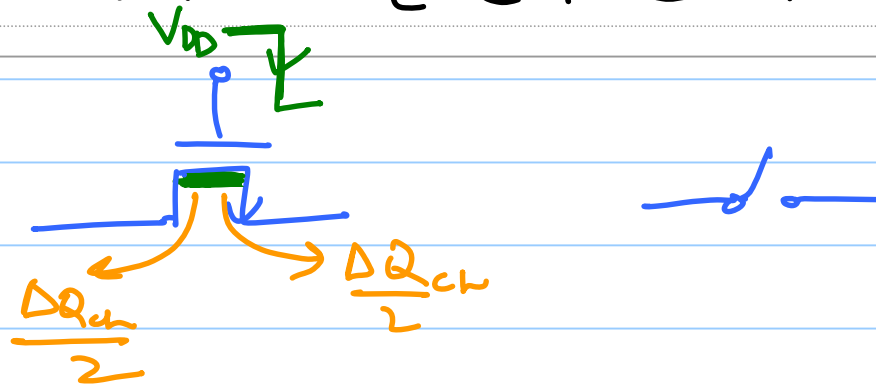
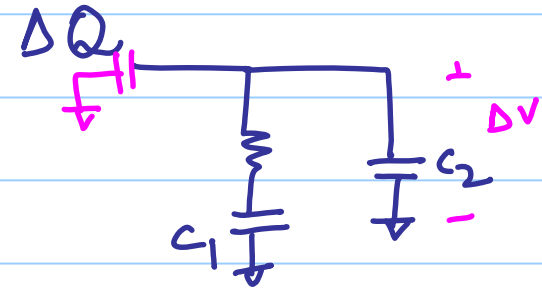
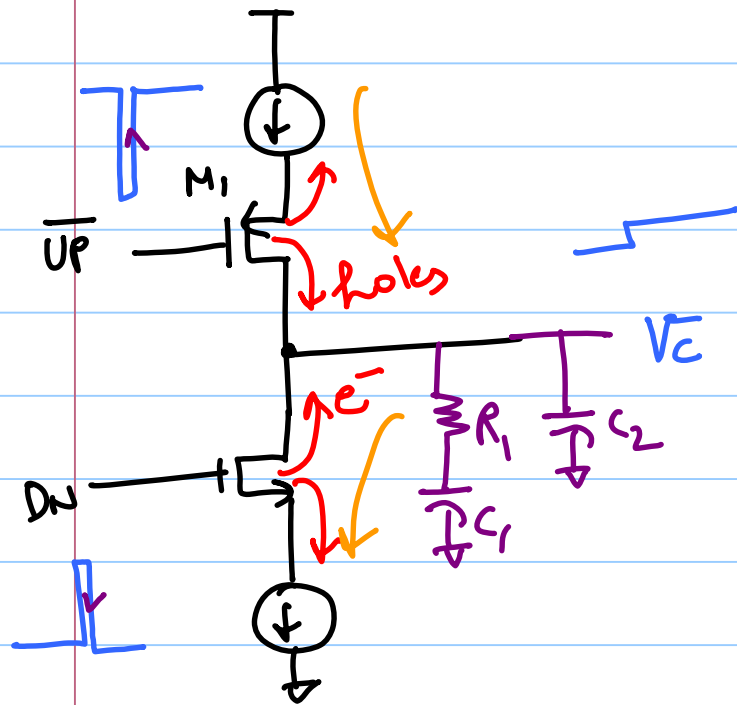


