Islamic University of Technology (IUT)
Organisation of Islamic Cooperation (OIC)
Department of Electrical and Electronic Engineering
Electronics Laboratory, Room No.:502

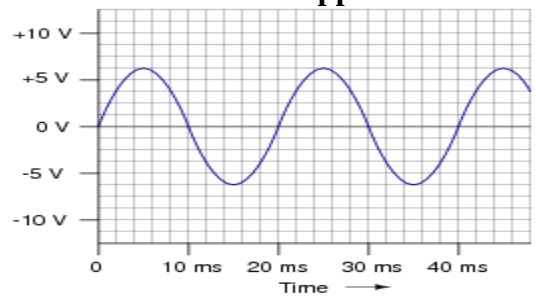
Study of clipping and clamping circuits

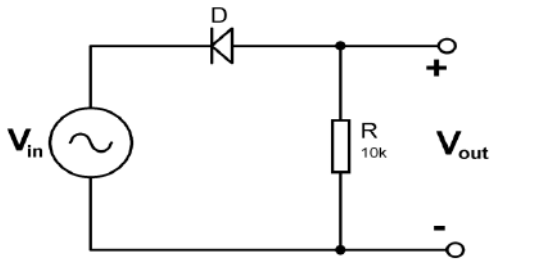
Clipping circuits:

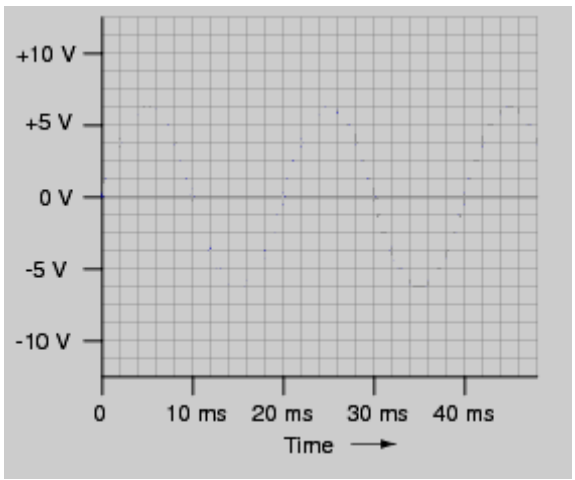
Often it is necessary to modify the shape of a particular waveform. Circuits which perform that function are called clippers. Clipper circuits have the ability to "clip" off a portion of the input signal without distorting the remaining part of the alternating waveform. The half wave rectifier of the previous experiment is an example of the simplest form of diode clipper. Depending on the orientation of the diode, the positive or negative region of the input signal is "clipped" off. There are two general categories of clippers: series and parallel. The series configuration is defined as one where the diode is in series with the load, while the parallel variety has the diode in branch parallel to the load.

Series Clipper Circuit (with Diode and Resistor):

