Effect of Preconditioning on Post-soldering Failures In Tantalum Capacitors

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Soldering have a strong effect on performance and reliability of most surface mount technology components, including tantalum capacitors. High quality tantalum capacitors are likely the only type of components where soldering simulation is the first step during screening. Nevertheless, post-soldering failures of tantalum capacitors do happen and require additional analysis. Popcorning is a well-known effect in plastic encapsulated microcircuits (PEM) and it occurs also in chip tantalum capacitors. The sensitivity of parts to the presence of moisture during soldering is characterized by the moisture sensitivity level (MSL); however, contrary to PEMs, there is no standard procedure for establishing MSL for tantalum capacitors. In this work, the effect of absorbed moisture on soldering related degradation and failures in tantalum capacitors have been studied using 22 types of polymer and 11 types of MnO2 cathodes tantalum capacitors including single and multianode parts. The amount of moisture released during soldering has been estimated by measurements of mass and capacitance variations. Results show that moisture uptake in similar parts is approximately two times greater in polymer than in MnO2 capacitors. Cracking of the case and degradation of parameters can occur in both types of parts, but MnO2 capacitors are much more susceptible to catastrophic short circuit failures and their ignition is possible during the first power-on cycle. This type of failure in MnO2 capacitors is lot-related, can occur even at derated voltages and relatively low levels of moisture sorption corresponding to room conditions. Baking before soldering is an effective measure to prevent failures even in lots susceptible to popcorning damage. Recommendations for testing to establish MSL and for baking to reduce the probability of failures are suggested.