



North America 3DS-IC (Three-dimensional Stacked Integrated Circuits) Standards Committee Meeting Summary and Minutes



SEMI®
International
Standards

North America Standards Fall 2013 Meetings
29 October 2013, 15:00 – 17:00 Pacific Time
SEMI Headquarters in San Jose, California

Committee Announcements

Next Committee Meeting

North America Standards Spring 2014 Meetings

March 31 to April 3, 2014

SEMI Headquarters in San Jose, California

Table 1 Meeting Attendees

Italics indicate virtual participants

Co-Chairs: Urmi Ray (Qualcomm), Sesh Ramaswami (Applied Materials), Richard Allen (NIST), Chris Moore (---)

SEMI Staff: Paul Trio

<i>Company</i>	<i>Last</i>	<i>First</i>	<i>Company</i>	<i>Last</i>	<i>First</i>
AGC Electronic Materials	Takahashi	Mark	<i>NIST</i>	<i>Read</i>	<i>Dave</i>
BayTech Group	Baylies	Win	<i>SEMATECH</i>	<i>Vartanian</i>	<i>Victor</i>
NIST	Allen	Richard	SEMI	Trio	Paul

Table 2 Leadership Changes

<i>Group</i>	<i>Previous Leader</i>	<i>New Leader</i>
None		

Table 3 Ballot Results

Passed ballots and line items will be submitted to the ISC Audit & Review Subcommittee for procedural review.

Failed ballots and line items were returned to the originating task forces for re-work and re-balloting.

<i>Document #</i>	<i>Document Title</i>	<i>Committee Action</i>
5617	Line Item Revisions to SEMI 3D5-0613, Guide for Metrology Techniques to be used in Measurement of Geometrical Parameters of Through-Silicon Vias (TSVs) in 3DS-IC Structures	
Line Item 1	Rewrite sections 6.1 and 6.2 for clarity	Passed as balloted. Superclean
Line Item 2	Correct wording in Section 7.1	Passed as balloted. Superclean
Line Item 3	Correct wording in Section 7.4	Passed as balloted. Superclean
Line Item 4	Modify wording in Note 1 to clarify intent	Passed as balloted. Superclean

Table 3 Ballot Results

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<i>Document #</i>	<i>Document Title</i>	<i>Committee Action</i>
Line Item 5	Correct wording in Section 9.1.1.1	Passed as balloted. Superclean

Table 4 Authorized Activities

<i>#</i>	<i>Type</i>	<i>SC/TF/WG</i>	<i>Details</i>
5506	Revised SNARF	Inspection & Metrology TF	Changed from <i>Test Method</i> to <i>Guide</i> New Standard: Guide for Measuring Warp, Bow and TTV on Silicon and Glass Wafers Mounted on Wire Grids by Automated Non-Contact Scanning using Laser Scanning Interferometry

NOTE 1: The NA 3DS-IC Bonded Wafer Stacks Task Force plans to split SNARF # 5173, New Standard: Guide for Describing Materials Properties for a 300 mm 3DS-IC Wafer Stack, into smaller document development activities. Corresponding SNARFs will be submitted to the 3DS-IC Global Coordinating Subcommittee (GCS) for approval.

NOTE 2: Note: SNARFs and TFOFs are available for review on the SEMI Web site at:

<http://downloads.semi.org/web/wstdsbal.nsf/TFOFSNARF>

Table 5 Authorized Ballots

<i>#</i>	<i>When</i>	<i>SC/TF/WG</i>	<i>Details</i>
5447	Cycle 8, 2013 (or C1/C2- 2014)	Inspection & Metrology TF	New Standard: Terminology for Measured Geometrical Parameters of Through-Glass Vias (TGVs) in 3DS-IC Structures
5616	Cycle 8, 2013 (or C1/C2- 2014)	Inspection & Metrology TF	Revision to SEMI 3D4, Guide for Metrology for Measuring Thickness, Total Thickness Variation (TTV), Bow, Warp/Sori, and Flatness of Bonded Wafer Stacks

NOTE 3: The NA 3DS-IC Bonded Wafer Stacks Task Force plans to split SNARF # 5173, *New Standard: Guide for Describing Materials Properties for a 300 mm 3DS-IC Wafer Stack*, into smaller document development activities. Corresponding ballot authorization requests will be submitted to the 3DS-IC GCS for approval.

