\[ n_1 = 1.5 \times 10^{23} \text{ cm}^{-3} \]
\[ n_2 = 5 \times 300 \text{ cm}^{-3} \]
\[ n_1^* = 8 \times 10^{22} \text{ cm}^{-3} \]

- Intrinsic Carrier Concentration
- Band Gap Energy (E_{g})
- Energy Levels
- Covalent Bonds
- Free Electrons

Intrinsic vs. Extrinsic Semiconductors


- Function: \( C = \frac{C_0}{1 + \frac{V}{V_t}} \)
- Release - Based
- Thermal Voltage
  \[ V_t = \frac{kT}{q} \]
- Built-In Potential Energy
- Space-Charge Region
- Diffusion of Free Charges 

- p-n Junction

- Right ≠ Left

- Pop \( \rightarrow \) No

- n\text{p} \rightarrow n

- \text{p}\text{i}\text{n} \rightarrow \text{p}

- Accepting Majority (B)
- n-Type Semiconduct.
- Donor Impurity (P)
- n-Type Semiconduct.
(E.g. flaws, unit in each case)

Flow forces take place:

Duplication region

\[
\frac{N_C}{2} = \frac{P_0}{m_C^2}
\]

\[
N_0 = \frac{N_C}{n}
\]

\[
P_{-type} \quad n_{-type}
\]

\[
\text{pm Junction}
\]
\[ V_b = \frac{0.2}{V_{be}} + \sqrt{V_{be}^2 + 0.757} \]

\[ V_b = 0.026 \ln \left( \frac{1.5 \times 10^{-10}}{0.026} \right) \]

\[ V_b = 0.126 \ln \left( \frac{1.5 \times 10^{-10}}{0.026} \right) \]

Presence of built-in voltage.

$V_t = 0.026$ dropped w/ depth w/ $V_b = 10^{-10} \text{cm}$

$300K$ a pin junction of a silicon (n = $1.5 \times 10^{16} \text{cm}^{-3}$)
# Charges Court

Remains constant

and the direction remains constant each other (equilibrium)

and the electric field

Recall: The gradient of concentration is the force created by...
Note: Is there any reverse bias current?
\[ V_e = 0 = \Delta \]

\[ C_0 = C' \]

\[ \frac{V_{61}}{V_e} (1 + \sqrt{C'})^{1/2} \]

\[ C_0 = C' \]

\[ V_e = 5 \quad C = 0.17 \mu F \]

\[ V_e = 1 \quad C = 0.31 \mu F \]

Note: \( V_e \neq C' \)

Verification:

Function Correctness
Forward - Biased pn Junction

Equations from n - p
Holes from p - n

Forward or Minority

Recall

$V_D = \frac{1}{e^{\frac{V_D}{VT}} - 1}$
\[ I_0 = 10^{-4} \text{ A} \]
\[ V_0 = 0.5 \text{ V} \]
\[ C_0 = 5 \text{ mF} \]

\[ I = 10^{-14} \text{ A} \]
\[ V = 0.5 \text{ V} \]
\[ C = 5 \text{ mF} \]
(Def. 1.01) 
- Avalanche (e.g., CAES) 
- Breakout (e.g., Baylor) 
- Breakout of Calculus 
- Breakout of Calculus 
- Breakout of Calculus 

$$\begin{align*}
(0 = a_A, 0 < d_l) \\
- a_A + \\
0 = d_l
\end{align*}$$

$$\begin{align*}
(0 = a_A, 0 > d_l) \\
- a_A + \\
0 = d_l
\end{align*}$$

$$(e)$$

Real J. O. E.
when $v > 0$

$$v = o$$

$\forall (N\text{-I\text{deal Case}})$

![Diagram](image)

**Rectifier (Total Scope)**
Pierce Linear Model
\[ y = \beta - ax \]

\[ I = \frac{V_p}{\sqrt{2}} \]

\[ V_p = R I \]

\[ V_{ps} = R \frac{I}{\sqrt{2}} \]

\[ V_{ps} = I G \]

\[ V_{ps} = V + I R \]

\[ R = 250 \Omega \]

\[ V_{ps} = 5V \]

\[ \text{Analysis Techniques} \]
\[
\theta = \frac{\sqrt{\gamma}}{\sqrt{\pi}} \left( \sqrt{\frac{I_{SC}}{\gamma}} - \frac{1}{\sqrt{\pi}} \right)
\]

where

\[
I_A = \frac{I_T}{R_f} = \frac{94}{39}
\]

- Piecewise model
- Point to determine
- Use DC analysis

AC Equivalent Circuit