iNEMI®
International Electronics Manufacturing Initiative

2009 Technology Plan Board Assembly TIG

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for :

Technical Committee
Research Committee
TIG Chair Meeting
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Advancing manufacturing technology

Introduction

Board Assembly Technology Integration Group (TIG)

- **Objective: Encourage the development of cost effective board assembly strategies and solutions to close roadmap gaps for key technologies**

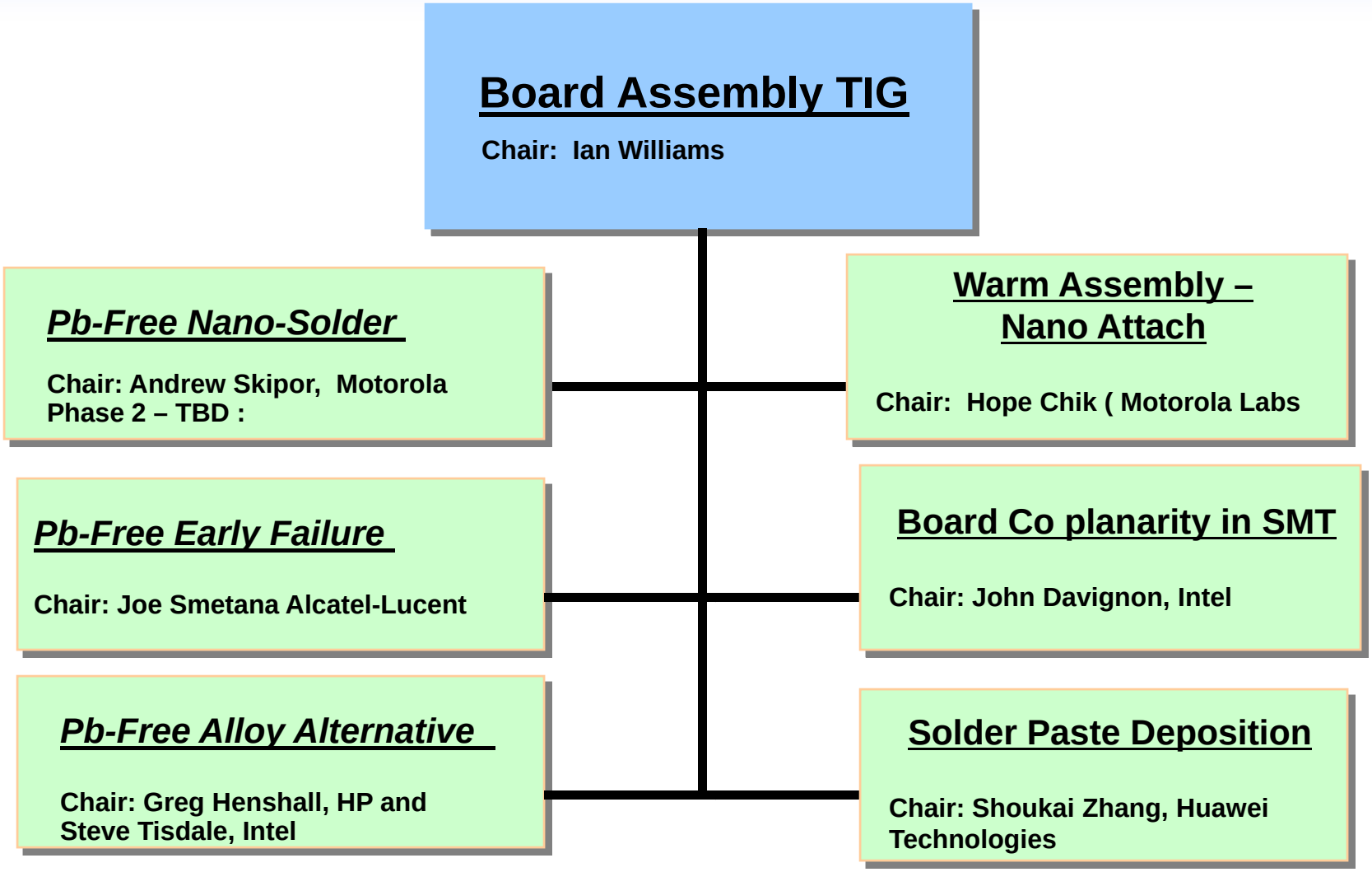
- **Scope: All processes and collaterals used in the creation of a printed wire assembly, including SMT assembly, wave solder, test in the board manufacturing, rework, and information control /factory control system processes.**

Introduction

Background:

- **Primary source for this plan is from evaluation of the iNEMI 2009 Roadmap, especially the Board Assembly chapter**
- **Consideration of other summary documents of the roadmap**
- **Spreadsheet of assembly gaps, commented on by others**
- **Boiled down to most key short term and long term gaps**
- **Consideration was given to existing projects**

Board Assembly Projects



Board Assembly 5 year plan

Drivers - Continued increase in component and substrate I/O density capability - Cost of new technology adoption
- Environmental and Regulatory Requirements - Cost of R&D efforts

2009

Attributes
Large BGA: .6mm pitch
Small BGA : .4 mm pitch
BGA Rel req – Corner glue
Components – 2.4 per sqr. inch
Line/Space – 100um/100um
PWB min plated via -.25mm
Passive size - 0402
Substrate type –FR4/HF
NPI cycle time -12-16 wks
Env/reg Pb free

Deployed Technology
Lead free solder processes for servers
Corner glue for larger BGA SLR
Pb-Free in SnPb assemblies
Alternative LF surface finish

Research /Development
Pb-Free BGA's in SnPb Assy
Pb-Free Nano-solder
Mixed paste volume process
Halogen Free Spec.

2011

Attributes
Large BGA: .5 mm pitch
Small BGA : .4 mm pitch
BGA Rel req – Corner underfill
Components – 2.8 per sqr. inch
Line/Space – 75um/75um
PWB min plated via -.25mm
Passive size - 0201
Substrate - FR4/HF/LCP/flex
NPI cycle time -12-16 wks
Env/reg Pb free /HF

Deployed Technology
Lead free solder processes for large office systems and telecommunications
Halogen Free
Pb-Free in SnPb assemblies
Mixed paste volume process

Research /Development
Reworkable large BGA underfill/glue process
"3-D" Assy – mats / guidelines
RoHS II /??
Embedded Comp – handling/ESD/rework

2013

Attributes
Large BGA: .5 mm pitch
Small BGA : .3 mm pitch
BGA Rel req – full underfill
Components – 2.8 per sqr. inch
Line/Space – 75um/75um
PWB min plated via -.25mm
Passive size - 01005
Substrate - –FR4/HF/LCP/flex
NPI cycle time -10-12 wks
Env/reg Pb free /HF

Deployed Technology
Lead free solder processes for large office systems and communication products
Full underfill – large BGA /reworkable
RoHS II / ??

Research /Development
Pb-Free Nano Solder - usable
Wafer/Die level assembly
SiP Assembly – high speed HVM assembly

2015

Attributes
Large BGA: .5 mm pitch
Small BGA : .2 mm pitch
BGA Rel req – full underfill
Components – 3.0 per sqr. inch
Line/Space – 75um/75um
PWB min plated via -.25mm
Passive size - 01005
Substrate - FR4/HF/LCP/flex
NPI cycle time -8-10 wks
Env/reg Pb free /HF

