

Thermo-mechanical analysis of various solder materials via finite element method

Abstract

The thermal environment may cause the unintended thermal stress to the solder joint which could lead to the reliability issue. This study aims to study the temperature cycling analysis of various solder materials (i.e., Sn-58Bi, Sn-3.5Ag and Sn-9Zn) by using the finite element method. A leadless solder joint of the surface mount component was considered and the three-dimensional model was created in the simulation software. The thermo-mechanical aspects (i.e., maximum displacement, stress and strain) of lead-free solder materials were investigated. The simulation results revealed the solder material significantly affects the thermo-mechanical aspects during the temperature cycling test. The maximum stress of the leadless solder joint was concentrated around the interface region of the solder and pad. The lowest stress (195MPa) was noticed on the solder joint when the Sn-58Bi material was applied. This study is expected to provide the understanding of the thermo-mechanical aspects of various solder materials during the temperature cycling test.