



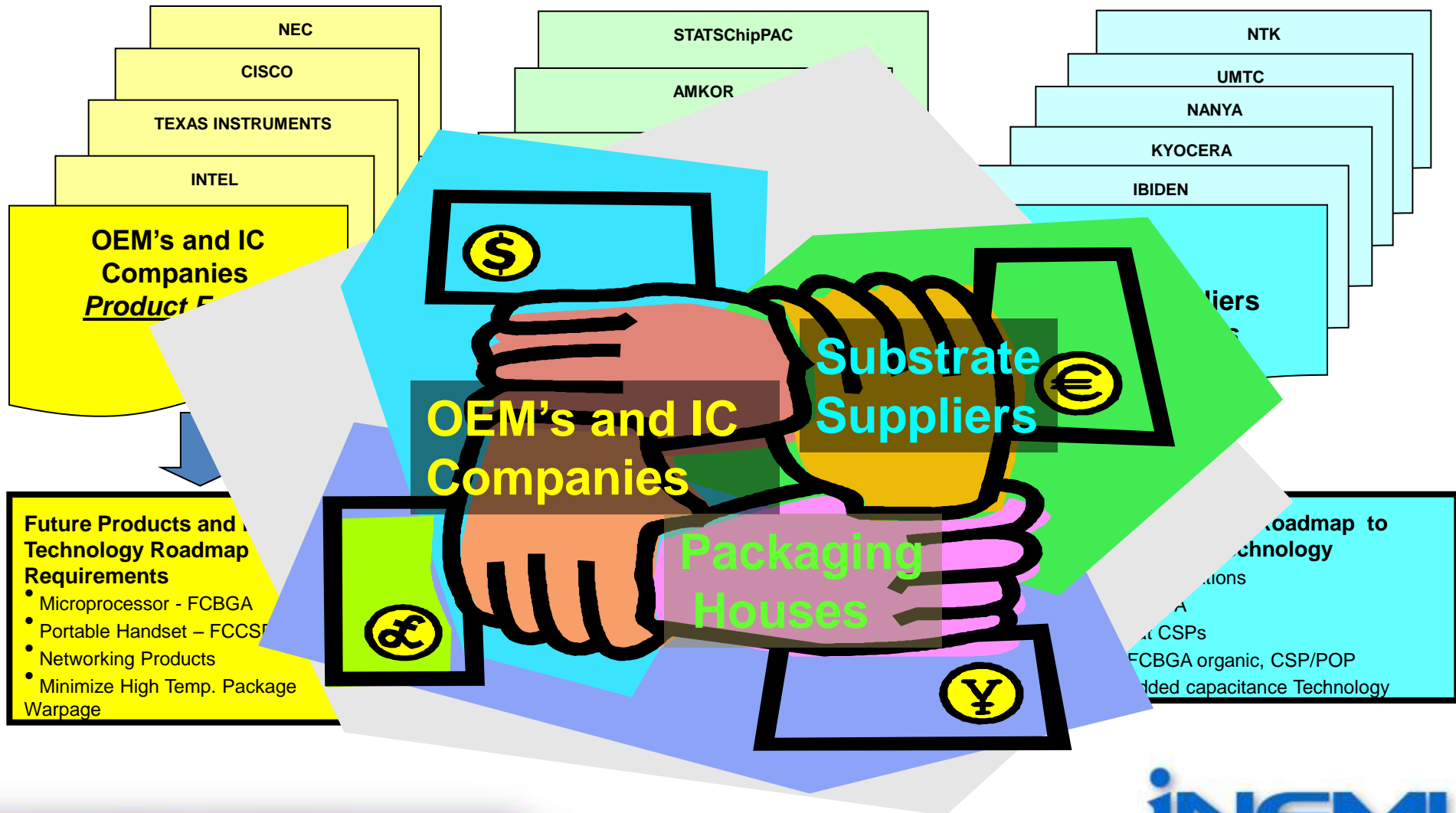
INEMI
International Electronics Manufacturing Initiative

New Initiative Opportunities

Miniaturization

Advancing manufacturing technology

Six Initiatives from iNEMI Packaging Substrate Workshop (November, 2009, Japan)



Six Packaging Substrates Project Opportunities

- **Warpage Qualification Criteria**
 - Wei Keat Loh - Intel, Robert Carter - Cisco Systems
- **Primary Factors in Warpage**
 - Peng Su - Cisco Systems
- **Wiring Density Program**
 - Luis Rivera - Texas Instruments, Charan Gurumurthy - Intel
- **Holistic Modeling Process**
 - Darwin Edwards - Texas Instruments, Mudasir Ahmad - Cisco
- **Optimizing Time to Yield**
 - Mario Bolanos - Texas Instruments
- **Reliability Methodology for Substrates**
 - Mario Bolanos - Texas Instruments

Schedule for these project initiatives will be posted at www.inemi.org
These formation meetings are open to the industry.



