

# Lecture 7

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- Silicon Diodes
  - Applications
    - \* Rectifiers (AC-to-DC converters)
    - \* Overvoltage protection circuits
    - \* Signal processing
  - Small-signal silicon diodes
    - \* Low and medium power applications
    - \* Discrete components (in lab)
  - Circuit symbol: a triangle (positive side, anode), with a vertical line through the point (negative side, cathode)

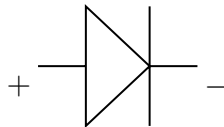


Figure 1: Diode Symbol

- Diodes dissipate power
- Ideal Diode Model
  - Rough approximation
    - \* For quick and intuitive circuit analysis
    - \* Idealized transfer characteristic (without forward voltage drop and reverse breakdown)

- In the reverse bias region,  $V < 0 \rightarrow i = 0$ , while, in the forward bias region,  $i > 0 \rightarrow V = 0$

- Analysis Using the Ideal Diode Model

1. Assume each diode is either open/reverse-biased (RB) or short/forward-biased (FB)
2. Redraw the circuit while replacing all assumed RB diodes with open-circuits and all FB diodes with short-circuit
3. Following conventional circuit analysis, solve for:
  - Voltages across RB diodes  $\rightarrow$  verify  $V_d < 0$
  - Currents through FB diodes  $\rightarrow$  verify  $i_d > 0$
4. If all assumptions are correct, then the analysis is complete. If any of the RB/FB conditions are not met, proceed with step 1 by making different assumptions for diodes.