

EE-202 Electronics

Chapter 3:

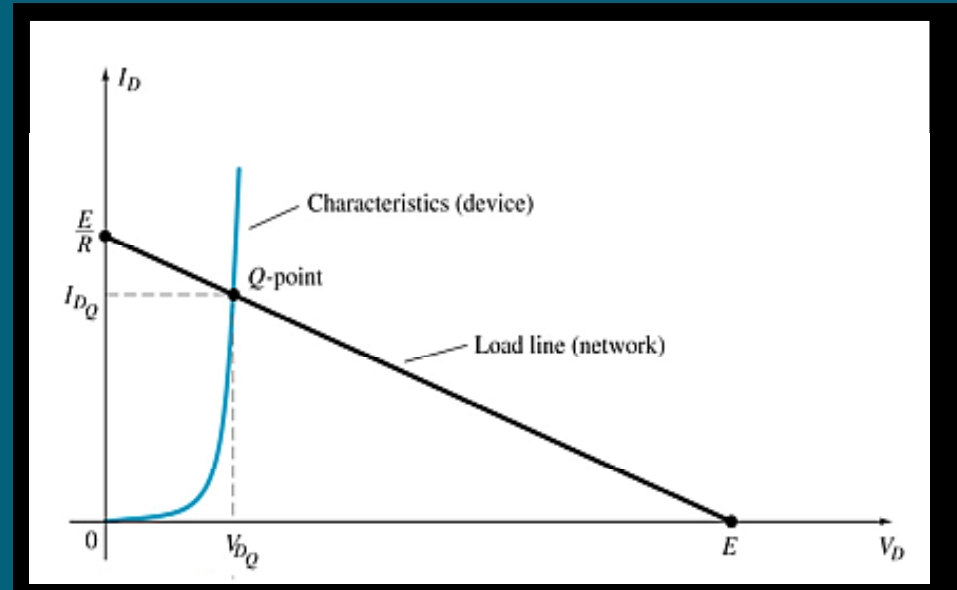
Diode Applications

Series and Parallel

Configurations

Load-Line Analysis

- Shows all current (I_D) versus voltages (E) applied to the diode (V_D).
- Intersecting point of the load line and the characteristic curve gives the Q-point,



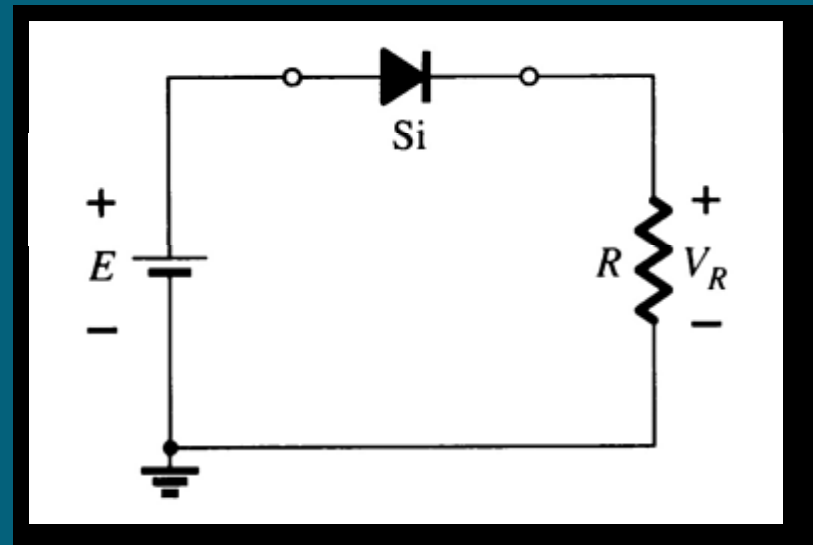
Series Diode Configurations

For forward Bias;

