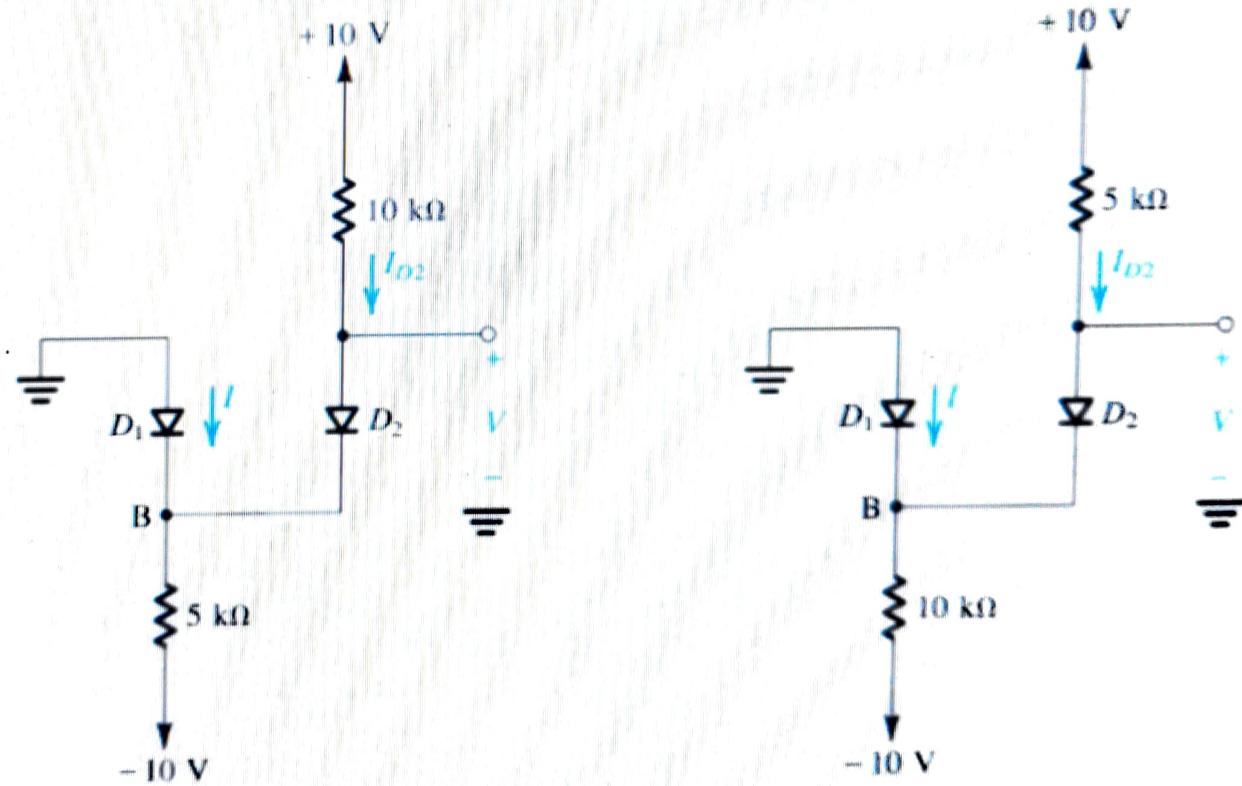


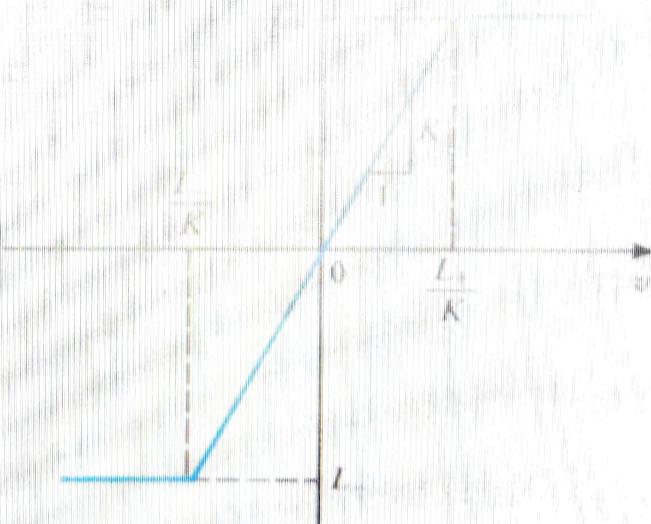
# Problems

- Find  $V$  and  $I$ . Assume diodes to be ideal.



