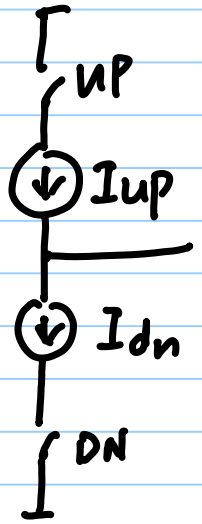
Lecture #28

Note Title 26-09-2017

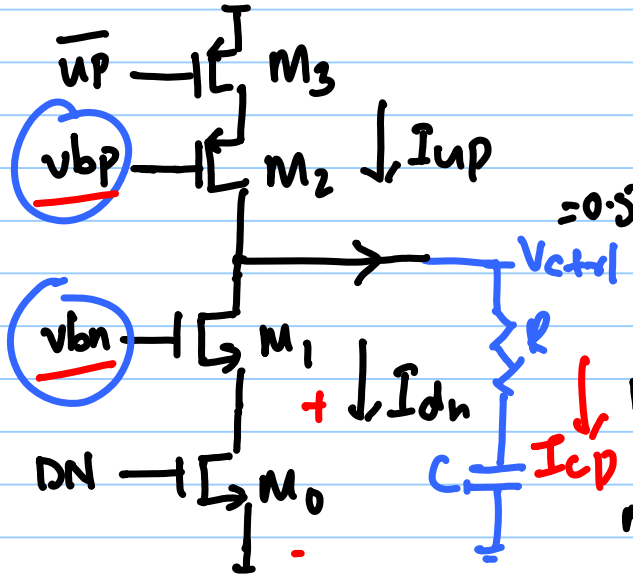
Charge-pump

$$I = \frac{K_N}{2L}(V_{gs} - V_t)^2 (1 + \lambda V_{DS})$$

1. Source-switched
2. Gate-switched
3. Drain-switched

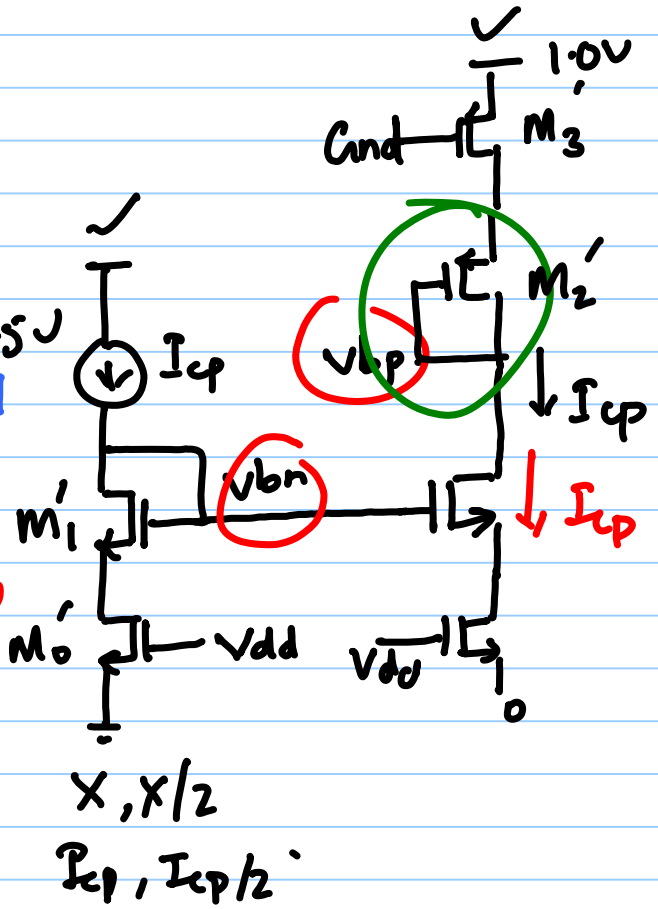


