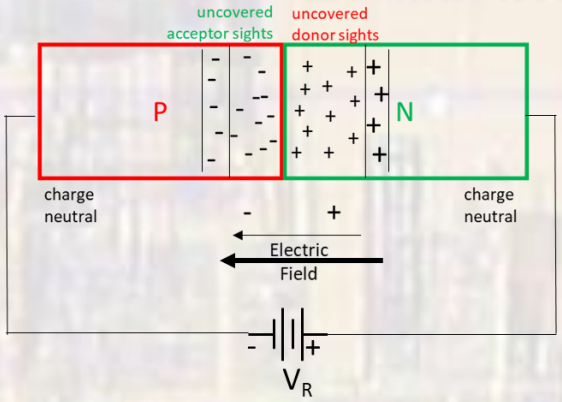
Diode Switching

Last updated 1/25/22

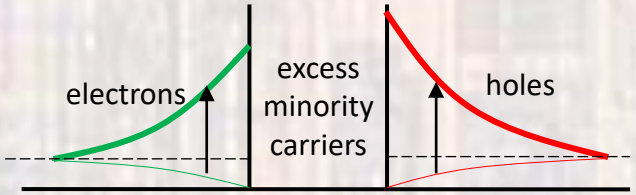
Diode Switching

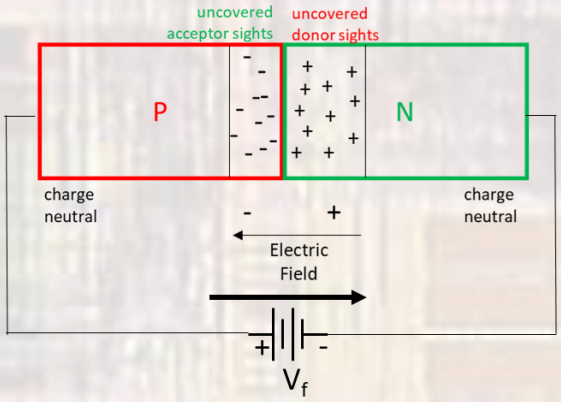
- In forward bias, carriers are traversing the depletion region and create an excess of minority carriers in the N and P regions

Reverse Bias



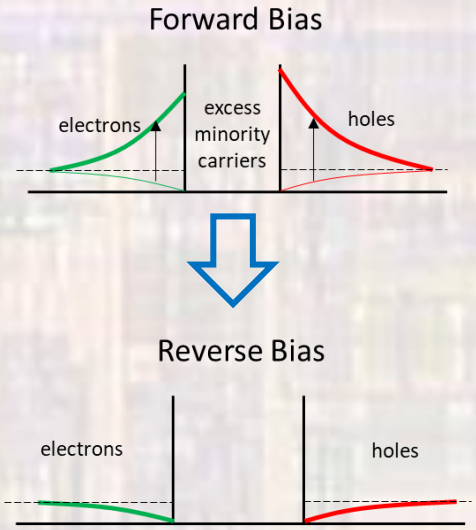
Forward Bias

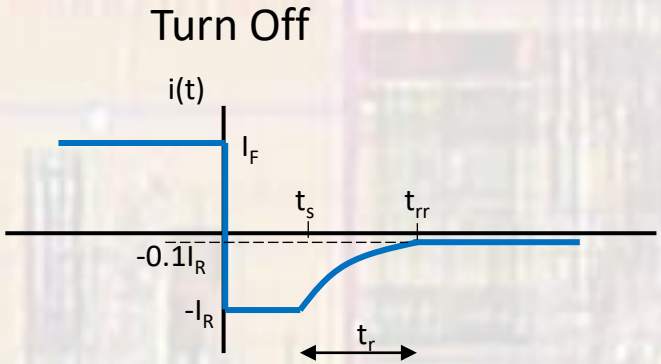




Diode Switching

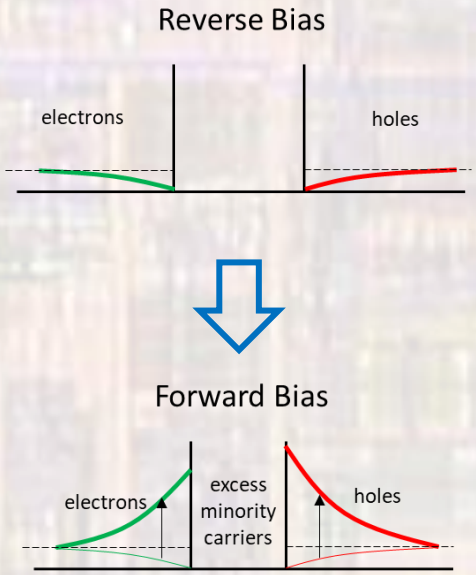
- Switching from forward bias to reverse bias
  - Excess minority carriers must be removed
  - → reverse (negative) current flow
    - Amplitude is a function of V_F and minority carrier lifetimes
    - Storage Time – t_s
      - Time for concentrations to reach their 0V bias level
    - Recovery Time – t_r
      - Time for concentrations to reach their reverse bias level
    - Reverse Recovery Time – t_{rr}
      - Sum of t_s and t_r



