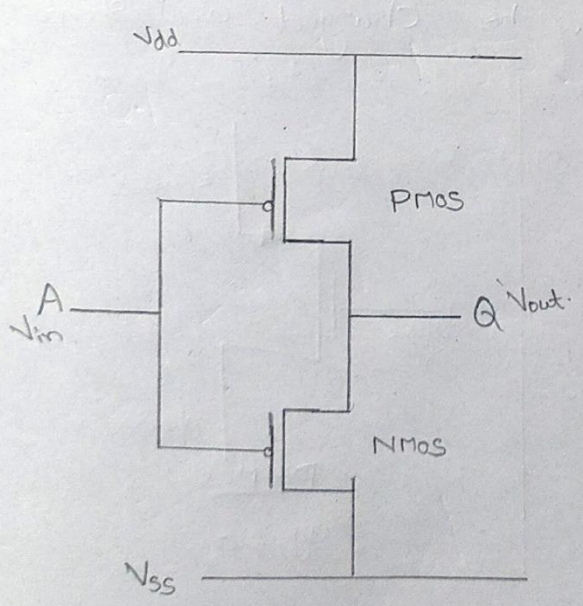
Designing of An Inverter :-

Practical - 1

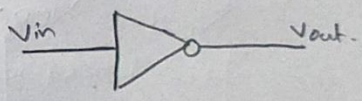
→ Aim :- Designing of CMOS Inverter Using Cadence Virtuoso Environment.

→ Introduction to CMOS Inverter :-

A CMOS inverter is a FET (Field Effect Transistor), Composed of a Metal gate lies on the top of oxygen's insulating layer on top of a Semiconductor. These inverters are used in most electronic devices which are accountable for generating data in small Circuits.



CMOS Inverter



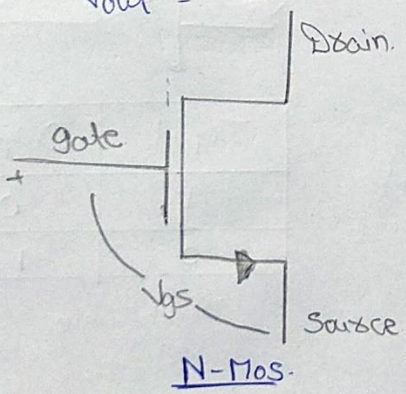
Input	Output
1	0
0	1

Truth Table.

→ Working of operation of CMOS Inverter :-

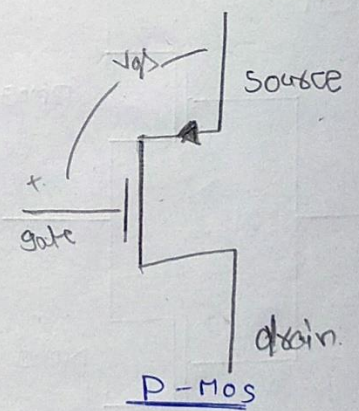
- The working of CMOS inverter is same as the working of FET. Except depends on an oxygen layer to divide electrons within the gate & semiconductor.
- When the low input voltage is given to the CMOS inverter, then the PMOS transistor is switched ON whereas the NMOS transistor will switch OFF by allowing the flow of electrons throughout the gate terminal & generating high logic output voltage.
- Thus, direct current supplies from the supply voltage (V_{DD}) & to the output voltage (V_{out}) & the Load Capacitor (C_L) can be charged and shows the

$V_{out} = V_{DD}$.



N-MOS.

$\therefore V_{gs} \geq 0$.

