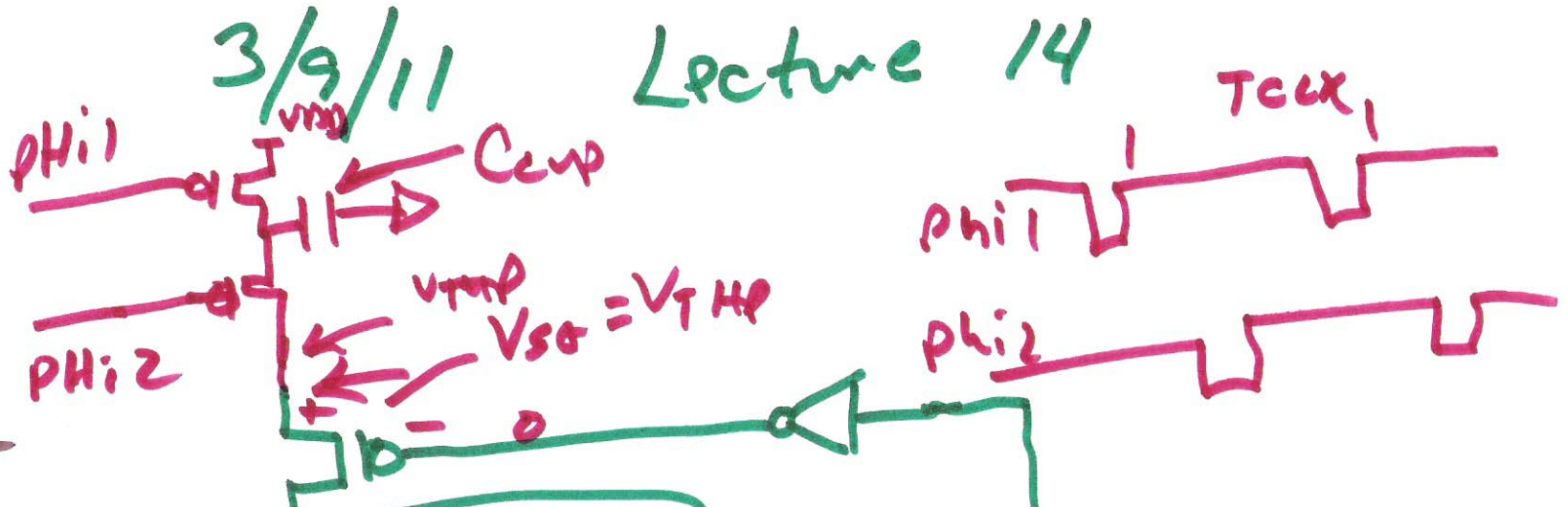


ECE 5/418 Memory Circuit Design

3/9/11

Lecture 14

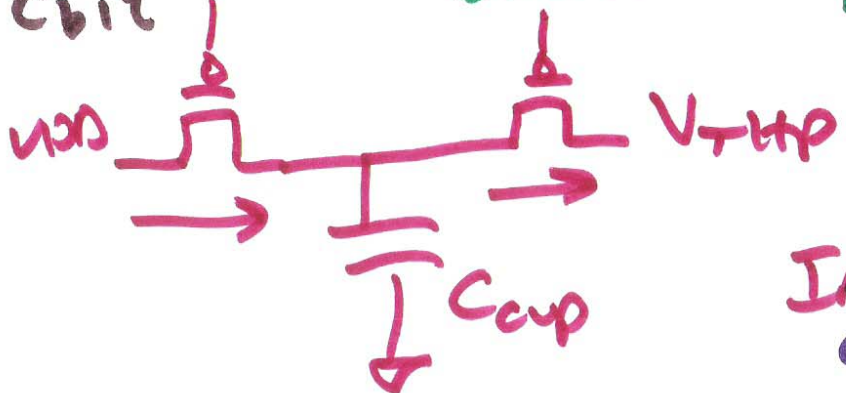


$$I = C \frac{dv}{dt}$$

$$I_{bit} = I_{cup} \cdot \frac{M}{N}$$