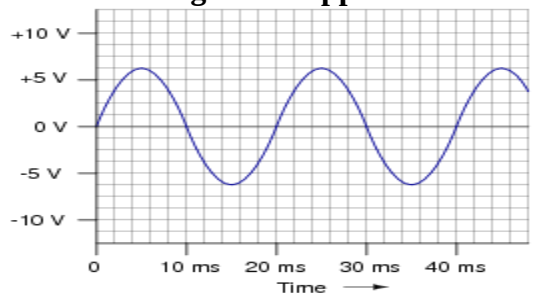
Positive Clipper

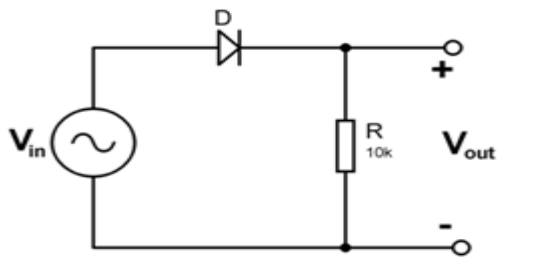


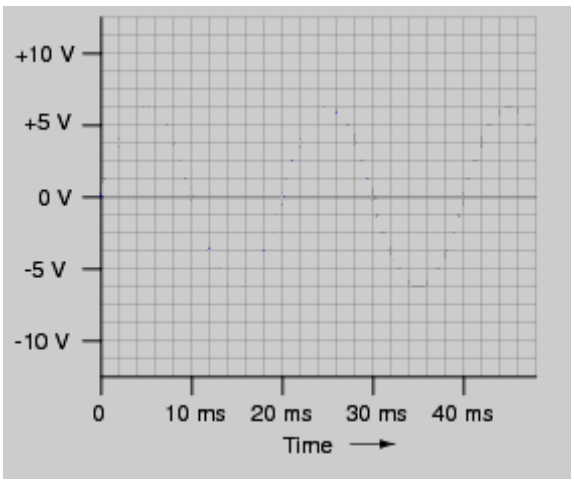




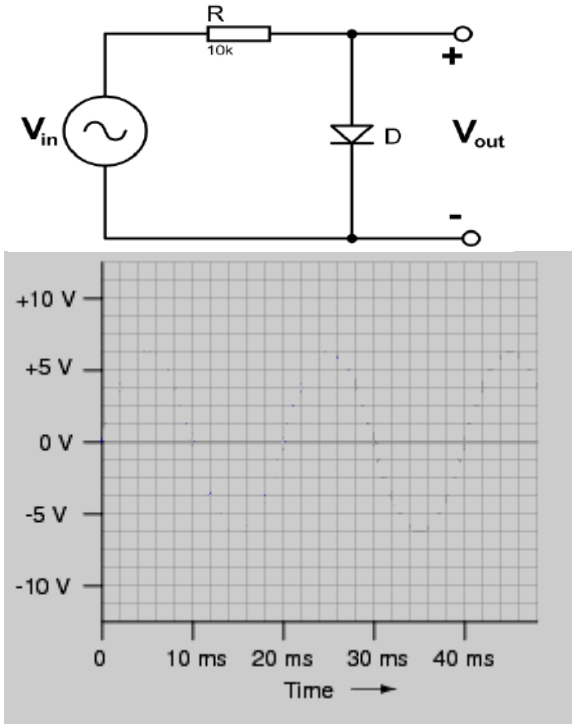
Negative Clipper

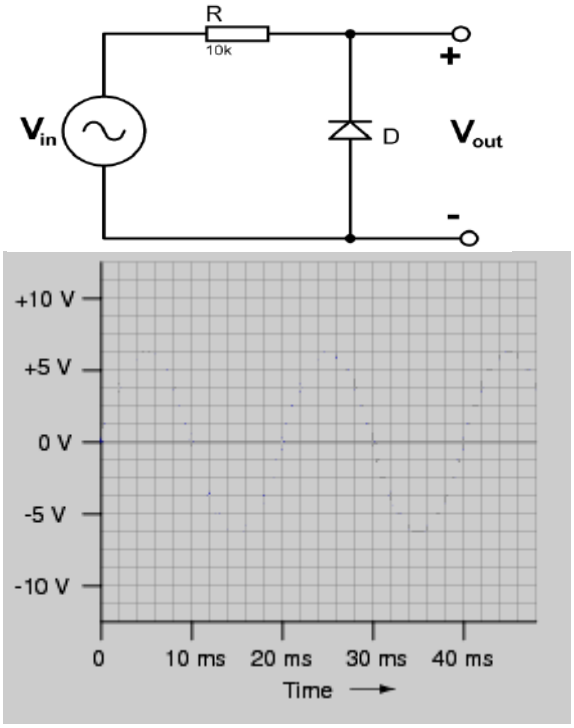






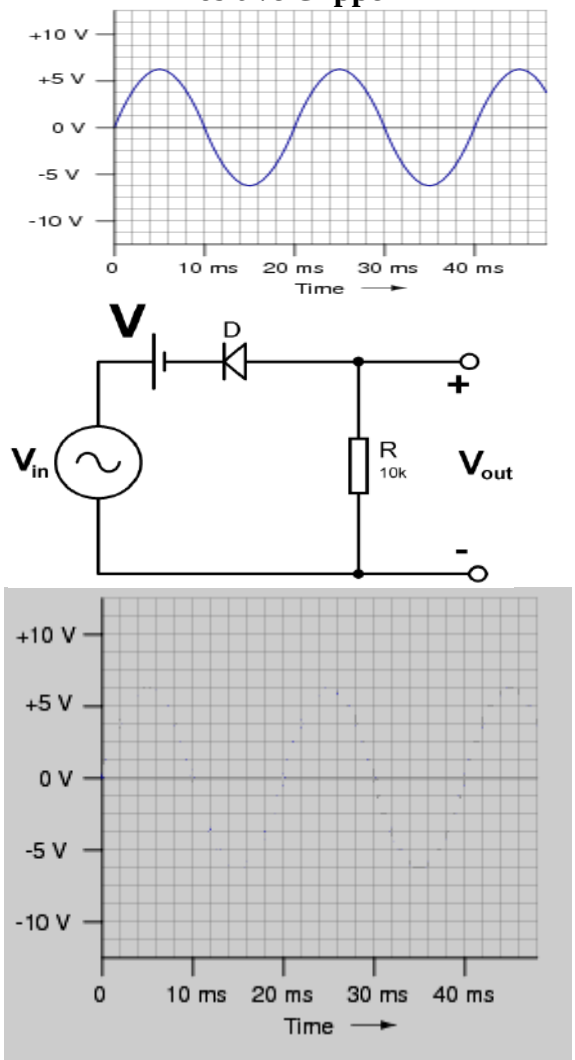
Parallel Clipper Circuit (with Diode and Resistor):



