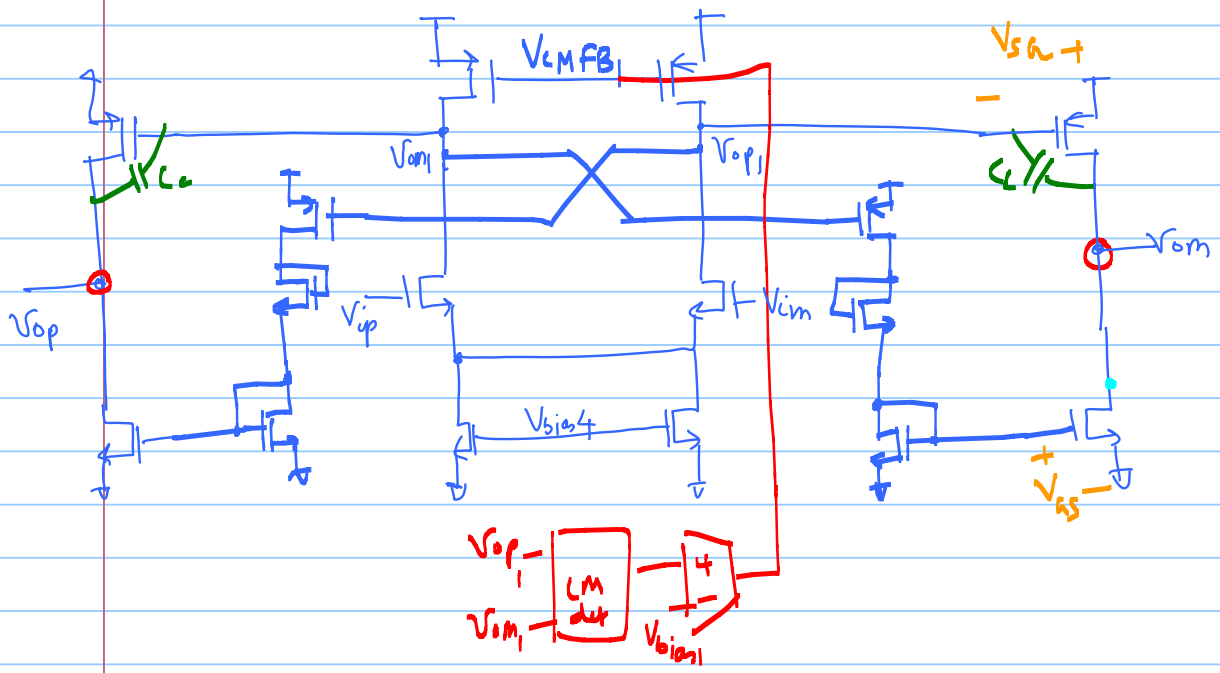
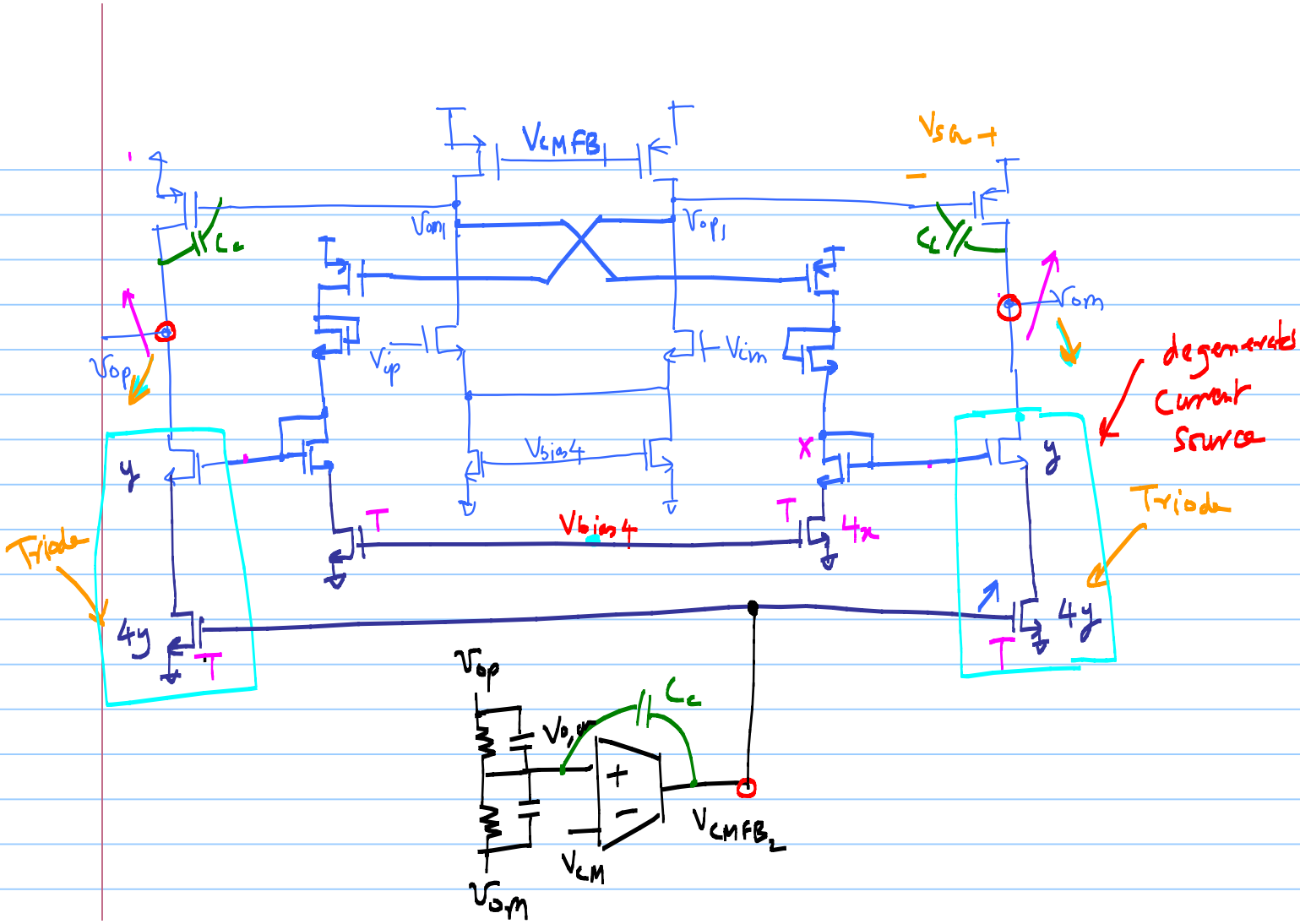
