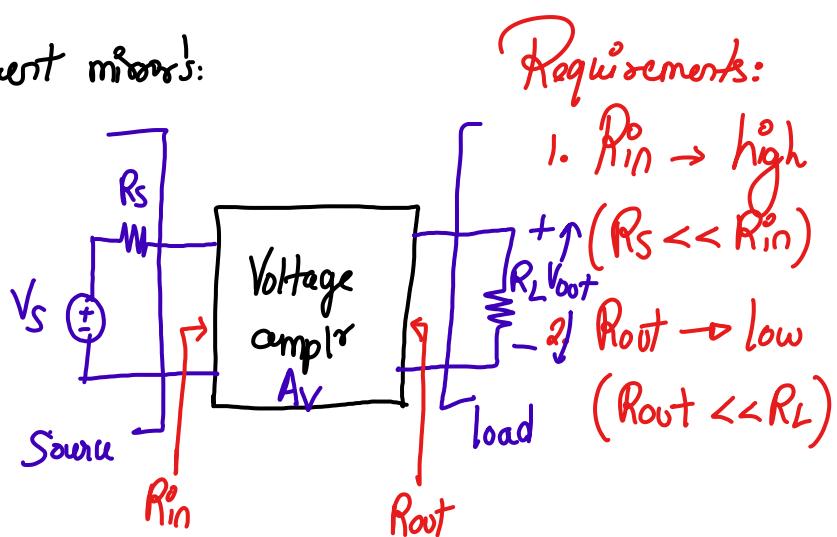


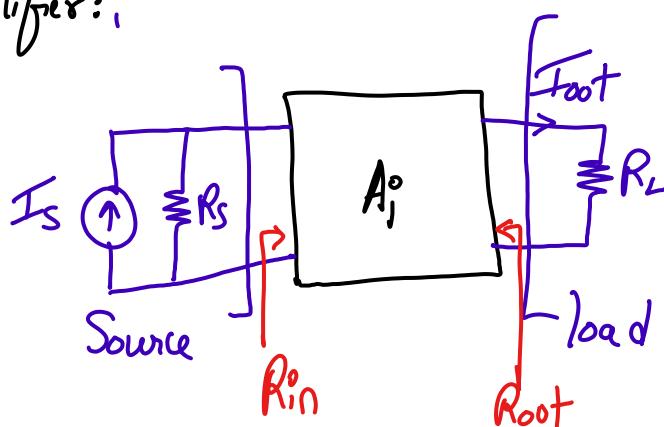
Module 5.2 : Current mirrors

Pre-requisites for current mirrors:

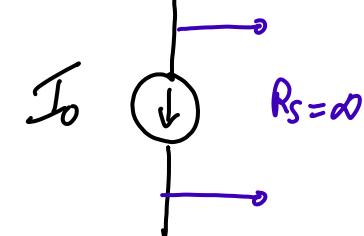
① Voltage amplifier



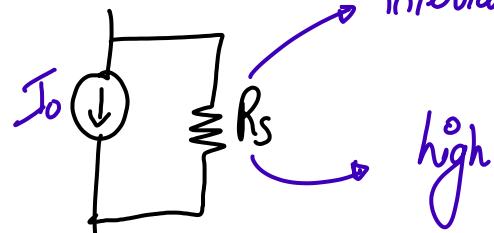
② Current amplifier:

 $I_{out} \propto I_s$ ③ Ideal Current amplifier $\rightarrow R_{in} \rightarrow 0$ $\rightarrow R_{out} \rightarrow \infty$

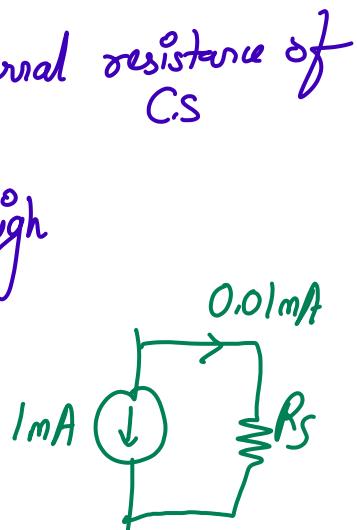
④ Ideal Vs Practical Current source:



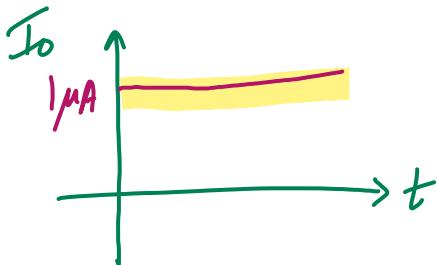
A) Ideal C.S



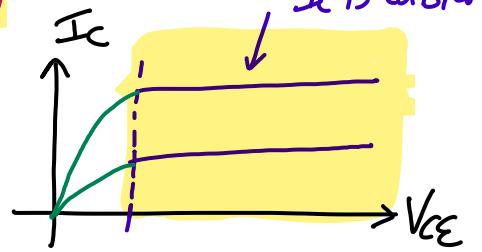
B) Practical C.S



internal resistance of CS

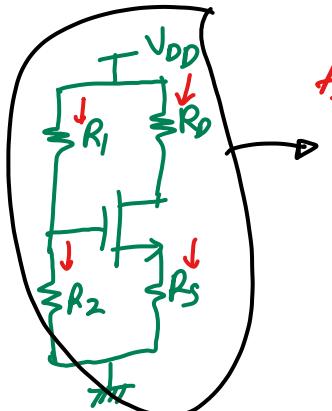


c) A current source should provide constant current



Why use current sources?