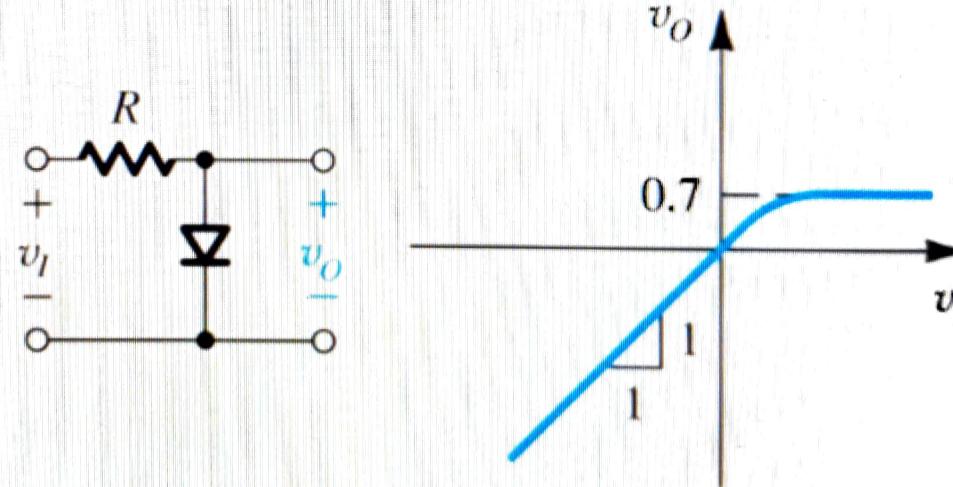
# Diode applications

- Limiter circuits
- Clamped capacitor
- Voltage doubler

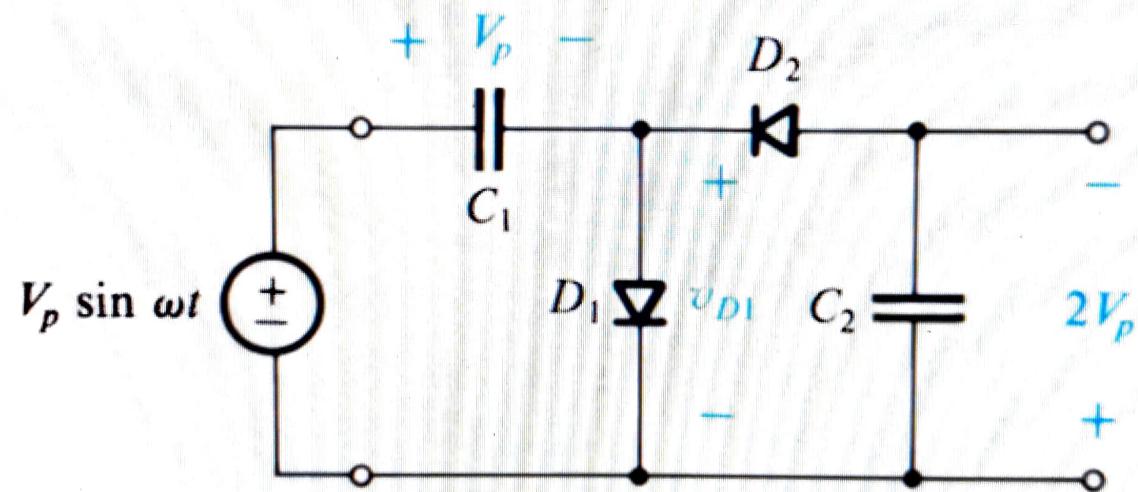


# Limiter circuits

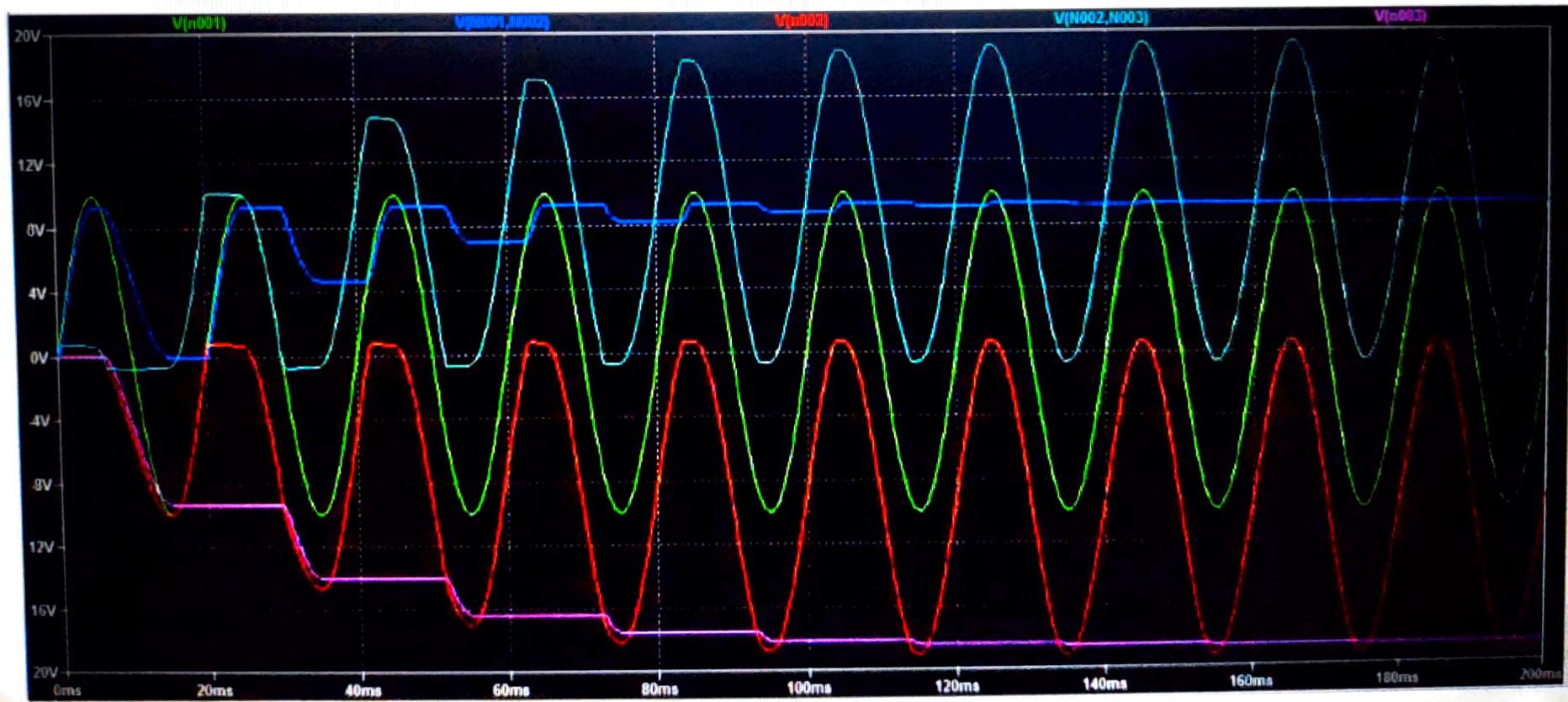
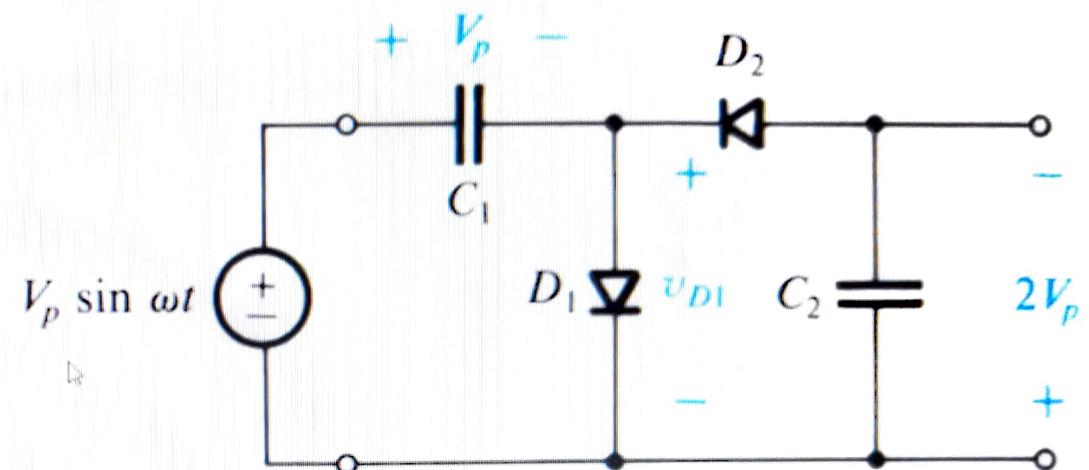
- Transfer characteristic of a limiter circuit



# Voltage doubler



$$C = 10\mu F$$



# Material classification

{ Gold  
O<sub>2</sub>

- Material classification based on conductivity ( $\sigma$ )/resistivity ( $\rho$ )

