Clipper

An electronic circuit is said to be a clipping circuit if it removes part of the input signal based on the requirement. It is also known as a clipper, in short. A wave shaping circuit is said to be a clipper if it performs one of the following three operations.

- Clips portion or entire positive half part of the input signal
- Clips portion or entire negative half part of the input signal
- Clips portions of both positive and negative half parts of the input signal

Types of Clipper

Clippers can be classified based on the portion of the signal that is being clipped and placing of Diode in the circuit. The clipper circuits are of the following types.

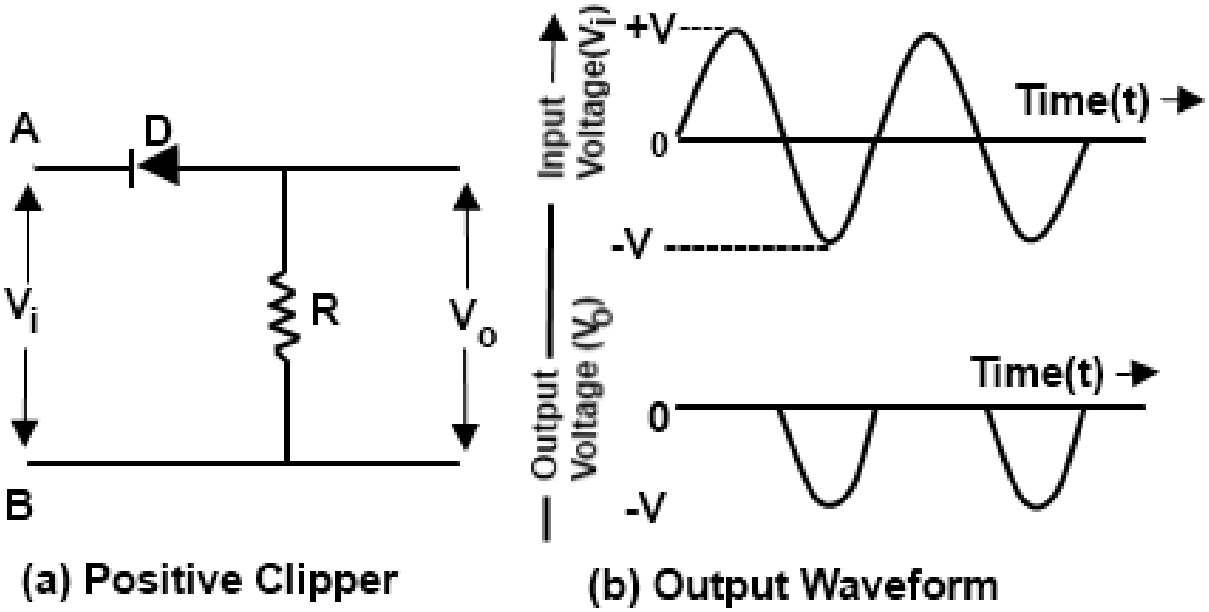
1. Series Clippers
2. Shunt Clippers
3. Biased
4. Combinational

1. **Series clippers:**

- The diode and output are connected in a series of clipper circuits. In these clippers, when the diode is forward biased and conducting, the input signal is visible at the output.
- It is separated into clippers that are positive and negative.

a. Series Positive clippers:

The positive half of the waveform is removed or clipped with a series of positive clippers. The diode is reverse-biased and connected in series with the output in a series positive clipper, as depicted in the figure below.



(a) Positive Clipper (b) Output Waveform

During the positive half of the input voltage, terminal A is positive with respect to B. This reverse biases the diode and it acts as an open switch Therefore all the applied voltage drops

across the diode and none across the resistor As a result of this there is no output voltage during the positive half cycle of the input voltage.

During the negative half cycle of the input voltage, terminal B is positive with respect to A. Therefore it forward biases the diode and it acts as a closed switch. Thus there is no voltage drop across the diode during the negative half cycle of the input voltage.

A positive Clipper is that which removes or clips the positive half completely.

b. Negative Series Clipper:

A series clipper is said to be a negative series clipper if it clips the negative half part of the input signal.

