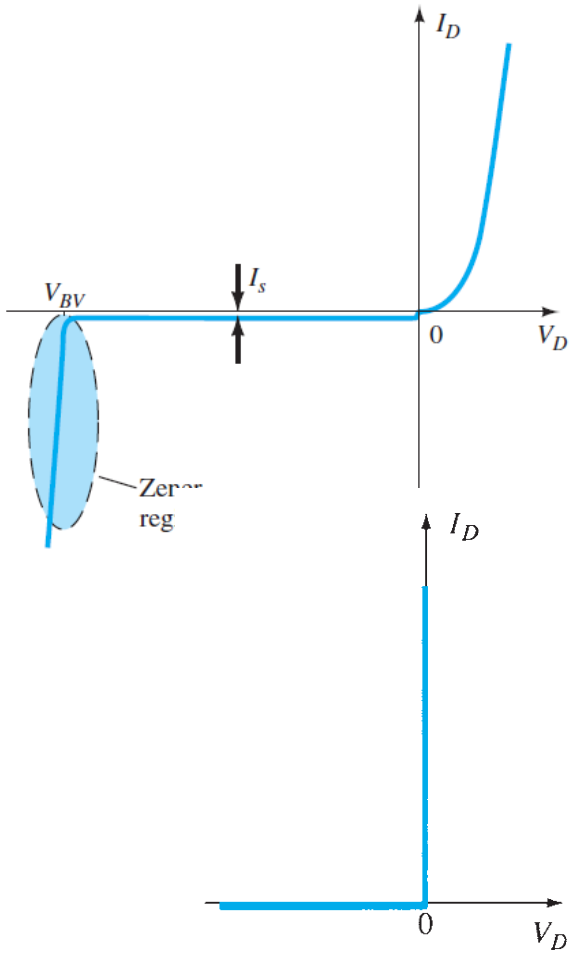
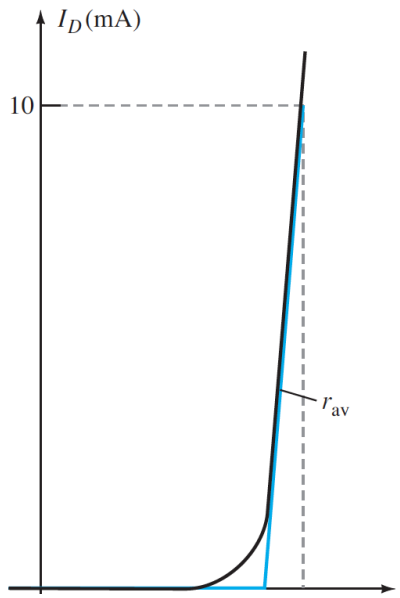
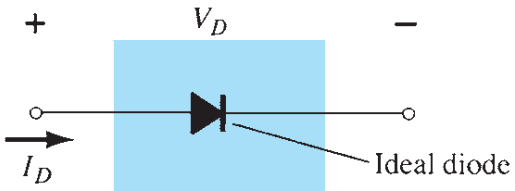
Fundamentals of Electronics

