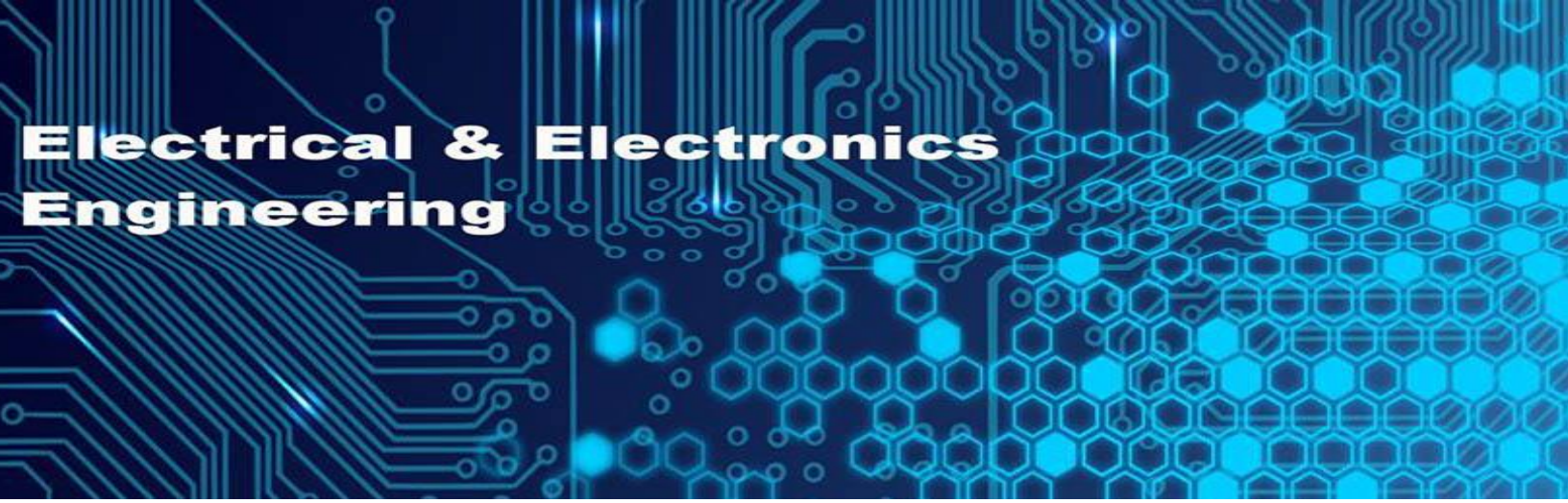

EEE Lab Report

Course: Electronic Devices and Circuits & Pulse Techniques Lab
Course Code: EEE 204

Experiment No: 01
Experiment Name: Observation of the V-I characteristic of a diode
Date of Performance: 18/02/2021
Date of Submission: 04/03/2021

Submitted By:	Submitted To:
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Signature and Date
Mr. Sharif Nafis Mahmood
Lecturer
Department of EEE
Green University of Bangladesh

Experiment No: 01

Experiment Name: Observation of the V-I characteristic of a diode

Objective:

To study and verify the functionality of a) PN junction diode in forward bias

b) Point-Contact diode in reverse bias

Apparatus required:

a) A diode

b) A DC voltage supplier

c) Bread board

d) 100 Ω resistor

e) 2 multimeter for measuring current and voltage

f) Connecting wires.

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Pre Lab: This lab does not require a pre lab. However, the rest of the labs require the Pre lab in the form of calculations, research and or design.

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 called the cathode. In general, the cathode of a diode is marked by a solid line on the diode.

