AREA Consortium

December 2012 Newsletter

Dear Members;

The staff within the AREA Consortium at Universal Instruments Corp. would like to wish you a Merry Christmas, Happy Holidays, and Happy New Year! It has been a busy year here and we expect 2013 to be no different. Many of the projects defined in the 2013 Plan are being formalized with Research Proposals authored by our staff. Those completed this month will be posted on the 2013 web site in January. We have been successful in attracting new members to our Consortium in 2012 and we look forward to introducing our new members in February (13th and 14th).

Thank you for your continued support.
Martin Anselm, Manager AREA Consortium

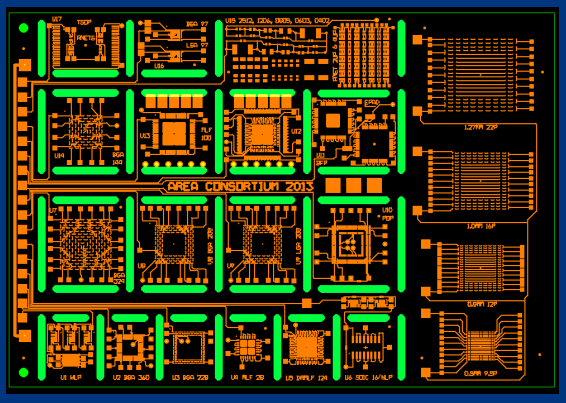
Website Updates

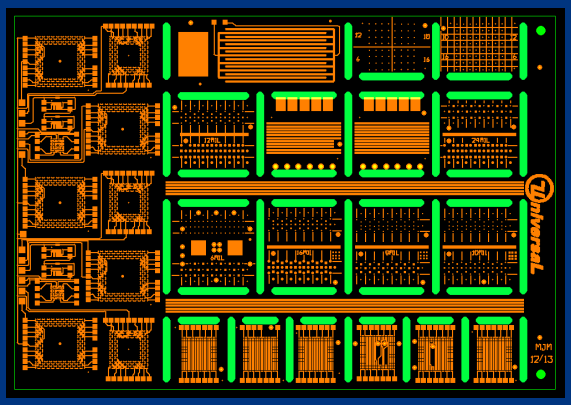
Look for new Reports!!
http://smtweb.uic.com/consortium/2012_AREA_Consortium/Reports/2012%20Reports.htm

Test Board Updates

TB2013:

Our first test board for early 2013 arrival has been ordered! TB2013 is an eight layer panel with a specified thickness of 2.5mm. The board has been designed for thermal cycle evaluations of multiple device types including PoP, TSOP, WLCSP, BGA, SOIC, QFN and SMR. We plan on obtaining samples with ENIG, ENEPIG, Lead-Free HASL, direct palladium (Pallaguard) and Enthone OM for surface finish and solder alloys studies plus many boards will be used in conformal coating and underfill projects. A preliminary report discussing the board design has been *posted to our website*.





Spherical Bend/Pad Cratering:

We have just received our Pad Cratering Test Board designed specifically for the spherical bend test method. This board is a 370HR laminate with copper OSP surface finish. The board has been designed to test for both the onset and completion of pad cratering in order to 'bound' the phenomena in drop, vibration, bend and thermal cycle experiments. This project is unique because we plan on prestressing the test specimens to 50 and 75% of the inflection strain prior to reliability testing in an attempt to determine the degradation in product life due to induced partial PCB pad cratering. Expect preliminary results of this experiment at the **February** meeting.

PCB Microvia-in-Pad

Our analysis comparing filled and unfilled microvia-in-pad designs on our Fine Pitch Test Board 2012 has been completed. Drop testing was recently finished with some boards requiring over 1000 drops for sufficient data acquisition and thermal cycling was terminated following 3000 cycles of -40 to 125ºC. The results indicate that the via-in-pad design can impact reliability, but the results depend upon the test condition, dominant failure mode, and package type. A report will be issued in early January.

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TIM

After several modifications, the TIM compression fixture is ready for testing. Room temperature testing of several TIM gap pads as a function of initial bond line thickness will begin in early January and presented in **February**.

HMP

Our study on the effect of Sn impurity concentration on the melting behavior of 92.5Pb-5Sn-2.5Ag is complete. We will now turn our attention to the effect of Sn concentration on the microstructure of 92.5Pb-5Sn-2.5Ag. Liquid shock testing and die shear testing for the Pb-free die-attach materials is complete. The results will be reported at the **February** meeting.

Pad Cratering

Some minor issues were ironed out from the Dage software that allows fatigue tests (both shear and hot bump pull) to be conducted with the DAGE4000+, making it easier to collect data. Fatigue studies on various laminates in order to construct S/N curves are continued and will be presented in **February**.

Mild Cycling

Our collaboration with HDPUG group has been progressing. The main focus of research is to understand the failure mechanism in thermal cycling of various kinds of packages. The unique ATC test profile (20-80C) performed by Alcatel-Lucent has given us the chance to extend our knowledge of failure in mild thermal cycling condition and compare it to common standard thermal cycling profiles (such as 0-100 ºC). In addition, the effect of pre-aging on the thermal cycling performance of these packages is being investigated. The results will be summarized in **February** consortium meeting. The knowledge is going to help us better design our experiment on aging proposal for next year. It is planned to perform aging on substrates, components and assembly separately before the thermal cycling test in order to investigate the effect of each on the reliability of package as the current knowledge in the industry is discrepant/absent. Both low and high silver alloys with various ball sizes will be investigated.

Creep Corrosion

Preliminary tests with several ENEPIG substrates in the humid sulphur container continued, this time with various amounts of chloride contamination added. More systematic studies will be conducted when the TB2013 board becomes available. Updates to be presented in **February**.

Lead-Free Alloys

We have been continuing our research to understand the properties of new solder alloys. The mechanical properties of solder bumps have been evaluated using the Dage bond tester. Both low and high speed shear tests have been performed on reflowed and aged solder joints. Results clearly show that the mechanical performance and its degradation are significantly influenced by the dopants. As there are some uncertainties regarding the effect of dopants on the composition and morphology of IMCs at the interface, more work is going to be performed on that subject. The result will help members to choose a better solder alloy for hand-held devices subject to mechanical shock and drop where the main failure is reported to happen in/adjacent to IMCs.

It is planned to perform ATC reliability testing using the new solder alloys on the new UIC TB2013 test board (images of board on previous page). In addition to new alloys, SAC 305 and SnPb alloys will be tested as control samples. It is planned to perform the ATC testing on various size of solder balls (10, 16, 20 and 30 mil) on different board finishes. Our members from Nihon Superior and Indium Co. have been contacted regarding the details of the experiment and asked to provide suggestion/comments. Any further inputs from other members would be very welcomed.