

Abstract

The combinations of one kind lead free solder($\text{Sn/Ag3.8-4.0/Cu0.5-0.7}$) and two kinds of surface finishing (OSP and ENIG) were investigated. By suitable design of PCB board, the analyze of single joint reliability during the four point cycle bending could be monitored and recorded in real time. The pads used for four point cyclic bending test are 400um in diameter. However, the pads used in thermal cycle aging test are 350um in diameter. The pad size is very small. The effect of IMC (intermetallic compound)growth and the situation of high temperature testing environment are taken into consideration in this investigation.

The cycle date of four point cyclic bending was analyzed by using two-parameter Weibull distribution. The result of shear test and four point cyclic bending test showed that the OSP pad is batter than ENIG pad in all test situation. However, the OSP pad had thicker IMC layer. The IMC growth layer will become a weaker layer and cause the damage area flatter and brittle.

The pull residual strength will be stable after two hundred cycles of thermal cycle aging. The fracture mode changed from smooth to coarsing during the thermal aging. However, the resistance of two kinds of pads did not have significant change.

摘要

兩種晶片尺寸等級(CSP)大小的無鉛焊墊(ENIG 與 OSP)與常見的無鉛焊料(Sn/Ag3.8-4.0/Cu0.5-0.7)的結合可靠度被探討。透過對 PCB 版的設計，來達到對焊點做四點循環彎矩(four point cyclic bending)與熱循環(thermal cycle)等測試。有鑒於四點循環彎矩的文獻記載並不多，因此先做剪力推球強度與 IMC(intermetallic compound)生成分析，作為一個基本的參照。四點循環彎矩實驗的過程中同時考量了含有 IMC 生成的試片，以及在高溫環境中做測試等因素。實驗的數據以雙參數韋伯分布做分析(two-parameter Weibull distribution)，配合斷面分析與破壞面的成分分析，進而了解在不同測試條件下主導破壞的因素。熱循環測試用中，在一定的週次數後，以正向拉開，量測其殘餘強度，並紀錄其電阻值的變化情形，最後觀察其破壞模式的變化。以本實驗的結果來看 OSP 表面處理是具有比較好的可靠度。