- Si Diode: $V_D = 0.7V$
- Ge Diode: $V_D = 0.3V$

Analysis

- $V_D = .07V$ (or $V_D = E$ if $E < .7V$)
- $V_R = E - V_D$
- $I_D = I_R = I_T = V_R / R$



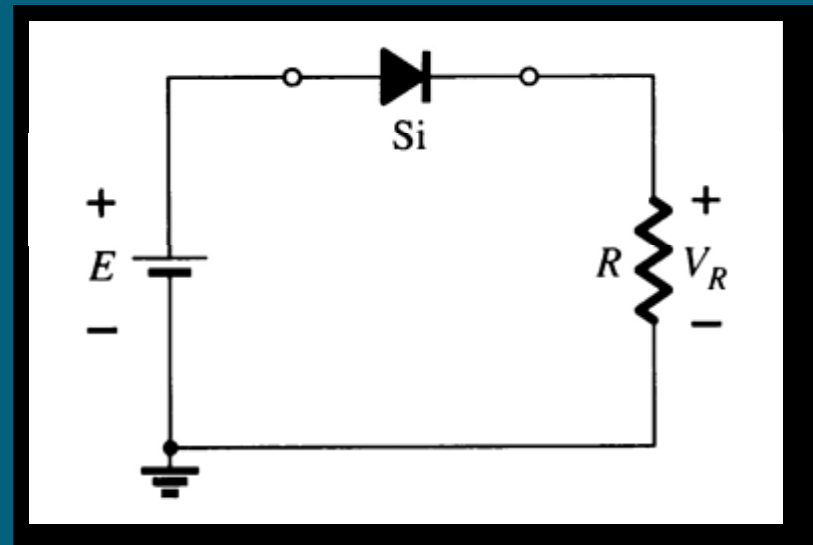
Series Diode Configurations

For Reverse Bias:

Diodes behave as open circuits

Analysis

- $V_D = E$
- $V_R = 0 \text{ V}$
- $I_D = 0 \text{ A}$



Parallel Diode Configurations

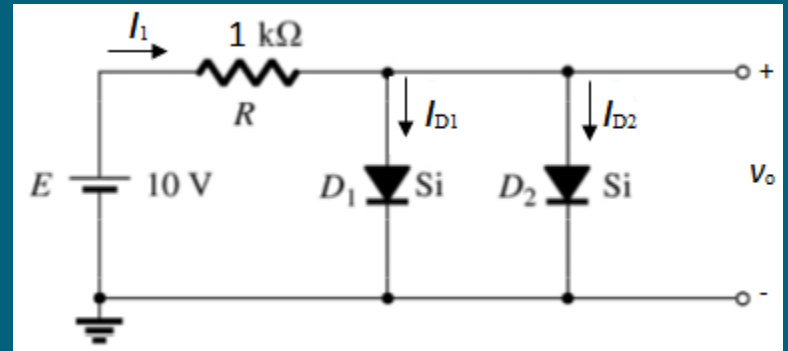
$$V_D = 0.7 \text{ V}$$

$$V_{D1} = V_{D2} = V_O = 0.7 \text{ V}$$

$$V_R = 9.3 \text{ V}$$

$$I_R = \frac{E - V_D}{R} = \frac{10 \text{ V} - 0.7 \text{ V}}{1 \text{ k}\Omega} = 9.7 \text{ mA}$$

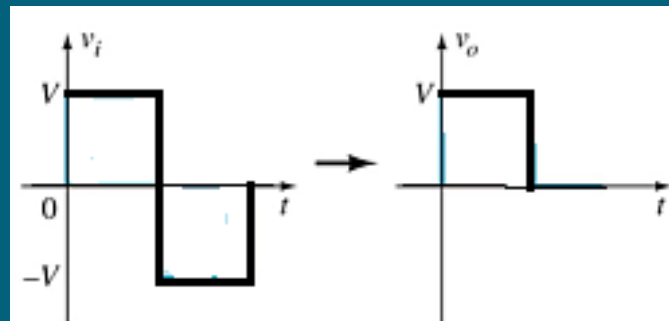
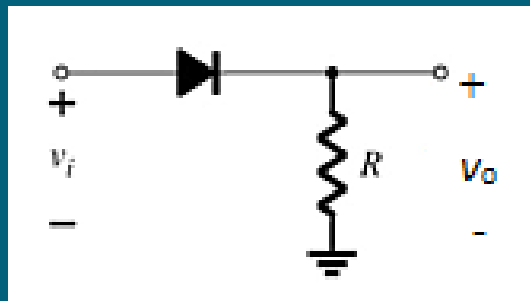
$$I_{D1} = I_{D2} = \frac{9.7 \text{ mA}}{2} = 4.85 \text{ mA}$$