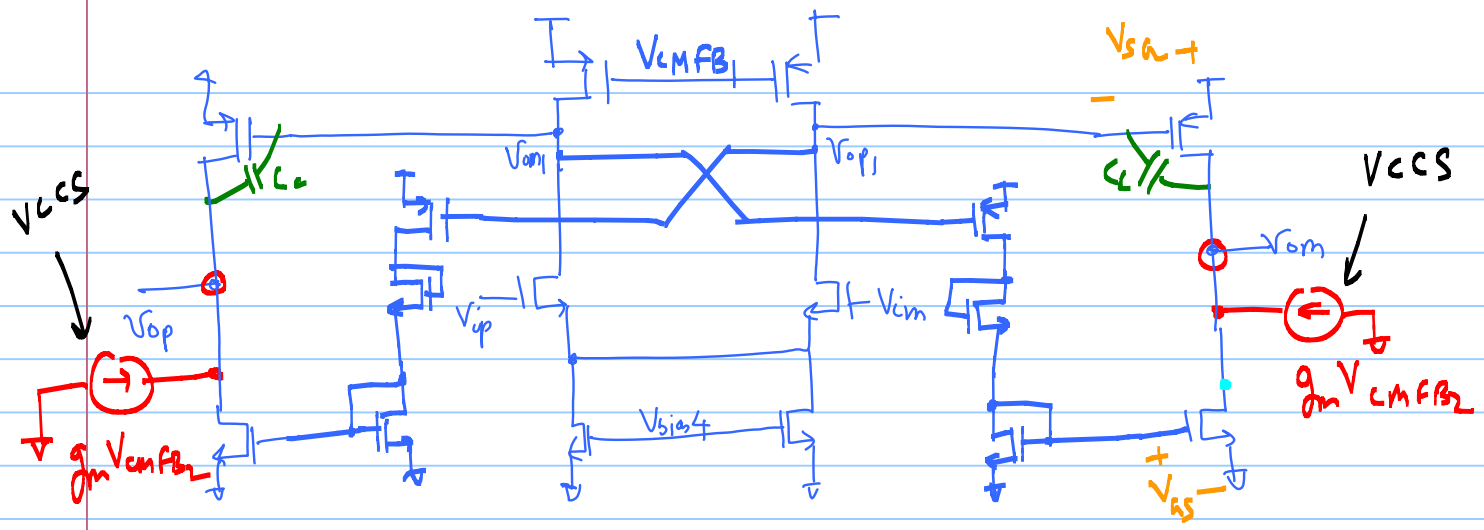
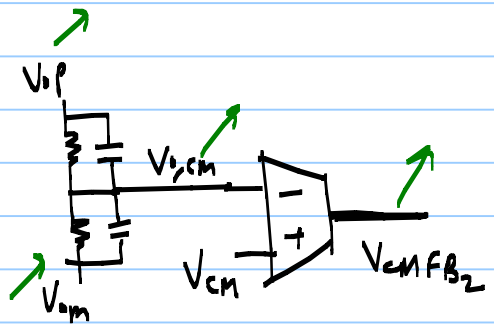
ECE 614 – Lecture 6

