VLSI (Stick Diagram)

CMOS NAND gate
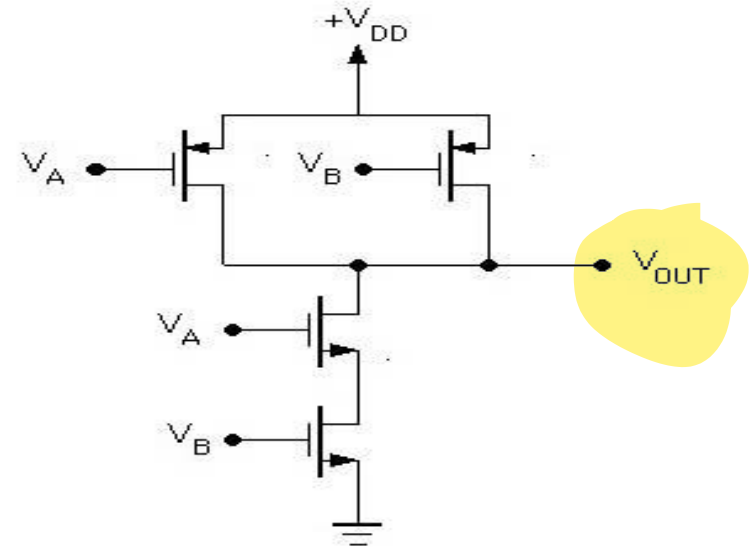
NAND GATE

$$C = \overline{A.B}$$
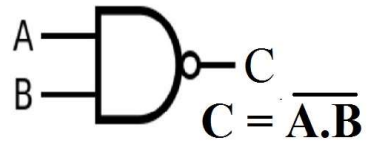
Truth Table

INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

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Va	Vb	Q1	Q2	Q3	Q4	Vout
0	0	ON	ON	OFF	OFF	1
0	1	ON	OFF	OFF	ON	1
1	0	OFF	ON	ON	OFF	1
1	1	OFF	OFF	ON	ON	0

CMOS NOR gate?

NOR GATE

A
B ———⫸o——— C

$$C = \overline{A + B}$$
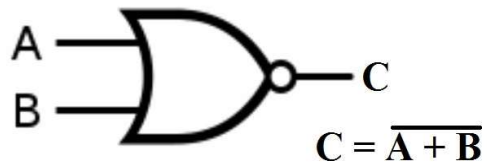
TRUTH TABLE

INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

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A	B	NMOS-V1	NMOS-V2	PMOS-V1	PMOS-V2	Vout
0	0	off	off	on	on	1
0	1	off	on	on	off	0
1	0	on	off	off	on	0
1	1	on	on	off	off	0

CMOS-2 Input NAND & NOR GATE
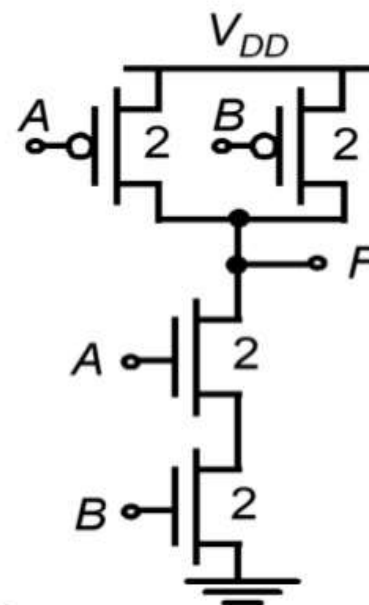
▶ 15
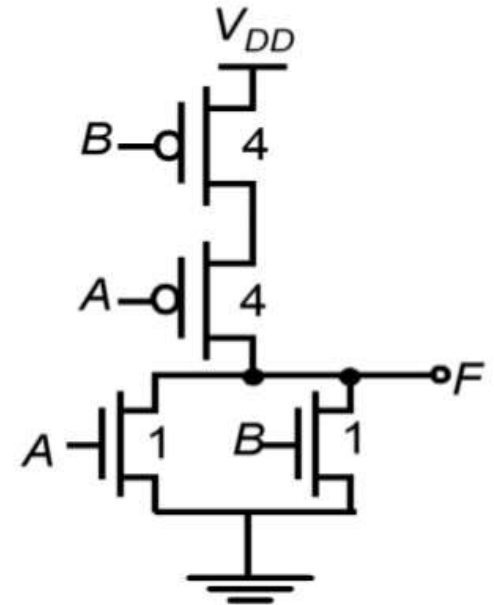
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Behavior of MOS Transistor