$I_{up} = I_{dn}$



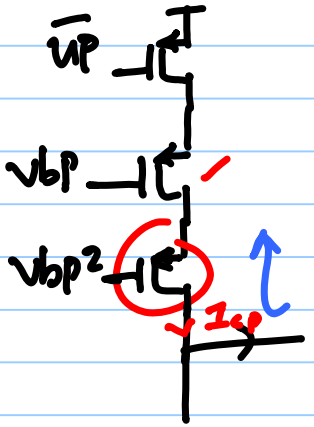
$I_{up} = I_{dn} = I_{cp}$

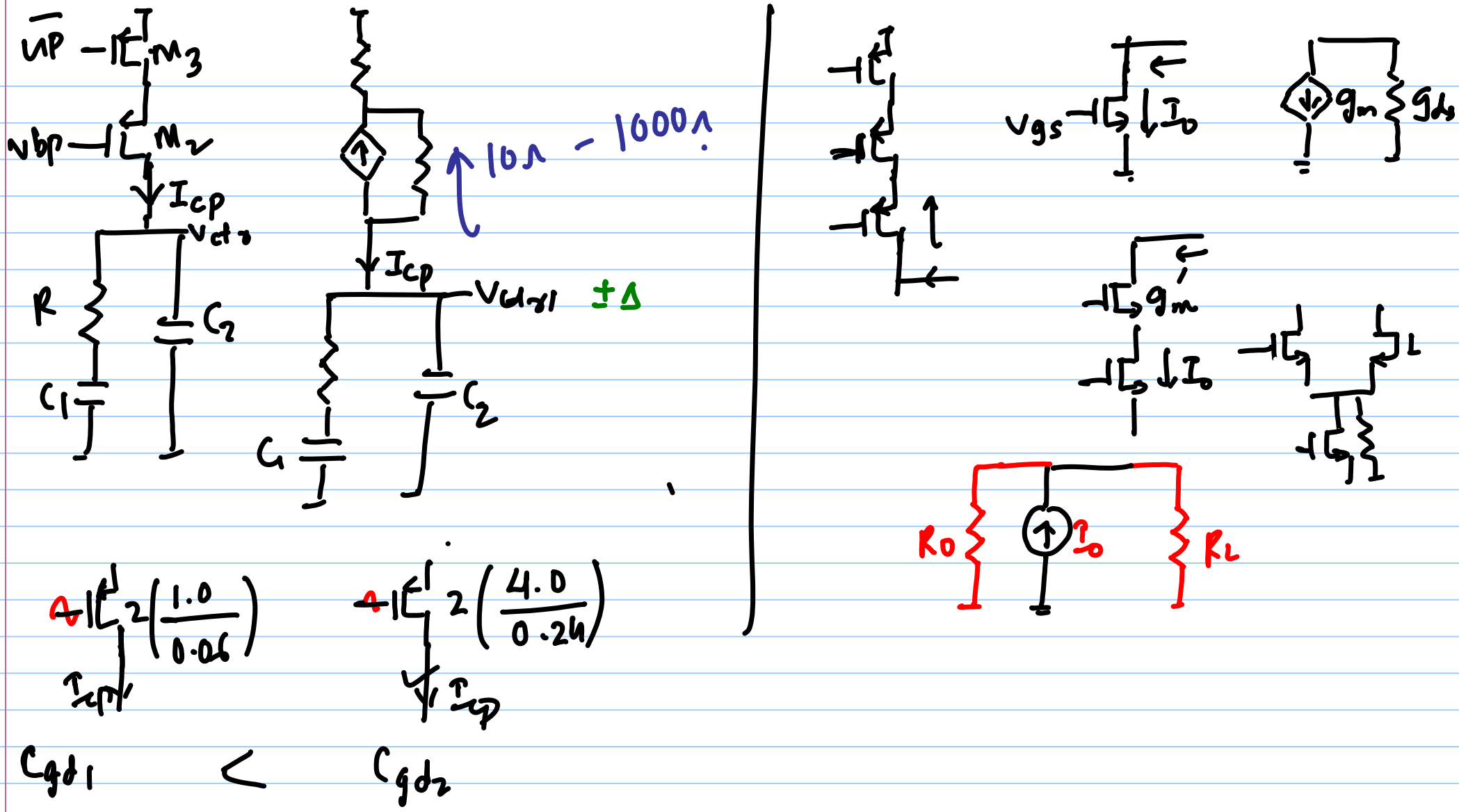
X

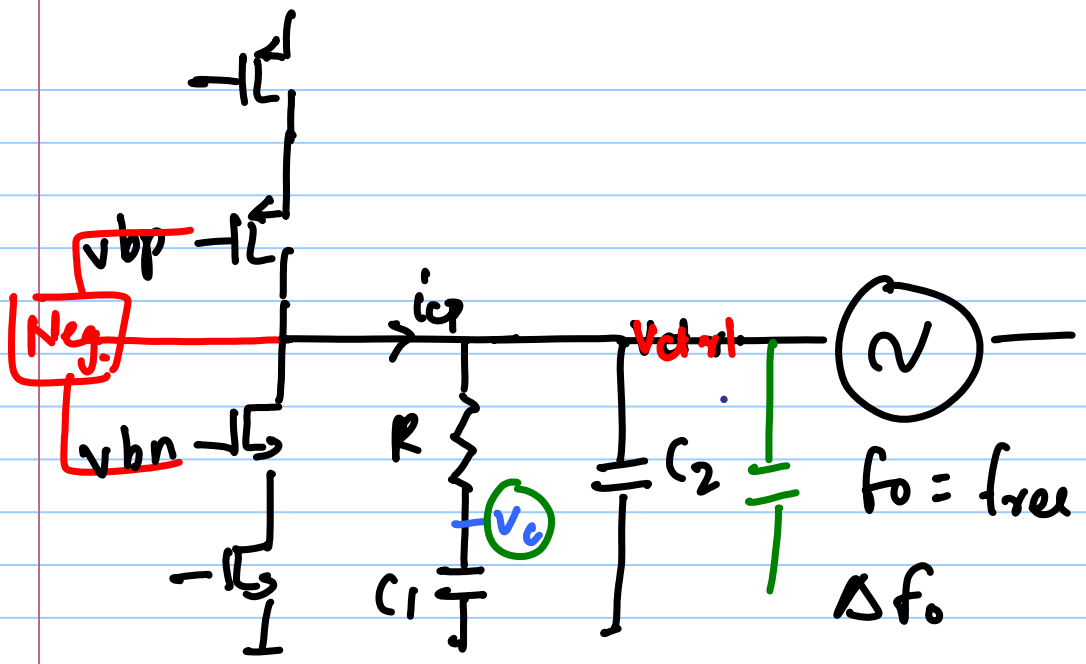


X, X/2

I_{cp}, $I_{cp}/2$

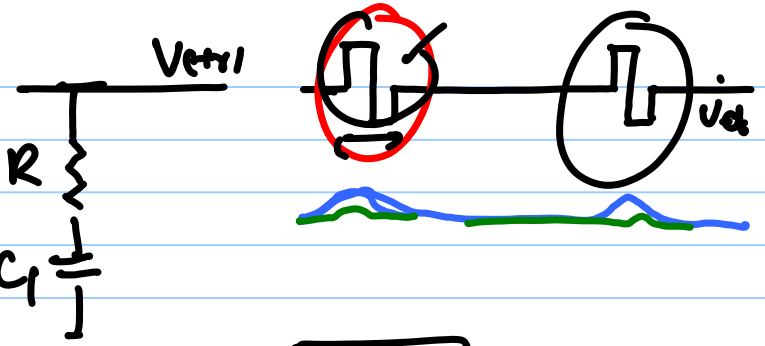


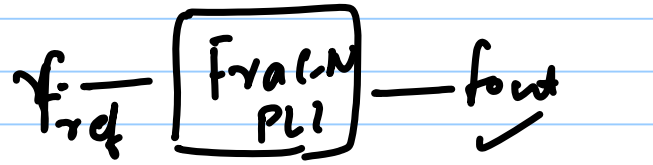

$\overline{UP}$
M_3
vbp
M_2
I_{cp}
V_{ctrl}
R
C_2
C_1
10Ω - 1000Ω
I_{cp}
V_{ctrl}
$\pm\Delta$
C_1
C_2
$2\left(\frac{1.0}{0.06}\right)$
I_{cp}
$2\left(\frac{4.0}{0.24}\right)$
I_{cp}
C_{gd1} < C_{gd2}
V_{gs}
I_o
g_m
g_{ds}
g_m
I_o
L
R_O
I_o
R_L