ECE 518 - Lecture 10

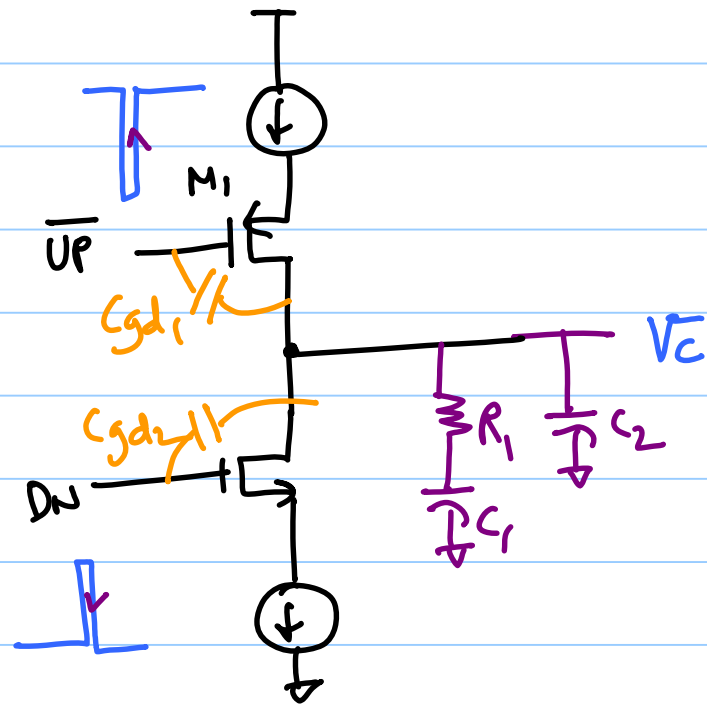
Note Title

2/17/2015

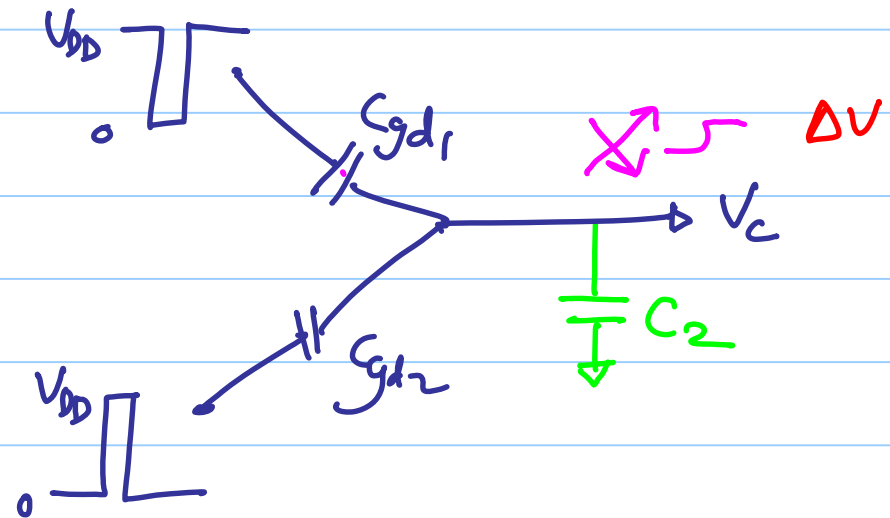




if # hole injected $\neq$ # e^- s
 $\Rightarrow V_c$ is disturbed



clock feedthrough



* UP & DN pulses couple through C_{gd1} & C_{gd2} resp. and affect V_c

* Since $R_1 C_1$ is quite large, only C_2 attenuates the pulses initially

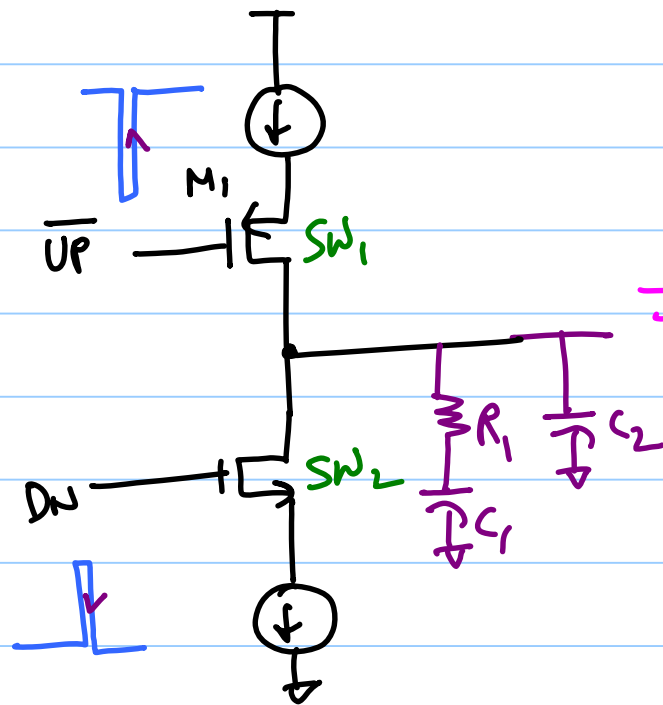
$$\Delta V = \frac{C_{gd1} - C_{gd2}}{C_{gd1} + C_{gd2} + C_2} \cdot V_{DD}$$

