



INEMI[®]

International Electronics Manufacturing Initiative

Test, Inspection & Measurement

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Shanghai, China

April, 21 2009

Advancing manufacturing technology

Test Inspection Measurement TWG Presentation Outline

- **Test Inspection Measurement Chapter Scope**
- **Test Inspection Measurement TWG Membership**
- **Situation Analysis 情况分析**
 - Global Electronics Production by Region 全球电子生产分布
 - Board Level Testing Look Across 板级测试比较
 - System Level Testing Look Across 系统级测试比较
- **Critical Issues 关键问题**
- **Technology Needs 技术支持需求**
- **Test Technology Implementation Group Projects**
 - Functional Test Coverage Model Project 功能测试覆盖率模型项目
 - Boundary Scan Technology Project 边界扫描技术项目
 - Board Flexure Project 板曲项目

- **Test Inspection Measurement TWG Scope**

测试检查及测量小组研究范围

- **Technologies which allow for the identification of product defects and the characterization / improvement of the product and associated manufacturing process.**

- **TWG Group Participants**

- **Test Inspection Measurement TWG Members**

- Mike Reagin, Delphi (chair)
- Michael Smith, Teradyne (co-chair)
- Bob Stasonis, Pickering Test
- Dan Helein, Plexus
- David Anthus, Jabil
- Gerald Fitzpatrick, NIST
- James Grealish, Intel
- Kenneth Parker, Agilent
- Mike Dewey, GeoTest inc
- Rosa Dolores Reinoso, HP
- Stig Oresjo, Consultant (Ex Agilent)
- Tim Kruse, Plexus
- Aik Peng Ng, Delphi

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Global Electronics Production by Region

	Computers and Office Equipment			Netcom			Portable and Consumer			Automotive Electronics			Medical		
	2004	2006	2008	2004	2006	2008	2004	2006	2008	2004	2006	2008	2004	2006	2008
Worldwide Production estimate (\$ billions)	463			186			308			81			69		
% Production															
Americas	34%	36%	23%	43%	45%	44%	16%	15%	13%	29%	24%	20%	62%	53%	54
Europe	16%	13%	13%	31%	29%	28%	22%	18%	19%	33%	34%	33%	21%	22%	25
Japan	9%	7%	7%	11%	7%	5%	18%	15%	14%	20%	17%	17%	10%	10%	8
Asia (exclude Japan)	41%	49%	57%	15%	19%	23%	44%	52%	54%	18%	25%	30%	7%	10%	13
% Production outsourced to EMS	31%	31%	36%	38%	38%	33%	18%	27%	28%	6%	6%	7%	7%	8%	11

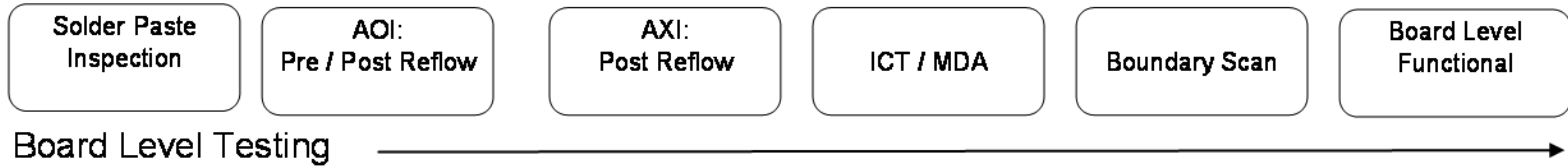
Source:

Prismark Report to iNEMI. Report No. 2853-02, May 2004, Report No. 3217, June 2006, Report No. 3657, July 2008



Test Inspection Measurement TWG

Board Level Test Look Across



	Solder Paste Inspection	AOI: Pre / Post Reflow	AXI: Post Reflow	ICT / MDA	Boundary Scan	Board Level Functional
Automotive						
Entertainment	Mostly	Sometimes/Sometimes	Rarely	Always	Rarely	Mostly
Safety	Mostly	Mostly / Mostly	Rarely	Always	Sometimes	Sometimes
Portables						
Mobiles	Mostly	Sometimes	Rarely	Never	Sometimes	Always
Netcom						
Consumer	Sometimes	Sometimes/Sometimes	Audit Only	Sometimes	Mostly	Sometimes
Enterprise	Sometimes	Sometimes/Sometimes	Rarely	Always	Always	Sometimes
Service Providers	Mostly	Sometimes/Sometimes	Sometimes	Always	Always	Always
Office Systems						
Desktop	Rarely	Sometimes/Sometimes	Rarely	Always	Sometimes	Always
Mobile	Mostly	Sometimes / Always	Audit only	Always	Sometimes	Always
Servers/High End	Mostly	Sometimes / Always	Audit only	Always	Always	Always
Medical						
Imaging	Audit Only	Rarely / Always	Sometimes	Mostly	Mostly	Mostly
Monitoring	Audit Only	Rarely / Always	Sometimes	Mostly	Mostly	Mostly
Implantables	Always	Mostly	Rarely	Mostly	Mostly	Always