$$\Delta V_{OL} = \frac{T_{CLK} \cdot I_{bit}}{C_{bit}}$$

down



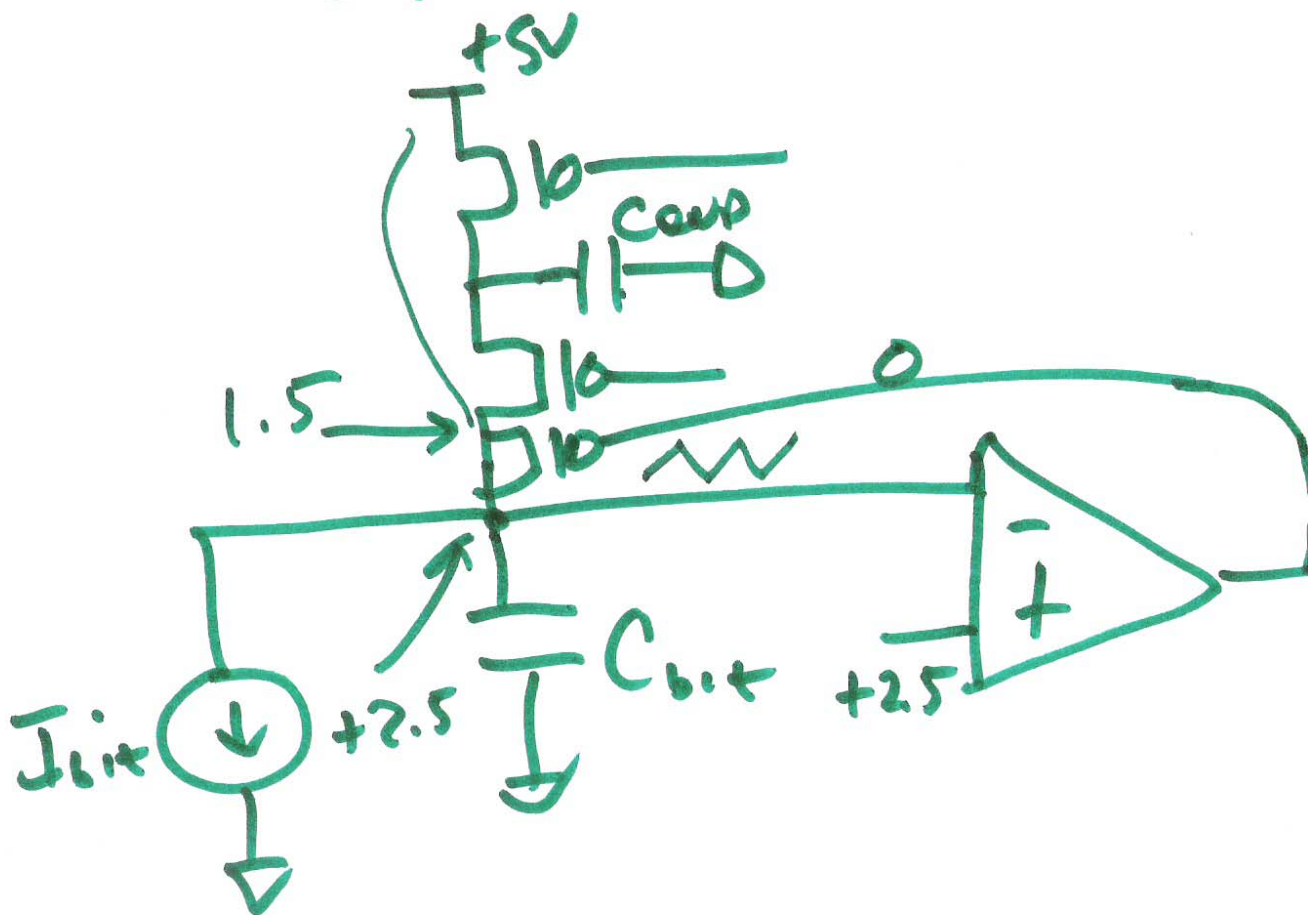
$$\frac{VDD \cdot C_{cup} - V_{THP} \cdot C_{cup}}{T_{CLK}}$$