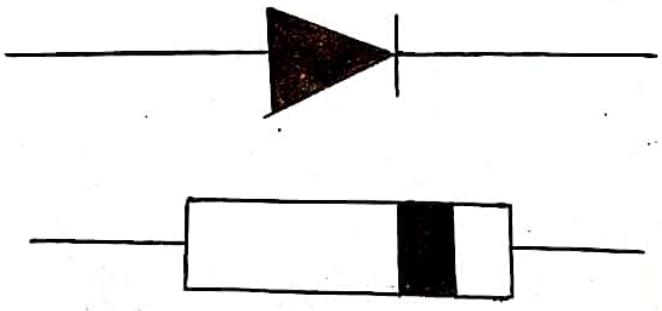

Figure 1.1: The symbol for a diode compared to an actual diode package

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This primary function of a diode is the rectification. When it is forward biased (the higher potential is connected to the anode lead), it will pass current. When it is reverse biased (the higher potential is connected to the cathode lead), the current is blocked. The characteristic curves of an ideal diode and a real diode are seen in Figure 1.2.

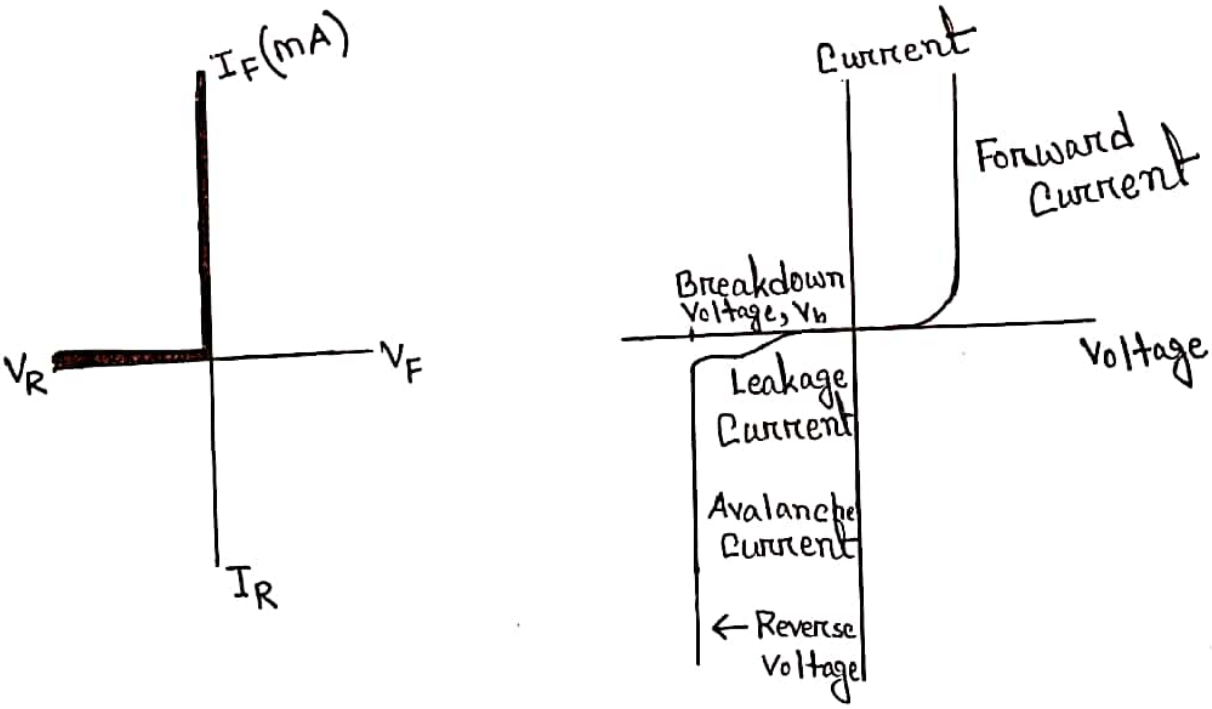

Figure 1.2: Characteristic curves of an ideal diode and a real diode

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When analyzing circuits, the real diode is usually replaced with a simpler model. The simplest form, the diode is modeled by a switch (Figure 1.3). The switch is closed when the diode is forward baised and open when the diode is reverse baised.