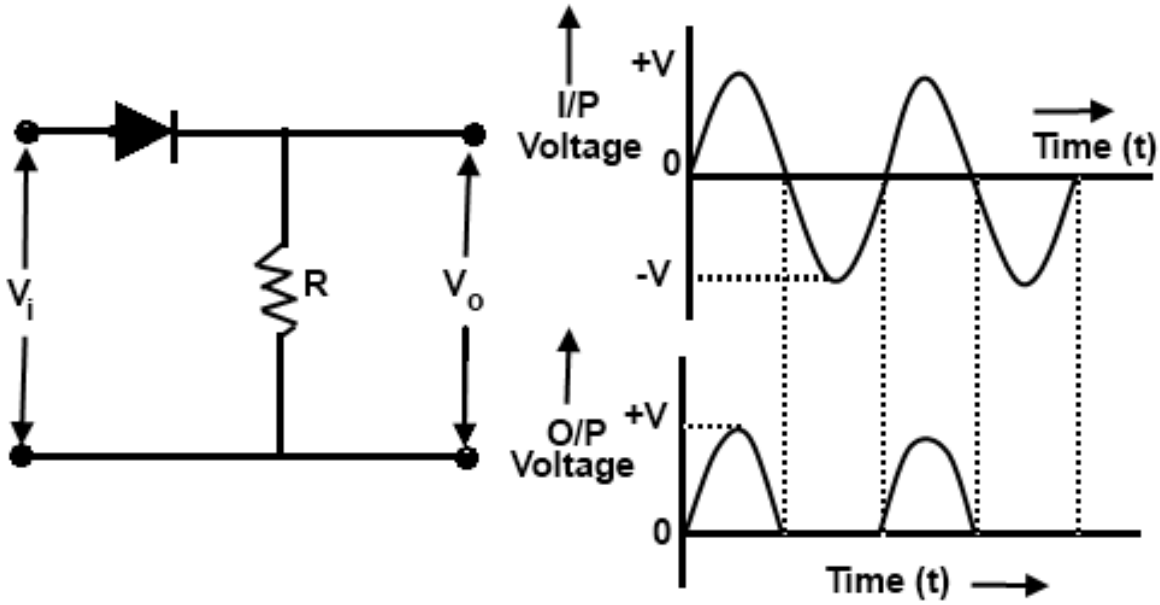
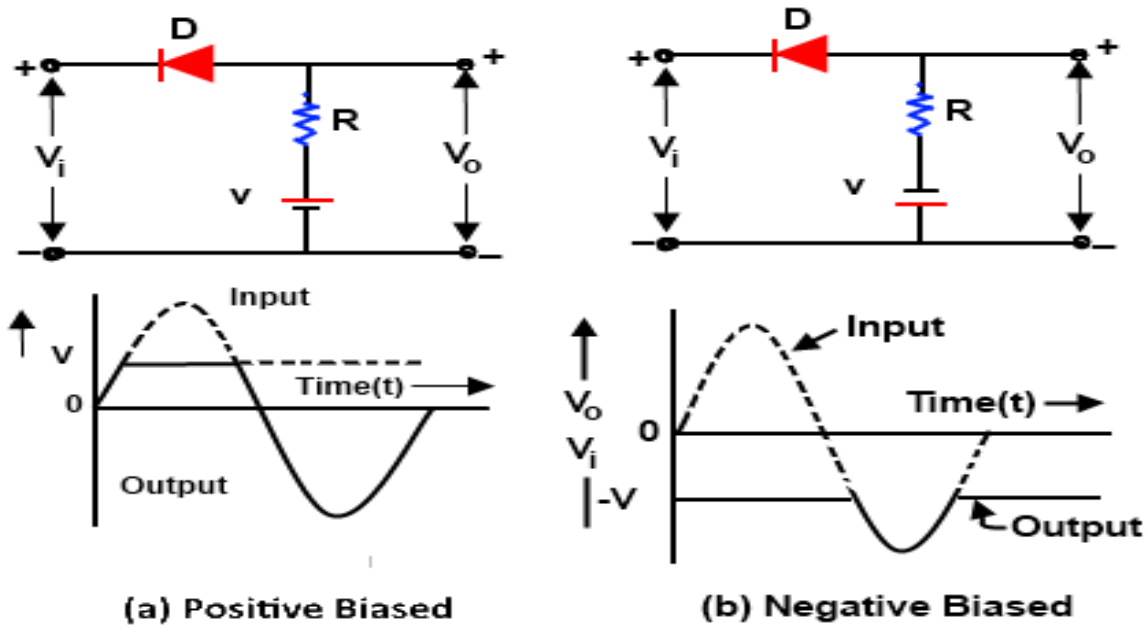


