Voltage Diode vs Current Instrumentation Lab Drishikaa and Suhani

Suhani Surana

October 2023

1 Introduction

A Light Emitting Diode (LED) is a semiconductor device that emits light when an electric current passes through it. This phenomenon occurs as electrons within the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the emitted light corresponds to the energy required for electrons to traverse the band gap of the semiconductor. To generate white light, multiple semiconductors or a layer of light-emitting phosphor are used in conjunction with the semiconductor device.

1.1 Representation

The LED symbol is the standard symbol for a diode, with the addition of two small arrows denoting the emission of light.

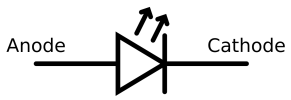

Figure 1: An image of the symbol of an LED

2 Circuit Design and Modifications

For this experiment, the same inverting amplifier circuit was used, however a resistor and diode were added to the circuit. Our initial experiment used a red LED. The frequency, wave pattern, voltage supply, amplitude and offset were set constant.

- Frequency: -20 Hertz
- Amplitude: -0.5 Vp-p

- Offset: -0.2
- Power Supply: -10.06 volts

3 Description about the VI Graph

To investigate how potential difference changes with varying current in ohmic conductors, filament bulbs, and diodes, we can conduct an experiment. The setup comprises a circuit with a battery, a variable resistor, a function generator, operational amplifiers (op-amps), and an oscilloscope for data collection. The specific component under examination (ohmic conductor, filament bulb, or diode) is integrated into the circuit. The experiment involves adjusting the resistance of the variable resistor to control the current in the circuit. An increase in resistance reduces current, while a decrease in resistance increases it.

4 Current voltage curve of Red LED

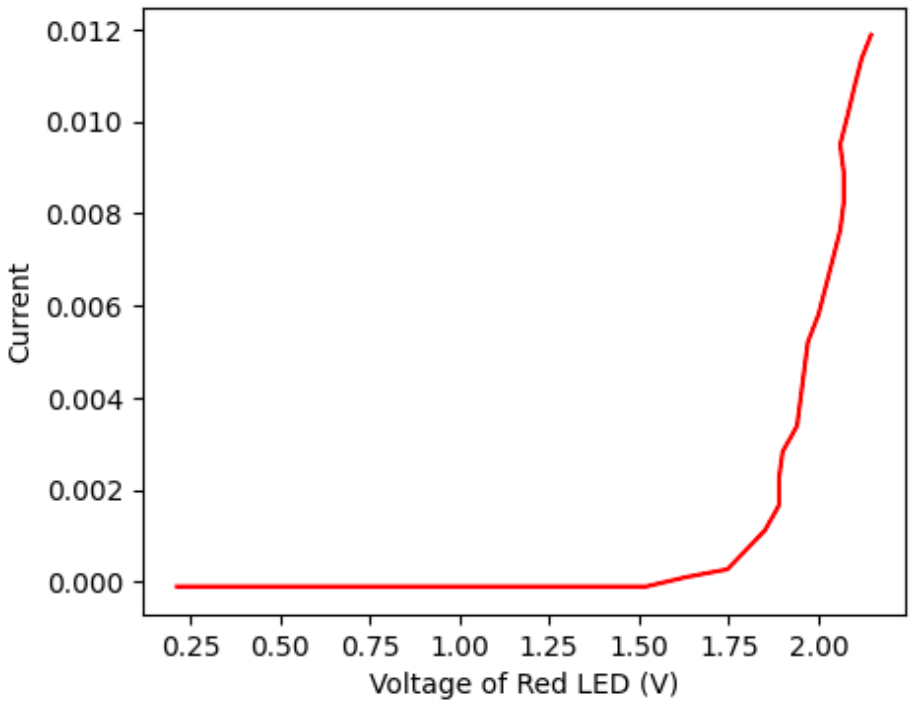

Figure 2: I-V Curve of a Diode: Figure 2 shows typical characteristics of a red diode.

5 Current voltage curve of Yellow LED

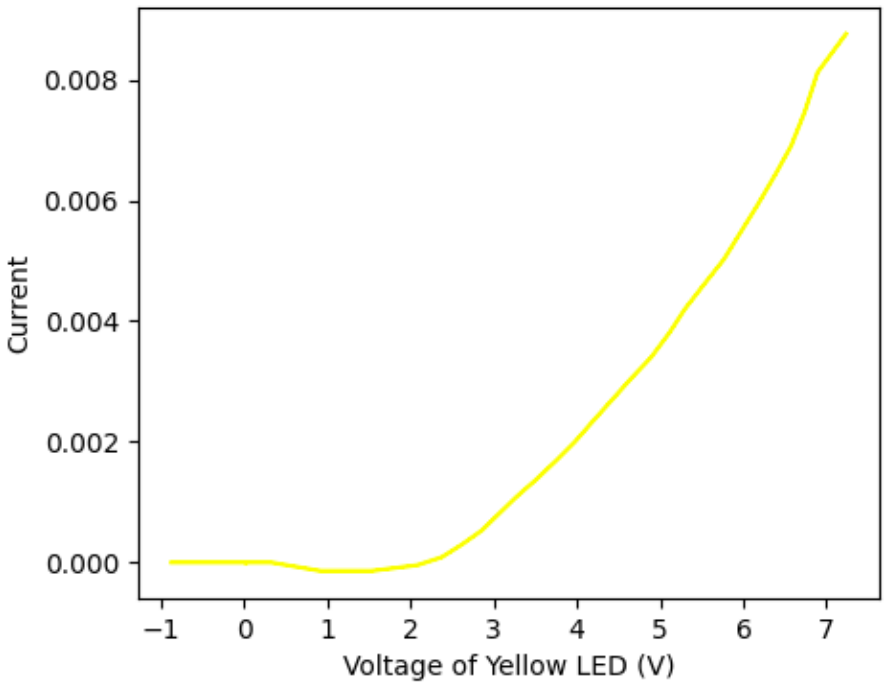

Figure 3: I-V Curve of a Diode: Figure 2 shows typical characteristics of a yellow diode.

I-V Characteristic Curve: In order to understand how a diode functions, it is useful to look at a plot of the voltage across the diode vs. the current through the diode. We call this type of curve and i-v characteristic curve. If we were to create an i-v curve of a resistor, where the current is directly proportional to the voltage (V=IR), we would see a straight line with a constant slope or R-1. When we plot the characteristic curve of an ideal diode (that switches on when the voltage across it goes above zero), we see zero current when vD is negative and infinite current as soon as vD tries to go positive. This is shown in figure 2 and 3. Note that, when an ideal diode turns on, it is a short circuit and, therefore, the voltage across the ideal diode when it is on is always zero.