TCLK

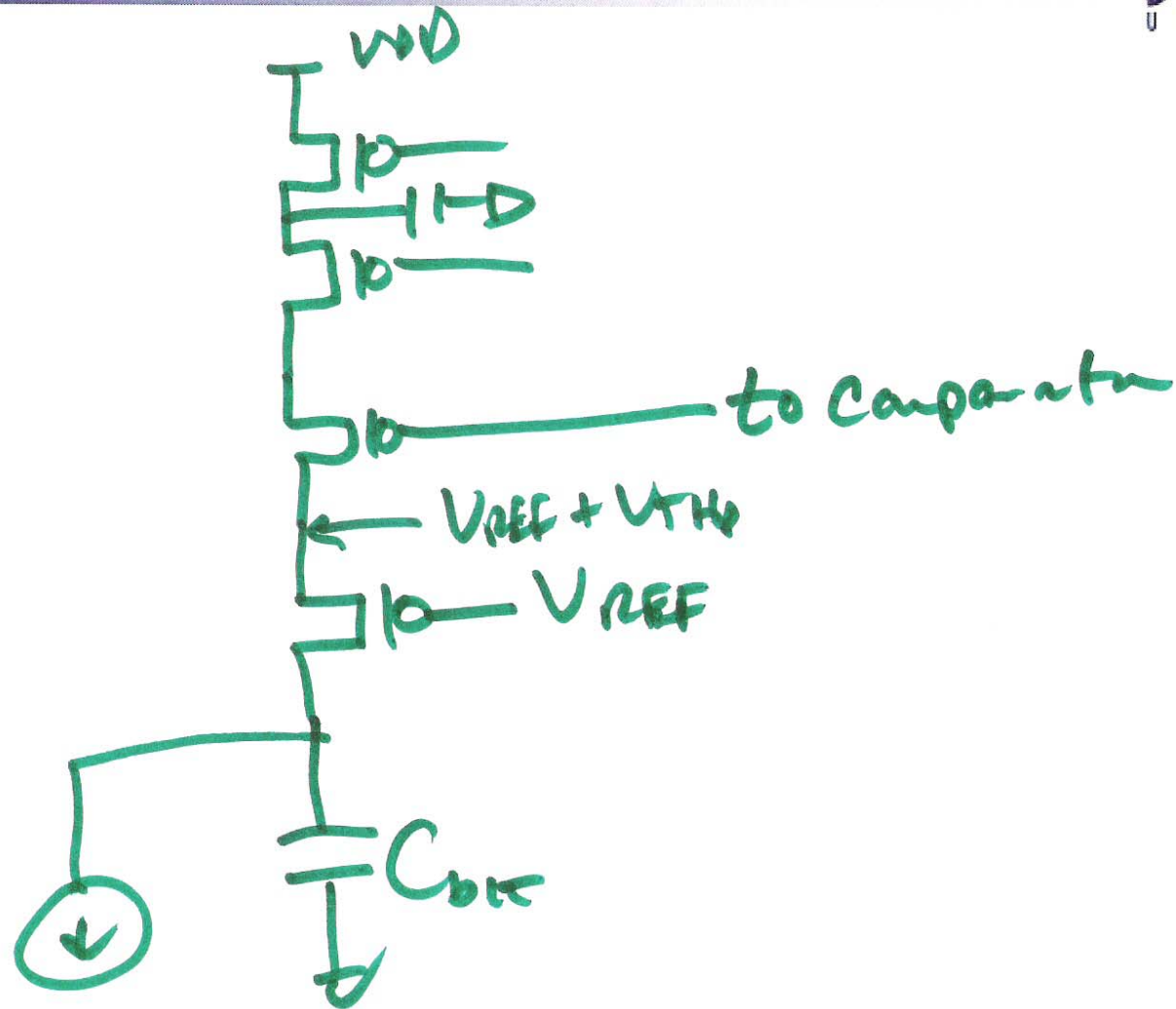
1)

