East West University

Department of CSE

LAB REPORT

Course Code and Name: CSE251[Electronic Circuits]	
Experiment no: 01	
Experiment name: I-V Characteristics and Modeling of Forward Conduction of a Diode	
Semester and Year: Fall-24	**GROUP NO: 02**
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Date of Report Submitted: 11 November 2024	**Pre-Lab Marks:**
	Post Lab Marks:
	TOTAL Marks:

Data sheet

CSE251 (Section-7)

Group-02

Members Name:

1. Abdul Wadud (2022-2-60-133)
2. Ajmain Nur Shihab (2022-3-60-188)
3. Nasrullah Kaisher Sijan (2023-1-60-204)
4. Md Sabik Hossen (2023-2-60-305)

Data Sheet:

Vs	V_D (V)	V_R (V)	I_D (mA) = V_R/R(KΩ)	Measured Value of R (KΩ)
0.1	0.487	0	0	
0.2	0.145	0	0	
0.3	0.21	0	0	
0.4	0.316	0	0	
0.5	0.437	0.018	0.18	
0.6	0.482	0.060	0.061	
0.7	0.504	0.105	0.107	
0.8	0.532	0.196	0.202	
0.9	0.549	0.285	0.294	
1	0.559	0.360	0.371	
1.3	0.589	0.669	0.689	0.97kΩ
1.6	0.607	0.967	0.996	
1.8	0.614	1.111	1.145	
2	0.623	0	0	
2.5	0.639	0	0	
3	0.649	2.291	2.362	
3.5	0.695	2.790	2.876	
4	0.668	3.296	3.397	
4.5	0.674	3.818	3.936	
5	0.681	4.202	4.924	
6	0.690	5.256	5.41	
7	0.698	6.272	6.465	
8	0.706	7.279	7.50	
9	0.711	8.292	8.548	
10	0.716	9.328	9.616	
12	0.728	11.305	11.65	
14	0.735	13.267	13.677	
16	0.742	15.33	15.804	
18	0.748	17.326	17.862	
20	0.753	19.308	19.905	

05/11/24

Post lab questions and solutions

1. **Plot the I-V characteristics of the p-n junction diode in forward conduction. Label the axes appropriately and have them printed.**

