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# Application Note

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## Reduce the risk of tin Whiskers in lead-free RJ connectors

Please refer to the Xmultiple reference drawing for the combination of tin and nickel plating used in each product. Xmultiple has developed our plating processes based on the best solutions possible for each product.

Xmultiple has worked with JEDEC International Electronics Manufacturing Initiative to analyze reduction of tin whiskers in our RJ Connector produce lines. The JEDEC standard JESD201 and JEDEC/IPC joint publication JP002 were formed to help manufacturers reduce the risk of tin whiskers in lead-free products

These documents are part of the industry groups' three-fold strategy that includes mitigation practices, process controls and verification testing to reduce the risk of tin whiskers in lead-free assemblies to be in compliance with the European Union's Restriction of Hazardous Substances (RoHS) directive.

The JEDEC standard JESD201, "Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes," was developed by the JEDEC JC-14.3 Subcommittee on Silicon Device Reliability Qualification and Monitoring and the iNEMI Tin Whisker User Group. This standard provides a uniform environmental acceptance testing and reporting methodology for tin whisker susceptibility of tin and tin alloy surface finishes used in the electronics industry, and is to be used in conjunction with JESD22-A121, "Test Method for Measuring Whisker Growth on Tin and Tin Alloy Surface Finishes" (published May 2005).

### **Suggestions for Reducing Risk of Tin Whisker Induced Failures:**

The uncertainties associated with tin whisker growth make it extremely difficult to predict if/when tin whiskers may appear. The following list provides some suggestions for reducing the risk of tin whisker induced failures. Note: In addition to our connector content the second level assembly processed used to assembly your products needs to be analyzed as well.

1. **Avoid the use of PURE TIN plated components if possible.** Utilization of procurement specifications that have clear restrictions against the use of pure tin plating is highly recommended. Most (but not all) of the commonly used military specifications currently have prohibitions against pure tin plating. Studies have shown that alloying tin with a second metal reduces the propensity for whisker growth. Alloys of tin and lead are generally considered to be acceptable where the alloy contains a minimum of 3% lead by weight. Although some experimenters have reported whisker growth from tin-lead alloys, such whiskers have also been reported to be dramatically smaller than those from pure tin plated surfaces and are believed to sufficiently small so as not to pose a significant risk for the geometries of today's microelectronics.



2. **Plating of Tin and Nickel** - The plating composition of our products is determined for each product. Please refer to our reference drawing for each connector composition.

Simple avoidance of pure tin plating is not a viable option and other factors are involved such as assembly.

**Solder Dip** the plated surfaces sufficiently using a tin-lead solder to completely reflow and alloy the tin plating. Obviously, special precautions are required to prevent thermal shock induced damage and to avoid thermal degradation.

**Conformal Coat** over the whisker prone surface appears to be beneficial but the limitations are not completely understood suggest that use of Uralane 5750 conformal can provide some benefit by reducing the growth rate, but tin whiskers can grow through conformal coating and once exposed can then short to other tin whiskers or other exposed surfaces. It has also been demonstrated experimentally that conformal coating can restrict the availability of tin sufficiently to minimize the risk of plasma formation. However, such factors as the minimum thickness of coating necessary to prevent whisker growth or plasma formation have not been determined. Similarly, it has been shown that foam can prevent sustained arcing but the effects of foam type, foam density, pore size etc. have not been evaluated. Additional studies and evaluations are underway to try to answer these questions.

**XMULTIPLE USA**

1420 Los Angeles Avenue, Suite G • Simi Valley, CA 93065 USA  
(805) 579-1100 • (800) 753-9526 • FAX: (805) 579-7800, [www.xmultiple.com](http://www.xmultiple.com),  
[www.xrjax.com](http://www.xrjax.com), [www.ultrajax.com](http://www.ultrajax.com)