- 1 Current source biasing \rightarrow eliminates the need of resistor-intensive biasing

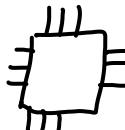


$$A_V = -g_m R_o$$

Discrete circuits

R, L, C

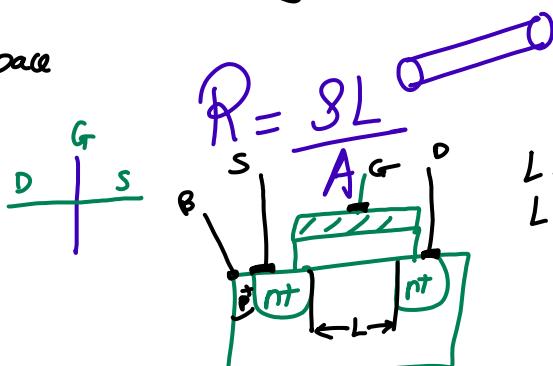
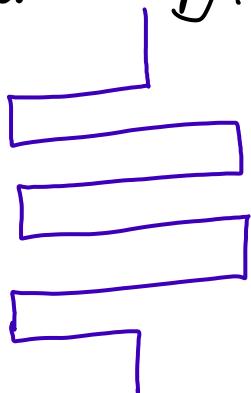
Integrated circuits (IC)



1 million transistors

- 2 Current-source are used for biasing transistor's (in Integrated circuits)
- 3 Why are resistors not preferred in Integrated circuit

a) Resistors occupy large space in IC



$$L = 5 \text{ nm}$$

$$L = 5 \times 10^{-9} \text{ m}$$

Human hair
diameter: 50 - 100 μm

- 4 Why MOSFET's are preferred in IC?

Length - 180 nm \longrightarrow 5 nm

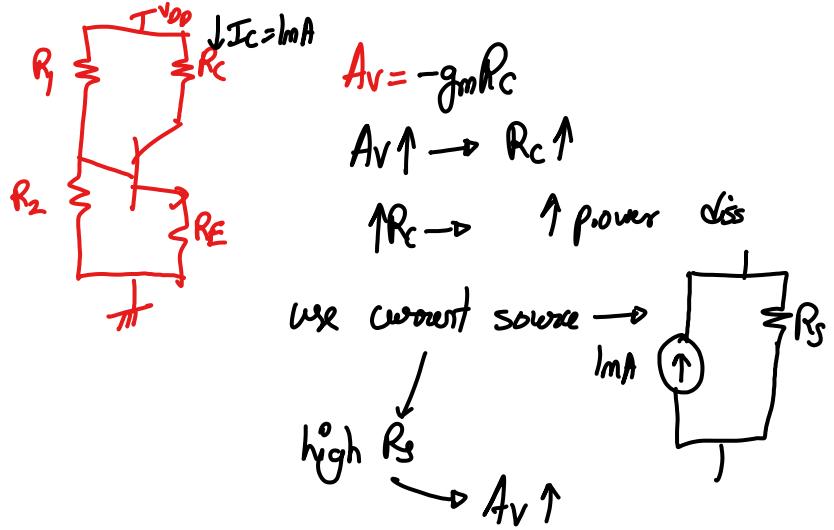
Scalable
easier to fabricate in IC's

a) with matched or identical parameters

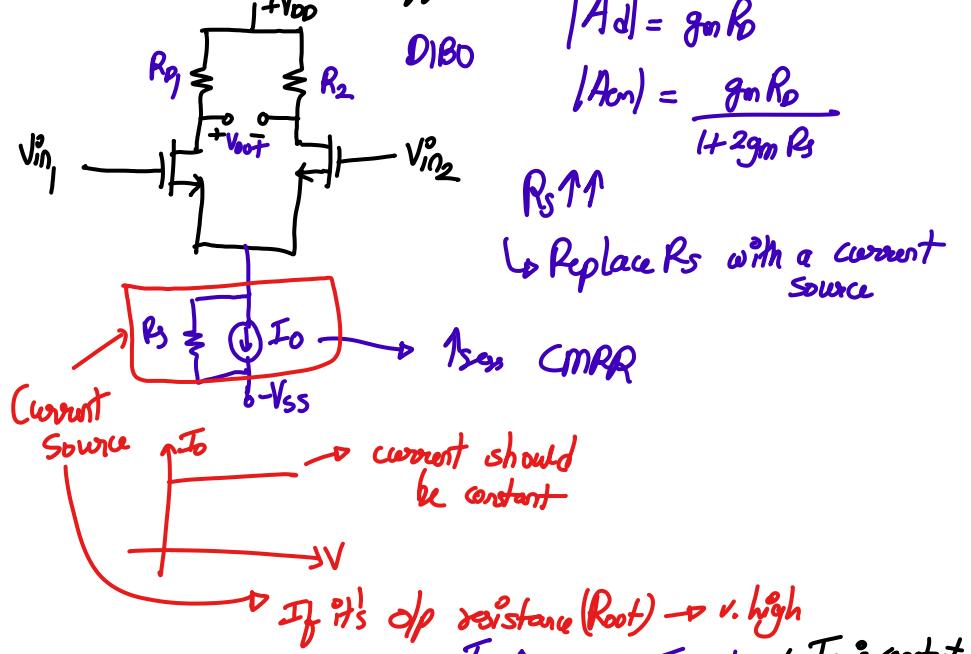
$$M_1 \quad M_2$$

$$V_{t1} = V_{t2}$$

$$R_{n1} = R_{n2}$$



Use of current source in diff amp



MOSFET current sources:

