

# EMS Forum

## *on Lead-Free PCB Assembly*

### Guidelines for Suppliers Transitioning to RoHS Compliant Components

(Rev. 2.0)

#### Background

- This document is intended to provide guidelines to suppliers transitioning to lead-free/RoHS compliance.
- RoHS compliance includes materials compliance as well as the process and reliability requirements for lead-free soldering.

#### Logistics

- As per JESD46-B, all changes from existing parts to lead-free/RoHS compliance should be documented by a PCN issued by the manufacturer. Any component changes related to lead-free/RoHS compliance should be considered major changes.
- Any product discontinuances of existing parts should be published to the customers as per the standard JESD48-A.
- All manufacturers who provide notification that they will be producing lead-free/RoHS compliant products should provide a product roadmap to their customers indicating the planned changes and implementation timetable. Availability and life cycle information for both current and lead-free/RoHS compliant products should be specified.
- Sample devices and qualification data should be available to customers prior to the release of the PCN or introduction of the new product.

#### Compatibility & Testing

- A qualification package for lead-free components should be provided that includes the following tests:
  - 1) Handling, Packing, Shipping and Use (per IPC/JEDEC J-STD-033A)
  - 2) Solderability testing (per IPC/EIA J-STD-002, current revision)
    - a) Both no-clean and aqueous clean solder paste and wave solder flux should be included.
  - 3) Solder joint reliability testing (per IPC-A-9701)
  - 4) Mechanical shock and vibration (per AEC-Q100-Rev E/Mil-Std 883)
  - 5) High temperature storage (per AEC-Q100-Rev E/JESD22-A103-A)
  - 6) Tin whisker growth (Reference document: "Test Method for Evaluating Tin Whisker Growth on Plated Surfaces, Rev. 6.1", until applicable industry standards become available)

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- 7) MSL testing
  - a) For components which go through the reflow process
    - o In general, 260°C reflow peak temperature is an overall requirement.
    - o Component moisture sensitivity levels (MSL) should not exceed the current levels. Wherever possible, testing should include old vs. new part comparisons. MSL testing should follow IPC/JEDEC J-STD-020 (current revision), with the exception that 6 heat cycles for area array packages and 4 heat cycles for other components should be included in pre-conditioning. *(The 6 heat cycle requirement reflects the maximum heat cycle an area array package can be expected to be exposed to, including: 2 reflows, wave soldering, component removal, reballing, and re-attachment).*
    - o Pre-conditioning for connectors should include 1 reflow at 260°C peak temperature.
  - b) For components (SMD and/or through-hole) which go through the wave soldering process
    - o Solder pot temperature: 270°C
    - o Contact time: 10s
    - o Thermal shock: 130°C
    - o Ramp rate: 4°C/s
  - c) Components which may go through either reflow or wave soldering or both, should be qualified through both process conditions.
- The qualification data should include:
  - 1) Solder alloy(s) used
  - 2) Termination metallurgy and thickness
  - 3) Forward compatibility (ability to solder the components using lead-free solders and the appropriate higher temperature profiles) and backward compatibility (ability to solder the components using existing Sn-Pb solder and profiles, using process parameters as defined in IPC/JEDEC J-STD-020 current revision), with the exception of area array packages with lead-free balls which are not considered to be backward compatible. *(The incompatibilities of Bi-containing termination with Sn-Pb solder, and Bi or Pb containing termination with lead-free solder for through-hole components for wave soldering, are also of particular concern.)*
  - 4) First level interconnect compatibility
    - a) It is the supplier's responsibility to ensure that the first level interconnect (i.e. within the component package) is compatible with the second level (i.e. board level) soldering processes (as defined by IPC/JEDEC J-STD-020, current revision).

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### Part Identification

- All components should have the outer packaging boxes and inner package material (tray, tube, reel) marked with some form of traceable information indicating that the components are lead-free/RoHS compliant. This marking should also appear on the component package where there is room for such a marking.
- All lead-free/RoHS compliant components should have new supplier P/N's assigned. Suffix or prefix additions to existing P/N structures are acceptable.
- Device datasheets should clearly indicate the termination solder composition, maximum component temperature rating, recommended & absolute reflow profile limits, and the moisture sensitivity rating. If this information is not present on the datasheet, there should be a clear reference as to where it can be located.
- We encourage industry associations and consortia to come up with globally accepted labels or marking for easy identification of lead-free/RoHS compliant products. At this time, we endorse JEDEC JESD97 "Marking, Symbols, and Labels for Identification of Lead (Pb) Free Assemblies, Components, and Devices" (May 2004).

### Compliance

- A master "Certificate of RoHS Compliance" should be generated and submitted, prior to any RoHS compliant component shipment, to document verification methodology and results.
- A "Certificate of RoHS Compliance" with lot-specific data should be submitted with every lot of shipment of RoHS compliant components.
- The certification should follow the guidelines of the "Material Composition Declaration Guide" by EIA, EICTA and JGPSSI, when finalized and released. "Level A" materials and substances (Annex A) are required for this certification; Others are optional.

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