



RESISTORS • CAPACITORS • COILS • DELAY LINES

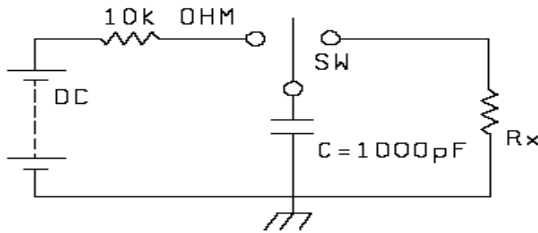
APPLICATION GUIDE R-42

Pulse Capability Derating Factors

Unless indicated otherwise on RCD's data sheet, the resistor peak pulse voltage, wattage, and/or energy ratings are based on single capacitive discharge pulse with RC time constant of 1uS at 25°C and RH <65% at altitude <10,000 ft. Derate for multiple pulses, longer pulse durations, and environmental conditions as detailed below. The pulse rating shall be the lower of the peak power, voltage, or energy rating after applying the derating factors.

Peak Pulse Voltage Rating

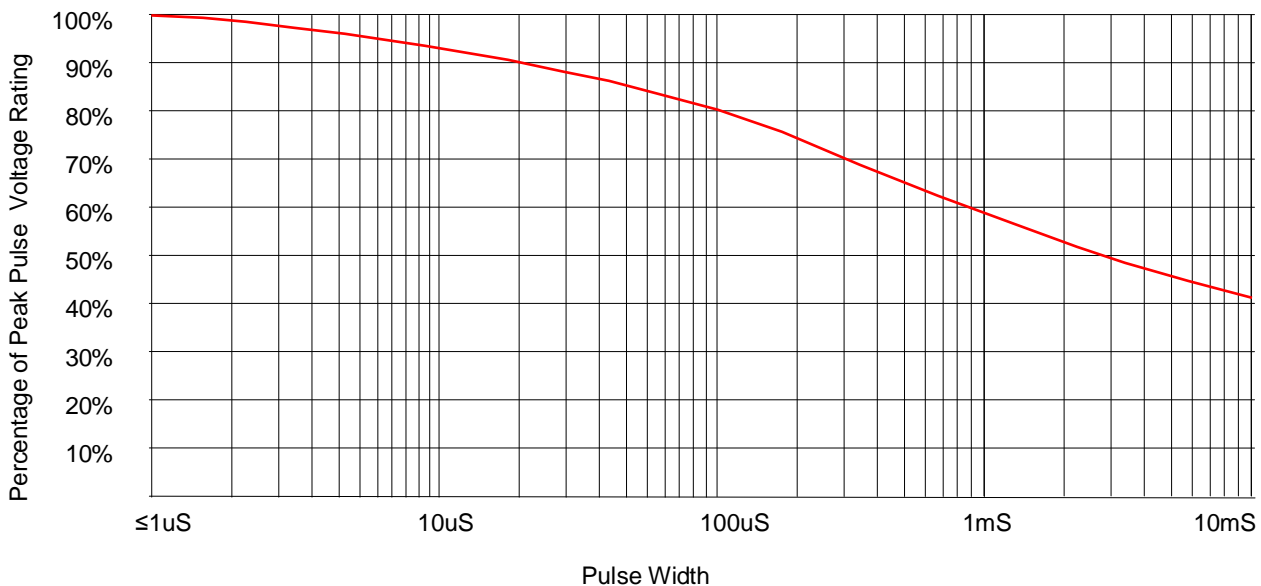
Peak pulse ratings are in accordance with RCD data sheets when tested per the pulse test circuit is in accordance with DSCC (Defense Supply Center) Drawing 03007 par. 4.11 "Resistance to Pulse Test Circuit" with capacitance value selected to limit the RC time constant to 1uS. Circuit for 1KΩ resistor is illustrated below. For longer pulses, derate in accordance with "Peak Pulse Rating as a Function of Pulse Width" chart below.



Resistance Value	Capacitance
1KΩ	1000pF
10KΩ	100pF
100KΩ	10pF
100MΩ	1pF

Table 1. Capacitance Value to be Utilized in Pulse Test Circuit

Peak Pulse Voltage Rating as a Function of Pulse Width:



Pulse Energy Rating As A Function of Pulse Width, Series PR & PRM

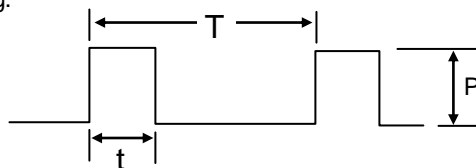


Derating the Single-Pulse Surge Rating for Multiple or Repetitive Pulse Streams:

a) Firstly, the pulse must not exceed the single peak power pulse rating given in the applicable Surge Capability chart for given time duration, and also must not exceed the rated peak pulse voltage levels. The peak pulse voltage capability is generally well above the Max. Continuous Voltage Rating and if not listed on data sheet is often available on the Surge Application Guide for the product in question (if not, consult RCD's engineering department). Note: elevated ambient temperatures can impact surge capability and should be derated accordingly (refer to data sheet).

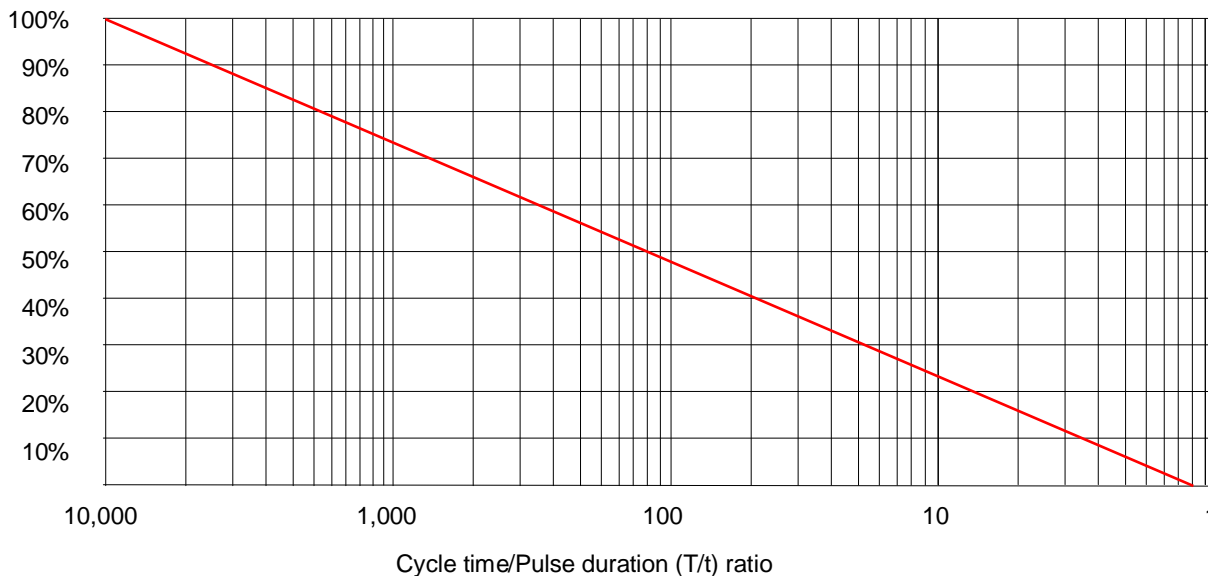
b) Resistors subjected to multiple pulses or repetitive pulse streams must meet the criteria for a single pulse, and the average power must not exceed the published wattage rating.

Average Power = Pt/T
 P = Peak Power (Watts)
 t = Pulse duration (Seconds)
 T = Cycle Time



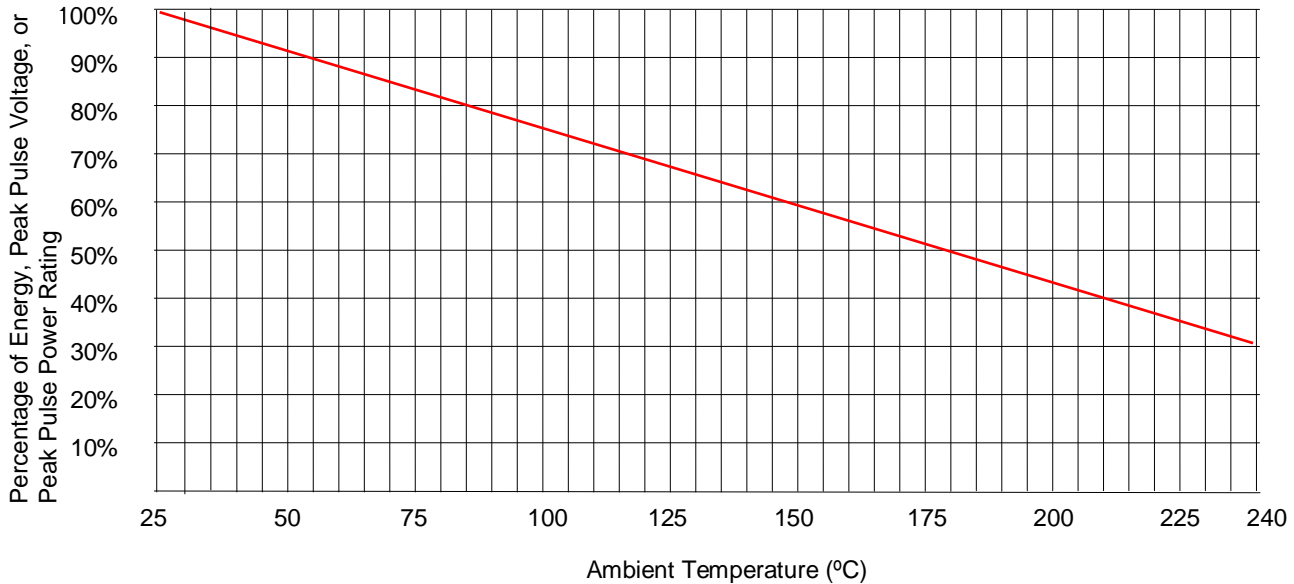
Example: Peak Power (P) = 1000W, pulse duration (t) = 10uS, cycle time = 60Hz (.01667S)... $1000W \times .00001S / .01667S = .6$ Watts average power.

c) The single pulse rating is based on Cycle time/Pulse duration (T/t) ratio of 10,000 or greater. For smaller T/t ratios, derate pulse capability according to following chart. Complete RCD's "Surge Questionnaire Form" if standard or Opt.P (Pulse Tolerant) construction won't suffice so that we can recommend the optimum resistor for your application. Always verify selection by evaluating prototypes under worst-case conditions.



Derating Pulse Capability for Elevated Temperatures:

Elevated ambient temperatures impact pulse as well as continuous performance capability and therefore require derating of peak and continuous power, voltage, and energy ratings. Continuous power and voltage ratings are to be derated according to “derating” section on data sheet. Peak pulse voltage, power and energy are to be derated according to chart below.



Derating Pulse Capability for High Altitudes and Humidity:

Power capability is affected by altitude. Operation at high altitudes can also result in corona and arcing, especially in high humidity environments. Peak pulse voltage, power and energy ratings are to be derated 10% per 10,000 feet. RCD has not established a derating factor for high humidity, however offers hermetically sealed designs for products utilized in harsh environments such as tropical or naval.