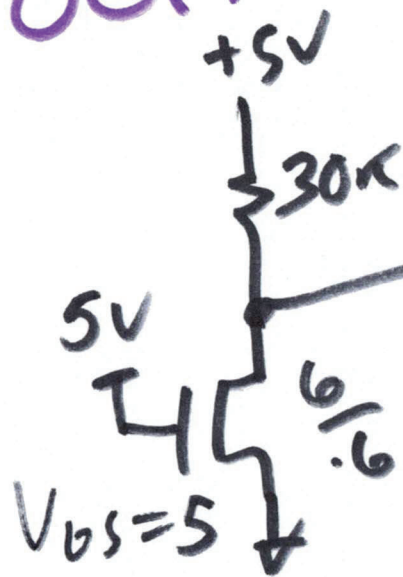


EE 421 / ECG 621

Digital IC Design

Lecture 18

Oct. 27, 2021



SAT  $V_{DS} \geq V_{GS} - V_{THN}$   
 $? = 5 - .8$

$V_{DS} \geq 4.2V$

$$I_D = K_{PN} \cdot \frac{W}{L} \left( (V_{GS} - V_{THN}) V_{DS} - \frac{V_{DS}^2}{2} \right)$$

$$\frac{5 - V_{OL}}{30K} = 120\mu \cdot 10 \cdot \left( \frac{(5 - .8)V_{OL}}{4.2} \right)$$

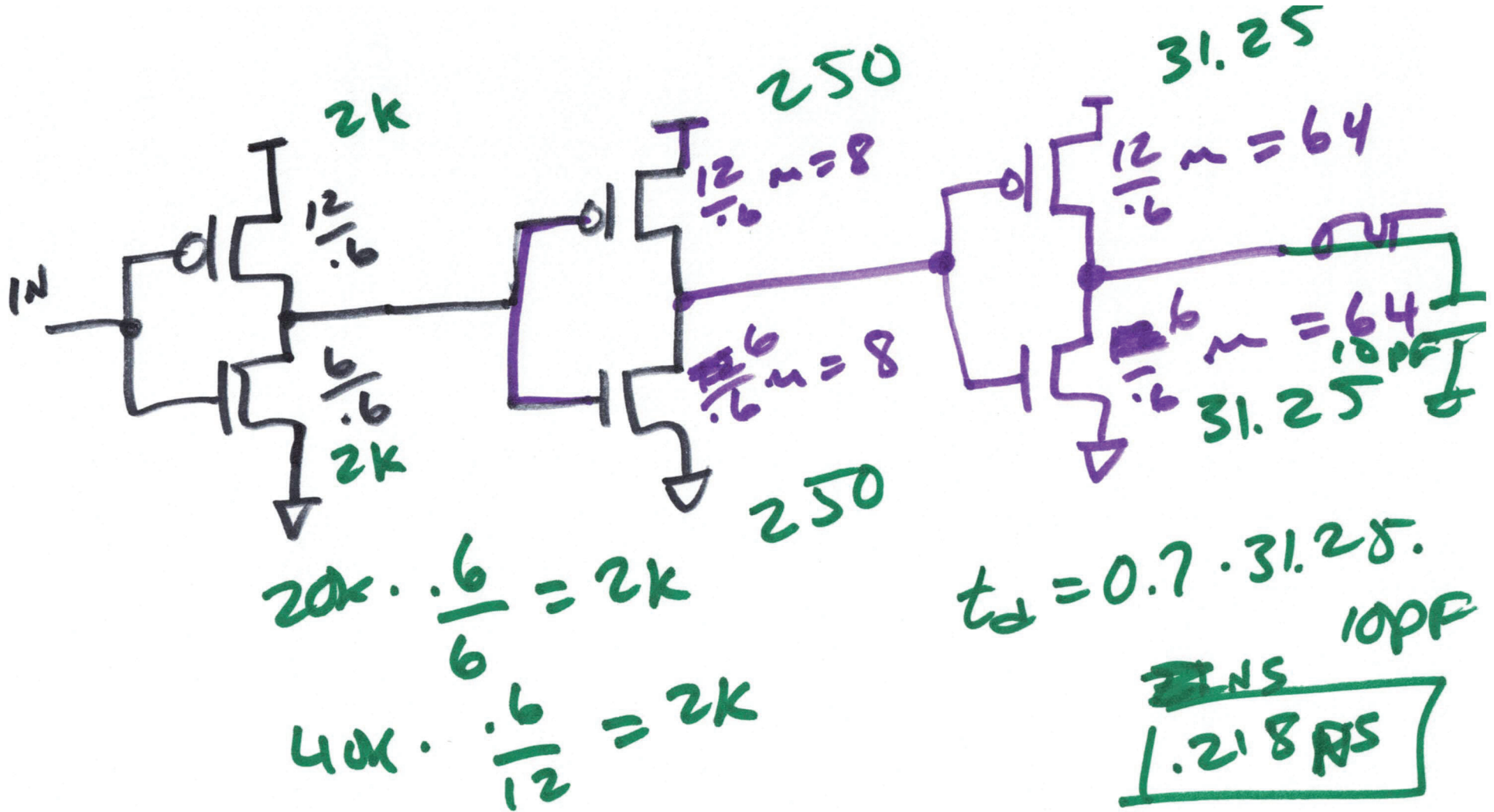
$$5-V_{OL} = 30 \times 1.2m(4.2) \text{ VOL}$$

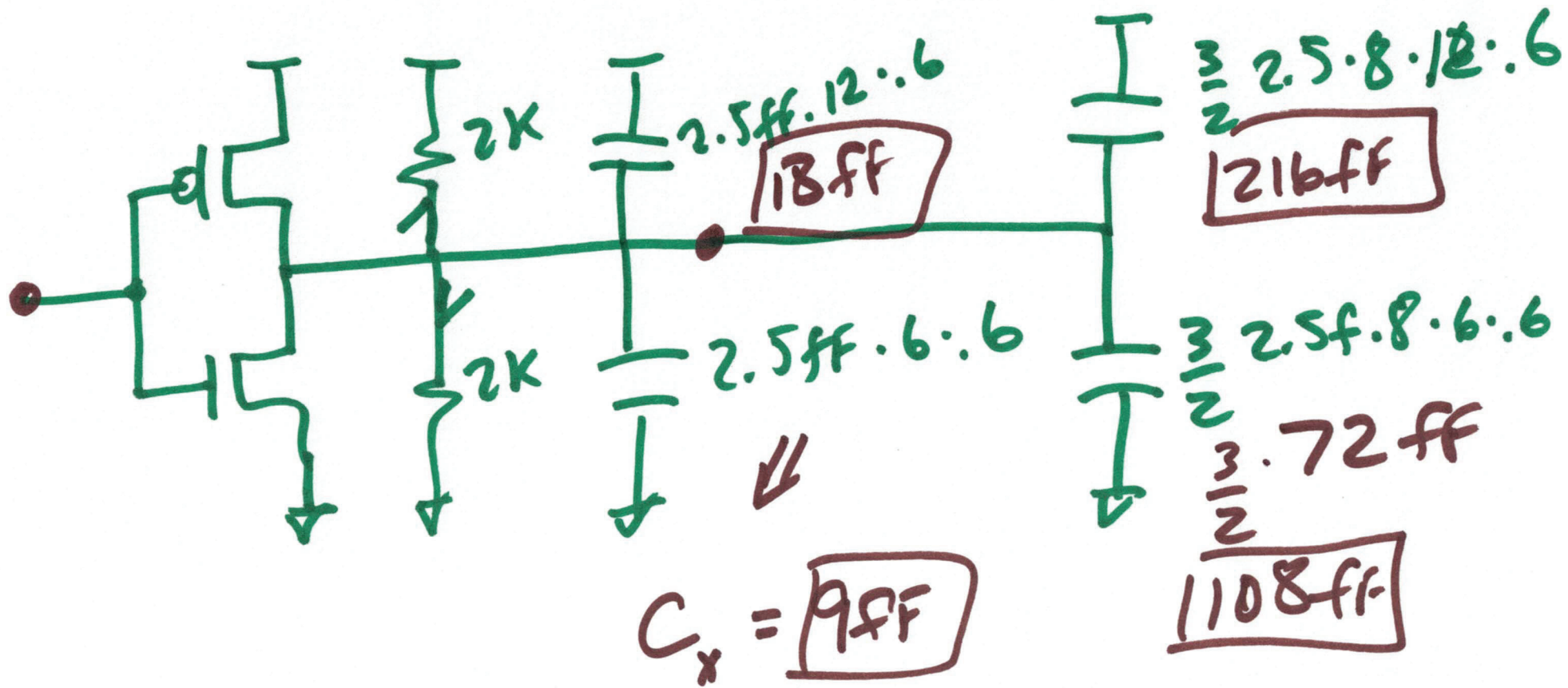
$$5-V_{OL} = 36 \cdot 4.2 \text{ VOL}$$

$$5-V_{OL} = 151 \text{ VOL}$$

$$V_{OL} = \frac{5}{156} = 32 \mu\text{V}$$







$$t_{pCH} = t_{pHL} = 0.7 \cdot 2\text{k} \cdot (9 + 18 + 108 + 216) \text{ fF}$$

$$= 1491 \text{ ps}$$

4)