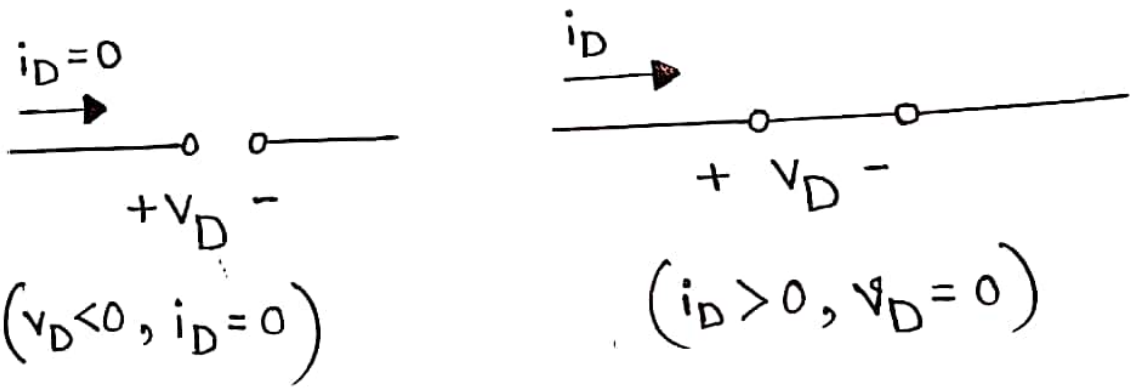

Figure 1.3: Equivalent Circuit of Diode

Biasing of PN junction Diode:

Forward bias operation

The P-N junction supports uni-directional current flow. If +ve terminal of the

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input supply is connected to P-side and -ve terminal is connected to the n side, then diode is said to be forward biased condition. In this condition the height of the potential barrier at the junction is lowered by an amount equal to given forward biasing voltage. Both the holes from P-side and electrons from n-side cross the junction simultaneously thereby decreasing the depleted region. This constitutes a forward current (majority carrier movement - diffusion current). Assuming current flowing through the diode to be very large, the diode can be approximated as short-circuited switch. Diode offers a very small resistance called forward resistance (few ohms).

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Reverse bias operation

If negative terminal of the input supply is connected to P-side and -ve terminal is connected to n-side then the diode is said to be reverse biased. In this condition an amount equal to reverse biasing voltage increases the height of the potential barrier at the junction. Both the holes on P-side and electrons on N-side tend to move away from the junction thereby increasing the depleted region. However the process cannot continue indefinitely, thus a small current called reverse saturation current continues to flow in the diode. This current is negligible; the diode can be approximated as an open circuited switch it offers a very high resistance called reverse resistance (few

