EXPERIMENT 7:Observation of characteristics of a Zener diode

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1 Aim of experiment

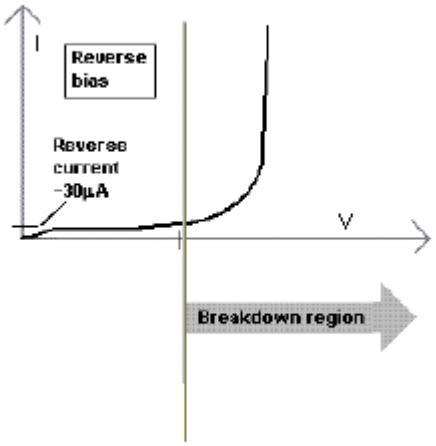
In this experiment, we try to observe the relation between the voltage and corressponding current generated. We will then plot it to get the dependence.

2 Apparatus required

a)A Zener diode
b)A DC voltage supplier
c)Bread board
d)100Ω resistor
e)2 multimeter for measuring current and voltage
f)Connecting wires

3 Theory of experiment

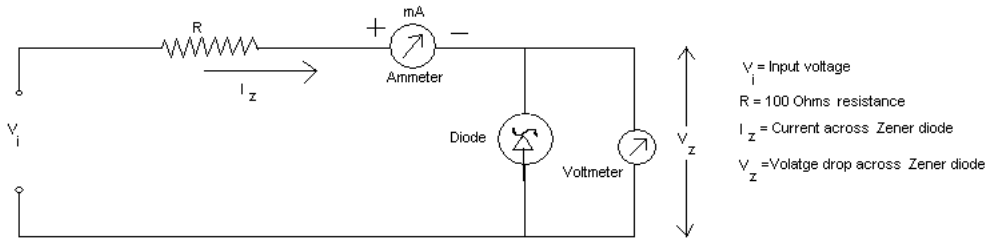
A Zener Diode is constructed for operation in the reverse breakdown region.The relation between I-V is almost linear in this case $V_z = V_{z0} + I_z r_z$, where r_z is the dynamic resistance of the zener at the operating point.V_{z0} is the voltage at which the straight-line approximation of the I-V characteristic intersects the horizontal axis. After reaching a certain voltage, called the breakdown voltage, the current increases widely even for a small change in voltage. However, there is no appreciable change in voltage. So, when we plot the graph, we should get a curve very near to x-axis and almost parallel to it for quite sometime. After the Zener potential V_z there will be a sudden change and the graph will become exponential.



V vs I graph for a Zener diode

4 Procedure

We first construct the circuit as shown in the figure with the 100Ω resistance and a variable DC input voltage.



Circuit for observing V-I characteristioc of Zener diode

Now, we start increasing the voltage till there is some reading in the multimeter for current. Then, we note that reading. Now, we start increasing the input voltage and take the corressponding current readings. We get a set of values and construct a V vs I graph. This graph gives us the I-V characteristics. The slope of the curve at any point gives the dynamic resistance at that voltage.

5 Claculations and observations

Measurement of V and I in reverse bias

S.No	Voltage(V)	Current(mA)
1	1.62	0
2	1.79	0.001
3	1.96	0.001
4	2.8	0.002
5	3.2	0.002
6	3.6	0.003
7	4	0.003
8	4.4	0.003
9	4.8	0.004
10	5	0.004
11	5.2	0.005
12	5.45	0.006

S.No	Voltage(V)	Current(mA)
13	5.6	0.008
14	5.75	0.011
15	5.86	0.014
16	5.96	0.017
17	6.01	0.023
18	6.03	0.024
19	6.06	0.028
20	6.07	0.029
21	6.08	0.031
22	6.09	0.033
23	6.11	0.035
24	6.15	0.046
25	6.21	0.077
26	6.23	0.095
27	6.26	0.148
28	6.28	0.243
29	6.30	0.58
30	6.31	1.931
31	6.32	4.2
32	6.33	7
33	6.34	12.9
34	6.35	14.7
35	6.36	19.7
36	6.367	20.7

On plotting V vs I graph, we get the following:

6 Result

The breakdown potential, also called the zener potential i.e $V_z \approx 6.30V$.

7 Discussions

The precautions are quite similar to that taken in a normal diode i.e
•Excessive flow of current may damage the diode
•Current for sufficiently long time may change the characteristics
•Zener diodes are used in voltage regulation in circuits because even when, a large current flows through, their voltage does not change appreciably.