Figure 3: Series Negative Clipper

During the positive half cycle of the voltage, terminal A is positive with respect to terminal B There for the diode is forward biased and it acts it as a closed switch As a result, all the input voltage appears across the resistor as shown in Fig (b).

During the negative half cycle of the input voltage, terminal B is positive with respect to the terminal A. Therefore the diode is reverse biased and it acts as an open switch, Thus there is no voltage drop across the resistor during the negative half cycle as shown in the output waveform.

Sometimes it is desired to remove a small portion of the positive or apposite halt cycle of the signal voltage (input signal). For this purpose a **biased clipper is** used



Series Positive Clipper with Bias

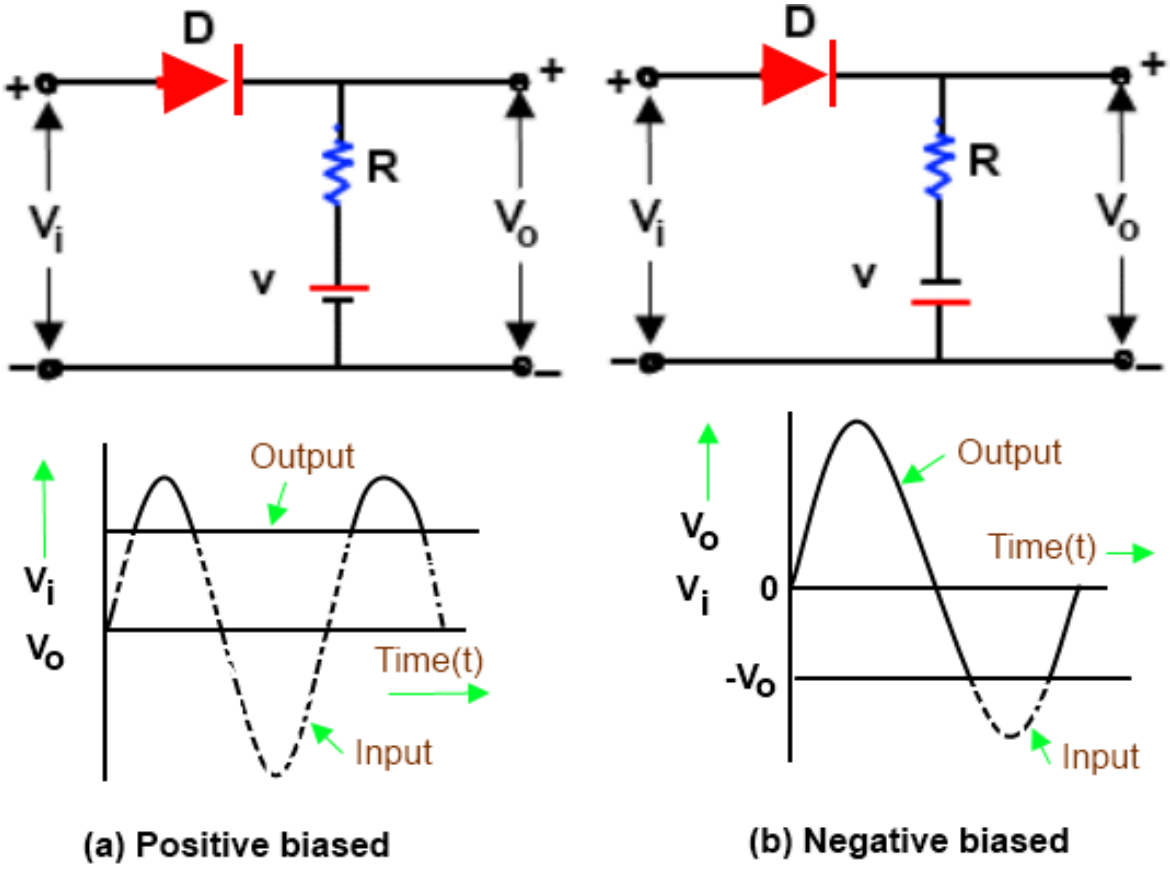


Figure 4: Biased series negative clipper

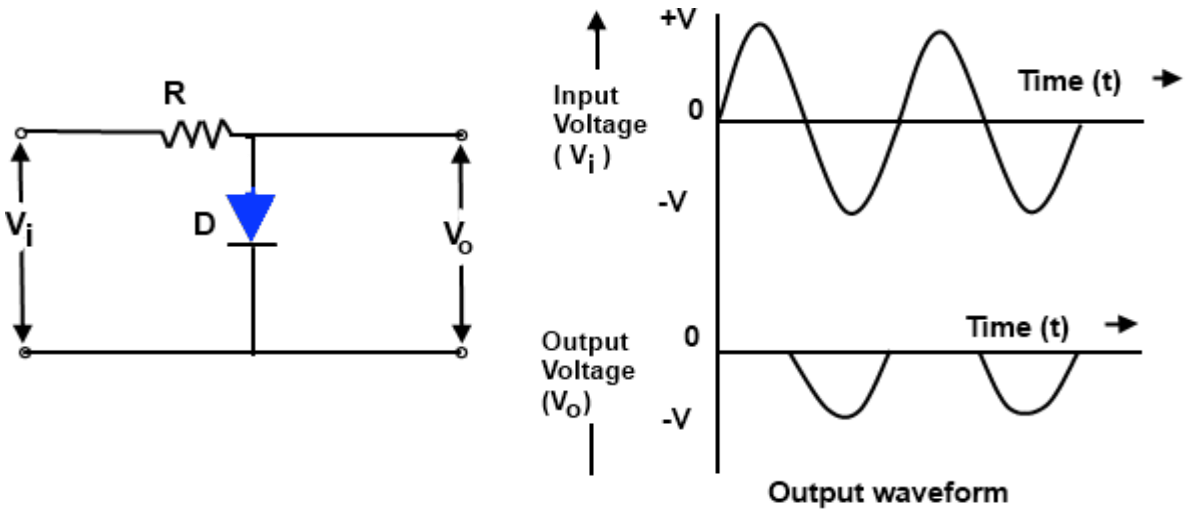
2.Shunt Clipper

A clipper is said to be a shunt clipper if the resistor and diode are connected in series with the input AC (voltage) signal and the output is taken across the diode. Based on the position of the diode, we can clip either the positive half part or the negative half part of the input signal.

The following two types of shunt clippers.

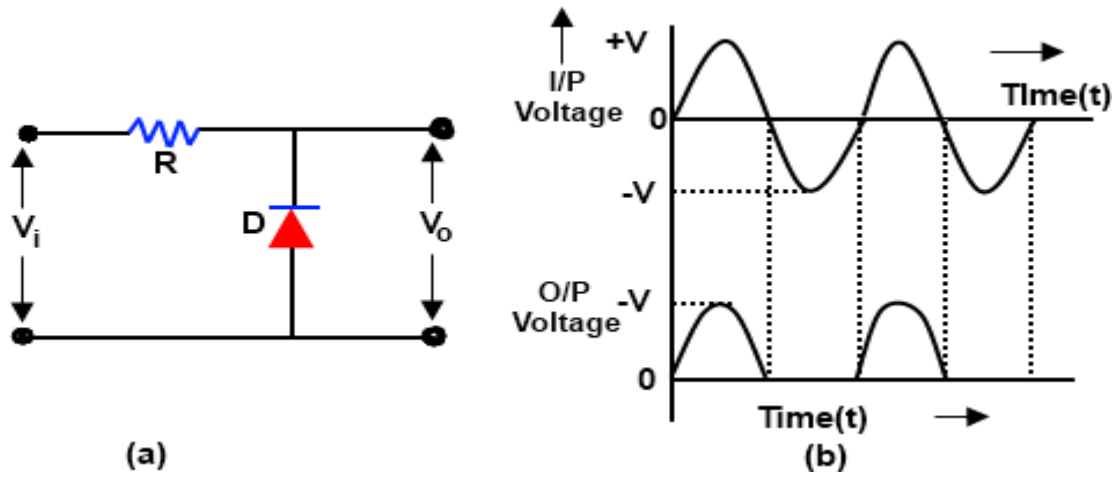
a. **Positive Shunt Clipper:** A shunt clipper is said to be a positive shunt clipper if it clips the positive half part of the input signal.

