(EL2-2) Zener Diode

Aim of experiment

Study the characteristics of Zener diode and to determine the reverse breakdown voltage.

Apparatus

DC Power Supply – Ammeter – Voltmeter – Zener Diode.

Theory of experiment

The characteristics of a regular junction diode will show that it is designed primarily for operation in the forward direction. Forward biasing will cause a large I_F with a rather small value of V_F. Reverse biasing will generally not cause current conduction until higher values of reverse voltage are reached. If V_R is great enough, however, breakdown will occur and cause a reverse current flow. Junctions' diodes are usually damaged when this occurs. Special diodes like Zener diodes are designed, manufactured to operate in the reverse direction without being damaged , *figure1*.

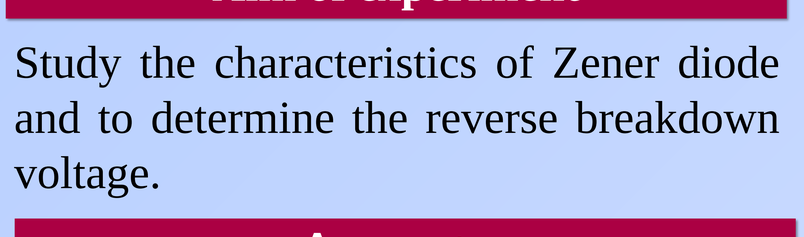

Figure 1 Zener diode and its symbol

In the forward bias direction, the Zener diode behaves like an ordinary silicon diode. In the reverse bias direction, there is practically no reverse current flow until the breakdown voltage is reached. When this occurs there is a sharp increase in reverse current.

Varying amount of reverse current can pass through the diode without damaging it. The breakdown voltage or Zener voltage (V_d) across the diode remains relatively constant.

The Zener Diode is used in its "reverse bias". From the I-V Characteristics curve shown in *Figure 2*, we can study that the Zener diode has a region in its reverse bias characteristics of almost a constant negative voltage regardless of the value of the current flowing through the diode and remains nearly constant even with large changes in current as long as the Zener diodes current remains between the breakdown current $I_{d(min)}$ and the maximum current rating $I_{d(max)}$.

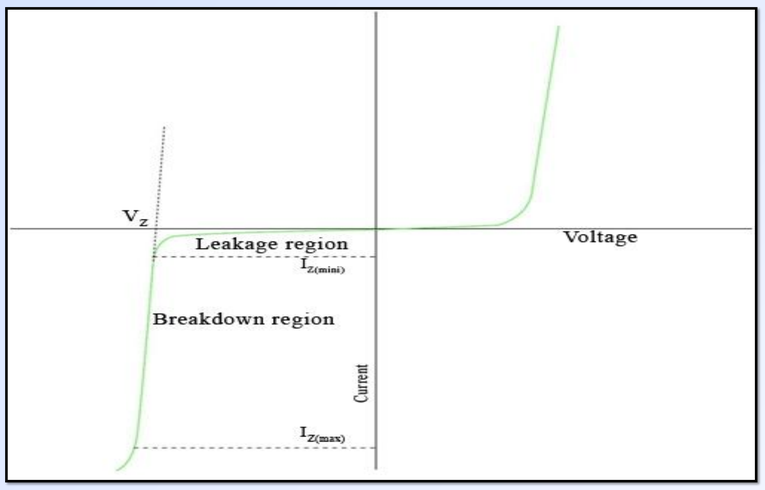

Figure 2 Zener diode Characteristics curve

This ability to control itself can be used to great effect to regulate or stabilize a voltage source against supply or load variations. The fact that the voltage across the diode in the breakdown region is almost constant turns out to be an important application of the Zener diode as a voltage regulator.

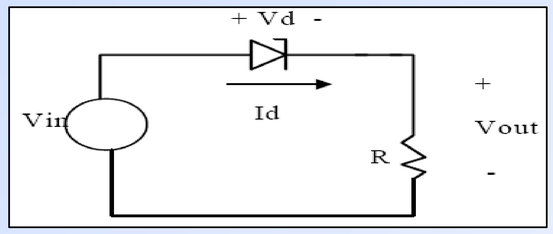

Figure3 A circuit diagram to determine the characteristics of a diode

Procedure

1. Connect of the circuit in *figure 3.*
2. Change the potential each *1 volt* up to *10V* and record the corresponding current in each case.
3. Tabulate the results.
4. Invert the polarity of the Zener diode.
5. Repeat step 2 and tabulate the obtained results.
6. Draw a graph between the potential V_d on x-axis and the current I_d on y-axis.
7. Comment on the obtained results and determine the break down voltage of Zener diode.

Results

Forward bias

V_d (V)	I_d(A)

Reverse bias

V_d (V)	I_d(A)

V_b = Volt

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