

HW-1

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Problem - 1

a

$$N = \frac{\pi w_r^2}{d_e^2} - \frac{2\pi w_r}{\sqrt{2}d_e} = \pi \left(\frac{w_r}{d_e}\right)^2 - \sqrt{2}\pi \frac{w_r}{d_e} = \pi \frac{w_r}{d_e} \left(\frac{w_r}{d_e} - \sqrt{2}\right) \quad (1)$$

Where N is the number of useful dies on the wafer in terms of w_r and d_e .

b

With result from a, it is clear that $N > 0$. Thus $\frac{w_r}{d_e} > \sqrt{2}$.

c

Let $R_{wd} = \frac{w_r}{d_e}$. Thus

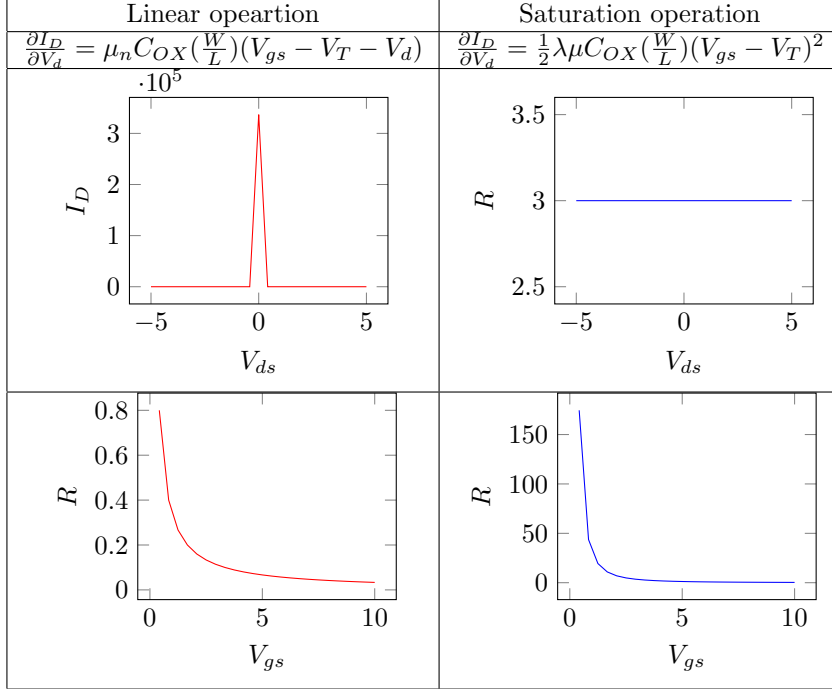
$$N = \pi R_{wd}(R_{wd} - \sqrt{2}) \quad (2)$$

d

As die yield formula is not allowed to use in HW-1. I could only assume that dies on the wafer with defect is $ND - d$, Thus wafer yield can be calculated as following:

$$Y = N(1 - D_d) = \pi \frac{w_r}{d_e} \left(\frac{w_r}{d_e} - \sqrt{2}\right)(1 - D_d) \quad (3)$$

Problem - 2



Problem - 3

While $V_{gs} < V_T$,

$$I_{DS} = I_0 \exp\left(\frac{q(V_{gs} - V_T)}{nk_B T}\right) \left(1 - \exp\left(-\frac{qV_{ds}}{k_B T}\right)\right) \quad (4)$$

As $V_{ds} \gg k_B T/q$

$$I_{DS} = I_0 \exp\left(\frac{q(V_{gs} - V_T)}{nk_B T}\right) (1 - \exp(-V_{ds})) \quad (5)$$

