MidTerm 2 – Review Session

Note Title 4/9/2011

Chapter 21 → Amplifiers

→ CS, CS – source degeneration
cascode amplifier

CG → current buffer

SF → level shifting

Input impedance

* Miller Effect

* Analyze simple AC equivalent circuit
  - ↳ transfer function

* frequency response of CS amplifiers
  - ↳ pole-splitting
  - ↳ RHP zero

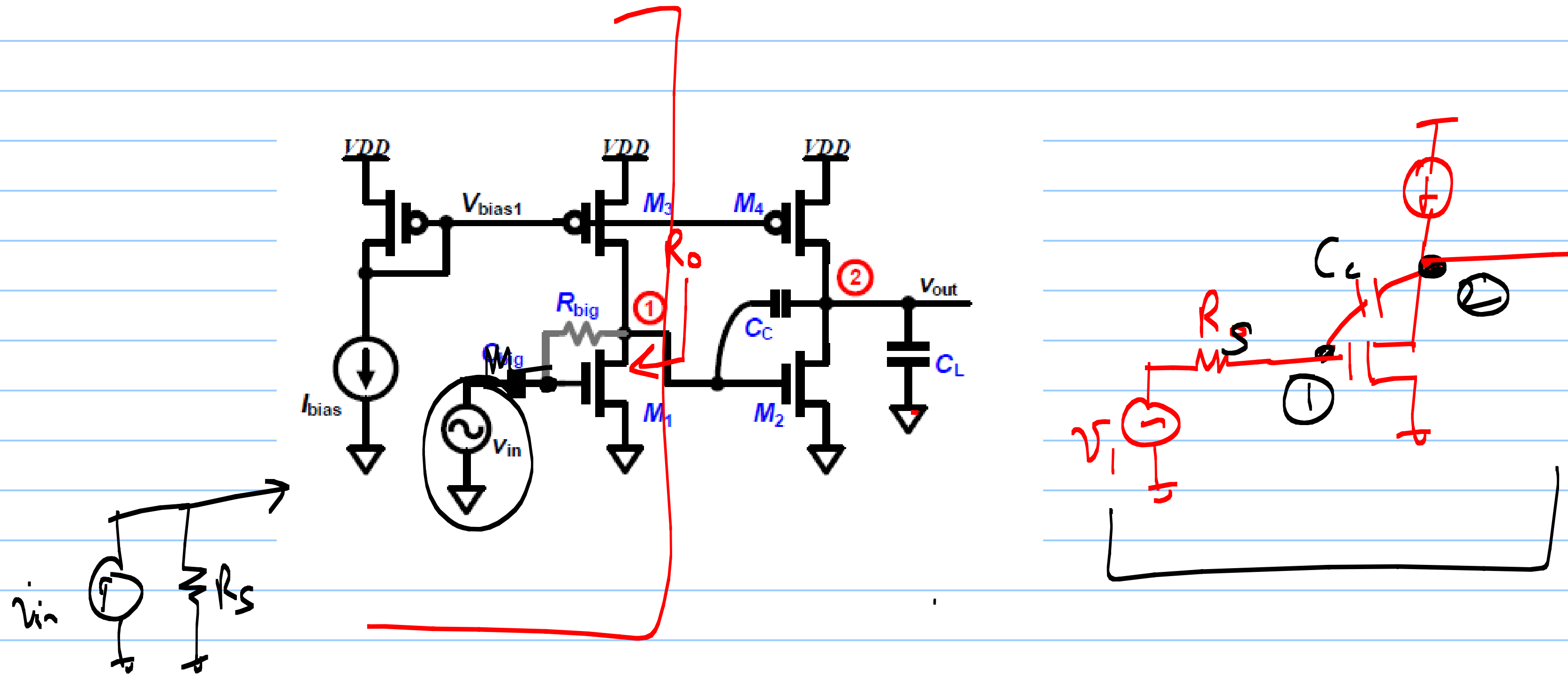
* Dominant pole compensation → ω_u, f_u
  - ↳ Bode Plots

* Cascode CS amplifier
  ↳ poles, (Miller approximation).

