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Batch – 2024

Application No - 158377

Subgroup – 1H3

Experiment: VI Characteristics of Diode

Aim: To plot VI characteristics of a PN junction diode

Apparatus: Using Virtual Lab (http://vlabs.iitkgp.ernet.in/be/)

Theory:

The diode is a device formed from a junction of n-type and p-type semiconductor material. The lead connected to the p-type material is called the anode and the lead connected to the n-type material is the cathode. In general, the cathode of a diode is marked by a solid line on the diode.

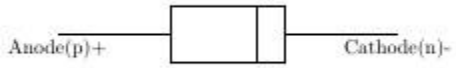


Figure 1 PN junction diode structure

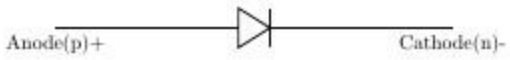


Figure 2 PN junction diode symbol

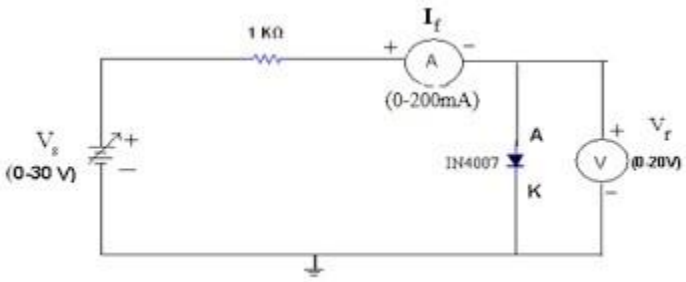


Figure 3 Circuit diagram for VI characteristics of diode

In forward biasing, the positive terminal of battery is connected to the P side and the negative terminal of battery is connected to the N side of the diode. Diode will conduct in forward biasing because the forward biasing will decrease the depletion region width and overcome the barrier potential. In order to conduct, the forward biasing voltage should be greater than the barrier

potential. During forward biasing the diode acts like a closed switch with a potential drop of nearly 0.6 V across it for a silicon diode. The forward and reverse bias characteristics of a silicon diode. From the graph, you may notice that the diode starts conducting when the forward bias voltage exceeds around 0.6 volts (for Si diode). This voltage is called cut-in voltage.

In reverse biasing, the positive terminal of battery is connected to the N side and the negative terminal of battery is connected to the P side of a diode. In reverse biasing, the diode does not conduct electricity, since reverse biasing leads to an increase in the depletion region width; hence current carrier charges find it more difficult to overcome the barrier potential. The diode will act like an open switch and there is no current flow.

Procedure:

Forward Biased: (http://vlabs.iitkgp.ernet.in/be/exp5/forwardbiaseddiode_si_ver1.html)

1. Set DC voltage to 0.2 V .
2. Select the diode.
3. Set the resistor to 1k
4. Voltmeter is placed parallel to Silicon diode and ammeter series with resistor.
5. The positive side of battery to the P side(anode) and the negative of battery to the N side(cathode) of the diode.
6. Now vary the voltage upto 5V and note the Voltmeter and Ammeter reading for particular DC voltage.
7. Take the readings and note Voltmeter reading across Silicon diode and Ammeter reading.
8. Plot the V-I graph and observe the change.

Reverse Biased: (http://vlabs.iitkgp.ernet.in/be/exp5/reversebiaseddiode_si_ver1.html)

