

Circuits and Electronic Laboratory

Experiment #6

Purpose of Experiment

In this experiment we will see how diodes work. Learn more about AC/DC and rectifiers.

General Information

Alternating current (AC) is an electric current which periodically reverses direction, in contrast to direct current (DC) which flows only in one direction. Alternating current is the form in which electric power is delivered to businesses and residences, and it is the form of electrical energy that consumers typically use when they plug kitchen appliances, televisions, fans and electric lamps into a wall socket. A common source of DC power is a battery cell in a flashlight. The abbreviations AC and DC are often used to mean simply alternating and direct, as when they modify current or voltage.

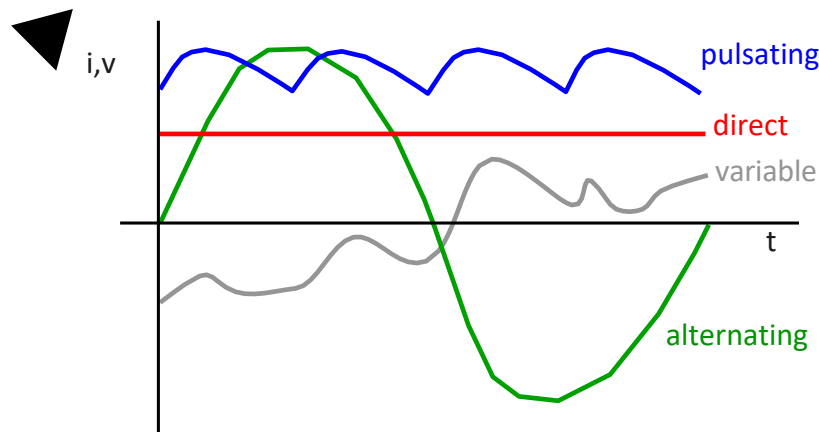


Figure 1: Types of Current Sources

A diode is an electronic component that allows one directional current flow only. Using this property a lot of useful applications such as rectifiers, clippers/clappers, voltage multipliers, etc. can be realized.

Rectifiers are AC-DC converters. They provide time varying but unidirectional current at their output. Capacitors are generally used with rectifiers to filter the time varying output of them and obtain a smooth signal instead.

Part List

- $R_1 = 12K$
- $D_1 = 4.7V$ Zener Diode for circuit 1
- D_1 1N4001 Diode for circuit 2

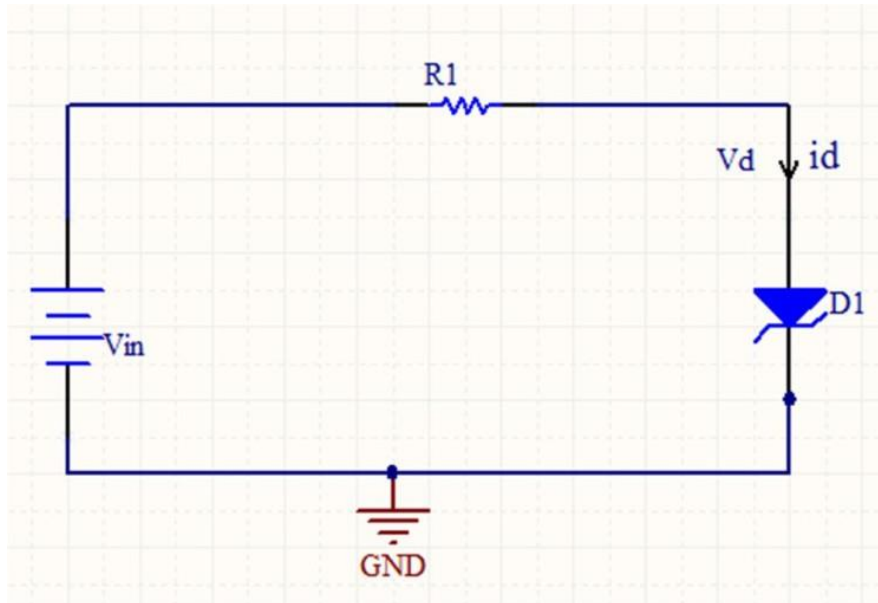
Preparations Before Experiment

- Make research about AC and DC current sources.
- What is a diode? What does it do on a circuit?
- Make research about rectifiers.
- Construct the circuit given in Figure 1 on a simulation program.
- Vary V_{in} on the simulation tool according to the values in the first row of Table 1 and record the voltage across the diode and the current passing through the diode on Table 1 to *Calculated* rows.

