Experiment No.2

CHARACTERISTICS OF SEMICONDUCTOR DIODE

Objectives

The purpose of the experiment is to examine characteristics of a silicon diode and to determine the barrier potential of the diode. From the characteristic curve determine the dc resistance, ac resistance, for forward biased conditions and reverse resistance for reverse biased conditions.

Apparatus:

1. Breadboard & DC power supply.
2. Diode & 1KΩ Resistor.
3. AVO meters.

THEORY

• The diode is a device made up of a junction of n-type and p-type semiconductor material.
• An ideal diode has two regions: a conduction region of zero resistance and a non-conduction region of infinite resistance.
• In forward bias operation, the silicon diode will not conduct significant current until the voltage reaches about 0.7V, called cut-in voltage.
• After the point of cut-in voltage small change in voltage causes large increase in current.
• In reverse bias operation, the diode will not conduct significant current until certain threshold voltage called breakdown voltage.
• DC resistance or static resistance is the ratio of voltage to current in the forward bias characteristics.
• AC or dynamic resistance is the reciprocal of the slope of the characteristic curve.

• The resistance offered by the diode under reverse bias is the reverse resistance.

CIRCUIT DIAGRAM

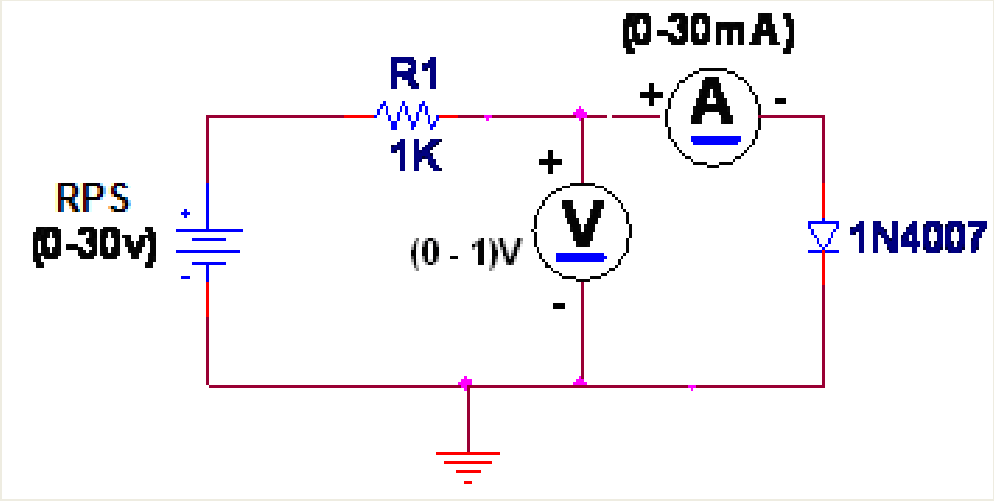

Figure1: Forward Biased Diode

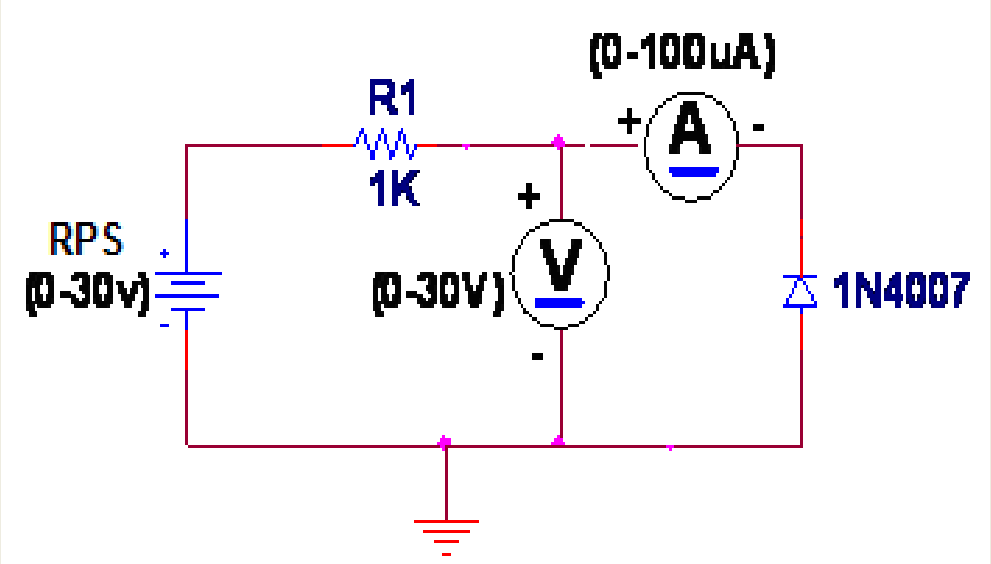

Figure2: Reverse Biased Diode

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PRACTICE PROCEDURE

❖ *Forward Bias*

1. Construct the circuit as per the diagram shown in figure1.
2. Vary the power supply voltage in steps of 0.1V upto cut-in voltage and thereafter in steps of 1V upto a maximum of 10V.
3. Note down the voltage drop across the diode and the corresponding current.
4. Plot the graph: IF against VF
5. From the plot, find the static resistance, R = VF / IF.
6. Find also the dynamic resistance, r = Δ VF /Δ IF.

Table 1: Forward Bias

Bias voltage, Vin Volts	Diode Forward voltage, V_F Volts	Diode forward current, I_F mA
0.0		
0.1		
0.2		
0.3		
0.4		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		

❖ *Reverse Bias*

1. Connect the circuit as per the diagram shown in figure2.
2. Vary the power supply voltage in steps of 1V up to 15V.
3. Note down the voltage drop across the diode and the corresponding current.
4. Plot the graph: IR against VR.

Table 2: Reverse Bias

Bias voltage, Vin Volts	Diode Reverse voltage, V_R volts	Diode Reverse current , I_R µA
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Discussion:

How does PN-junction diode acts as a switch?

What is the effect of temperature in the diode reverse characteristics?

What is break down voltage?

Compare between the Si & Ge diode? which is has the better forward characteristic?

What is the barrier field and how is it produce?