Table 6 New Action Items

<i>Item #</i>	<i>Assigned to</i>	<i>Details</i>
2013Oct #01	Paul Trio	Contact NA 3DS-IC chairs and TF leaders and ask whether they plan to attend SEMICON Japan for the joint 3DS-IC meeting (see § 5 of these minutes)
2013Oct #02	Paul Trio	Work with SEMI Taiwan staff in identifying and reaching out to industry stakeholders in Taiwan. Paul to also consult with Bevan Wu (ITRI/BW & Associates) for additional support and guidance.
2013Oct #03	Paul Trio, Rich Allen	Finalize the NA 3DS-IC Spring 2014 meeting schedule by the end of February.

Table 7 Previous Meeting Actions Items

<i>Item #</i>	<i>Assigned to</i>	<i>Details</i>
2013Jul #02	Paul Trio	Remind Rich Allen to look into renaming the Thin Wafer Handling Task Force to Thin Wafer Task Force then form appropriate working groups focusing on various areas (e.g., Handling WG, Shipping WG).



1 Welcome, Reminders, and Introductions

Rich Allen, committee co-chair, called the meeting to order at 3:05 PM. After welcoming all attendees, the SEMI meeting reminders on membership requirements, antitrust, patentable technology, and meeting guidelines were presented and explained. Finally, the agenda was reviewed.

Attachment: 01, SEMI Standards Required Meeting Elements

2 Review of Previous Meeting Minutes

The committee reviewed the minutes of the previous meeting held July 9 in conjunction with SEMICON West 2013.

Motion: Accept the minutes of the previous meeting as written.

By / 2nd: Win Baylies (BayTech Group) / Mark Takahashi (AGC Electronic Materials)

Discussion: None

Vote: 3-0 in favor. Motion passed.

Attachment: 02, NA 3DS-IC SEMICON West 2013 meeting (July 9) minutes

3 SEMI Staff Report

Paul Trio (SEMI) gave the SEMI Staff Report. The key items were as follows:

- 2013 Global Calendar of Events
 - PV Taiwan (October 30 – November 1, Taipei)
 - SEMICON Japan (December 4-6, Chiba)
- [early] 2014 Global Calendar of Events
 - European 3D TSV Summit (January 21-22, Grenoble, France)
 - SEMICON Korea / LED Korea (February 12-14, Seoul)
 - SEMICON China (March 18-20, Shanghai)
 - SEMICON Singapore (April 23-25, Marina Bay Sands)
 - SEMICON West (July 8-10, San Francisco, California)
- NA Standards Fall 2013 Meetings (October 28-31)
 - Committees meeting at SEMI Headquarters (San Jose)
 - 3DS-IC | EHS | Facilities & Gases | HB-LED | Information & Control | MEMS/NEMS | Metrics | PV Materials
 - SEMI thanks Intel (Santa Clara) for hosting the PIC and Silicon Wafer meetings
- Standards Publications Report
 - July 2013 Cycle
 - New Standards – 2, Revised Standards – 2, Reapproved Standards – 3, Withdrawn Standards – 0
 - August 2013 Cycle
 - New Standards – 0, Revised Standards – 15, Reapproved Standards – 0, Withdrawn Standards – 0
 - September 2013 Cycle
 - New Standards – 3, Revised Standards – 2, Reapproved Standards – 6, Withdrawn Standards – 0, Total in portfolio – 892 (includes 98 Inactive Standards)



