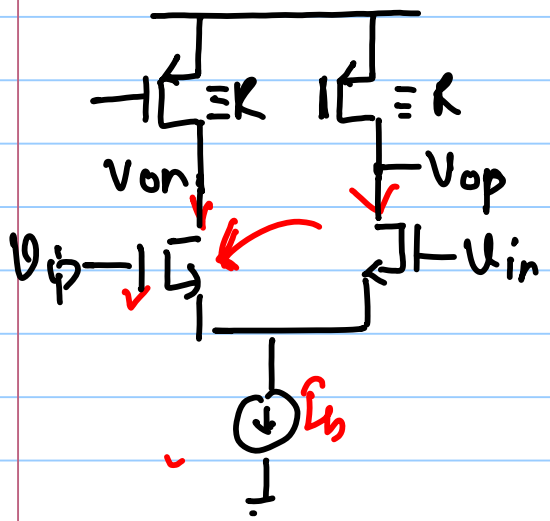
Lecture # 27

Note Title 29-10-2020



$$\max. V_{op} = V_{DD}$$
$$\min. V_{op} = V_{DD} - I_b.R$$
$$\text{Swing}, \Delta V = I_b.R$$

$$f_{osc} \propto \frac{1}{R}$$

$f_{osc}\uparrow \Rightarrow R\downarrow \Rightarrow \Delta V\downarrow$

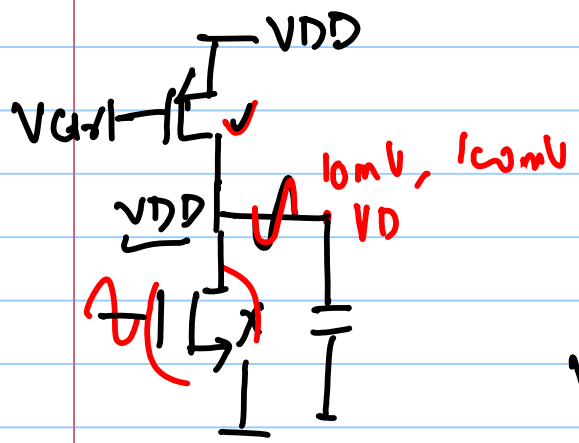
$$R = \frac{1}{\mu_p C_{ox} \frac{W}{L} \left(V_{DD} - V_{ctrl} - |V_{Tp}| \right)}$$

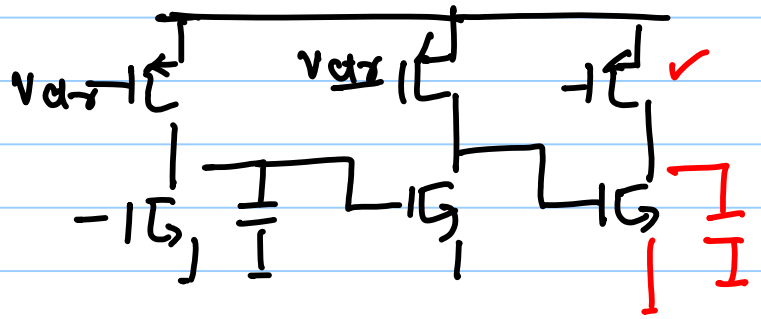
$V_{ctrl}\downarrow \Rightarrow R\downarrow$