$$Cv = Q$$

$$\frac{(V_{DD} - V_{th}) C_{up}}{C_{bit}} = \Delta V_{BL} \Big|_{max}$$



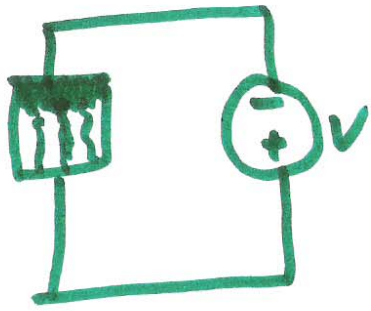
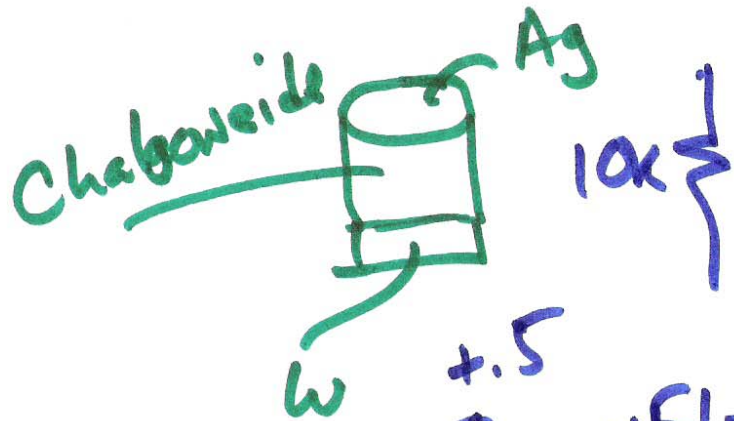
2)



3)

