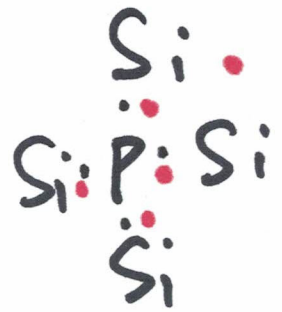
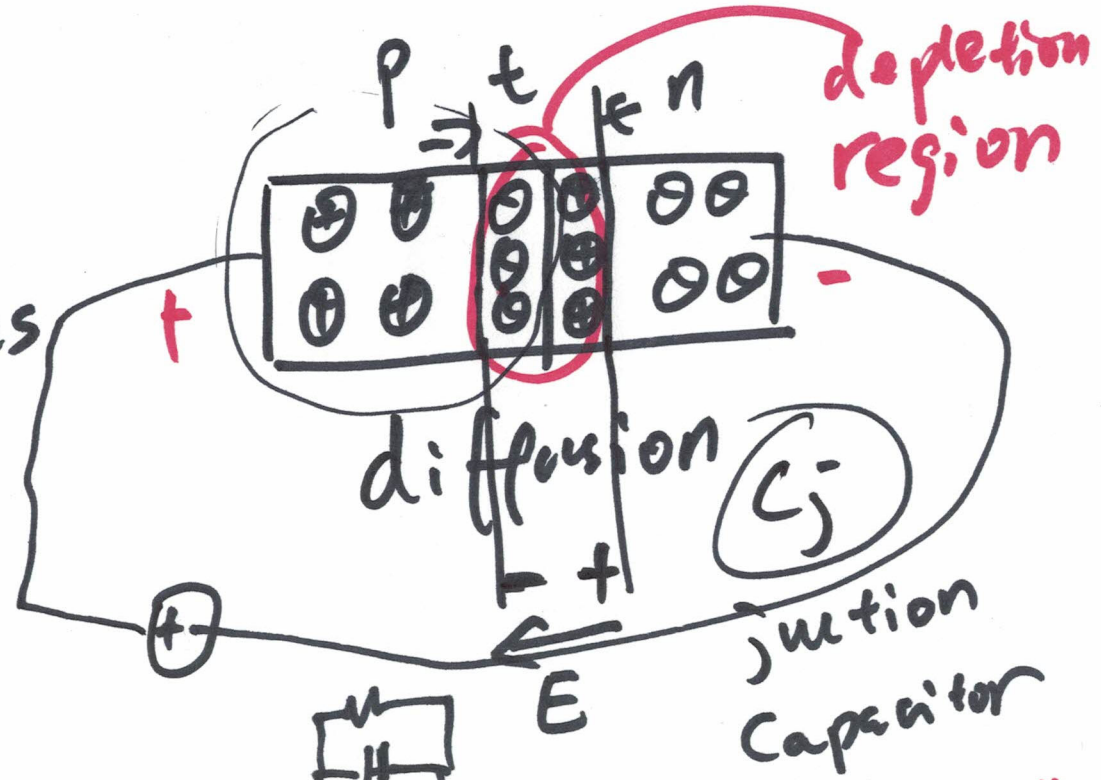
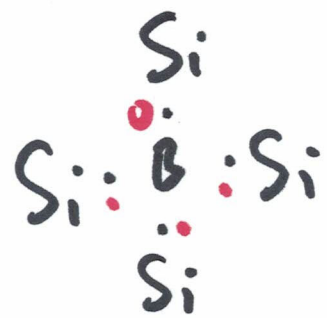