- New Cycle 8 Voting Period
 - Ballot Submission Date: Nov 15, 2013
 - Voting Period Starts: Nov 29, 2013
 - Voting Period Ends: Dec 31, 2013
- Upcoming North America Meetings (2013)
 - NA Liquid Chemicals Fall 2013 Meetings [*task force and committee meetings*] (November 5; SEMI HQ in San Jose, California)
 - NA Compound Semiconductor Materials [*committee meeting*] (November 15, teleconference and web meeting only)
- North America Standards 2014 Meetings
 - NA Standards Spring 2014 Meetings (March 31 – April 3 at SEMI HQ in San Jose, California)
 - NA Standards Meetings at SEMICON West 2014 (July 7-10 in San Francisco, California)
 - NA Standards Fall 2014 Meetings (November 3-6 at SEMI HQ in San Jose, California)
- Standards Usage Interview
 - Looking for details on how standards are actually used:
 - Development/Engineering
 - Procurement
 - Manufacturing
 - Interview should take less than 30 minutes – contact James or any Standards staff
- Official SEMI Standards Groups
 - LinkedIn
 - <http://www.linkedin.com/groups/Official-SEMI-Standards-Group-1774298/about>
 - Twitter
 - @SEMI_standard

Attachment: 03, SEMI Standards Staff Report

4 Taiwan 3DS-IC Committee

Paul Trio (SEMI) provided an update on Taiwan 3DS-IC activities.

- Published Standards
 - SEMI 3D6, Guide for CMP and Micro-Bump Processes for Frontside Through Silicon Via (TSV) Integration (formerly SEMI Draft Document # 5474)
 - SEMI 3D7, Guide for Alignment Mark for 3DS-IC Process (formerly SEMI Draft Document # 5473)
- Discussing new standards activity on wafer stack overlay definition and inspection criteria
- SEMI Staff:
 - Cher Wu | cwu@semi.org

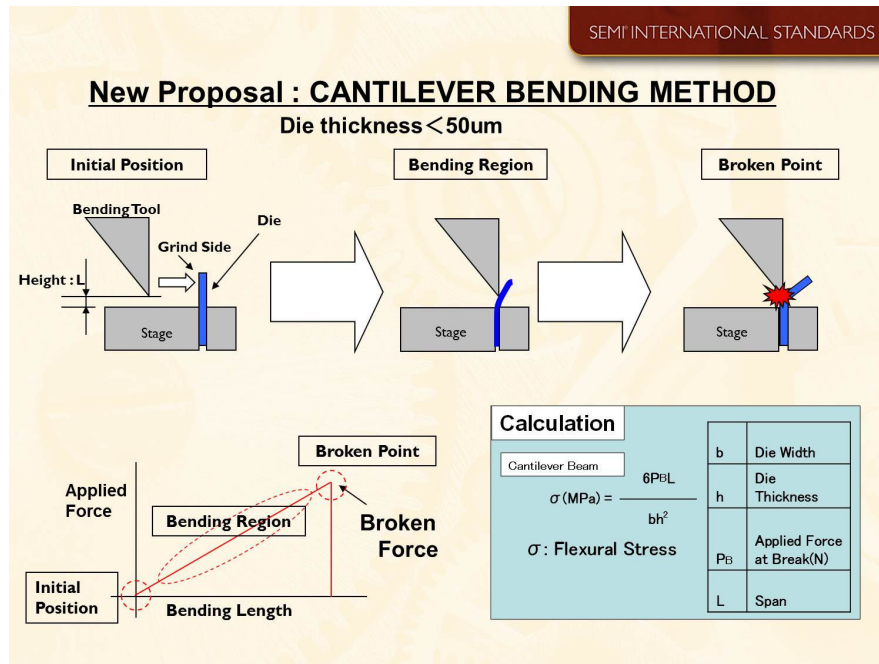
5 Japan 3D-IC Study Group

Paul Trio provided the Japan 3D-IC liaison report. The key items were as follows:

- Formed under the Japan Packaging Committee



- Next meeting: November 11 during the Japan Fall 2013 Meetings (SEMI Japan office, Tokyo)
- 3D-IC Study Group
 - Study Group meeting is being held actively
 - Aug. 29, 2012: Workshop with 20 attendees
 - Oct. 5, 2012: Kick Off Meeting with 20 attendees
 - Nov. 7, 2012: 2nd Meeting with 14 attendees
 - Dec. 6, 2012: 3rd Meeting with 31 attendees
 - Feb. 1, 2013: 4th Meeting with 17 attendees
 - Mar. 7, 2013: 5th Meeting with 28 attendees
 - Mar. 26, 2013: 6th Meeting with 21 attendees
 - Apr. 26, 2013: 7th Meeting with 16 attendees
 - May. 17, 2013: 8th Meeting with 18 attendees
 - Jun. 27, 2013: 9th Meeting with 17 attendees
 - Sep. 19, 2013: 10th Meeting with 13 attendees
 - Oct. 22, 2013: 11th Meeting with 24 attendees
 - Discussing possible new standards activity on Bonded Wafer Handling, Stacked Wafer Handling and Diced Stacked Dies Handling
 - During SEMICON Japan 2013
 - Global 3DS-IC meeting (with NA-Taiwan-Japan members) will be held on December 5
 - 3D-IC SG will have booths in the Advanced Manufacturing Technology Pavilion (Hall 1) to introduce global SEMI Standards 3D-IC activities
 - <http://www.semiconjapan.org/en/pavilion2>
- Thin Die Bending Strength Measurement Method Task Force
 - Charter:
 - Spreading out of 3D Packaging, wafer/chip thickness becomes thinner and thinner. Chip strength measurement has already been standardized, but it needs special tool for less than 50um thickness and is not a convenient method. To solve this problem, a new bending strength measurement method called “Cantilever Bending Method” for ultra-thin dice is proposed. It will make it easy to prescribe in requirements and specifications among several suppliers and achieve smooth handling through the supply-chain.
 - Scope:
 - Method of Chip Strength Measurement for Ultra Thin Thickness (<50um)
 - Clarified by Chip Thickness
 - Currently gathering the measurement data by newly proposed bending method with various wafer thickness down to 10 um. And the validity of measurement method is under discussion.
 - Also discussing measurement data with/without TSVs which are significant for 3D-IC.



- SEMI Staff:
 - Naoko Tejima | ntejima@semi.org

Additional Discussion:

- NA 3DS-IC will provide feedback on Thin Die Bending Strength Measurement Method TF activity.

Action Item: 2013Oct #01, Paul Trio to contact NA 3DS-IC chairs and TF leaders and ask whether they plan to attend SEMICON Japan for the joint 3DS-IC meeting.

Attachment: 04, Japan 3D-IC Report

6 Ballot Review

Passed ballots and line items will be submitted to the ISC Audit & Review Subcommittee for procedural review.

Failed ballots and line items were returned to the originating task forces for re-work and re-balloting.

NOTE 4:Committee adjudication on Cycle 6 ballots are detailed in the Audits & Reviews (A&R) Subcommittee Forms for procedural review. These A&R forms are available as attachments to these minutes. The attachment number for each document is provided below the summary tables.

6.1 Cycle 6 Ballots

Document #	Document Title	Committee Action
5617	Line Item Revisions to SEMI 3D5-0613, Guide for Metrology Techniques to be used in Measurement of Geometrical Parameters of Through-Silicon Vias (TSVs) in 3DS-IC Structures	
Line Item 1	Rewrite sections 6.1 and 6.2 for clarity	Passed as balloted. Superclean
Line Item 2	Correct wording in Section 7.1	Passed as balloted. Superclean
Line Item 3	Correct wording in Section 7.4	Passed as balloted. Superclean
Line Item 4	Modify wording in Note 1 to clarify intent	Passed as balloted. Superclean

Document #	Document Title	Committee Action
Line Item 5	Correct wording in Section 9.1.1.1	Passed as balloted. Superclean

Attachment: 05, Ballot Review for Doc. 5617

7 Task Force Reports

7.1 Bonded Wafer Stacks Task Force

Rich Allen reported that the task force is planning to split SNARF # 5173, *New Standard: Guide for Describing Materials Properties for a 300 mm 3DS-IC Wafer Stack*, into smaller document development activities. Corresponding SNARFs and ballot submission authorizations will be submitted to the 3DS-IC Global Coordinating Subcommittee (GCS) for approval. The task force is still working on Document 5174, *New Standard: Specification for Identification and Marking for Bonded Wafer Stacks*. There are no major updates on Document 5174 at this time.

