

ST 589-01 Lab 1

Diode current and voltage characteristics

The purpose of this lab is to measure and plot the current-voltage characteristics of a *pn* junction. The theoretical relationship between the voltage and the current in the *pn* junction is given by

$$i_D = I_S [e^{(v_D/nV_T)} - 1] \quad (1)$$

The parameter I_S is the **reverse-bias saturation current**. For silicon *pn* junctions, typical values of I_S are in the range of 10^{-5} to 10^{-13} A. The actual value depends on the doping concentrations and the cross-sectional area of the junction. The parameter V_T is the thermal voltage, and is approximately $V_T = 0.026$ V at room temperature. The parameter n is usually called the emission coefficient or ideality factor, and its value is in the range $1 \leq n \leq 2$. Unless otherwise stated, we will assume the emission coefficient is $n=1$.

We will start by building the circuit described in Figure 1. We will vary the voltage source from -5 V to 5 V and at every time we will measure the voltage across and the current through the circuit (diode).

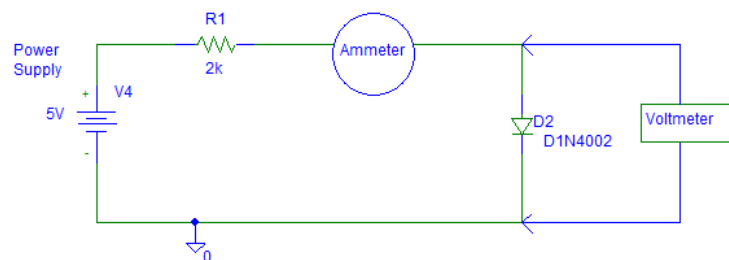


Figure 1. A simple diode circuit

Comments

DO NOT probe in parallel across the power supply with the multimeter configured as an ammeter! You could damage the meter by doing this.

Perform enough measurements so that we could see the diode *i-v* characteristics.