* Class-A ← slew limitation

* Class AB → output buffer (floating current mirror biasing)
  (Push-pull amplifier)

⇒ HW6, HW7, HW8


VDD
VDD
VDD
Vbias1
M3
M4
Ro
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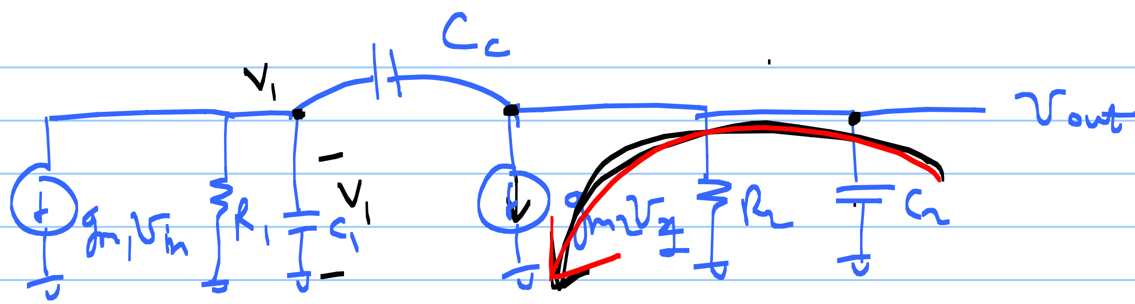
1
2
vout
CC
CL
Ibias
M1
M2
vin
vin
Rs
Cc
Rs
v1
1
2



$(-)$

RHP zero

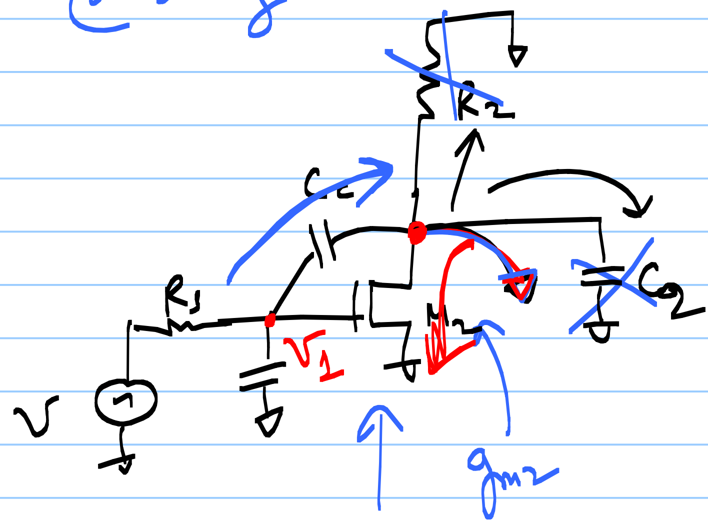
$$H(s) = \frac{\left(1 - \frac{s}{\omega_z}\right)}{D(s)} = 0$$

$$s = s_z \leftarrow j\omega_z$$

$$\frac{v_{out}}{v_{in}}(s_z) = 0$$

@ $s = s_z$

$s = s_z \leftarrow j\omega_z$



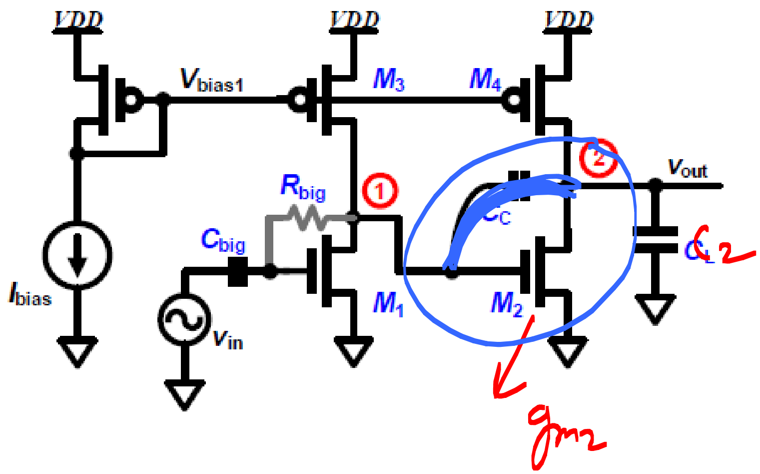
$$\left.\frac{v_1}{1/sC_c}\right|_{s=s_z} = g_{m2} v_1$$