iNEMI Packaging Substrates

Prospective Participants		
Alcatel-Lucent	Fujitsu Advanced Technology	NIST
Richard Coyle [1,2,4]	Masateru Koide [1,2]	Kevin Brady [1,2]
Amkor Technology	Georgia Tech PRC	Quanta Computer
JaeYoon Kim [3]	Dr. Venky Sundaram [1,2,6]	Yu Xi [1,2,3,6]
ASE	Hewlett-Packard	Rogers Corporation
Leander Liang [1,3]	Russ Lewis [1,2,6]	Diana Williams [1,2,3,4,6]
Cisco Systems	IBIDEN	Shengyi Sci. Tech
Robert Carson [1,2]	Masaru Takada [3]	Scarlet Wang [1,2,3,6]
John Savic [5,6]		Edward Sun [1,2,3,6]
Peng Su [1,2,3,4,5,6]	Intel	
Mudasir Ahmad [4]	Wei Keat Loh [1,2,4]	SUNY Binghamton
	Mun Leong Loke [1,2]	SB Park [1,2,3,6]
Dell	Charan Gurumurthy [1,2,3,4,5,6]	
Eddie Maruri [1,2]		Texas Instruments
	Nan Ya Plastics	Mario Bolanos [1,2,3,4,5,6]
Doosan	Kao-Cheng Huang [1,2,6]	Luis Rivera [3]
Minsu (Tim) Lee [1,3]	Charan Gurumurthy [1,2,3,4,5,6]	Darvin Edwards [4]
Changhoon Koh [2,3]		
Eo Tae Sik [2]	NGK	iNEMI
	Kozo Yamasaki [2]	Jim Arnold
Dow Electronic Materials	Takuya Torii [2]	David Godlewski
Hiroshi Hoshiyama [3,6]		
Martin Bayes [3,6]		

[1] Warpage Qualification Criteria

[2] Primary Factors in Warpage

[3] Wiring Density Program

[4] Holistic Modeling Process

[5] Optimizing Time to Yield

[6] Reliability Methodology



1. Warpage Qualification Criteria

Summary

1. Warpage Qualification Criteria

Co-Chairs: Wei Keat Loh-Intel, Robert Carson-Cisco Systems

- **Problem statement:**
 - **Current qualification criteria and standards are not adequate to predict good yield results at 1st and 2nd level assembly**
 - **Measurement methods (dimensional and test) not common nor up to date**
- **Objectives:**
 - **Define the qualification method and criteria e.g. sample size, precondition, variations of material and processes (1st and 2nd level).**
 - **Establish repeatable and correlated measurement methods**
- **Expected Outputs:**
 - **Procedure and criteria reference for OEM and suppliers**



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2. Primary Factors in Warpage

Summary

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2. Primary Factors in Warpage

Chair: Peng Su-Cisco Systems

- **Problem statement:**
 - No clear understanding of the key contributors to warpage at the 1st and 2nd 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 1st level and 2nd level 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 for materials, design and process and the working window to control the warpage through supply chain
 - Recommendation/guidelines for shipping and storage.



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3. Wiring Density Program

Summary

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3. Wiring Density Program

Co-Chairs: Luis Rivera-Texas Instruments, Charan Gurumurthy-Intel

- Problem statement:
 - Meeting the wiring density needs of the next generation of packaging technology will require radical improvements & innovations in all areas of organic packaging substrates technology. A piecemeal approach will not be sufficient.
- Objectives:
 - The objective is to develop a system optimized next generation technology that focuses on the following prioritized 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.

4. Holistic Modeling Process

Summary

4. Holistic Modeling Process

Champions: Darwin Edwards-Texas Instruments, Mudasir Ahmad-Cisco

- **Problem Statement:**
 - Lack multilevel design tools that optimize package designs for electrical, mechanical, and thermal performance
- **Objectives:**
 - Identify critical materials properties and proposed specifications for a specific package type.
 - 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 specs need to be provided from the OEM side.
Coverage of multiple applications is desirable
 - Determine data depth/accuracy in critical materials properties required for model effectiveness.
 - Involve data experts from materials, packaging, and substrate suppliers
- **Expected Output**
 - An integrated multi level set of design and simulation tools that ensure high performance on a pilot package.



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5. Optimizing Time to Yield

Summary

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5. Optimizing Time to Yield

Champion: Mario Bolanos-Texas Instruments

- **Problem statement:**
 - There is a lack of a methodology for low volume learning for substrate supplier, packaging supplier &, then into OEM product 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
 - Methodology should include data support for Cpk, first Pass Yields, and FA
 - 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.

6. Reliability Methodology for Substrates

Summary

6. Reliability Methodology for Substrates

Champion: Mario Bolanos-Texas Instruments

- **Problem statement:**
 - We lack realistic and up to date effective reliability requirements and specifications which benefit the entire supply chain. Every OEM has their own spec(s) and thus every job is custom – many specs are years out of date.
- **Objectives covering the initial project that will center on one TBD agreed upon package type:**
 - Cover details of reliability specs – life cycle, thermal cycles, shock test, etc.
 - Offers a potential research cooperative project with universities
 - OEM's to provide detailed specifications/requirements – mechanical and electrical
 - Will require metrology (some of which will be developed in sync) to support the reliability model
 - New acceleration methods are highly desirable to shrink TTM
 - Coverage to include interfacial & chemical properties
- **Expected Output**
 - Improved reliability specifications that focus on issues of current technology rather than previous technology; thus improving reliability and reducing cost.



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