DRL / LVS mask

N-type phosphorus



P-type

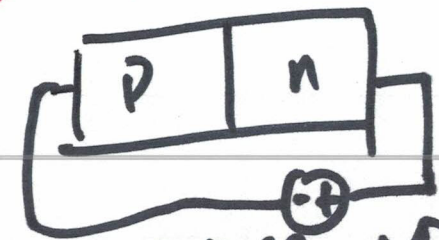


Boron



$$C = \epsilon \frac{A}{t} \uparrow$$

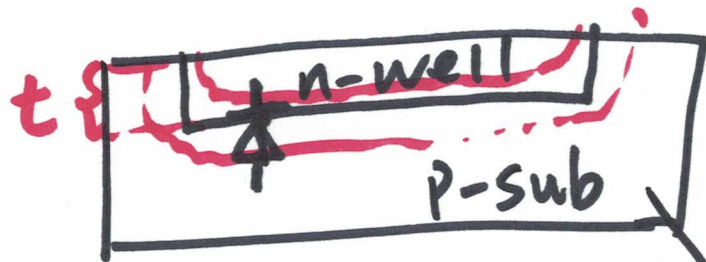
$t \downarrow C_j$



reverse Biased $t \uparrow C_j \downarrow$

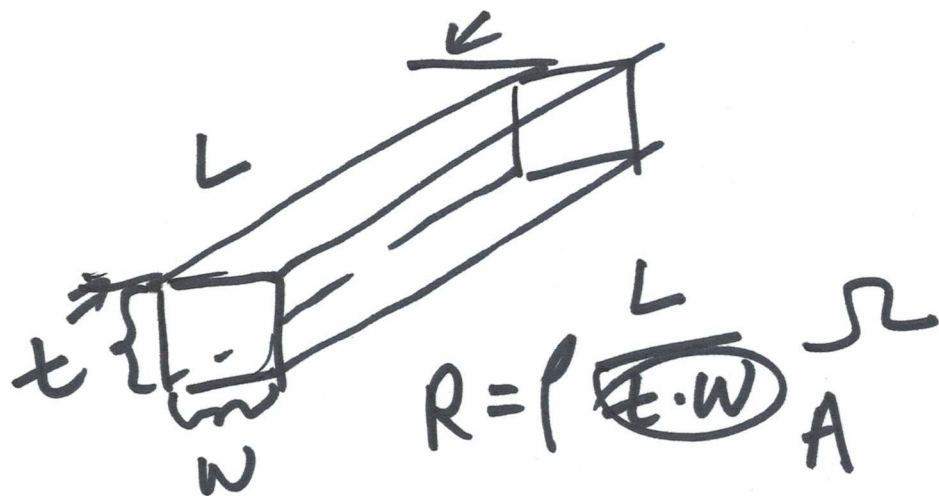
Forward Biased

side view

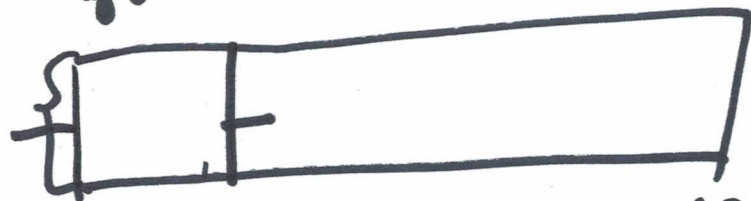


p-type substrate

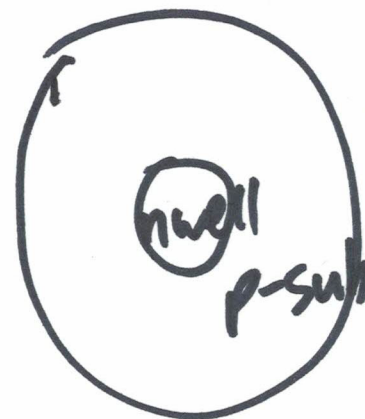
Body



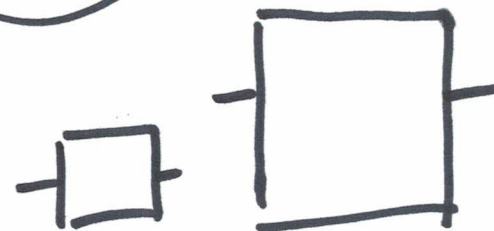
800 Ω



top view

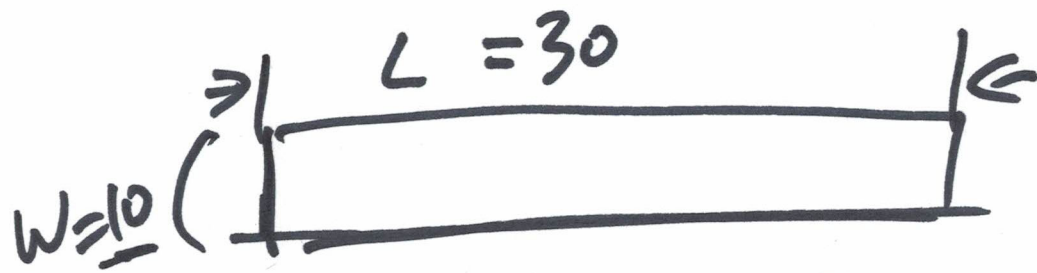


top-view



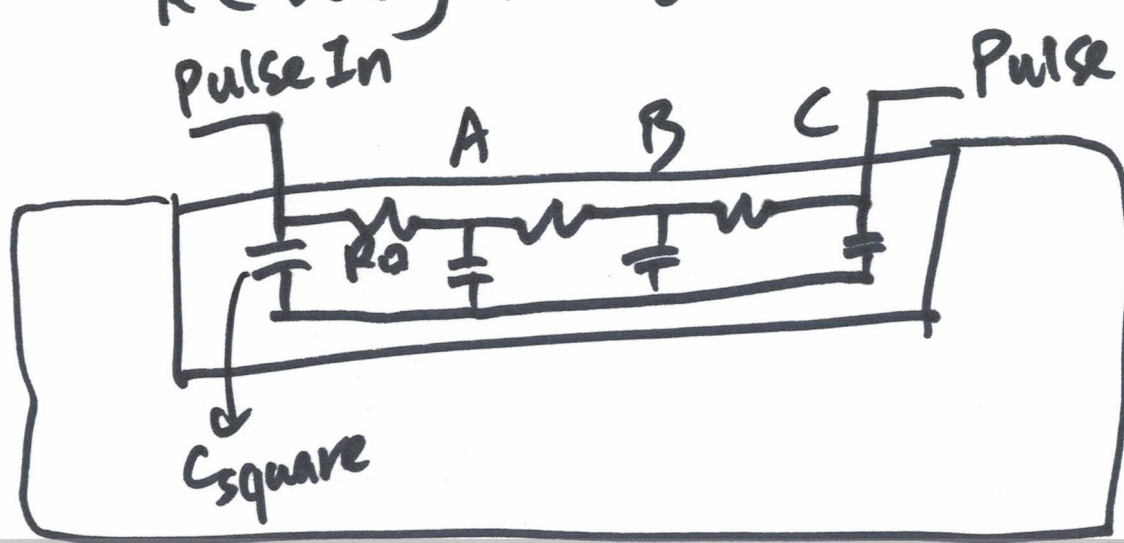
Sheet resistance = 800 Ω / $\square$

(2)



$$R = R_{\square} \cdot \frac{L}{W} = 800 \times \frac{30}{10} = 2.4K$$

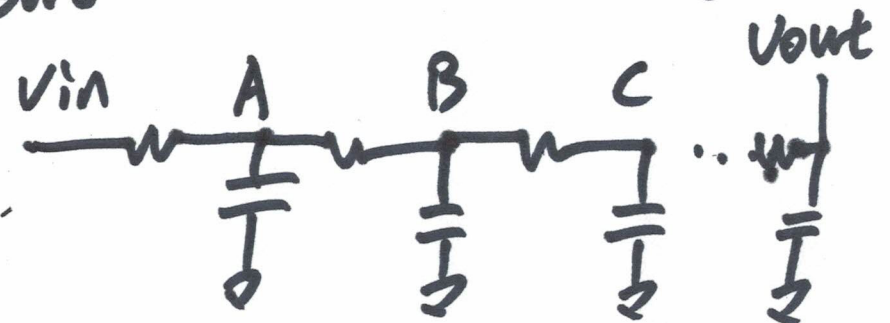
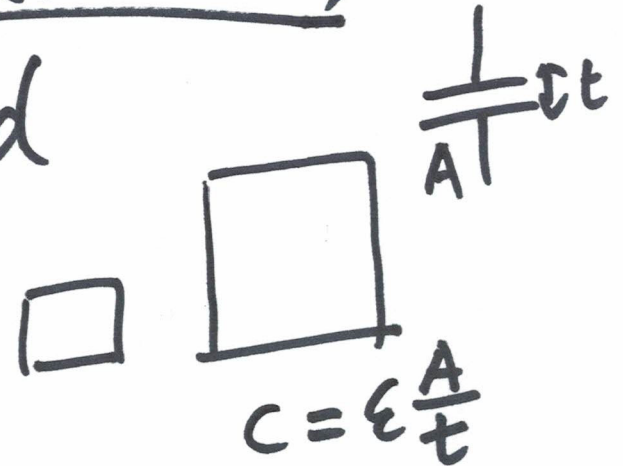
RC Delay through an N-well



$C_{\square}$ 500nm
 λ rule 300nm

2λ (minimum)

yield



