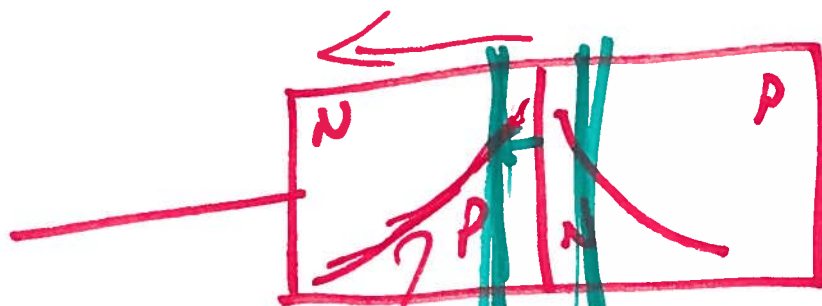


EE 421 / ECG 621

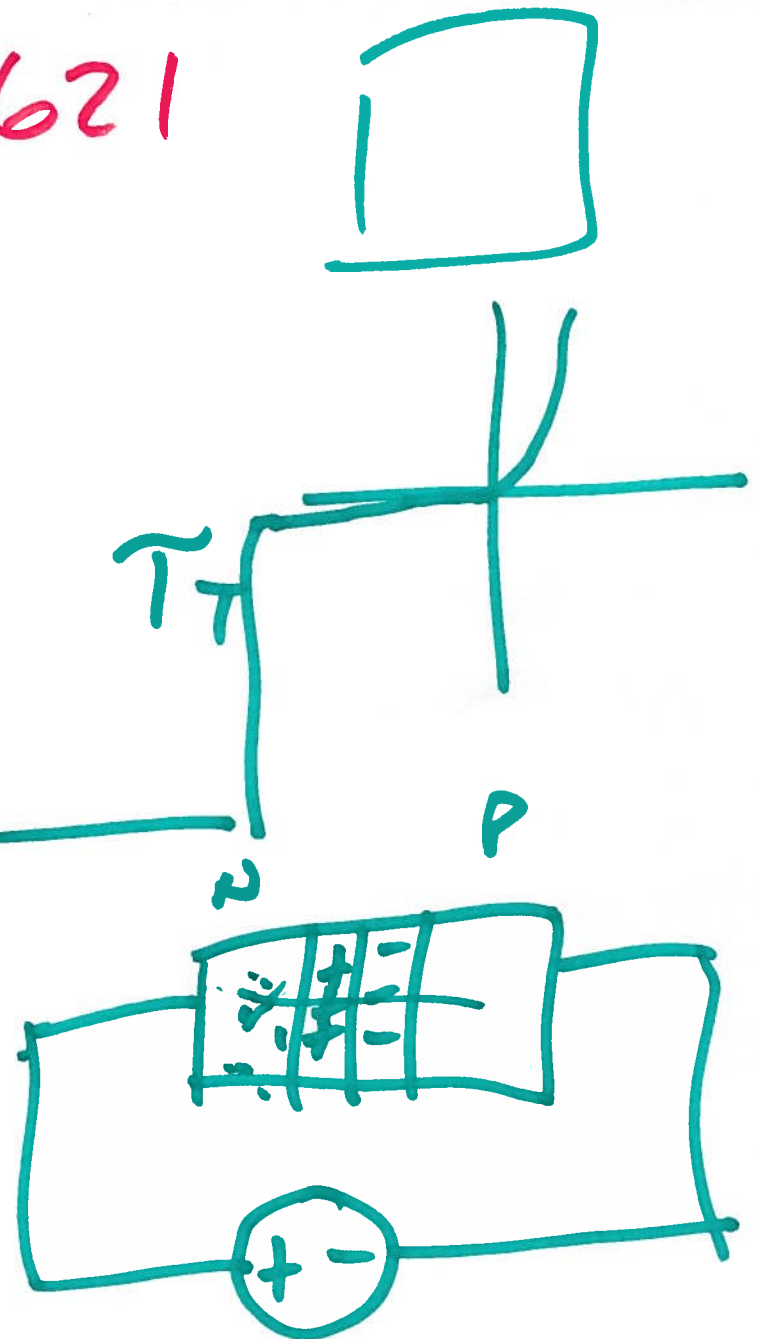
Lecture 4

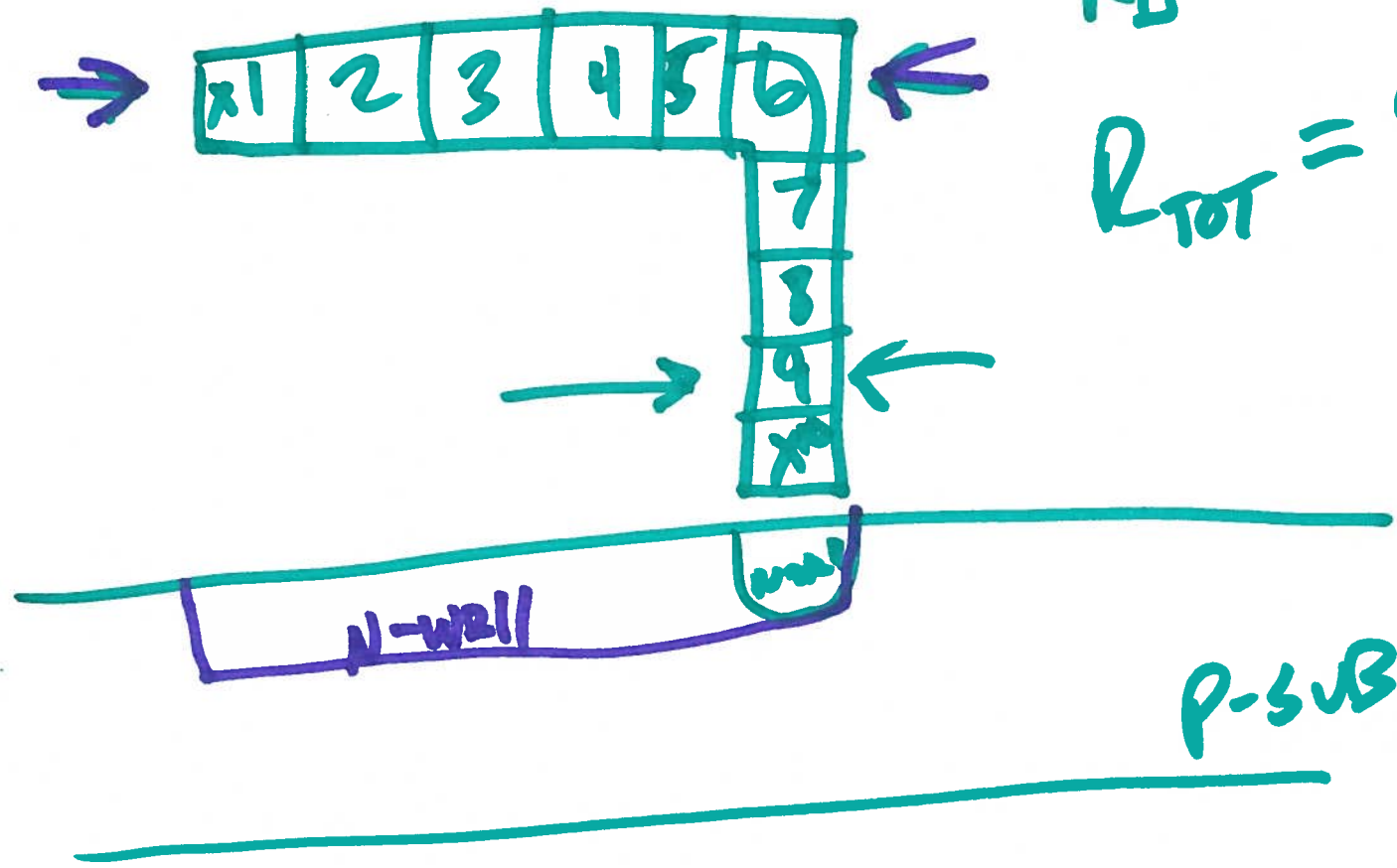