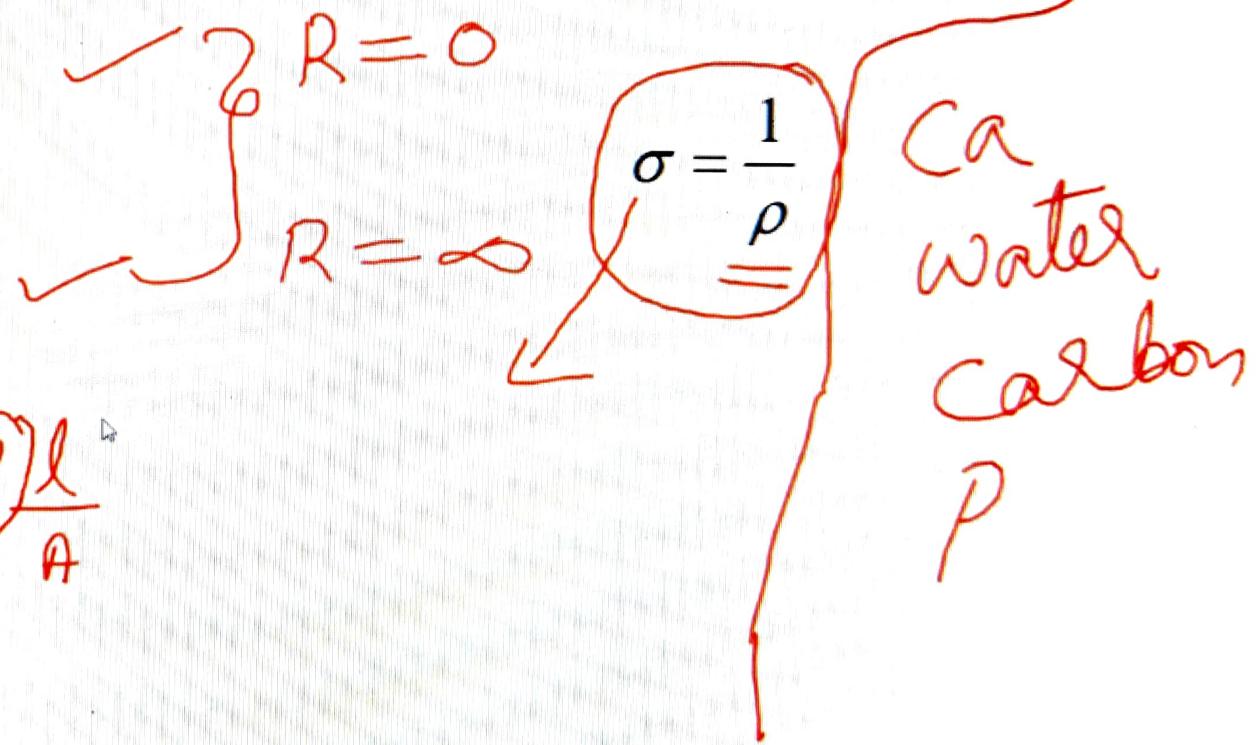
- Conductors

- Semiconductors

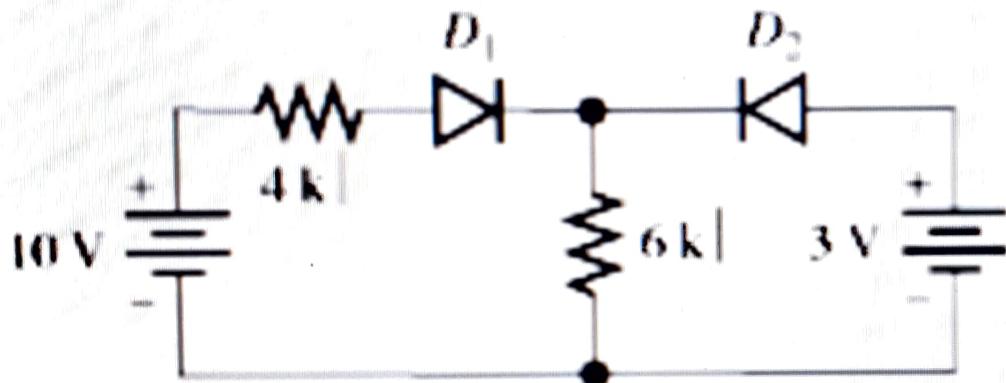
- Insulators

②

$$R = \rho \frac{l}{A}$$



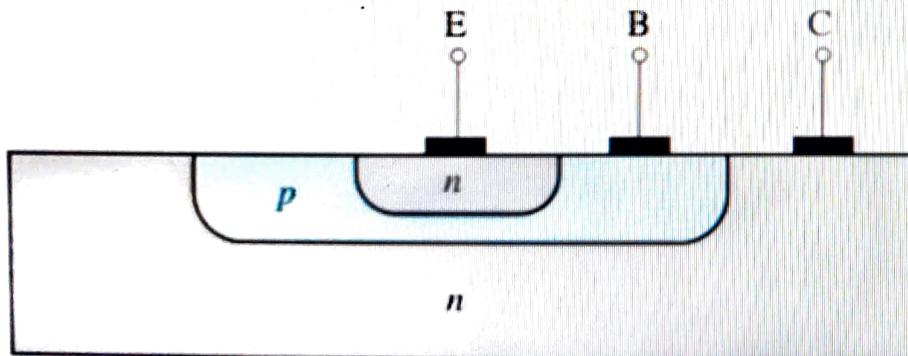
- Find current flowing in  $6k\Omega$  resistor. Assume ideal diode model