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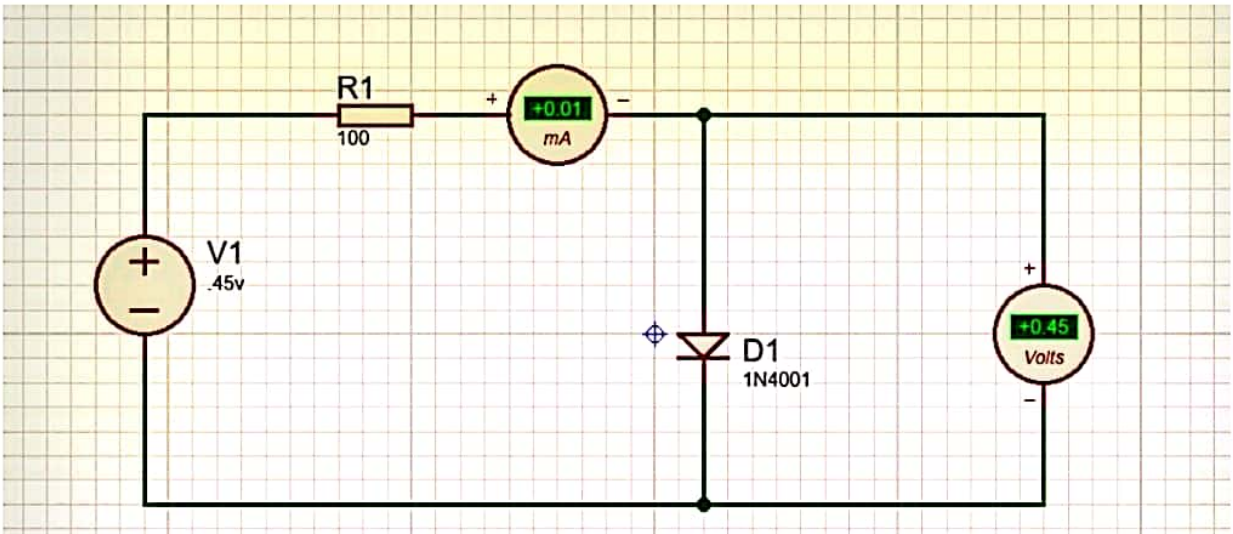
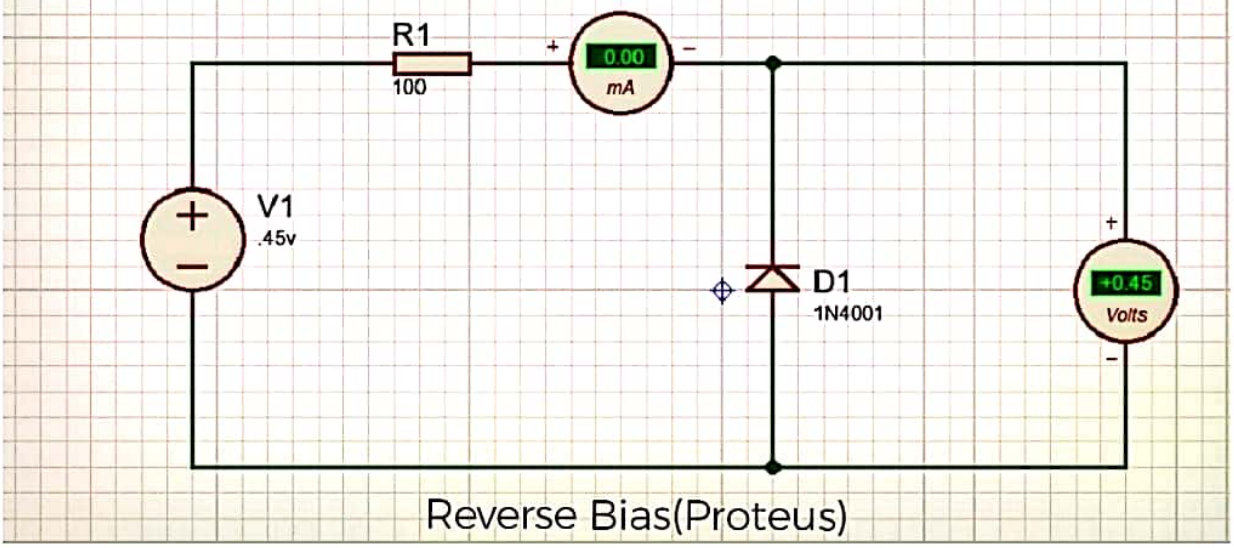
kiloohms).

Circuit Diagram:



Forward Bias(Proteus)



Reverse Bias(Proteus)

