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Pulse operation of film capacitors

When capacitors are subjected to waveforms that contain fast rising (or falling) pulses care needs to be taken to prevent the capacitors from becoming damaged from these waveforms.
The peak currents generated from these waveforms place a large amount of stress on the internal connections and contact areas of the capacitors which in turn generates localized heating in these areas.
To prevent the capacitors from being damaged by the localized heating the peak current must be limited. The peak current for any given capacitors is determined by:

1. The amplitude and shape of the pulse.
2. The capacitance value.
3. voltage rating of the capacitor.
4. The shape of the capacitor.

The pulse current rating of a capacitor is determined by the following formula:

$I=C*dv/dt$

Where I= the peak current rating for the capacitors.
C= Capacitance value.
dv/dt= maximum rate of change the capacitor can withstand.

To determine the energy content of the waveform (Ko) the following formula is used:

$Ko=2\int (dv/dt)^2 dt$ where dv=change in voltage over time interval.
dt= Change in time of the slope section measured.

For waveforms with straight edge transitions

$Ko=2V_{pp}^2/t$ where V_{pp} = Peak to peak voltage of the waveform.
t= Rise time of the voltage.

For applications where short circuit type discharging is present

$Ko=V_{CH}^2/(R*C)$ Where V_{CH} = Charging voltage
R= Resistance of circuit
C= Capacitance