Power Supply Filters and Regulators

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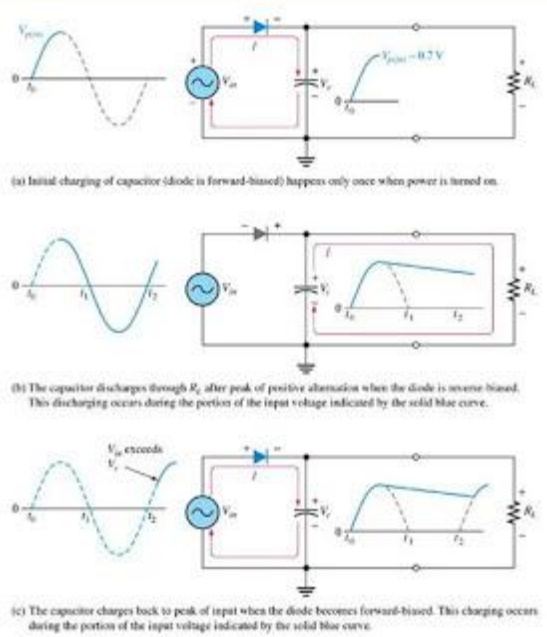
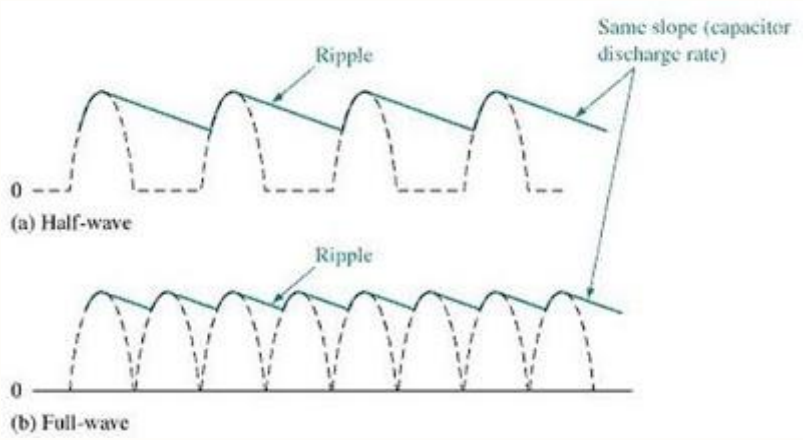


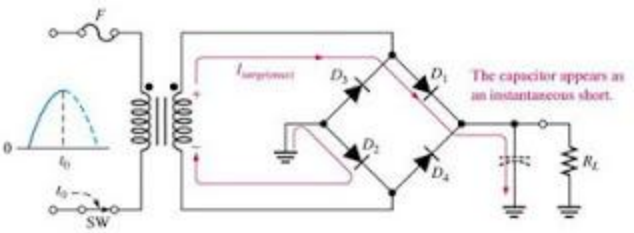
We know that a pulsating dc wave is the output of the rectifier circuit. Our ultimate aim is to obtain a constant dc output. In order to obtain the constant dc output, we need to filter out the oscillations from the pulsating dc wave. with the help of a diode capacitor combination, this can be achieved.

The charging and discharging of a capacitor-input filter is such that it fills in the “gaps” between each peak value. The variations ofvoltage can be reduced by this action. This variation in voltage can be defined as ripplevoltage.

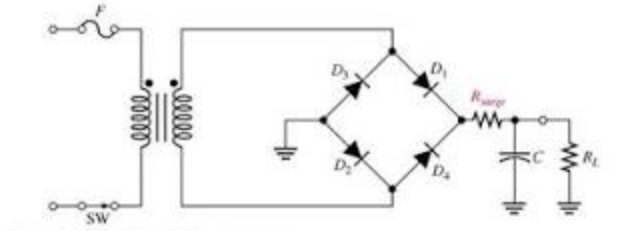
We know that the performance (advantage) of a full-wave rectifier over a half-wave is much good. When the time between peaks is shorter, thecapacitor can more effectively reduce the ripple.



The capacitor appears as a short circuit While charging.
This will leads to a large current flow through the diodes.
A surge resistor (Rsurge) is added, in order to avoid damaging the devices.
The surge resistance value (Rsurge)should be small in comparison to the load resistor (R_L).



(a) Maximum surge current occurs when switch is closed at peak of an input cycle.

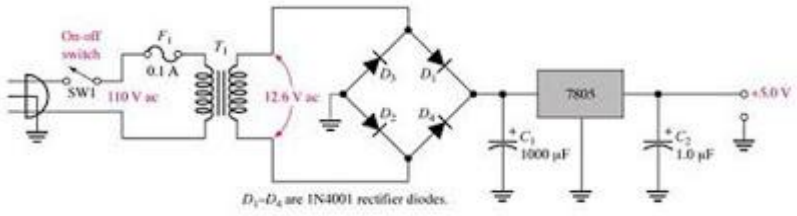


(b) A series resistor (R_{surge}) limits the surge current.

We can use IC voltage regulator, to effectively reduce the ripple occurring after filtering.

We know that a regulator consists of 3 terminals: input, output and reference (or adjust) terminal. It is better to add capacitors after (and before) the regulator circuit. Further filtering of the signal can be done by the help of a largecapacitor between the input voltage and the input terminal.

A smaller capacitor is added after the regulator in order to improve transient response.



D_1–D_4 are 1N4001 rectifier diodes.

Examples of positive output regulators are the 78XX series .
Examples of negative output regulators are the 79XX series.

Type Number (Series)	Output Voltage (in Volts)
7805	5 V
7806	6 V
7808	8 V
7809	9 V
7812	12 V
7815	15 V
7818	18 V
7824	24 V

Voltage regulation can be measured by two means:
Line regulation : For a given change in input voltage, how much change occurs in the output voltage.

Line regulation = $(\Delta V_{out}/\Delta V_{in})*100\%$

Load regulation : The rate of output voltage change over a certain range of current values: minimum (no load, NL) to maximum current (full load, FL).

$$\textbf{Load regulation} = (V_{NL} - V_{FL})/V_{FL}\ 100\%$$

Source:

http://www.electronicsandcommunications.com/2013/04/power-supply-filters-and-regulators.html