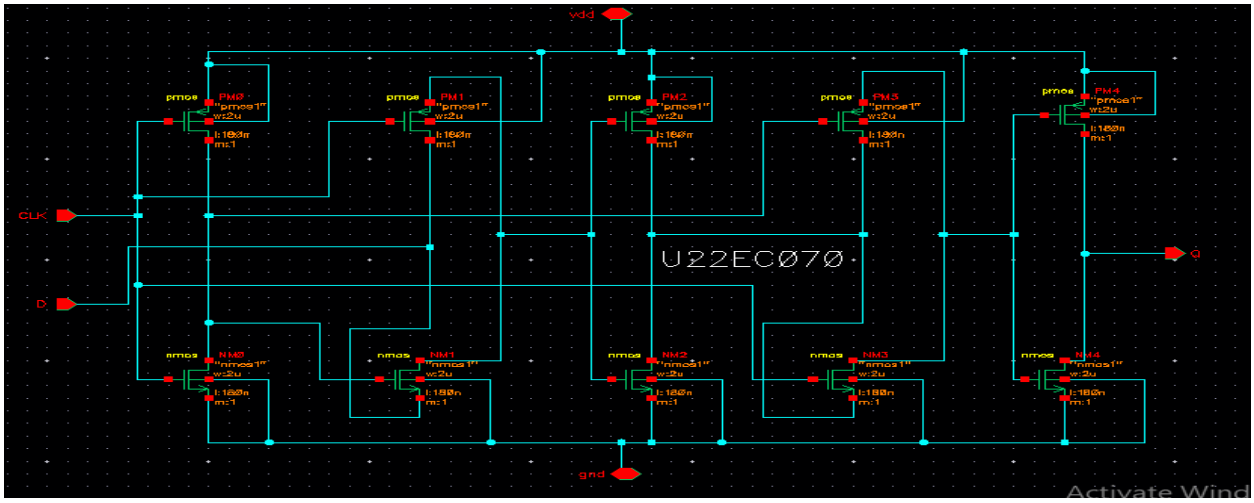
Apparatus: Cadence Virtuoso Software

Schematic:

Master slave based negative edge triggered flip flop:

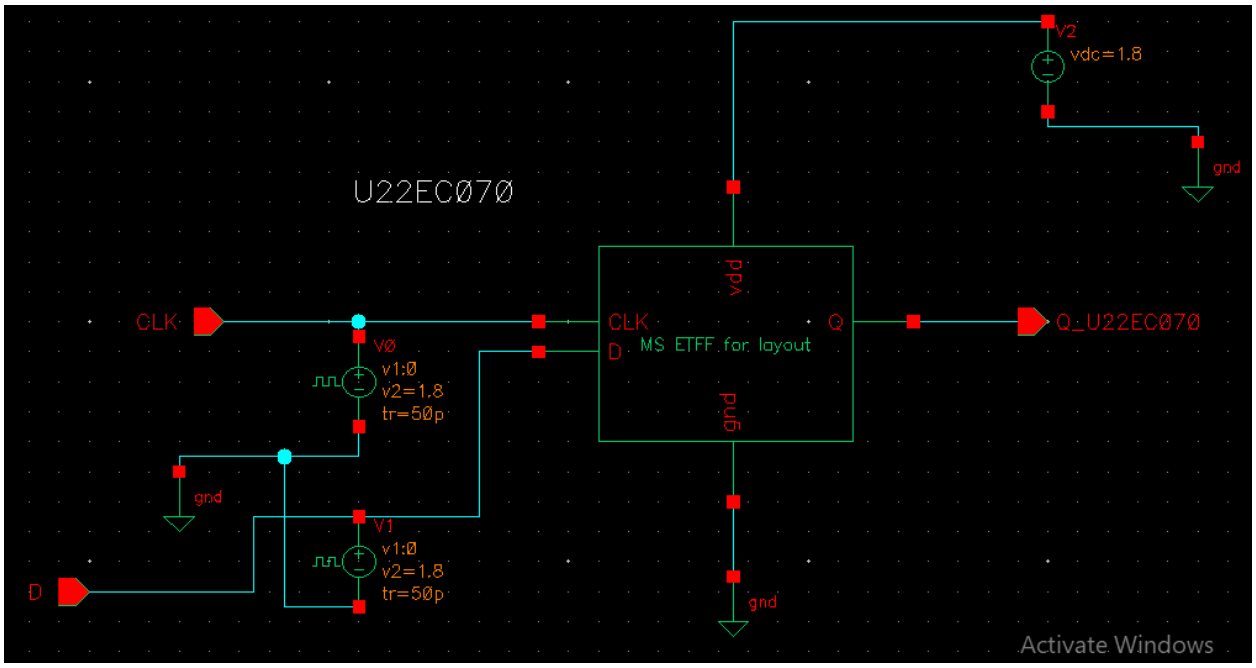


Dynamic positive edge triggered flip flop:

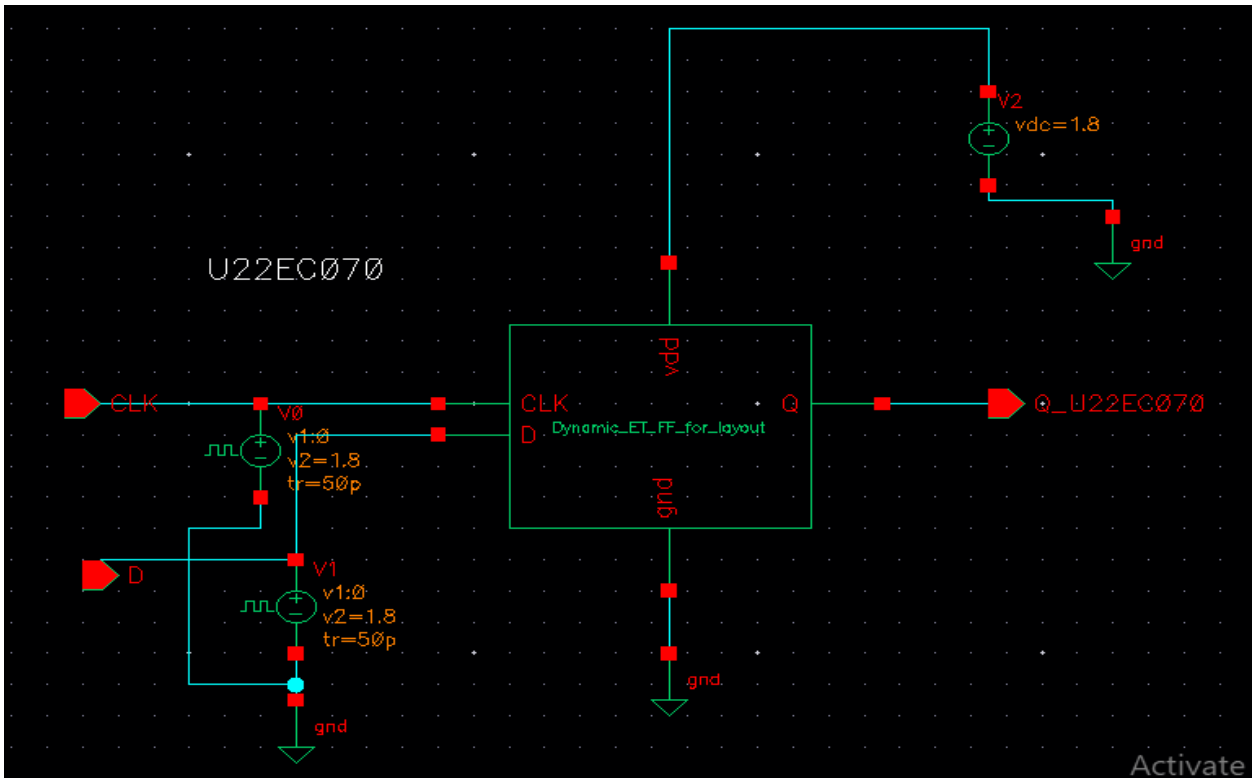


Testbench:

Master slave based negative edge triggered flip flop:

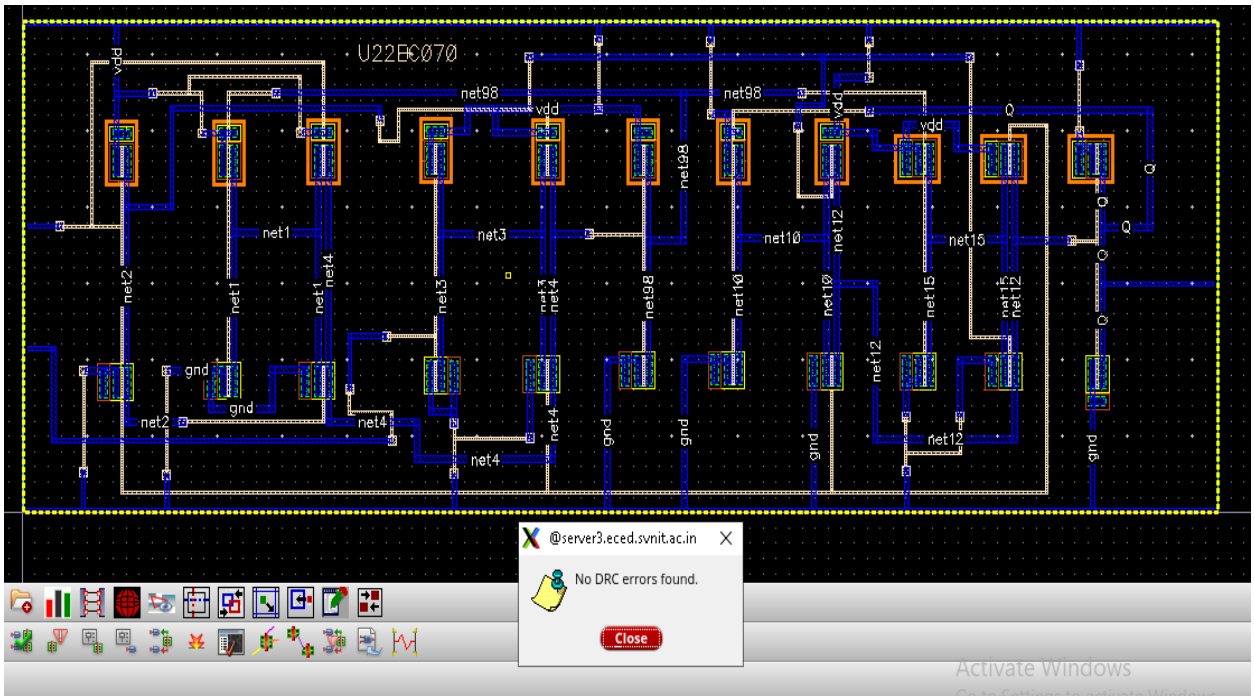


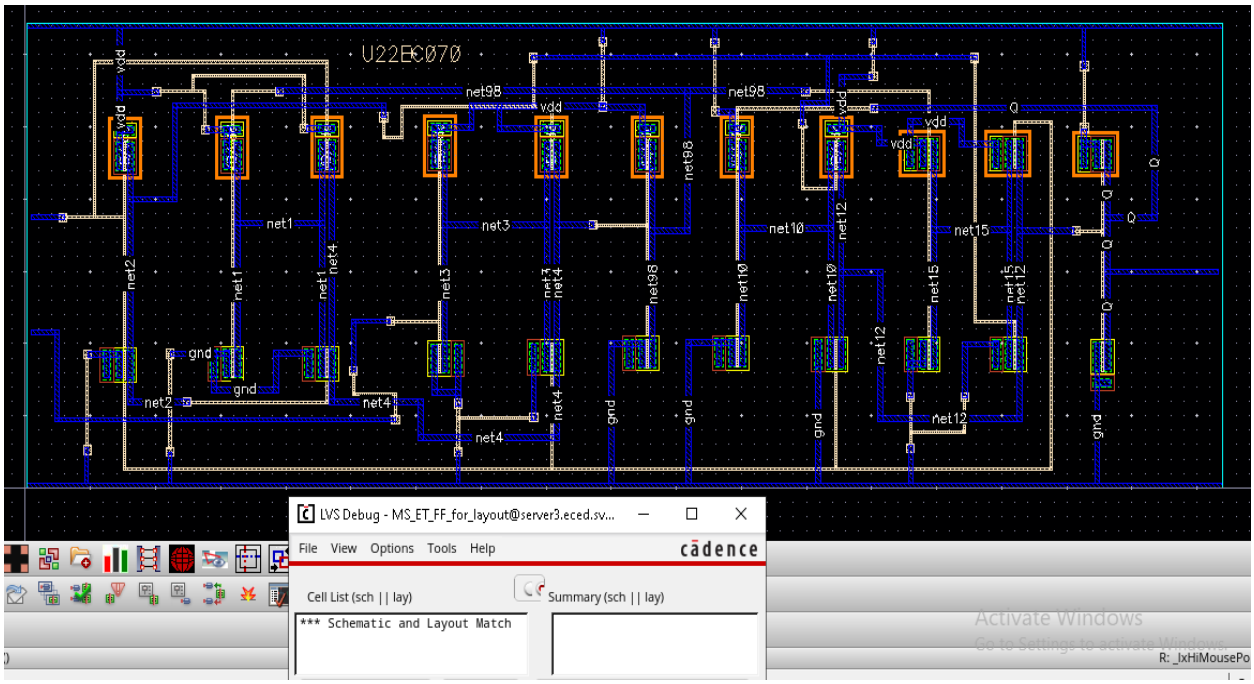
Dynamic positive edge triggered flip flop:



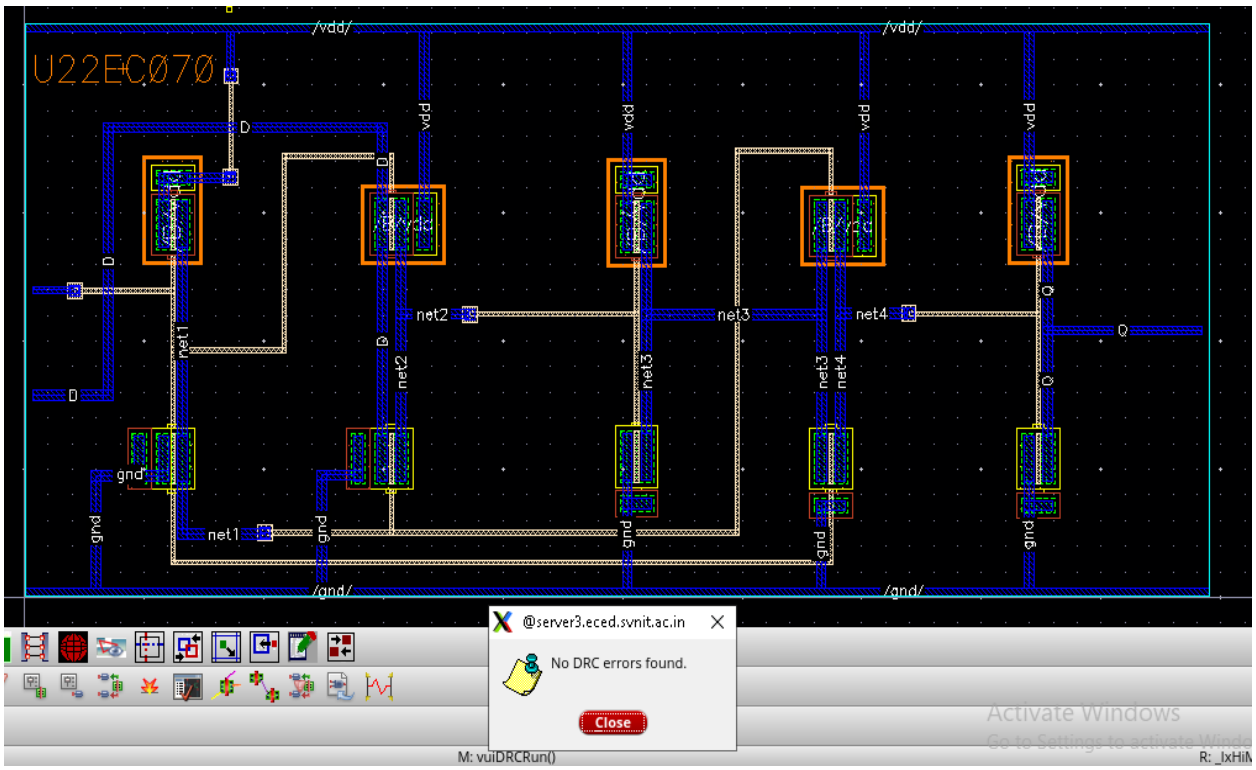
Layouts:

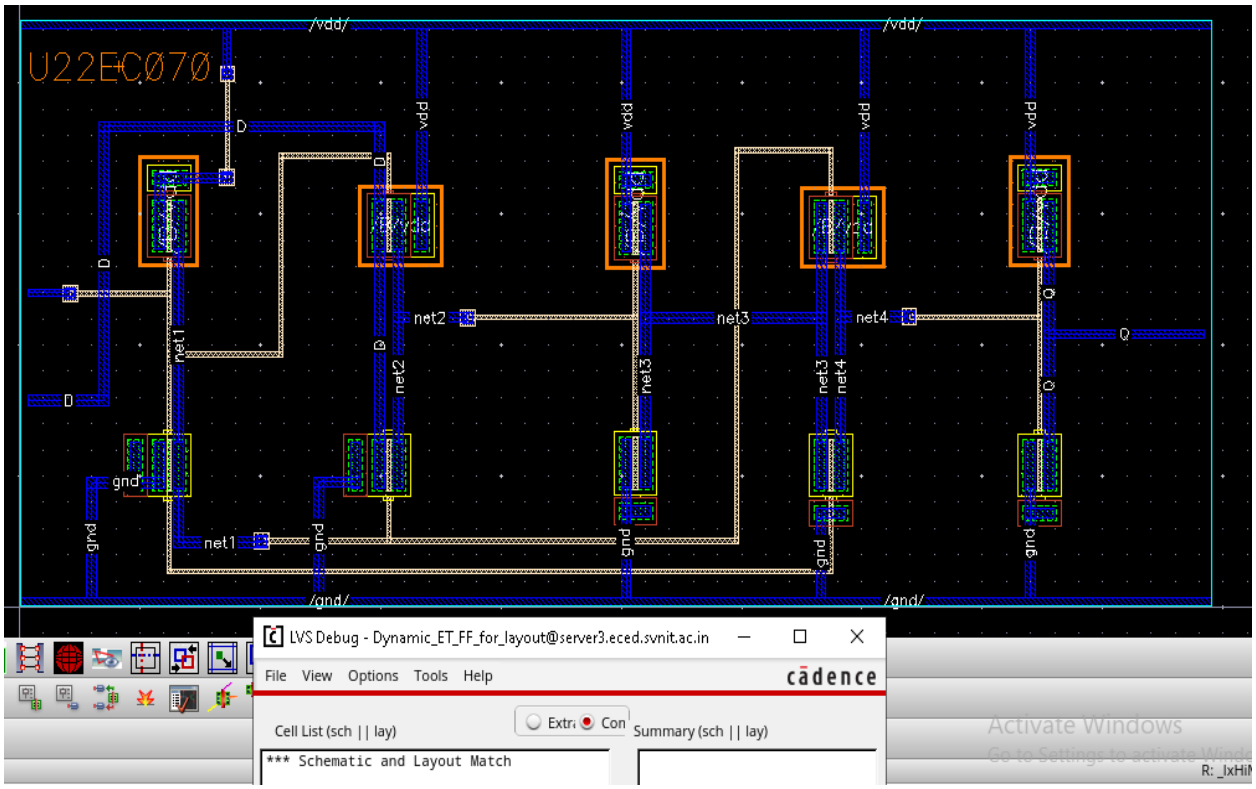
Master slave based negative edge triggered flip flop:





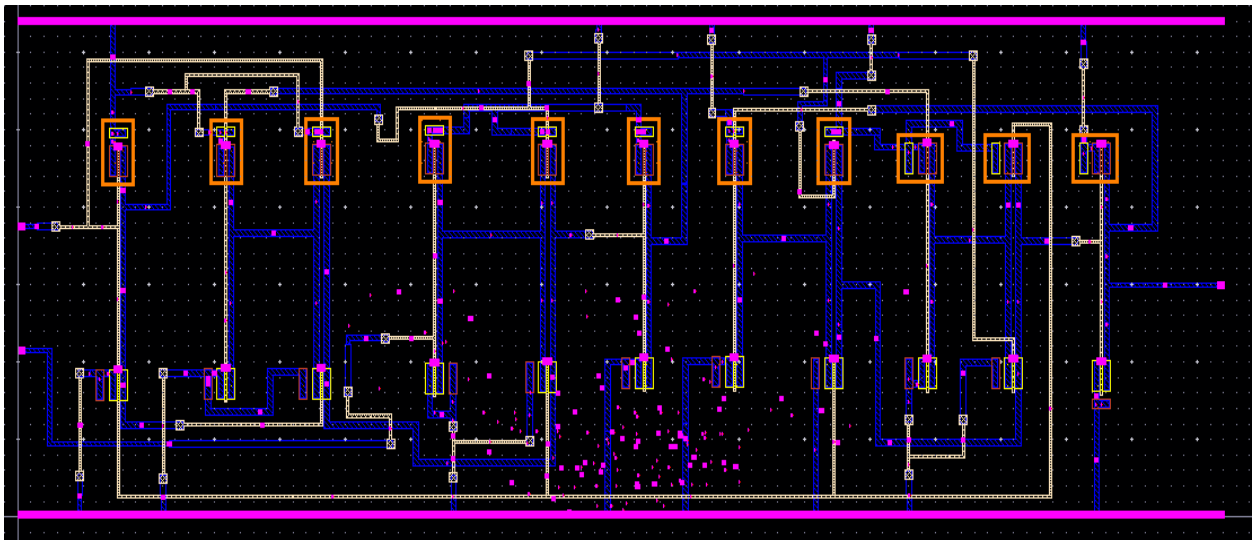
Dynamic positive edge triggered flip flop:

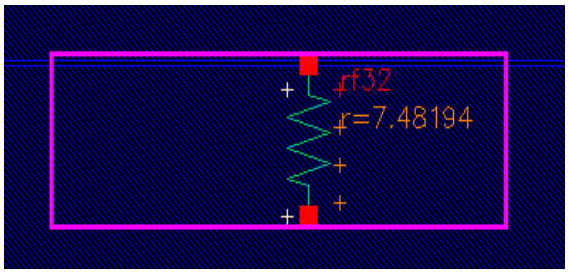


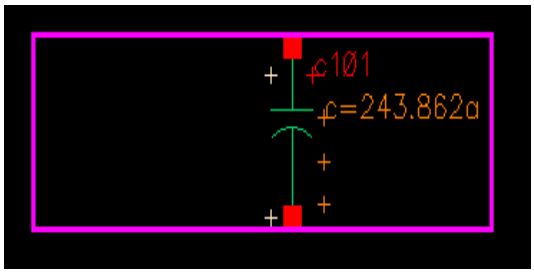


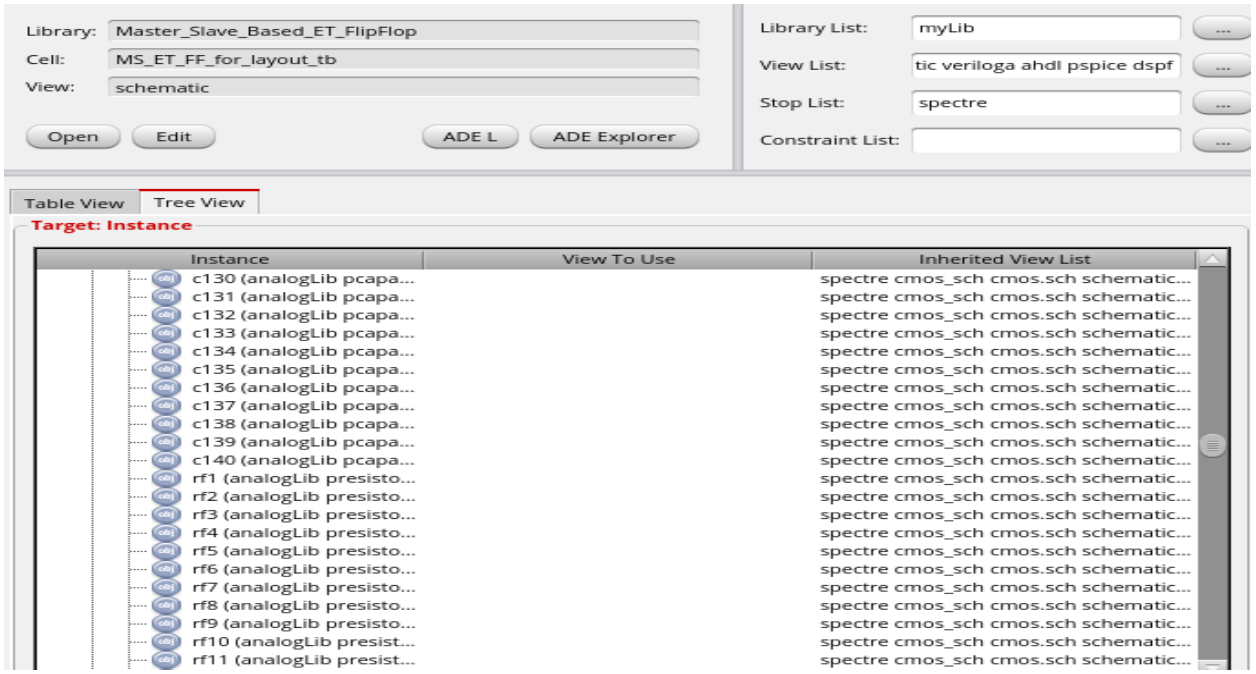
RC Extraction:

Master slave based negative edge triggered flip flop:

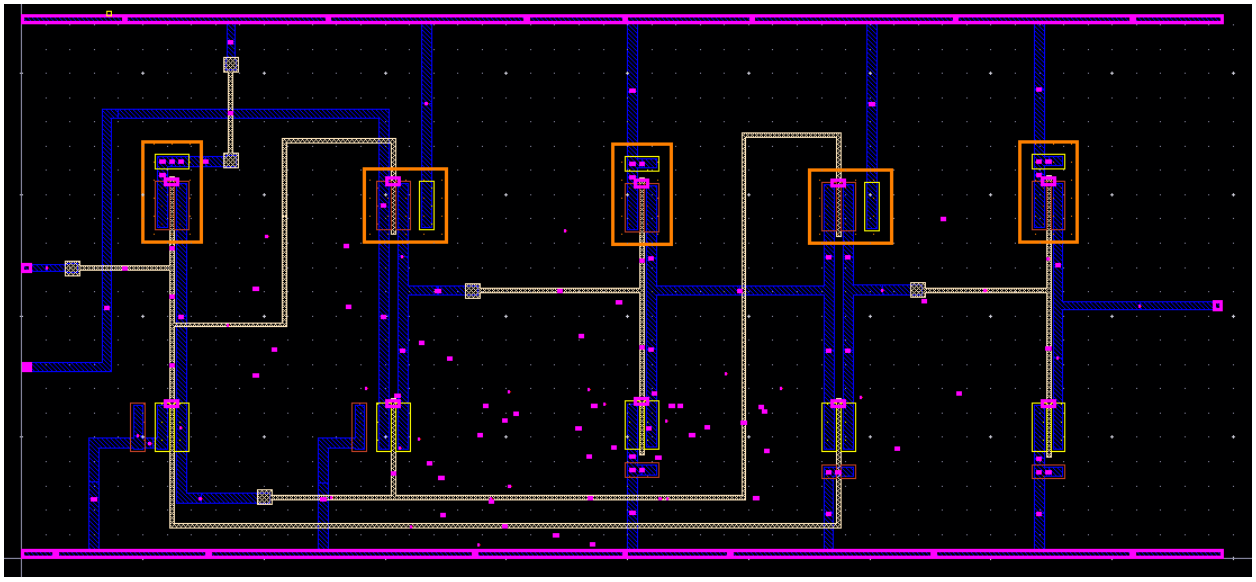


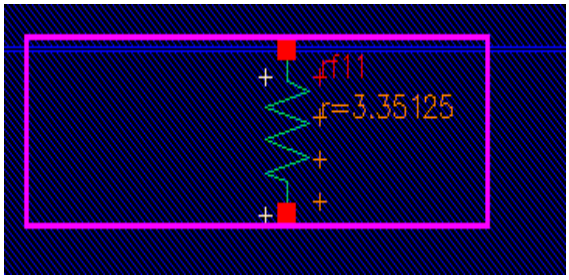


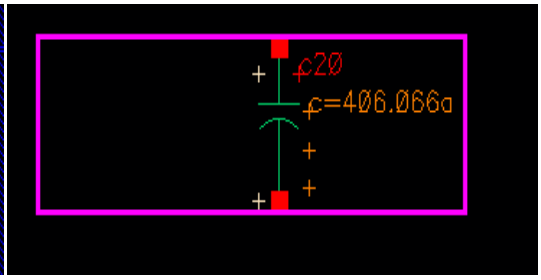


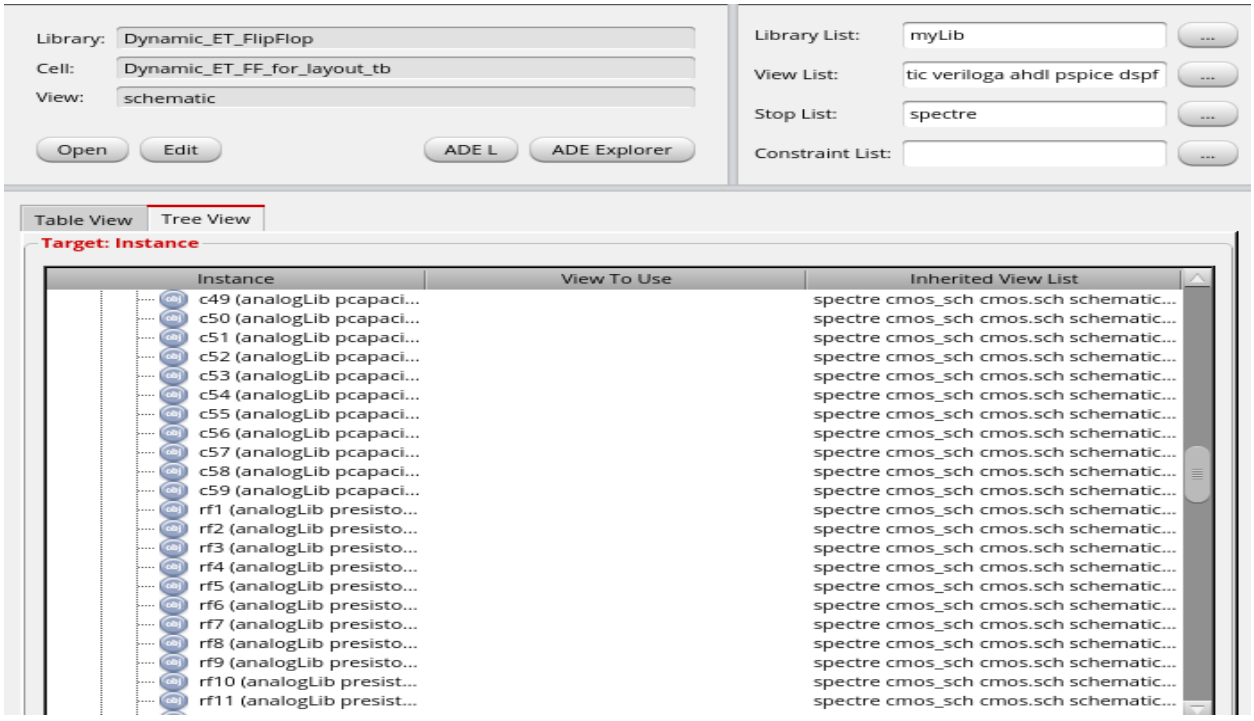


Dynamic positive edge triggered flip flop:





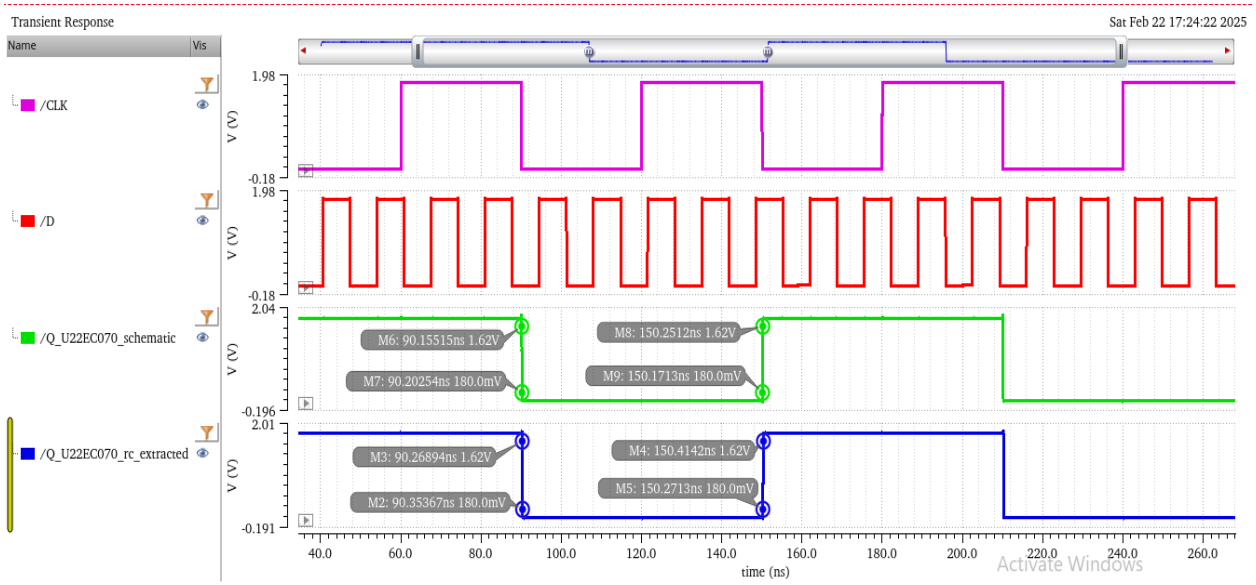




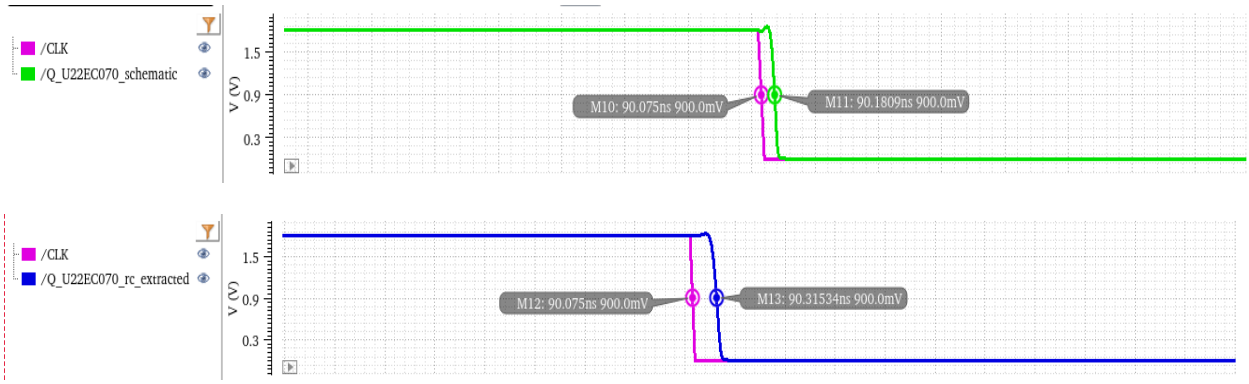
Outputs:

Master slave based negative edge triggered flip flop:

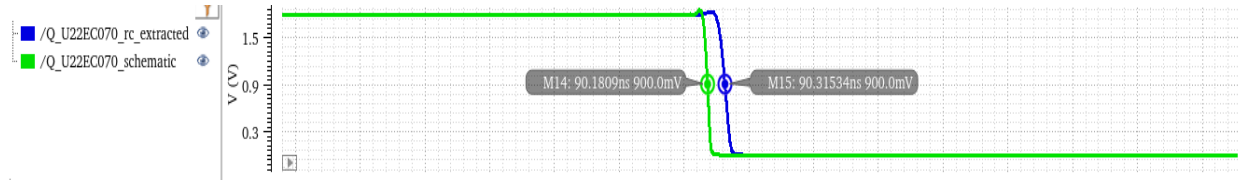
a) Rise time and fall time:



b) CLK to Q delay:

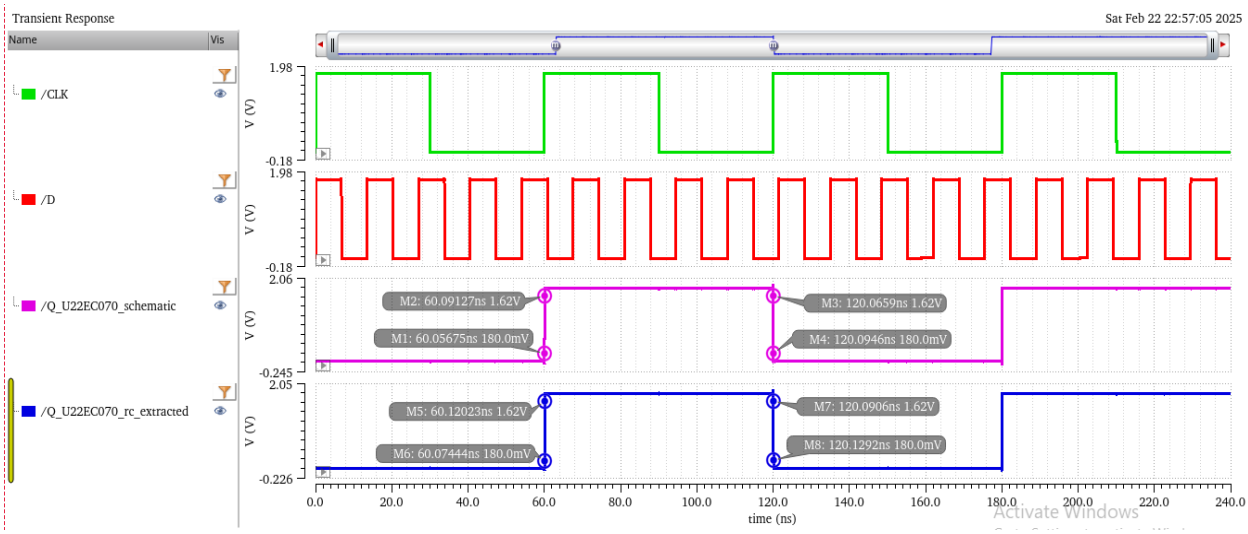


c) Post layout simulation:

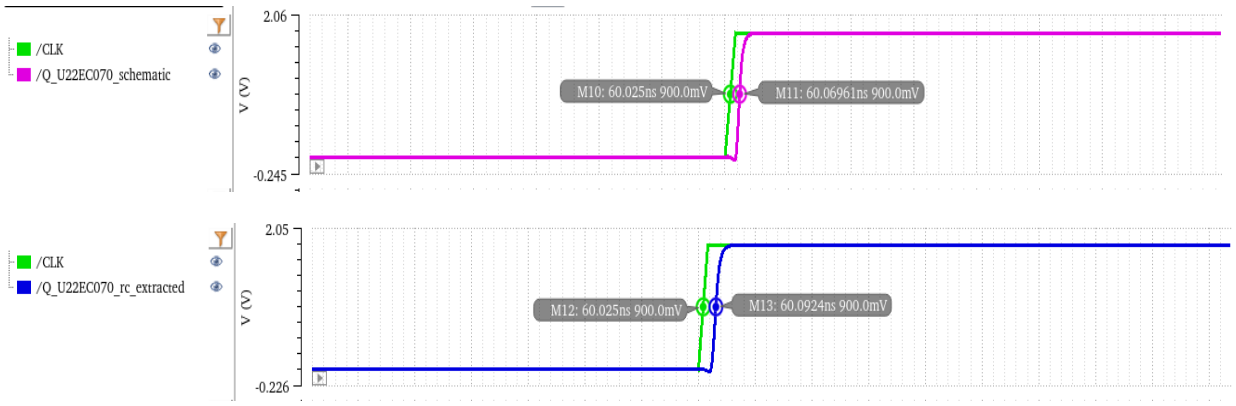


Dynamic positive edge triggered flip flop:

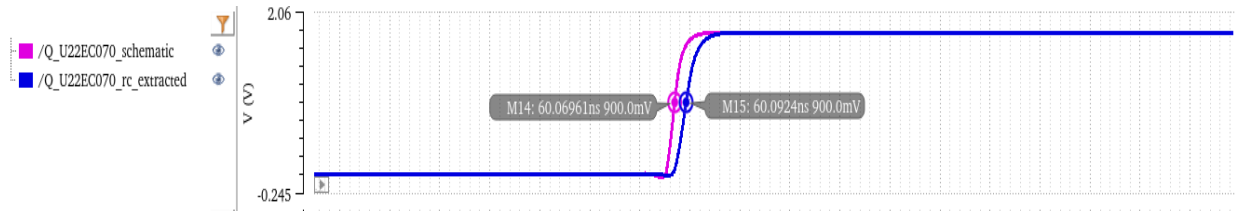
a) Rise time and fall time:



b) CLK to Q delay:



c) Post layout simulation:



Calculations:

Conclusion:

SIGNATURE