clock - feed through

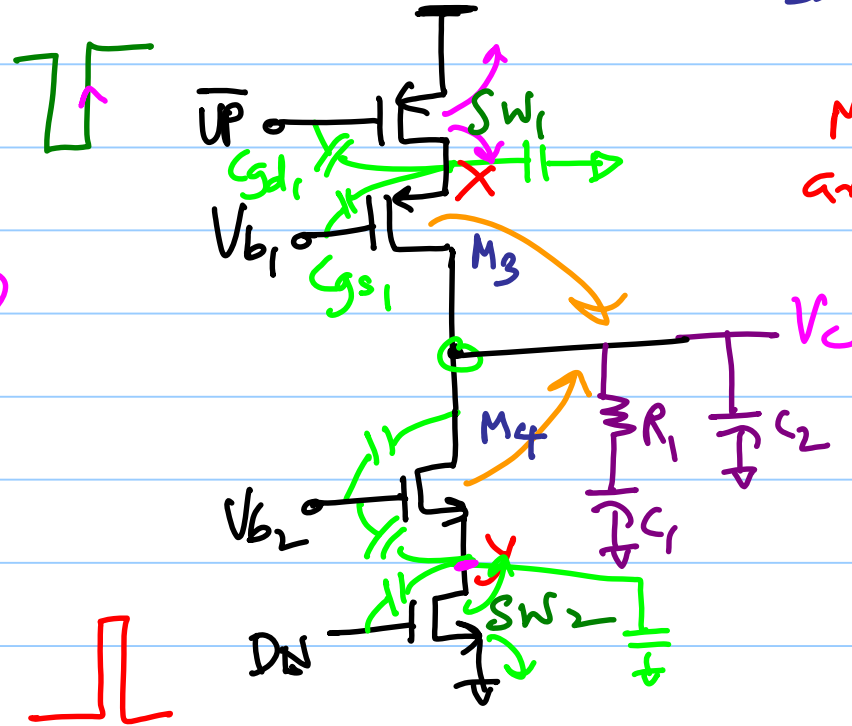
* After the CP turns off, the charge sharing b/w C_1 & C_2 further reduces this error to

$$\Delta V' = \frac{C_{gd1} - C_{gd2}}{C_{gd1} + C_{gd2} + C_1 + C_2}$$

① Place the switches near the supply rails (Source Switching)



