

Process and Reliability Investigation of Sn-Bi Assembly for BGA Components

Chongyang Cai, Jiefeng Xu, Huayan Wang, Seungbae Park

Department of Mechanical Engineering

State University of New York at Binghamton

Lead-free solder alloys are widely used in microelectronic fields nowadays due to the environmental problems and toxicity of SnPb solder alloys. With the miniaturization of electronic packages, the industry is putting higher demands on the reliability of solder joints. The eutectic SnBi solder alloy, with low melting temperature, is a possible alternate for Pb-free solder alloy. Low temperature soldering can not only save the energy for heating, but also can increase the reliability of joints by minimizing warpage during processing. Besides, it brings benefits for packages involving organic materials and can be used for heat sensitive devices. In this study, board level reliability of assembly for BGA components were investigated. Three types of assembly are compared: pure SnBi assembly, SnBi/SAC305 hybrid assembly and pure SAC305 assembly. 42Sn-58Bi and SAC305 balls are placed on BGA components with different size of pitch and ball diameter. All components are daisy chained to form circuit paths when assembled to PCB boards so that the resistance can be inspected. To study the reliability of solder connections, the thermal cycling test results of each kind of assembly are compared. The fatigue life and behavior of low melt joints comparing conventional SAC305 solder joints are discussed. This study provides guidance for low melt solder ball assembly processing and shows the influence of solder alloy on reliability of BGA joints.