

## Abstract for

IPC/JEDEC International Conference on Reliability, Rework and Repair in  
RTP March 11-12,

### Accelerated Reliability Testing of Ni-Modified SnCu and SAC305

Joelle Arnold\* and Keith Sweatman\*\*

\* DfR Solutions, College Park, Maryland, USA

\*\* Nihon Superior Co., Ltd., Osaka, Japan

While the credentials of the Ni-modified Sn-0.7Cu (with a addition of Ge) as a reliable and user-friendly lead-free solder have been established in large scale commercial application in wave soldering since 1999 a shortage of formal reliability data on joints made with this alloy has limited its more widespread adoption. As a first step in addressing that deficiency a test program was devised that would generate quickly and cost-effectively data that would define the basic reliability of the alloy in reflowed surface mount application. Because of the extensive reliability data available for the SAC305 this lead-free solder was also included in the test program for comparison and a limited number of tests were also carried out with Sn-37Pb solder for benchmarking purposes. The components used in the test program were a large (2512) chip resistor, a Thin Small Outline Package and a 98 bump CSP with the solder spheres of the same alloy as that was used to reflow solder the component to the substrate. The printed circuit board on which the components were mounted was a 4 layer 0.062" with FR-408 with a  $T_g$  of 180°C and a CTE of ~13ppm. The solderability of the one ounce copper was protected with OSP. The components were daisy chained for event monitoring during testing and the assemblies were subject to:

- Vibration testing with loads up to 30G,
- Drop testing to JEDEC JESD22-B111 with joints aged at up to 150°C for up to 1000 hours
- 25-125°C thermal cycling with 5 minute dwells at 25°C and 10 minute and 30 minute dwells at 125°C
- 25-100°C thermal cycling with 5 minute dwells at 25°C and 10 minute dwells at 100°C
- -45-125°C thermal cycling with 5 minute dwells at -45°C and 10 minute dwells at 125°C

In this paper the results of testing will be reported in detail and interpreted in terms of standard reliability models. A general conclusion is that the results are consistent with the Clech analysis that relates the relative performance of Sn-Cu based alloys and SAC alloys on the basis of accumulated strain. The results provide those considering using the Ni-modified Sn-0.7Cu alloy some assurance that this lead-free solder can deliver reliable service in a wide range of situations.