The diode acts as a closed switch when the input voltage is positive (i.e. $V_i > 0$ and as an open switch when the input voltage is negative (i.e. $V_i < 0$)

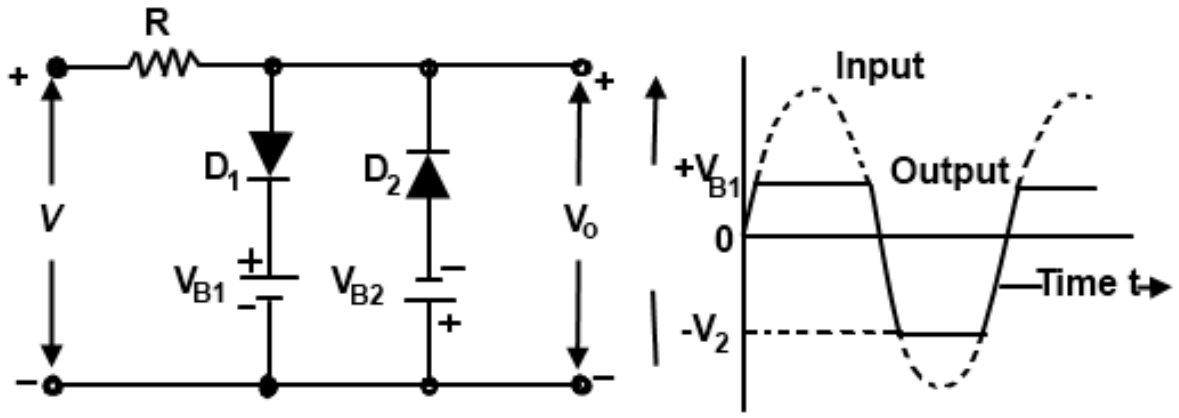


b.Negative Shunt Clipper: A shunt clipper is said to be a negative shunt clipper if it clips the negative half part of the input signal. This circuit diagram and the corresponding input-output waveforms are shown in the following figures.

There is no output or zero output during the negative half cycle of the input signal since the diode is forward-biased. Output is the same as that of input during the positive half cycle of the input signal since the diode is reverse biased.



4. Combinational : The two diodes and the load resistor are parallel to one another in the double clipper, which is a combination clipper. When a portion of both the positive and negative input cycle needs to be cut off, this technique is used.



Let us suppose a sinusoidal ac voltage is applied at the input terminals of the circuit. Then during the positive half cycle, the diode D_1 is forward biased, while diode D_2 is reverse. biased. Therefore the diode D_1 will conduct and will act as a short circuit. On the other hand, diode D_2 will act as an open circuit. However, the value of output voltage cannot exceed the voltage level of V_{B1} .

Similarly, during the negative input half-cycle, diode D_2 acts as a short circuit while the diode D_1 as an open circuit However the value of output voltage cannot exceed the voltage level of V_{B2} It may be noted that the clipping levels of the circuit be varied by changing the values of V_{B1} and V_{B2} If the values of V_{B1} and V_{B2} are equal, the circuit will clip both the positive and negative half cycles at the same voltage level. Such a circuit is known as a symmetrical clipper

Application of Clipper:

1. The clipper circuit limits voltage in power supplies because it provides overvoltage protection.
2. For the separation of synchronizing signals from composite picture signals, clippers are frequently used.
3. An ac signal's amplitude contains unwanted noise, which clippers remove.
4. They are utilized in television transmitters and receivers.
5. They are used to create new waveforms like squares, triangles, and others, or to modify existing waveforms.