D1	D2
ON	ON
OFF	OFF
ON	OFF
OFF	ON

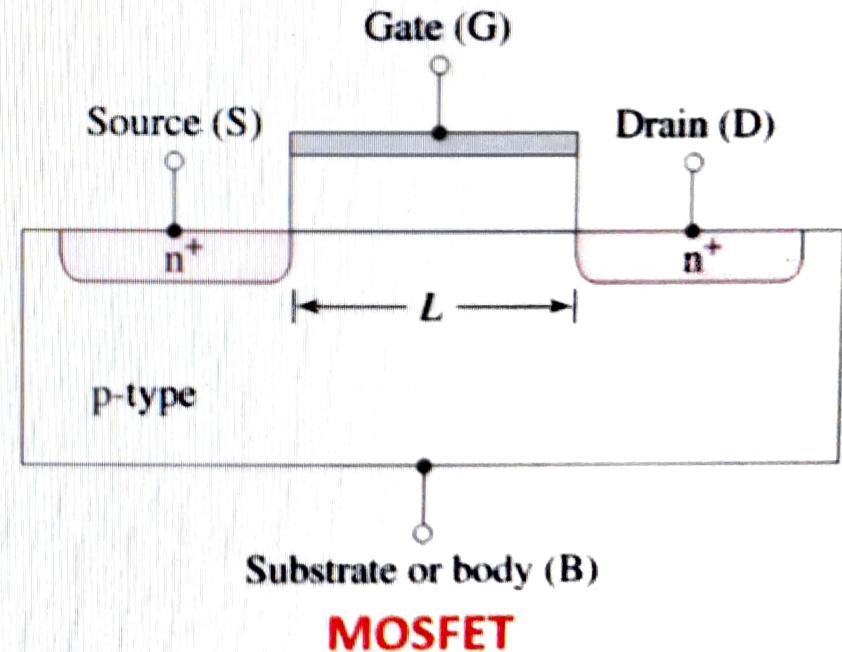
# Transistors

- *Transistor*
  - *Transfers resistance*
- Transistor types
  - BJT (bipolar)
  - FET (Unipolar)



