

Circuit Simulation

by

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<https://esim.fossee.in/circuit-simulation-project>

Title:

Parallel Diode Positive limiting circuit.

Theory/Description:

Basically, nonlinear waveshaping circuit are classified into two types clipping circuit and clamping circuit. Clamping circuit play a role in energy storage therefore capacitor and inductor are involved in circuit building. In case of clipper circuit there is no role of energy storage therefore resistor and diode generally used to build a clipper circuit. In this work a basic parallel diode positive limiting circuit is used to simulate in esim software.

In this circuit a diode is connected in parallel with the DC source which limits only positive half cycle of the input supply. A constant DC reference is provided so as to limit the positive half of the supply signal.

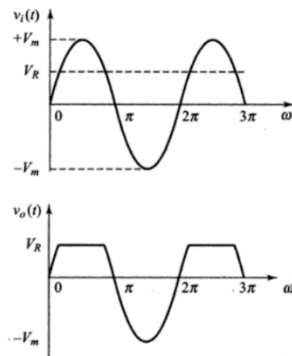


Fig. No. 1 Waveform of positive slicing operation

As shown in figure $V_i(t)$ is the input sinusoidal waveform, V_R is the constant reference waveform and $V_o(t)$ is the output waveform. $V_o(t)$ is not allowed to exceed beyond V_R . A parallel diode circuit can perform the limiting operation. The mathematical expression for the output signal will be written as

$$V_o(t) = V_i(t) \text{ for } V_i(t) \leq V_R$$

$$V_o(t) = V_R \text{ for } V_i(t) > V_R$$

Circuit Diagram:

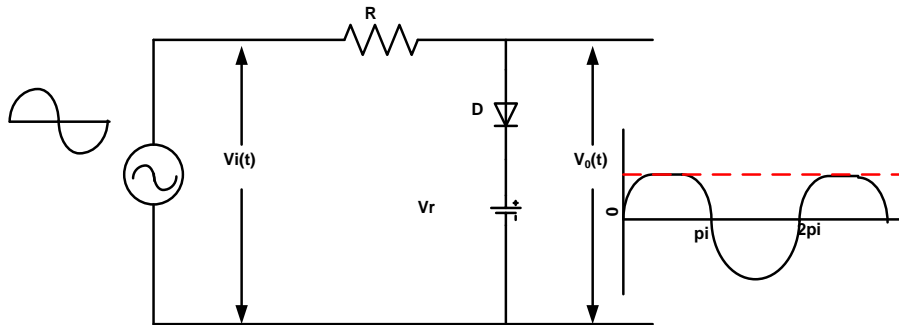


Fig.2 Parallel Diode Positive limiting circuit

Results/ Output (ngspice and Python plots)

