



Reliability analysis of lead-free soldering

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ABSTRACT

In this research, analysis of the reliability of lead-free soldering was investigated and a qualitative analysis was discussed about fracture modes of lead-free solder under different tensional tests such as: releasing test, bending test, thermal test and vibration test. Cracks caused by fatigue is the main reason of lead-free soldering's fracture 'primary cracking speed can change according to the different test conditions and different soldering materials. A quantitative analysis was also carried out on the behavior of lead-free soldering's fatigue SAC (copper and silver) under preheating conditions. This dissertation presents a method for predicting the fracture lifetime of soldering alloys by creating the Weibull regression model. The lifetime of solder fracture is supposed on orbital board which was been distributed in the form of Weibull. Different test materials and conditions can affect distribution following changes of formation parameters and Weibull distribution scale. The method used in this thesis is modeling regression of parameters under different test conditions as a predictor based on Bayesian inference concepts. In the process of creating regression models, former distributions are done according to previous studies and the Monte Carlo Markov Chain (MCMC) has been used under the WinBUGS environment. The results showed that in general, lead-free solder alloy shows a good fracture lifetime. The alloy with a low mercury had a higher fracture lifetime While the alloy with a high mercury value had a longer fracture lifetime under the thermal precondition process.

Keyword:

Reliability, Lead-free solder alloy, Weibull distribution

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