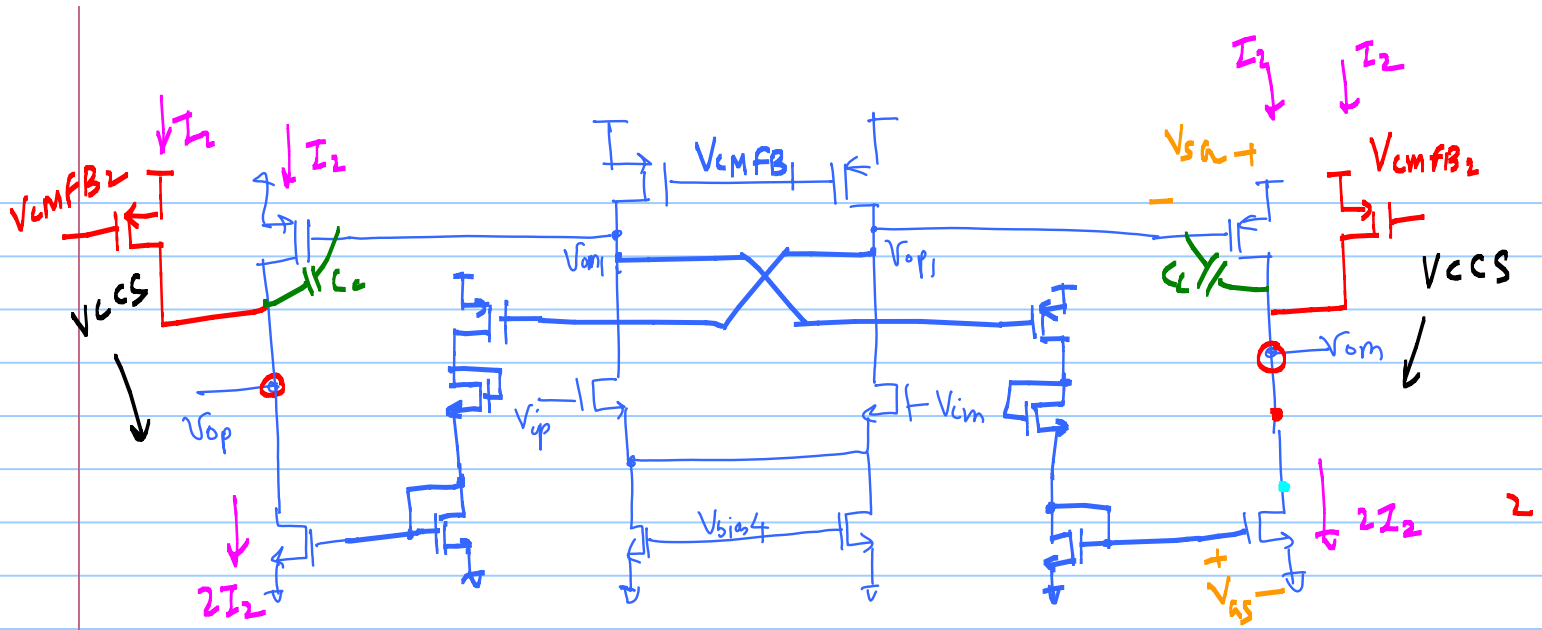
Note Title 9/13/2012

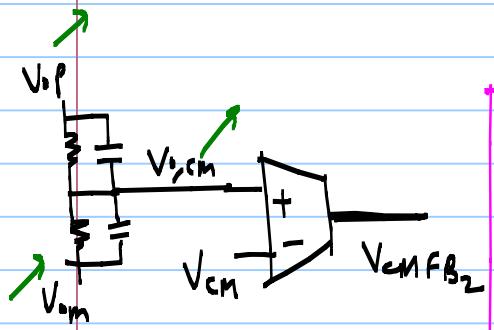


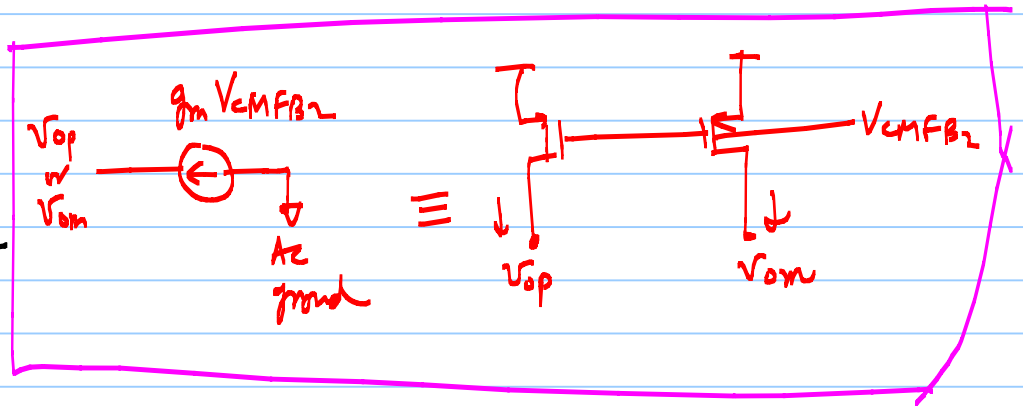

VCMFB
Vop1
Von1
Vip
Vin
Vbias4
Vop
Von
Cc
degenerated
Current
Source
Triode
Triode
y
4y
x
4x
T
VCMFB2
VCM