Resistive memory

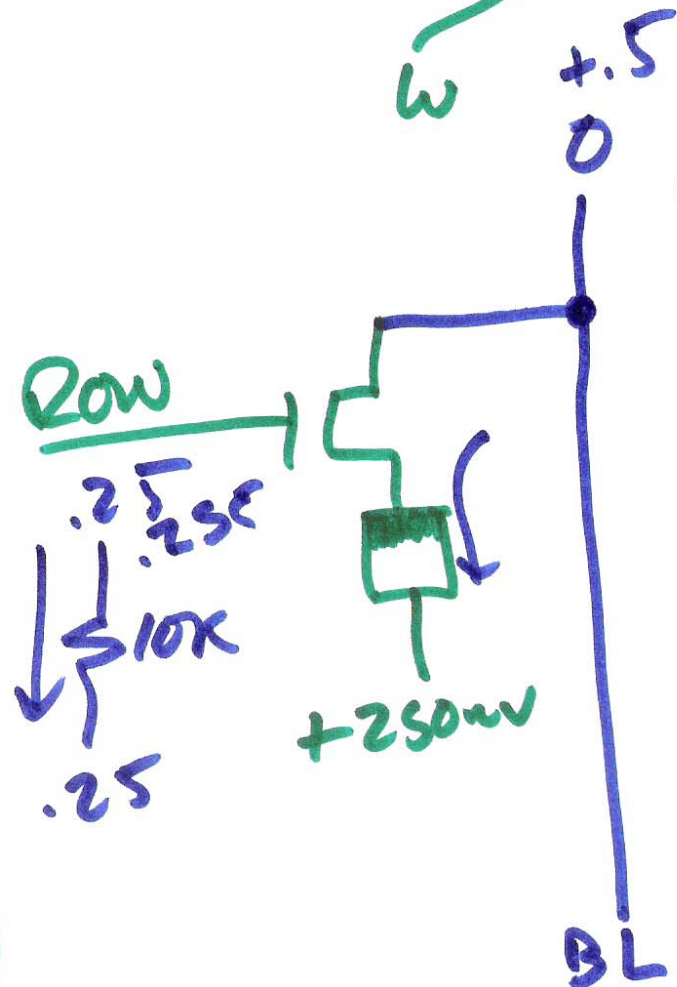
ion conducting



R is low
programmed



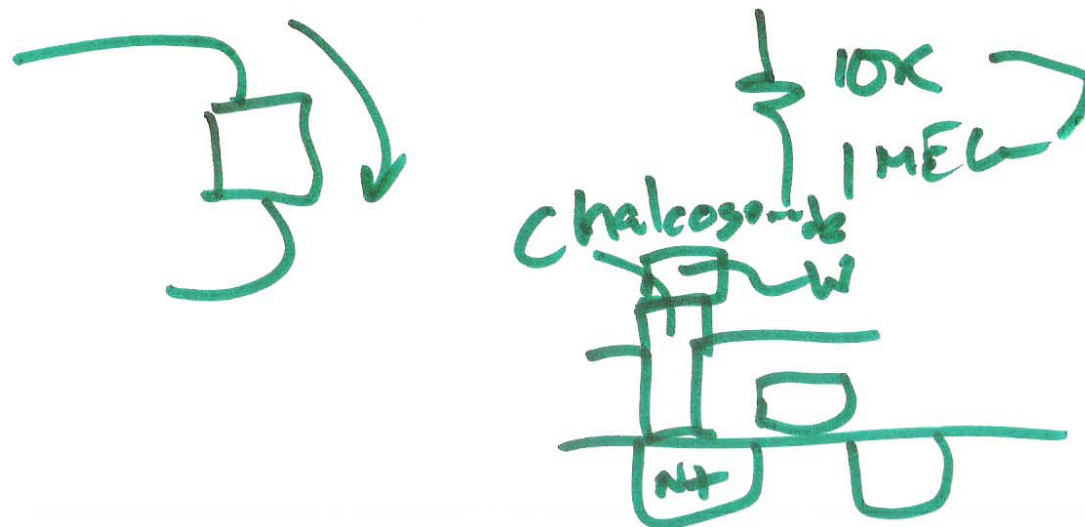
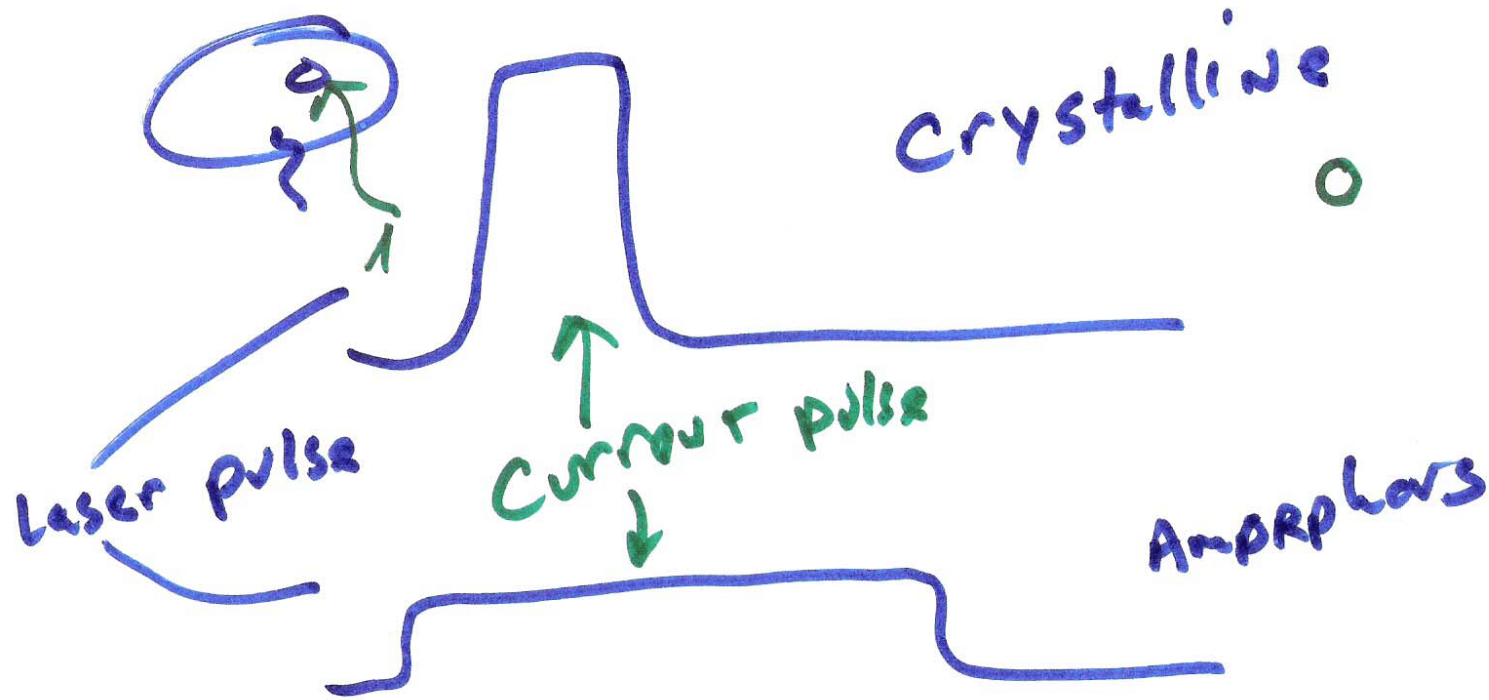
R is high
Erased