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System Level Testing Look Across

	Ambient Functional	Cold Functional	Hot Functional	BurnIn / Run In	Run Mode Test
System Level Testing →					
Automotive					
Entertainment	Always	Never	Never	Rarely	Always
Safety	Mostly	Sometimes	Mostly	Sometimes	Always
Netcom					
Consumer	Always	Never	Rarely	Audit Only	Always
Enterprise	Always	Mostly	Mostly	Sometimes	Always
Service Providers	Always	Rarely	Mostly	Mostly	Always
Portables					
Mobiles	Always	Never	Never	Audit only	Always
Office Systems					
Desktop	Always	Rarely	Rarely	Rarely	Audit Only
Mobile	Always	Rarely	Audit Only	Mostly	Audit Only
Servers/High End	Always	Rarely	Audit Only	Mostly	Audit Only
Medical					
Imaging	Always	Sometimes	Sometimes	Mostly	Always
Monitoring	Always	Rarely	Rarely	Mostly	Always
Implantables	Always	Never	Never	Mostly	Always

Test Inspection Measurement TWG: Critical Issues

- **Test Coverage, Defect Detection / Prevention**
 - System on Chip
 - High Density Interconnect - Smaller Vias, Blind Vias, Buried Vias, Higher layer counts
 - Embedded Components
 - All the above source of reduction in test access
- **Increased product complexity discussed in previous roadmap continues to place upward pressure on the cost of test.**
 - Increasing complexity of system on chip (SOC) devices is making SOC device test as well as board level and system level test more difficult.
 - Is the cost of test increasing at an increasing rate?
- **Complex Product Value Streams make test development / testing more difficult.**
 - Cost, resource, organizational boundaries, and timing pressures create challenges for test development and reduce the quality / timeliness of failure analysis
- **Global Test Development / Implementation**
 - Common Solutions versus regional solutions
 - Training and support issues
 - Impact of tariffs and regulations on test equipment costs
- **OEM ability to proactively evaluate test coverage effectiveness at supplier / remote site in real-time**
- **Lead free Impact on Test**

Test Inspection Measurement TWG: Technology Needs

- **Tools that integrate test development with product development similar to those in the IC world.**
 - Design for test strategy automation
 - Assessment of product testability during design phase
- **Metrology for Nanotechnology**
- **Tools that help identify mapping between component level faults and system (functional) testing**
- **Tools (particularly for system level / functional test) that allow the defect coverage for a value stream to be documented and verified.**
- **Improvements in AOI technologies (capability, reduced capital and operating costs) to help mitigate the challenges caused by reduced ICT coverage and increased defect rates on lead free boards.**
- **Increased adoption of Boundary Scan and use of the new 1149.6 specification for high speed differential signals.**
- **Ability to probe on smaller vias**
- **Ability to test vacant connectors and sockets**

Test Inspection Measurement TWG: Test Technology Implementation Group Projects

- **Functional Test Coverage Model Project**
 - Develop a standard framework for assessing functional test coverage.
 - Establish an assessment methodology that enables coverage comparison between test states (e.g., functional vs. in-circuit) and test revisions.
- **Boundary Scan Technology Project**
 - Promote wider adoption of boundary scan (IEEE 1149.1, 1149.6 and P1581) throughout the industry.
 - Encourage semiconductor vendors to include the technology in their products.
 - Promote the development of tools by ATE vendors to support boundary scan based board test.
- **Board Flexure Project**
 - Enhance current IPC/JEDEC standards to promote the use of the spherical bend test method and the use of a common type of strain (diagonal vs. principal) for reliability risk assessment.

Test Inspection Measurement TWG: 2009 Test Technology Implementation Group Plan

- **Board & Systems Mfg. Test TIG is Presently Developing 2009 Plan**
 - Development is open to all.
 - Plan is based upon 2009 iNEMI Roadmap gaps.
 - Most work is done via WebEx and telephone meetings.
 - Final plans are due for completion on July 15, 2009.
 - Help drive the project focus for test technology.
 - Used only within iNEMI to plan projects over a 5 year horizon.
 - Requires iNEMI membership to participate in projects.
 - Help focus the R&D funds available for test programs through development of the iNEMI Research Priorities Document.
 - Available to all academic, industry and government institutions through focused research and to funding.
 - Contact Rosa Reinosa (rosa.reinosa@hp.com) or Chuck Richardson (crichardson@inemi.org) for more information.

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