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iNEMI Task Force Addresses RoHS Transition Issues

High-reliability community wants to ensure availability of components that meet their needs

HERNDON, VA (August 25, 2005) — The International Electronics Manufacturing Initiative (iNEMI) today announced publication of recommendations for safeguarding the dependability of high-reliability products as the supply chain converts to lead-free components and materials. The consortium's High-Reliability RoHS Task Force is calling for continued availability of tin-lead (SnPb)-compatible components for exempted products, and for a standardized strategy of mitigation practices and testing methods to minimize the risk of tin whiskers.

"The iNEMI High-Reliability (Hi-Rel) Task Force consists of OEMs and EMS providers whose products are characterized by long service life and high-reliability requirements," says Jim McElroy, CEO of iNEMI. "Maintaining high product reliability is absolutely critical to these companies' survival. They are very concerned about the transition to lead-free and have banded together to provide a unified voice and message to the supply chain. We are currently surveying the components supply base to see if it makes sense to organize an industry forum that will bring together high reliability users and suppliers to further discuss these needs."

Continued Availability of Components

Certain products are exempt or out of scope under the European Union's RoHS Directive and will be allowed continued use of lead in solder for reliability purposes. These products include servers, storage and storage array systems, monitoring and control instruments, plus network infrastructure equipment for switching, signaling and transmission as well as network management for telecommunication. However, the supply chain, which is increasingly driven by high-volume, low-cost applications that do not have stringent reliability requirements, is converting (or has converted) to lead-free. Many suppliers plan to no longer offer SnPb products.

Several compatibility issues have been identified as high-reliability OEMs and EMS providers try to "mix and match" Pb-free components in exempted SnPb assembly processes.

"The RoHS Directive provides 'lead in solder' exemptions for important 'mission-critical' and high-reliability systems, ostensibly because the Commission recognized that industry does not yet have adequate field data or verified acceleration models to ensure the reliable functioning of these critical products if lead-free solders were used. Their intention was to guard against unnecessary risk in applications where failure could be anything from problematic to catastrophic," says Joe Smetana, principal engineer, advanced technology for Alcatel and chair of the iNEMI Tin Whisker User Group. "Companies that manufacture high-reliability, long-service-life systems must be assured of the availability of components that are compatible with tin-lead

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assembly, not only to provide continued quality and performance in new products but to maintain products already in use. Many telecom, server, monitoring and control instruments, or storage products, for example, often have a field life of 10 to 25 years and are high-end systems that customers will want to repair rather than replace."

Mike Davisson, distributed materials engineering manager for Agilent Technologies, points out that ball grid array (BGA) components are of particular concern. He notes that solder balls are designed to operate within a particular set of process and materials parameters.

"Lead-free BGAs are designed to be assembled with tin-silver-copper solder paste, not tin-lead solder paste. We need a continued supply of tin-lead ball BGAs. We cannot take lead-free BGAs and attach them to boards using tin-lead solder with today's typical assembly process. Industry experience has shown that doing so can produce lower assembly yields and less reliable interconnects," Davisson says.

Tin Whisker Mitigation

The other area of concern is tin whiskers. The predominant whisker mitigation strategy for more than 50 years has been the addition of Pb to the tin plating. As Pb is eliminated from electronic products, many component suppliers are proposing the use of pure tin plating as the most convenient and least costly strategy for meeting RoHS requirements. However, especially for the high-reliability user community, the pure tin strategy presents reliability risks due to the whisker-forming tendencies of pure tin and tin alloy plating.

Economic realities are driving most component suppliers to offer tin and/or high tin content (>95%) Pb-free finishes, and the availability of multiple surface finishes will not be a long-term option in most cases. The High-Rel RoHS Task Force has defined a set of requirements to ensure that their suppliers provide the least whisker-prone finishes possible. These companies (listed below) are requiring their suppliers to combine mitigation practices with testing.

"We are requiring that our suppliers employ a proven whisker mitigation strategy, such as nickel underlay or annealing," says George Galyon, senior technical staff member, IBM, and chair of the iNEMI Tin Whisker Modeling Project. "However, since mitigation techniques can vary significantly in effectiveness, we are also asking for supporting measurements — meaning testing — to provide objective evidence of mitigation efficacy."

The iNEMI Hi-Rel Task Force companies will require electronic component suppliers to implement the following recommendations for high-reliability applications:

1. Adopt one of the iNEMI-recognized whisker mitigation practices as an integral part of Sn and/or high Sn content (>95%) Pb-free plating processes, as outlined in the iNEMI Tin Whisker User Group's *Recommendations on Lead-Free Finishes for Components Used in High-Reliability Products*, Version 3 (updated May 2005). This document can be downloaded from: http://thor.inemi.org/webdownload/projects/ese/tin_whiskers/User_Group_mitigation_May05.pdf

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2. Perform testing and adhere to the qualification criteria of either the iNEMI *Tin Whisker Acceptance Test Requirements* (July 28, 2004) or the final agreement of the JEDEC JESD-201A qualification criteria (*Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes*, currently in industry review), in conjunction with the JESD22-A-121 test method (*Test Method for Measuring Whisker Growth on Tin and Tin Alloy Surface Finishes*). The iNEMI test requirements document can be downloaded from: http://thor.inemi.org/webdownload/projects/ese/tin_whiskers/Tin_Whisker_Accept_paper.pdf

   JEDEC standards are available at www.jedec.org or http://www.jedec.org/download/.

3. Continue to provide an alternative non-whiskering finish, such as SnPb or nickel-palladium-gold (NiPdAu), until the requirements of the iNEMI/JEDEC acceptance tests have been met.

The following companies from the iNEMI High-Rel RoHS Task Force support the concepts as stated above:

Agilent Technologies, Inc.
Alcatel
Andrew Corporation
Cisco Systems, Inc.
Celestica, Inc.
Delphi Electronics & Safety
Hewlett Packard Company
IBM Corporation
Intel Corporation
Jabil Circuit, Inc.
Lucent Technologies
Plexus Corp.
Sanmina-SCI Corporation
Solectron Corporation
Sun Microsystems, Inc.

The group's recommendations are available from:
http://www.inemi.org/cms/projects/ese/High_Rel_RoHS.html

About iNEMI

The International Electronics Manufacturing Initiative's mission is to assure leadership of the global electronics manufacturing supply chain. Based in Herndon, Va., the industry-led consortium is made up of approximately 70 manufacturers, suppliers, industry associations and consortia, government agencies and universities. iNEMI roadmaps the needs of the electronics industry, identifies gaps in the technology infrastructure, establishes implementation projects to eliminate these gaps (both business and technical), and stimulates standards activities to speed the introduction of new technologies. The consortium also works with government, universities and other funding agencies to set priorities for future industry needs and R&D initiatives. For additional information about iNEMI, visit www.inemi.org.

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