Deployed Technology
SiP assembly in HVM board assembly
Wafer/Die level assembly

Research /Development

Board Assembly Gap Analysis

Materials

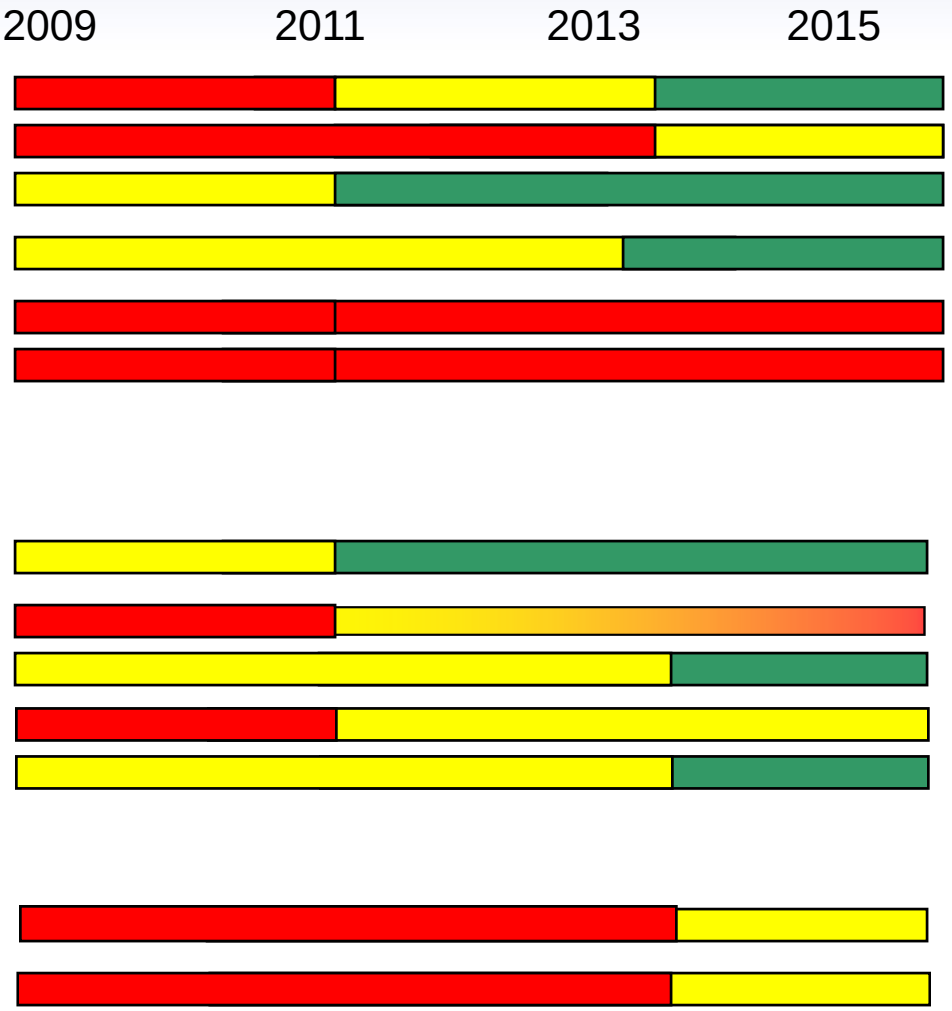
- Solder Paste materials (LF/ HF/ mixed etc) ----
- Low cost fine line/via PCB technology----------
- 01005 passives ----------
- Joint alloy (cost, performance, low temp) ------
- PB-Free Nano solders – usable quantities ----
- New materials – (Support increase frequency and smaller size)

Equipment & Assembly Processes

- SMT solder application for mixed tech ----------
- Inspection/test for higher density ----------
- SMT Rework (LF/density/adhesives) ----------
- "3-D" assembly (mats/equip/guidelines)---------
- LF wave solder assembly and rework ----------

Business Processes

- DFM control and comprehension ----------
- R&D adoption at EMS and low cost geos -------



Green = No Gap Issues or Resolved

Yellow = Known Gap Mitigation Techniques

Red = No Known Solution – Development Required

What has changed ?

- **Going Green -**
  - **The Role of Non Government Organizations (NGO's) has become a very strong and confusing influence in the industry.**
  - **Power consumption in the manufacture and use has become an even stronger factor in technology decision making.**
  - **The expected extension of various RoHS exemptions will continue to drive both SnPb and PB-Free in parallel**
- **Segmentation –**
  - **SnPb gains new life against Pb-Free – impact to supply chain**
  - **Segmentation of markets, leading to specialization and therefore specialized solutions for materials and use conditions / SJR**
- **Cost –**
  - **The impact of raw material costs (silver) is driving technology compromises more so than it ever has before.**
  - **PCB technology is maxed out. Can not get higher density without higher cost. Leading to some creative solutions – "3D" in nature**
  - **R&D cost structure, even if outsourced continue to grow, leading to re-use challenges.**

TIG Plan

- **Existing projects that are correctly focused**
  - **PB-Free Early Failure**
  - **Pb-Free Alloy Alternatives**
  - **Solder Paste Deposition**
  - **Board Co planarity**

- **New focus areas – iNEMI opportunities**
  - **Solder paste capability – today's standard measures against it's ability to wet to copper, not the issue with Industry wide HaP/HiP/HoP problems**
  - **LF rework – SMT parts, their density and their adhesives**
  - **"3-D" assembly – materials, equipment and guidelines**
  - **Consolidation of the impact of environmental regulations**
  - **The battle between surface finish and corrosion.**

TIG Plan

- **New focus areas – Research (University / Non profit)**
  - **Nano tech efforts –**
    - **Taking things to the next level**
  - **DFM Efforts**
    - **Will benefit all involved**
    - **Loss of competitive advantage**

Summary

- Not everything that was hoped for in 2007 has happened
- The economic challenges at the end of this decade could slow technology progress in the short term
- The existing projects are focused on gaps that continue to exist and need to be closed
- Within this plan horizon, the cost of the PCB will be the single most prevalent technology limiting factor
- A significant portion of the technology development budget will continue to be used to keep up with environmental issues

Contributors

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- Chuck Richardson
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Back Ups