



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **19ECB302–VLSI DESIGN**

III YEAR/ V SEMESTER

UNIT 1 –MOS TRANSISTOR PRINCIPLE

TOPIC 3 –TWIN-TUB PROCESS



## OUTLINE



- INTRODUCTION
- SIX MASKS
- TWIN TUB PROCESS: N-WELL / P-WELL
- TWIN TUB PROCESS: POLYSILICON
- ACTIVITY
- TWIN TUB PROCESS: N+ / P+ DIFFUSION
- TWIN TUB PROCESS: CONTACT / VIA / METAL
- TWIN TUB PROCESS: CROSS SECTION VIEW
- ASSESSMENT
- SUMMARY



# INTRODUCTION



n-well: The pMOS transistors are placed in the n-well and the nMOS transistors are created on the substrate

p-well: The nMOS transistors are placed in the p-well and the pMOS transistors are created on the substrate

n-well + p-well =Twin tub Process



## SIX MASKS

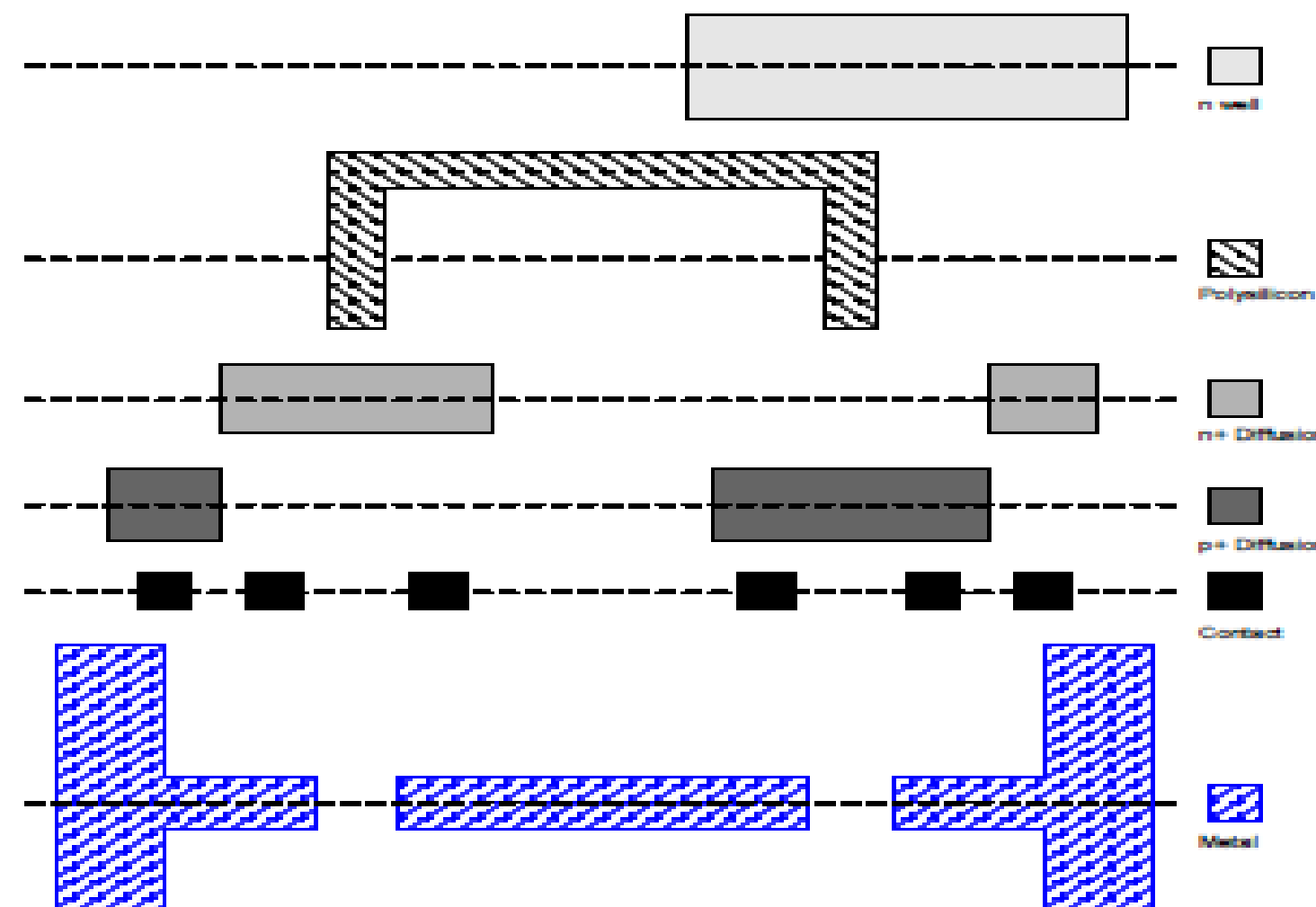


•Twin-tub CMOS technology provides the basis for *separate optimization* of the **p-type** and **n-type** transistors.

