

Ministry of Higher Education and Scientific Research

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The electronic is a practical analogue

the first lecturer

diode

by

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Experiment (1)

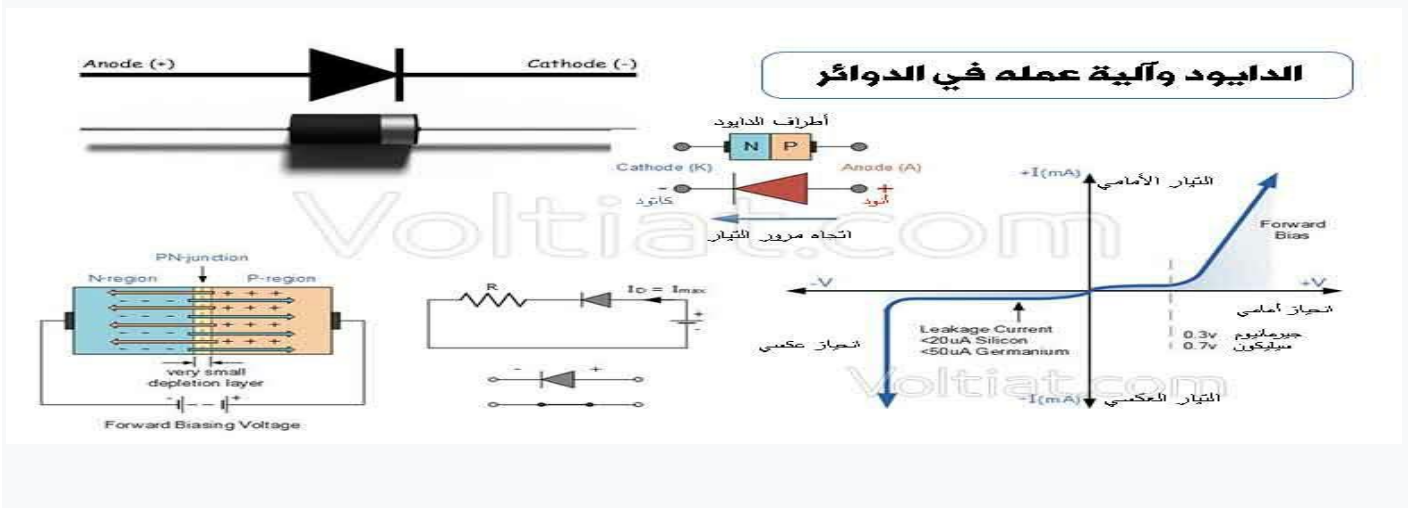
Two-junction (p-n) properties in the forward and reverse directions

the purpose of the experiment :-

Draw a curve of the properties of the diode (p-n junction) in the case of forward bias and in the case of reverse bias, as well as finding the electrical resistance in both directions

Used equipments :

- 1-Experiment plate
- 2-binary p-n
- 3-resistance
- 4- Ovometer
- 5-Continuous voltage source
- 6- Equipped capacity
- 7-connection wires



The theoretical part :

The diode is a p-n crystal where the positive (p) region, which has majority carriers which are positive gaps, meets the negative region, which has majority carriers which are negative electrons. In this experiment, we will deal with the properties of the diode in the forward and reverse directions, and we will notice the presence of a barrier voltage for the silicon diode.

si=0.7v and germanium Ge=0.3v at a temperature of 25c, and the diode will not be connected unless the barrier voltage and the total resistance of the diode are overcome

In the case of forward bias, the width of the depletion layer will decrease and the diode is connected easily, while the reverse bias will increase the width of the depletion layer and it will be connected with difficulty. Maximum continuous forward current, we keep the duo from damage

practical part :

front binding:

- 1- Connect the circuit as shown in the figure above
- 2- Connect the positive part to the resistance and its value is equal to 1k
- 3- Connect the positive end of the diode to the resistance
- 4- Connect the negative terminal to the ammeter (Ma)
- 5- According to the above drawing, we connect the ammeter to the negative side of the source
- 6- Connect the voltmeter in parallel with the diode
- 7- Connect the negative terminal to the voltmeter
- 8- I turn on the source and take the values of the readings according to the given in the table below
- 9- Connect the source as shown in the figure, provided that it is at the lowest voltage, and it is better to be at (0)
- 10- Set the source (on) for continuous voltages, then change the source voltages and record the corresponding current values according to the following table:

| | | | | | | | | | | | |
|------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| $V_f(\text{V})$ | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
| $I_F(\text{Ma})$ | | | | | | | | | | | |

- 11- Through the above table, draw the relationship between (I_f - V_f) so that the current I_f is on the vertical axis and the voltage V_f is on the horizontal axis, according to the results extracted from the table.

reverse link:

1- Connect the circuit as in the above figure so that the diode is in reverse bias mode

2- Connect the source and set it (on), then change the voltage of the source and record the corresponding current values according to the following table:

3- Through the above table, draw the relationship between I-V so that the current I is on the vertical axis and the voltage V is on the horizontal axis, according to the results obtained from the table (the characteristic curve of a diode

4- Calculate the resistance value of the diode in the forward (RF) and reverse (Rr) directions from the graph according to the following equations.

$$R_F = \frac{V_2 - V_1}{I_2 - I_1}$$

$$R_r = \frac{V_2 - V_1}{I_2 - I_1}$$

Discussion questions:

- 1- How do you explain the appearance of the isotropy curve in the forward and reverse biases of the junction diode? .
- 2- Compare the forward and reverse bias?
- 3- If the diode does not conduct current in the reverse direction, why does it represent current?
- 4- What is the resistance (R_s) connected in series with the diode called? .
- 5- In a crystal diode, why is the voltage barrier region (the depletion region) or called the energy gap large in the case of reverse bias and small in the case of forward bias?
- 6- When do we use the diode in reverse connection?