$f_o = f_{rest} + K_{VCO} V_{ctrl}$

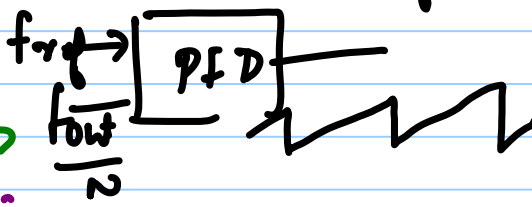
Δf_o

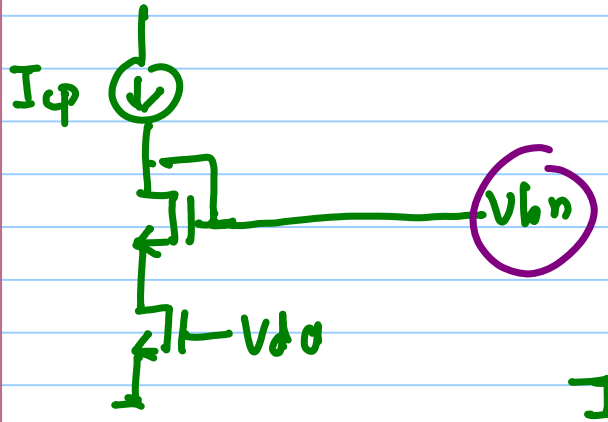


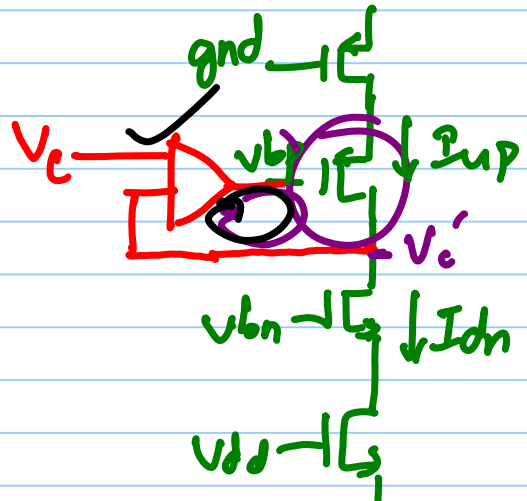


$f_{out} = (N+\alpha) f_{ref}$

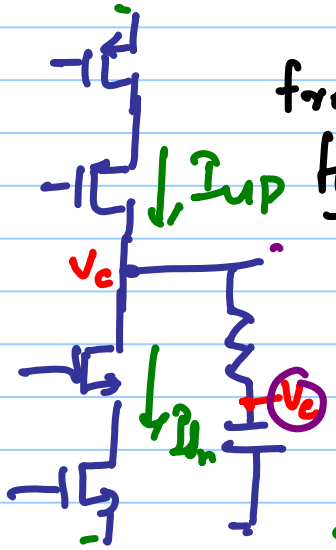
$= 4.25 \; f_{ref}$







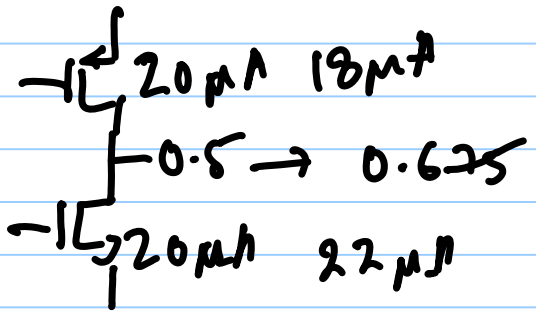
$I_{up} = I_{dn} \neq I_{cp}$



$I_{up} = I_{dn}$.

$V_c = 0.5$ $\pm 0.25V$ 0.675

$f_{out} = 2.5\ GHz$ $\pm 0.5\ GHz$. $2.75\ GHz$



$I_{up} = I_{dn}$

Differential CP