

SEMI M55.3-0814

SPECIFICATION FOR 150 mm ROUND POLISHED MONOCRYSTALLINE 4H AND 6H SILICON CARBIDE WAFERS

This Standard was technically approved by the Compound Semiconductor Materials Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 12, 2014. Available at www.semiviews.org and www.semi.org in August 2014.

1 Purpose

1.1 This Subordinate Standard details the dimensional values and other information required for 150 mm polished monocrystalline silicon carbide wafers for high power and high frequency applications.

2 Scope

2.1 The complete specification for this product includes all general requirements of SEMI M55.

2.2 The available quality options are intended to reflect the market at the time of publication of this Document. Requirements labeled 'specification' represents market capability at the time of publication of the Standard.

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 The backside finish properties and dopant are not addressed. Currently these properties depend strongly on quickly evolving technology. Suitable limits for a standard do not exist.

3.2 This Standard addresses two types of application: high power and high frequency. Requirements are applicable to both applications types when not stated otherwise.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI M55 — Specification for Polished Monocrystalline Silicon Carbide Wafers

SEMI M81 — Guide to Defects Found on Monocrystalline Silicon Carbide Substrates

SEMI MF534 — Test Method for Bow of Silicon Wafers

SEMI MF673 — Test Method for Measuring Resistivity of Semiconductor Wafers or Sheet Resistance of Semiconductor Films with a Noncontact Eddy-Current Gauge

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

SEMI T5 — Specification for Alphanumeric Marking of Round Compound Semiconductor Wafers

4.2 DIN Standards¹

DIN 50448 — Determination of the Resistivity of Semi-Insulating Semiconductors Using a Capacitor

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *SBIR* — flatness property (See SEMI M1, Appendix 1, *Flatness Decision Tree*. Formerly also named as 'local thickness variation.')

¹ Deutsches Institut für Normung e.V., Available from Beuth Verlag GmbH, Burggrafenstrasse 4-10, D-10787 Berlin, Germany; <http://www.din.de>

5.1.2 *GM3YMCD* — shape property (See SEMI M1, Appendix 3, *Shape Decision Tree* for details. Formerly also named as ‘bow.’)

5.1.3 *GLMYMER* — shape property (See SEMI M1, Appendix 3, *Shape Decision Tree* for details. Formerly also named as ‘warp.’)

6 Requirements

6.1 *Dimension and Tolerance Requirements* — See Table 1.

6.2 *Orientation and Flat Location Requirements* — See Tables 2 and 3.

6.3 *Polished Wafer Defect Limits* — See Table 4.

6.4 *Electrical Requirements* — See Table 5.

6.5 *Lasermark Requirements* — See SEMI T5.

6.6 *Edge Contour Requirements* — Specify by customer and supplier.

6.7 *Surface Metal Contamination* — Specify by customer and supplier.

Table 1 Dimension and Tolerance Requirements

Property	Dimension	Tolerance	Units	Remark
DIAMETER	150.0	±0.20	mm	
PRIMARY FLAT LENGTH	47.5	±2.5	mm	
SECONDARY FLAT LENGTH Option 1: with secondary flat	20.0	±5.0	mm	Lasermark is centered within marking window ^{#1}
SECONDARY FLAT LENGTH Option 2: without secondary flat	No flat			Lasermark is left-aligned within marking window ^{#1}
BOW (GM3YMCD)	$-60 \leq \text{bow} \leq 60$		μm	Test Method SEMI MF534
WARP (GLMYMER)	≤ 60		μm	Test Method SEMI MF1390
LOCALTHICKNESS VARIATION (SBIR)	$\max \leq 5 \mu\text{m}$		μm	On 10×10 mm field, edge exclusion to be agreed by customer + supplier
THICKNESS (option 1)	500	±25	μm	
THICKNESS (option 2)	350	±25	μm	Not for high-frequency applications

#1 Lasermark is always within marking window defined in SEMI T5.

Table 2 Orientation and Flat Location Requirements for 4H *n*-type (Power Application)

Property	Dimension ^{#4}
Surface Orientation ^{#1,#2}	Tilt Angle (see Figure 2 in SEMI M55)
‘off axis ($11\bar{2}0$)’	$2^\circ \pm 0.5^\circ$ parallel to edge of primary flat away from secondary flat ^{#3}
‘off axis ($11\bar{2}0$)’	$4^\circ \pm 0.5^\circ$ parallel to edge of primary flat away from secondary flat ^{#3}
Tolerance of Primary Flat Orientation	$\pm 5^\circ$ ^{#2}
Tolerance of Secondary Flat Orientation ^{#3}	Not specified

#1 The frame of reference is the (0001)-plane of the crystal. It is the wafer normal on the silicon-face that is tilted towards the given crystallographic direction. That means that the crystallographic *c*-axis lies between the secondary flat and the silicon-face surface normal vector (see Figures 1 and 2).

#2 Measured at the center of the wafer.