IPC Lead-Free Labeling Standard

- Blue Ribbon Committee
- Chairs: Jasbir Bath, Solectron
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Lead-Free Bandwagon

- European ROHS (Restriction of Hazardous Substances)
  - Effective July 1st 2006
  - Ban on manufacture, import, or sale of lead soldered assemblies
  - Additional restrictions on cadmium, mercury, hexavalent chromium and 2 brominated flame retardants(PBB, PBDE)
- In Japan, OEMs are in lead-free production now
- In Europe/ North American companies are starting to prototype and manufacture lead-free assemblies

Why a Labeling Standard

- Various lead-free labeling on boards, components being used now
  (LF1, LF, *, G, Z…)
- Need a global lead-free labeling standard
  - To differentiate between lead-free and tin-lead
  - Component/board identification
  - Component/board assembly
  - Rework/ repair operations

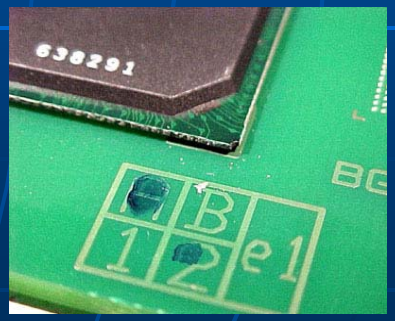
Draft JEDEC Standard

- **Lead-free component / board markings and solders used in assembly**
- **Out for ballot**

e1 – SnAgCu
e2 – Other Sn alloys -no Bi or Zn (i.e. SnCu, SnAg, SnAgCuX, etc.)
e3 – Sn
e4 – Pre-plated (i.e. Ag, Au, NiPd, NiPdAu)
e5 – SnZn, SnZnX (no Bi)
e6 – Contains Bi
e0, e7,e8,e9 unassigned at this time

e2

e2



Courtesy: SMART Grou
(UK)

IPC lead-free Labeling Standard

- **“MARKING, SYMBOLS AND LABELS FOR IDENTIFICATION OF LEAD-FREE AND OTHER REPORTABLE MATERIALS IN LEAD (Pb) FREE ASSEMBLIES, COMPONENTS AND DEVICES”**
  - Incorporates JEDEC lead-free labeling document
  - Additions for …

Purpose

- Provide a distinctive symbol and labels to identify assemblies, components or devices that are
  - Totally Pb-free, and/or
  - Capable of providing Pb-free 2nd level interconnects.
- Indicating certain types of Pb-free materials
- Maximum safe component temperature during assembly
- Labeling of the bare board
  - optional markings
  - Halide-free base resin
  - Conformal coating used after assembly

Definitions

Pb-free (lead-free):

Electrical and electronic assemblies and components in which the Lead (Pb) level in any of the raw materials and the end product is <= 0.1% by weight and also meets any Pb Free requirements/definitions adopted under the RoHS Directive 2002/95/EC.

Definitions

Pb-free category:

A category assigned to Pb-Free components and assemblies indicating the general family of material used for the 2nd level interconnect including solder paste, lead/terminal finish, terminal material/alloy if not plated or coated.

5.1 SOLDER FINISH CATEGORIES

- Same as JEDEC Categories
  - e1 – SnAgCu
  - e2 – Other Sn alloys - No Bi or Zn (i.e. SnCu, SnAg, SnAgCuX, etc.)
  - e3 –Sn
  - e4 – Pre-plated (i.e. Ag, Au, NiPd, NiPdAu)
  - e5 – SnZn, SnZnx (no Bi)
  - e6- contains Bi
- e0, e7, e8, e9 symbols are unassigned categories at this time.
- Tin-lead boards and components have no assigned label.

5.2 Halogen Free Label

- **RoHS prohibited brominated substances (PBB, PBDE) are not generally found in printed circuit board materials**
- **The halide-free board marking is an aid for recycling end-of-life electronic products**
- **Halogen-free definition: Resins that contain less than 900 ppm bromine, and less than 900 ppm chlorine, and less than 1500 ppm total halogens.**
- **Optional “HF” label/marking on the bare board identification label shall denoted halogen free base resin and solder mask**
- **If no “HF” is present, a halogen containing base resin and/or solder mask is assumed**

5.3 Conformal Coatings

- If assembly marking space permits, or if
- Contractually required by purchasing agreement

ER – Epoxy Resin
UR – Urethane Resin
AR – Acrylic Resin
SR – Silicone Resin
XY - Parylene

6.0 COMPONENT MARKING

- If space permits the individual device/component shall be marked with the category designation shown in 5.1 (e1 to e6) enclosed within a circle/ellipse
- The size and location of the mark shall be optional
  - Must be legible to normal vision

7.0 BOARD/ASSEMBLY MARKING

- Boards/assemblies will be identified as being assembled with Pb-Free solders using the category as defined in 5.1 (e1 to e6)
- The preferred location for marking of the categories is on PCB layer 1 (topside) at the lower right hand segment.

7.0 BOARD/ASSEMBLY MARKING (cont.)

- The sequence of marking shall follow the production process:

  i.e. halogen free (if applicable), solder alloy used for assembly, conformal coating (if applicable)

Example: HF e1 XY

This board marking indicates Halide-free resin board assembled with SnAgCu solder followed by Parylene conformal coating

7.0 BOARD/ASSEMBLY MARKING (cont.)

- **Category hierarchy:** If two or more solder alloys are used in assembly (i.e. Reflow and wave solder use different ‘e’ category solder alloys) the category of the reflow(s) will be shown first and the wave solder category will follow.

Example: HF e1 e2 XY

This board marking indicates Halide-free resin board surface mount assembled with SnAgCu

with wave assembly using SnAg/SnCu/SnAgCuX solder

followed by Parylene conformal coating