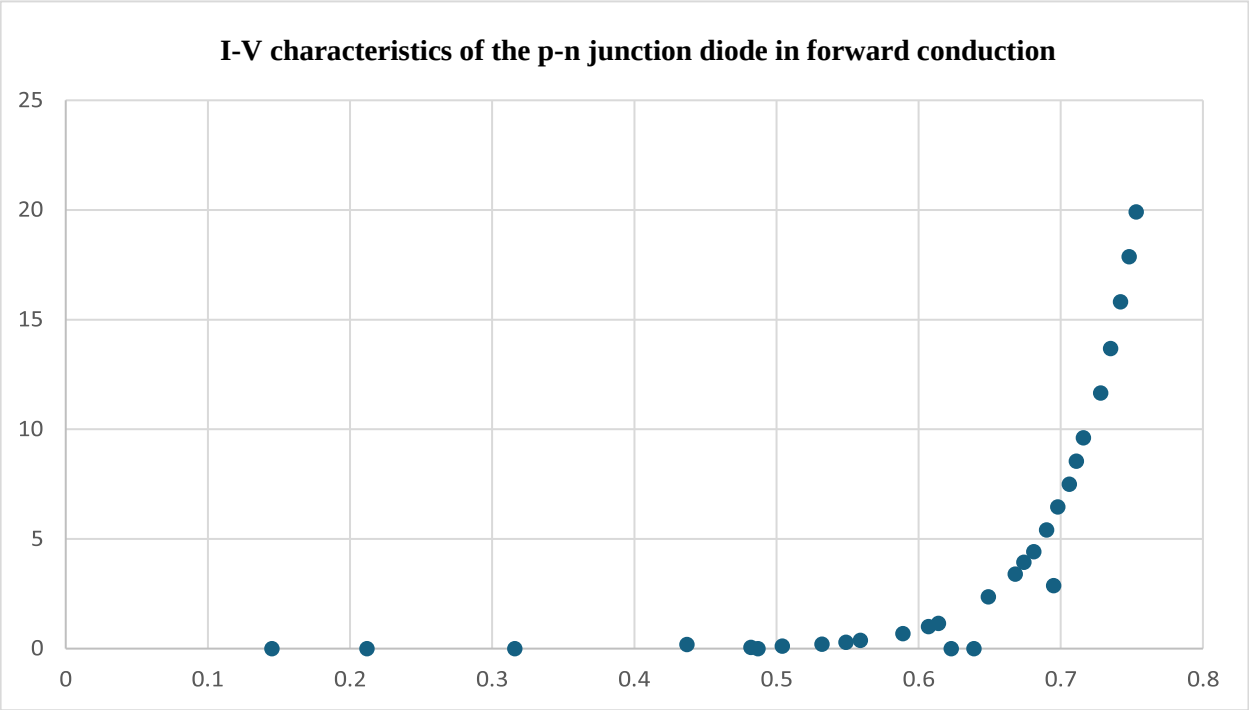


Figure-1

2. Use pencil to identify the points on your graph that are corresponding to ID1 = 2 mA and ID2 = 2.5 mA. Use these data points to calculate the diode parameters IS and n from the equation ID = IS exp [VD/nVT]. Use VT = 0.0259V.

When, ID1 = 2mA then VD1 = 0.64 V

And ID2 = 2.5mA then VD2 = 0.66 V

Now to find n we can use this equation, VD2 –VD1 = nVT ln(ID2 / ID1)

=> n = VD2 –VD1 /VT ln(ID2 / ID1)

=> n= (0.66−0.64) / 0.0259 ln(2.5 / 2)

=> n = 3.46

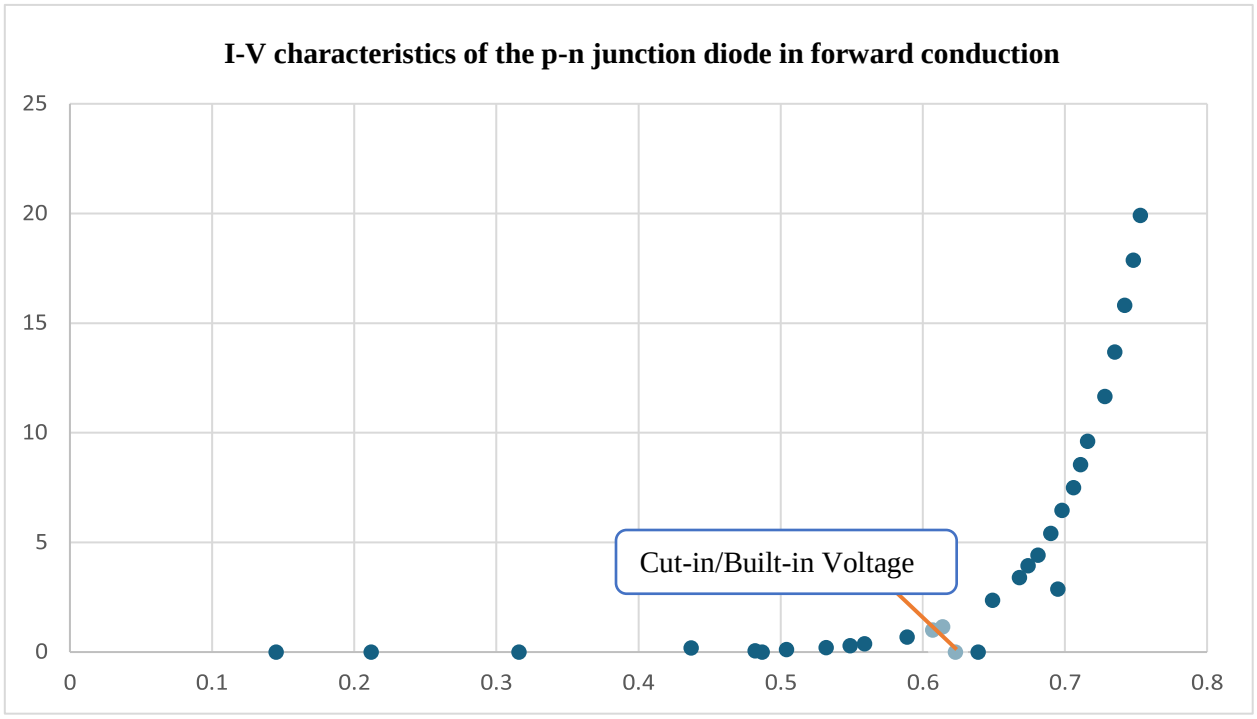
And, ID = IS *e* [VD1/nVT]

=> IS = ID / *e* [VD1/nVT]

=> IS = 2 / *e*^ [0.64/1.73×0.0259]

=> IS = 0.00125 mA**.**

3. Determine the cut-in voltage from the printed graph by drawing extrapolated line with pencil.



From the graph, the cut-in or built-in voltage is V_{DO} = 0.6V

4. If the diode resistance for the piecewise linear model is defined as 1/ $rD = \partial ID/\partial VD = (ID2 - ID1) /(V_{D2} - V_{D1})$, calculate the value of r_D from the data points corresponding to I_{D1}=2mA and I_{D1}=2.5mA.

