Experiment No. 3: Series and Parallel Diodes

Objectives:

To study the characteristics of silicon diodes in series and in parallel.

Equipment:

DC power supply

Function Generator

Digital Multimeter (DMM)

Components

Diodes: Silicon (D1N4002)

Resistor: 1.8 kΩ,

Theory:

Diode:

A diode is a two-terminal electronic component that conducts current primarily in one direction; it has low resistance in one direction, and high resistance in the other.

Series Configuration

Series connection means a side-by-side connection. When two components are connected in series, they have one common junction. The variation of voltage and current in a series connection is as follows:

- Potential difference across every component is different.
- The current across every component connected in series remains the same.

Diode Characteristics in Series Configuration

When connected in series, we observe the following properties to hold true among the diodes:

- Resultant diode's forward voltage increases.
- Reverse blocking capabilities of diodes are increased in series connection.

Parallel configuration

Parallel connection means the components are connected across each other, having two common points. Current differs across each component while voltage drop is same. When diodes are connected in parallel, this same trend is observed.

Diode Characteristics in Parallel Configuration

- Current carrying capacity increases.
- No conduction in resultant diode in both sides.

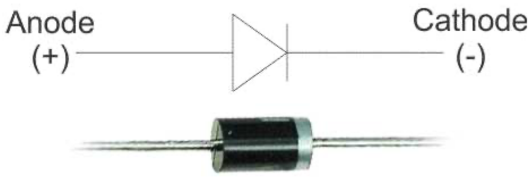


Figure 12 Diode

Function Generator

A function generator is usually a piece of electronic test equipment or software used to generate different types of electrical waveforms over a wide range of frequencies. Some of the most common waveforms produced by the function generator are the sine, square, triangular and saw tooth shapes.

Figure 2 Function Generator

Power Supply

A *power supply* is an electronic device that supplies electric energy to an electrical load. The primary function of a *power supply* is to convert one form of electrical energy to another and, as a result *power* supplies are sometimes referred to as electric *power* converters.