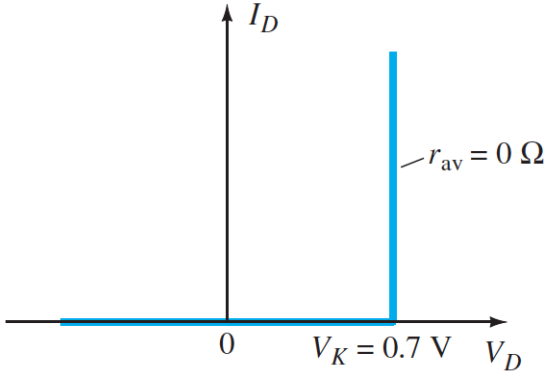
ECE 101

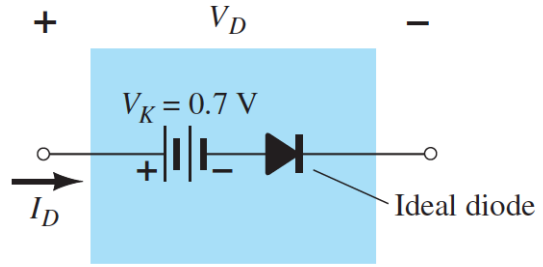
Summary



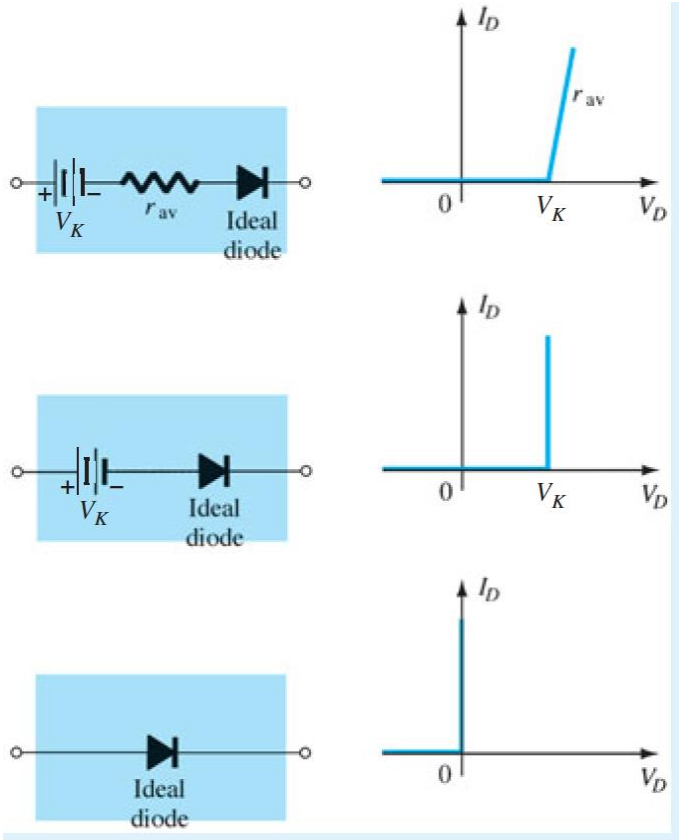






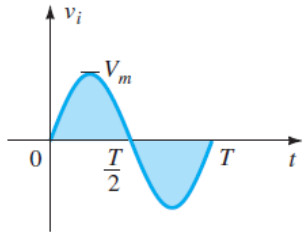


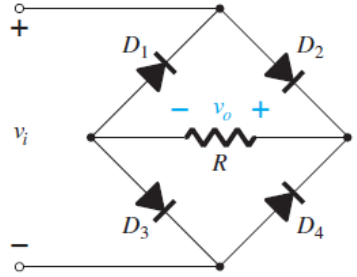
Si

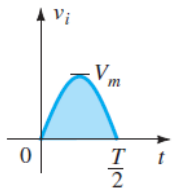


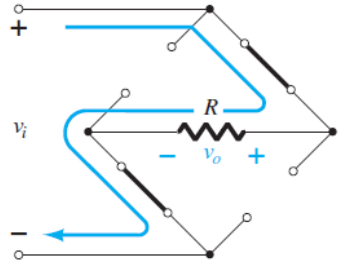
Difference b/w Semiconductors and Metals