PMos & NMos 0~1 sign different
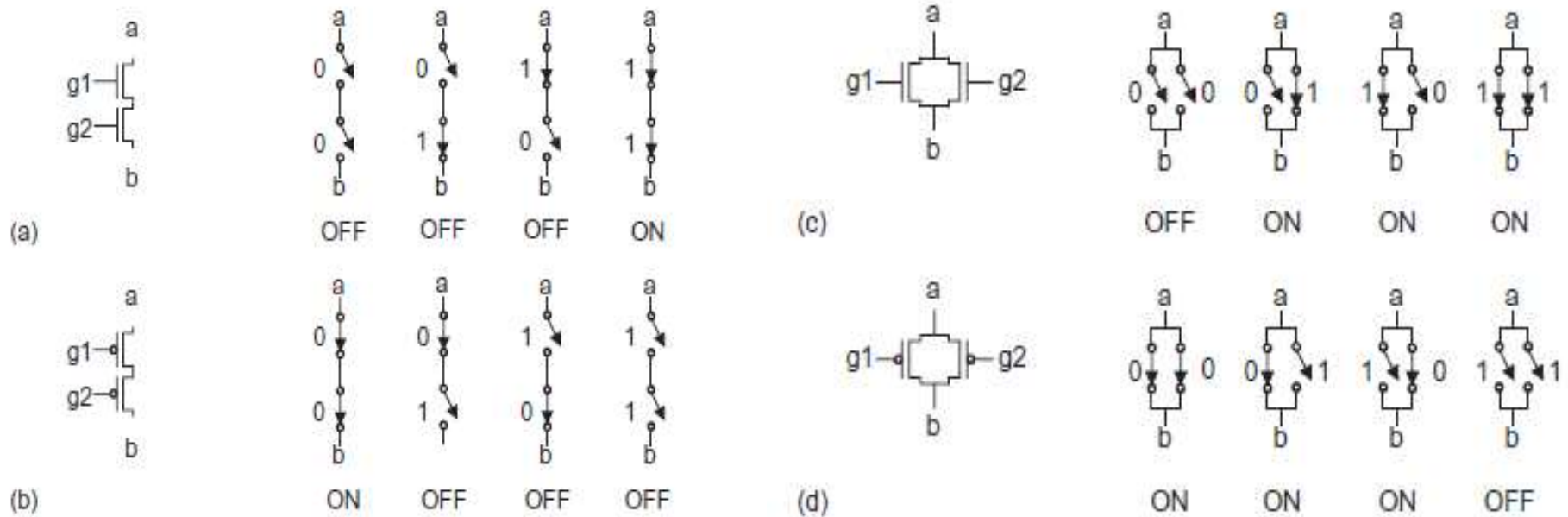
Color Code

Color codes used in stick diagrams:

|		
Metal:	🟦	Blue
Polysilicon:	🟥	Red
Metal contact:	⬛	Black
P-type Doping:	🟨	Yellow
N-type Doping:	🟩	Green