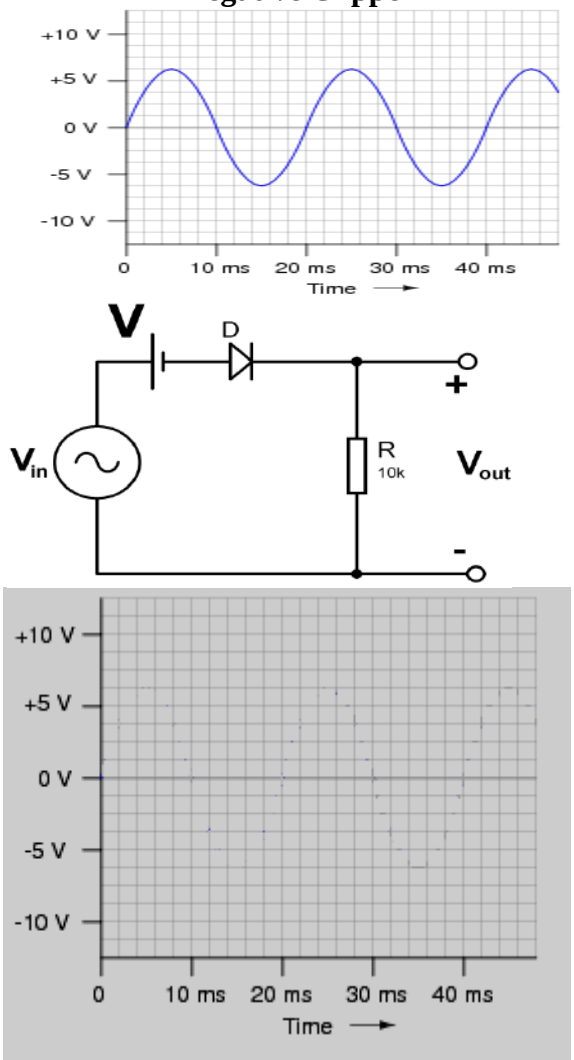


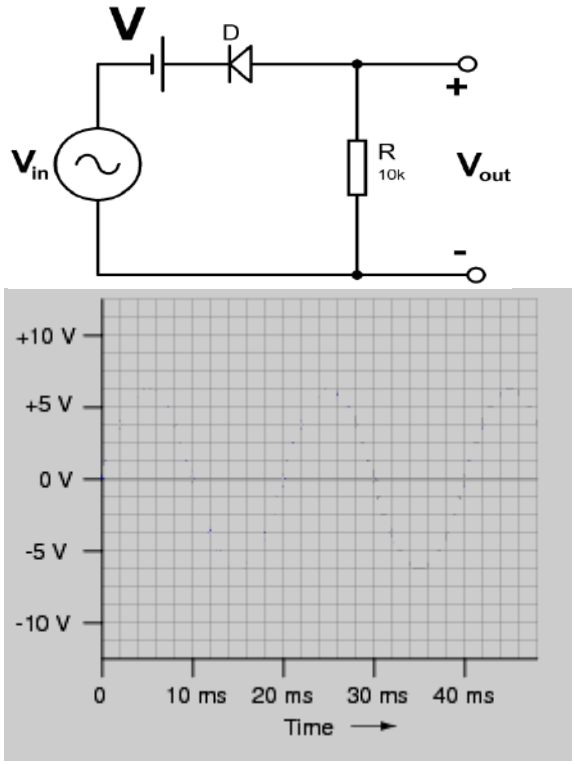
Biased Series Clipper Circuit (with Diode and Resistor):

