ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES®

IPC-4554

Specification for Immersion Tin Plating for Printed Circuit Boards

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

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

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Table of Contents

1 Scope ... 1
1.1 Description ... 1
1.2 Objective ... 1
1.3 Performance Functions ... 1
1.3.1 Solderability ... 1
1.3.2 Contact Surface ... 1
1.3.3 Electromagnetic Interference (EMI) Shielding ... 1
1.3.4 Connectors ... 1
1.3.4.1 Press-Fit ... 1
1.3.4.2 Edge Tab ... 1
1.3.5 Wire Bonding ... 2
1.4 Definition of Terms ... 2

2 APPLICABLE DOCUMENTS ... 2
2.1 IPC ... 2
2.2 Telcordia™ ... 2

3 REQUIREMENTS ... 2
3.1 Visual ... 2
3.2 Finish Thickness ... 2
3.2.1 Immersion Tin Thickness ... 3
3.3 Porosity ... 3
3.4 Adhesion ... 4
3.5 Solderability ... 4
3.5.1 Solder Spread Test ... 4
3.6 Cleanliness ... 4
3.6.1 Electrolytic Corrosion ... 4
3.7 Chemical Resistance ... 4
3.8 High Frequency Signal Loss ... 5
3.9 Whisker Issues ... 5

4 QUALITY ASSURANCE PROVISIONS ... 7
4.1 Qualification ... 7
4.1.1 Sample Test Coupons ... 7
4.2 Quality Conformance Testing ... 7

APPENDIX 1 Chemical Process Definitions ... 8

APPENDIX 2 Typical Process Sequence ... 9

APPENDIX 3 Qualification of ISn Process by the Board Supplier ... 10

APPENDIX 4 XRF Measurement Techniques ... 11

APPENDIX 5 Auger/XPS and Coulometric Stripping Techniques ... 14

APPENDIX 6 Tin Whiskers ... 19

APPENDIX 7 Solder Spread Test Protocol ... 20

APPENDIX 8 Standard Development Efforts for IPC-4554, Specification for Immersion Tin Plating for Printed Circuit Boards ... 21

Figures

Figure 3-1 Example of Uniform Plating ... 2
Figure 3-2 Example of Uniform Plating ... 3
Figure 3-3 Example of Improper ISn Deposit Showing Inconsistent Plating ... 3
Figure 3-4 Coupon for Surface Mount Solderability Testing ... 4
Figure 3-5 Rating of 1 As Measured at 100 X ... 6
Figure 3-6 Rating of 4 As Measured at 100X ... 6
Figure 3-7 Rating of 7 As Measured at 100X ... 6
Figure 3-8 Rating of 5 As Measured at 100X ... 6
Figure A5-1 Auger vs. X-ray Emission Process ... 14
Figure A5-2 Coulometric Stripping Analysis Using Test Coupon (A) ... 14
Figure A5-3 Coulometric Stripping Analysis Using a Tube with a Gasket (B) ... 15
Figure A5-4 Coulometric Stripping of Tin on Copper in Diluted Sulfuric Acid (Area = 5 cm^2; Stripping Current = 25.30 mA; Stainless Steel Cathode) ... 15
Figure A5-5 Coupons after Coulometric Stripping ... 16
Figure A5-6 SNMS Measurement for an Untreated Deposit (initial thickness approximately 0.8 µm) ... 17
Figure A5-7 SNMS Measurement of a Deposit; Storage of Four Hours at 155 °C and 2X Reflow Oven (initial thickness approximately 0.8°µm) ... 17
Figure A5-8 Comparison of Coulometric Measurements (MacDermid p-test) with Chemical Analysis (AAS) ... 18
Figure A6-4 Whisker in an Immersion Tin Plated 0.46 micron (0.018 in) Diameter Via Hole ... 19
Figure A8-1 Industry Survey for ISn Deposit Recommendations ... 22
Figure A8-2 Sample of XRF Measurements for the Five Suppliers to the Round Robin Testing ... 23
Figure A8-3 Impact of Age on 0.6 Micron Average Thickness Deposit Through 265 Days ... 23
Figure A8-4 Comparison of Impact of Aging On a 1.0 Micron Average Deposit Through 239 Days ... 24
Figure A8-5 Wetting Balance Coupon ... 24
Figure A8-6 Solder Spread Test Vehicle ... 25

Figure A8-7 Wetting Balance Results for Vendor A Through 400 Days of Normal Storage 25
Figure A8-8 Wetting Balance Data for Vendor B Through 182 Days of Normal Storage 26
Figure A8-9 Wetting Balance Data for Vendor C Through 149 Days of Normal Storage 26
Figure A8-10 Wetting Balance Data for Vendor D Through 229 Days in Storage 27
Figure A8-11 Wetting Balance Data for Vendor E Through 239 Days of Normal Storage 27
Figure A8-12 Impact of Test Temperature on Wetting Times for Vendor A Through 229 Days of Normal Storage - Test Temperature of 215 °C 28
Figure A8-13 Impact of Test Temperature on Wetting Times for Vendor B Through 182 Days of Normal Storage - Test Temperature of 215 °C 29
Figure A8-14 Vendor B Post 1260 Days of Storage 30
Figure A8-15 Vendor E Post 1260 Days 31
Figure A8-16 Vendor C Post 1260 Days 31
Figure A8-17 Surface Morphology of Vendor B Post 1260 Days 32
Figure A8-18 Surface Morphology of Vendor C - Post 1260 Days 32
Figure A8-19 Surface Morphology of Vendor E - Post 1260 Days 32
Figure A8-20 Surface Scan Showing Cu, C, Sn and O for Vendor B 33
Figure A8-21 Chemical Map of Surface for Vendor B 34
Figure A8-22 Surface Map for Vendor C - Note a Greater Presence of Copper on the Surface 35
Figure A8-23 Vendor C at 20 Å - Note Large Carbon Rich Areas 36
Figure A8-24 Vendor E Surface Scan 37
Figure A8-25 Vendor E at 1000 Å 38
Figure A8-26 Comparison of Vendor C (top) to Vendor E (bottom) at 100 Å - Significant Difference in the Deposits 39
Figure A8-27 Contact Wetting Angles for the Four Suppliers Tested with SnPb in a Normal (Air) Atmosphere - All Four Showed Excellent Wetting 40
Figure A8-28 Contact Wetting Angles for the Four Suppliers Tested with SnPb in an Nitrogen Atmosphere - Again, All Four Showed Excellent Wetting 40
Figure A8-29 Contact Wetting Angles for the Four Suppliers Tested with SAC305 in a Normal (Air) Atmosphere - All Four Exhibit Excellent Wetting 40
Figure A8-30 Contact Wetting Angles for the Four Suppliers Tested with SAC305 in a Nitrogen Atmosphere - Again, All Four Exhibit Excellent Wetting 41
Figure A8-31 Comparison of Contact Angles for Vendor A - All Tests 41
Figure A8-32 Average SEC Values for the Five Vendors ... 41

Tables

Table 3-1 Requirements of Immersion Tin Plating 5
Table 3-2 ISn Whisker Rating Scheme Using 100 X Magnification 6
Table 4-1 Qualification Test Coupons 7

Specification for Immersion Tin Plating for Printed Circuit Boards

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.