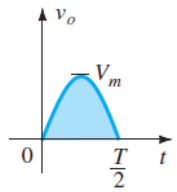
Full wave rectification

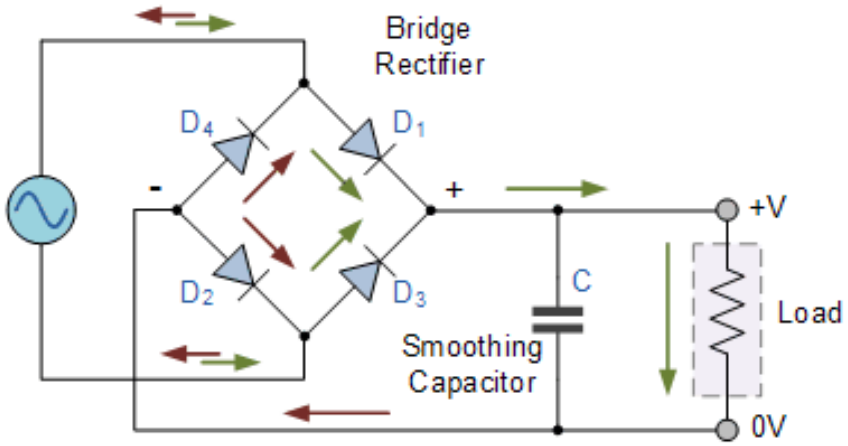


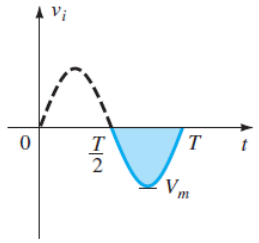


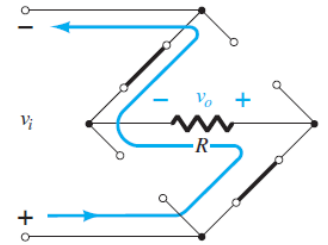


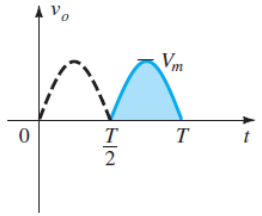


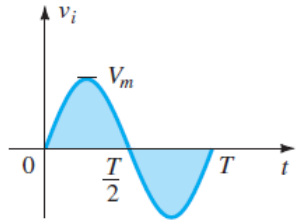


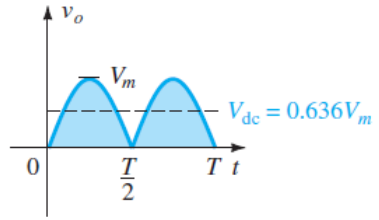


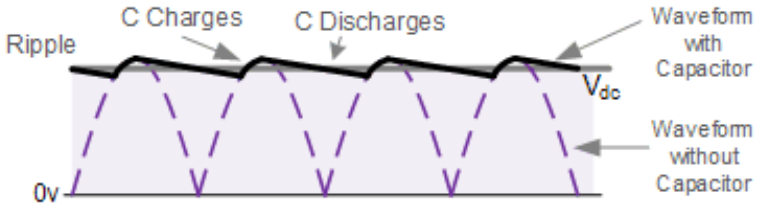






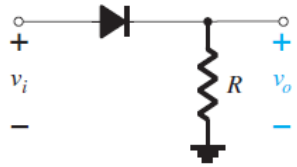


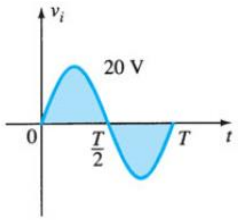


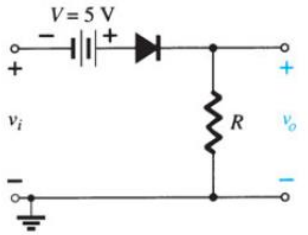


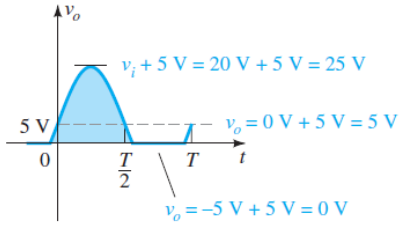