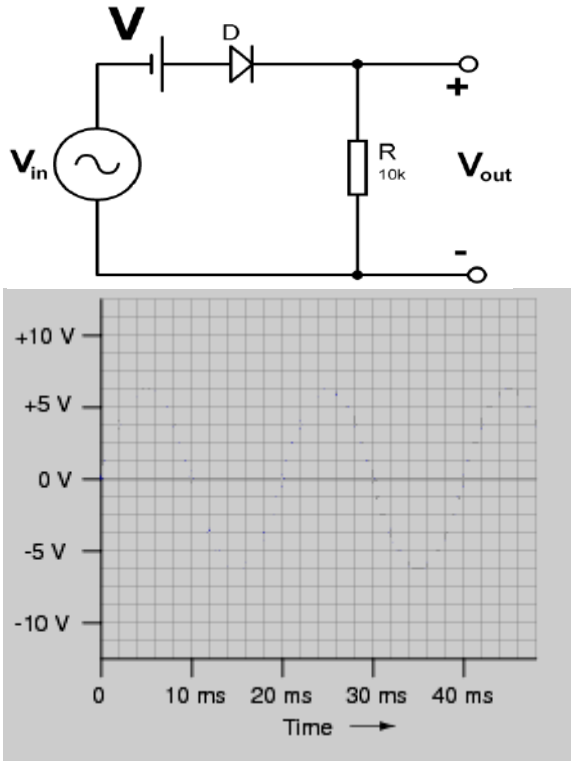
Positive Clipper



Negative Clipper

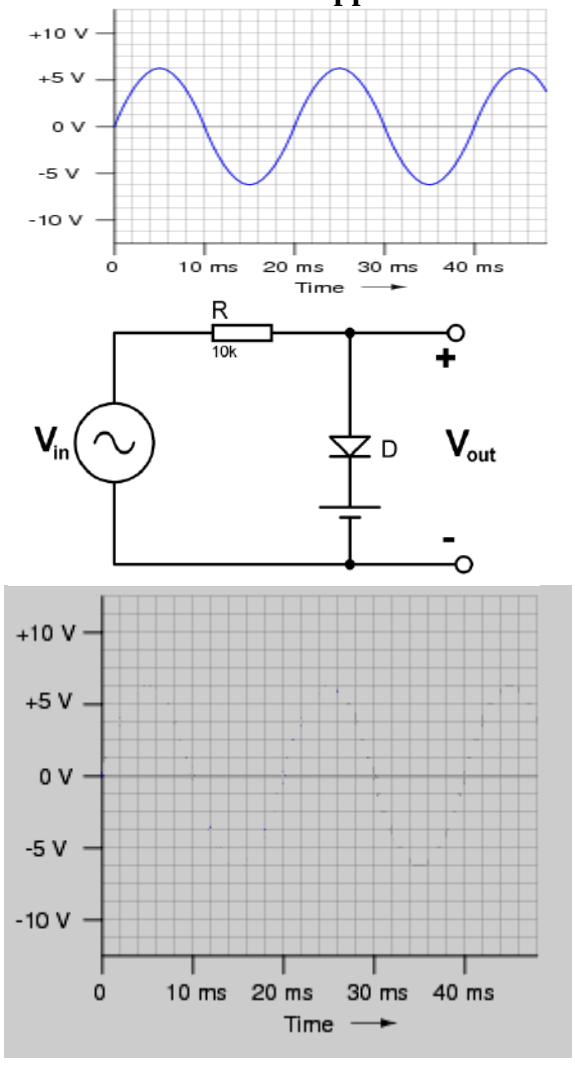




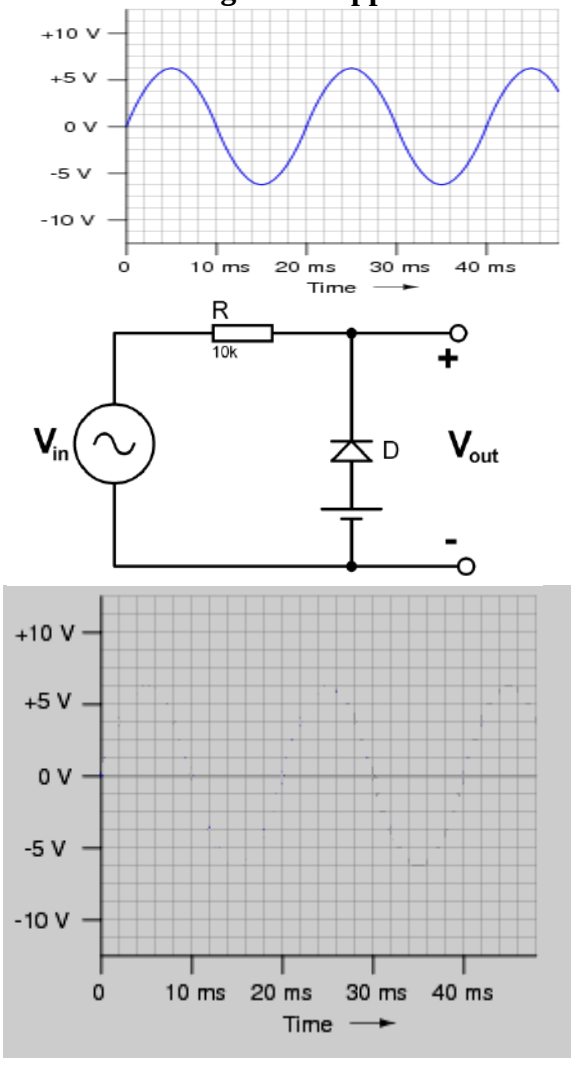


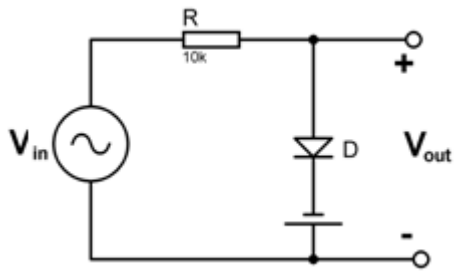
Biased Parallel Clipper Circuit (with Diode and Resistor):

