Tin Whisker Mitigation

Background

Heat sinks with solderable mounting features such as tabs or pins have traditionally been plated with tin-lead to maintain solderability until assembly. Due to the RoHS limitations on lead content in electrical and electric products, we have released new versions of our products that specify 100% matte tin in place of tin-lead. Because of the potential for tin whisker formation with pure tin plating, we have selected the following specifications to mitigate whisker formation.

Approach

Based on reviews of research and testing performed by leading electronic industry corporations, Aavid has selected 100% matte tin with nickel underplating as the standard specification for lead free solderable components. The Aavid specification calls for 75 to 150 micro inches (1.8 to 3.8 microns) nickel underplating followed by 160 to 350 micro inches (4 to 8.9 microns) 100% matte tin. 100% matte tin was chosen for its compatibility with both tin-lead and lead free (tin/silver/copper) solders. Our plating specification essentially matches the recommendation in Elmgren, et al, cited below.

This mitigation plan chosen by Aavid-Thermalloy relies on industry recommendations such as those in Elmgren, which states that one of the primary mechanisms for whisker formation is stress created in the plane of high tin content platings by tin-copper intermetallic formation. Adding a nickel plating layer between the tin and copper creates a barrier to diffusion, thus minimizing intermetallic formation. See chart 1, below.

Most applications for Aavid-Thermalloy standard products involve cooling of power electronic devices which are at a low risk of shorts by tin whiskers. Power devices generally do not have finely pitched leads which are most at risk for shorting by whiskers. In addition, the heat sink's plated features are typically solderable mounting tabs or pins which, upon installation, will be located a substantial distance from any active device leads.

Summary

Aavid Thermalloy is specifying an industry tested plating specification that substantially mitigates the formation of tin whiskers. As always, Aavid recommends that our customers test for acceptability in their product.

Reference

Elmgren, et al, "Pure Tin-The Finish of Choice for Connectors", Proceedings of IPC/JEDEC Conference, Frankfort, Germany, Oct., 2003.

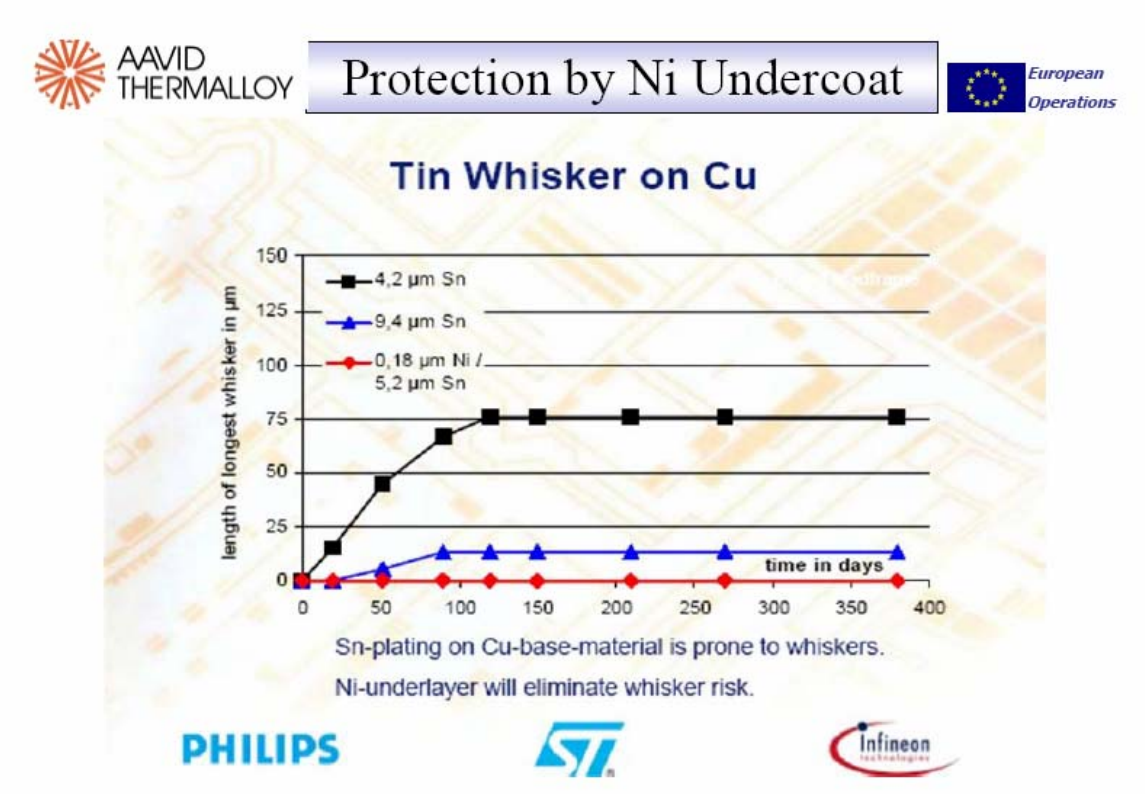

Chart 1

Source: E3 consortium, PhillipsSemiconductors, Infineon Technologies & ST Microelectronics

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