Light-Emitting Diodes
LED

• Is the acronym for Light-Emitting Diode, which is a semiconductor diode (a p-n junction) that emits light when positive current flows from the anode to the cathode of the LED.
  – Anode is the p or positive side of the diode.
  – Cathode is the n or negative side of the diode.
Symbol

- The symbol for the diode is an arrow head touching a vertical line.

\[ \text{anode} \quad \rightarrow \quad \text{cathode} \]

- The arrow shows the direction of current that will cause light to be emitted by the LED.
- Occasionally, the symbol for an LED will also include arrows that represent light leaving the diode.
Discrete LEDs

• The individual green, red, and yellow LEDs in the parts kit are called discrete LEDs. There is only one diode in each package.
  – Most of the package is not the actual LED, but wires and a plastic lens.
    • The longer lead on the package is the anode or p side of the diode.
    • The wire next to the flat on the package base is the cathode when looking at the LED from the bottom.
To Determine Anode and Cathode with your DMM

• Switch your DMM to the diode symbol.
• Place the red probe into the V-Ω plug and the black probe into the COM plug.
• Place your probes across the diode.
  – If the result is a very small number, then your red probe is contacting the anode and the black probe is contacting the cathode of the diode.
  – If the result is an overload (overflow) condition, then the red probe is contacting the cathode and the black probe is contacting the anode of the diode.
Simulating a LED in PSpice

There is no LED part in the student version of PSpice so we use a series combination of parts.

– Dbreak (diode breakout part)
  • Allows current to flow when the voltage on the anode is 0.7V higher than the voltage on the cathode.

– Vdc
  • Set to the difference in the voltage needed on the anode to turn the LED on
    – The yellow LEDs need at least 2V to turn on.
    – Note that the direction of the battery.