

SEMI M75-0816

SPECIFICATION FOR POLISHED MONOCRYSTALLINE GALLIUM ANTIMONIDE WAFERS

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Purpose

1.1 The purpose of this Document is to define standard descriptions for the parameters to be specified in the procurement and supply of round wafers of gallium antimonide (GaSb) monocrystalline material.

2 Scope

2.1 This Specification covers the information required for the procurement of round, flatted GaSb wafers and the standard dimensional and orientation conventions for the supply of such wafers.

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 Referenced Standards and Documents

3.1 SEMI Standards and Safety Guidelines

SEMI MF26 — Test Method for Determining the Orientation of a Semiconductive Single Crystal

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

SEMI T5 — Specification for Alphanumeric Marking of Round Gallium Arsenide Wafers

3.2 ASTM Standard¹

ASTM F76 — Standard Test Methods for Measuring Resistivity and Hall Mobility and Determining Hall Mobility in Single-Crystal Semiconductors

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

4 Terminology

4.1 Definitions

4.1.1 *grade* — a quality description agreed on between supplier and customer, related to the intended use of the wafer in device processing.

4.1.2 *growth method* — the technique used to create the single crystal.

4.1.3 *major flat* — straight segment of the wafer edge, abbreviated OF, identifying the direction of the family of {110} planes within the wafer.

4.1.4 *minor flat* — straight segment of the wafer edge, abbreviated IF, oriented 90 degrees clockwise from the major flat.

4.1.5 *off-orientation* — the tilt by which the wafer surface is inclined with respect to the crystal lattice.

4.1.6 *orientation* — the lattice plane nominally parallel to the wafer surface plane.

4.1.7 *resistivity, mobility and carrier concentration ranges* — the allowable upper and lower limits on the electric transport parameters.

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4.1.8 *surface characteristics* — properties of the wafer indicating limits of permissible deviations from the ideally flat surface.

4.2 *Illustrating Remarks on the Definitions*

4.2.1 Commonly used GaSb wafer grades include ‘prime,’ ‘epi-ready,’ ‘process trial,’ ‘test’ or ‘mechanical.’

4.2.2 For GaSb the available methods include Czochralski, Liquid Encapsulated Czochralski (LEC) and Vertical Gradient Freeze (VGF).

4.2.3 For a (100) wafer with no surface off-orientation, the plane of the major flat is parallel to a {110} plane perpendicular to the (100) plane and intersecting either the {111}Ga or {111}Sb planes, which may be exhibited as facets on the grown crystal.

4.2.4 The IF identifies the specific set of {110} planes intersecting either the {111}Ga or {111}Sb planes.

4.2.5 The off-orientation shall specify both the amount θ and the direction α of tilt (see Figure 1).

4.2.6 The great majority of wafers are oriented (100).

4.2.7 The electric transport parameters shall be determined by Hall measurements as prescribed in ASTM F76. They may be influenced by impurity segregation effects during crystal growth. Therefore, the range allowing the maximum material yield from a crystal batch usually corresponds to the values measured at the first-to-freeze or ‘seed’ end and the last-to freeze or ‘tail’ end of a crystal.

4.2.8 These attributes may relate to limits on the areal density of structural defects or contaminants or to the expected behavior of the surface during processing.

5 Ordering Information

5.1 *Mandatory Criteria*

5.1.1 Purchase orders for GaSb wafers furnished to this standard shall include the following items:

5.1.1.1 Growth method

5.1.1.2 Grade

5.1.1.3 Diameter

5.1.1.4 Thickness

5.1.1.5 Single or double side polishing

5.1.1.6 Surface orientation including any requirements for misorientation

5.1.1.7 Conduction type

5.1.1.8 Dopant

5.1.1.9 Resistivity range

5.1.1.10 Mobility range

5.1.1.11 Carrier concentration range

5.1.1.12 Dislocation density as determined by etch pit density

5.2 *Optional Criteria* — The following items may be specified optionally in addition to those listed above:

5.2.1 Total thickness variation

5.2.2 Bow and warp

5.2.3 Surface characteristics

5.2.4 Laser marking

5.2.5 Packaging and labeling