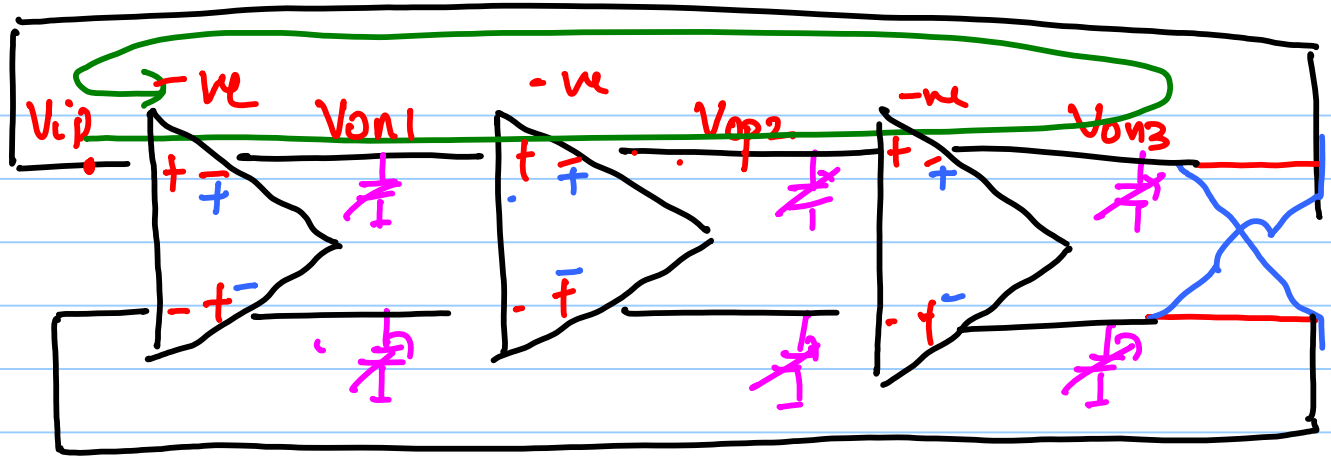
CLK — CML / CMOS

CML: VDD−ΔV to VDD or 0 to ΔV

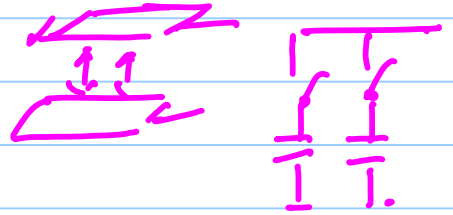
CMOS: 0 to VDD

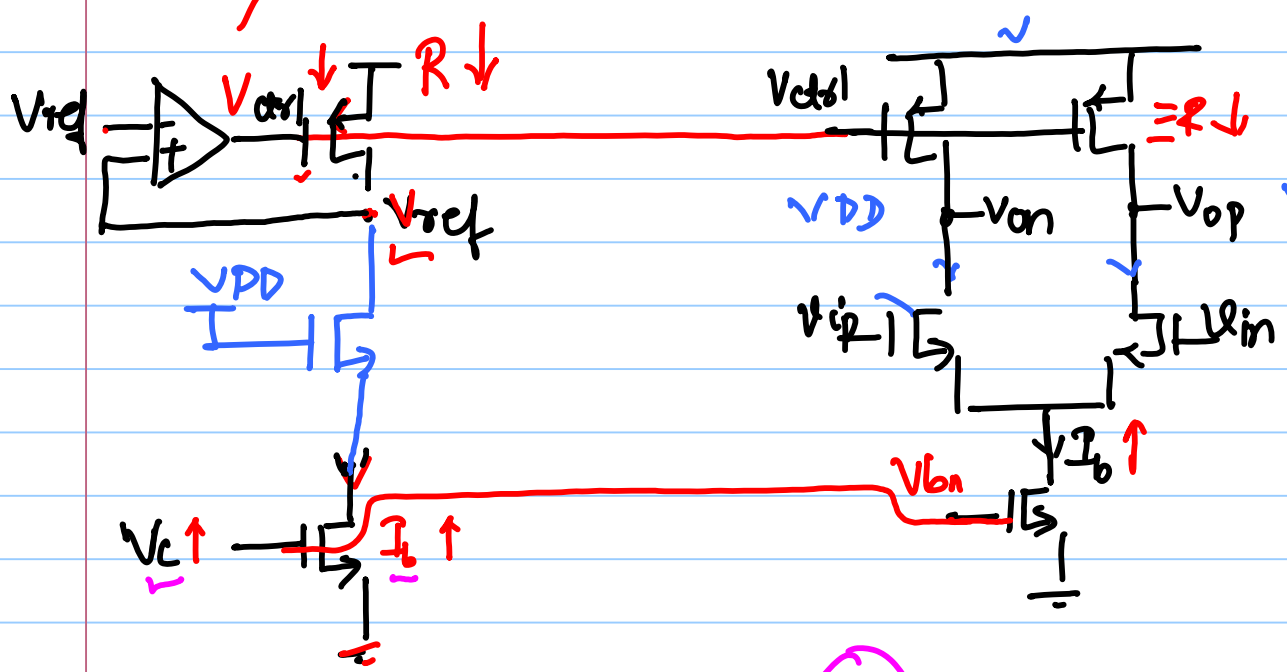






- I ↗ MOS-Cap, Diode