9/12/2016



carrier  
injection

$T_v$



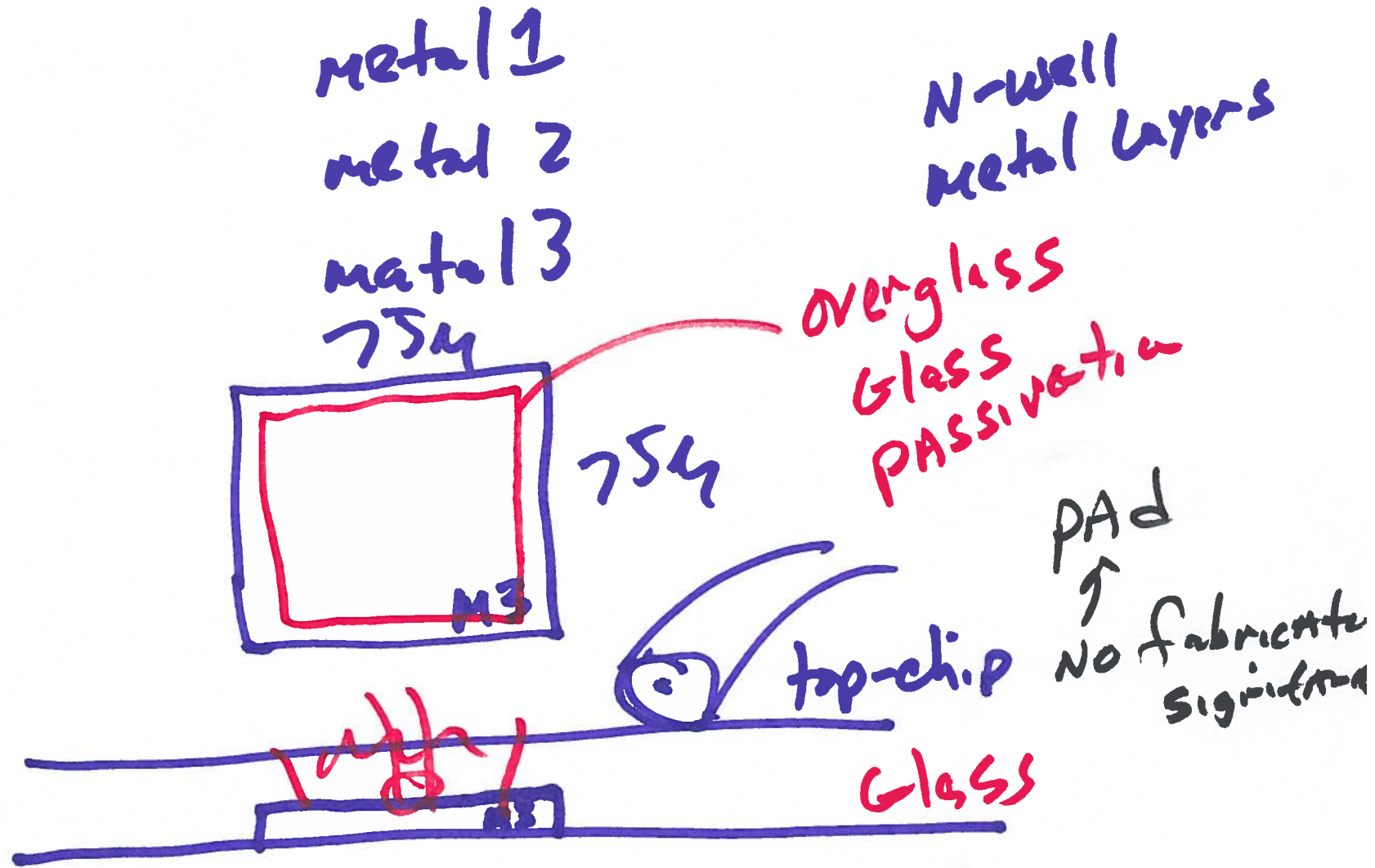


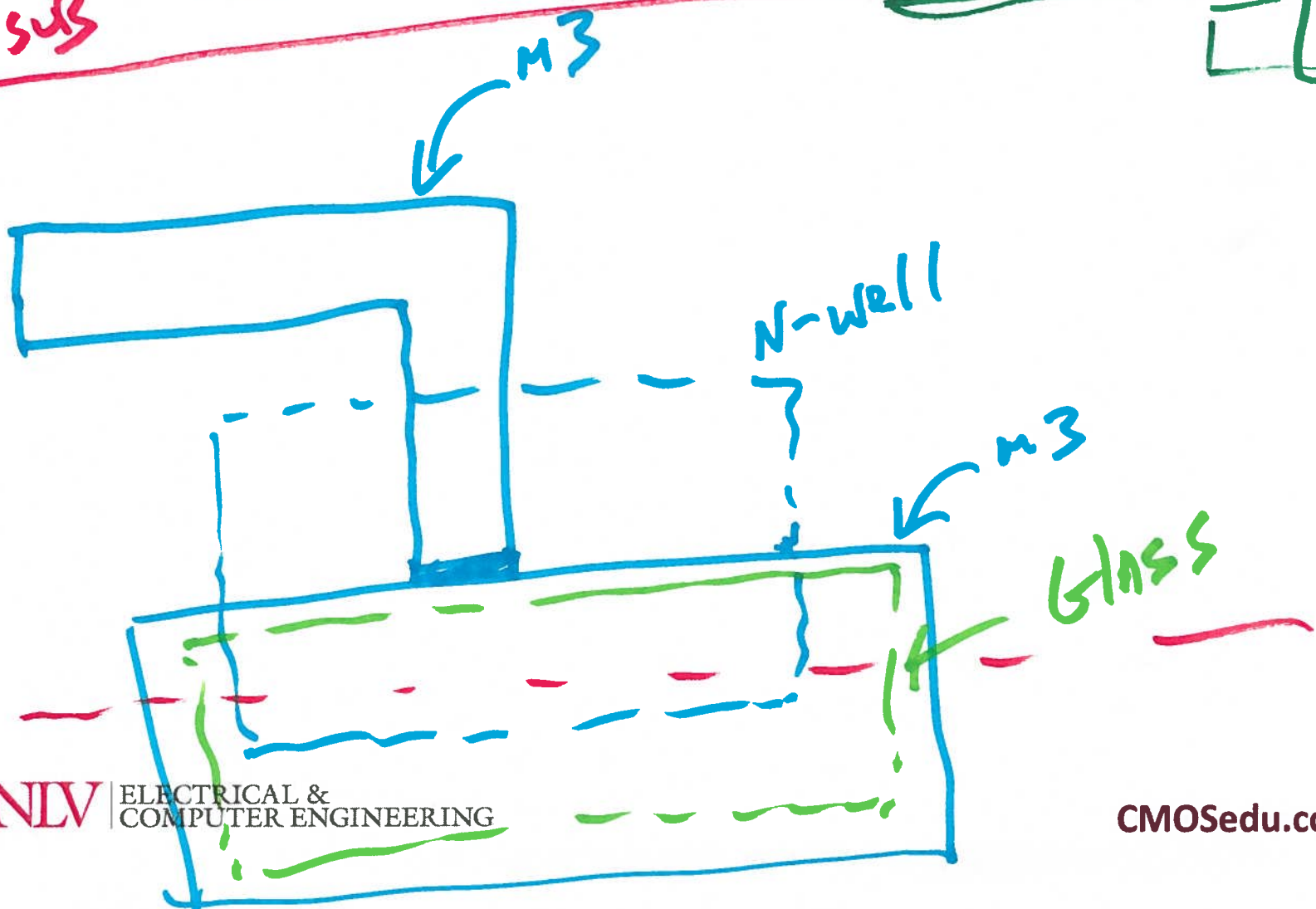