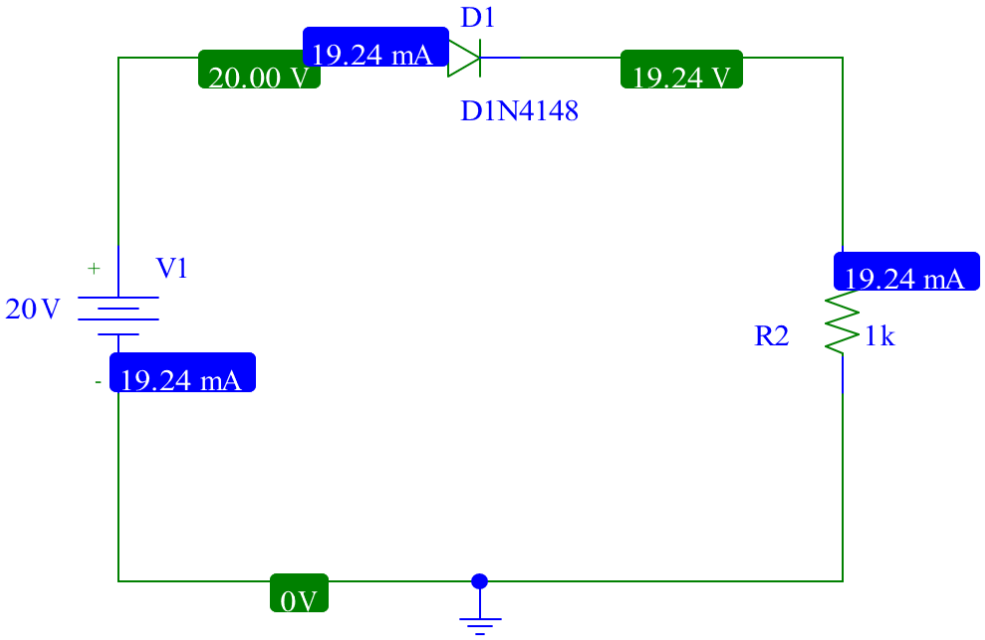
I_{D1} = 2.0 mA and V_{D1} = 0.64V

And for
I_{D2} = 2.5mA and V_{D2} = 0.66V

We know,
$r_D = (I_{D2} - I_{D1}) / (V_{D2} - V_{D1})$

r_D = 0.04 KΩ So, the value of r_D = 0.04 KΩ

5. Simulate the circuit of Figure 1 for a DC bias (Vs) range of 0-5 volts using PSpice. Print the ID vs. VS and VD vs. VS plots generated by PSpice and attach them with your report.