$$\Rightarrow \quad \cancel{v_1}\, s_z C_c = g_{m2} \cancel{v_1}$$

$$\Rightarrow \boxed{s_z = \frac{g_{m2}}{C_c}}$$

$j\omega_z$

$$|\omega_z| = \left|\frac{g_{m2}}{C_c}\right|$$



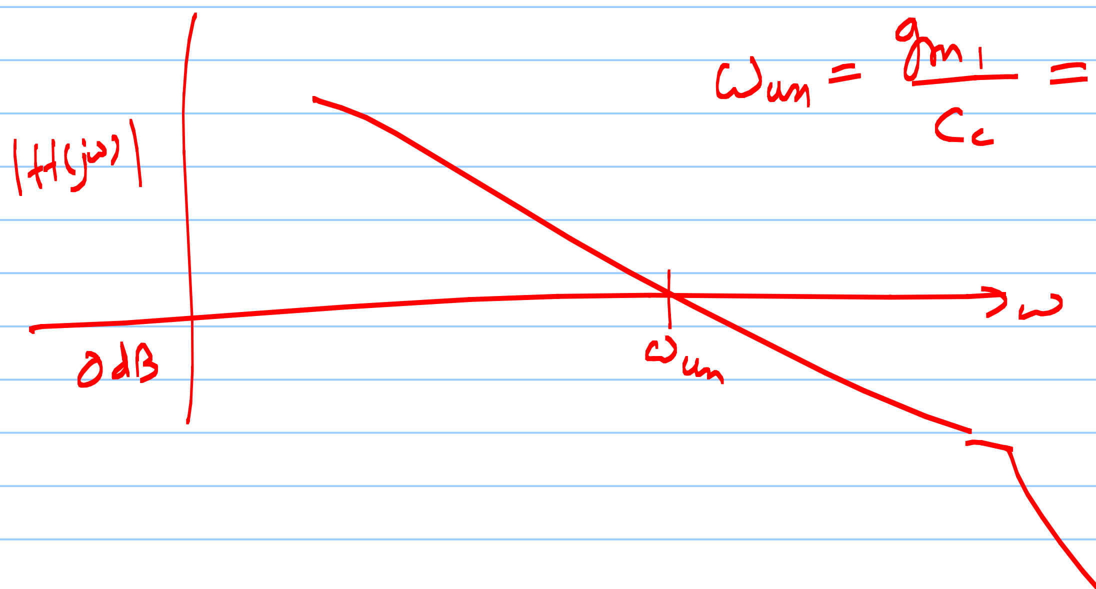
$$\omega_{p2} \simeq \frac{g_{m2}}{C_2}$$

$$= \frac{1}{\underbrace{R}_{1/g_{m2}} C_2} = \frac{g_{m2}}{C_2}$$

$$H(s) = \frac{A_{v0}}{\left(1 + s/\omega_{p1}\right)} \simeq \frac{A_{v0}}{s/\omega_{p1}} \qquad s \gg \omega_{p1}$$

$$= \frac{\omega_{p1} \cdot A_{v0}}{s} = \frac{\omega_{um}}{s}$$

$$\omega_{um} = \frac{g_{m1}}{C_c} =$$



⇒ Class A ⟶ +ve slew rate limitation

$\sim \dfrac{I_{bias}}{C_L}$

no −ve slew rate limitation