Accelerating Reliability Assessment with Multi-Oven Racks and Sensor Chips for Wire Bonds

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Abstract

A multi-rack multi-oven system has been developed for the non-destructive reliability testing of hundreds of wire bonds. The system relies on 10 mini-ovens in each rack, allowing for simultaneous multiple temperature testing, and it relies on sensor chips that provide precise non-destructive data for bond quality of Au, Cu, or Ag wire bonds, recorded every few seconds. The system includes analytical equipment and software to automatically switch between hundreds of microsensors placed next to wire bonds, and record data for weeks and months. The system can also measure contact resistance of bonds.

Example results are presented involving varying aging temperatures, ball bond geometries, and bonding wire materials. Findings from the sensor chip signals include for example the slowing of Au bond aging at 200 C when the bonded ball height is increased. For this, sets of ball bonds were made with deformed ball diameter of 56 micron and bonded ball heights varying between 12 and 16 microns with critical aging times found to be 200 h and 232 h, respectively, their difference being statistically significant. This means the higher bond height resulted in a ~15 % longer life.