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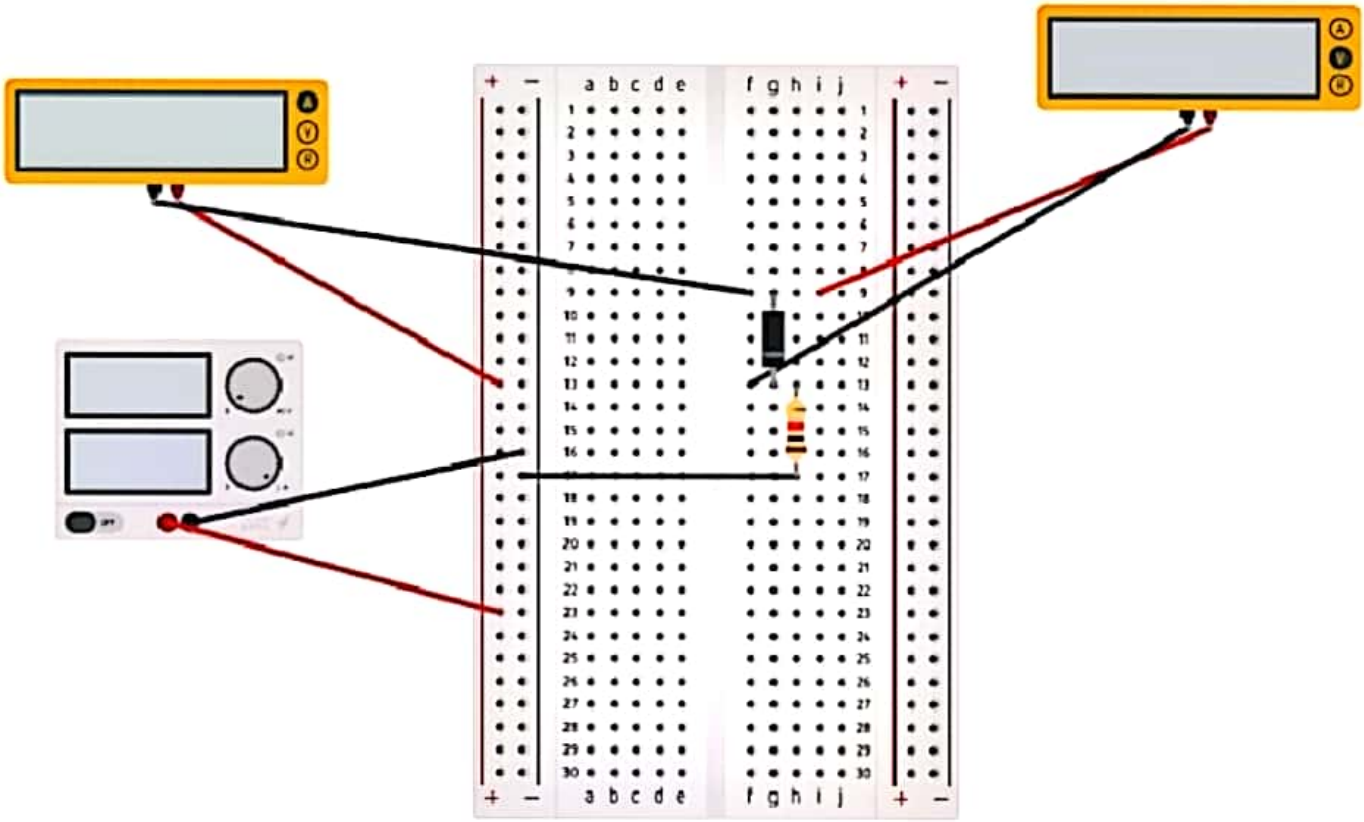
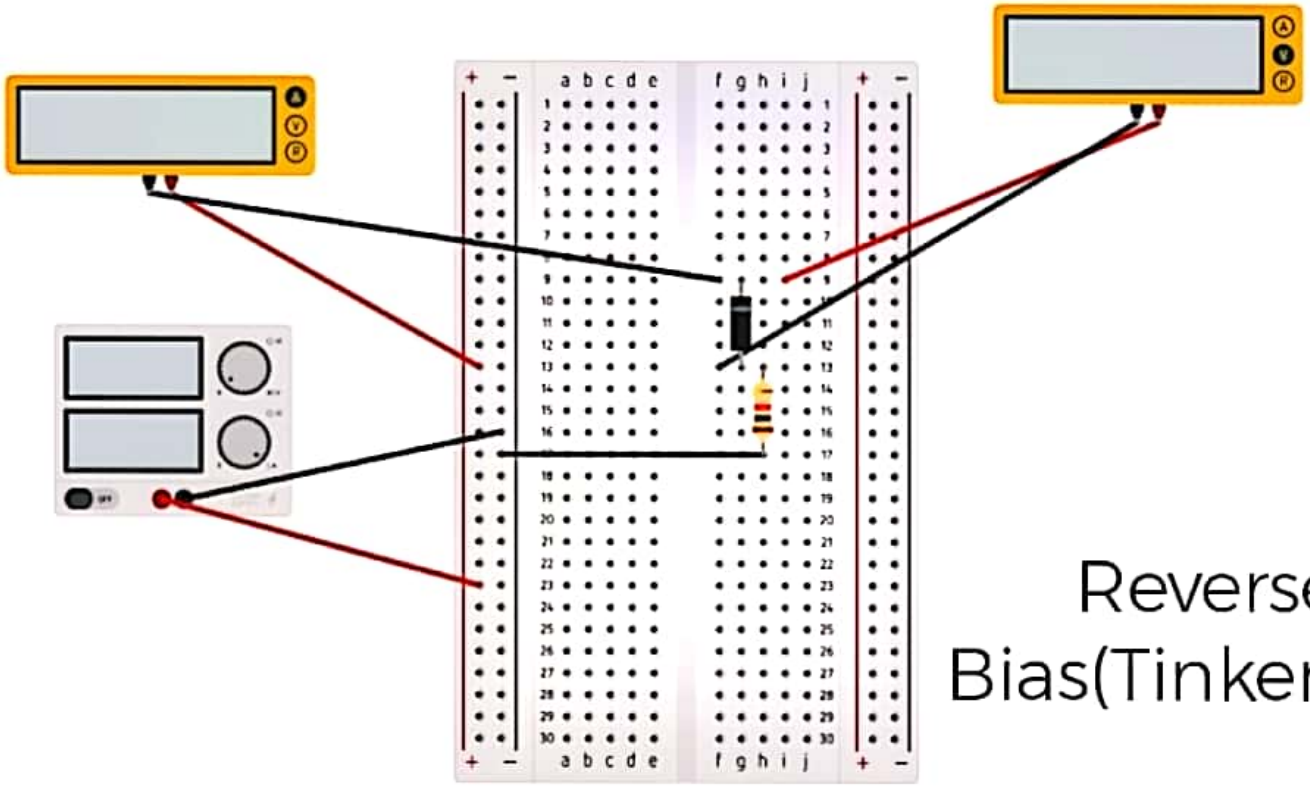