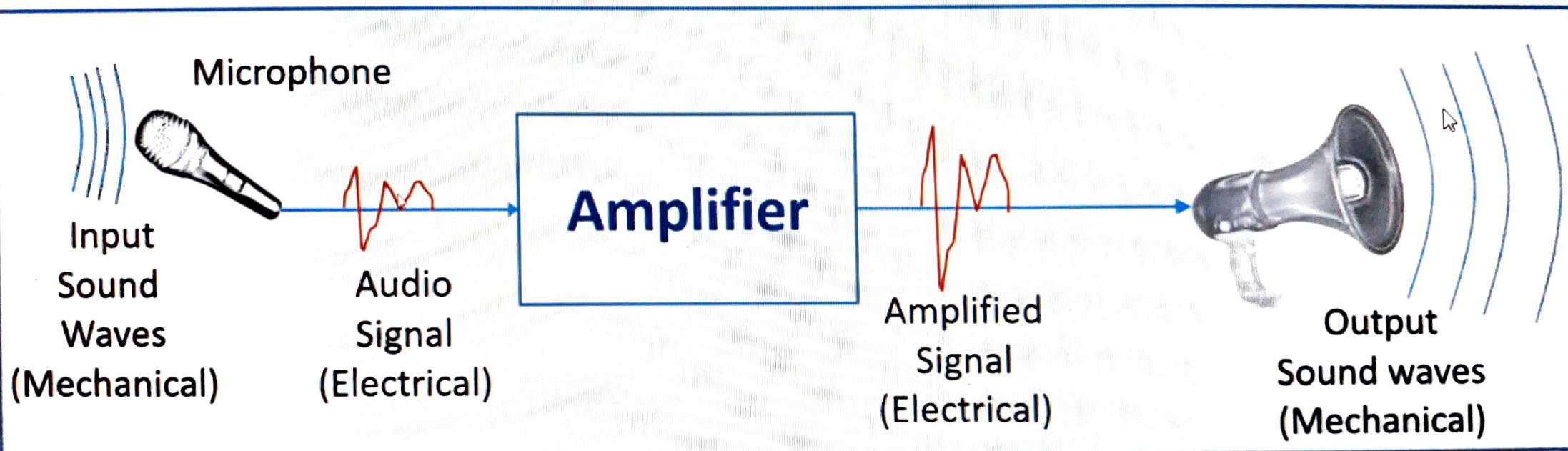
BJT

- Applications
- Amplifier
  - Switch



MOSFET

# Amplifier: Basic PA system

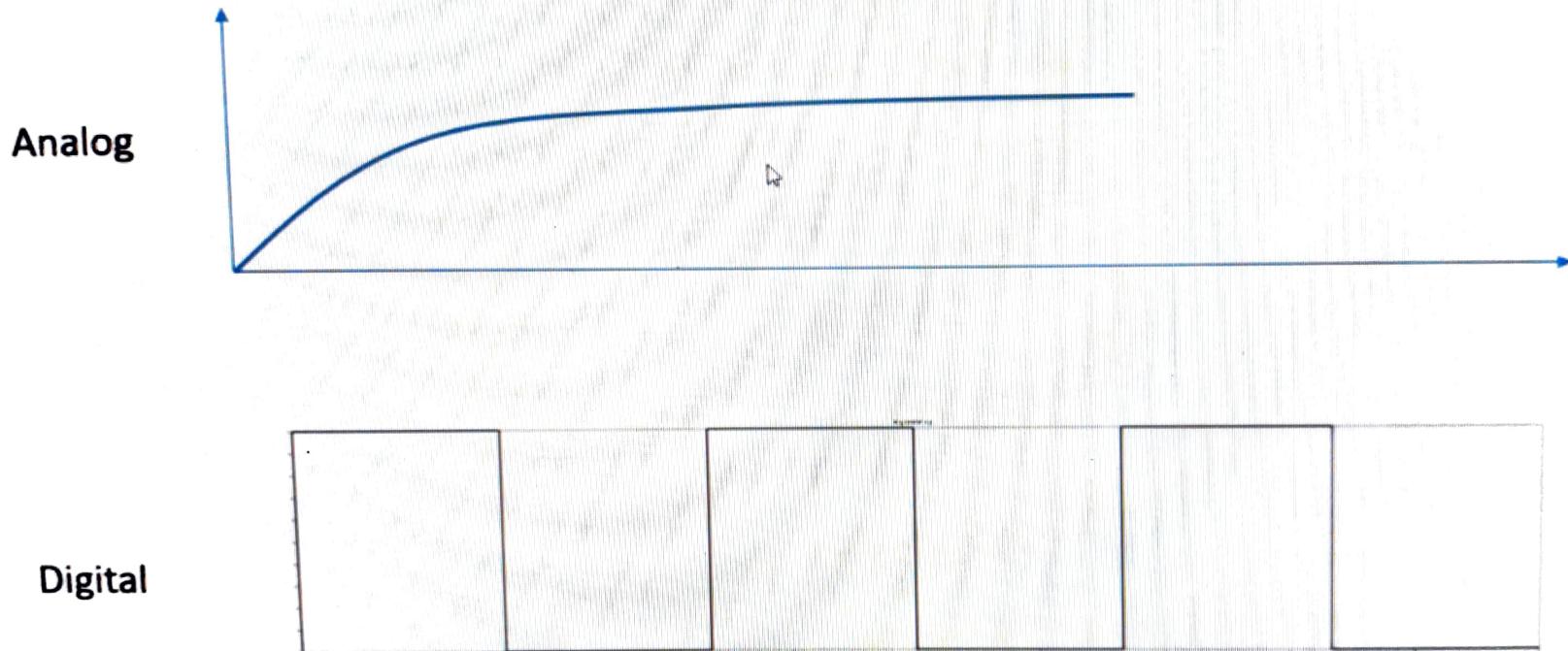


To amplify audio signal

1. Sound wave → electrical signal
2. Amplified electrical signal
3. Electrical signal → Amplified sound wave

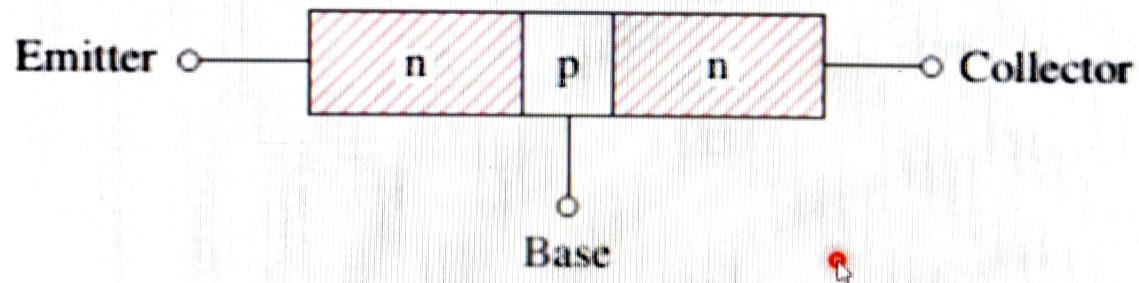
PA: Public Address

# Switching



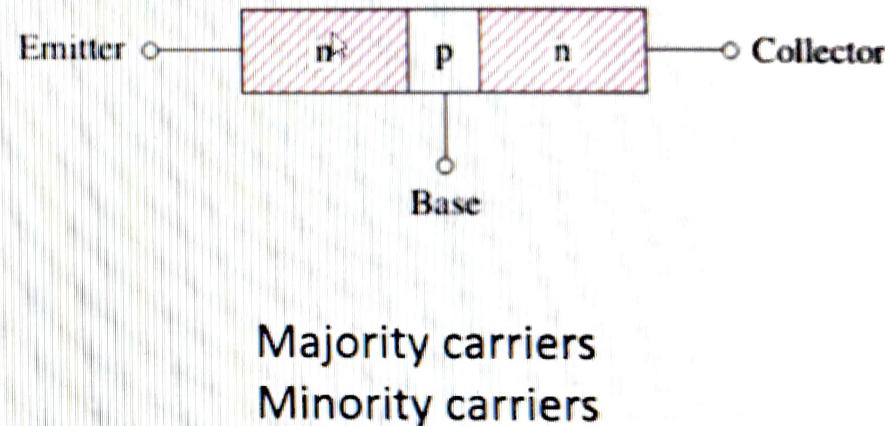