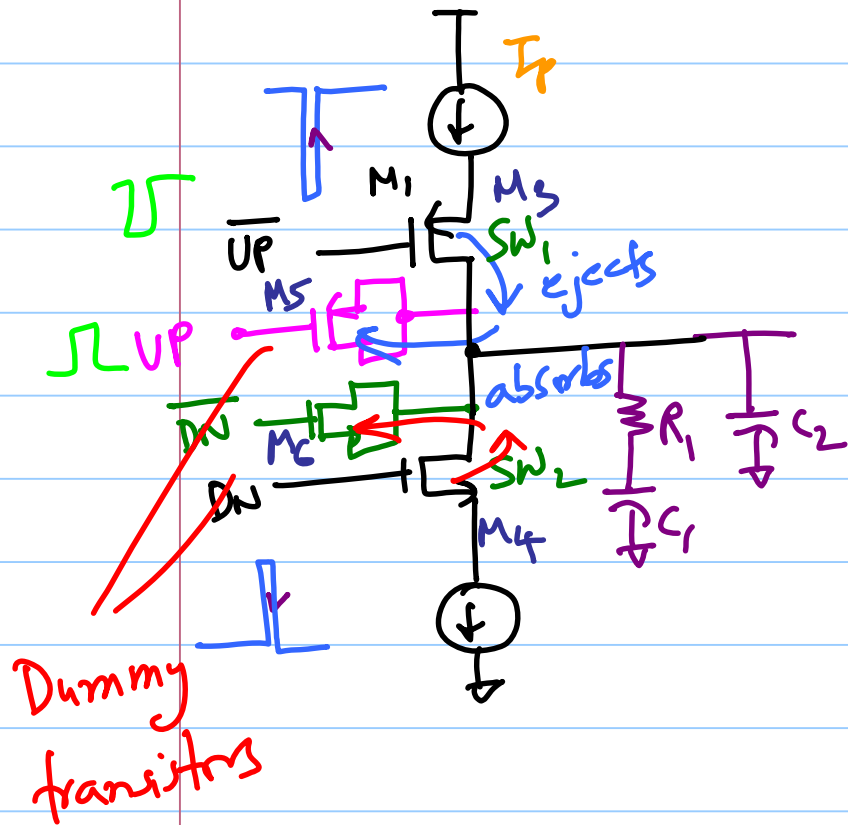
$\Rightarrow$



M_3 & M_4
are controlled
by
switching
their
sources

feedthru is somewhat attenuated by the total
capacitance seen from X & Y to the ground
* charge injection from M_3 & M_4 when they turn
off

② Use of dummy switches



locally absorb charge injection

size of $M_5 = \frac{1}{2}$ size of M_3

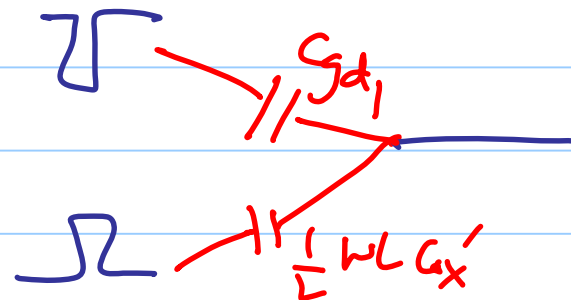
$$\left(\frac{W}{L}\right)_{M_5} = \frac{1}{2} \left(\frac{W}{L}\right)_{M_3}$$