Stick Diagram

Steps followed to draw a Stick Diagram

- Draw the Schematic Diagram.
- Understand the nature devices used (E.g PMOS or NMOS).
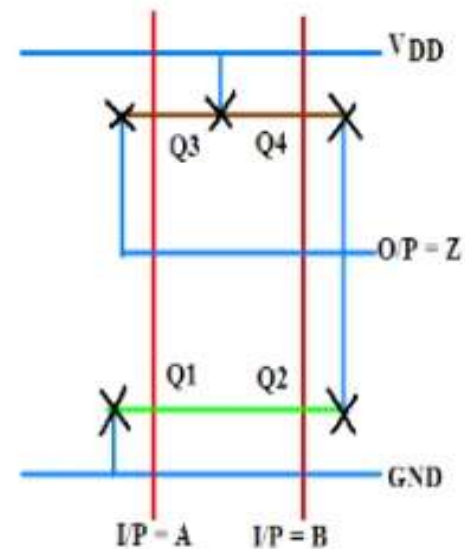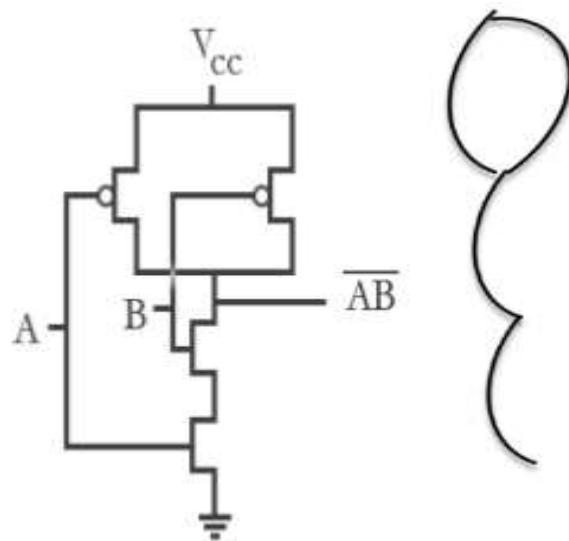- Use the Exact Color Code.

Stick Diagram

- **Stick diagrams** are a means of capturing topography and layer information using simple **diagrams**.

- **Stick diagrams** convey layer information through color codes (or monochrome encoding).
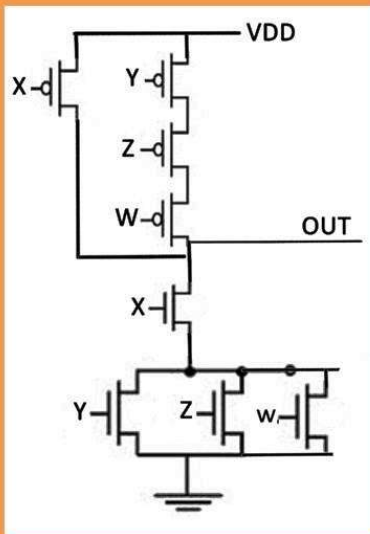

CMOS Inverter
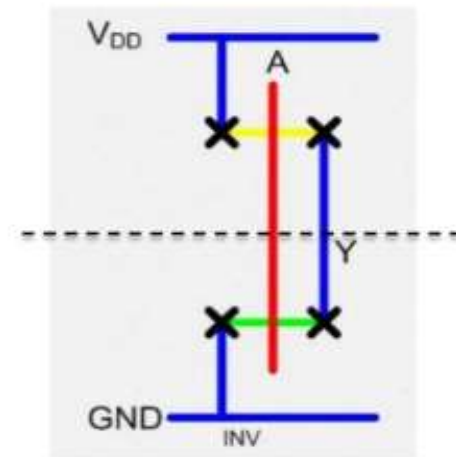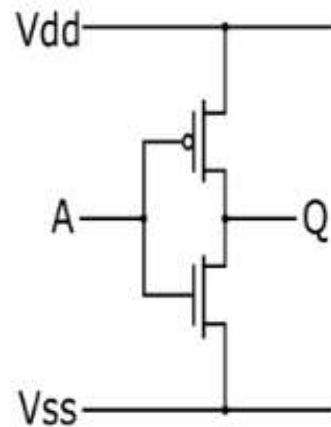
Stick Diagram

