

## Project Summary:

### Review and Assessment of Accelerated Testing of Flip Chip BGA

DfR Solutions was asked to analyze the results of accelerated temperature cycling of a flip chip BGA. The temperature cycling revealed failure at the solder bump interconnects, attaching the flip chip to the BGA substrate. The solder bump also exhibited microstructure coarsening, die metallization, and cracking of the underfill, solder mask, and substrate. Further analysis of the test results showed that time to failure and damage evolution were normal for the given design, test conditions and materials. DfR Solutions recommended correlating the testing time to failure and field environment time to failure to derive an acceleration factor. If this correlation shows insufficient lifetime, switching to a high modulus underfill with a lower coefficient of thermal expansion may extend the product lifetime.

Keywords: FCBGA, flip chip ball grid array device, temperature cycling, solder bump microstructure, acceleration model, test environment, part design, part materials, cross-sectioning, phase coarsening, disintegration, interconnection, cycles, single chamber oven, SiGe, underfill, glass transition,  $T_g$ , coefficient of thermal expansion, CTE, flexural modulus, laminate, prepreg, high lead core, eutectic cap, optical micrograph, substrate attachment, elemental map, continuity / functional failure, test vehicle model, ramps, dwells, life modeling, creep strain, intergranularly, brittle