7.2 Inspection & Metrology Task Force

Victor Vartanian and Dave Read provided the following summary of the items discussed during the TF meeting held earlier in the day:

- The task force reviewed the inter-laboratory experimental results on bond voids which would ultimately be used towards the development of Document 5270, *New Standard: Guide for Measuring Voids in Bonded Wafer Stacks*.
- The task force also plans to update SNARF 5506 (activity related to *Measuring Warp, Bow and TTV on Silicon and Glass Wafers Mounted on Wire Grids by Automated Non-Contact Scanning using Laser Scanning Interferometry*) from a Test Method to a Guide. Doing so gives the task force more technical flexibility.
- The task force plans to submit Document 5447, *Terminology for Measured Geometrical Parameters of Through-Glass Vias (TGVs) in 3DS-IC Structures*, for either Cycle 8, 2013 or Cycle 1/2, 2014 voting period.

7.3 Thin Wafer Handling Task Force

Rich Allen reported that the TF discussed the current activity from the Japan Thin Die Bending Strength Measurement Method TF and how it would communicate feedback/inputs to the Japan TF. The task force also discussed possible new activities:

- Dicing tape characterization and performance (presentation from SEMATECH)
- Unsupported thin wafer handling

8 Old Business

8.1 Action Items from previous meeting:

Item #	Assigned to	Action Item	Status
2013Jul #01	Paul Trio	Request more information on the Japan Thin Chip (Die) Bending Strength Measurement TF activity	Completed. Closed.
2013Jul #02	Paul Trio	Remind Rich Allen to look into renaming the Thin Wafer Handling Task Force to Thin Wafer Task Force then form appropriate working groups focusing on various areas (e.g., Handling WG, Shipping WG).	Open.
2013Jul #03	Sesh	Provide Paul Trio a list of key stakeholder contacts	Closed. Paul to work with SEMI Taiwan staff

	Ramaswami	so that Paul Trio can inform them of current activities and invite them to participate. Paul Trio will also arrange for access to the published 3DS-IC Standards for their review and input.	in identifying and reaching out to stakeholders. Paul to also consult with Bevan Wu (ITRI) for additional support/guidance.
2013Jul #04	Paul Trio, Rich Allen	Finalize the NA 3DS-IC Fall 2013 meeting schedule by the end of September.	Closed.

Action Item: 2013Oct #02, Paul Trio to work with SEMI Taiwan staff in identifying and reaching out to industry stakeholders in Taiwan. Paul to also consult with Bevan Wu (ITRI/BW & Associates) for additional support and guidance.

9 New Business

9.1 SNARF # 5506 Revision

Victor Vartanian presented the updated #5506 SNARF (changed from Test Method to Guide):

New Standard: ~~Test Method~~ Guide for Measuring Warp, Bow and TTV on Silicon and Glass Wafers Mounted on Wire Grids by Automated Non-Contact Scanning using Laser Scanning Interferometry

- Revised Rationale:
 - The current metrology strategies have evolved from methods used to characterize smaller, lower aspect ratio geometries. Conventionally, three point mounts have been used to measure flatness/warp of wafer along with gravity compensation.
 - Nowadays, however, the trend goes to use larger in diameter and thinner wafers, for instance in 3DS-IC applications. Larger and thinner wafers are less stiff than conventional ones. Low stiffness leads to a high deflection and sag, which can even exceed the required warp tolerance. In addition, the new applications require a complete depiction of the wafer's shape, thus interpolation calculation methods based on few data points fail to depict the real free state of the wafer and allow passing failures like local bow.
 - The industry therefore would benefit from identifying a guide that better reflects the application usage of these wafers. One such approach used in the industry is a similar set up to Sori with a wire mount and a noncontact scanning method that allows depicting a complete picture of the wafer's shape and dimensional parameters.
 - This guide will recommend the wafer to be characterized in a position that allows for a free state profile measurement on a semi-continuous flat mounting surface.
 - Comments in balloting suggested some edits need to be made so we propose to ballot several line item changes.
- Scope:
 - Establish a guide on how to measure wafers with a deflection of more than twice their warp tolerance. This guide can be applied to all materials and geometrical shapes.