Min-cap., Mom-cap





$f_{osc} \uparrow \Rightarrow R \downarrow$

$\Delta V = I_b \uparrow . R \downarrow$

$V_{DD} - V_{ref} = I_b . R$

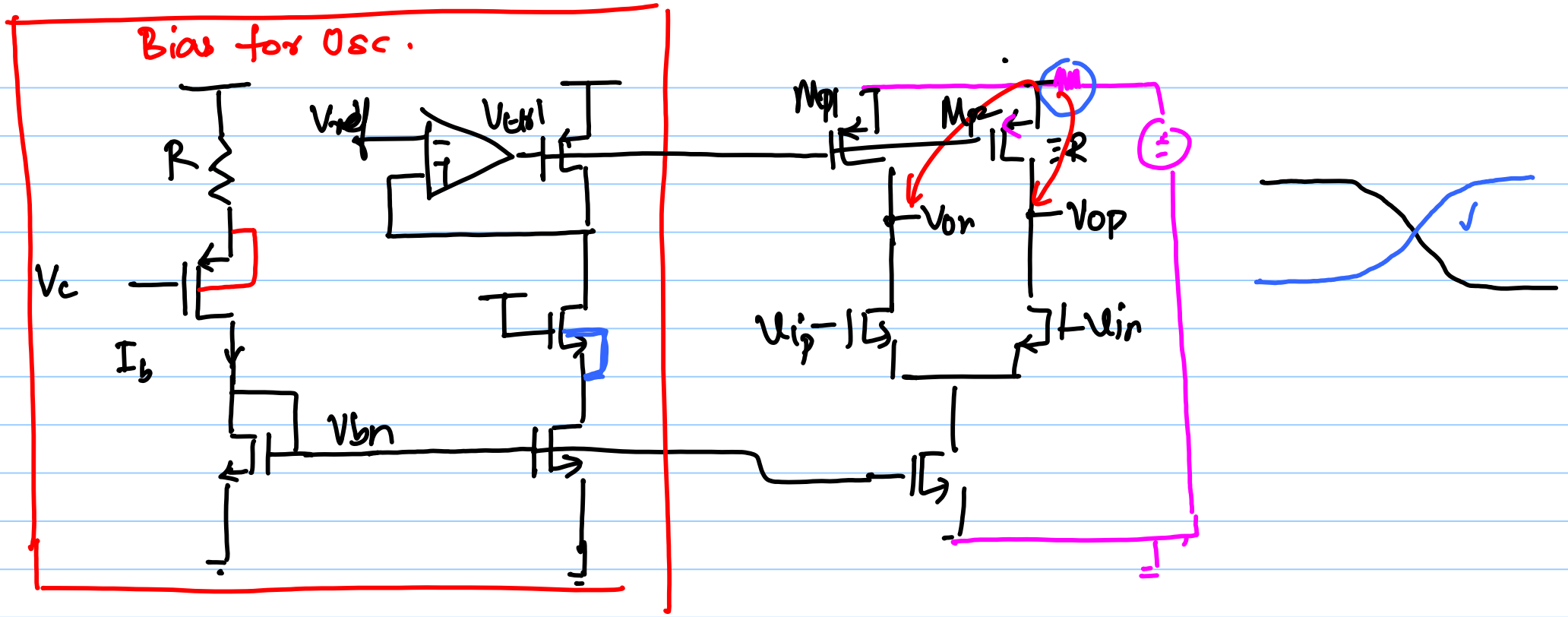
$\Delta V = V_{DD} - (V_{DD} - V_{ref})$