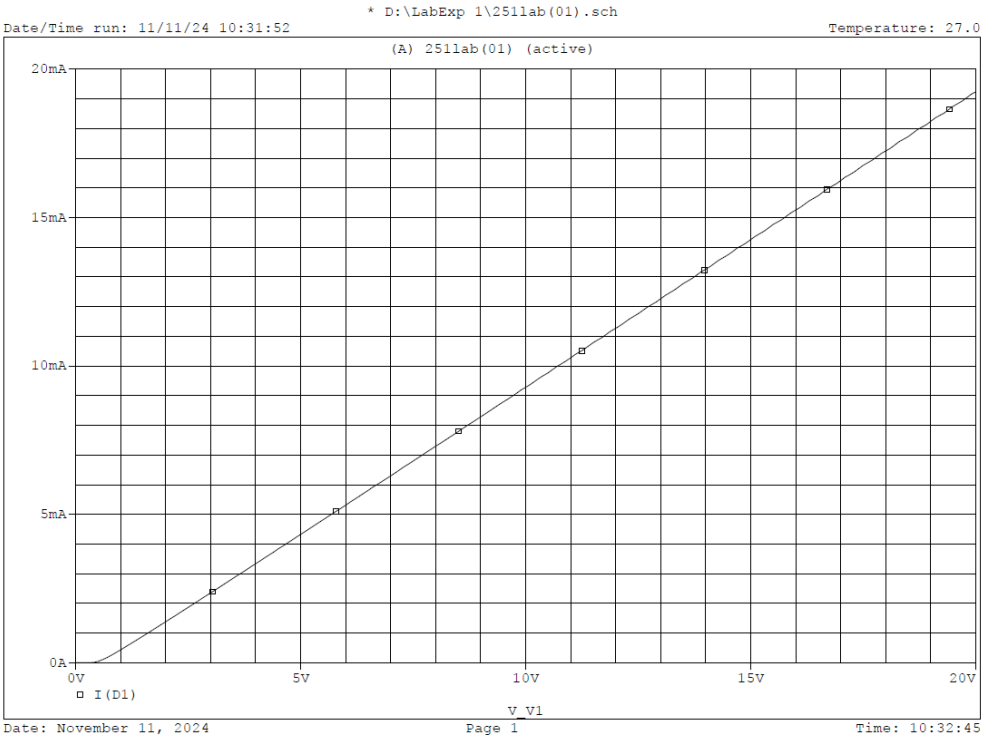


Figure: I_D vs V_S

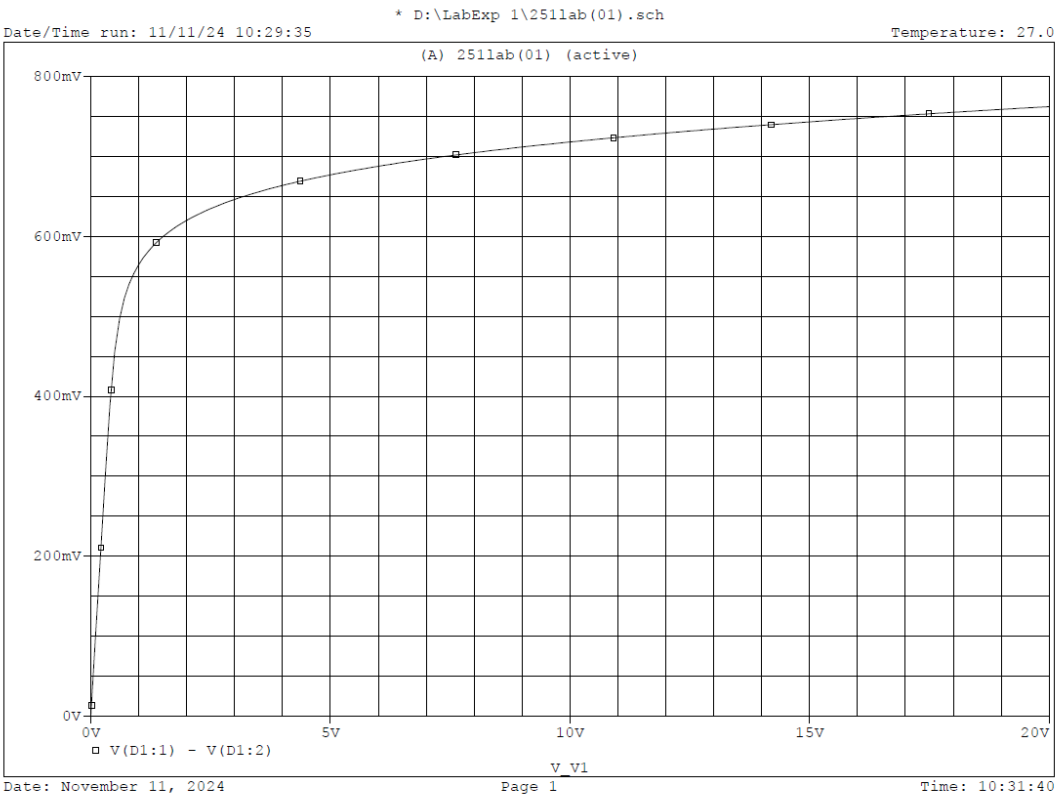


Figure: V_D vs V_S

Conclusion:

From this lab, we have learned about the characteristics of diodes. From this experiment, we've learned that Diodes will prevent currents in reverse directions. From the I-V characteristics we know about forward, reverse and no bias concept. Our concept is increased about diode and I vs. V characteristics by doing this experiment. To do the experiment easily ohms law helps us. By using ohms law, we can easily find voltage and current. We can easily find the I-V characteristics by using Shockley ideal equation. We also use a piecewise linear model to understand the lab easily.