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Specification for Immersion Tin Plating for Printed Circuit Boards

Developed by the Plating Processes Subcommittee (4-14) of the Fabrication Processes Committee (4-10) of IPC

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Users of this publication are encouraged to participate in the development of future revisions.

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1 SCOPE

This specification sets the requirements for the use of Immersion Tin (ISn) as a surface finish for printed circuit boards. It is intended for use by supplier, manufacturer, contract manufacturer (CM) and original equipment manufacturer (OEM).

1.1 Description ISn is a metallic finish deposited by a chemical displacement reaction that is applied directly over the basis metal of the PCB, that is, copper. ISn is primarily used as a solderable surface. It has been used in press fit connections and as the interface for Zero Insertion Force (ZIF) edge connectors.

The ISn protects the underlying copper from oxidation over its intended shelf life. Copper and tin however have a strong affinity for one another. The diffusion of one species into the other will occur inevitably, directly impacting the shelf life of the deposit and the performance of the finish.

Various ISn formulations designed specifically for use as surface finishes for PCBs utilize various methods of retarding the diffusion process, including the use of co-deposition of organics, the use of another metal as a diffusion barrier or the use of grain structure refining. It is recommended that the user of the deposit clearly understand the different methods of copper migration retardation and that the supplier know the positive and negative impacts of the system chosen.

1.2 Objective This specification sets the requirements specific to ISn as a surface finish. As other finishes require specifications, they will be addressed by the IPC Plating Processes Subcommittee as part of the IPC-4550 specification family. As this and other applicable specifications are under continuous review, the Subcommittee will add appropriate amendments and make necessary revisions to these documents.

1.3 Performance Functions

1.3.1 Solderability The primary function of ISn is to provide a solderable surface finish, suitable for all surface mount and through-hole assembly applications and with an appropriate shelf life. The deposit has demonstrated the ability to meet a Category 3 durability per J-STD-003 when produced per this specification's requirement.

Due to the diffusion of the copper through the tin deposit and its impact on solderability, the ability to meet the greater than six months shelf life is DIRECTLY related to the deposit thickness. This diffusion also has a negative impact on the correct thickness measurement of the deposit.

The ability to measure and differentiate the tin species in the deposit is imperative to ensure the manufacture and receipt of parts with this useable shelf life. The use of correct XRF standards is imperative. The use of foils over polyester (Mylar® is very common) prevents the impact of basis metal diffusion and should be the XRF ''standards of choice'' - see Appendix 4 for detailed recommendations.

1.3.2 Contact Surface Immersion tin is not recommended as a finish for soft membrane switch applications.

1.3.3 Electromagnetic Interference (EMI) Shielding A key characteristic for this application is a consistent metal interface between the PCB and the shield material. Due to the dynamic nature of the ISn deposit and the basis metal (Cu) of the PCB, the interface between the EMI shield and the deposit is NOT consistent. The growth of intermetallic compounds (IMCs) will change the electrical characteristics of the interface between the EMI shield and the deposit. It has however been demonstrated to be a suitable interface for EMI shielding for certain specific applications. Testing for suitability is recommended.

1.3.4 Connectors

1.3.4.1 Press-Fit The use of ISn as a deposit suitable for press-fit requirements **shall** meet Telcordia GR-1217-CORE. It should be noted that changing to a thin immersion deposit such as ISn from HASL may require a re-evaluation of the pre-fabrication hole sizes to ensure the correct interference fit required for press-fit applications.

The possibility of tin whisker formation, as a direct consequence of stresses induced on the deposit as a function of press-fit insertion, exists. The end user **shall** determine the impact of whisker formation on the reliability of the module in its end use application.

1.3.4.2 Edge Tab The use of ISn as a surface finish for edge connectors utilizing a zero insertion force (ZIF) connector, i.e., for memory modules, has been successfully demonstrated.

Whisker formation is a concern particularly in fine pitch devices. The end user **shall** determine the impact of whisker formation on the reliability of the module in its end use application.