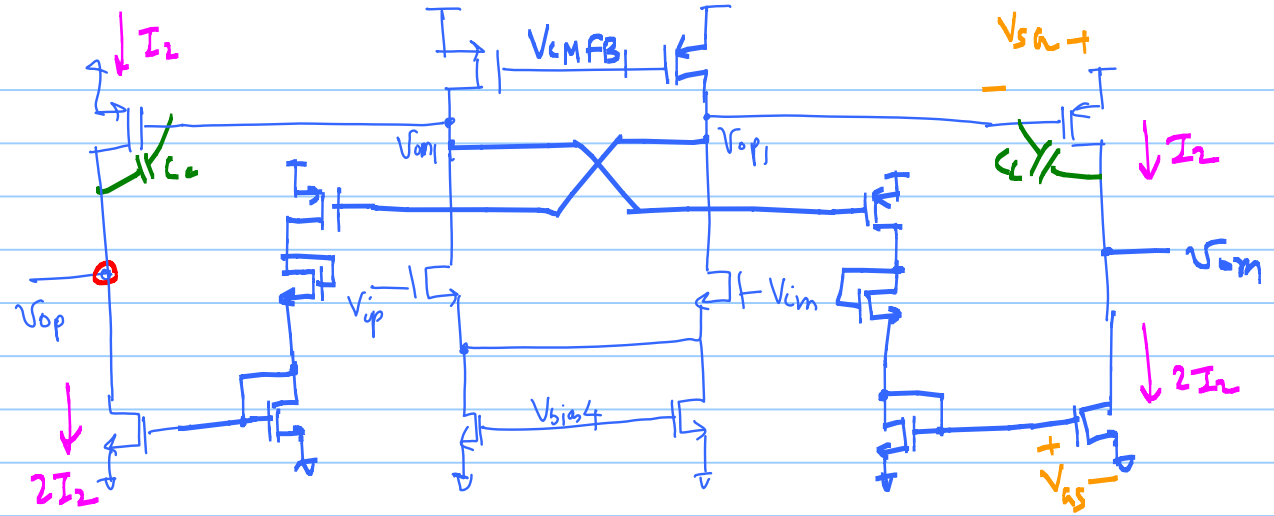

VCMFB
VCCS
Vop
gm VcmFB2
Vom1
Vop1
Vip
Vim
Vbias4
VSG+
VCCS
Vom
gm VcmFB2
VSG-


Vop
Vo,cm
Vom
Vcm
VcmFB2

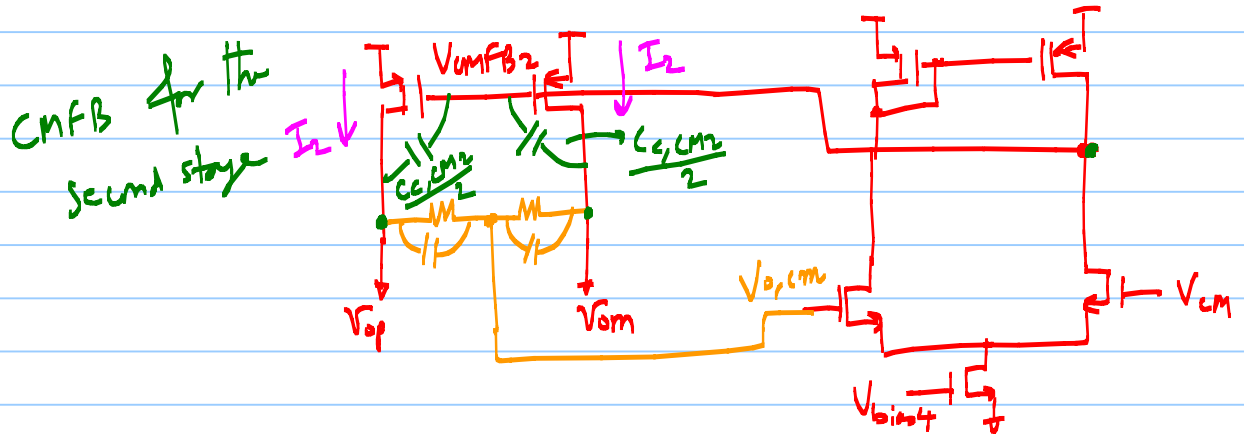

V_{CMFB_2}
I_2
I_2
V_{CMFB_1}
V_{CMFB_2}
V_{GS}
V_{CCS}
V_{CCS}
V_{op}
V_{om}
V_{op}
V_{om}
V_{ip}
V_{im}
V_{bias4}
$2I_2$
$2I_2$
V_{GS}


