

EXPERIMENT 3: DIODE APPLICATIONS PART CLAMPER & RECTIFIER CIRCUITS

Objectives

The objectives of Experiment 3 are

1. To understand clamper circuits.
2. To understand rectifier circuits.

Components Required:

- 1N4148, 1N4001, $1k\Omega$, $100k\Omega$, $1\mu F$, $100\mu F$, LEDs (4 in two different colors).

Preliminary Work:

1. Study clamper and rectifier circuits from your lecture notes and textbook.
2. **Analyze each circuit theoretically.**
3. Perform simulations of the part of experimental work in ORCAD and add them to your report. All diodes are 1N4001 except for in Figure 1. Apply 1kHz V_{sin} voltage.
 - a) (Figure 1)
 - ☐ Simulate the circuit and plot the **input and the output voltages on the same plot pane** for three periods (Use white background in plot pane and change the graphic line thickness to be legible).
 - ☐ Explain how the circuit works.
 - b) (Figure 2 & Figure 3)
 - ☐ Choose $R1=1k$, $C1=1\mu F$. Apply 1kHz V_{sin} voltage.
 - ☐ Firstly, observe the output signal when the capacitor is not connected.
 - ☐ Secondly, observe it when the capacitor is connected.
 - ☐ Simulate the same circuit when $R1=100k$ and $C1=100\mu F$.
 - ☐ Give simulation results in your homework for each case.
 - ☐ Plot the **input and the output voltages on the same plot pane** for three periods (Use white background in plot pane and change the graphic line thickness to be legible).
 - ☐ Explain how the circuits work.
 - c) Perform simulations of all of the circuits in the experimental work using TinkerCAD.

Experimental Work:

Clamper circuits:

1. Build the circuit in Figure 1. Draw the output that you observe on the oscilloscope for $V_1=5V$.

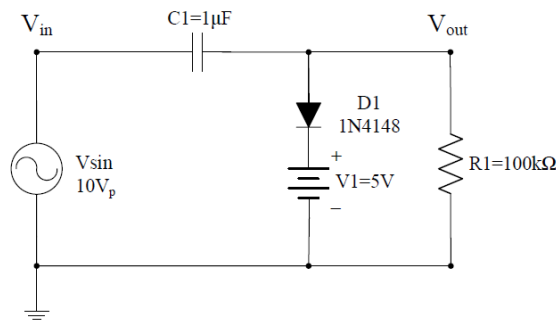


Figure 1

Rectifier circuits:

2. Build the one-way rectifier given in Figure 2, observe the output signal when the capacitor is connected and when it is not. Choose $R1=1k\Omega$, $C1=1\mu F$, and $R1=100k\Omega$ and $C1=100\mu F$. Examine the operation of the circuit and record the results. Diode is 1N4001.

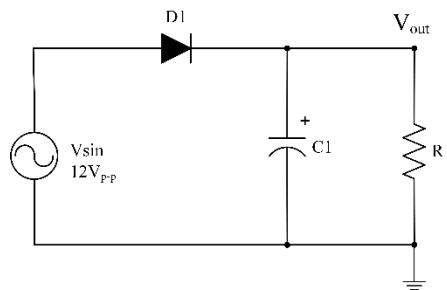


Figure 2

3. Build the bridge type rectifier given in Figure 3, observe the output signal when the capacitor is connected and when it is not. $R1=1k\Omega$ and $C1=1\mu F$. Examine the operation of the circuit and record the results. Comment on the difference with the other circuits.

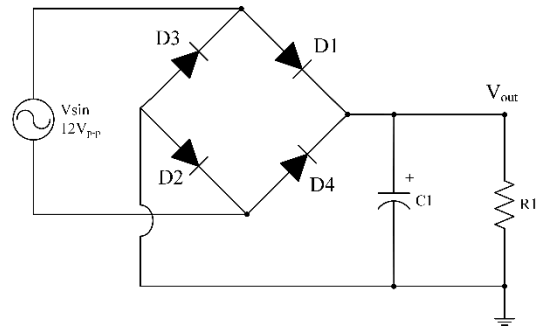


Figure 3