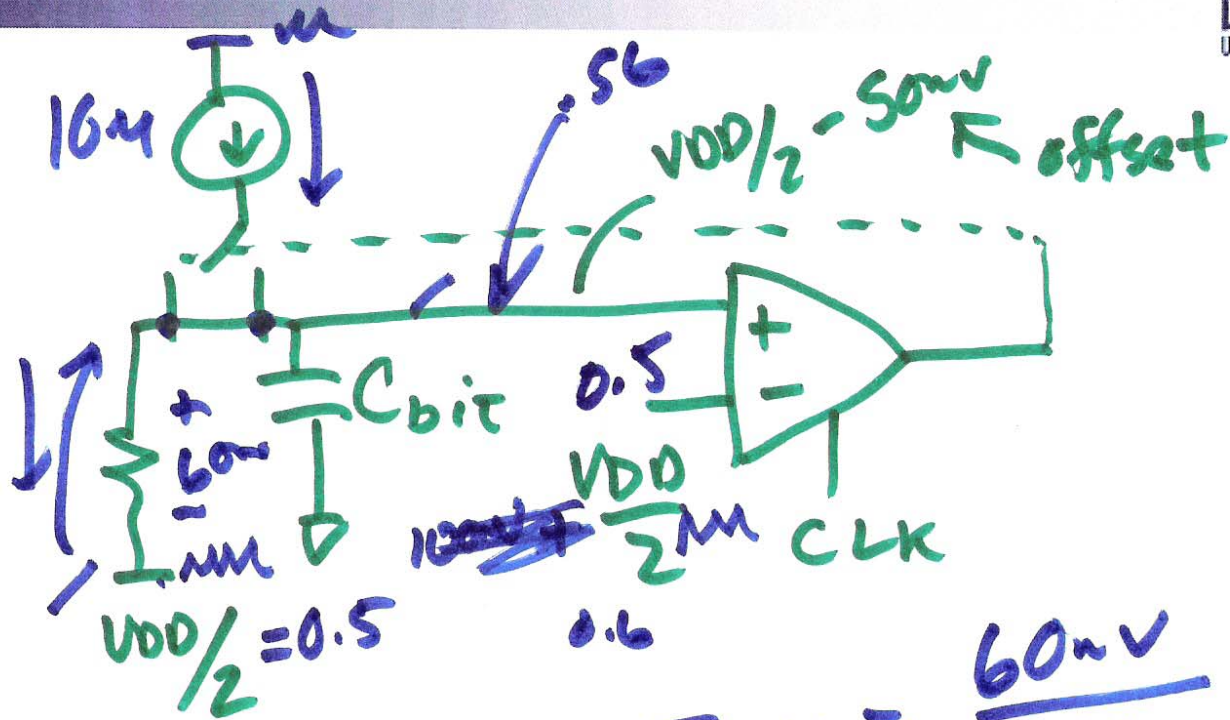
key point
across cell
retention!

Minimize V
for good

DVD AND CD

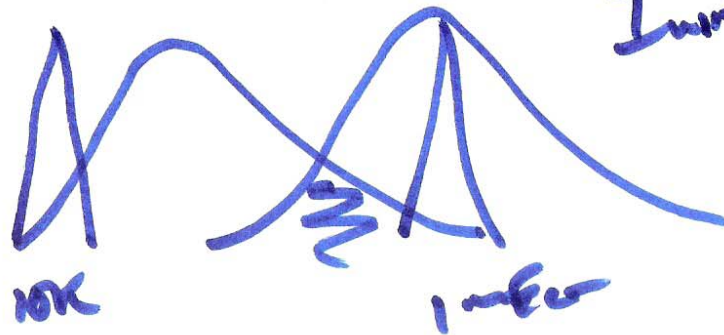


5)