Forward Bias(Tinkercad)



Reverse Bias(Tinkercad)

Procedure: (a) Forward Bias Condition:

1. Connect the circuit as shown in Figure (PN Junction diode with milli-ammeter in series with the diode).
2. Initially vary Regulated Power Supply (RPS) voltage V_s in steps of 0.1V. Once the current starts increasing vary V_s in steps of 0.02V and note down the corresponding readings V_f and I_f.
3. Tabulate different forward currents obtained for different forward voltages.
4. Plot the V-I characteristics and calculate the resistance levels.
5. Compare the theoretical and practical values (cut-in voltage and resistances).

Tabular column:

Forward Bias		Reverse Bias	
V_D (volts)	I_D (mA)	V_D (volts)	I_D (μA)
0.45V	0.01mA	0.90V	0.01 μA
0.50V	0.04mA	1.60V	0.02 μA
0.55V	0.13 mA	2.50V	0.03 μA
0.57V	0.19 mA	3.50V	0.04 μA
0.59V	0.26mA	5.00V	0.06 μA

(b) Reverse Bias Condition:

01. Connect the circuit as shown in Figure (Point contact diode in series with micro ammeter).
02. Vary V_S in the Regulated Power Supply (RPS) gradually in steps of 1V from 0V to 12V and note down the corresponding readings V_R and I_R.
03. Tabulate different reverse currents obtained for different reverse

voltages.

04. Plot the V-I characteristics and calculate the resistance levels.

05. Compare the theoretical and practical values.

Results:

Forward Characteristic

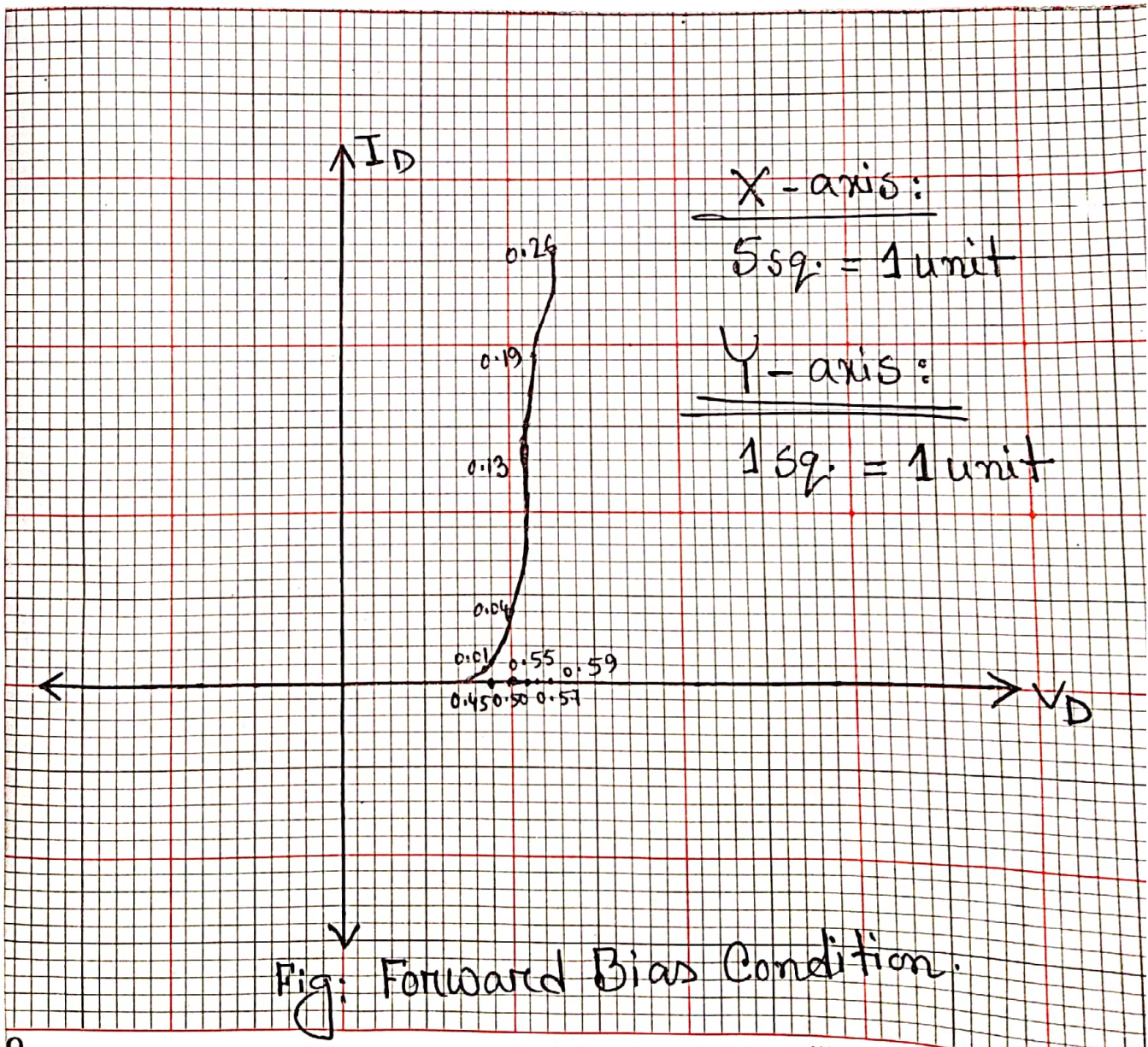


Fig: Forward Bias Condition.