Diode as clipper

In series

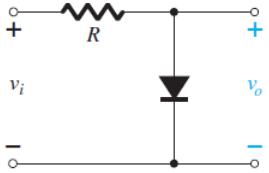


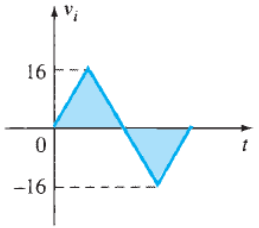


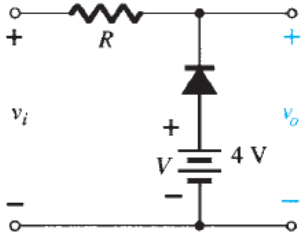


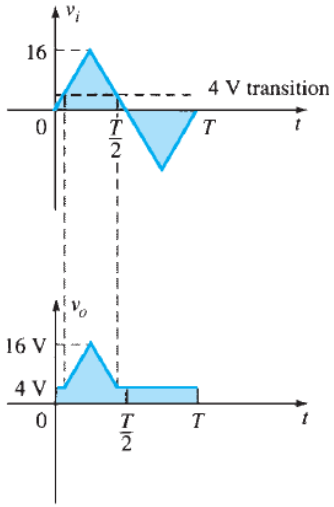


In parallel



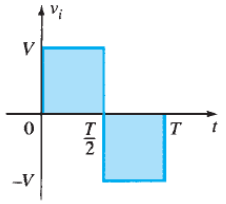


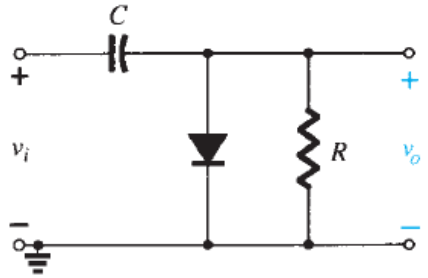


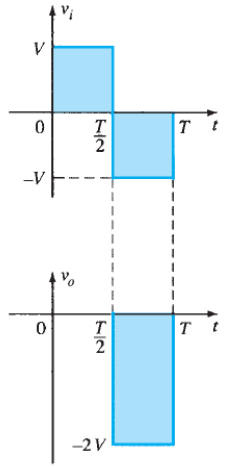


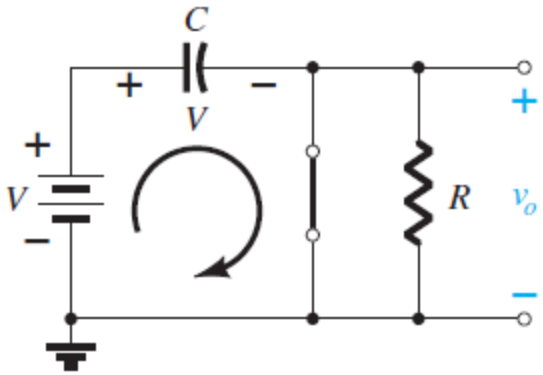
Diode as clamper

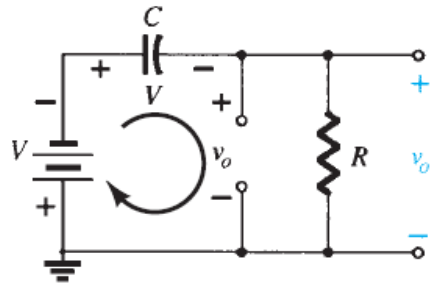
Clamper is a circuit that changes the dc level of a waveform without changing its appearance.



