

SEMI M57-0704

GUIDE FOR SPECIFYING SILICON ANNEALED WAFERS

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1 Purpose

1.1 This guide provides information for developing specifications for silicon annealed wafers used to fabricate semiconductor devices and integrated circuits.

2 Scope

2.1 This guide covers dimensional, electrical, chemical, and structural properties of silicon annealed wafers for 180 nm, 130 nm, and 90 nm device technology generations.

2.2 Based on the guidance herein, the user of this guide can generate specifications for silicon annealed wafers.

2.3 One of the reasons for using annealed wafers is to allow a reduction in the crystal originated particles (COP) near the top surface region of the wafer. Currently, only the COP surface density can be estimated.

2.4 Bulk microdefects (BMD) denuded zone (DZ) width is also an important parameter. However, there is no standardized method to evaluate this characteristic as well at the present time.

NOTICE: This standard does not purport to address safety issues, if any associated with its use. It is the responsibility of the users of this Standard to establish appropriate safety health practices and determine the applicability or regulatory limitations prior to use.

3 Referenced Standards

3.1 Standard test methods for the parameters in Table 1 are listed in Table 1 of SEMI M18.

3.2 SEMI Standards

SEMI M1 — Specifications for Polished Monocrystalline Silicon Wafers

SEMI M18 — Format for Silicon Wafer Specification Form for Order Entry

SEMI MF951 — Standard Test Method for Determination of Radial Interstitial Oxygen Variation in Silicon Wafers

SEMI MF1241 — Standard Terminology of Silicon Technology

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

4 Terminology

4.1 Most general terms relating to silicon technology are defined in SEMI M1 and SEMI MF1241.

4.2 Terms specific to commonly-used annealed wafers are defined as follows:

4.3 *annealed wafer* — wafer that has a defect (COP) free zone near the surface resulting from high temperature annealing under a neutral or reducing atmosphere.

4.3.1 *argon annealed wafer* — annealed wafer produced under argon atmosphere.

4.3.2 *hydrogen annealed wafer* — annealed wafer produced under hydrogen atmosphere.

5 Specifying Silicon Annealed Wafers

5.1.1 Table 1 provides a guide for specifying the polished silicon annealed wafers for the 180 nm, 130 nm, and 90 nm technology generations. All parameters listed in the format of SEMI M18 but not listed in this table are not to be specified.

Table 1 Guide for Specifying Polished Silicon Annealed Wafers for the 180 nm, 130 nm and 90 nm Technology Generations (Note 1)

<i>Item</i>		<i>180 nm Technology Generation</i>	<i>130 nm Technology Generation</i>	<i>90 nm Technology Generation</i>
PRE-ANNEAL STATE				
GENERAL CHARACTERISTICS				
1.1	Growth Method	CZ or MCZ	CZ or MCZ	CZ or MCZ
1.2	Crystal Orientation	(100)	(100)	(100)
1.3	Conductivity Type	<i>p</i> -type	<i>p</i> -type	<i>p</i> -type
1.4	Dopant	Boron	Boron	Boron
1.5	Nominal Edge Exclusion	3 mm	3 mm	2 mm
ELECTRICAL CHARACTERISTICS				
2.1	Resistivity	As agreed between supplier & customer.	As agreed between supplier & customer.	As agreed between supplier & customer.
2.2	Radial Resistivity Variation	≤ 20%	≤ 20%	≤ 20%
CHEMICAL CHARACTERISTICS				
3.1	Nominal Oxygen Concentration (Center)	As agreed between supplier & customer	As agreed between supplier & customer	As agreed between supplier & customer
TBD	Oxygen Concentration Tolerance (Center)	As agreed between supplier & customer	As agreed between supplier & customer	As agreed between supplier & customer
3.2	Radial Oxygen Variation (Note 2)	± 10%, 10 mm from edge	± 10%, 10 mm from edge	± 10%, 10 mm from edge
3.3	Carbon Concentration (Note 3)	≤ 0.5 ppma (Background)	≤ 0.5 ppma (Background)	≤ 0.5 ppma (Background)
STRUCTURAL CHARACTERISTICS				
4.3	Lineage	None	None	None
4.4	Twins	None	None	None
4.5	Swirl	None	None	None
WAFER PREPARATION CHARACTERISTICS				
5.1	Wafer ID Marking	As agreed between supplier & customer	SEMI M1.15	SEMI M1.15
5.2	Front Surface Thin Films	None	None	None
5.4	Extrinsic Gettering	None	None	None
5.5	Backseal	None	None	None
MECHANICAL CHARACTERISTICS				
6.1	Nominal Diameter	200 mm (SEMI M1)	300 mm (SEMI M1) (Note 4)	300 mm (SEMI M1) (Note 4)
6.6	Edge Profile	As agreed between supplier & customer (SEMI M1)	As agreed between supplier & customer (SEMI M1)	As agreed between supplier & customer (SEMI M1)
6.7	Thickness	SEMI M1	SEMI M1	SEMI M1
6.8	Thickness Variation (TTV)	SEMI M1	SEMI M1	SEMI M1