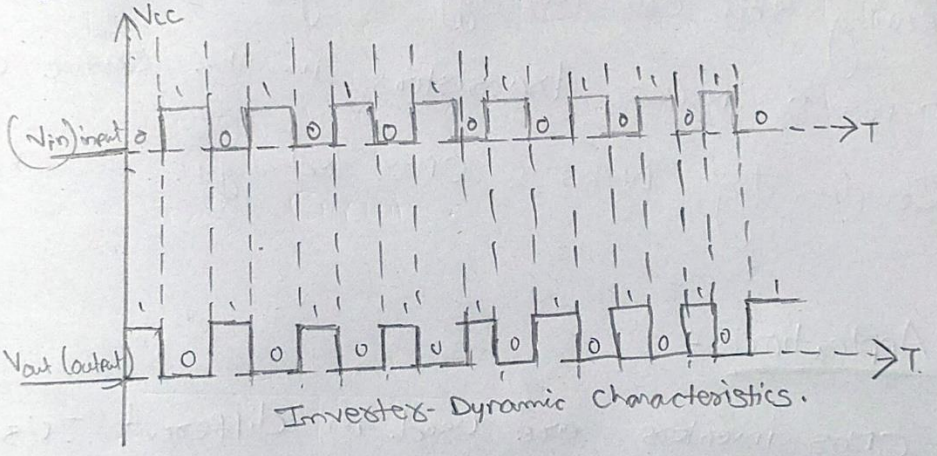


P-MOS

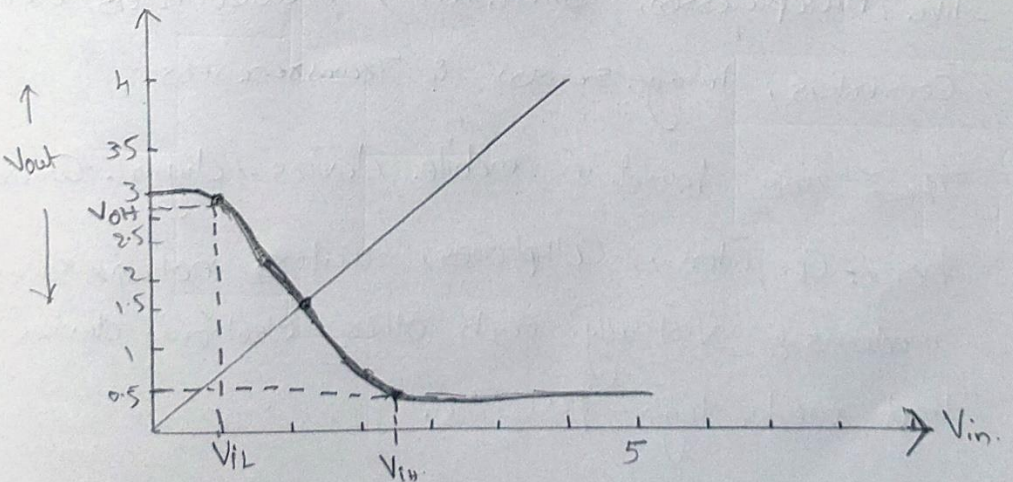
$V_{gs} \leq 0$.

→ observations :-

- We observe the output signal of the inverter by using the transient Analysis.
- We have observed the transient Analysis and dc Analysis of the inverter.
- We have observed the transient Analysis and Compared with the truth table of inverter and verified it.
- We have observed that how the n-mos and p-mos works as an inverter.

