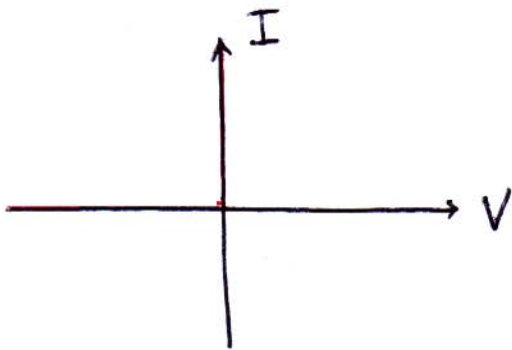


Lecture 13

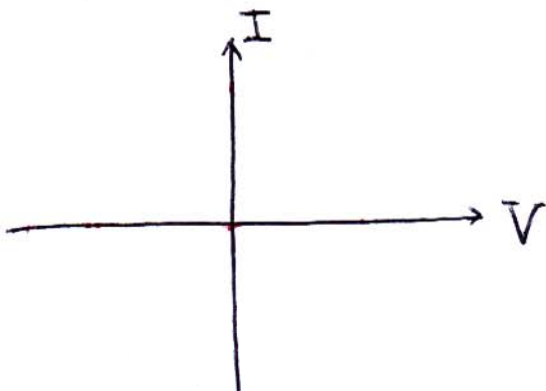
Diodes

- 2 terminal

1) ideal diode



2) real diode



Shockley equation

$$I = I_0 \left(e^{\frac{V}{V_T^*}} - 1 \right)$$

 I_0 - V_T^* -

3) diode resistance

(2)

$$R_D = \frac{V}{I} =$$

$$r_d = \frac{dV}{dI} =$$

4) modes of operation

V	I (mA)	$R_D (\Omega)$	$r_d (\Omega)$
0.1			
0.2			
0.3			
0.4			
0.5			
0.6			
0.7			
0.8			
0.9			
1.0			

5) max ratings

③


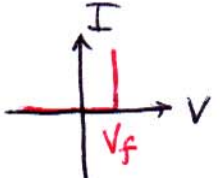
forward I_{max} (DC)
 V_{br}

Power dissipation on a diode $P = I \cdot V$

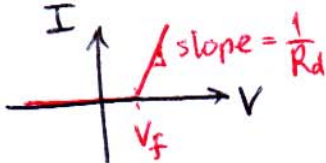
For fixed I , $\frac{dV}{dT} \approx -2 \text{ mV}/^\circ\text{C}$

E.g. fixed voltage bias:

Diode circuit analysis

ideal diode  \rightarrow approximate model 

\rightarrow approximate resistive model \rightarrow Shockley eqn.



Diode types

- signal: fast, small I
- power (rectifier): large I

- Zener: const $V_{br} = V_z$
- LED: GaAs, InP $V_f \approx 1.5-2V$

Diode applications

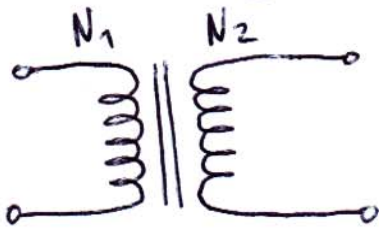
④

① rectifiers

High voltage lines:

To step down high volt:

DC power supply



i) transformer