Unit-1

Lecture -1

Current Mirrors using BJT
and MOSFETs, Simple current Mirror

Biasing Mechanism of IC's

- MOSFET Circuits
  - The basic MOSFET current source
  - MOS current-steering circuits
- BJT Circuits
  - The basic BJT current source
  - Current-steering

Biasing Mechanism of IC's

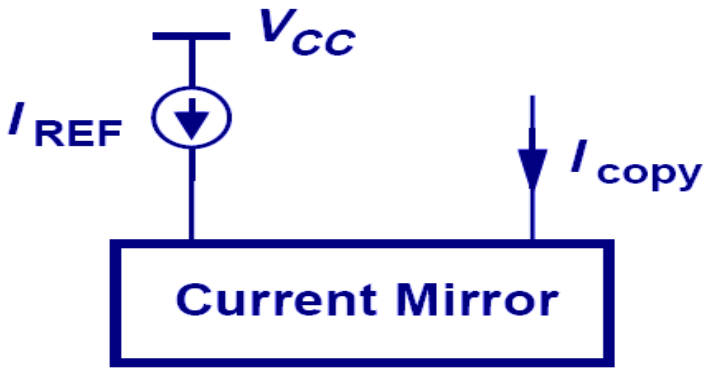
- Current-mirror circuits with improved performance
  - Cascode MOS mirrors
  - A bipolar mirror with base-current compensation
  - The wilson current mirror
  - The wilson MOS mirror
  - The widlar current source

Concept of a Current Mirror

- Circuit designs to provide a supply- and temperature-independent current exist, but require many transistors to implement.

  → "golden current source"

- A ***current mirror*** is used to replicate the current from a "golden current source" to other locations.



Features of Current Mirror

- A current mirror is a circuit block which functions to produce a copy of the current in one active device by replicating the current in second active device.

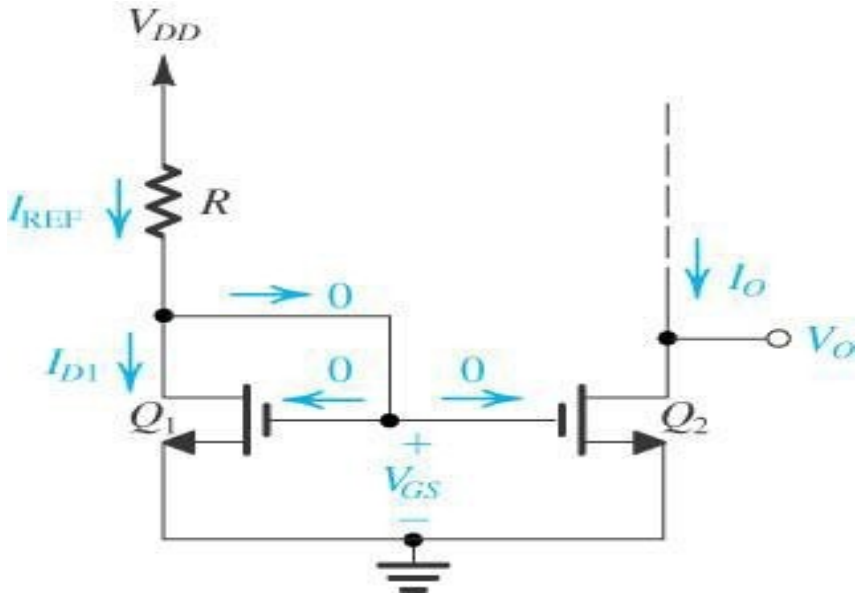
- An important feature of the current mirror is a relatively high output resistance which helps to keep the output current constant regardless of load conditions.

- Another feature of the current mirror is a relatively low input resistance which helps to keep the input current constant regardless of drive conditions.

- The current being 'copied' can be, and often is, a varying signal
- current.