$$\left(\frac{W}{L}\right)_{M_6} = \frac{1}{2} \left(\frac{W}{L}\right)_{M_2}$$

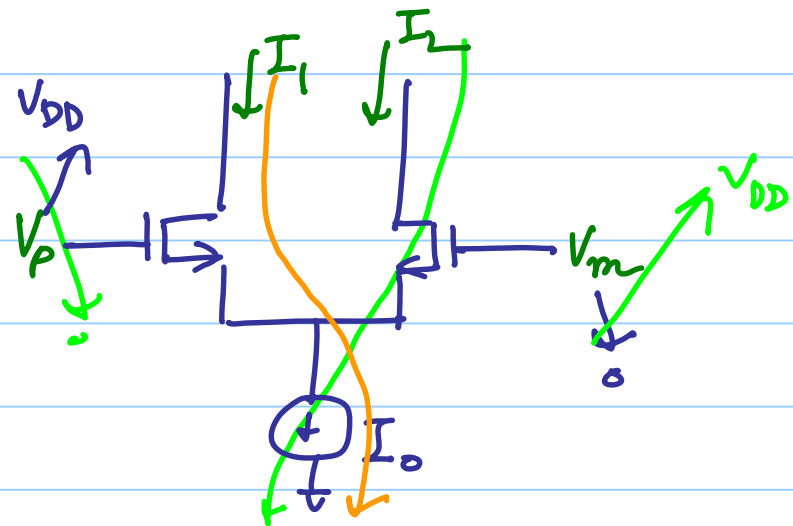
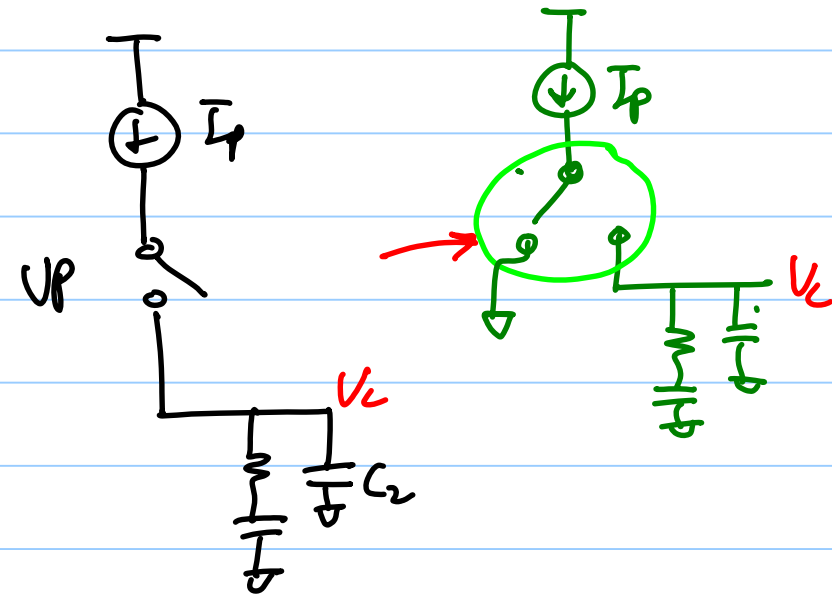
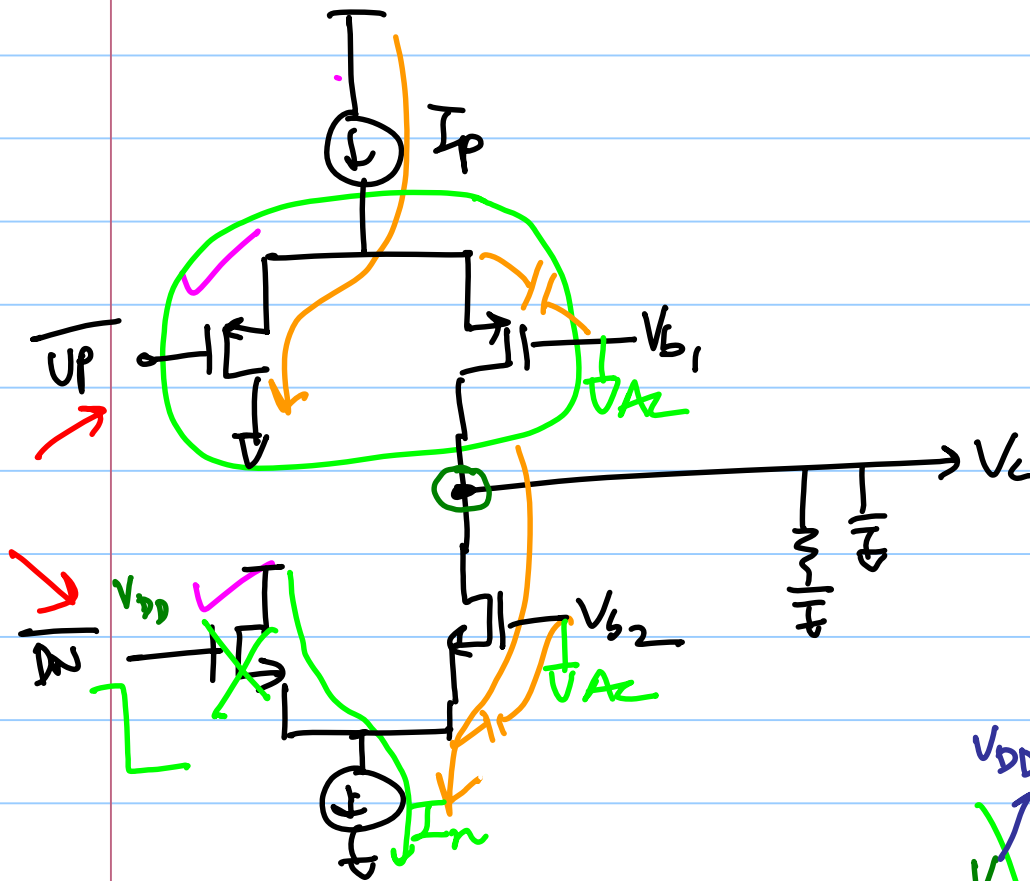
the charge injection here is mostly cancelled.

