CURRENT:

The instantaneous value of current in an oscillatory RLC circuit, as shown in Figure I, is calculated as:

$$i = 2\pi fCVe^{-\frac{Rt}{2L}} \sin 2\pi ft$$

where $2\pi fCV$ = undamped peak current

$e^{-\frac{Rt}{2L}}$ = damping factor (δ)

$\sin 2\pi ft$ = oscillatory function

t = time

The peak discharge current occurs at 1/4 the period of the circuit ringing frequency. At peak current the oscillatory function is unity, and the expression for peak current is:

$$I_{peak} = 2\pi fCVe^{-\frac{R}{8Lf}}$$

In under damped circuits, where $\frac{1}{LC} >> \frac{R^2}{4L^2}$, the expression for peak current is reduced to:

$$I_{peak} = 2\pi fCV, \text{ or } \quad I_{peak} = V\sqrt{\frac{C}{L}}$$

In over-damped circuits, where $\frac{R^2}{4L^2} > \frac{1}{LC}$, the general expression for current versus time is as follows:

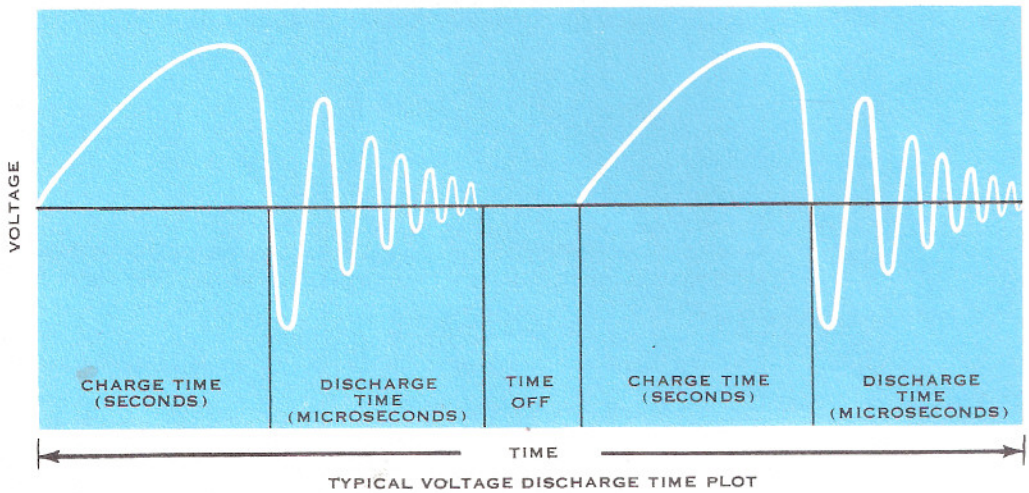
$$i = \frac{E}{L\sqrt{\frac{R^2}{4L^2} - \frac{1}{LC}}} e^{-\frac{Rt}{2L}} \sinh\left(\sqrt{\frac{R^2}{4L^2} - \frac{1}{LC}}\, t\right)$$

and the time to peak current is expressed as:

$$T_R = \frac{1}{\sqrt{\frac{R^2}{4L^2} - \frac{1}{LC}}} \tanh^{-1}\left(\frac{2L}{R}\sqrt{\frac{R^2}{4L^2} - \frac{1}{LC}}\right)$$

LIFE EXPECTANCY:

The life expectancy of an energy discharge capacitor is defined as the number of "charge-discharge" cycles of operation before failure. The repetition rate should not exceed three charge-discharge cycles per minute in order to obtain extended life expectancy characteristics. The life expectancy of Type EDC, Class C, energy discharge capacitors will approach 100,000 shots when discharged under the recommended conditions of operation.



TYPICAL VOLTAGE DISCHARGE TIME PLOT

Fig. II