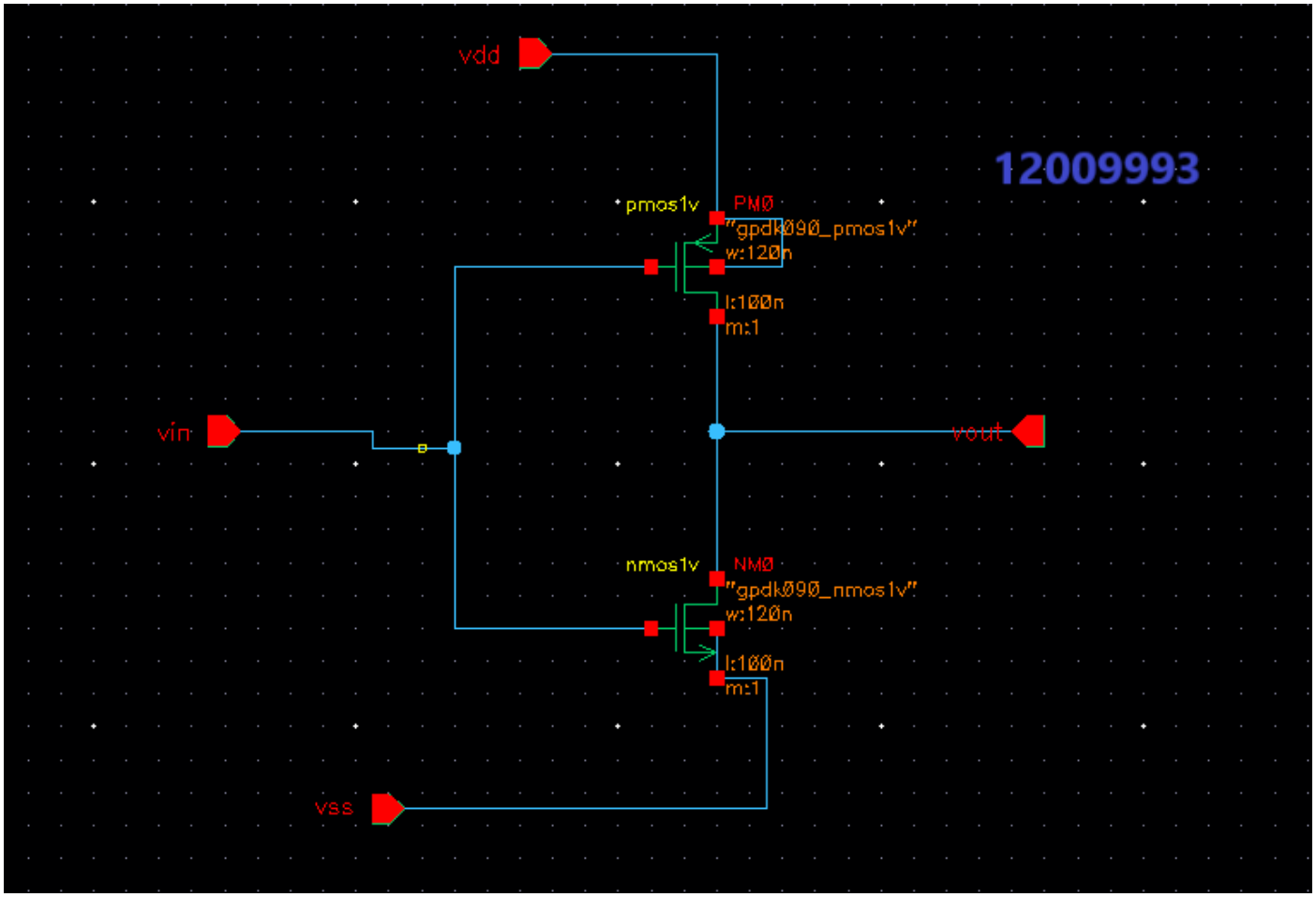