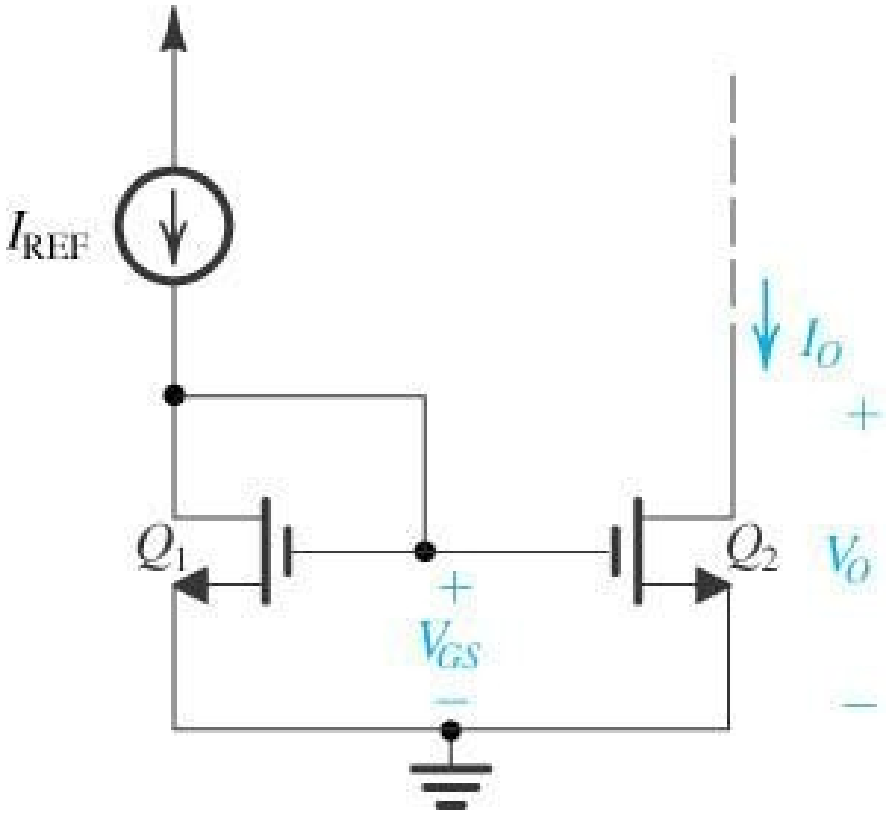
Basic MOSFET Current Source

A current mirror is a circuit block which functions to produce a copy of the current in one active device by replicating the current in second active device.



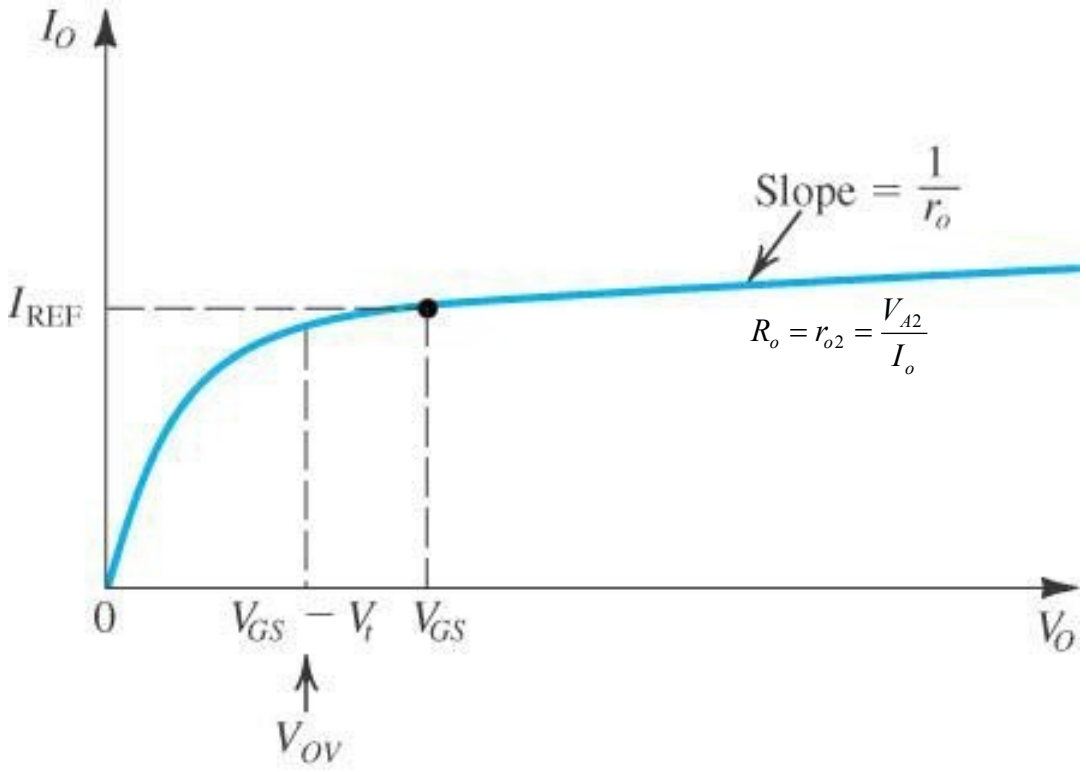
$$\frac{I_o}{I_{REF}} = \frac{(W/L)_2}{(W/L)_1}$$

Basic MOSFET Current Mirror



$$I_o = \frac{(W/L)_2}{(W/L)_1} I_{REF} \left(1 + \frac{V_o - V_{GS}}{V_{A2}}\right)$$

Output Characteristics



$$R_o = r_{o2} = \frac{V_{A2}}{I_o}$$