DID YOU KNOW?

POLYMER CAPACITOR DERATING GUIDELINES

Derating guidelines for various capacitor technologies vary greatly depending on technology and application conditions. The EIA published guideline for derating of traditional manganese dioxide (MnO2) tantalum capacitors is 50 % application voltage rated voltage (V_a / V_r). By contrast, polymer tantalum capacitors are more resilient under voltage stress and require less derating while still delivering the same high level of reliability. Typically, polymer derating guidelines are 10 % for $V_r \leq 10$ V and 20 % for $V_r > 10$ V. Without understanding these differences, you might choose to derate polymer in the same way as traditional tantalum capacitors and therefore potentially forego one of the key benefits of polymer technology.

RECOMMENDED VOLTAGE DERATING GUIDELINES

Capacitor Voltage Rating	Operating Voltage
2.5	2.3
4.0	3.6
6.3	5.7
7.0	6.3
10	9.0
12.5	11.2
16	12.8
20	16
25	20
35	28
50	40

In selecting a capacitor, there is an inverse relationship between capacitance and voltage rating. As you move to higher voltage ratings, less capacitance is available. In a given application, excessive derating might force you to select capacitors from a higher voltage range than the application requires, thereby limiting the capacitance range available for your design. There may be other detrimental impacts as well, including higher equivalent series resistance (ESR), higher DC Leakage current (DCL), and a higher dissipation factor (DF).

For example take the application of battery decoupling in smartphones. With battery voltages of 3.7 V to 4.2 V, a traditional design would use tantalum caps with a 10 V rating (10 V_r x 50 % = 5 V_a max). With the lower derating requirements of polymer capacitors, you can use 6.3 V rated capacitors for the same application (6.3 V_r x 90 % = 5.7 V_a max) and still maintain an excellent design margin for reliability.

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