Organic Packaging Substrate Workshop

Nagoya Japan

November 17-18, 2009

New Initiatives

1. **Warpage**
    a. Identification of Qualification Criteria (Substrates, Package and Board Levels)
    b. Identification of Primary Factors of Warpage
2. **Miniaturization**
    a. **Wiring Density Program**
        1) Materials
        2) Lithography
        3) Plating
        4) Inspection and Test
3. **Holistic Approach to Packaging**
    a. Development of Holistic Modeling Process
    b. Optimization of Time to Yield (Design, Materials, Packaging)
    c. Reliability Methodology for Substrates

See the following pages for more details on above new initiatives.

1. Warpage

Champions: ML Loke, Intel; Jie Xue, Cisco

a. Qualification Criteria including Substrates, Package, and Board Levels

Problem statement:

The current standard is not adequate to predict good yield results at package and board level assembly

Measurement methods (dimensional and test) not common

Objectives:

Define the qualification method and criteria e.g. sample size, precondition, variations of material and processes (package and board level)

Establish measurement methods

Expected Outputs:

Procedure and criteria reference for OEM and suppliers

b. Identify primary factors of warpage:

Problem statement:

No clear understanding of the key contributors at package and board level assembly

Objectives:

Identify key material properties (core, core/SM thickness, substrate, design (Cu trace/via), package assembly) and key contributors (die size, thickness) which impacts package and board level assembly for different applications.

Identify key process parameters (UF, MC etc), reflow profile, package pitch, PCB, environmental factors (shipping and storage; moisture effect) which impact warpage

Establish understanding to modulate the key contributors

Expected Outputs

A set of primary parameters (materials, design and processes) and the working window to control the warpage through supply chain

Recommendation/guidelines for shipping and storage.

2. Miniaturization Champions: Claudia Beckering, Epcos; Hamid Azimi, Intel

a. Wiring Density Program

Problem statement:

Meeting the wiring density needs of the next generation of packaging technology will require improvements in all areas of organic packaging substrates technology. A piecemeal approach will not be sufficient. This program will address each technology area with individual projects.

Objectives:

The objective is to develop a system optimized next generation technology that focuses on the following prioritized technology areas to achieve maximized wiring density at minimal cost:

- **Material Set**
- **Low Cost Litho/Laser**
- **Plating**
- **Inspection and Test**

Achieve these results by 2014

Expected Outputs

New materials, processes, and products that achieve a disruptive improvement in wiring density without increased cost.

3. Holistic Approach to Packaging   Champions: Bernd Appelt, ASE; Mario Bolanos, TI

Problem statement:

Because of today's extended supply chain, system optimization does not occur in developing packaging solutions. The following three proposed initiatives address this need for holistic solutions

a. Develop Holistic Modeling Process

Problem statement:

Develop a multilevel design tool to optimize package designs for electrical, mechanical, and thermal performance

The initial scope would be limited to focus on one package type which is defined as a market need 2-4 years out in the future.

Package selected needs to be one which Application details and specs need to be provided from the OEM side. Coverage of multiple applications is desirable

Objectives:

Identify critical materials properties and proposed specifications for a specific package type.

Determine data depth/accuracy in critical materials properties required for model effectiveness.

Develop a holistic approach by involving data experts from materials, packaging, and substrate suppliers

Expected Outputs

By improving performance a single package, demonstrate that this consortial approach can achieved improved performance and competitive costs.

b. Optimizing time to yield covering design, materials, packaging

Problem statement:

There is a need to build in a methodology for low volume learning from substrate supplier, through packaging, then into system level yields. The methodology should include assessments including Cpk, FA. Etc

Objectives:

Develop an approach for cooperative design teams from substrate through system that leverages off existing BKM's and proven specifications where possible

Explore approaches for financial contracts that specify ramp quantities and time frame – Developing a commitment from both sides

Define and use standards on areas such as surface finishes

Expected Outputs

Shortened and predictable time lines for achieving high-yield volume production for new products.

c. Reliability Methodology for Substrates

Problem statement:

A number of alternative packaging technologies, each covered by different specifications and reliability requirements are currently being used in Multichip packaging such as POP. These specifications and requirements are also a function of market segment and OEM requirements. This effort looks to develop an alternative approach to develop realistic requirements and specifications which benefit the entire supply chain. Pick a market segment and/or product line as a pilot vehicle. The scope of this first initiative should focus on one package type identified by the team.

Objectives:

Cover details of reliability specs – life cycle, thermal cycles, shock test, etc.

Good potential research cooperative project with universities

OEM's to provide detailed specifications/requirements – mechanical and electrical

Substrate suppliers to provide material properties early to support OEM simulations

May require that new metrology be developed to support the reliability model

New acceleration methods are highly desirable to shrink TTM

Define interfacial & chemical properties – define metrology requirements and methods

Expected Outputs

Improved reliability specifications that focus on reliability issues of current technology rather than previous technology; thus improving reliability and reducing cost. An industry wide consolidation of reliability specifications.