V_{op}
$V_{o,cm}$
V_{om}
V_{CM}
V_{CMFB_2}

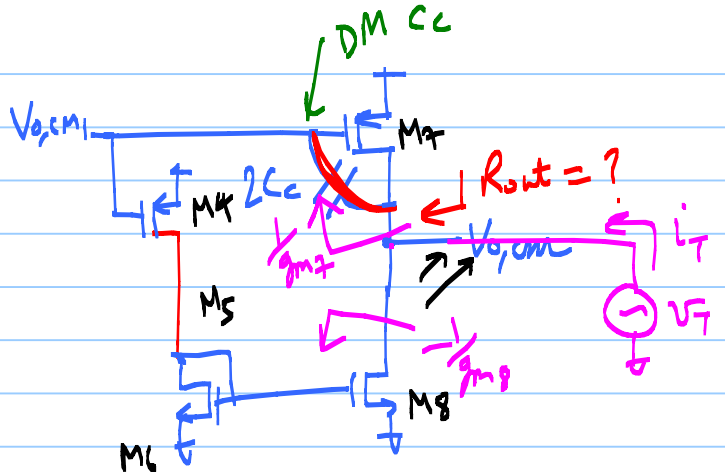

V_{op} or V_{om}
$g_m V_{CMFB_2}$
AC ground
≡
V_{op}
V_{om}
V_{CMFB_2}



CMFB for the second stage



CM circuit for the 2nd stage



@ high frequencies C_c shorts

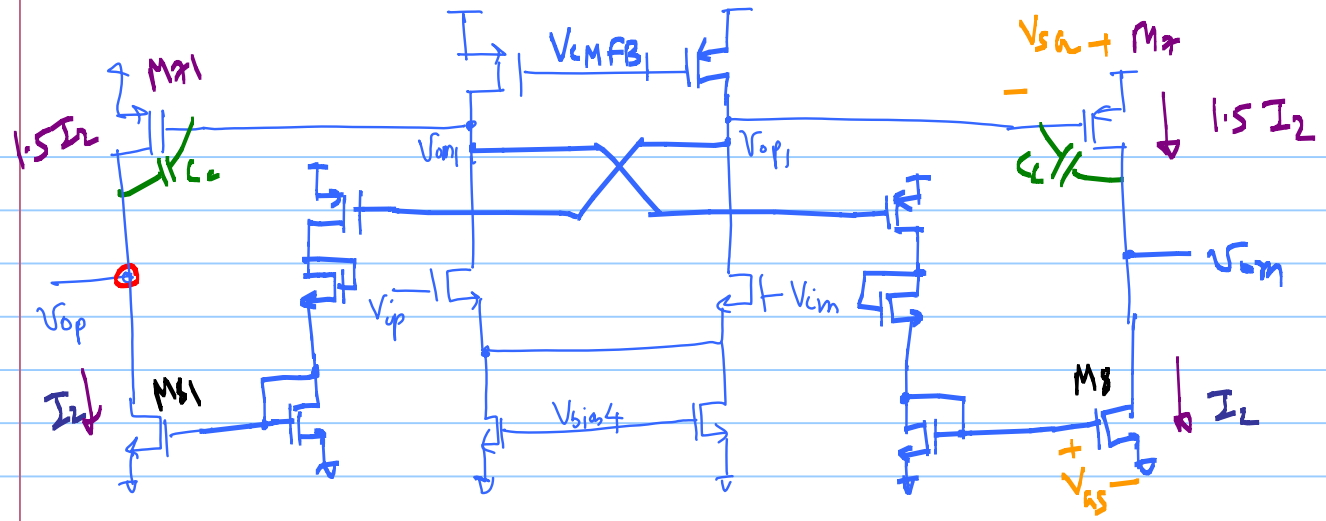
for $g_{m7} = g_{m8}$

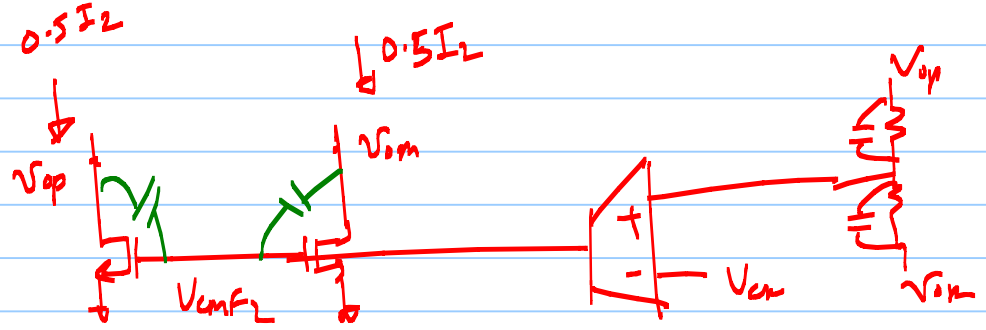