Motion: Approve revised SNARF # 5506

By / 2nd: Win Baylies (BayTech Group) / Dave Read (NIST)

Discussion: None

Vote: 3-0 in favor. Motion passed.

9.2 Upcoming Ballots

#	Type	SC/TF/WG	Details
5447	Cycle 8, 2013 (or C1/C2-2014)	Inspection & Metrology TF	New Standard: Terminology for Measured Geometrical Parameters of Through-Glass Vias (TGVs) in 3DS-IC Structures
5616	Cycle 8, 2013 (or C1/C2-2014)	Inspection & Metrology TF	Revision to SEMI 3D4, Guide for Metrology for Measuring Thickness, Total Thickness Variation (TTV), Bow, Warp/Sori, and Flatness of Bonded Wafer Stacks

Motion: Approve letter ballot distribution of Document 5447 for Cycle 8, 2013 (or Cycle 1/2, 2014) voting period.

By / 2nd: Win Baylies (BayTech Group) / Dave Read (NIST)

Discussion: None

Vote: 3-0 in favor. Motion passed.

Motion: Approve letter ballot distribution of Document 5616 for Cycle 8, 2013 (or Cycle 1/2, 2014) voting period.

By / 2nd: Victor Vartanian (SEMATECH) / Dave Read (NIST)

Discussion: None

Vote: 3-0 in favor. Motion passed.

10 Action Item Review

10.1 Open Action Items

Paul Trio (SEMI) reviewed the open action items. These can be found in the Open Action Items table at the beginning of these minutes.

10.2 New Action Items

Paul Trio (SEMI) reviewed the new action items. These can be found in the New Action Items table at the beginning of these minutes.

11 Next Meeting and Adjournment

The next meeting of the North America 3DS-IC committee is scheduled for Tuesday, April 1 in conjunction with the NA Standards Spring 2014 meetings. The tentative schedule is provided below:

North America Standards Spring 2014 Meetings
 March 31 – April 3, 2014
 SEMI Headquarters
 3081 Zanker Road
 San Jose, California 94103
 U.S.A.

Tuesday, April 1

- Inspection & Metrology Task Force (8:00 AM to 10:00 AM)
- Wafer Bonded Stacks Task Force (10:00 AM to 12:00 Noon)
- Thin Wafer Handling Task Force (1:00 PM to 3:00 PM)
- NA 3DS-IC Committee (3:00 PM to 5:00 PM)



Action Item: 2013Oct #03, Paul Trio and Rich Allen to finalize the NA 3DS-IC Spring 2014 meeting schedule by the end of February.

Having no further business, a motion was made to adjourn the NA 3DS-IC Fall 2013 Committee meeting at SEMI Headquarters in San Jose, California. Adjournment was at 4:35 PM.

Respectfully submitted by:

Paul Trio
Senior Manager, Standards Operations
SEMI North America
Phone: +1.408.943.7041
Email: ptrio@semi.org

Minutes approved by:

Sesh Ramaswami (Applied Materials), Co-chair	Not present
Urmi Ray (Qualcomm), Co-chair	Not present
Richard Allen (NIST), Co-chair	January 29, 2014
Chris Moore (---), Co-chair	Not present

Table 8 Index of Available Attachments #1

#	<i>Title</i>	#	<i>Title</i>
1	SEMI Standards Required Meeting Elements	4	Japan 3D-IC Report
2	NA 3DS-IC SEMICON West 2013 Meeting (July 9) Minutes	5	Ballot Review for Doc. 5617
3	SEMI Standards Staff Report		

#1 Due to file size and delivery issues, attachments must be downloaded separately. A .zip file containing all attachments for these minutes is available at www.semi.org. For additional information or to obtain individual attachments, please contact Paul Trio at the contact information above.