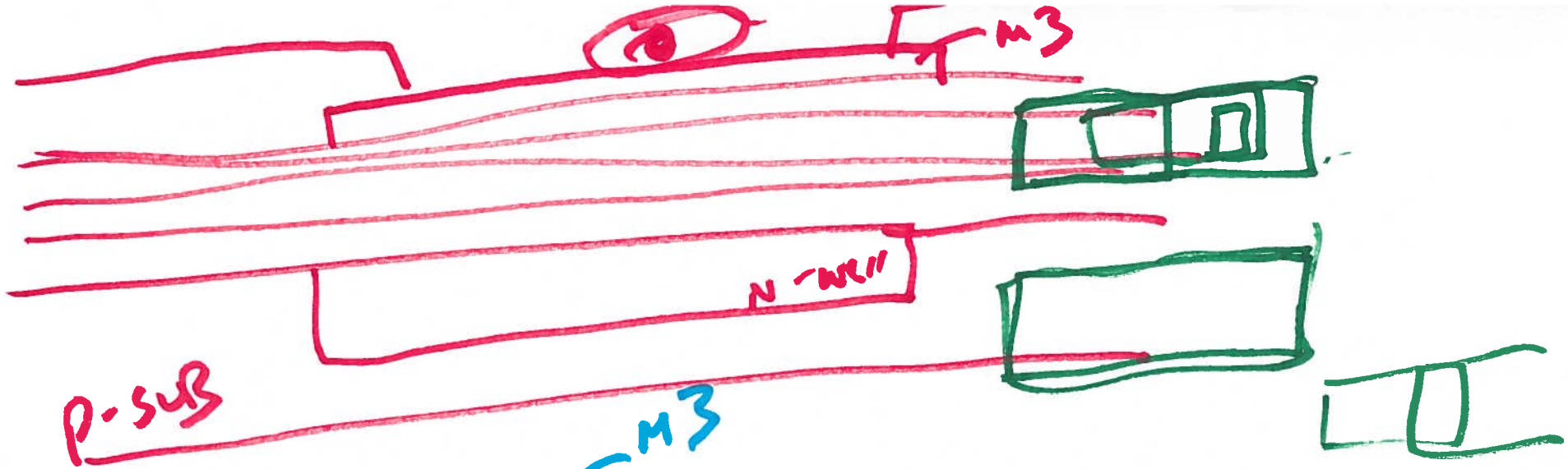
$$R_D = 1k\Omega$$