Series Diode Clippers

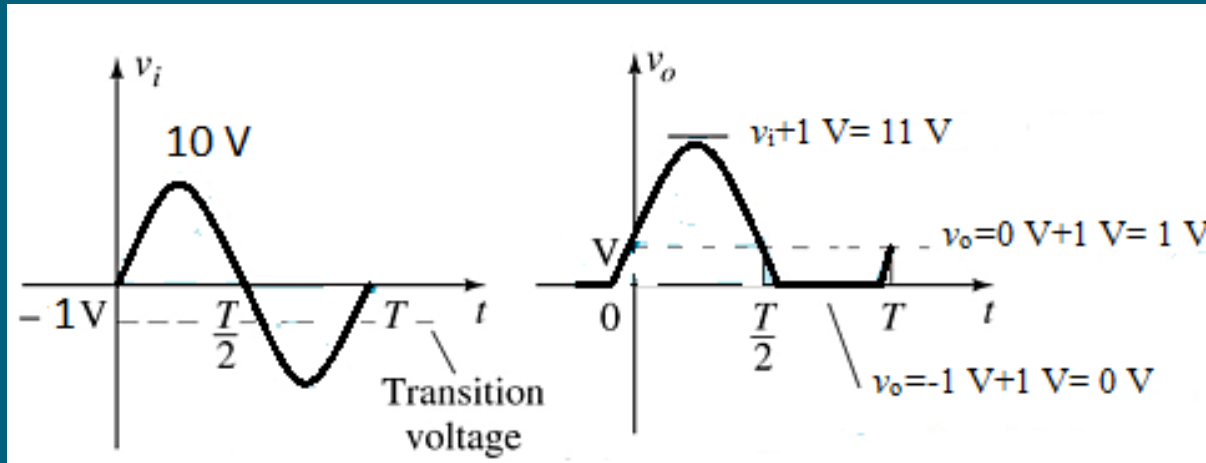
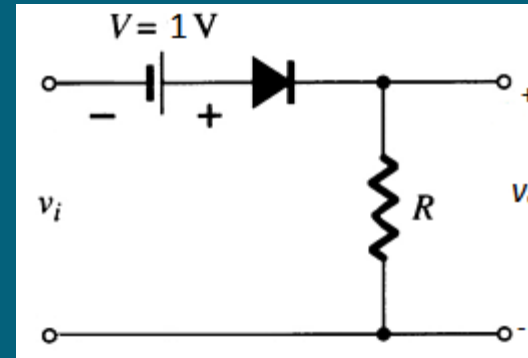
The diode in a **series clipper** circuit “clips” any voltage

- A reverse-biasing polarity
- A forward-biasing polarity less than 0.7V for a silicon diode



Biased Clippers

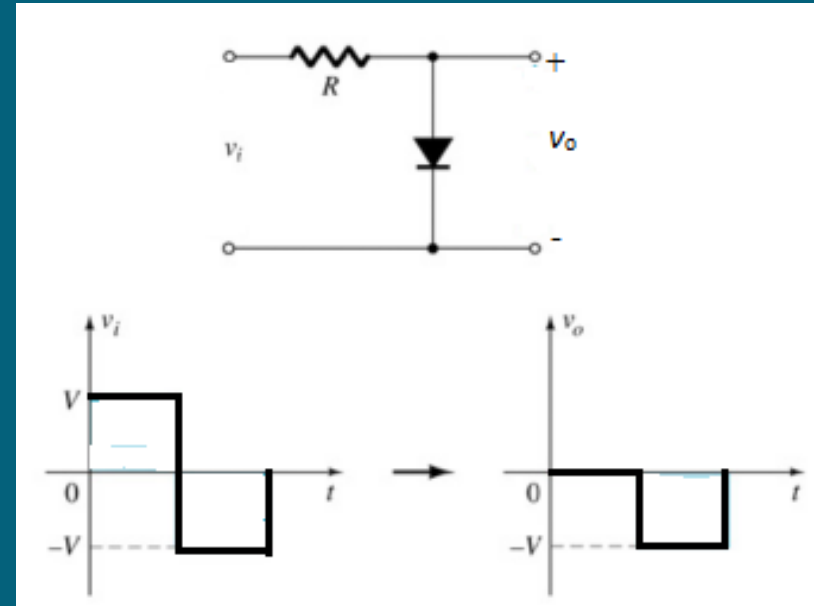
Adding a DC source to diode changes the effective forward bias.