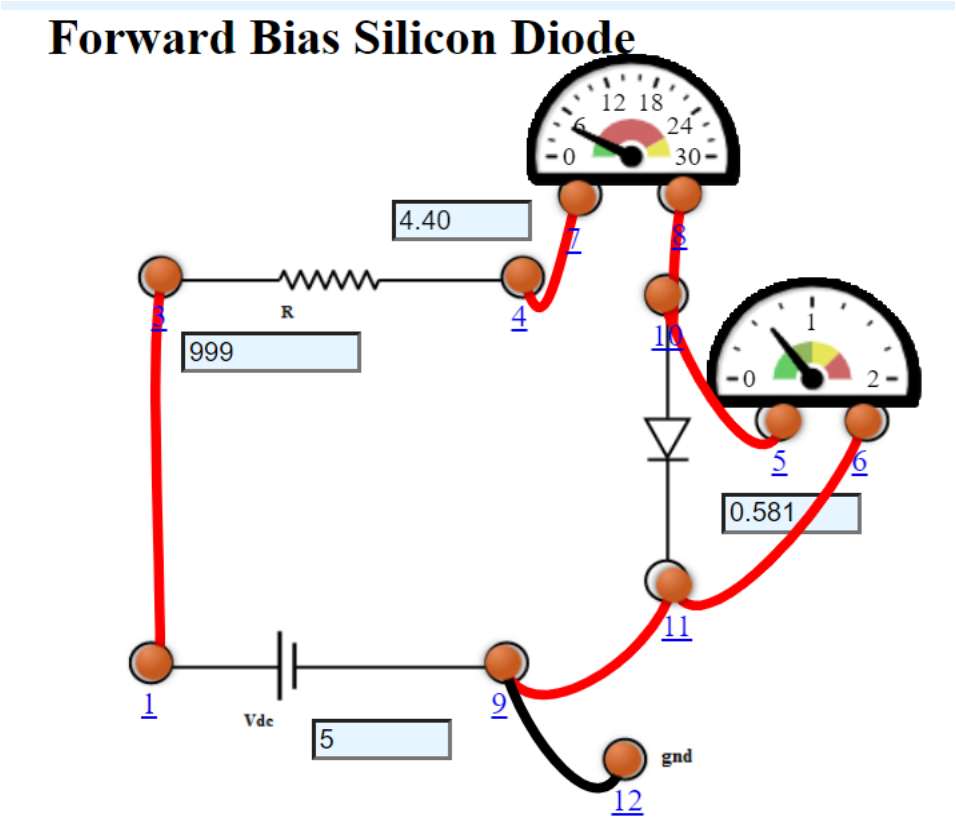
1. Set DC voltage to 0.2 V .
2. Select the diode.
3. Set the resistor.
4. Voltmeter is placed parallel to Silicon diode and ammeter series with resistor.
5. The positive terminal of battery is connected to the N side(cathode) and the negative terminal of battery is connected to the P side(anode) of a diode.
6. Now vary the voltage upto 30V and note the Voltmeter and Ammeter reading for DC voltage.
7. Take the readings and note Voltmeter reading across Silicon diode and Ammeter reading.
8. Plot the V-I graph and observe the change.

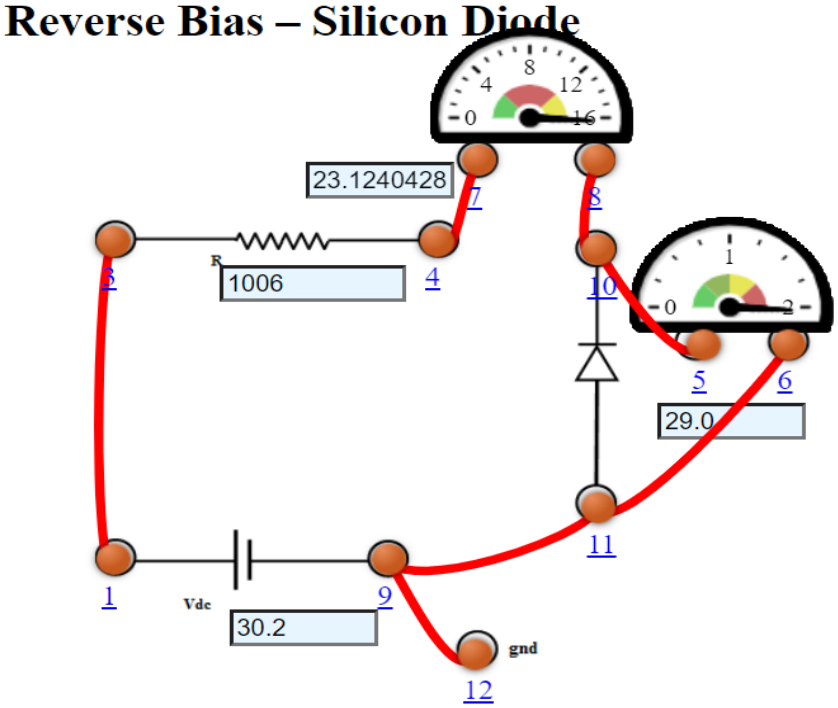
Observation Table :

EXPERIMENTAL TABLE		
Serial No.	**Forward Voltage(Volt)**	**Forward Current(mAmp)**
1	0	0
2	0.539	0.400
3	0.552	1.05
4	0.556	1.37
5	0.562	1.89
6	0.568	2.48
7	0.572	2.98
8	0.575	3.38
9	0.577	3.80
10	0.581	4.40