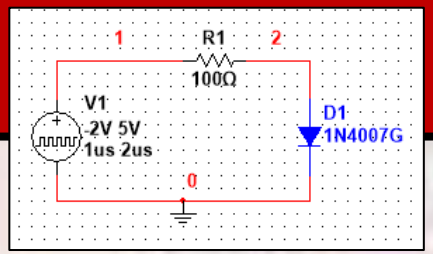


Diode Switching

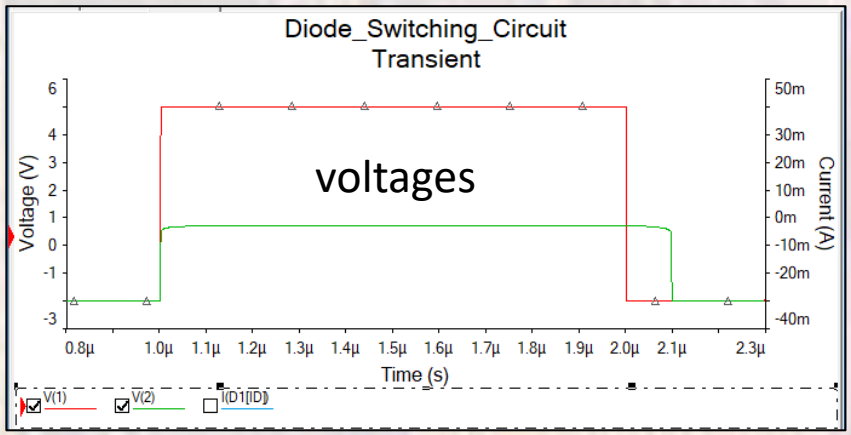
- Switching from reverse bias to forward bias
  - No excess minority carriers to be removed
  - → No storage time
    - Fast transitions