Reverse Characteristic

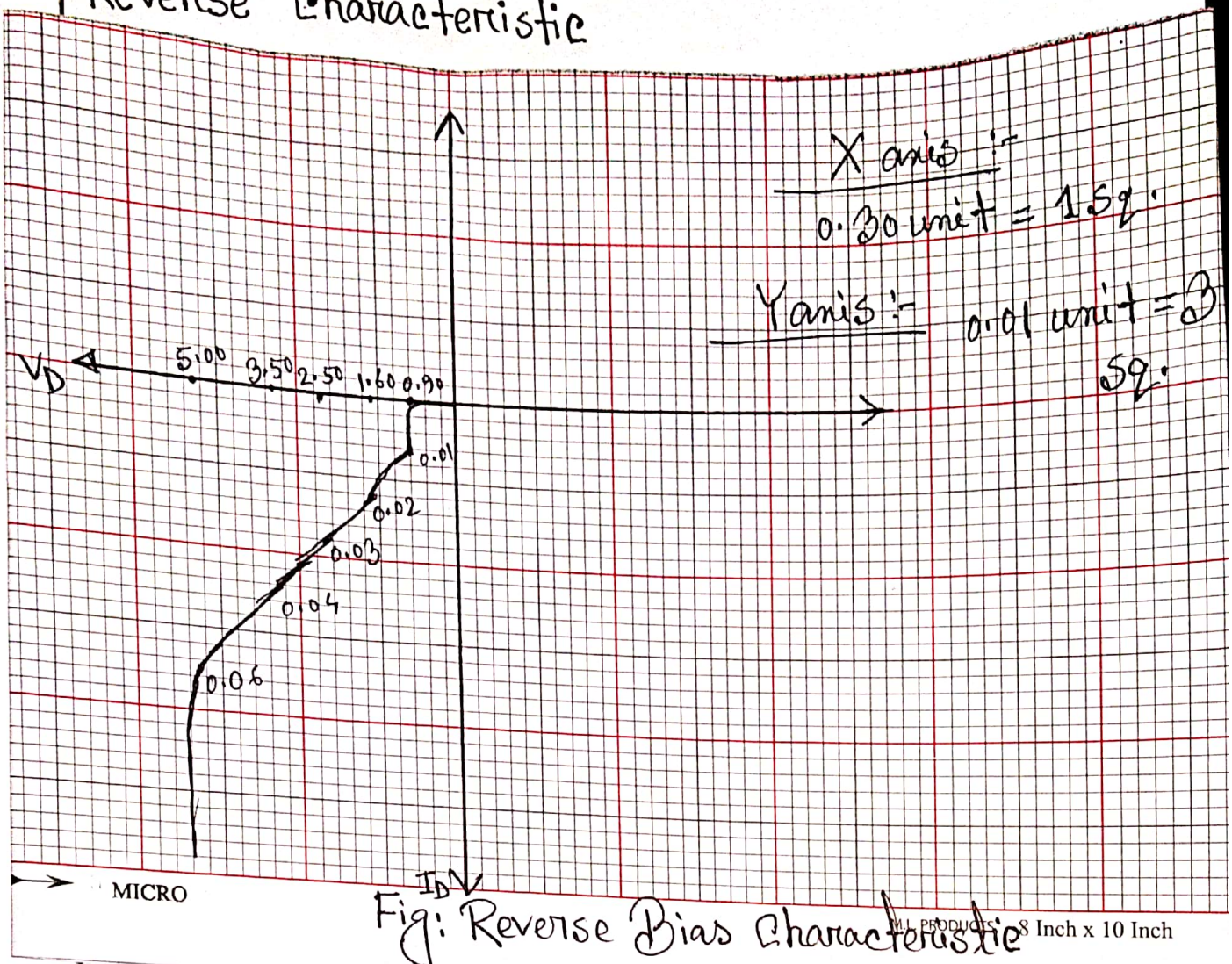


Fig: Reverse Bias Characteristic

Discussion: In our today's lab our target was observing the V-I characteristic of a diode. Actually diode is nothing but a device which is formed by two types semiconductor material. The primary function of diode is the reflection.

From this experiment, we can realize that when the diode in forward biased it will pass current and when it is in reverse biased, the current will be blocked. So we can easily say from this experiment that, diodes prevent current in reverse direction.

Finally we can say that, this experiment is more effective to gain knowledge about forward and reverse biased characteristics.

Reference:

[1] Lab Manual for EEE 204 Course [Made & Edited by Mr. Sharif Nafis Mahmood, Lecturer, Dept. of EEE, Green University of Bangladesh]

[02] Electrical devices and circuit theory by Robert L. boylestad and L. nashelsky.