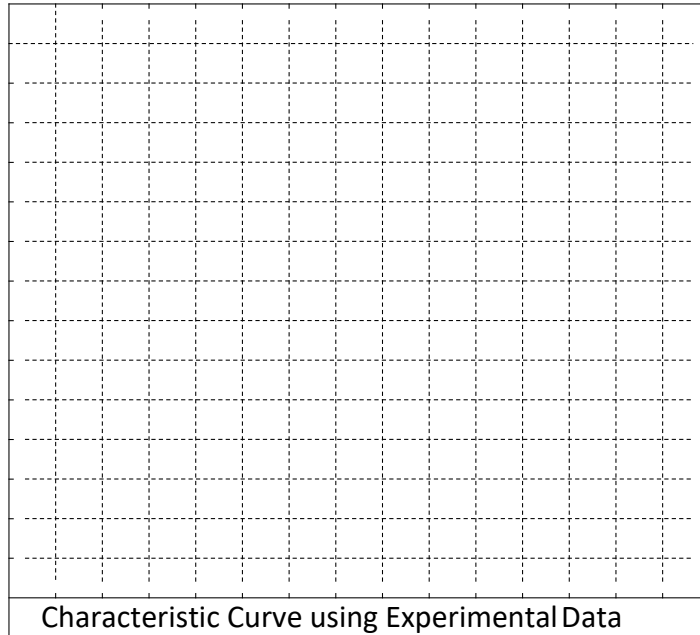
Section 1

- Construct the circuit depicted in Figure 1 on the board. Be aware that the diode in the circuit is a zener diode.
- Vary V_{in} according to the values in the first row of Table 1 and record the voltage across the diode and the current passing through the diode on Table 1 on measured row.
- Using the data in the 2nd and the 3rd rows of table 1, plot the characteristic curve of the zener diode.

Figure 2: Circuit 1



$V_{in}(V)$	-12	-11	-10	-9	-8	-7	0	0.6	0.65	0.7	0.75	0.8	0.85	0.9
$V_d(V)$ Cal- culated	-9.782V	-9.711	-9.57V	-8.995V	-8V	-7 V	3.1 44e -44	0.277 V	0.281 V	0.284 V	0.286 V	0.289 V	0.291 V	0.293 V
$I_d(A)$ Cal- culated	-184.853u A	-107.37 uA	-35.865 uA	-422.13n nA	-799.676.62 36p A	-676.62 6pA	-2.2 6e- 37	26.91 2uA	30.788 uA	34.69 7uA	38.632 uA	42.58 9uA	45.563 uA	50.552 uA
$V_d(V)$ Measured	-9.782V	-9.711	-9.57V	-8.995V	-8V	-7 V	3.1 44e -44	0.277 V	0.281 V	0.284 V	0.286 V	0.289 V	0.291 V	0.293 V
$I_d(A)$ Mea- sured	-184.853u A	-107.37 uA	-35.865 uA	-422.13n nA	-799.676.62 36p A	-676.62 6pA	-2.2 6e- 37	26.91 2uA	30.788 uA	34.69 7uA	38.632 uA	42.58 9uA	45.563 uA	50.552 uA
Table 1														



Section 2

- Construct the circuit given in Figure 2 without connecting the capacitor. Use a function generator to supply source voltage.
- Use a scope to observe the voltage signal on V_1 (with respect to the ground) and V_2 (with respect to the ground); connect V_1 to the 1st channel and V_2 to the 2nd channel of the scope. Choose the same volts/div value for both channels. Record volts/div and time/div values. Plot the observed graph.
- Connect C_1 to the circuit and repeat step 2.
- Calculate the effective value of V_1 . $V_{eff} = \dots\dots\dots$

Figure 3: Half-Wave Rectifier

