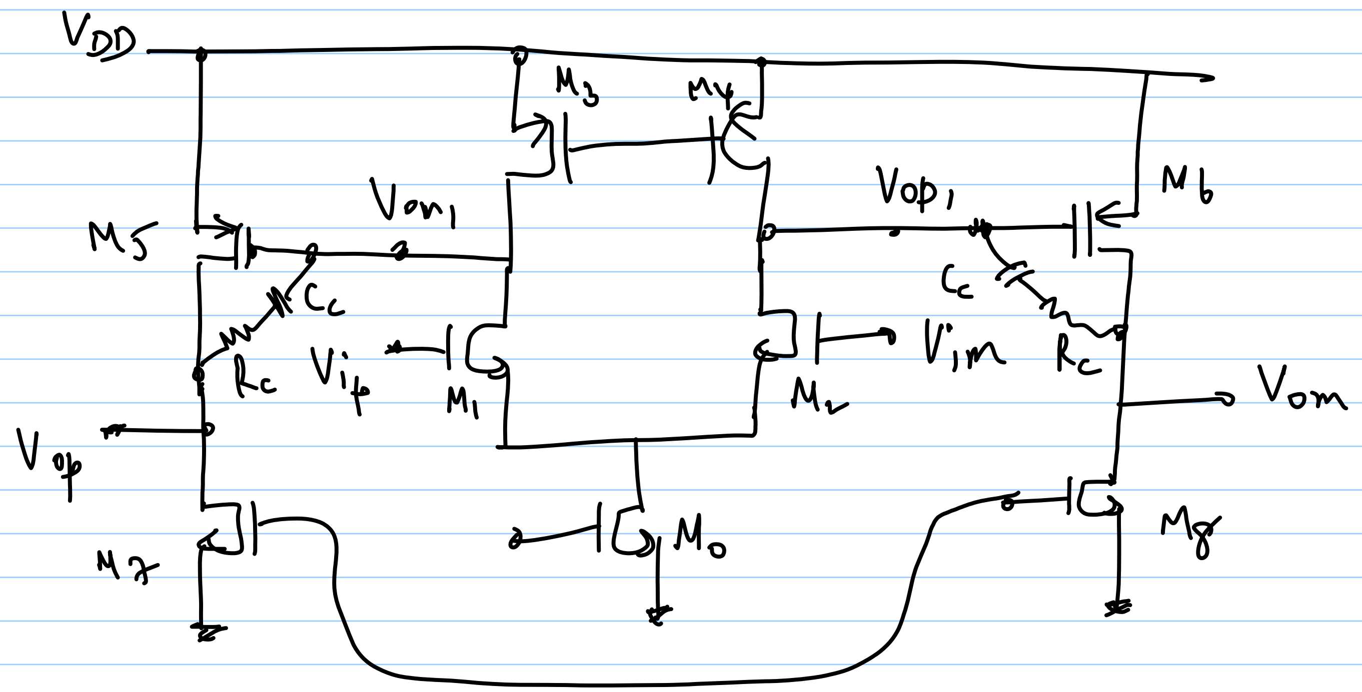
14-3-13

Lec 37

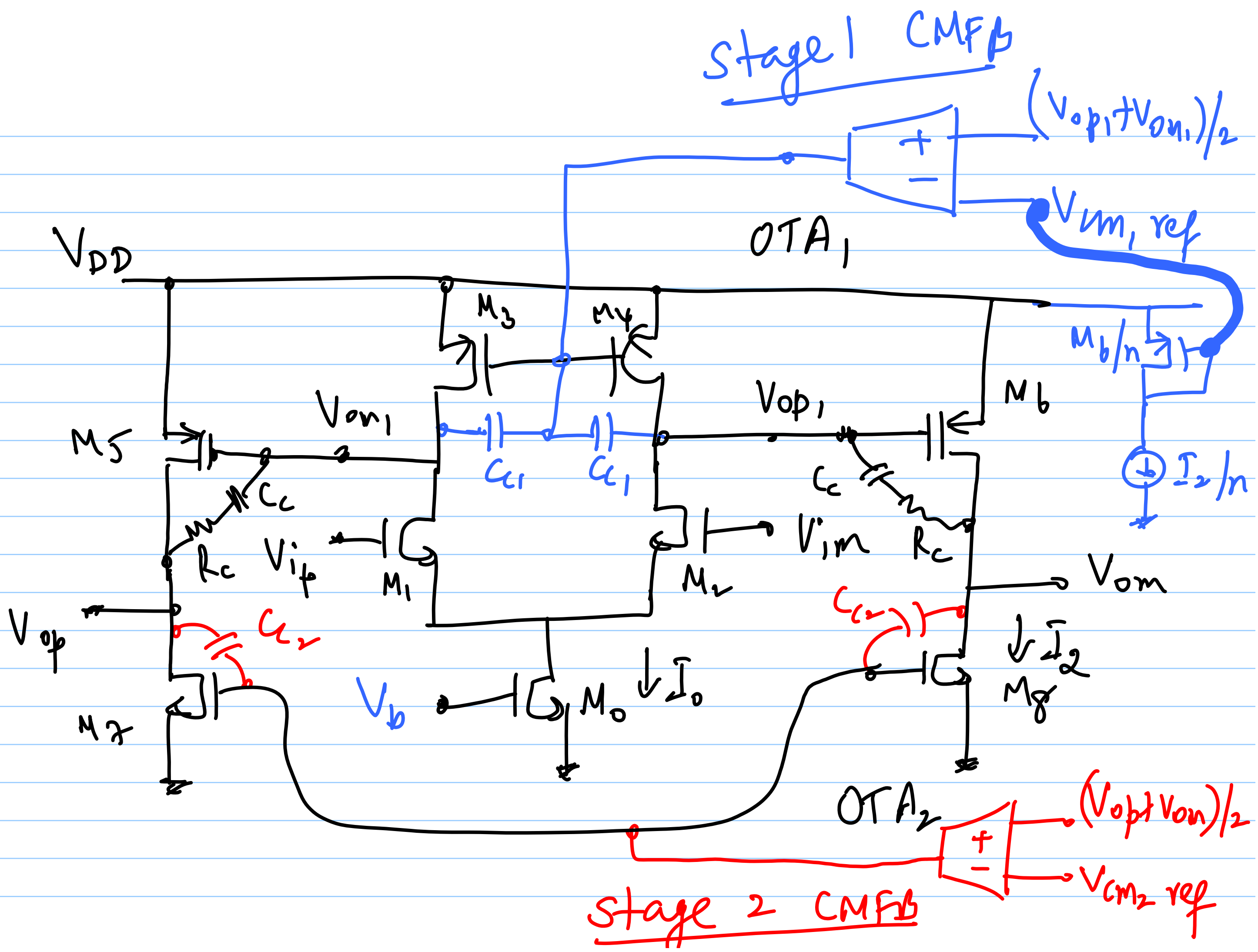
Two-stage Fully-differential Opamp



* V_{ocm1} ← control gates of M_0 or M_3/M_4

* V_{ocm2} ← control gates of M_7/M_8 or gates of M_3/M_4 or gate of M_0

M_5/M_6 – pseudo diff. pairs & have CM gain



* $V_{cm1,ref} = V_{DD} - V_{SG5}\big|_{I_2}$

* $V_{cm2,ref} \simeq V_{DD}/2$ for max swing

Separate CMFB

Stage 1

* Control gates of M_{34}
* Set $(V_{op1}+V_{om1})/2 = V_{DD} - V_{SG5}\big|_{I_2}$