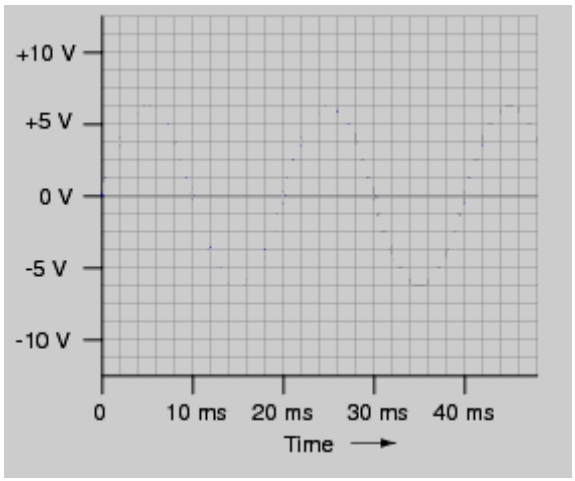
Positive Clipper

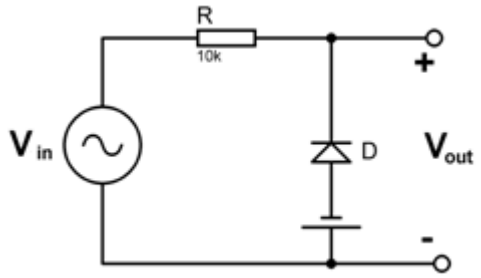


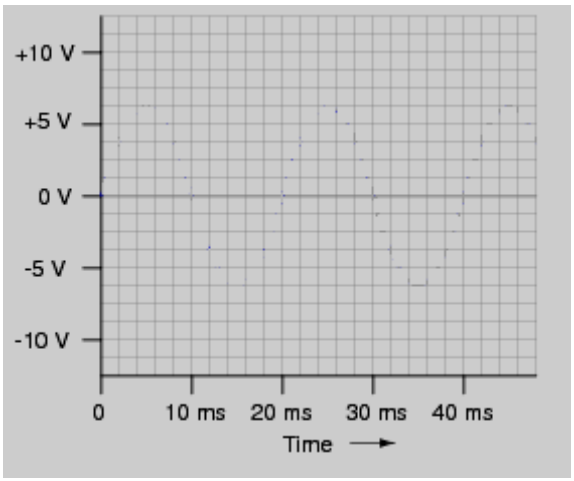
Negative Clipper



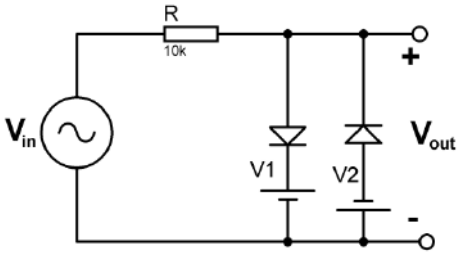


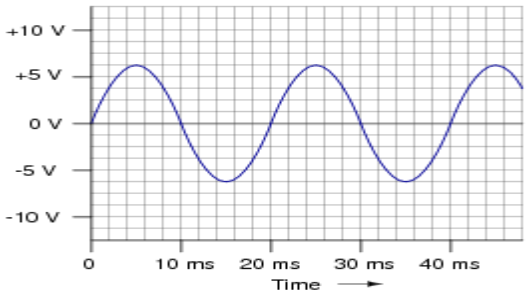


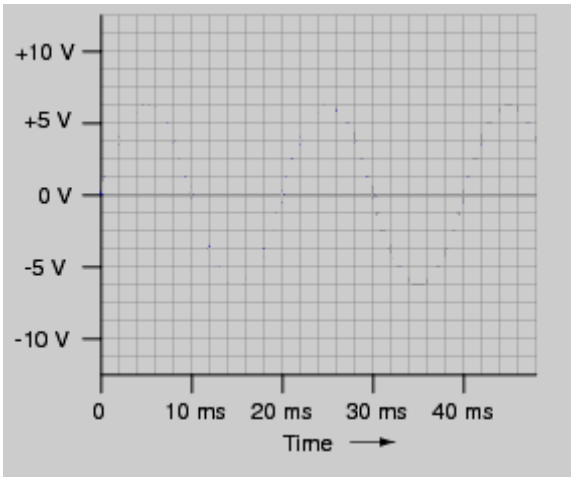




Combined







Clamping circuits:

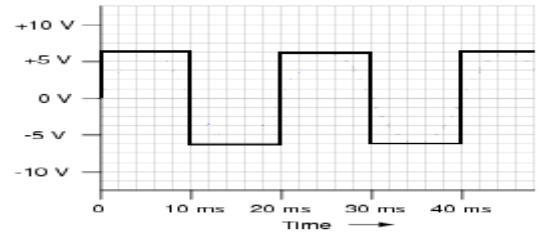
Sometimes we may want to leave the waveform unchanged, but modify its DC level up or down. To accomplish this, we use a clamper circuit. The beauty of clampers is that they can adjust the DC position of the waveform without knowing what the waveform actually is.

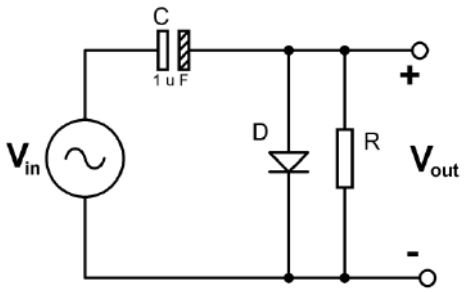
