

**VSD**  
OPEN TO INNOVATE!

**Power Aware CTS**

**Delay Table for CBUF '1'**

Input slew	Output Load	Delay (ps)
20ps	x1 x2 x3 x4 x5 x6	10F 30F 50F 70F 90F 110F
40ps	x7 x8 x9 x10 x11 x12	
60ps	x13 x14 x15 x16 x17 x18	
80ps	x19 x20 x21 x22 x23 x24	

**Delay Table for CBUF '2'**

Input slew	Output Load	Delay (ps)
20ps	y1 y2 y3 y4 y5 y6	10F 30F 50F 70F 90F 110F
40ps	y7 y8 y9 y10 y11 y12	
60ps	y13 y14 y15 y16 y17 y18	
80ps	y19 y20 y21 y22 y23 y24	

**Observations**

- 2 levels of buffering
- At every level, each node driving same load
- Identical buffer at same level

Let us assume  $C_1 = C_2 = C_3 = C_4 = 25\text{fF}$

How about creating a buffer tree at node 'A'

Let us assume  $C_{buf1} = C_{buf2} = 30\text{fF}$

Therefore, total Cap at node 'A'  $\Rightarrow 60\text{fF}$

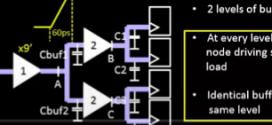
Therefore, total Cap at node 'B'  $\Rightarrow 50\text{fF}$