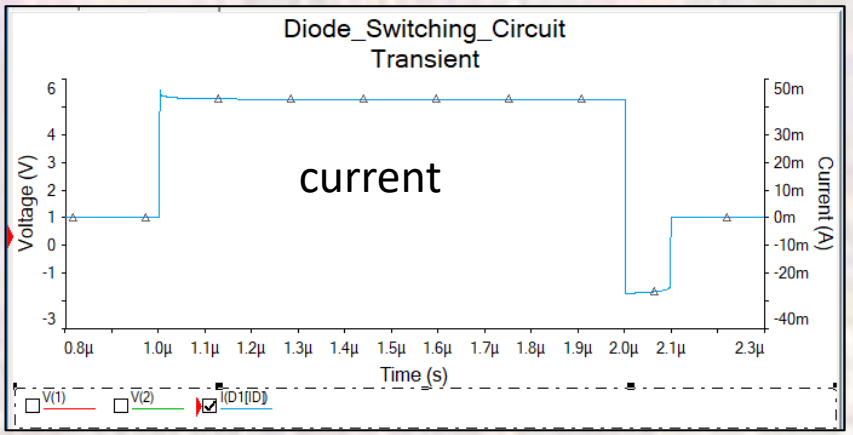


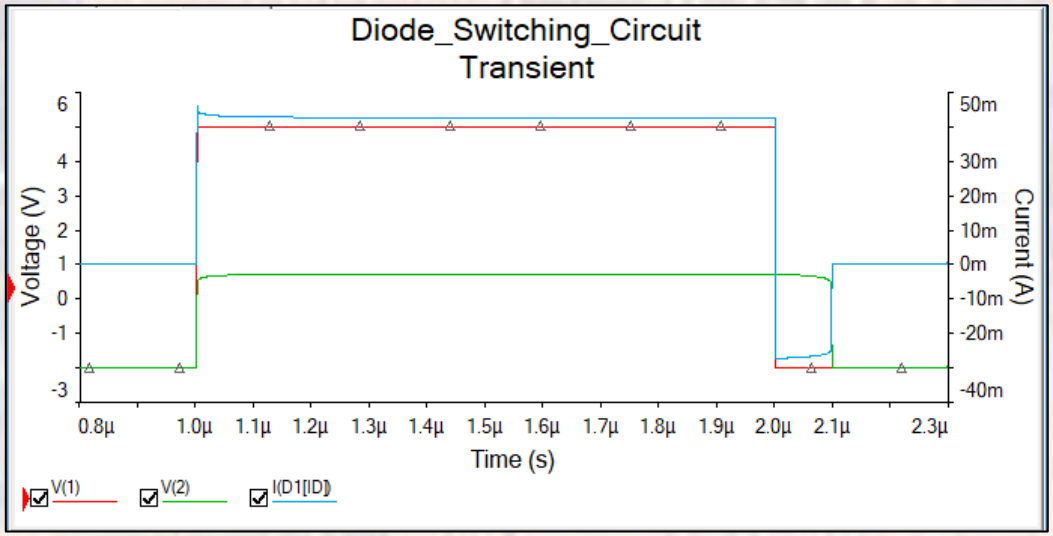
Diode Switching



- Simulation Example – 5V

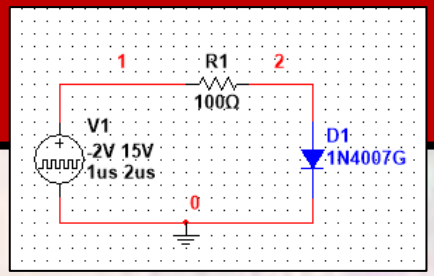




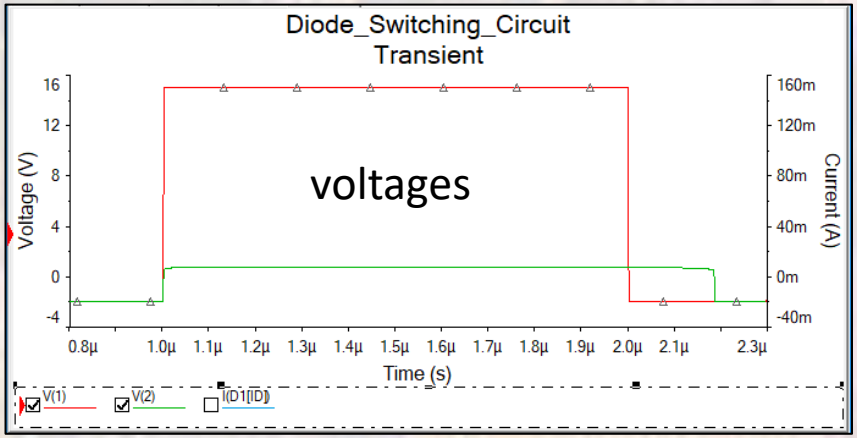


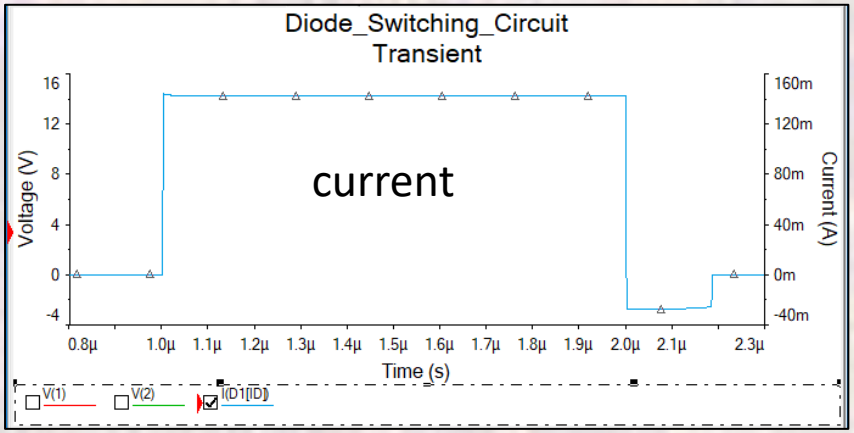
t_{rr} = 100ns

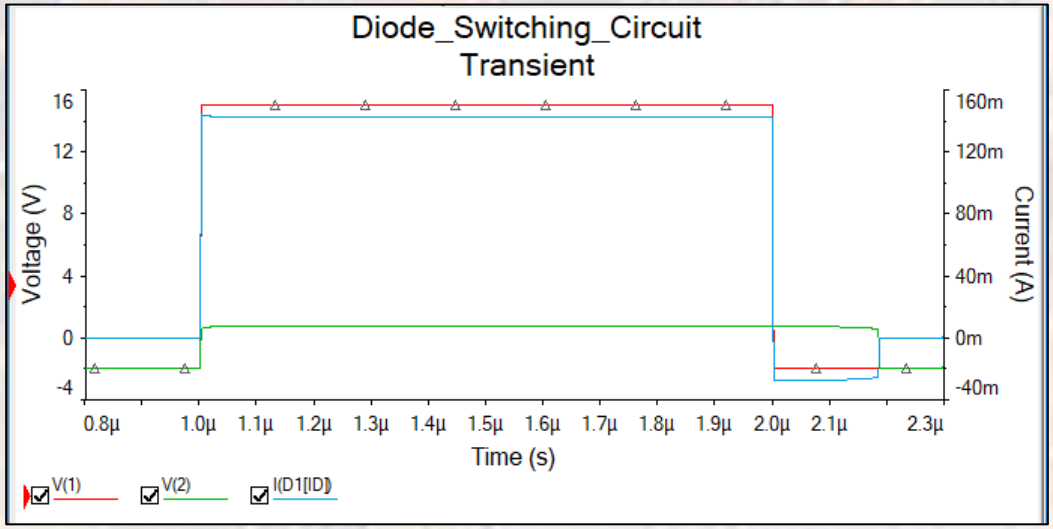
Diode Switching



- Simulation Example – 15V







t_{rr} = 200ns