The *clamping* network is one that will "clamp" a signal to a different dc level. The network must have a capacitor, a diode, and a resistive element, but it can also employ an independent dc supply to introduce an additional shift. The magnitude of R and C must be chosen such that the time constant $\tau = RC$ is

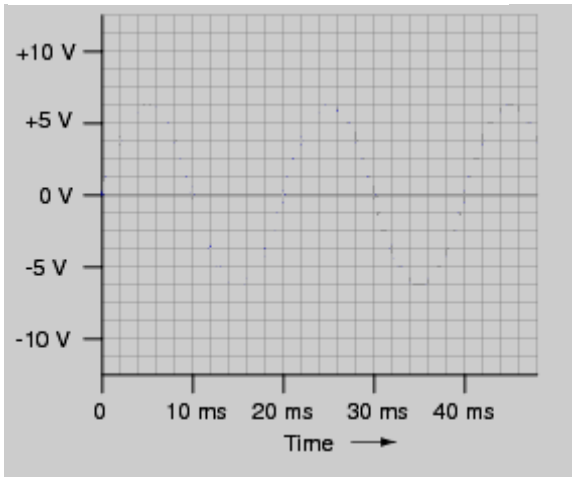
large enough to ensure that the voltage across the capacitor does not discharge significantly during the interval the diode is non conducting. Throughout the analysis we will assume that for all practical purposes the capacitor will fully charge or discharge in five time constants.

