

Useful Life of Tantalum Capacitors

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Currently, the major reliability characteristic of tantalum capacitors is the failure rate (FR) that is a constant used to characterize random failures of electronic components. However, contemporary MnO₂ and polymer tantalum capacitors have both types, infant mortality (IM) and wear-out (WO) failures. This requires assessments of the useful life of the parts that is limited by the time of the inception of WO failures. The time to WO inception can be determined using an adequate reliability model and results of highly accelerated life testing (HALT). In this presentation, a modified time dependent dielectric breakdown (TDDB) model is used to describe both infant mortality (IM) and WO failures during HALT. Specifics of physical processes resulting in degradation and failures in polymer and MnO₂ tantalum capacitors are discussed and increasing of IM failures with the level of stress explained. The model justifies exponential dependence of the acceleration factors on voltage, predicts higher values of the voltage acceleration constant for IM compared to WO failures, and allows for assessments of the useful lifetime of tantalum capacitors.