•One can optimize independently for *threshold voltage*, *body effect*, and the *gain* associated with n- and p-devices

### Six masks

- n/p-well
- Polysilicon
- n+ /p+ diffusion
- p+ /n+ diffusion
- Contact
- Metal

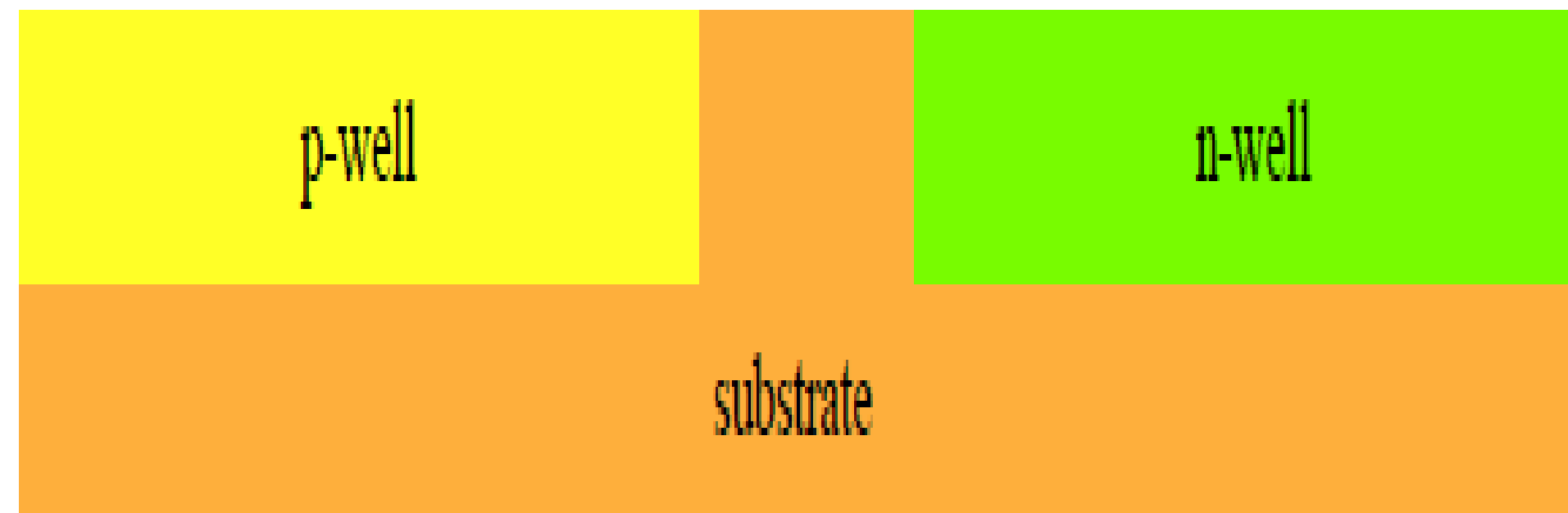




## TWIN TUB PROCESS: N-WELL / P-WELL



First place wells to provide properly-doped substrate for n-type, p-type transistors:

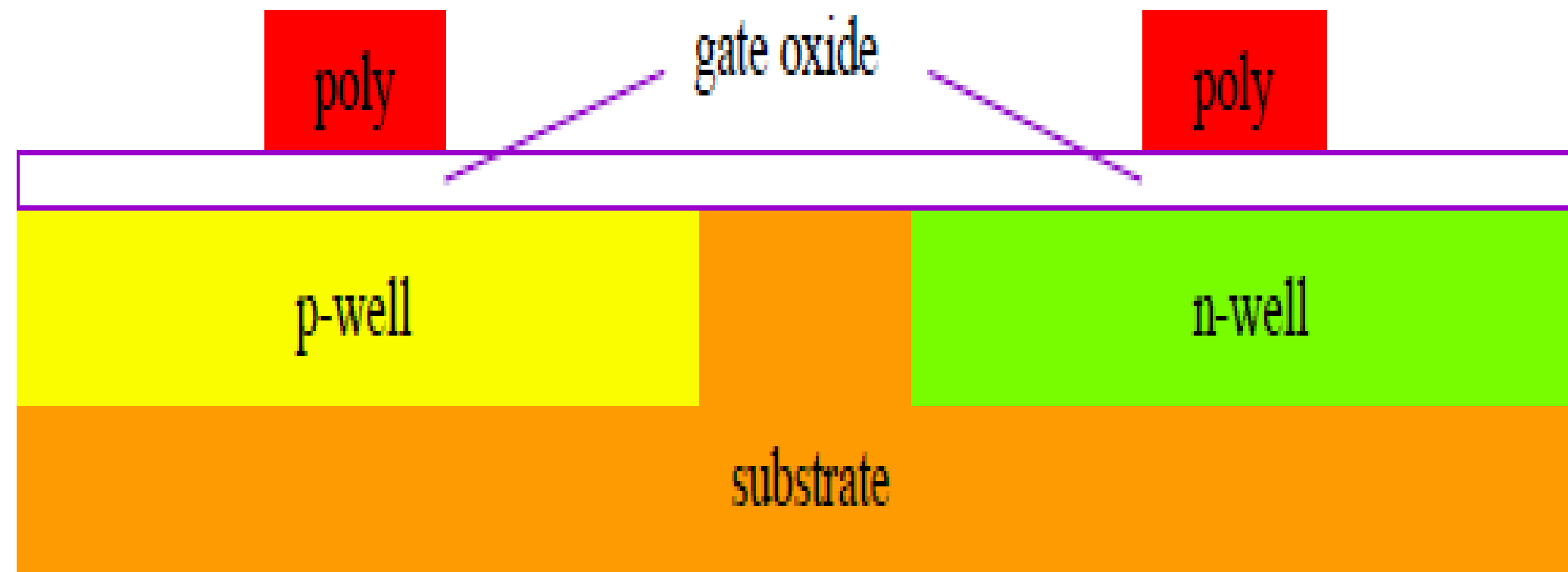




# TWIN TUB PROCESS: POLYSILICON



Pattern polysilicon before diffusion regions:





# ACTIVITY-BRAIN TEASERS



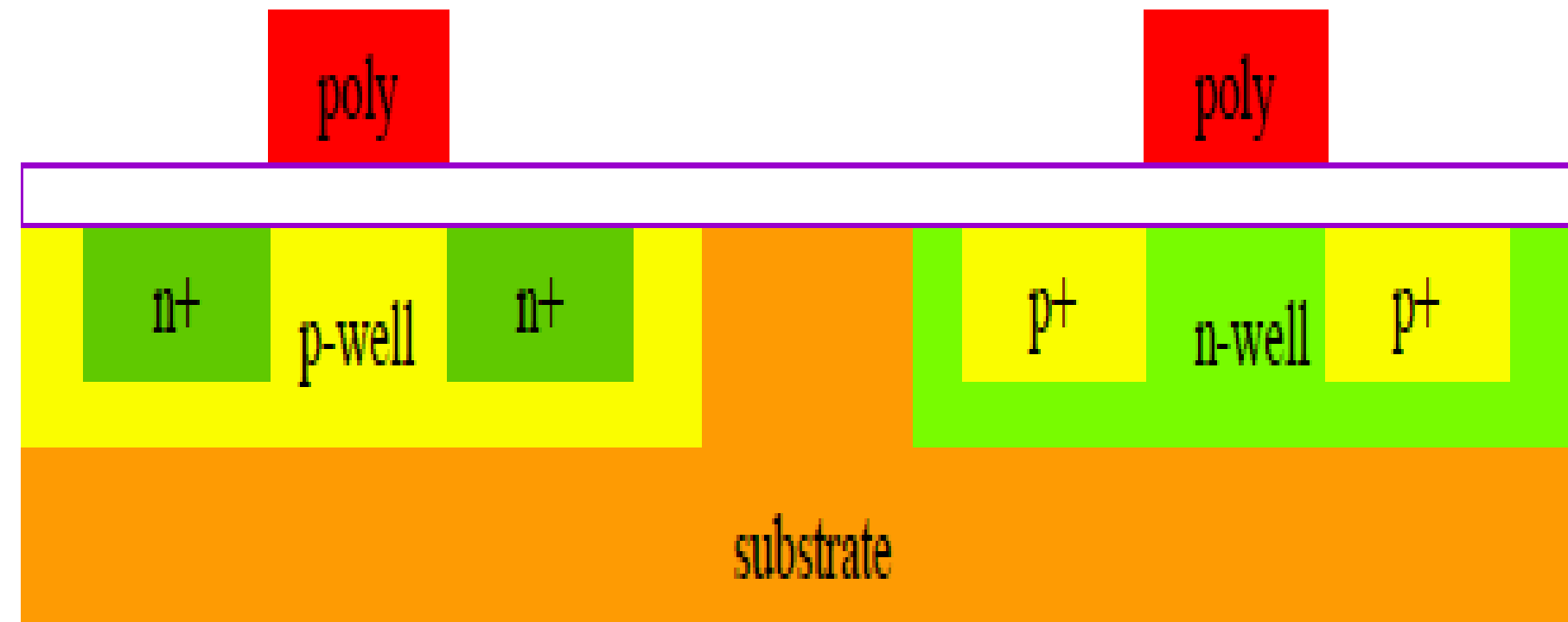
51	11	61
64	30	32
35	?	43



# TWIN TUB PROCESS: N+ / P+ DIFFUSION



Add diffusions, performing self-masking:



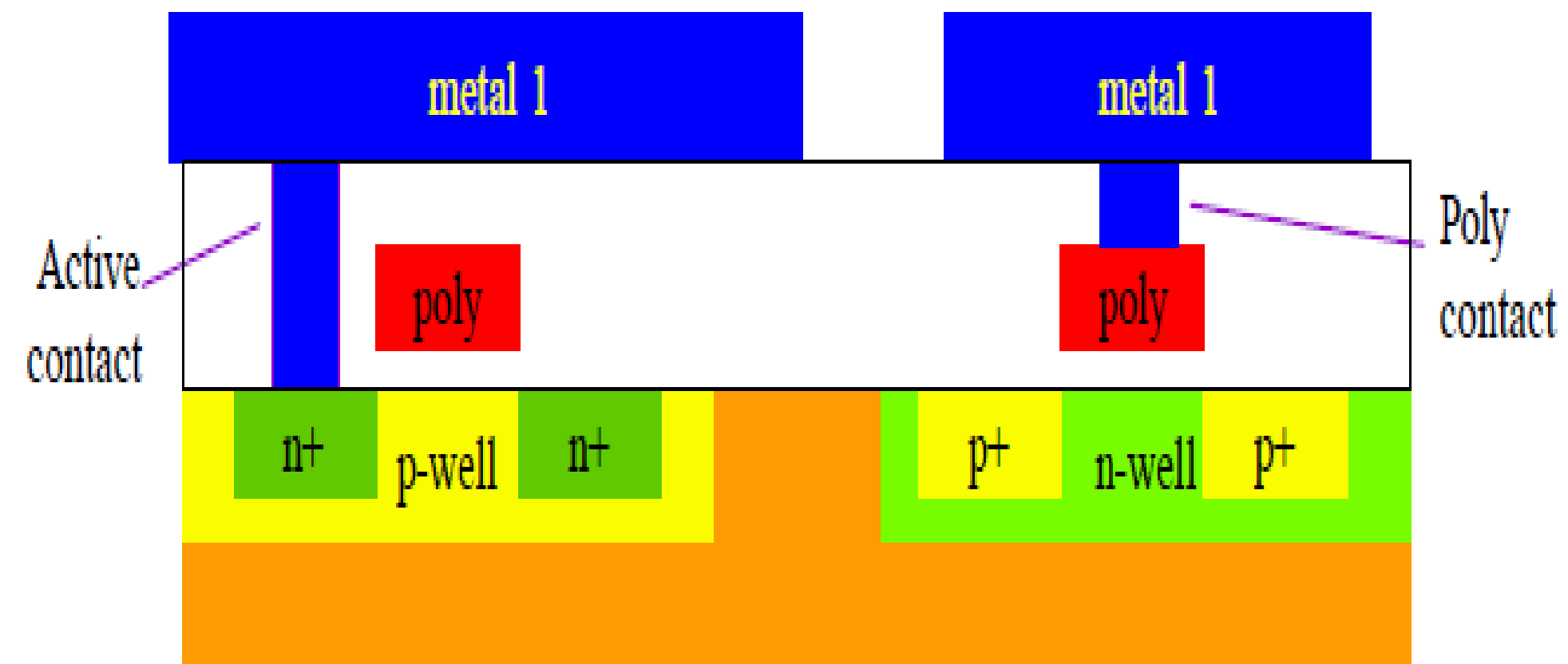




# TWIN TUB PROCESS: CONTACT / VIA / METAL

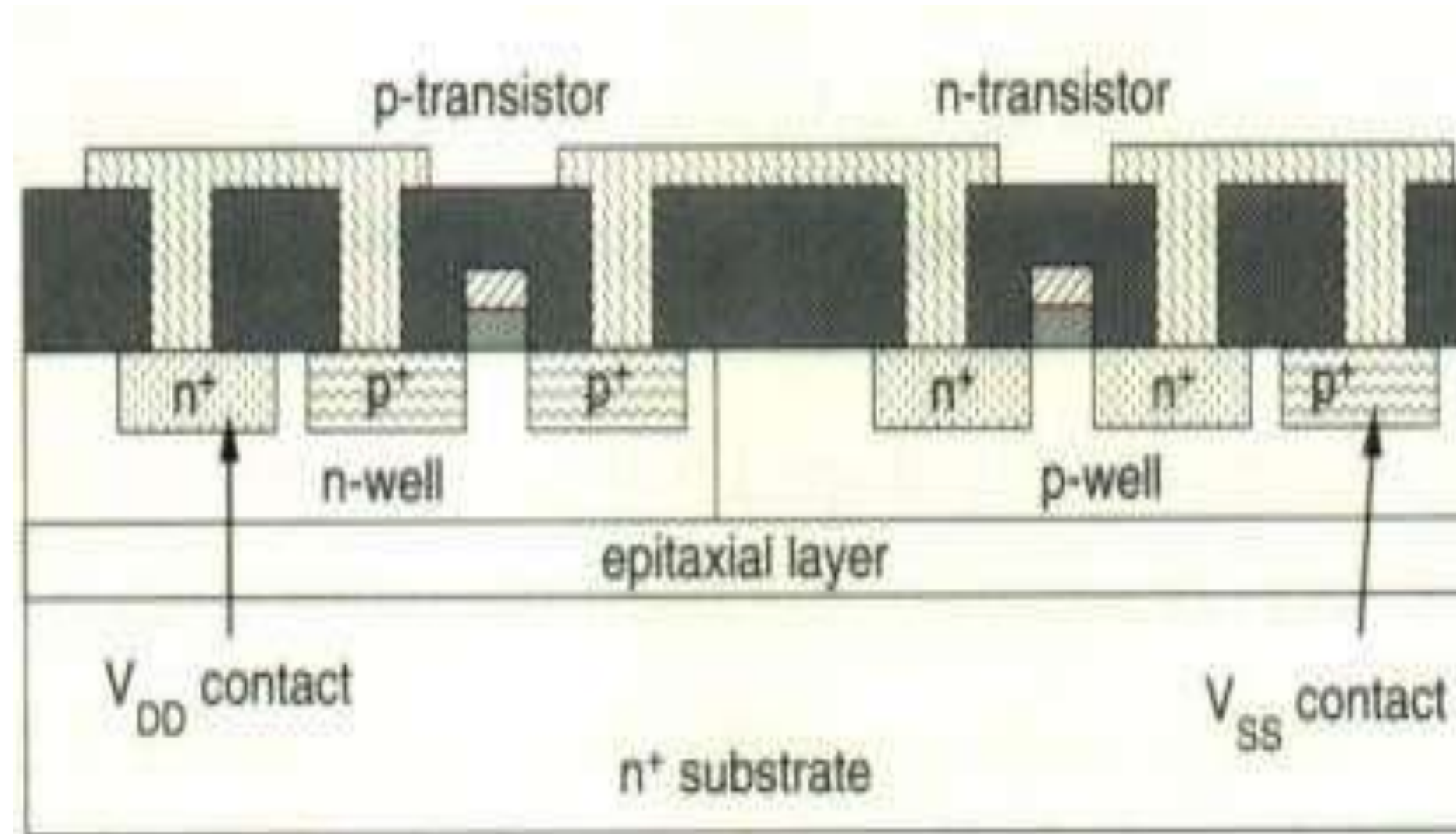


Start adding metal layers:





# CROSS SECTIONAL VIEW OF TWIN TUB PROCESS





# ASSESSMENT



1. List out the steps involved in Twin tub process
2. List out the six masking levels.
3. Draw the Cross sectional view of Twin tub process



## SUMMARY & THANK YOU