Series clamping Circuit (with Diode and Resistor):

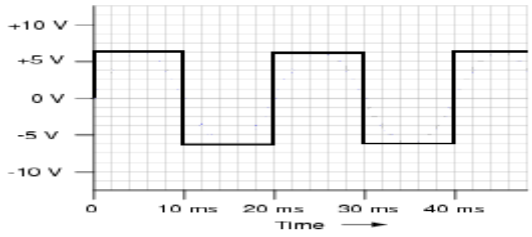
Positive clamper

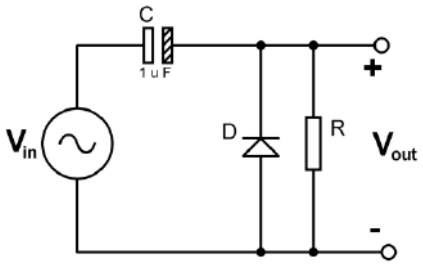


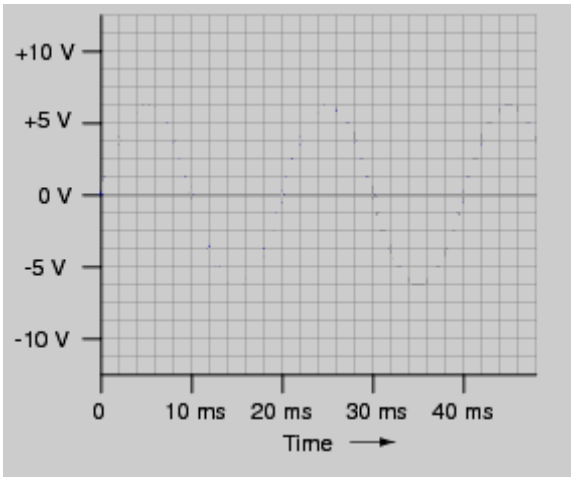




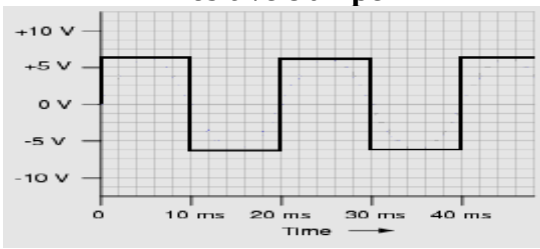
Negative clamper



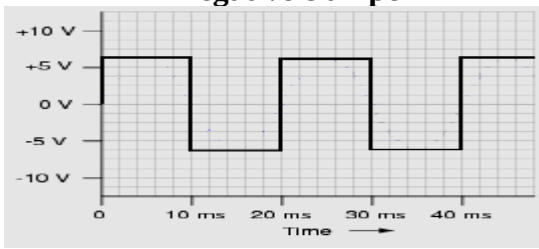


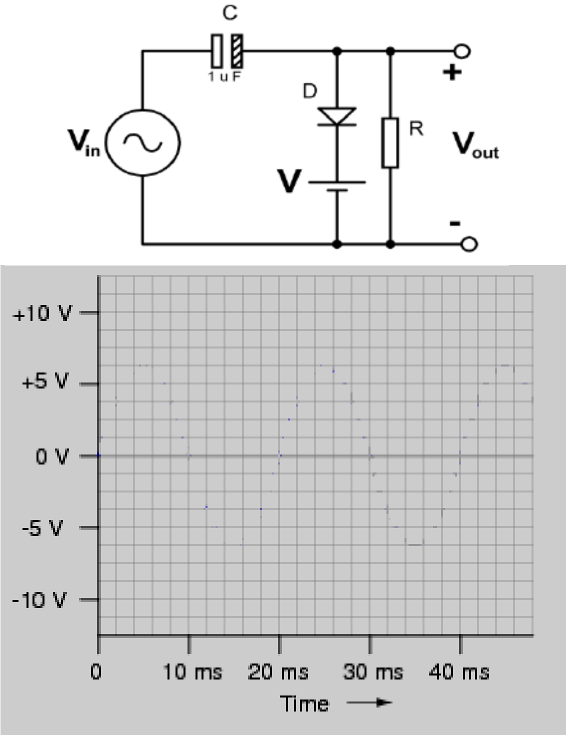


Positive clamper



Negative clamper




C
1 u F
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R
V
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Vout
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-