EXPERIMENTAL TABLE		
Serial No.	**Reverse Voltage(Volt)**	**Reverse Current(µAmp)**
1	**0.161**	**0.100**
2	**1.17**	**0.100**
3	**1.80**	**0.100**
4	**5.08**	**0.100**
5	**7.16**	**0.100**
6	**9.50**	**0.100**
7	**11.4**	**0.100**
8	**15.6**	**0.100**
9	**16.8**	**0.100**
10	**20.7**	**0.100**
11	**24.7**	**0.100**
12	**27.6**	**0.100**
13	**29.0**	**23.124042879019907**

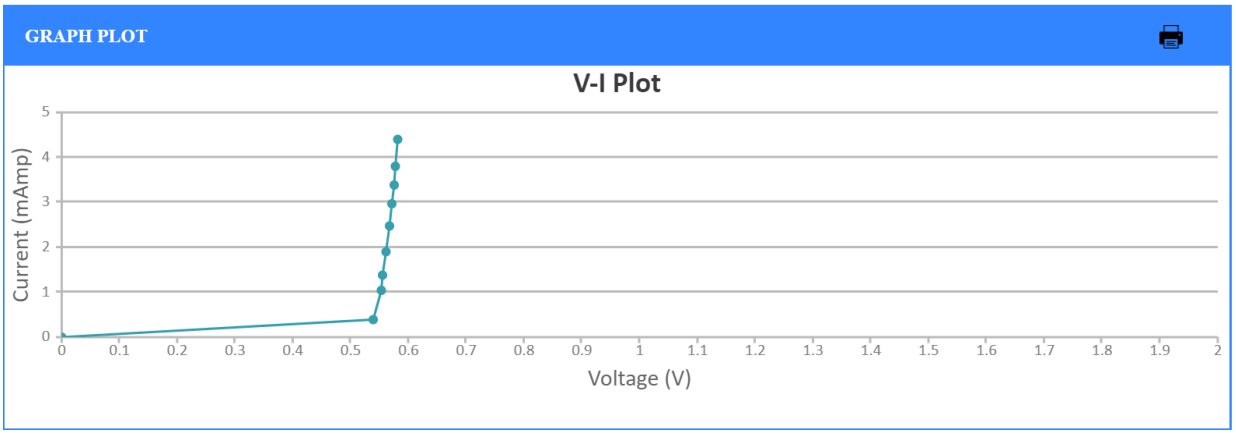
Circuit Diagram (on Vlab):



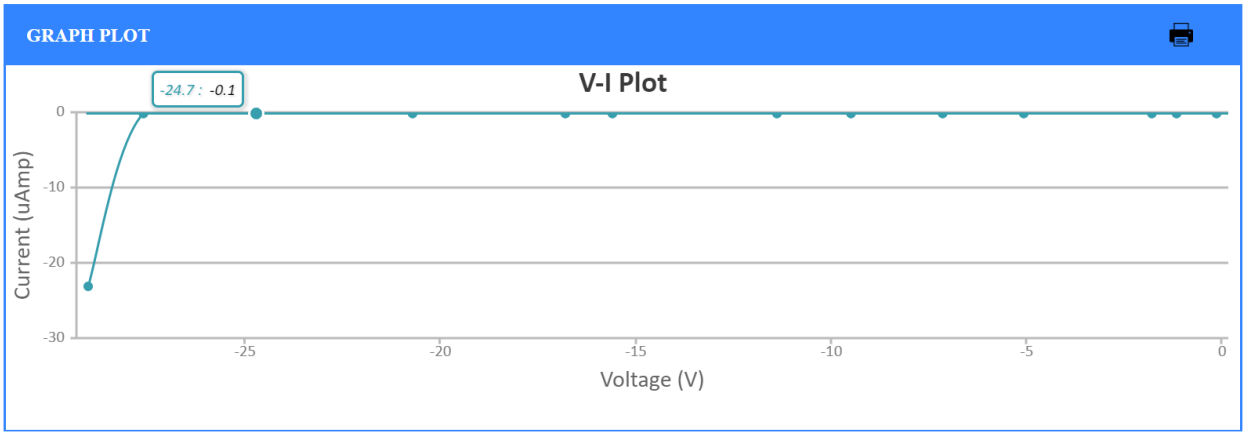


VI Characteristics of PN junction diode:

Forward Biased:



Reverse Biased:



Conclusion: During forward bias, the diode conducts current with increase in voltage. During reverse bias, the diode does not conduct with increase in voltage (break down usually results in damage of diode).