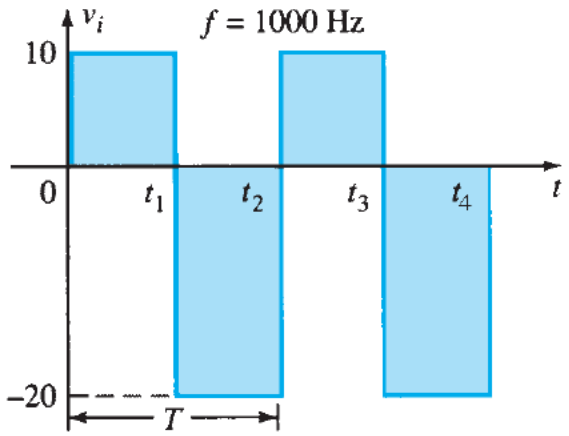


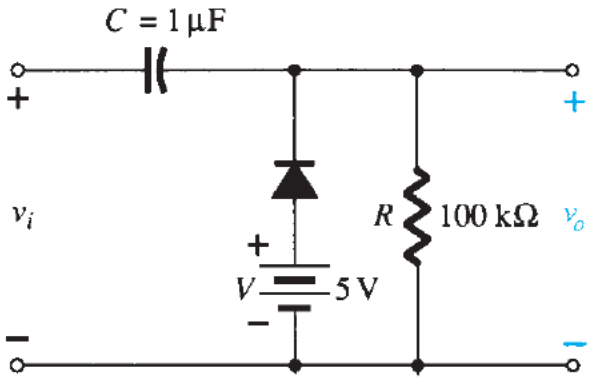




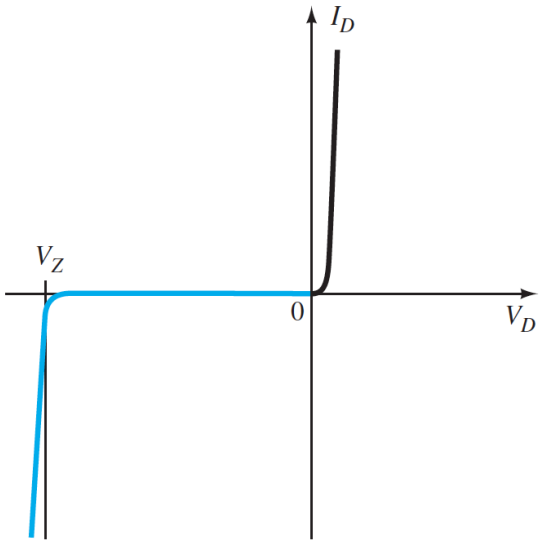


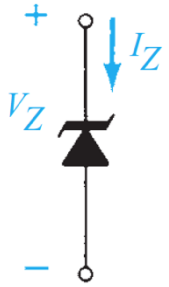
Determine the output voltage

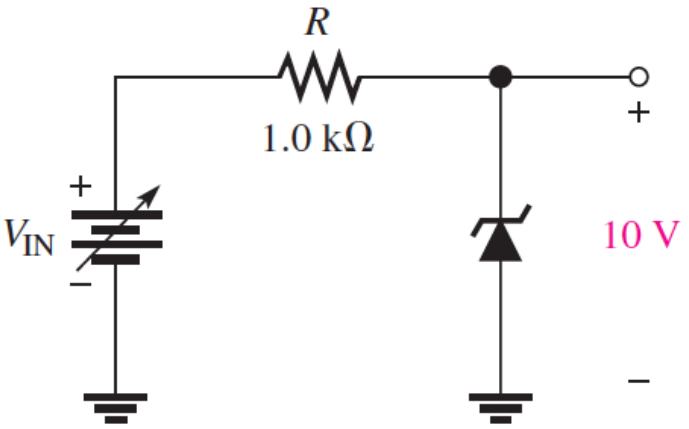


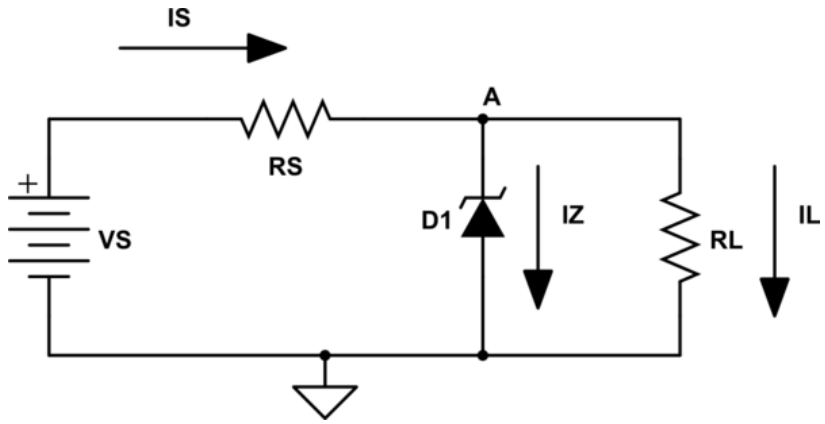


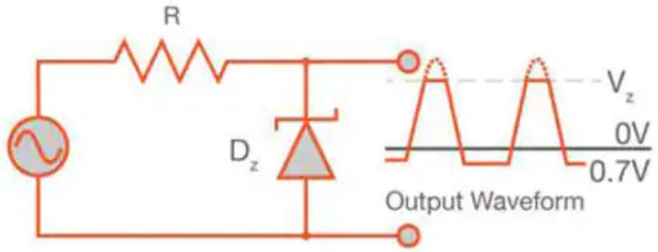
Zener Voltage Regulation





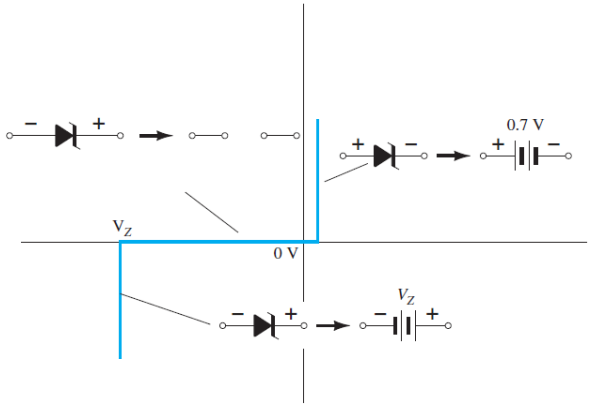


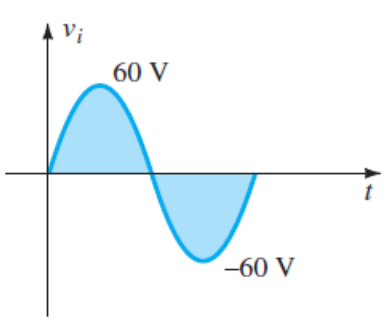


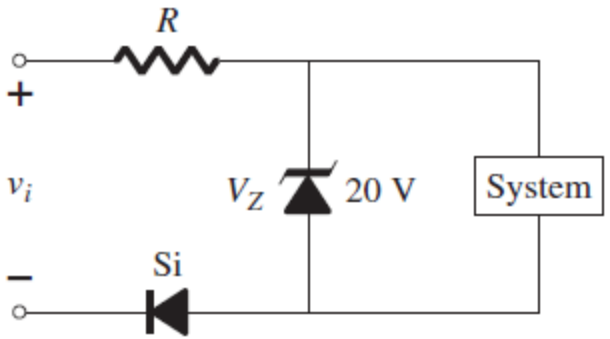


Zener regulation

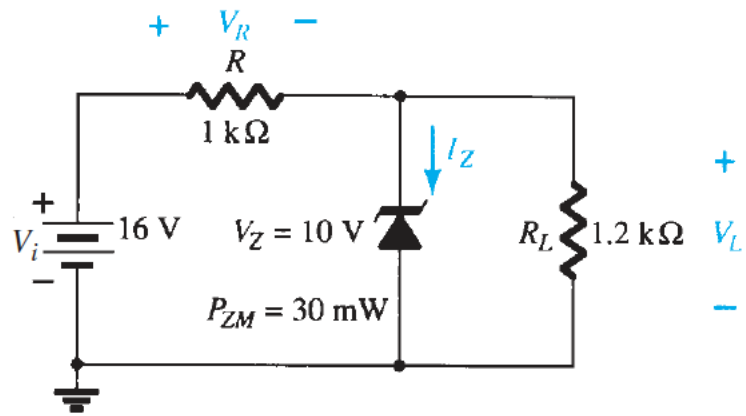
Voltage regulator







a. For the Zener diode network of Fig. 2.115, determine V_L, V_R, I_Z, and P_Z.
b. Repeat part (a) with $R_L = 3\,\text{k}\Omega$.



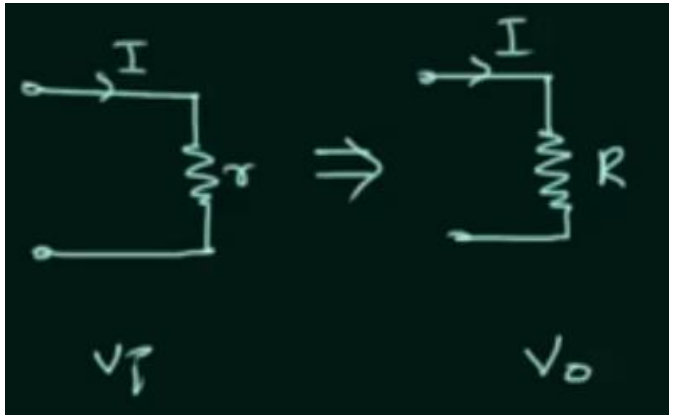
The Transistor

Amplification and switching

Transistor

- Key characteristic:
  - The transistor is a three-terminal device with the feature that the current through two terminals can be controlled by small changes we make in the current or voltage at the third terminal.
  - This control feature allows us to amplify small ac signals or to switch the device from an *on* state to an *off* state and back.
  - These two operations, *amplification* and *switching*, are the basis of a host of electronic functions.
  - This forms the basis for both bipolar junction transistors (BJT) and field effect transistors (FET).

The transistor action - 1



$V_i = I \times r$ $\quad V_o = I \times R$

$V_i < V_o$ (amplification)

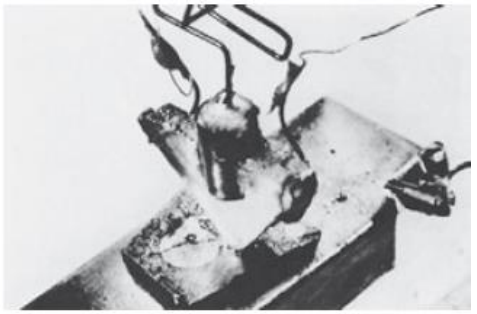
Active mode

$J_1 \rightarrow$ f.b. $\quad$ Res = 0

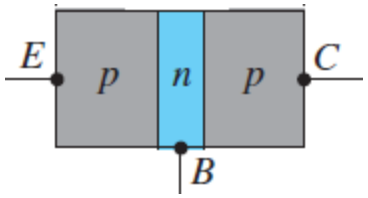
$J_2 \rightarrow$ r.b. $\quad$ Res = ∞

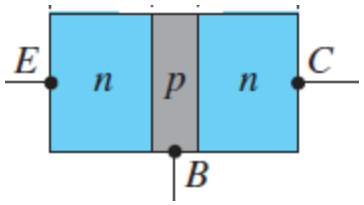
BJT

Bipolar Junction Transistor (BJT)