# Bipolar junction transistor

- Transistor principle:  
*the voltage between two terminals (Emitter and Base) controls the current through the third terminal (Collector)*

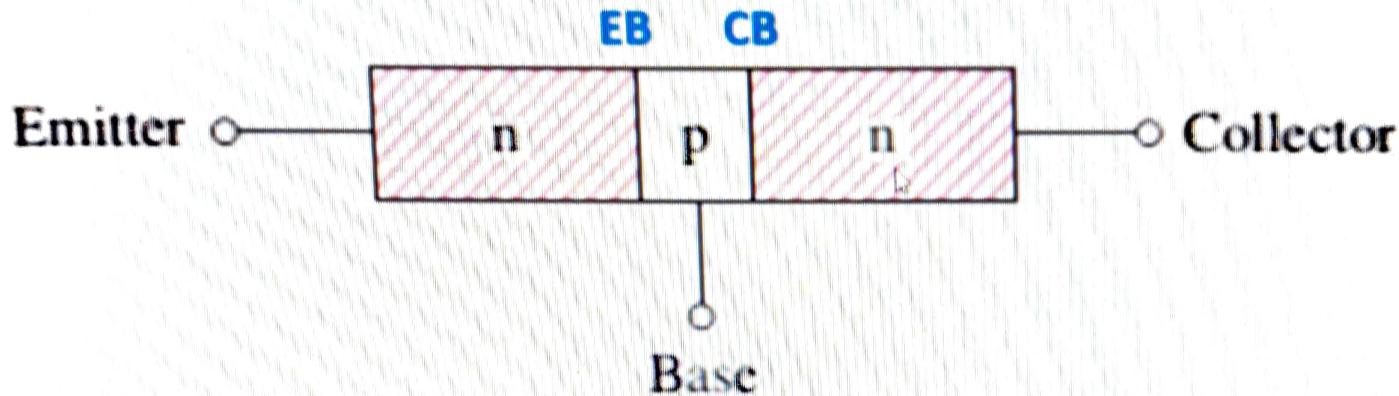


# Bipolar junction transistor (BJT)

- Three doped regions
- Three terminals
- Two pn junctions
- Single pn junction has two modes
  - FB
  - RB
- BJT has two junctions
  - Four modes of operation



