Clamper_Analysis -- Overview

D JOHN PRADEEP
Assistant Professor
SENSE
Vellore Institute Of Technology

Aim: The aim of the experiment is to examine the working of a simple clamper circuit.

Objective:

- Study the difference between the output of the clamper in transient state and steady state.
- Understand the relation between the discharge time constant of the circuit and clamping

Apparatus:

- Breadboard, connecting wires, diode (1N4007GP), Function generator, Oscilloscope, capacitor (1 microfarad)

Clamper_Analysis -- Procedures

Step 1

Theory:

A clamper is also called as a dc restorer circuit. Clamper introduces dc component into the signal fed as input to it.
Important points:
1. Initial charge inside the capacitor is zero.
2. The capacitor charges to a value defined by the circuit.
3. Once the capacitor is charged, it never discharges.
The circuit shown in figure 1 has two states a) Transient and b) Steady state.
In transient state, the voltage across the capacitor varies and is allowed to reach the maximum value.
The polarity of the voltage across the capacitor is given depending on the direction in which the capacitor charges.
Transient state analysis:

Assuming ideal diode, diode is switched ON when $v_I \geq 0$V. Then the capacitor starts charging and when it reaches v_m V (where v_m is the peak of the input signal), the diode is OFF because the effective voltage at the anode of the diode is always less than or atmost equal to zero

When the capacitor is charging, the voltage equation of the capacitor is given as $-v_I + V_C = 0$

At the end of the transient state $V_{Cmax} = v_m$ V.

Steady state analysis:

In steady state the diode is reverse biased and the output voltage is given by $v_O = v_I - V_{Cmax}$

The input signal is shifted down with a dc value of v_mV.

Step 2

Conncet the circuit as shown in the figure below

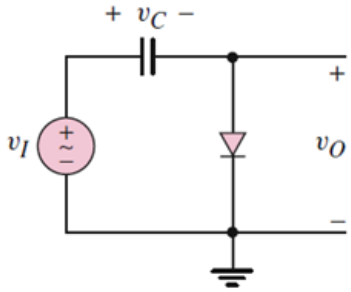

Fig1
Ref: Electronic circuit analysis and design_Donald A Neamann 4th edition, McGrawHill.

Step 3

- Vi = 10 sin (2 * pi * 1000 * t) signal should be generated using function generator.
- Connect channel 1 of the function generator to the input signal Vi and channel 2 across the diode
- Examine the input and output signals

Step 4

Connect a 1 M ohm resistor across the diode and repeat the procedure given in step 2.

Step 5

Connect a 100 ohm resistor across the diode and repeat the procedure given in step 2.

Step 6

Note the results

Probable observations

1. Clamping is observed in the cases resistor is not connected and when 1 M ohm resistor is used

2. Clamping doesn't happen when 100 ohm resistor is used

This is because discharge time constant RC is larger in first two cases and smaller in the case when 100 ohm resistoris used.