  $= V_{cm1,ref}$

* Use CM detector which is non-resistive

Stage 2

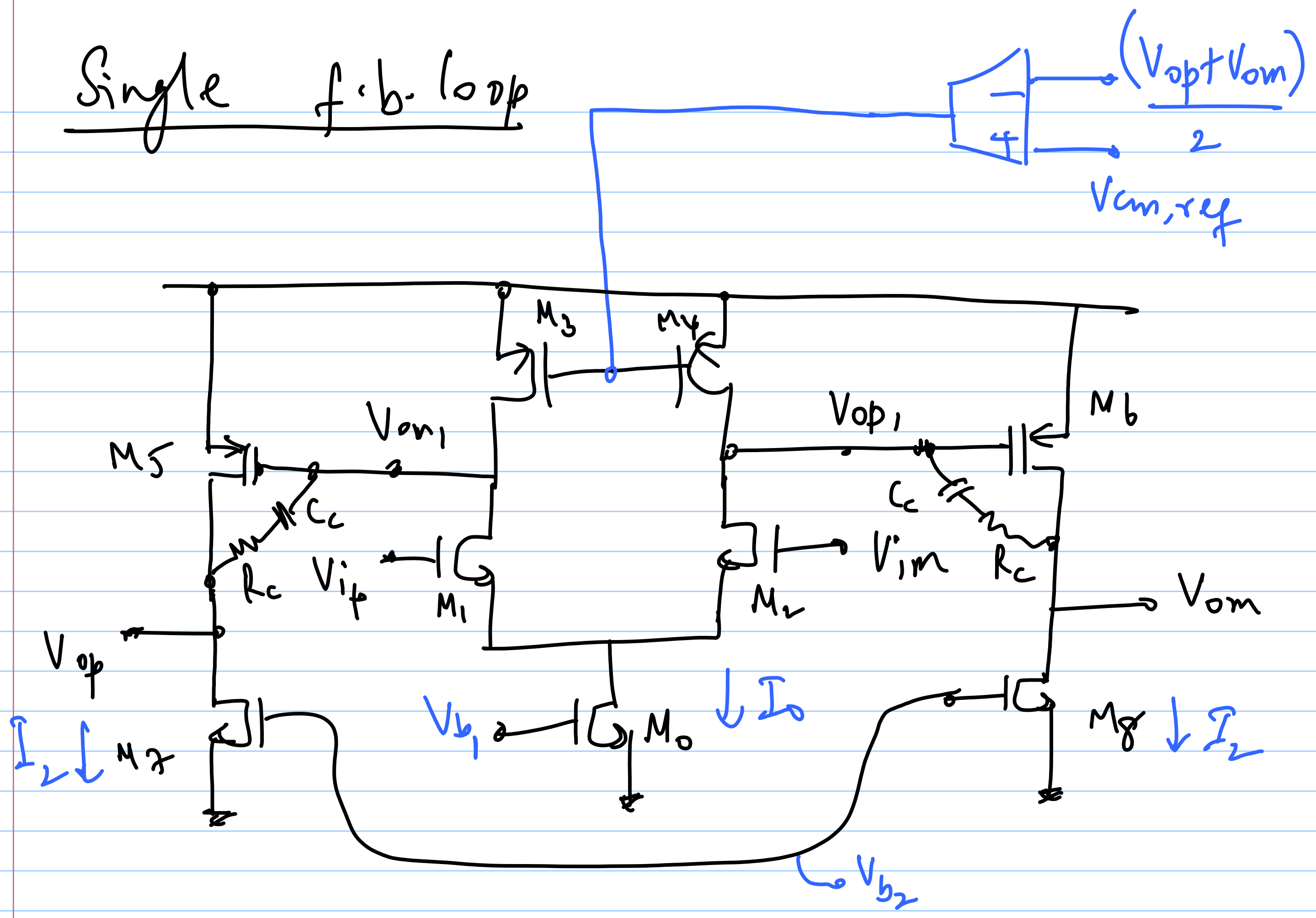
* $V_{cm_2,ref} = V_{DD}/2$
* resistive CM detector

Common

* Compensation
* Use 1-stage opamps in CMFB 1&2
* OTA_1 – nmos input pair w/ pmos load

  OTA_2 – pmos input pair w/ nmos load

Single f.b. loop



Single f.b. loop

* 3 stages in feedback, lots of gain ⇒ harder to stabilise
* Reduce OTA gain
  - use diode connected loads
* C_c — can be designed to stabilise CMFB loop as well.