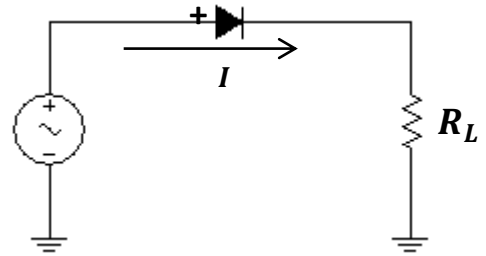
2-2 Half Wave Rectifiers

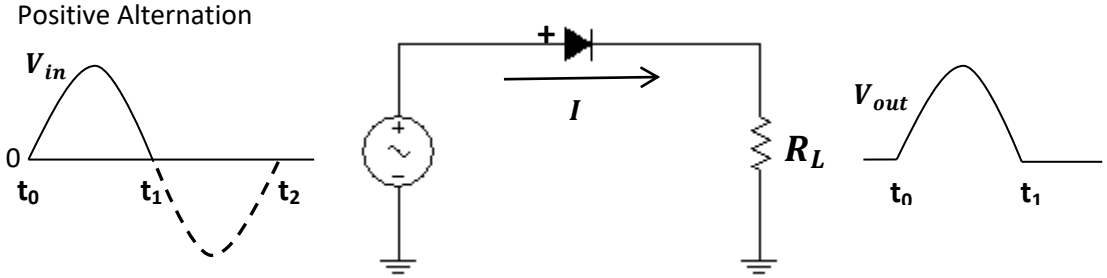
- Because of their unique ability to conduct current in one direction, diodes are used in rectifier circuits. Rectification is the process of converting ac to pulsating dc.

Half-Wave Rectifier

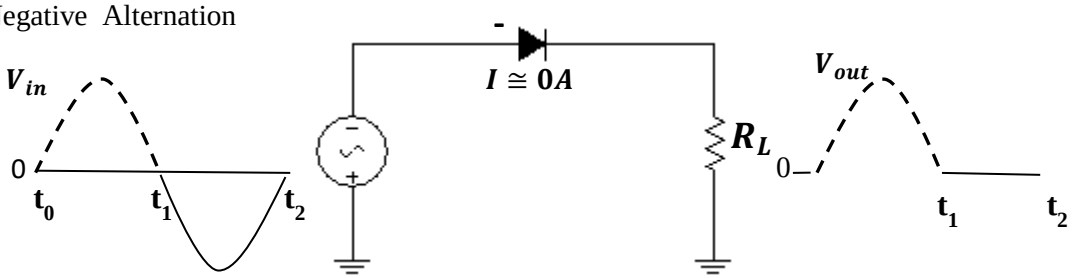
Circuit



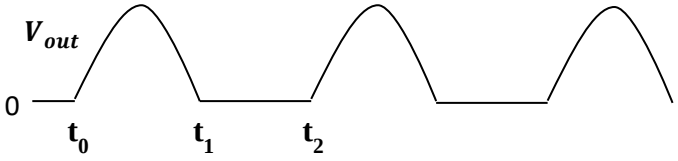
Positive Alternation



Negative Alternation



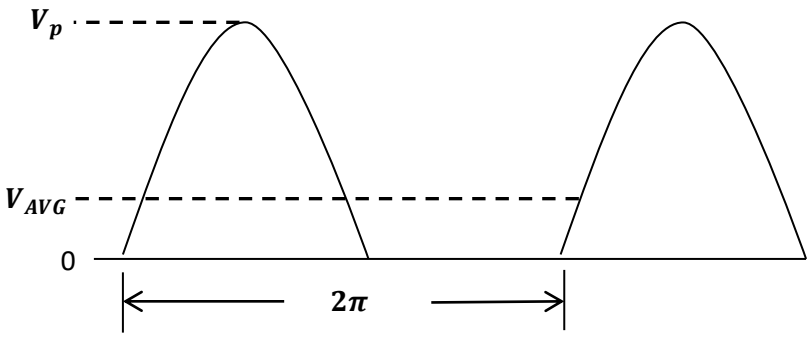
Half-Wave Rectifier Output



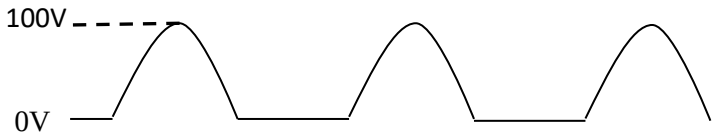
As for the average value of the half wave output,

$$V_{AVG} = \frac{V_p}{\pi}$$

The average value is the value that would be indicated by a dc voltmeter:



Example: What is the average dc value of the half-wave rectified voltage waveform in the following:

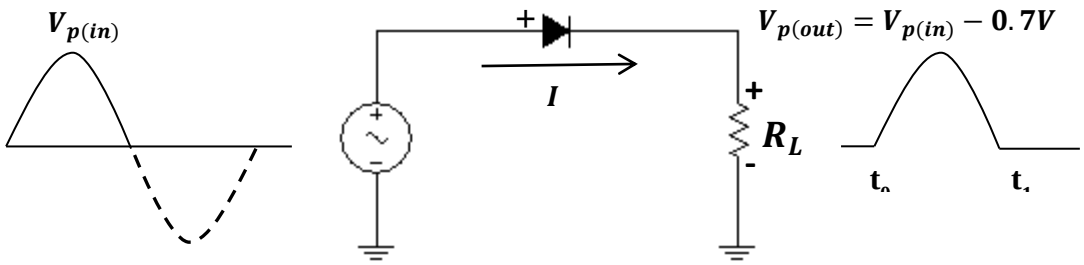


$$V_{AVG} = \frac{V_p}{\pi} = \frac{100V}{\pi} = 31.83V$$

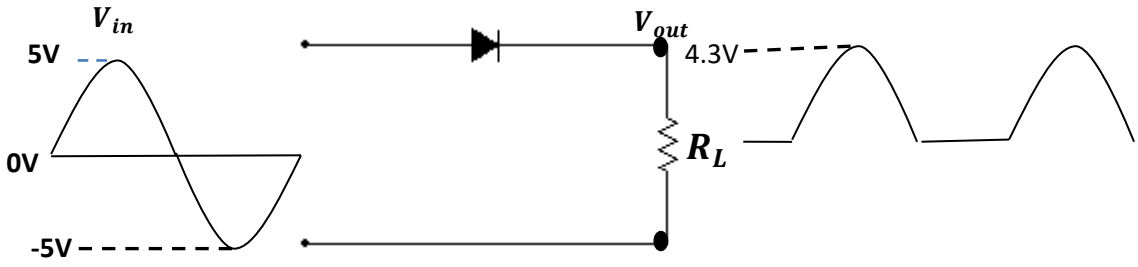
2-2.1 Effect of barrier potential on half wave rectifier output

During the positive half-cycle, the input voltage must overcome the barrier potential before the diode becomes forward bias.

$$V_{p(out)} = V_{p(in)} - 0.7V$$

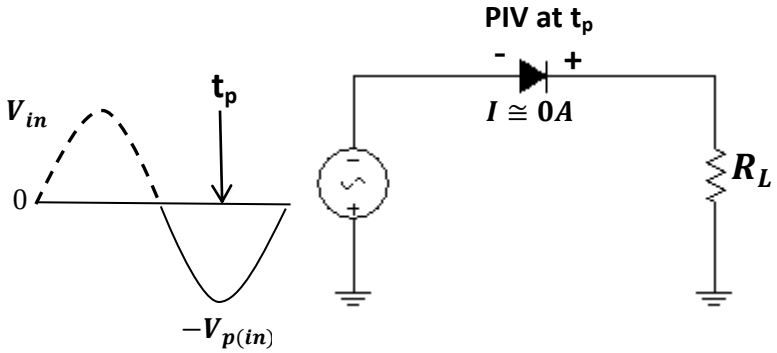


Example: Sketch the output voltage of the following Silicon rectifier circuit for the indicated rectifier voltage:



2-2.2 Maximum Reverse Voltage

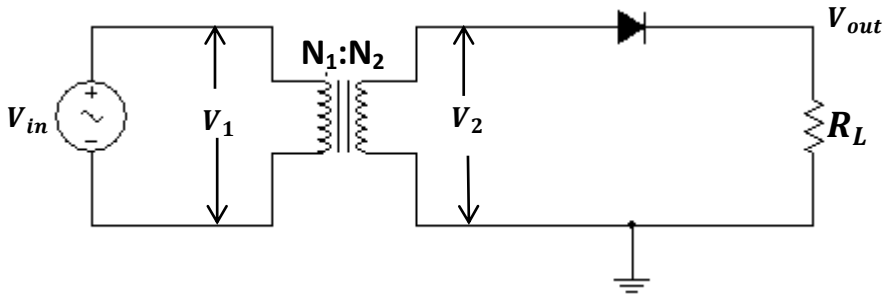
- The maximum value of reverse voltage sometimes called Peak Inverse Voltage (PIV) occurs at the peak of the negative alternation of the input when the diode is reverse biased.



- The diode must withstand the amount of repetitive reverse voltage.

2-2.3 Half-Wave Rectifier With Transformer- Coupled Input

- Transformer allows the source voltage to be stepped up or down as needed.
- Transformer electrically isolate ac power source from rectifier circuit, thus reducing shock hazard.



The secondary output voltage of the transformer equals the turns ratio ($\frac{N_2}{N_1}$) Times the primary input voltage:

$$V_2 = \left(\frac{N_2}{N_1}\right) V_1$$