The first transistor





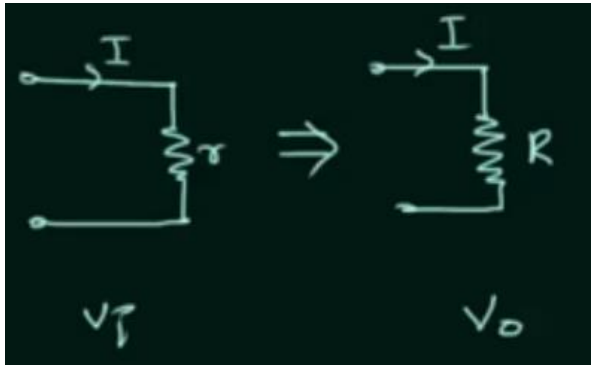
Active mode

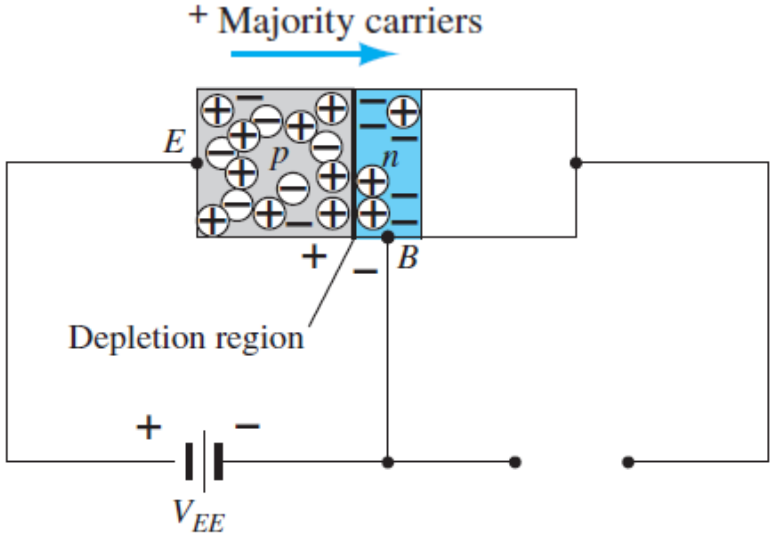
$J_1 \rightarrow$ f.b. Res = 0

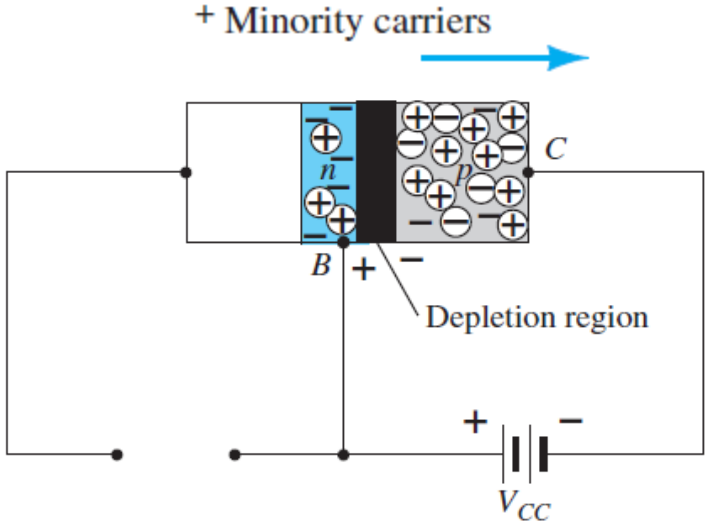
$J_2 \rightarrow$ r.b. Res = ∞

Basic mechanism

One p-n junction is forward biased, the other one is reverse biased.







$V_i = I \times r$ $\quad V_o = I \times R$

$V_i < V_o$ (amplification)

Thank you