International IslamicUniversity Islamabad Faculty of Engineering and Technology Department of Electricaland Computer Engineering

VLSI DESIGN LAB

EXPERIMENT Lab 9: INVERTER schematic

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Lab Performance Report#10

- Task#1: **Pre-layout Simulation**:
  - Build up an inverter schematic step by step in Electric. Perform Transient analysis of
  - CMOS inverter using a pulse input of your own choice

    in Electric and observing output of CMOS inverter in Ltspice
  - Use .meas command to evaluate propagation delay and power dissipation of the

    inverter.
  - Report the screenshots of schematic diagram, Spice netlist, I/O waveforms and log

    file

- **Caution**: There is no unique solution to this assignment. All submissions should be different, like wiring of your schematic and selection of circuit parameters, inputs and outputs. **Zero marks will be awarded for exact copies, so avoid sharing your assignments with friends**.

Task 1 :

Spice netlist

```
*** SPICE deck for cell inverter{sch} from library inverter
*** Created on Ø Ø¯Ù0³ 14, 2025 17:12:32
*** Last revised on Ø Ø¯Ù0³ 14, 2025 17:59:44
*** Written on Ø Ø¯Ù0³ 14, 2025 17:59:58 by Electric VLSI Design
System, version 9.07
*** Layout tech: mocmos, foundry MOSIS
*** UC SPICE *** , MIN_RESIST 4.0, MIN_CAPAC 0.1FF
*** Lambda Conversion ***


.global gnd vdd

*** TOP LEVEL CELL: inverter{sch}
MNMOS VOUT VIN gnd gnd NMOS L=0.35u W=1u
MPMOS vdd VIN VOUT vdd PMOS L= 0.35u W=2.5u

* Spice Code nodes in cell cell 'inverter{sch}'
.include tsmc350.txt
.PARAM SUPPLY=3.3V
VDD VDD 0 DC 'SUPPLY'
VIN VIN 0 PULSE 0 'SUPPLY' 100PS 10PS 10PS 200PS 500PS
.TRAN 10PS 600PS
.meas tran tphl TRIG v(Vin) VAL=1.65 FALL=1 TARG v(Vout) VAL=1.65
RISE=1
.meas tran tplh TRIG v(Vin) VAL=1.65 RISE=1 TARG v(Vout) VAL=1.65
FALL=1
.meas tran tp_avg PARAM = (abs(tphl)+abs(tplh))/2
.END
```

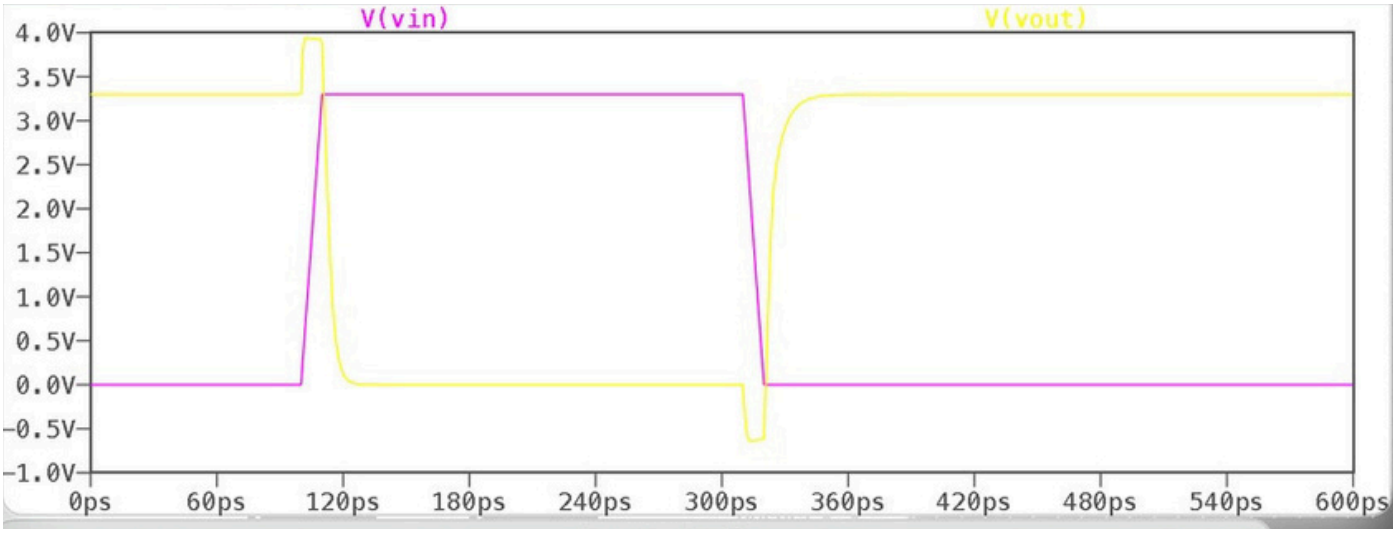
log file

```
LTspice 17.2.4 for MacOS
Circuit: *** SPICE deck for cell inverter{sch} from library inverter
Start Time: Sun Dec 14 18:01:48 2025
Ignoring BSIM parameter XL
Ignoring BSIM parameter XW
Ignoring BSIM parameter XL
Ignoring BSIM parameter XW
solver = Normal
Maximum thread count: 8
tnom = 27
temp = 27
method = modified trap
CompressWinPoints = 1024
Warning: Pd = 0 is less than W.
Warning: Ps = 0 is less than W.
Warning: Pd = 0 is less than W.
Warning: Ps = 0 is less than W.
Direct Newton iteration for .op point succeeded.

tphl=8.25099e-12 FROM 3.15e-10 TO 3.23251e-10
tplh=8.48761e-12 FROM 1.05e-10 TO 1.13488e-10
tp_avg: (abs(tphl)+abs(tplh))/2=8.3693e-12

Total elapsed time: 0.042 seconds.
```

I/O waveforms



schematic