ST 589-01 Lab 2

Ohm's and Kirchoff's laws

The purpose of this lab is to introduce the student to some instrumentation used to measure voltages and current in a circuit, and the application of the Ohm's and Kirchoffs laws to verify the measurements. The parts to be used in this lab are: (a) a prototype board (proto-board or bread-board), (b) a power supply, (b) a resistor, (c) and a Light Emmitting Diode (LED) (as shown in Figure 1). We will implement this circuit on a prototype board and use a multimeter (Amp and Volt meter) to measure voltages and currents.

A power supply is a reference to a source (voltage or current) of electrical power. The power supply in Figure 1 supplies 5 Volts to a load that consists of a resistor of 1 KΩ (kilo ohms or 1000 ohms) and one LED. The LED is fabricated from compound semiconductor materials, such as gallium arsenide and gallium arsenide phosphide. Because these materials have higher bandgap energies then silicon, the forward-bias junction voltage is larger than that in silicon-based diodes.

Apply the Ohm's law to find the voltage drop due to the resistor, then use Kirchoff's Voltage Law (KVL) to determine the value of R required to limit the current in the circuit:

$$I*R = 5\ Vdc - V_D \qquad\qquad\qquad (1)$$

 Assume that a diode current of ~10 mA (depending on the LED) produces the desired light output, and that the corresponding forward-bias voltage drop is ~1.7 V (depending on the LED). Implement the circuit in Figure 1 and compare to the results you obtained by applying (1). They should be comparable.
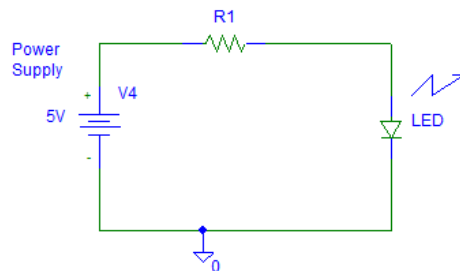

Figure 1. A simple LED circuit

Comments:

Typical LED current-limiting resistor values are in the range of ~300 Ω.