$Re(R_{out}) < 0$ ⇒ +ve feedback

↳ leads to instability

$$g_{m7} \neq g_{m8}$$

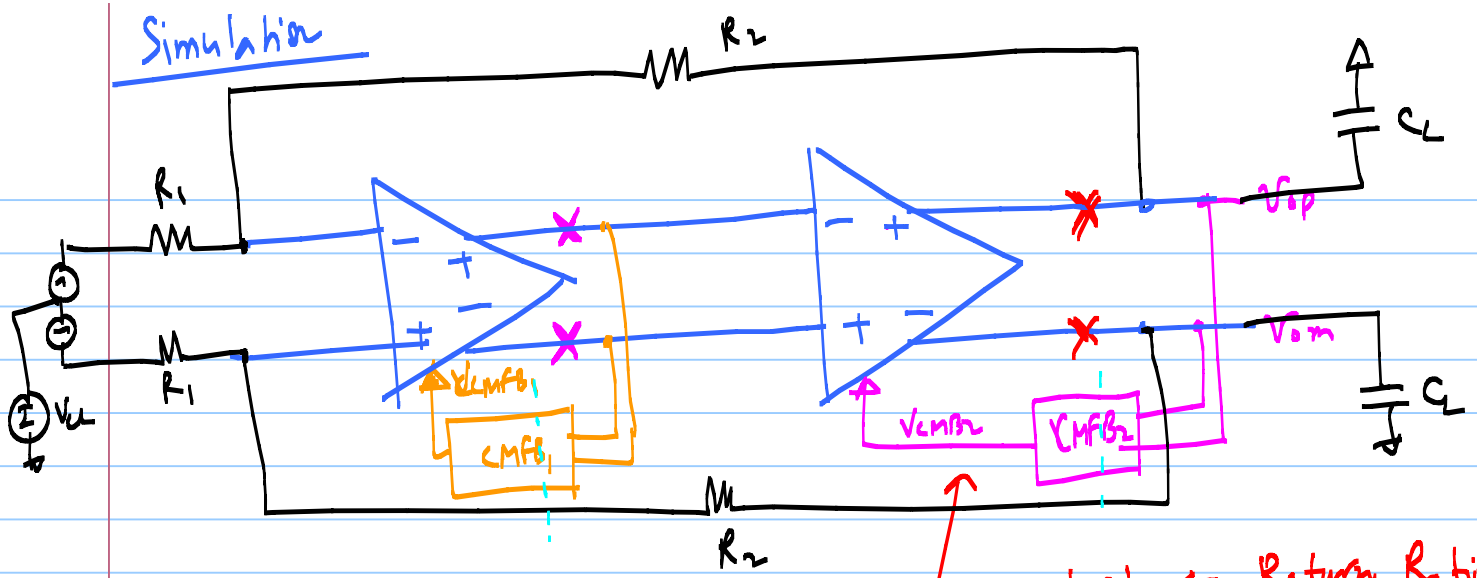
$$g_{m7} = 2\, g_{m8}$$


VCMFB
M11
1.5I2
Cc
Vom
Vop1
Vop
Vip
Vin
I2
M81
Vbias4
M8
1.5 I2
Vom
I2
+
Vgs
-


0.5I2
0.5I2
Vop
Vom
VcmF2
Vcm
Vop
Vom

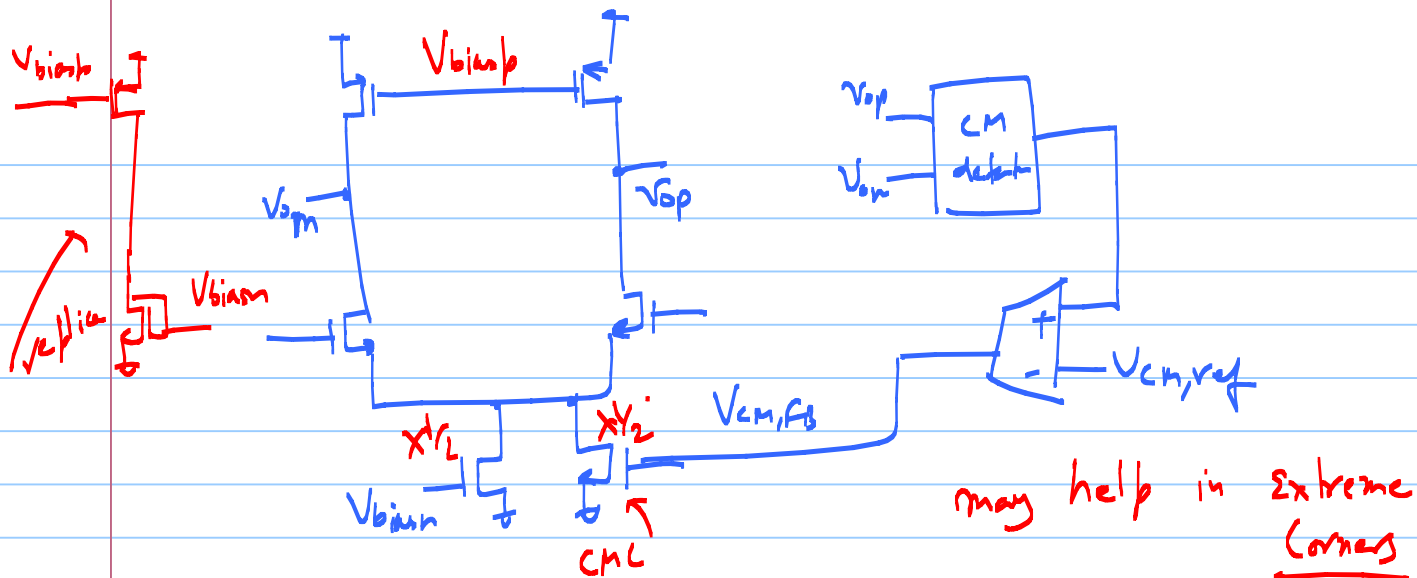
Rout >0

Simulation