Parallel Clippers

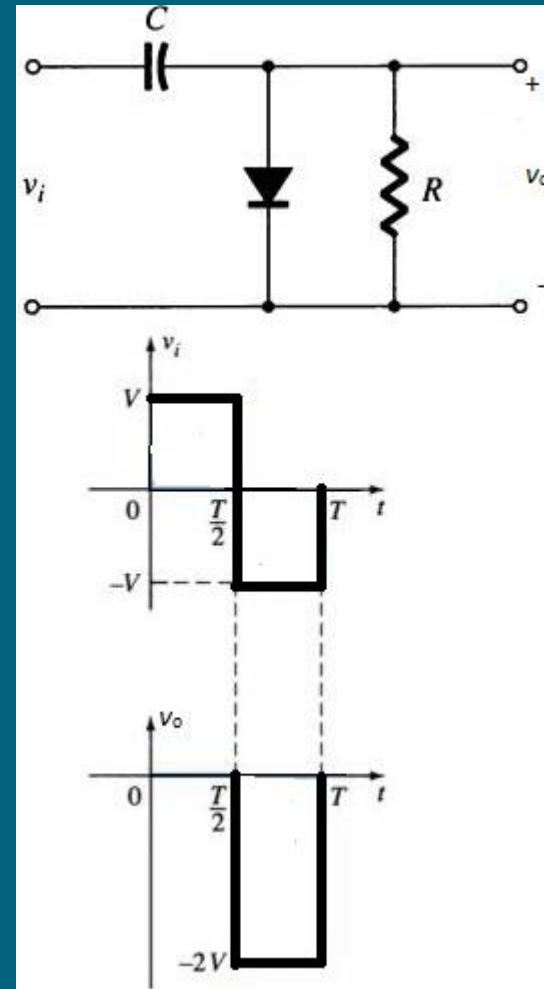
The diode in a **parallel clipper** circuit “clips” any voltage that forward bias it.

A DC bias can change the clipping level.



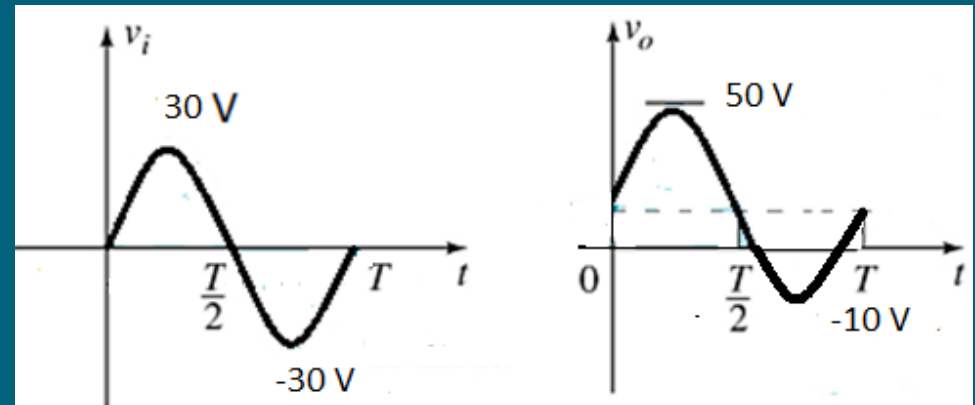
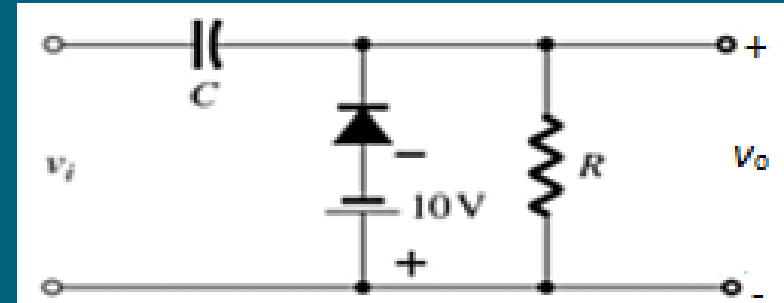
Clampers

A diode and capacitor can be combined to “clamp” an AC signal to a specific DC level.



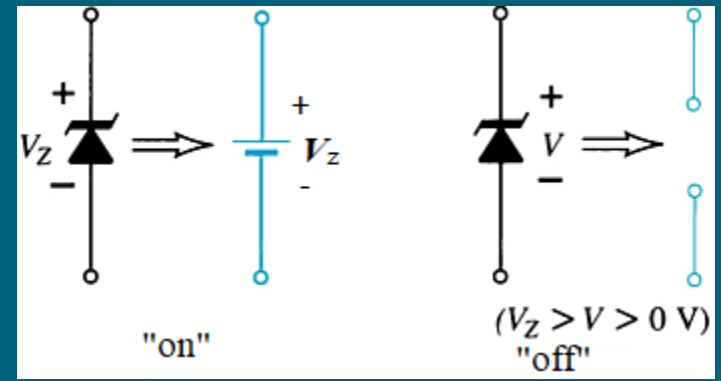
Biased Clamper Circuits

The DC source can adjust the DC clamping level.



Zener Diodes

The Zener is a diode operated in reverse bias at the Zener Voltage (V_z).



- When $V_i \geq V_z$
 - The Zener is on
 - Zener Voltage V_z
 - Zener current: $I_Z = I_R - I_{RL}$
- When $V_i < V_z$
 - The Zener is off
 - The Zener acts as an open circuit