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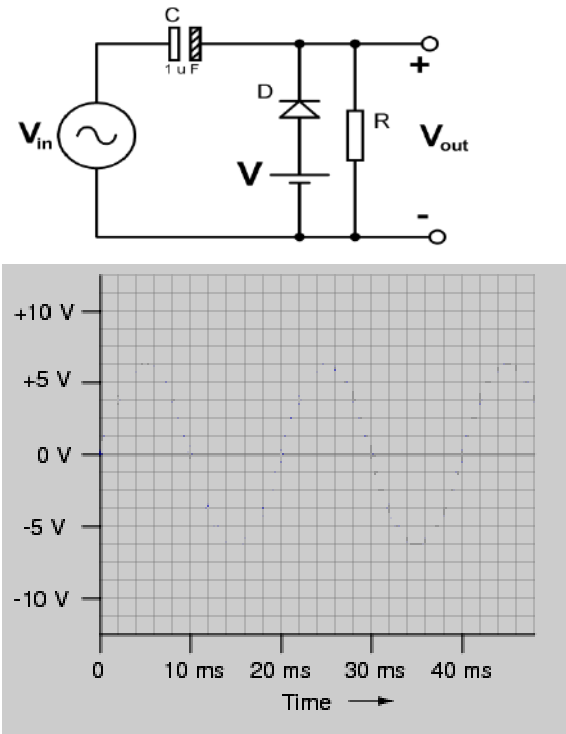
+5 V
0 V
-5 V
-10 V
0
10 ms
20 ms
30 ms
40 ms
Time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+10 V
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10 ms
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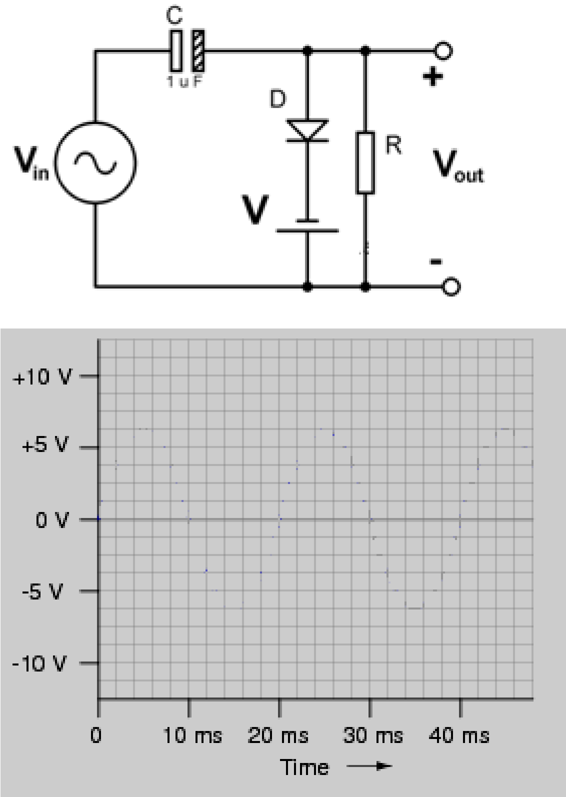
30 ms
40 ms
Time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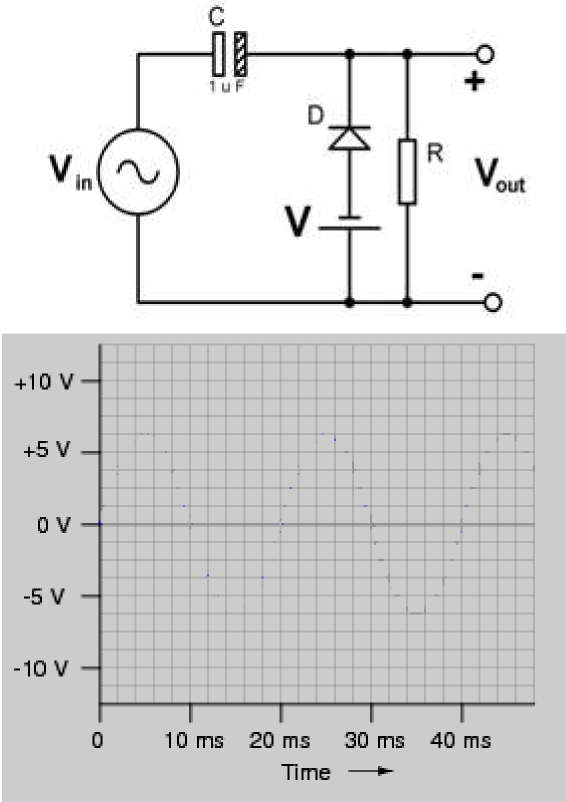
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Time