$$R_{TOT} = 9.6k$$

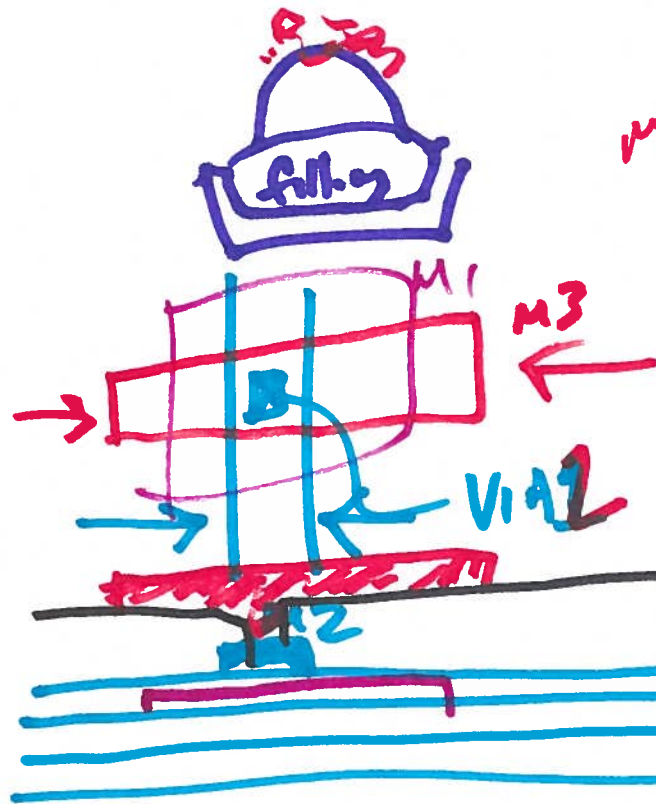
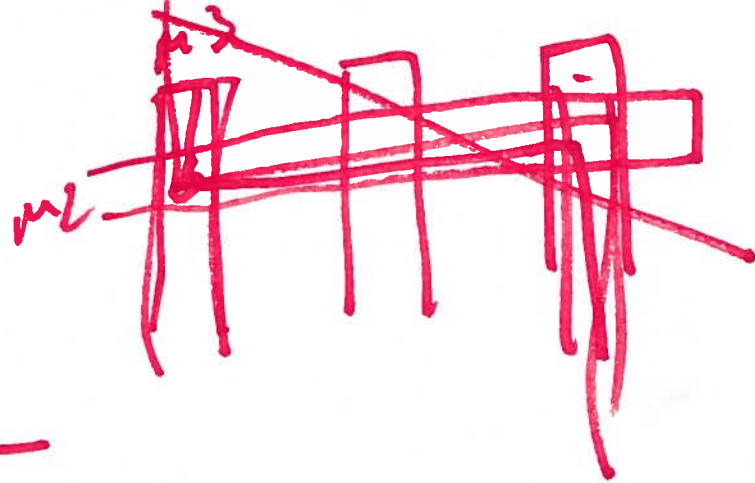
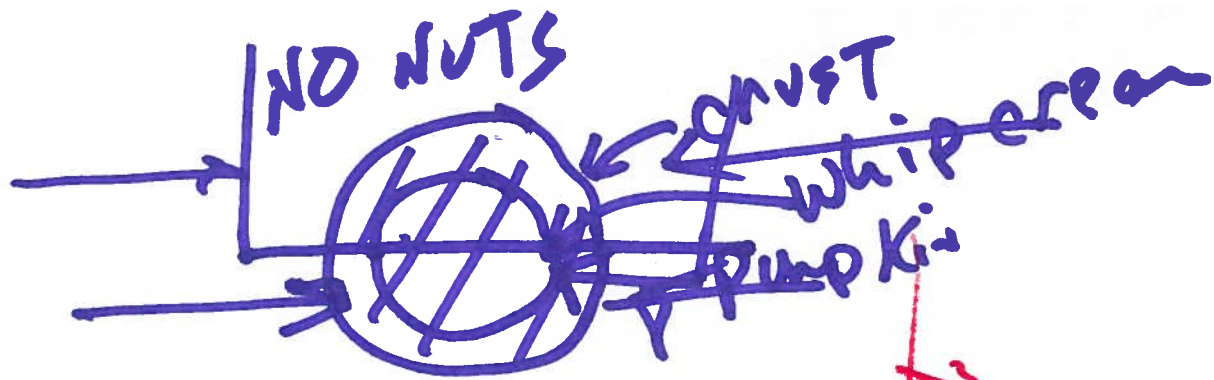
2)