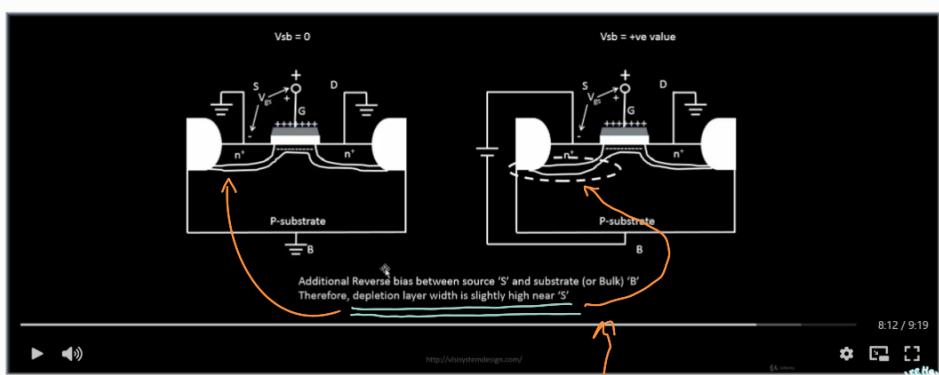
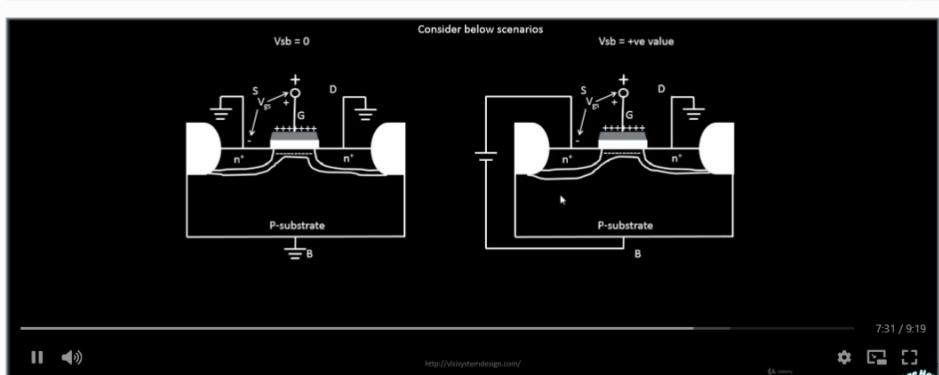
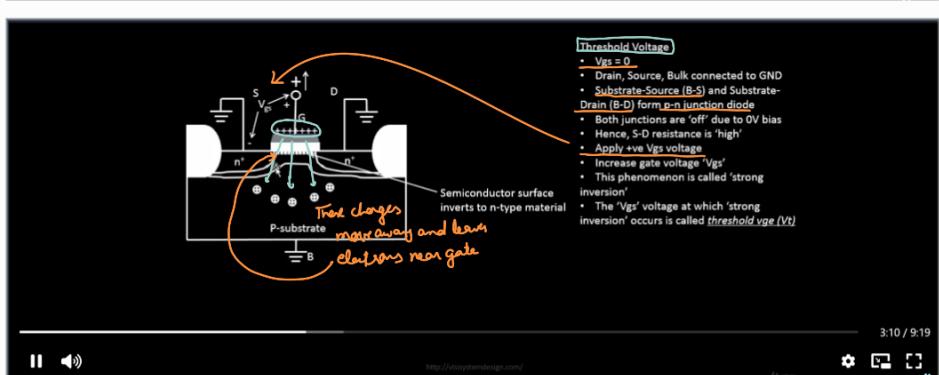
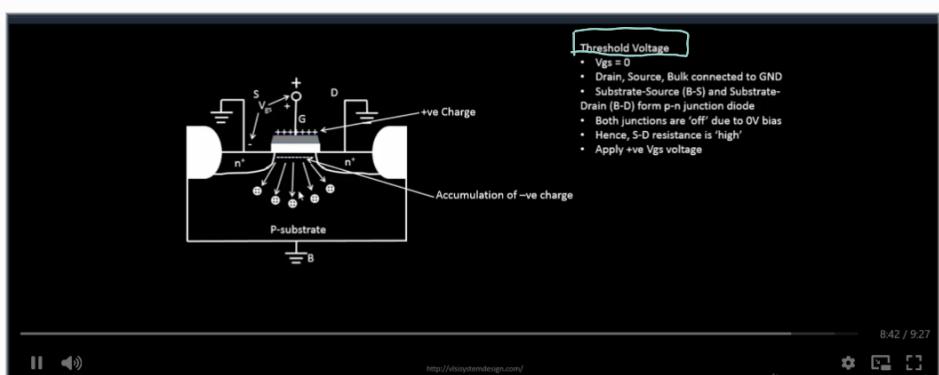
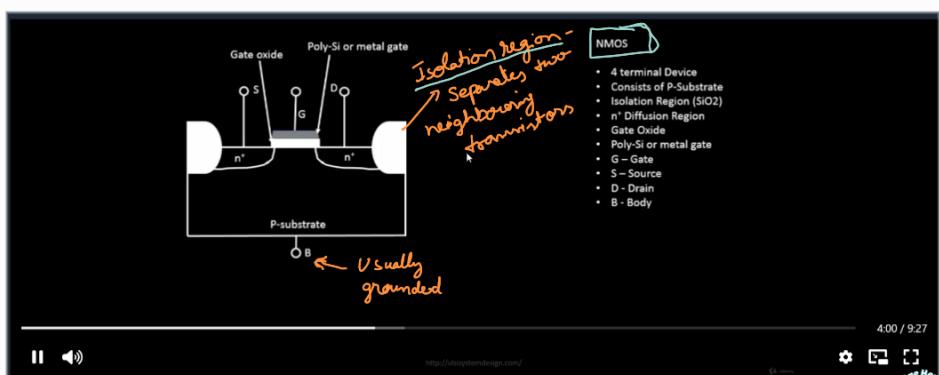
Therefore, total Cap at node 'C'  $\Rightarrow 50\text{fF}$

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The  $V_{GS}$  voltage at which strong inversion happens occurs is called threshold voltage  $V_t$

When we increase  $V_{GS}$  beyond  $V_t$ , there is no change in depletion layer width, however,

- Continuous n-channel is formed whose conductivity is modulated by  $V_{GS}$

- When we apply +ve  $V_{SB}$ , few charges from channel are pulled towards source's'. This leads to the  $V_{GS}$  at which inversion happens to increase

