P-N Junction diode characteristics

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in To plot the V-I characteristics of given semiconductor.

ii) To Find cut-in voltage

iii) To calculate dynamic and static resistances.

Of diode.

Apparatus

1. Power supply 0-300 one

2- Voitmeter : 0-1v,0-30v one

3. Ammeter 0-10mA, 0-200mA lone

Components to suppose the sold homes in the sold

r Semiconductor diode 1N4007 INO

2 Resistor Ika

Theory the mine Desires that their regist of the

and acceptors into the other side of single crystal of a semiconductor, a PN junction is formed the region uncovered by the and the region uncovered by the and the region or the Hansition region. The thickness of the region is the order of the wavelength of the visible rength when P-n junction is formed the concentration of holes in P-side is much greaten than that in the n-side, a very large hole diffusion current tends to flow accross the junction from P to n material. Hence an electric field must buildup accross the junction in such a direction that the hole drift current will tend to flow accross the junction from n to P side

in order to counter balance the diffusion current. This equilibrium condition of zero resultant hole current results at potential barrier vo. The numerical value for vo is of the order of magnitude of few tenths of a vost. The P-n junction can be operated in two regions are forward bias and reverse bias.

Forward Bias

A forward bias or 'on' condition is established by applying the potential to the p-type material and -ve potential to the n-type material . When voltage difference between p and n regions. is greater the Vy then the diode is forward biased otherwise reverse biased. In forward bias the height of the potential barrier at the junction, will be lowered by the applied forward voltage v. The holes accross the junction from P to n type regions and become a minority current in P side similarly the electrons cross the junction in reverse direction and become the minority carriers in Pside. Hoses travessing from seft to right will constitute a current in the same direction as the electrons moving from right to left. Hence resultant current crossing the Junition is the sum of hose and electron majority current.

Reverse Bias A reverse bias on 'off' condition is established by applying we potential to p-type material and tre potential to n'type material gn'reverse bias condition both the holes in Ptype and electrons in n type material will move away from the junction.

The height of the potential barrier increases. This increase in the barrier serves to reduce the flow of majority carriers. Hence zero current results. However the minority carriers are oninfluenced by the increase in height of the barrier. So a small current will flow due to these minority carriers and is called the revense saturation current.

Cut-in voltage /off set / Break point or threshold voltage
The cut-in voltage is defined as the voltage accross
the diode below which the current is very small (say
less than 17. max rated value, and beyond v, the
current raises very rapidly.

Procedure

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Forward Bias

- 1. Connect the circuit as shown.
- 2. Vary the supply voltage gradually, starting from 3000. Increase the applied Voltage and note voltmeter (V) reading.
- 3. For each only step the v note the corresponding Forward current (I) till v becomes say 0.7v. I should not exceed 10 mA:
- 4. Tabulate the result and draw the VI under forward bias condition.

Reverse bias

- 1. Connect the circuit as shown.
- 2. Measure the current (reverse current) & voltage
 by increasing the voltage in terms of ly steps. Do
 not exceed 200
- 3. Tabulate the result and plot the reverse bias characteristics.

Forward	Bias	Reverse Bias	
Voltage (v)	current (I)	voitage (v) current (in 4A)	
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Discussions

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in The resistance offered by a P-N junction diode to the changing forward current is defined as dynamic resistance.

ii) Silicon is preferred over germanium in the manufacture of semiconductor devices because they have higher PIV and current ratings than germanium.

iii) In the experiment the current should not exceed 10mA as it will bamage the diode.

Precautions

in Ensure that there are no toose connections
on breakboard.

Result:

in cut in voltage = 0.5V

iis Dynamic Forward resistance = DVF

ii) Static forward resistance = V

iv) Dynamic reverse resistance =

Circuit diagrams Forward Bias and the singer of SAL THE CONTROLLING THE CONTROLL OF THE PROPERTY OF the to anythogone of the A THE STATE OF THE neve signer of and consist ratings than remarked Meaning Boarres sat dostate on sat of the (0-30V), and series 13 made done biliaria that there we so look connections on hencestant Reverse Bias IKA D-SAMA the state of the state of the last the last