# CMOS - 3 layer metal process





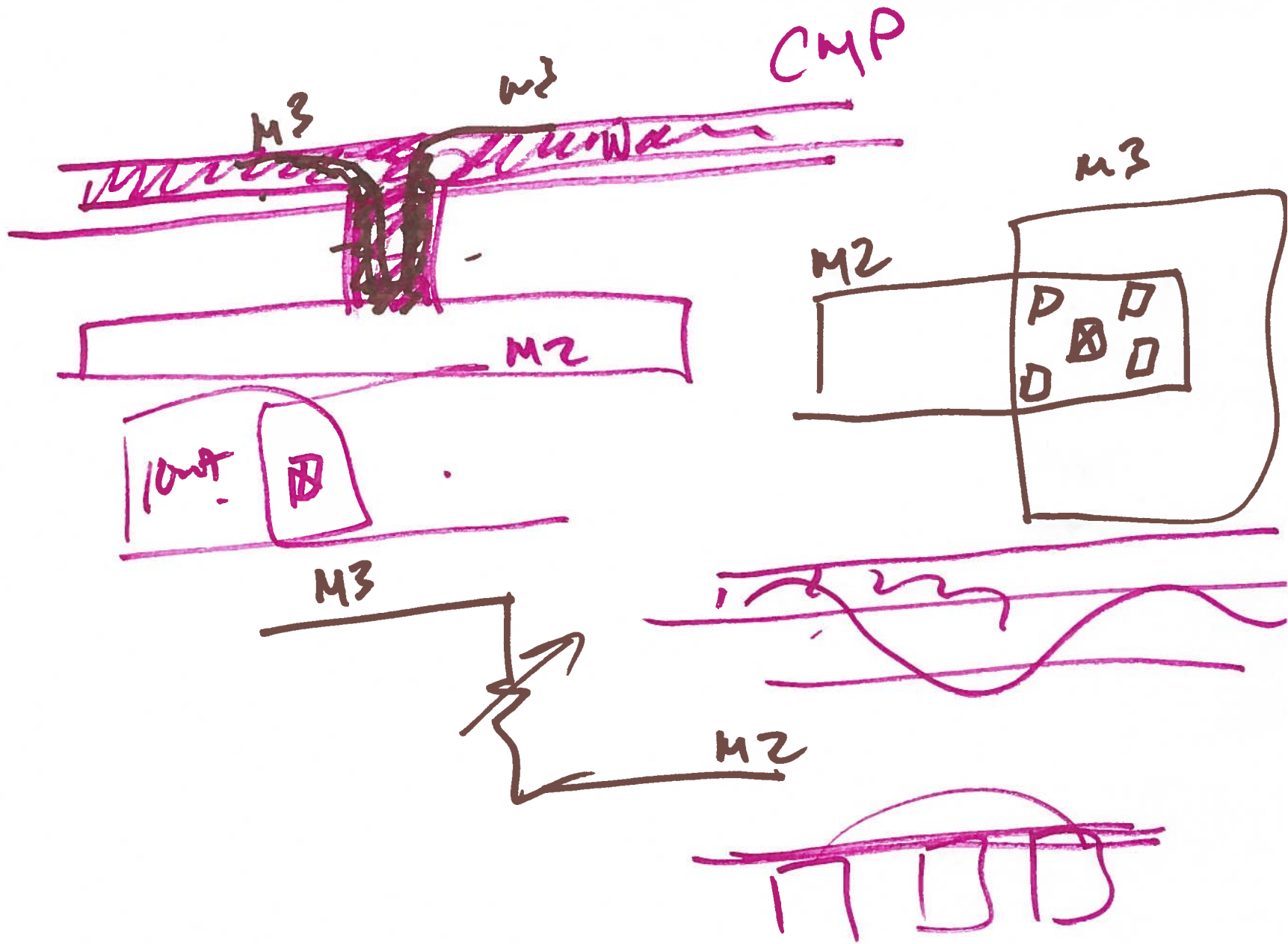
4)



M2  
M1  
poly sits on this one

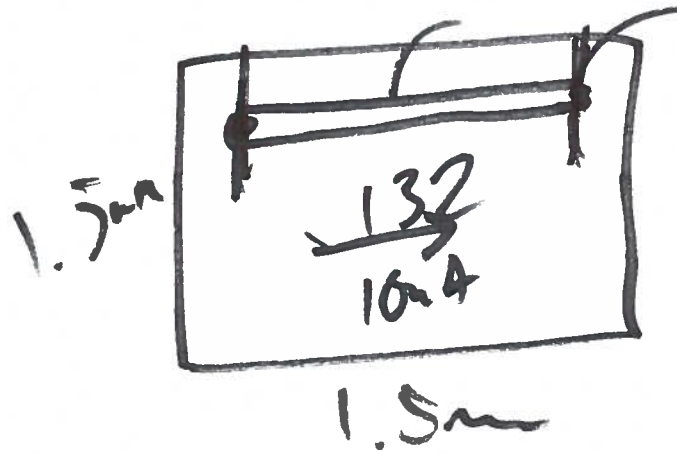
P-SUB

5/



6)

1)  $R_D = 0.1 \Omega / \mu\text{m}$   
 $1.2 \mu\text{m} = 1,200 \mu\text{m}$   
 $3\lambda = 0.9 \mu\text{m}$