**Stick Diagram of CMOS NAND Gate- Euler's Path**

Expressions F=X(Y+Z)+WX
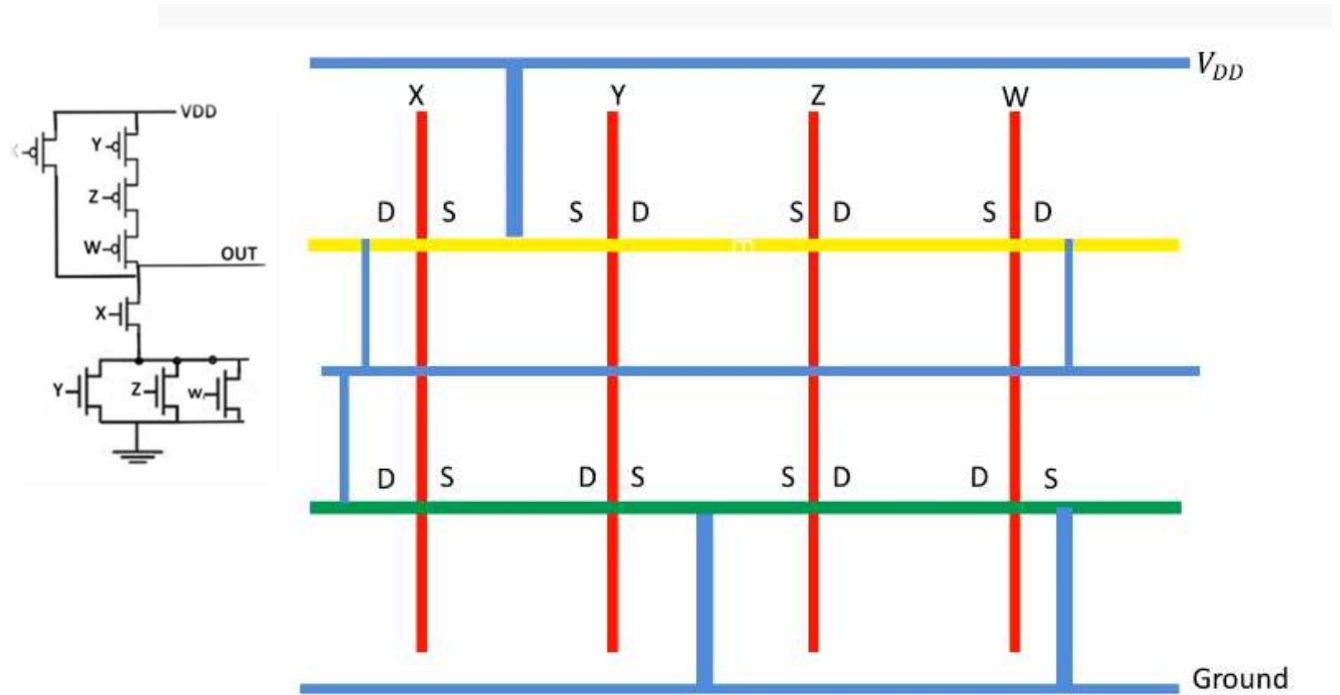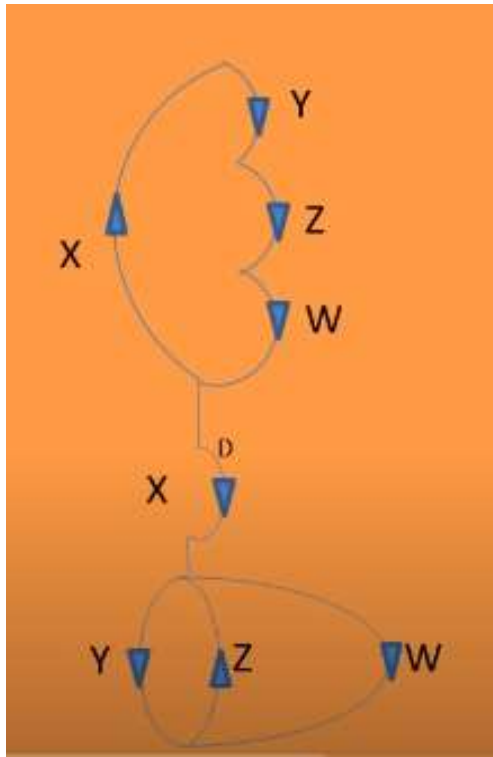
Final Schematic for F= X(Y+Z)+WX