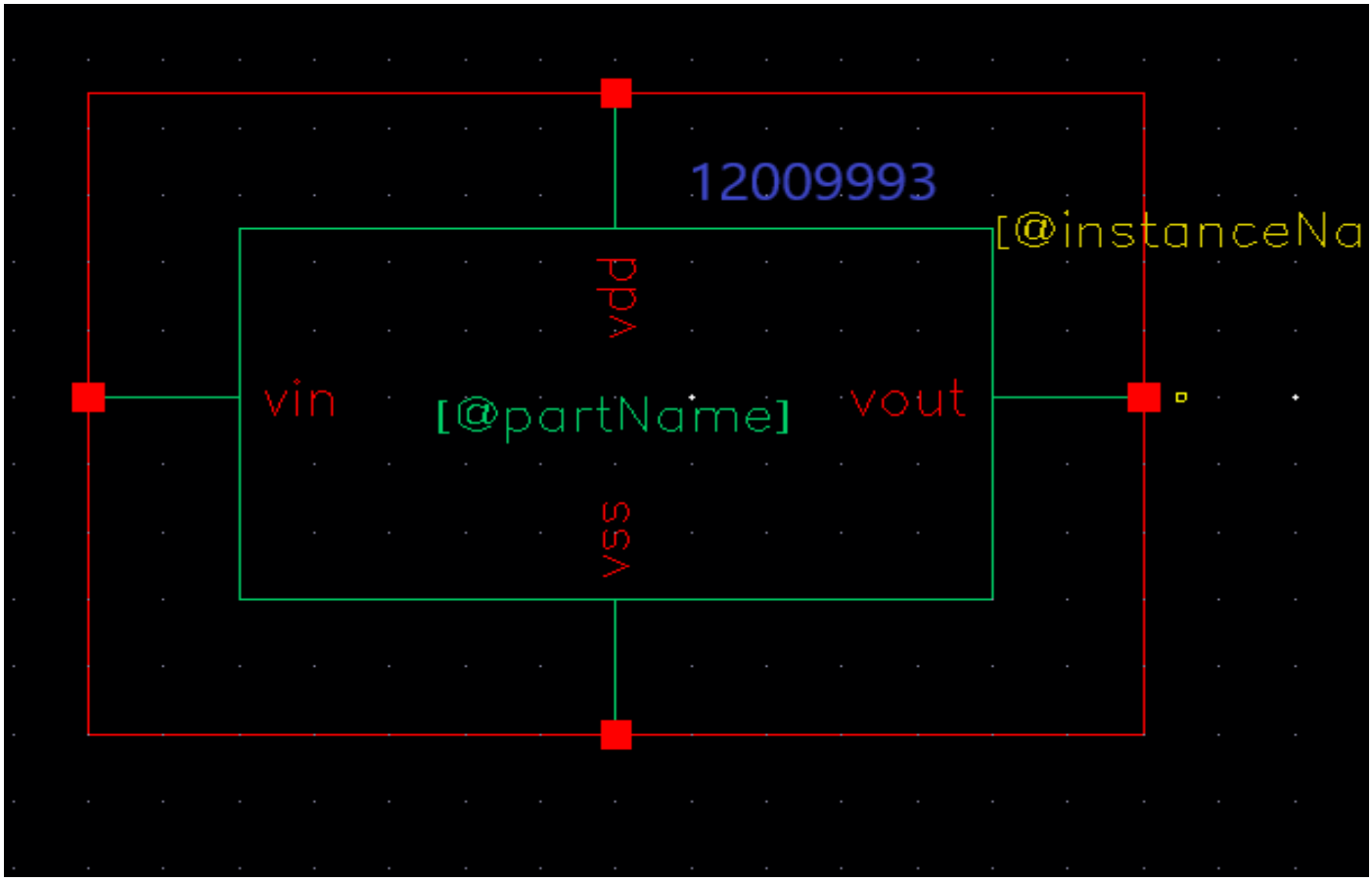
Inverter Dynamic characteristics.