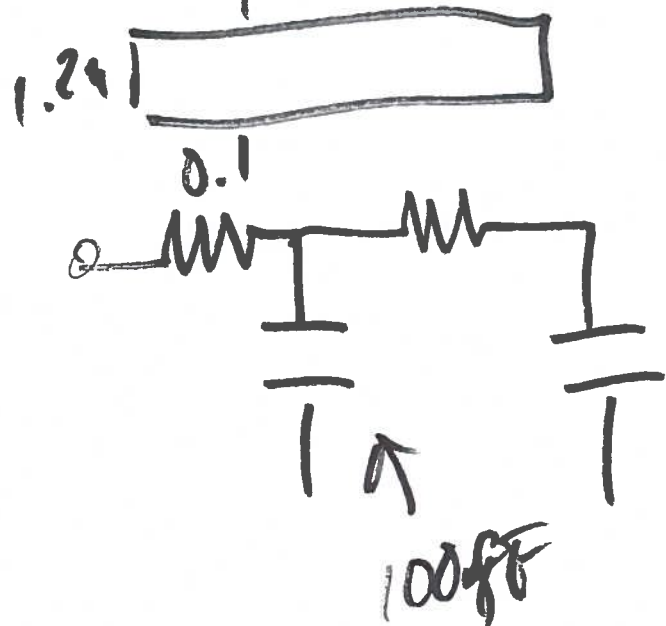


$$R = 0.1 \left( \frac{0.9}{1200} \right)^{-1}$$

$$= \frac{120}{0.9} \approx \underline{\underline{132 \Omega}}$$

2)

1.24 wide  
1200  $\mu$  long  
1200



$$R_D = 0.1 \Omega/\mu$$

$$C_H = 100 \text{ fF}$$

$$\# D_s = \frac{1200}{1.2} = 1000$$

$$t_d = 0.35 \cdot 1000^2 \cdot 0.1 \cdot 100 \text{ fF}$$

$$1 \text{ GHz} \Rightarrow \underline{\underline{1 \text{ ns}}}$$

$$10^9 \text{ Hz}$$

$$0.35 \cdot 10^6 \cdot 10^{-13} \cdot 10^{-1}$$

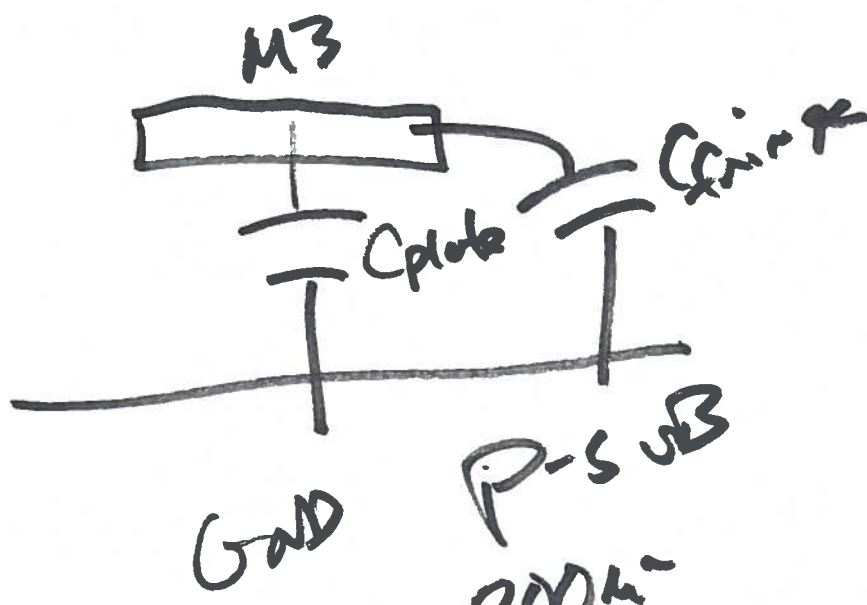
$$0.35 \cdot 10^{-8}$$

$$\underline{\underline{3.5 \text{ ns}}}$$

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Estimate the capacitance  
of our Bond  $75\mu \times 75\mu$



$$C_{TOT} = C_{plate} + C_{fringe}$$

$$C_{plate} = 10 \text{ aF}/\mu\text{m}^2$$

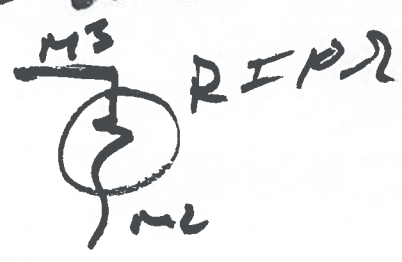
$$C_{fringe} = 20 \text{ aF}/\mu\text{m}$$

$$75 \cdot 4 = 300\mu\text{m}$$

↑  
perimeter

$$C_{TOT} = 75 \cdot 75 \cdot 10 \text{ aF} + 20 \text{ aF} \cdot 300\mu\text{m}$$

$$= 62.25 \text{ fF}$$



Read the Book

9)