Summary of Steps to be followed:

1. Always start from the NMOS section.(i.e Bottom to top approach)

2. Draw the transistors as per the convention Which means "•" or "+" convention as per the transistor.

3. Label each transistor with the variables mentioned in the function.

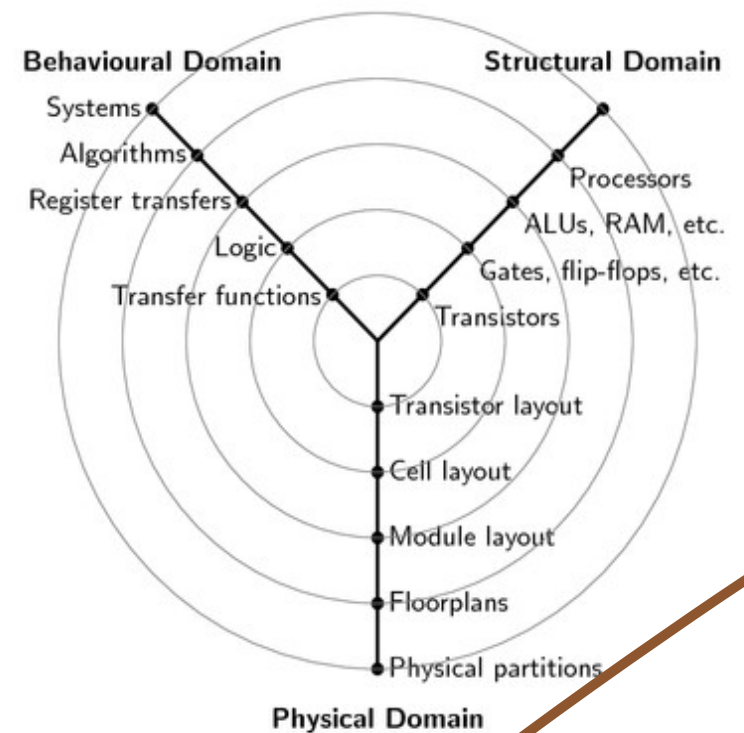4. Label the Power Supply V_{DD} and ground connection
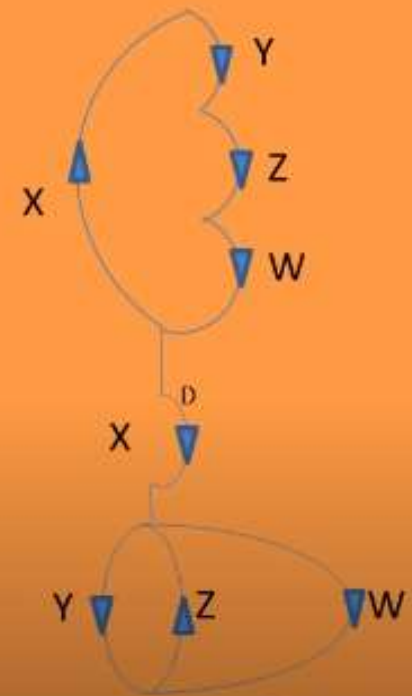
Stick Diagram

Gajski-Kuhn Y-chart

- The Gajski-Kuhn Y-chart is a model which captures the considerations in designing semiconductor devices.

- The three domains of the Gajski-Kuhn Y-chart are on radial axes.

VLSI Design Flow

- Specifications comes first, they describe abstractly, the functionality, interface, and the architecture of the digital IC circuit to be designed.

- Behavioral description is then created to analyze the design in terms of functionality, performance, compliance to given standards, and other specifications.