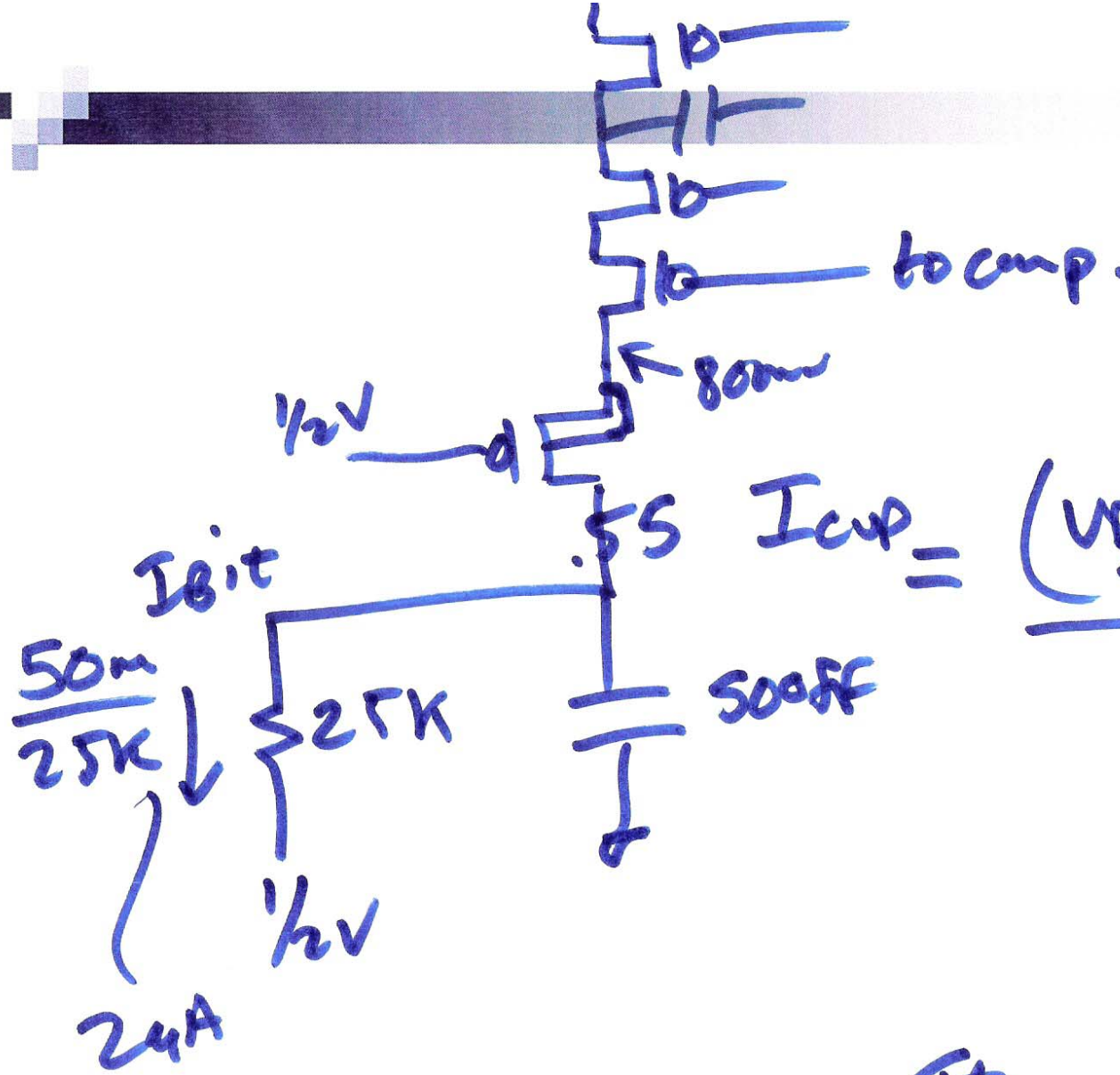


$$I_{max} = \frac{60mV}{10k} = 6\mu A$$

$$I_{in} = \frac{60mV}{1M\Omega} = 60nA$$



6)



$$I_{bit} = \frac{50m}{25K} = 2\mu A$$

$$I_{comp} = \frac{(V_{DD} - 800\mu A) \cdot 100fF}{10ns}$$

$$= \frac{.2 \cdot 100fF}{10^{-8}} = \frac{20 \cdot 10^{-15}}{10^{-8}} = 2\mu A$$

$$\frac{M}{N} \cdot I_{comp} = I_{bit} \cdot \frac{M}{N}$$

7)

$$\frac{50 \text{ mV}}{25 \text{ K}} = 2 \mu\text{A}$$

$$\frac{1 - .8}{25 \text{ K}} = \frac{.2}{25 \text{ K}} = 8 \mu\text{A}$$

$$8 \mu\text{A} \cdot \frac{\text{M}}{\text{V}} = 14 \text{ A}$$

1)