$= V_{ref}$.

$$f_{osc} \propto \frac{1}{R_{on} C} \propto \frac{I_b}{(V_{DD} - V_{ref}) C}$$

$$\Delta f_{osc} \propto \frac{g_m(\Delta V_c)}{(V_{DD} - V_{ref}) C}$$

$\Delta I_b = g_m \Delta V_c$ if Non-linear $\Rightarrow$ $\frac{\Delta f_{osc}}{\Delta V_c}$ non-linear.



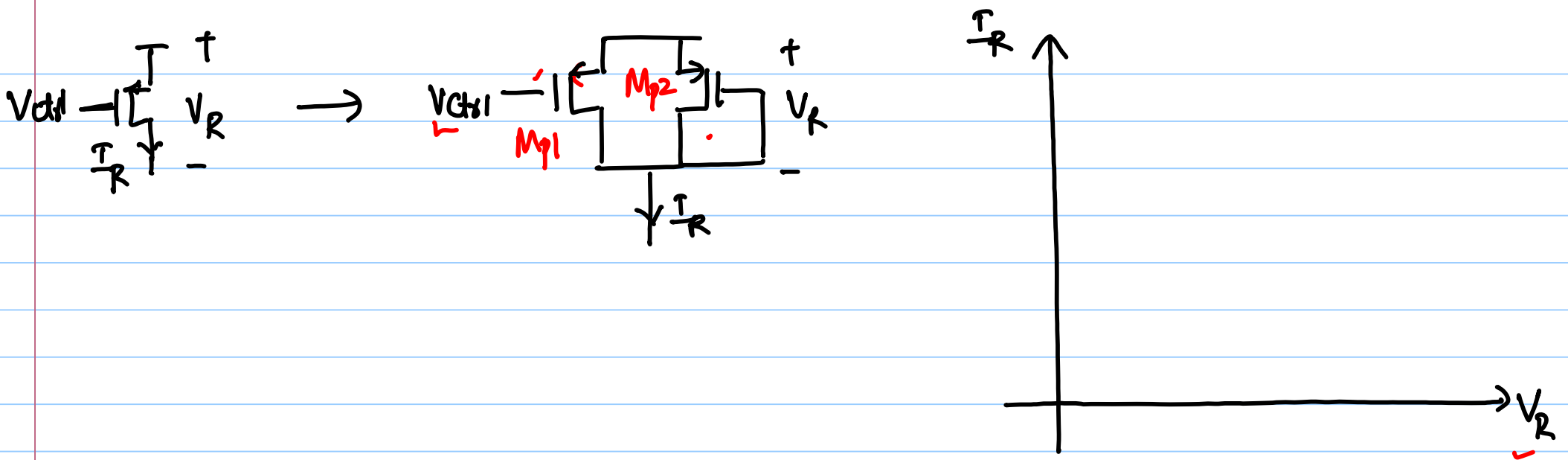
$$\Delta I_b = \frac{\Delta V_c}{R} = \left(\frac{1}{R}\right) \Delta V_c$$

$$V_{op} = V_{dd} - \left(\frac{I_b}{2} + \Delta I\right) \cdot R\,(V_{R1}, I_{R2})$$

$$V_{on} = V_{dd} - \left(\frac{I_b}{2} - \Delta I\right) R\,(V_{R1}, I_{R1})$$

$$\left|\underbrace{V_{op} - V_{on}}\right| = \underline{2 \cdot \Delta I \cdot R}$$

Power Supply Rejection Ratio (PSRR)


Vctrl
+
VR
−
IR
Vctrl
Mp1
Mp2
+
VR
−
IR
IR
VR