$$\begin{aligned} t_{dA} &= 0.7 R_{\text{square}} \cdot C_{\text{square}} \\ t_{dB} &= 0.72 R_{\text{square}} \cdot C_{\text{square}} \\ t_{dC} &= 0.7 \cdot 3 \cdot R_{\text{square}} \cdot C_{\text{square}} \\ t_{d\text{out}} &= 0.7 \cdot k \cdot R_{\text{square}} \cdot C_{\text{square}} \end{aligned}$$

(3)

$$\begin{aligned}
 \text{overall } t_d &= t_{d1} + t_{d2} + t_{d3} + \dots + t_{dL} \\
 &= 0.7 R_{\text{square}} C_{\text{square}} (1 + 2 + 3 + \dots + L) \\
 &= 0.7 R_{\text{square}} C_{\text{square}} \frac{L \cdot (1+L)}{2} \quad (L: \text{the number of squares}) \\
 \text{If } L \text{ is large } L &\approx L+1 \\
 &= 0.7 R_{\text{square}} \cdot C_{\text{square}} \frac{L^2}{2}
 \end{aligned}$$

$$= 0.35 R_{\text{square}} \cdot C_{\text{square}} \cdot L^2$$

Example:

$W = 10$, $L = 500$ $R = 250 \text{ k}\Omega$

10×10 Capacitor is 5 fF. t_d ?

$$\begin{aligned}
 R_0 &= \frac{250 \text{ k}\Omega}{500/10} \\
 &= 5 \text{ k}\Omega
 \end{aligned}$$

$$\begin{aligned}
 t_d &= 0.35 \cdot 5000 \cdot 5 \text{ fF} \cdot 10^{-15} \cdot (50)^2 \cdot 5 \\
 &= 22 \text{ ns} \quad (+)
 \end{aligned}$$