Stick Diagrams
Objectives:
• To know what is meant by stick diagram.
• To understand the capabilities and limitations of stick diagram.
• To learn how to draw stick diagrams for a given MOS circuit.

Outcome:
• At the end of this module the students will be able draw the stick diagram for simple MOS circuits.
Stick Diagrams
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Stick Diagrams

- VLSI design aims to translate circuit concepts onto silicon.
- Stick diagrams are a means of capturing topography and layer information using simple diagrams.
- Stick diagrams convey layer information through colour codes (or monochrome encoding).
- Acts as an interface between symbolic circuit and the actual layout.
Stick Diagrams

- Does show all components/vias.
- It shows relative placement of components.
- Goes one step closer to the layout.
- Helps plan the layout and routing.

*A stick diagram is a cartoon of a layout.*
Stick Diagrams

- Does *not* show
  - Exact placement of components
  - Transistor sizes
  - Wire lengths, wire widths, tub boundaries.
  - Any other low level details such as parasitics.
Stick Diagrams – Notations

Similarly for contacts, via, tub etc..

Can also draw in shades of gray/line style.
Stick Diagrams – Some rules

Rule 1.
When two or more ‘sticks’ of the same type cross or touch each other that represents electrical contact.
Rule 2.

When two or more ‘sticks’ of different type cross or touch each other there is no electrical contact. (If electrical contact is needed we have to show the connection explicitly).
Rule 3.

When a poly crosses diffusion it represents a transistor.

Note: If a contact is shown then it is not a transistor.
Rule 4.

In CMOS a demarcation line is drawn to avoid touching of p-diff with n-diff. All pMOS must lie on one side of the line and all nMOS will have to be on the other side.
How to draw Stick Diagrams
Example: $f = (A \cdot B) + C$
Stick Diagrams

Home work:

1. Draw the stick diagram for two input CMOS NAND gate.
2. Draw the stick diagram for two input NAND gate using NMOS Logic.
3. Draw the stick diagram for 2:1 MUX using
   a) Pass transistors
   b) Transmission gates.

Drawing stick diagram is truly Fun!! Enjoy it.