

Simulation Exercise: Temperature dependance

Part-1: Dark Forward Characteristics

1. Modify the netlist written for I/V characteristics of a solar cell in the previous section.
2. Run the simulation to measure the dark forward characteristics at 35^0C , 45^0C , 55^0C , 65^0C , and 75^0C .
3. Note the values of V_D for $I_D=1mA$, $2mA$ and $5mA$.
4. Fill up in the observation table 1 below. Calculate η for low forward bias (1mA) and for high forward bias (5mA) at all the temperatures.

Sr.No	V_D for $I_D=1mA$	V_D for $I_D=2mA$	V_D for $I_D=5mA$	η for $I_D=1mA$	η for $I_D=5mA$
35^0C					
45^0C					
55^0C					
65^0C					
75^0C					

Table 1

Part-2: Lighted I/V Characteristics

In this part, we will plot the I/V characteristics of the solar cell when used as a power source. We will measure I/V characteristics at various temperatures when the solar cell is lighted at the intensity to generate $I_L=8mA$.

1. A load resistor R is connected across the solar cell. The value of R is varied from 1 to 500Ω and the values of I_L and V_L are recorded for the temperatures 35^0C to 75^0C in steps of 10^0C .

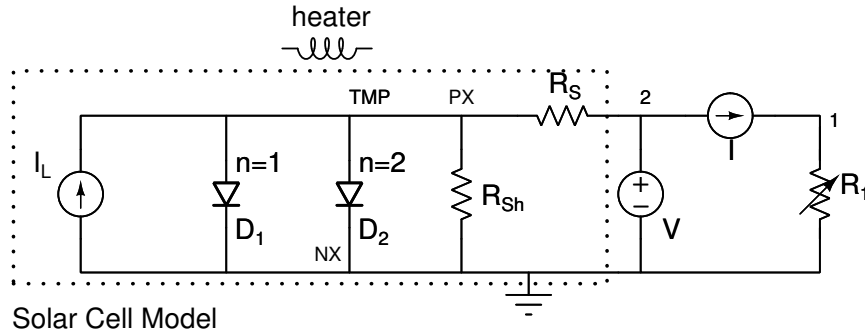


Figure 1: Solar Cell used as power source operated at different temperatures

2. Plot I_D - V_D and P_L - V_D characteristics under lighted condition at all the temperatures. Note the values of V_{oc} and I_{sc} values for all temperatures.
3. Obtain Fill Factor (FF) for all the temperature and plot FF v/s temperature.
4. Plot V_D v/s Temp and V_{oc} v/s Temp. You will get three sets of V_D for $I_D = 1\text{mA}$, 2mA and 5mA obtained in Part-1.
5. Comment on the dependence of V_{oc} , I_{sc} , and FF.