

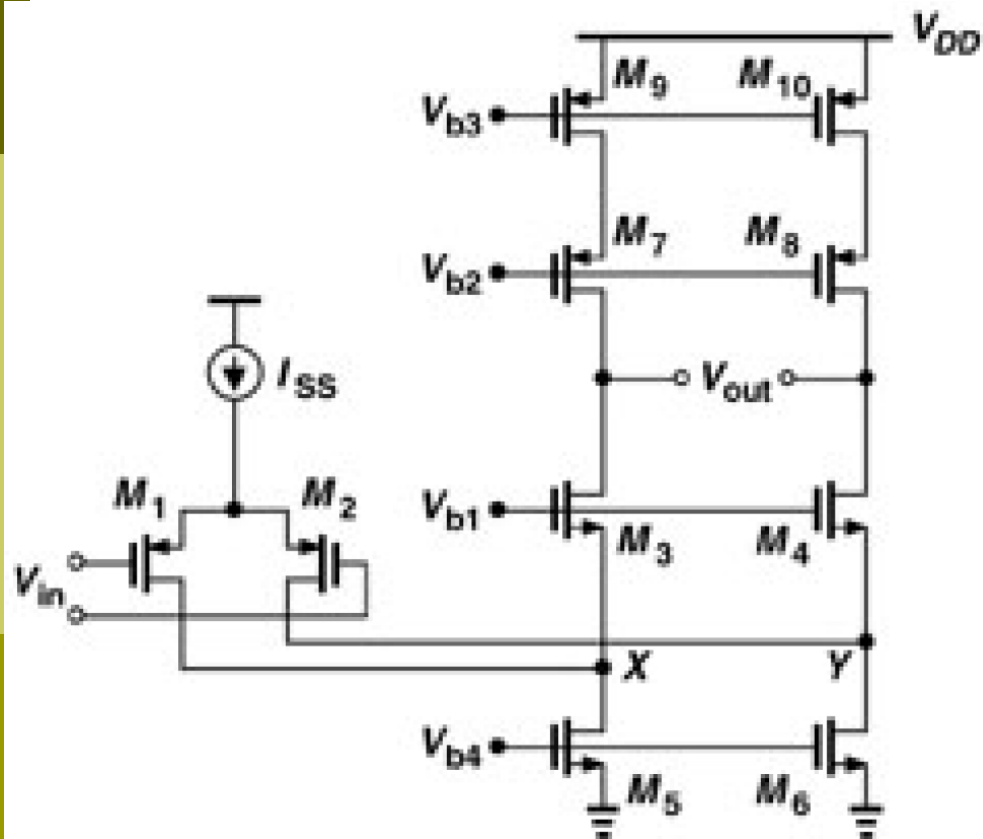
# AIC\_HW3



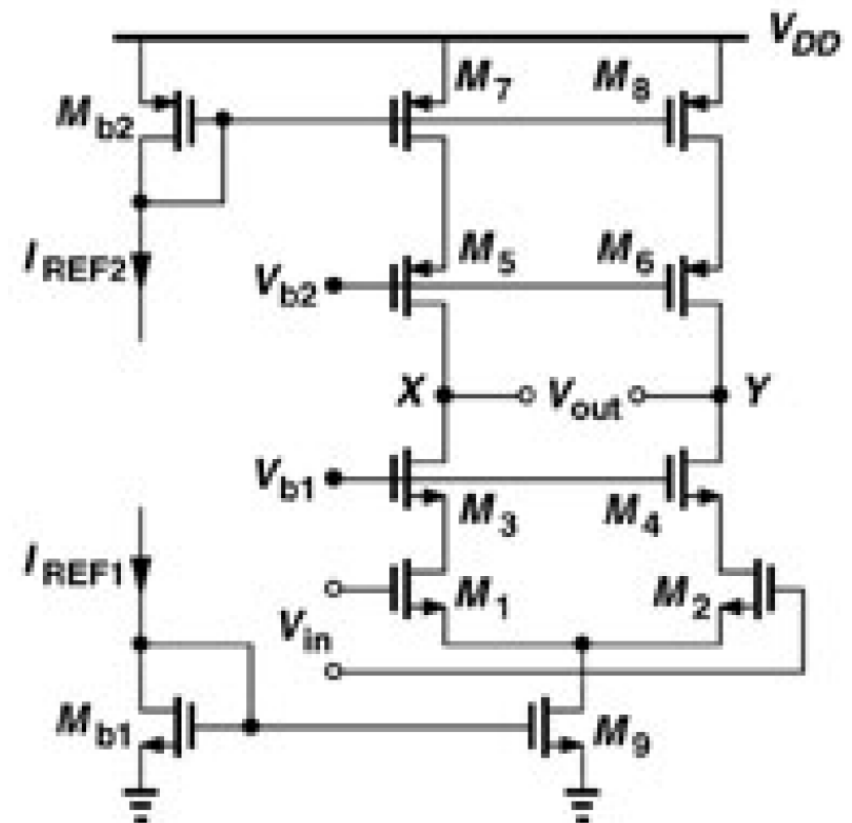
2023/11/26 ~2023/12/13

Fully differential OP

# Two fully differential OP Amps



1. Folded-cascode OP



2. Telescopic OP

# Design Specification

Simulation with 5 corners:  
TT, FF, SS, SF, FS

- Both **folded-cascode OP** and **telescopic OP** operate in **Temp=50**, with supply voltage  **$V_{DD}=3.3\text{ V}$**  and **1 pF** output loading.
- Use any bias circuit you have designed in HW2.

Parameter	Folded-cascode OP	Telescopic OP
DC Gain	> 80 dB	
Power Consumption (OP only)	< 1mW	
GBW	> 50 MHz	
Phase Margin	> 60 deg	
PSRR	>70dB	
CMRR	>80dB	
Output Swing	>2V	
Slew rate	> 20 V/ $\mu$ s	

# Design Parameters

- ❑ List all the design parameters of **folded-cascode OP** and **telescopic OP** in your report. (2 lists in total)
- ❑ Device list
  - MOS → 3.3V MOSFET

MOSFETs				
Name	Type (P or N)	Width	Length	Multiple
$M_1$				
:				
$M_{10}$				
$M_{b1}$				
$M_{b2}$				

# Detail

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## □ Homework3

- Design the fully differential OP to meet the spec.

- **Use any bias circuit you have designed in HW2**

## □ Your upload file must include

- 1. Report (.pdf), including the followings
  - (i) All the design parameters
  - (ii) Simulation results (With PVT variations and explain, AC response is required)
  - (iii) Comparison of the folded-cascode OP and telescopic OP (You can analyze the advantages/disadvantages of them)
  - (iv) Discussion (You can derive the formula by hand and compared the results with the simulated result and explain it.)
- 2. Spice file (.sp)

# Detail (con't)

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- 作業請上傳到E3
  - Title: 學校\_學號\_hw3 (ex: NCTU\_0123456\_hw3)
- Your upload file must include (一律上傳壓縮檔)
  - Report (.pdf)
  - Spice file (.sp)
- 遲交分數會打折，不可抄襲
- Deadline: 2024/12/13