# Modes of operation

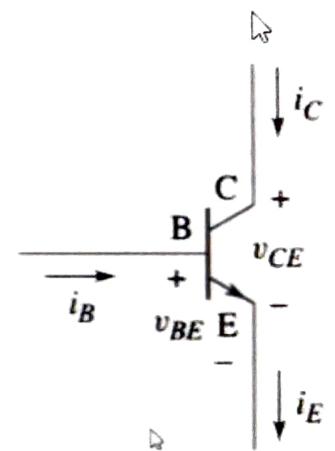
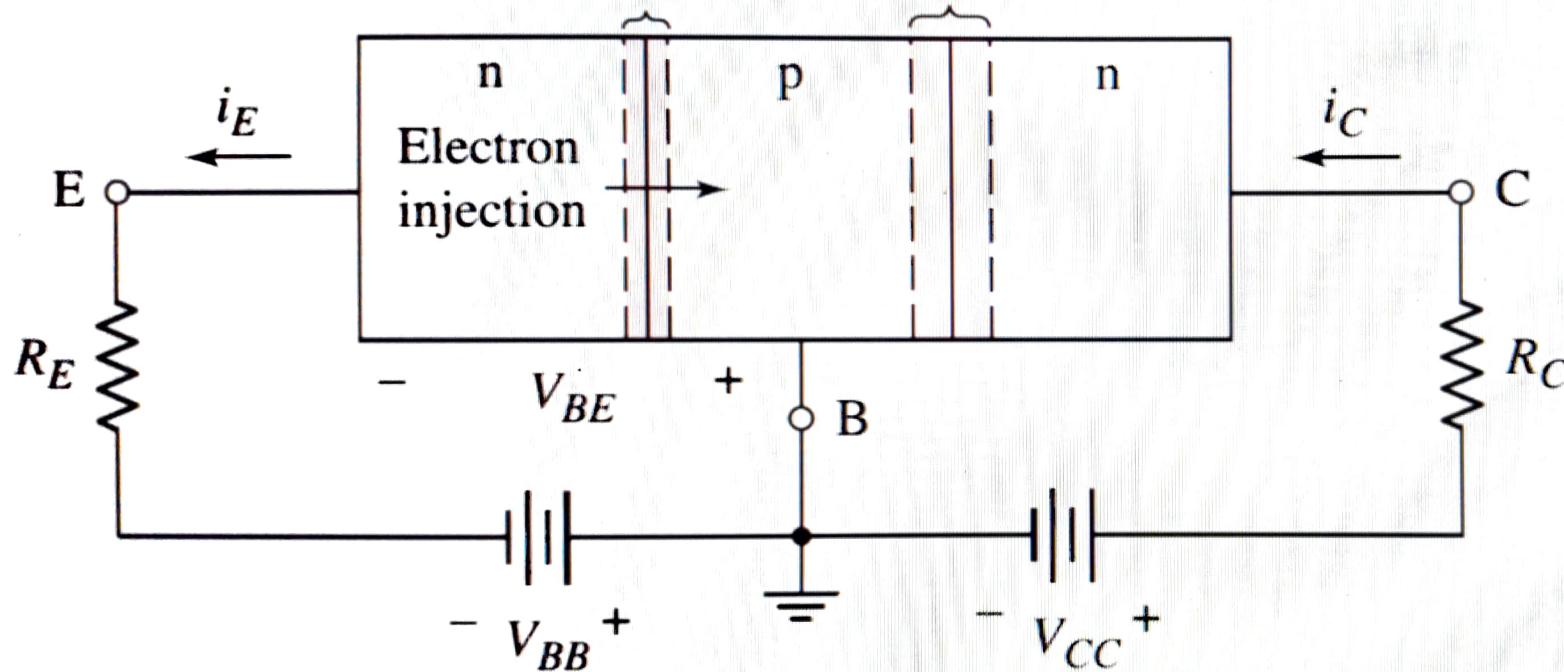


EB	CB	Mode
FB	RB	Active
FB	FB	Saturation
RB	RB	Cut-off
RB	FB	Reverse active

Draw the structural diagrams clearly mentioning the depletion region widths.

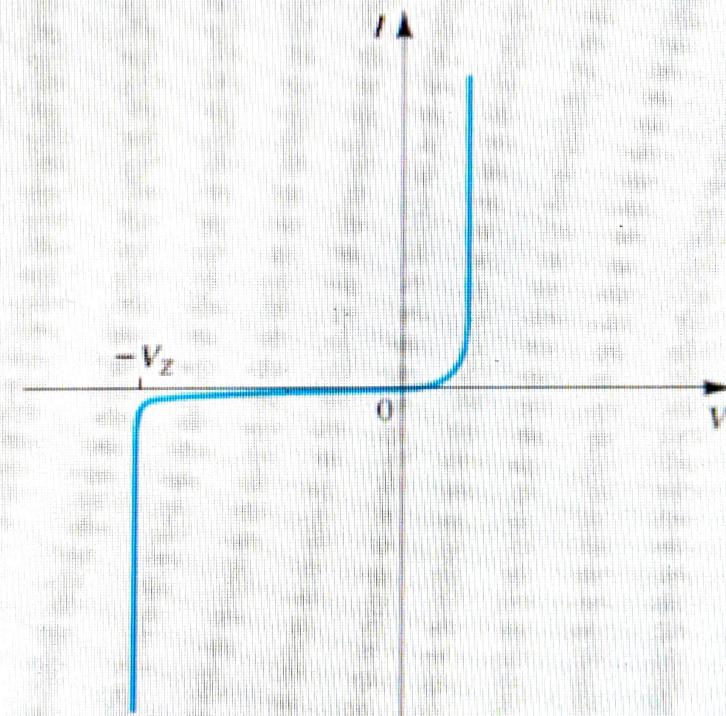
# Transistor as an amplifier

Base-emitter  
(B-E) junction      Base-collector  
(B-C) junction



Current flow in a *npn* transistor biased to operate in the active mode

# I-V characteristics of diode



$$C = 10\mu F$$