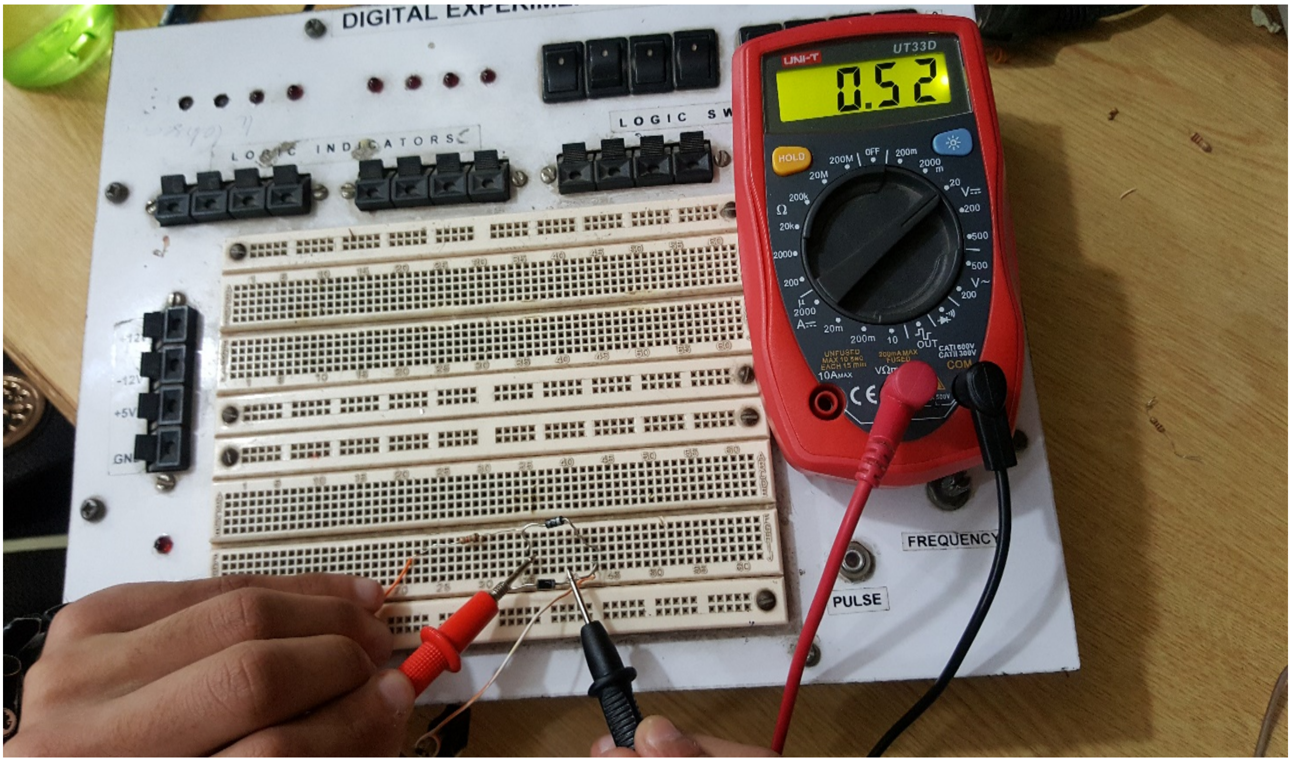
Figure 3 DC Power Supply

Digital Multimeter

A digital multimeter (DMM) is a test tool used to measure two or more electrical values principally voltage (volts), current (amps) and resistance (ohms). It is a standard diagnostic tool for technicians in the electrical/electronic industries.

Figure 4 Digital Multimeter

Procedure



Part 1: Diode in Series

4. Construct the circuit of *Fig.1.0* with the supply (E) is set at 5 V. Record the measured value of the resistor.

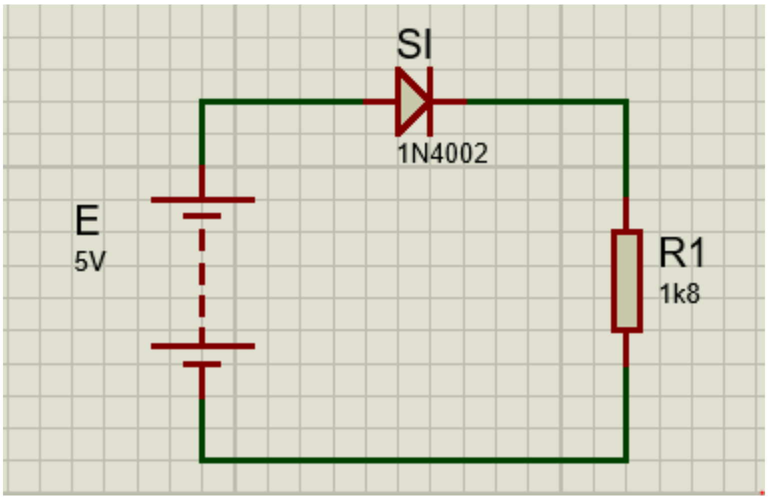


Figure 1.0

5. Measure the value of voltage across diode V_D and V_O.
6. Also calculate the current I_D.

Results:

Calculated:

Supplied Voltage = **5.22 V**

Voltage V_D = **0.63 V**

Resistance R = **1.76 kΩ**

Voltage V_O **= 5.22 – 0.63 = 4.59 V**

Current I_D **= 2.60 mA**

Measured:

Supplied Voltage = **5.22 V**

Voltage V_D = **0.56 V**

Resistance R = **1.76 kΩ**

Voltage V_O **= 4.67 V**

Current I_D **= 2.65 mA**

Part 2: 2 Diodes in Series

1. Construct the circuit of *Fig.1.1* with the supply (E) is set at 5 V. Record the measured value of the resistor.

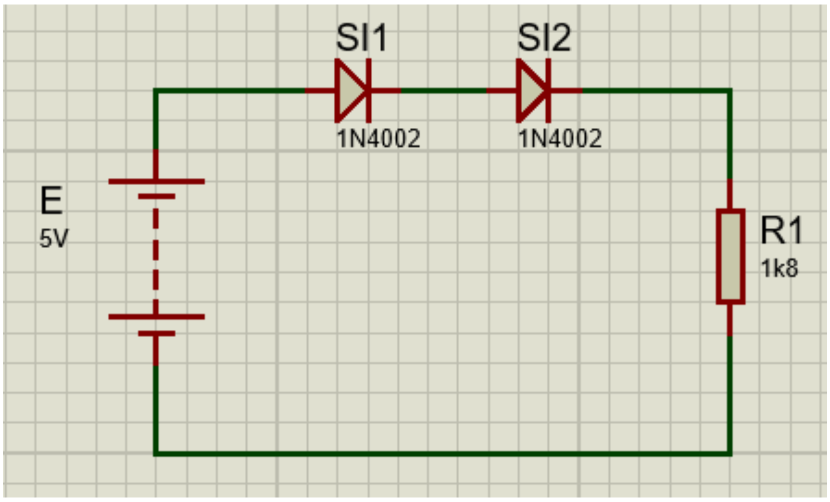


Figure 1.1

2. Measure the value of voltage across diode V_D and V_O.
3. Also calculate the current I_D.

<u>Results:</u>

Calculated:

Supplied Voltage = **5.22 V**

Voltage V_{T1} = **0.63 V**

Voltage V_{T2} = **0.60 V**

Voltage $V_D = V_{T1} + V_{T2}$ = **1.23 V**

Resistance R **= 1.76 kΩ**

Voltage V_O **= 5.22 – 1.23 = 3.99 V**

Current I_D **= 2.62 mA**

Measured:

Supplied Voltage = **5.22 V**

Voltage V_D = **1.23 V**

Resistance R **= 1.76 kΩ**

Voltage V_O **= 4.13 V**

Current I_D **= 2.34 mA**

Part 3: Diodes in Parallel

1. Construct the circuit of *Fig.1.3* with the supply (E) is set at 5 V. Record the measured value of the resistor.

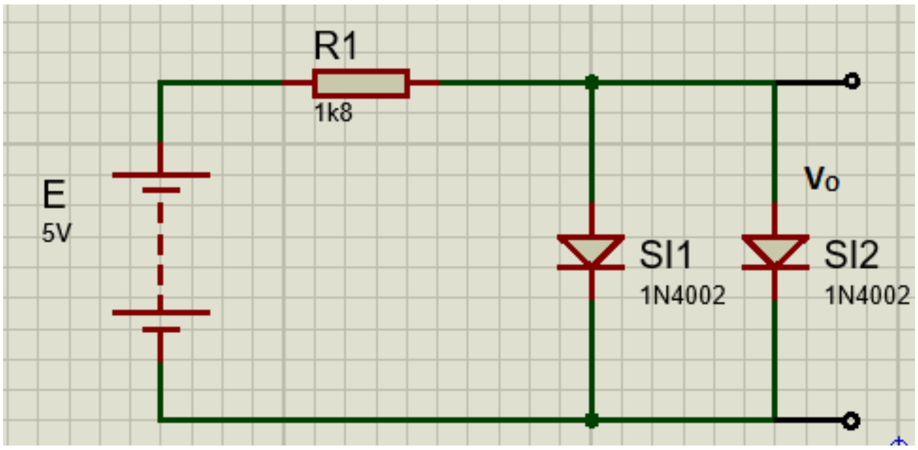


Figure 1.3

2. Measure the value of voltage across diode V_D and V_O.
3. Also calculate the current I_D.

Results:

Calculated:

Supplied Voltage = **5.22 V**

Voltage V_{T1} = **0.63 V**

Voltage V_{T2} = **0.60 V**

Voltage V = V_{T1} + V_{T2} **= 1.23 V**

Resistance R **= 1.76 kΩ**

Voltage V_O **= 0.60 V**

Voltage V_R **= 5.22 – 0.60 = 4.62 V**

Measured:

Voltage V_O = **0.53 V**

Voltage V_R **= 4.70 V**

Conclusion:

Hence, we practically observed the behavior of diodes in both series and parallel. We saw that,

- Connecting diodes in series will increase the forward voltage of the resultant diode.
- Connecting diodes in series will cause an open circuit until peak inverse voltage (smallest diode) is applied on total resultant.

- Connecting diodes in parallel will increase the current carrying capacity of the diode.
- Connecting diodes in parallel will not get you a resultant diode conduction in both sides.