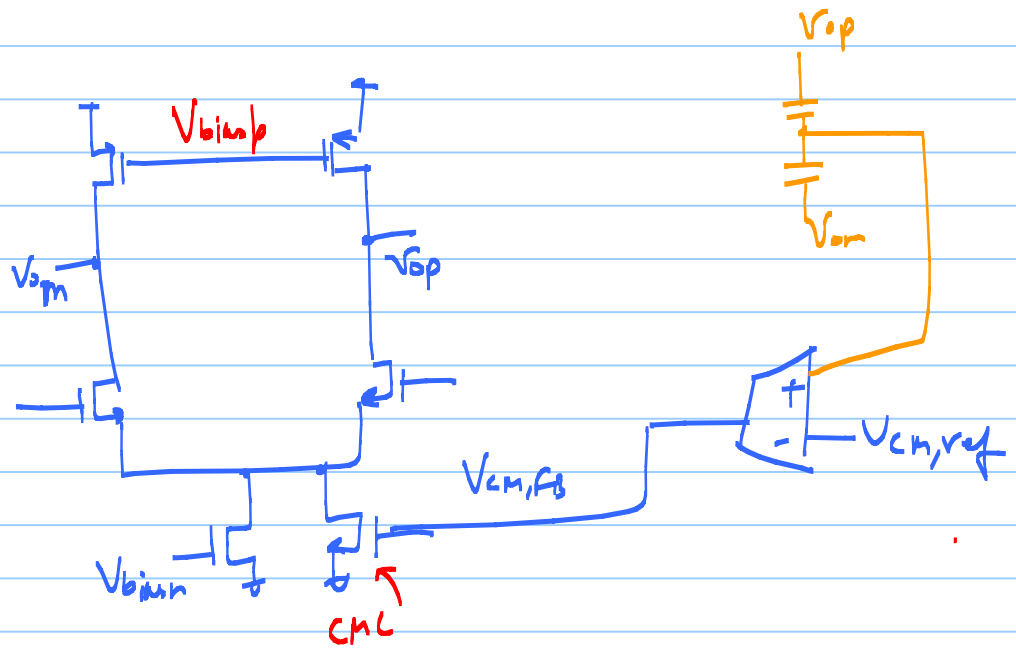


CMDM probe ← Return Ratio Analysis

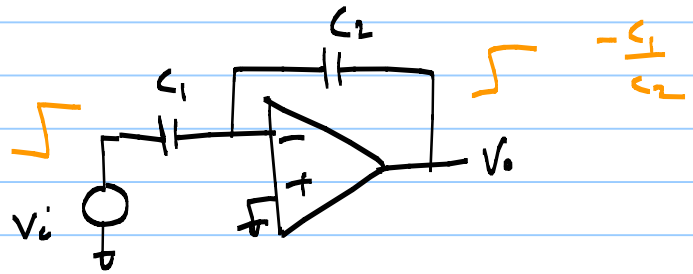
Break both CM & DM loops



may help in Extreme Corners

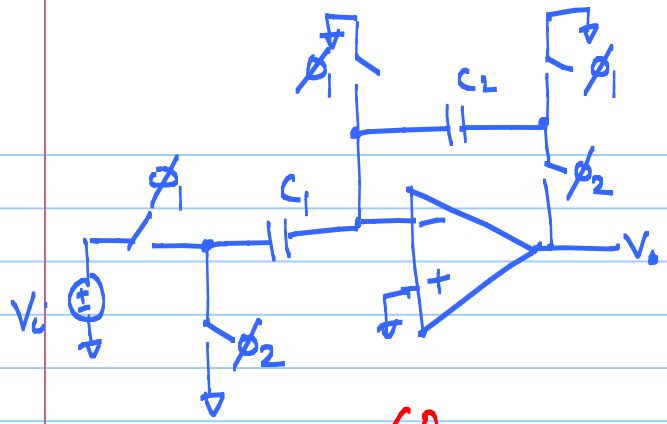

Vop
Vbiasp
Vom
Vop
Vom
Vcm,fb
Vcm,ref
Vbiasn
CMC

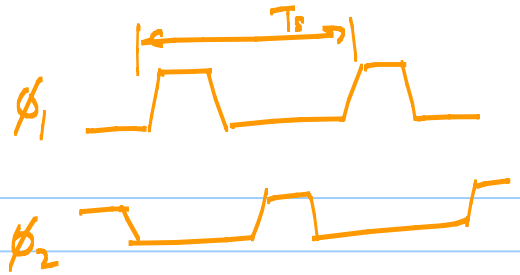
Introduction to Switched Capacitor Amplifier.

