$$\text{ESR (ohms)} = \frac{\text{d.f.}}{2\pi f C}$$

where C = capacitance (farads)

f = circuit ringing frequency (cps)

d.f. = dissipation factor $= \frac{1}{Q}$

Q = numerical figure of merit

RINGING FREQUENCY:

The ringing frequency of an RLC circuit is calculated as:

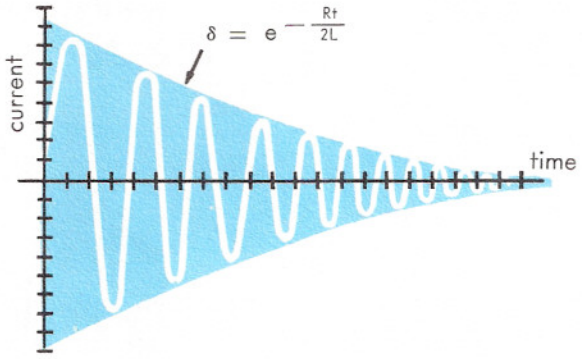
$$f = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}}$$

where f = ringing frequency (cycles per second)
C = capacitance (farads)
L = inductance (henries)
R = resistance (ohms)

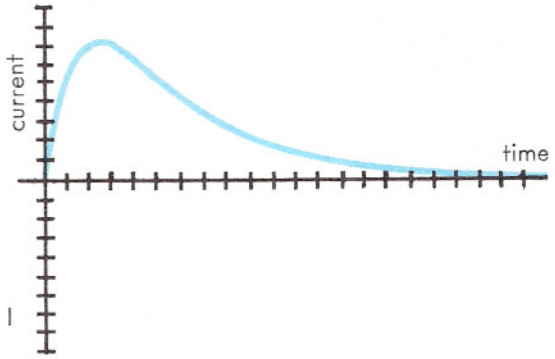
In under-damped circuits, where $\frac{1}{LC} >> \frac{R^2}{4L^2}$, this expression is reduced to:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

Over-damped circuits, where $\frac{R^2}{4L^2} > \frac{1}{LC}$, do not have an associated ringing frequency.



TYPICAL OSCILLATORY DISCHARGE FOR TYPE EDC



TYPICAL OVER DAMPED DISCHARGE FOR TYPE LDC

Fig. 1

VOLTAGE REVERSAL:

The voltage reversal of an oscillatory discharge is dependent upon the circuit resistance, inductance, and capacitance. Voltage reversal is defined as the percentage of overshoot, or as the ratio of the magnitudes of the first negative peak to the charge voltage. The damping factor of a shorted Type EDC capacitor permits the voltage reversal to be greater than 90%. In most applications resistance and inductance is introduced by other components in the circuit which limits the voltage reversals to 70%-85%.

Sangamo has designed capacitors for special applications which have exceptionally high values of Q at high ringing frequencies. Capacitors with high Q characteristics will enable the circuit voltage reversal to approach 99%.