Evaluating the Effect of Conformal Coat Selection on Pb-Free Whisker Mitigation and RF Performance Using “High Reliability” Solder Pastes

A
UNIVERSAL INSTRUMENTS CORPORATION
AREA CONSORTIUM 2025 PROJECT PROPOSAL

Problem:
Conformal coatings are often used to protect electronic assemblies from potentially damaging environmental conditions such as debris and moisture. The use of conformal coatings may also inhibit or prevent tin whisker growth thereby reducing or eliminating occurrences of electrical short formation. Unfortunately, some conformal coatings may introduce unwanted electrical phenomena such as induced capacitance or high frequency signal interference.

On the topic of whiskers, it is further noted that the likelihood of whisker formation may vary with solder alloy selection and the recent push to introduce “high reliability” solders into product requires that said solders be evaluated for whisker growth.

Project:
Given that conformal coatings are both a source of, and solution to electronic assembly issues, an AREA Consortium project has been proposed to examine tin whiskering as a function of solder paste selection with and without conformal coating while also evaluating the effects of the coatings on RF performance. To do so, the AREA Consortium and several participating entities plan to perform said experiment using two test vehicles: one designed for whisker evaluation and one designed for RF evaluation.

The whisker test vehicle populations will be assembled using up to seven solder pastes including SAC305 and Sn37Pb control groups while the RF test vehicle populations will be assembled with fewer solders as the solder alloy is not crucial to the RF evaluation. The samples will be cleaned as required and then one of four coatings will be applied to each population with non-coated control groups included.

The proposed solders are:

Indium Durafuse HR
Indium Durafuse LT
AIM Rel61
AIM Rel22
Heraeus Innolot
SAC305 (supplier TBD)
Sn37Pb (supplier TBD)

The proposed conformal coatings are:

CytoCure D4
Signal Seal
Urethane class
Parylene C
No coating (Baseline)

Execution:
The project will be managed by the AREA Consortium with assistance from RTX. Materials, assembly, test and analysis will be provided by the various participating members as required and noted tentatively below.

Participant / Service Provided (TENTATIVE):
AREA Consortium / Test Board Design / Material Acquisition / Project Management
RTX / Design of Experiment (material selection)
Indium Corporation / Solder paste(s)
AIM Solder / Solder paste(s)
HERAEUS / Solder paste(s)
SCS Coatings / Conformal Coating
Cytonix / Conformal Coating
Calce / Test services & analysis
Element / Test services & analysis
Fineline / Circuit board fabrication
Zestron / Cleaning services
Axiom Electronics / Assembly Services