

FILTERING

In power supplies, capacitors are used to smooth (filter) the pulsating DC output after rectification so that a nearly constant DC voltage is supplied to the load. The pulsating output of the rectifiers has an average DC value and an AC portion that is called ripple voltage. Filter capacitors reduce the amount of ripple voltage to a level that is acceptable. It should be noted that resistors and inductors can be combined with the capacitors to form filter networks. Here we will concentrate on capacitive filters only. In a filter circuit the capacitor is charged to the peak of the rectified input voltage during the positive portion of the input. When the input goes negative, the capacitor begins to discharge into the load. The rate of discharge is determined by the RC time constant formed by the capacitor and the load's resistance. See *Timing* paper for explanation of RC time constants.

The capacitance value needed to supply the power supplies output current (I) with the specified amount of ripple current (Vrms) with full wave rectification is:

$$C = \frac{I}{V_{rms} \times 4f} \quad \text{Where } V_{rms} = \frac{V_{(p-p)}}{2} \text{ for } f = 60\text{Hz}$$

$$C = \frac{2.4 I}{V_{rms}} \quad I = \text{DC Load current of power supply in milliamps}$$

A more general formula is:

$$C \sim \frac{I \times V_{dc}}{V_{rms} V_m 4} \quad \text{Where } V_{dc} = \frac{V_m - V_{p-p}}{2}$$

V_m = max. voltage of input waveform

V_{p-p} = peak to peak ripple voltage

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