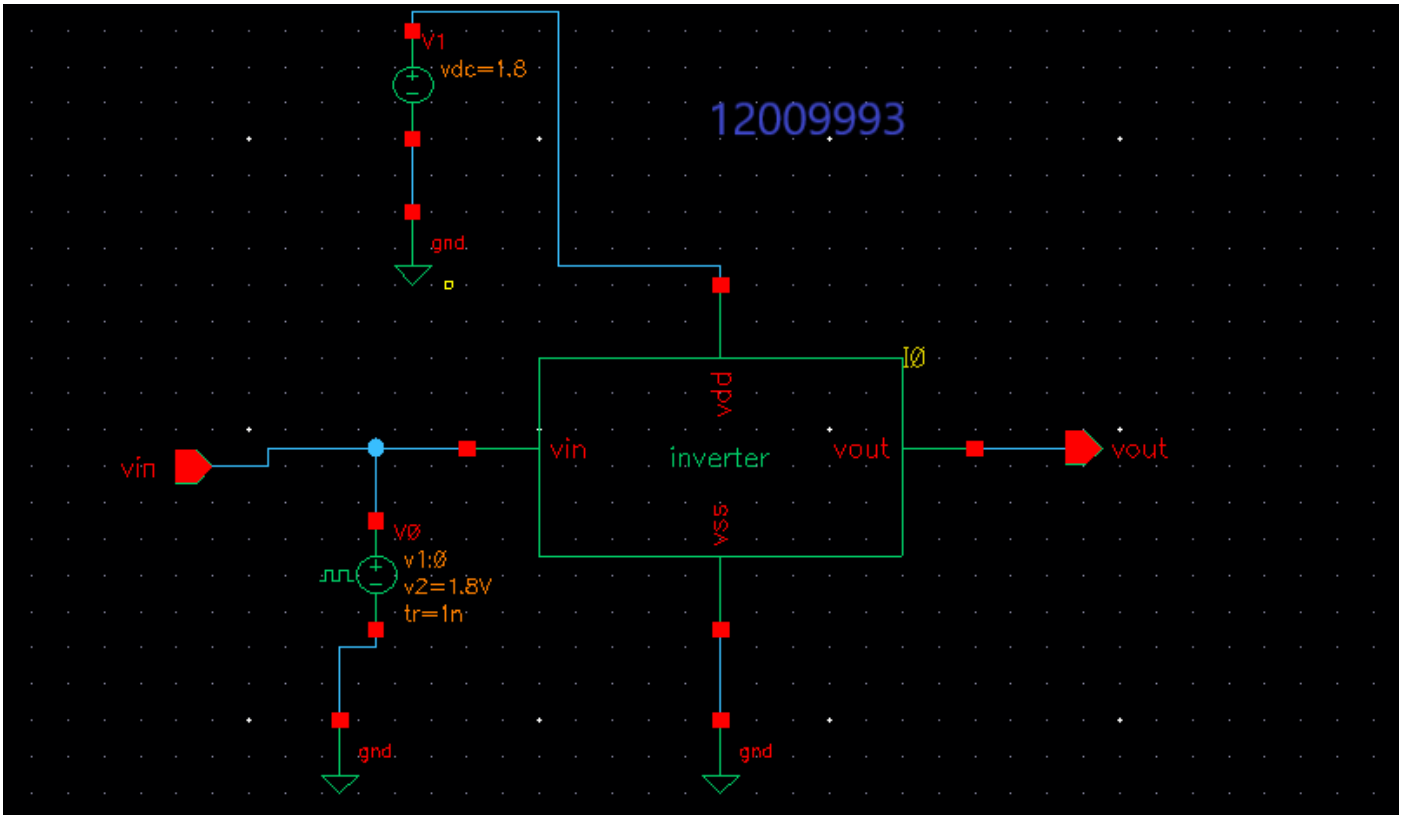


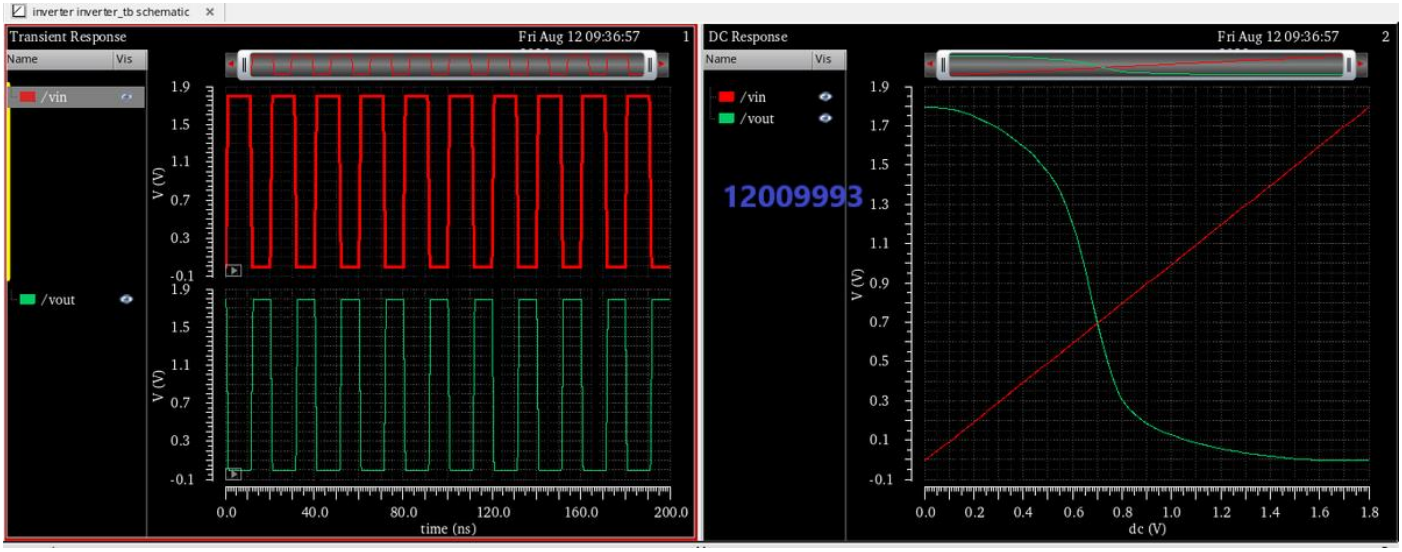
Inverter Static characteristics.

SCHEMATIC FROM CADENCE SOFTWARE:-






V1
vdc=1.8
12009993
gnd.
Ø
vdd
vin
inverter
vout
vout
vin
vss
VØ
v1:Ø
v2=1.8V
tr=1n
gnd.
gnd


inverter inverter_tb schematic
Transient Response
Fri Aug 12 09:36:57
1
Name
Vis
/vin
/vout
V (V)
time (ns)
DC Response
Fri Aug 12 09:36:57
2
12009993
dc (V)

→ Concepts learned :-

- We learned the design of CMOS inverter using the Cadence virtuoso tool.
- P-MOS & N-MOS circuits begin to dominate LSI & VLSI markets in the 1970's & 1980's.
- Use fewer components and are much simple to manufacture than TTL circuits.
- During this era, technology emerged that used for P-MOS & N-MOS transistors in the same circuits
- Complementry N-MOS & CMOS technology.

→ Applications :-

- CMOS inverters are used in different IC's like Microprocessors, Static Ram, Micro Controllers, data Converters, image sensors & Transreceivers.
- These are found in mobile devices, digital Cameras, home Computers, Cellphones, routers, network servers, modems & virtually each other electronic devices that needs logic functions.