Deep

$$C_{gd} \text{ in Triode} \approx \frac{1}{2} WL C_{ox}$$



③ Differential pair



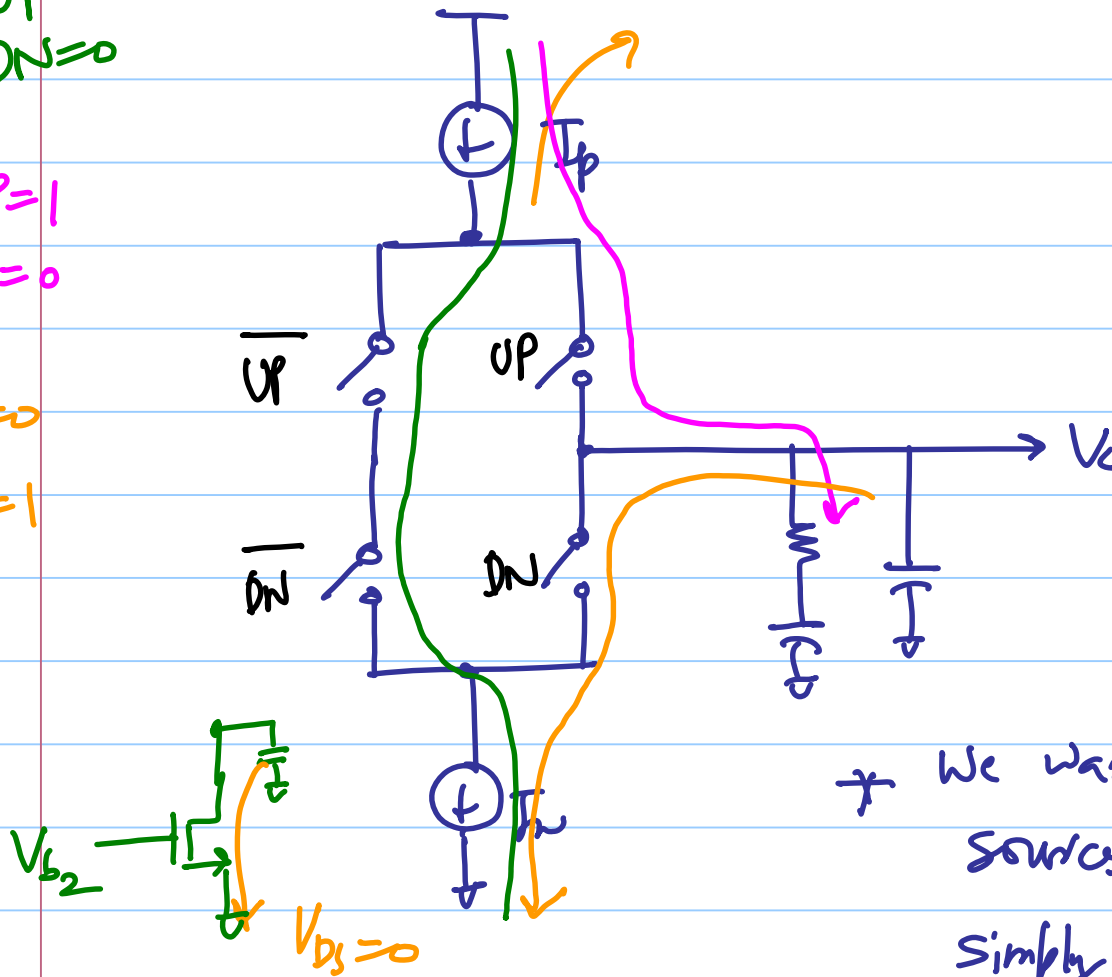
DN

Improved Differential Charge Pump

① $UP=0$
 $DN=0$

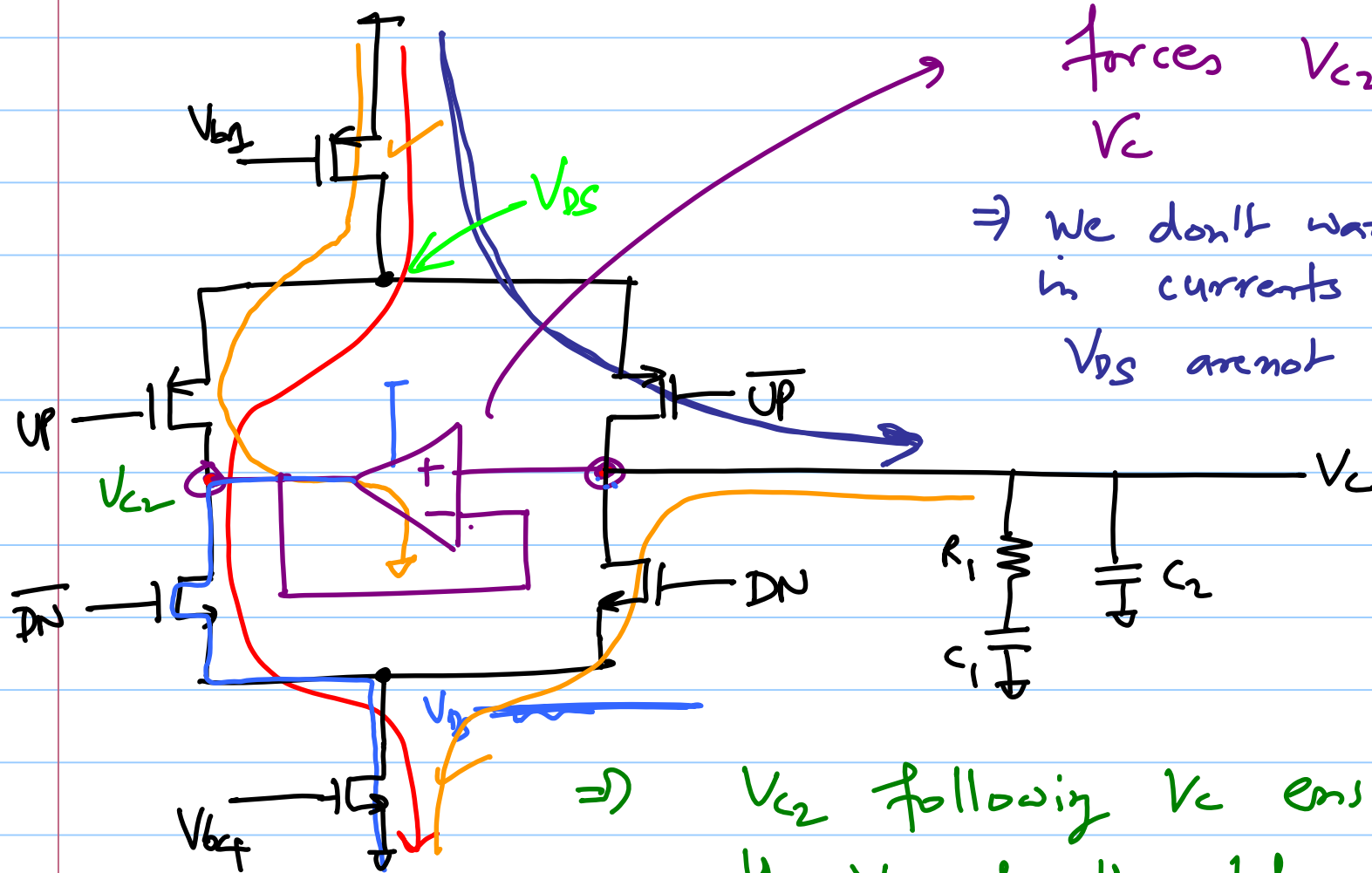
② $UP=1$
 $DN=0$

③ $UP=0$
 $DN=1$



* Current steering instead of turning the current sources on/off

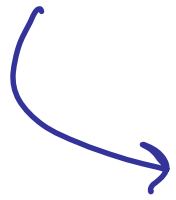
* We want to keep the current sources turned on and simply steer the currents



forces V_{c2} to track V_c

$\Rightarrow$ We don't want mismatch in currents when the V_{DS} are not equal

$\Rightarrow$ V_{c2} following V_c ensures that the V_{DS} of the top and bottom current sources are matched



V_{DS} 's of the devices are kept "stable"

⇒ Ensures reduced transient mismatch

