

SEMI 3D2-0216 (Reapproved 0222) SPECIFICATION FOR GLASS CARRIER WAFERS FOR 3DS-IC APPLICATIONS

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NOTICE: The section symbol (§) is used to reference a numbered section, paragraph, or header and all subordinate paragraphs, headers, and embedded material (i.e., EXCEPTIONs, lists) therein. The paragraph symbol (§) is used to reference a particular numbered paragraph and embedded material therein. When duplicated (i.e., §§ and §§) the symbols are used to reference more than one section or paragraph, respectively.

NOTICE: Paragraphs entitled ‘NOTE:’ are not an official part of this Standard or Safety Guideline and are not intended to modify or supersede the official Standard or Safety Guideline. These have been supplied by the global technical committee to enhance the usage of the Standard or Safety Guideline.

NOTICE: This Standard was reapproved with minor editorial changes.

1 Purpose

1.1 This Specification is intended to address the needs of the 3D Stacked IC (3DS-IC) industry by providing the tools needed to procure glass carrier wafers to be used in a 3DS-IC process.

2 Scope

2.1 This Specification describes dimensional, thermal, and wafer preparation characteristics for glass starting material that will be used as carrier wafers in a temporary bonded state.

2.2 This Specification describes glass carrier wafers with nominal diameters of 200 mm and 300 mm, and a thickness of 700 µm, although the wafer diameter and thickness required may vary due to process and functional variation. Such variations shall be clarified in the purchasing order or in the contract.

2.3 Methods of measurements suitable for determining the characteristics in the specifications are indicated.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 This Specification does not describe dimensions and procedures related to wafers and wafer stacks, 200 mm or 300 mm nominal diameter, with fiducials.

3.2 This Specification does not describe glass for interposers or any other active or passive devices.

3.3 This Specification does not describe glass wafers or panels for permanent bonding applications.

3.4 This Specification does not address issues associated with processing, bonding, or de-bonding.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI 3D12 — Guide for Measuring Flatness and Shape of Low Stiffness Wafers

SEMI E119 — Mechanical Specification for Reduced-Pitch Front-Opening Box for Interfactory Transport of 300 mm Wafers

SEMI G90 — Specification for 300 mm Wafer Coin-Stack Type Shipping Container Used for Test and Packaging Processes

SEMI M12 — Specification for Serial Alphanumeric Marking of the Front Surface of Wafers

SEMI M31 — Specification for Mechanical Features of Front-Opening Shipping Box Used to Transport and Ship 300 mm Wafers

SEMI M35 — Guide for Developing Specifications for Silicon Wafer Surface Features Detected by Automated Inspection

SEMI M40 — Guide for Measurement of Roughness of Planar Surfaces on Polished Wafers

SEMI M45 — Specification for 300 mm Wafer Shipping System

SEMI M59 — Terminology for Silicon Technology

SEMI MF533 — Test Method for Thickness and Thickness Variation of Silicon Wafers

SEMI MF657 — Test Method for Measuring Warp and Total Thickness Variation on Silicon Wafers by Noncontact Scanning (Withdrawn 0914)

SEMI MF671 — Test Method for Measuring Flat Length on Wafers of Silicon and Other Electronic Materials

SEMI MF928 — Test Method for Edge Contour of Circular Semiconductor Wafers and Rigid Disk Substrates

SEMI MF1152 — Test Method for Dimensions of Notches on Silicon Wafers

SEMI MF1390 — Test Method for Measuring Bow and Warp on Silicon Wafers by Automated Noncontact Scanning

SEMI MF1451 — Test Method for Measuring Sori on Silicon Wafers by Automated Noncontact Scanning

SEMI MF1530 — Test Method for Measuring Flatness, Thickness, and Total Thickness Variation on Silicon Wafers by Automated Noncontact Scanning

SEMI MF1617 — Test Method for Measuring Surface Sodium, Aluminum, Potassium, and Iron on Silicon and EPI Substrates by Secondary Ion Mass Spectrometry

SEMI MF2074 — Guide for Measuring Diameter of Silicon and Other Semiconductor Wafers

SEMI T7 — Specification for Back Surface Marking of Double-Side Polished Wafers with a Two-Dimensional Matrix Code Symbol

4.2 *ANSI® Standards*¹

ANSI/ASQ Z1.4 — Sampling Procedures and Tables for Inspection by Attributes

ANSI/OEOSC OP1.002-2009 — Optics and Electro-Optical Instruments – Optical Elements and Assemblies – Appearance Imperfections

4.3 *ASTM® Standards*²

ASTM C623 — Standard Test Method for Young's Modulus, Shear Modulus, and Poisson's Ratio for Glass and Glass-Ceramics by Resonance

ASTM E122 — Standard Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

ASTM E289 — Standard Test Method for Linear Thermal Expansion of Rigid Solids with Interferometry

4.4 *JSA Standards*³

JIS H 0611 — Methods of Measurement of Thickness, Thickness Variation and Bow of Silicon Wafer

JIS H 0614 — Visual Inspection for Silicon Wafers with Specular Surfaces

¹ American National Standards Institute, 25 West 43rd Street, New York, NY 10036, USA; Telephone: +1.212.642.4900, Fax: +1.212.398.0023, <http://www.ansi.org>. ANSI trademark is owned by American National Standards Institute.

² ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>. ASTM trademark is owned by ASTM International.

³ JSA Group, Mita MT Bldg., 3-13-12 Mita, Minato-ku, Tokyo, 108-0073, Japan; Telephone: +81.50.1741.7520, Fax: +81.3.4231.8650, <http://www.jsa.or.jp>.

4.5 MHIA Standards⁴

CEA 556-C — Outer Shipping Container Bar Code Label Standard

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Terms, acronyms, and symbols associated with silicon wafers and silicon technology are listed and defined in SEMI M59. Many of these terms and acronyms can be applied to wafers in a 3DS-IC process and to glass wafers as carriers.

5.2 General Definitions

NOTE 1: Many of these definitions are similar to, but slightly different from, those in SEMI M59. In many cases the definitions in SEMI M59 can be generalized to include 3DS-IC terms, but this is not being done at the present time.

5.2.1 *diameter* — the diameter of the minimum circle that encloses the wafer.

5.2.2 *back surface* — the surface of a wafer upon which the SEMI T7 mark appears.

5.2.3 *front surface* — the surface of a wafer opposite to that with the SEMI T7 marking.

5.2.4 *glass carrier wafer* — a glass wafer used for bonding to a device wafer temporarily during one or more process steps. A carrier wafer has neither active nor passive electrical parts.

5.2.5 *glass for interposers* — glass substrate with openings intended for further processing into an interposer.

5.2.6 *wafer bond* — a process by which two or more wafers are physically attached to each other using chemical and/or thermal and/or mechanical means.

5.2.7 *wafer bond, permanent* — any wafer bond which is intended to remain through the lifetime of the bonded layers.

5.2.8 *wafer bond, temporary* — any wafer bond which is intended to be de-bonded.

6 Ordering Information

6.1 Purchase orders for glass carrier wafers furnished to this Specification shall include the items identified in Table 1 Part 2 by a ♦ symbol in the left-most column.

6.2 In addition, the purchase order must indicate the test method to be used in evaluating each of those items for which alternate test procedures exist.

6.3 Also, requirements for bulk, front and back surface defects, such as bubbles, scratches, edge chips and indents, and surface contamination requirements together with appropriate test methodology should be included in the purchase order.

6.4 The following items must also be included in the purchase order:

6.4.1 Lot acceptance procedures,

6.4.2 Certification (if required),

6.4.3 Packing and shipping container labeling requirements.

7 Requirements for Standardized Glass Carrier Wafers for Temporary Bonding

7.1 Standard specifications for glass carrier wafers are listed in Table 1 Part 2. All of the parameters listed in the table and marked with a diamond (♦) symbol shall be included in the purchase order or contract.

7.2 Those specifications without a ♦ symbol should be included in the purchase order or contract, but are not mandatory.

⁴ Material Handling Industry of America, 8720 Red Oak Blvd., Suite 201, Charlotte, NC 28217, USA. Telephone: +1.704.676.1190; Fax: +1.704.676.1199; <http://www.mhia.org>

7.3 Some specifications leave optional values to be specified in the purchase order or contract. Those shall be included in the purchasing order or contract if they are considered mandatory requirements as indicated by a ♦ symbol.

7.4 If other types of glass wafers are required for an application or for research purposes, these may be ordered through the use of the glass carrier wafer specification order entry.

Table 1 Order Form for Glass Carrier Wafers for 3D Stacked IC Applications

Part 1 General Information

<i>ITEM</i>		<i>INFORMATION</i>	<i>Date:</i>
1-1	Customer Name		
1-2	Purchase Order Number		
1-3	Line Number		
1-4	Item Number		
1-5	General Specification Number		
1-6	Revision Level		
1-7	Part Number/Revision		

Part 2 Standardized Specifications for 200 mm and 300 mm Glass Wafers for 3DS-IC Applications

		<i>Parameter</i>	<i>Requirement</i>	<i>Measurement Method</i>
♦	2-1	Nominal Ground Edge Exclusion	☐ None ☐ Other: _____	
♦	2-2	Wafer ID Marking	☐ SEMI T7 ☐ SEMI M12	
♦	2-3	Edge Surface Condition	☐ Polished ☐ Not Polished	
♦	2-4	Edge Chamfer	☐ 200 ± 50 µm (for 300 mm glass wafers); ☐ Other: _____ ± _____ µm	SEMI MF928: ☐ Method A, ☐ Method B ☐ Other: _____
♦	2-5	Diameter	☐ 200.0 mm ± 0.2 mm ☐ 200.4 ± 0.2 mm ☐ 300.0 ± 0.2 mm ☐ 300.4 ± 0.2 mm ☐ Other: _____ ± _____ mm	☐ SEMI MF2074 ☐ Other: _____
♦	2-6	Orientation Fiducial Mark ^{#1}	☐ Notch Depth: 1.00 mm +0.25 mm -0.00 mm Notch Angle: 90.0° +5° -1° Flat (200 mm only): ☐ 195.50 ± 0.20 mm ☐ Other: _____	☐ SEMI MF1152 ☐ SEMI MF671
♦	2-7	Thickness, Center point	☐ 675 µm ± 5 µm ☐ 700 µm ± 5 µm ☐ Other: _____	☐ SEMI MF533 ☐ SEMI MF1530 ☐ JIS H 0611 ☐ Other: _____