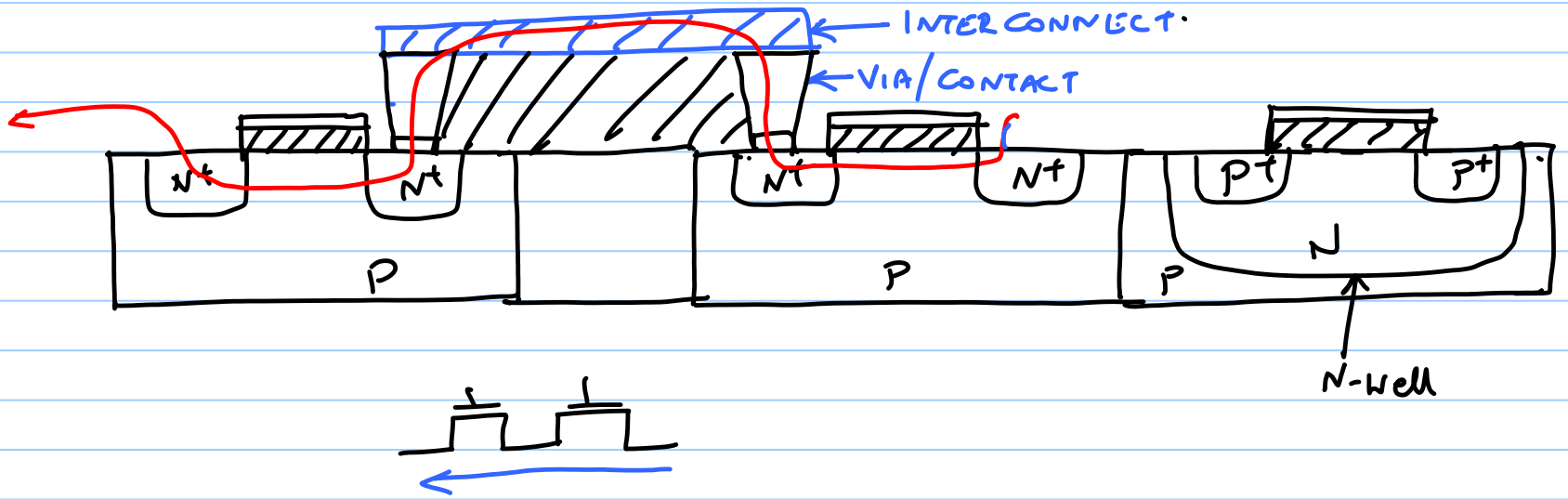
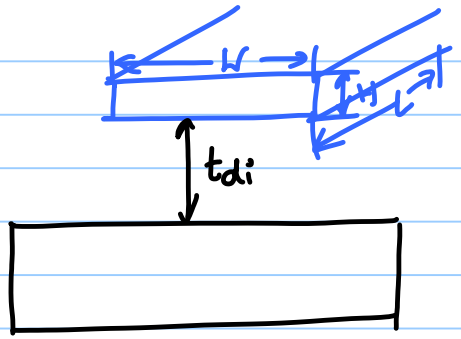
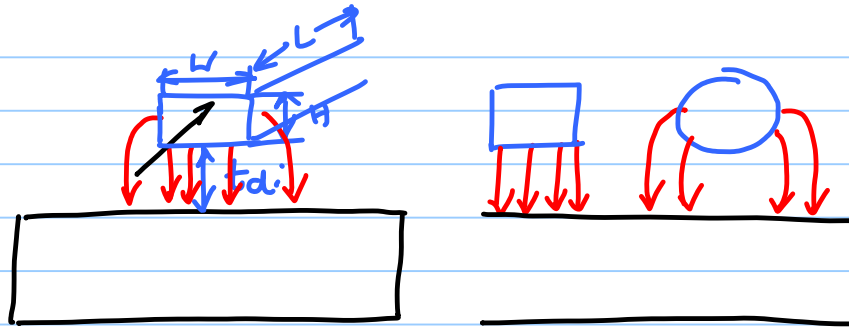
23/08/2019

EE5311

Module - 2 - Interconnects







$$C = \frac{\varepsilon_{ox} WL}{t_{di}} + 2x \frac{\varepsilon_{ox} L}{\ln\left(\frac{t_{di}}{H}\right)}$$

$$= C_{wire} \cdot L$$

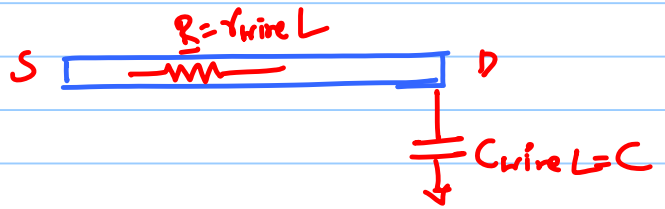
$$C_{wire} = \frac{\varepsilon_{ox} W}{t_{di}} + \frac{2x\varepsilon_{ox}}{\ln\left(\frac{t_{di}}{H}\right)} \quad \left(fF/\mu m\right)$$

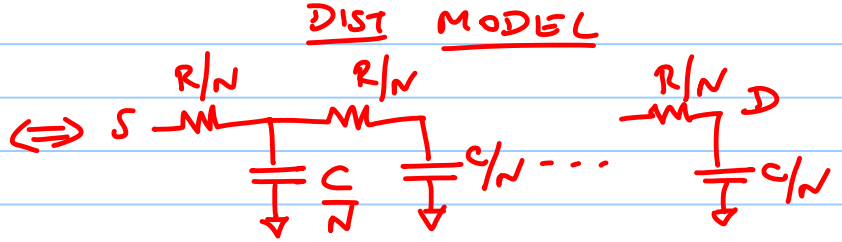
Resistance:

$$R = \frac{\rho L}{WH} = \left(\frac{\rho}{H}\right)\frac{L}{W} = R_{\square}\frac{L}{W} \qquad \left(R_{\square} \rightarrow \Omega/\square\right)$$

$$R = r_{wire} \cdot L$$

$$r_{wire} = \frac{R_{\square}}{W} \quad \left(\Omega/\mu m\right)$$



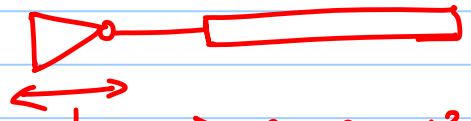


ELMORE DELAY = $\frac{N(N+1)}{2} \cdot \frac{R}{N}\frac{C}{N}$

$$\text{delay} = \lim_{N \to \infty} \frac{R \cdot C}{N^2} \frac{(N(N+1))}{2} = \frac{RC}{2}$$

$$= \frac{r_{wire} \cdot C_{wire}}{2} \cdot L^2 \quad \text{(ROUTE WITH SMALL LENGTH WIRES)}$$

LUMPED CAP MODEL



$$t_{gate} > \frac{r_{wire} C_{wire} L^2}{2} \Rightarrow \text{Use LUMPED C MODEL}$$

$$\Rightarrow L < \sqrt{\frac{2 t_{gate}}{r_{wire} C_{wire}}}$$