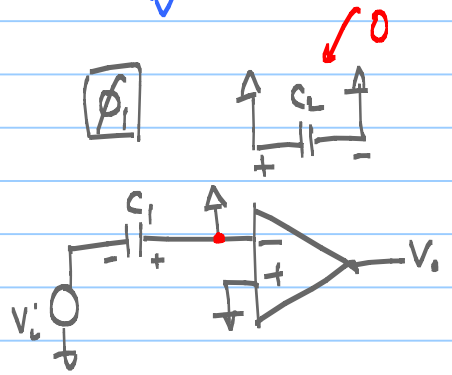


$-\frac{C_1}{C_2}$

No DC feedback path

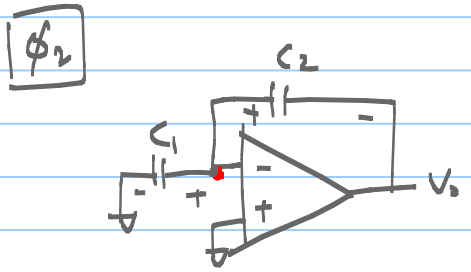






V_i is sampled on C_1

$Q_i = -V_i C_1$



$Q_f = 0 \cdot C_1 + V_o C_2 = -V_o C_2$

charge is transferred from C_1 to C_2

$$Q_i = Q_f$$

$$\Rightarrow \boxed{\frac{V_0}{V_i} = -\frac{C_1}{C_2}}$$