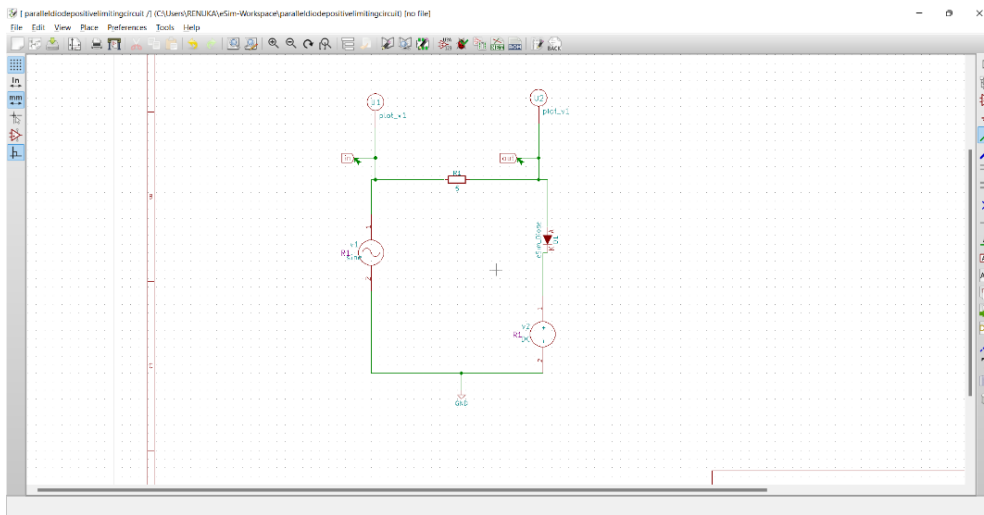


Fig. 3 esim Parallel Diode Positive limiting circuit

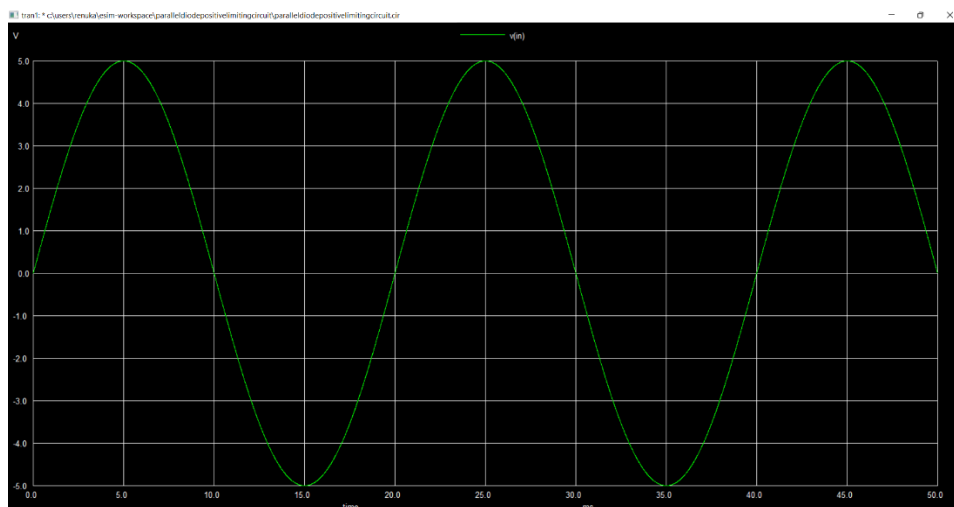


Fig. 4 Ngspace plot of input voltage to the circuit

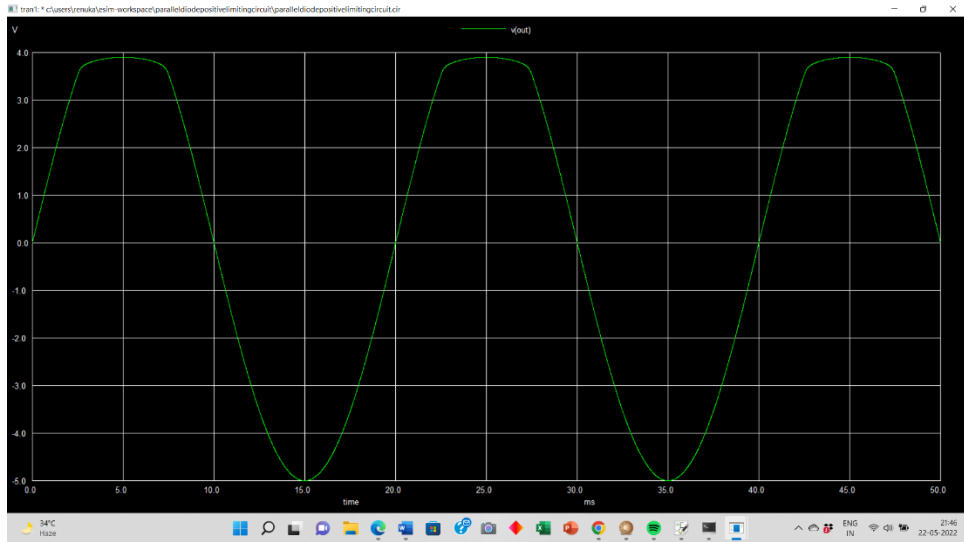


Fig. 5 Ngspice plot of output clipped voltage across the circuit

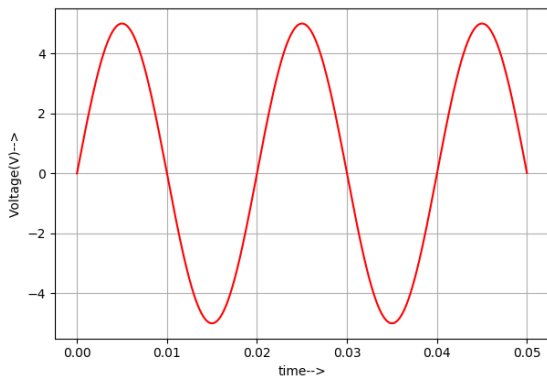


Fig. 6 Input voltage Parallel Diode Positive limiting circuit

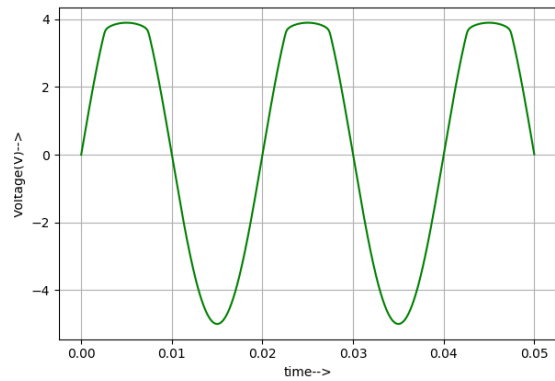
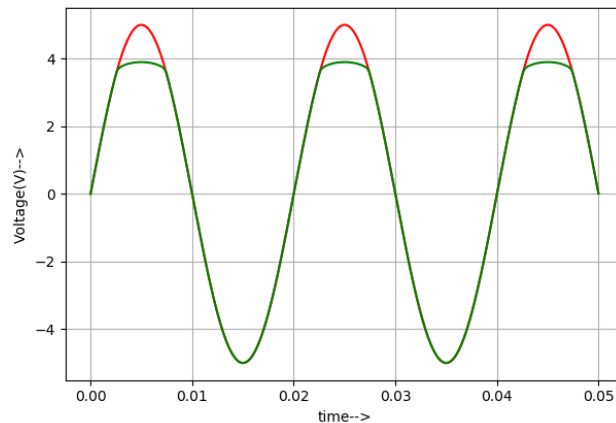


Fig. 7 output voltage Parallel Diode Positive limiting circuit



Python plot of Input and Output Voltage

Conclusion: Parallel Diode Positive limiting circuit is simulated successfully using esim software.

Source/Reference(s): Mothiki S. Prakash Rao, Pulse and Digital Circuit, Tata McGraw-Hill Publishing company limited. Chapter No. 2 Nonlinear Waveshaping Pg. No. 92.