

SEMI T7-1102

SPECIFICATION FOR BACK SURFACE MARKING OF DOUBLE-SIDE POLISHED WAFERS WITH A TWO-DIMENSIONAL MATRIX CODE SYMBOL

This specification was technically approved by the Global Traceability Committee and is the direct responsibility of the North American Traceability Committee. Current edition approved by the North American Traceability Committee on July 19, 2002. Initially available at www.semi.org September 2002; to be published November 2002. Originally published in 1997; previously published March 2002.

1 Purpose

1.1 This specification is intended to provide a marking symbology that can be used to mark silicon wafers with no intrusion into the fixed quality area of the wafer.

2 Scope

2.1 This specification defines the geometric and spatial relationships and content (including the error checking and correcting code) of a rectangular two-dimensional (2-D), machine-readable, binary data matrix code symbol for back surface marking of notched, double-side polished wafers of silicon which comply with SEMI M1.15, and other materials with diameters of 300 mm and larger.

2.2 Although this specification does not specify the marking techniques that may be employed when complying with its requirements, it is assumed that the symbol will be obtained by laser scribing individual dots.

2.3 The matrix code is applicable to a broad range of wafer products including epitaxial wafers, SOI wafers, and unpatterned or patterned polished wafers. The format and algorithms of this code are based on two-dimensional symbology specified in AIM International Symbology Specification-Data Matrix.

2.4 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 Documents

3.1 SEMI Standards

SEMI AUX001 — List of Vendor Identification Codes

SEMI M1.15 — Standard for 300 mm Polished Monocrystalline Silicon Wafers (Notched)

3.2 AIM International Technical Specification¹

AIM/ANSI BC11 — International Symbology Specification — Data Matrix

3.3 ANSI Standards²

ANSI MH10.8.2 — Data Application Identifier Standard

ANSI X3.4-1986 — American Standard Code for Information Interchange (ASCII)

NOTE 1: This standard is equivalent to ISO 646, Information Processing – ISO 7-bit Coded Character Set for Information Exchange.

4 Terminology

4.1 Definitions

4.1.1 *alignment bar, of a data matrix code symbol* — a solid line of contiguous filled cells abutting a line of alternately filled and empty cells [AIM - Data Matrix].

¹ AIM International Inc., 634 Alpha Drive, Pittsburgh, MO 15238-2802. Website: <http://www.aimusa.org>

² American National Standards Institute, 11 West 42nd Street, New York, NY 10036, tel.: 212-642-4900, fax: 212-398-0023.

4.1.2 *binary values* — a dot in the wafer surface indicates the binary value 1. The absence of a dot, or a smooth surface surrounding a cell center point indicates the binary value 0.

4.1.3 *border column* — the outermost column of a data matrix code symbol. This column is a portion of the finder pattern.

4.1.4 *border row* — the outermost row of a data matrix code symbol. This row is a portion of the finder pattern.

4.1.5 *cell, of a data matrix code symbol* — the area within which a dot may be placed to indicate a binary value.

4.1.6 *cell center point, of an array* — the point at which the centerline of a row intersects the centerline of a column.

4.1.7 *cell spacing, of an array* — the (equal) vertical or horizontal distance between the cell center points of contiguous cells.

4.1.8 *center line, of a row or column* — the line positioned parallel to, and spaced equally between, the boundary lines of the row or column.

4.1.9 *central area, of a cell* — the area enclosed by a circle centered at the cell center point; used by code readers to sense the binary value of the cell.

4.1.10 *data matrix code symbol* — a two-dimensional array of square cells arranged in contiguous rows and columns. In certain ECC200 symbols, data regions are separated by alignment patterns. The data region is surrounded by a finder pattern [AIM - Data Matrix].

4.1.11 *dot* — a localized region with a reflectance which differs from that of the surrounding surface.

NOTE 2: To assure reading efficiency, a minimum contrast of 30% is required between the reflectance value of a dot and the surrounding wafer surface. Various densitometers can provide such measurements nondestructively.

4.1.12 *dot misalignment, within a cell* — the distance between the physical center point of a dot and the cell center point.

4.1.13 *finder pattern, of a data matrix code symbol* — a perimeter to the data region. Two adjacent sides contain dots in every cell; these are used primarily to define physical size, orientation and symbol distortion. The two opposite sides are made up of cells containing dots in alternate cells [AIM Data Matrix].

4.1.14 *reference point, of a data matrix code symbol* — the physical center point of a corner cell common to the primary border row and the solid line of the alignment bar, used to identify the physical location of the symbol on the object being marked with the symbol.

NOTE 3: The reference point is at a fixed location on the object. Different cells may be chosen as the reference point depending on the desired orientation of the symbol on the object and the size variability of the symbol. The particular cell to be used as the reference point must be specified for each application.

5 Requirements

5.1 Shape and Size of the Data Matrix Code Symbol

5.1.1 Data Matrix Code Symbol Dimensions

5.1.1.1 Each rectangular matrix code symbol shall be composed of an array of 8 rows and 32 columns with an alignment bar as defined in AIM ISS Data Matrix.

5.1.1.2 Cell spacing shall be 125 μm , center to center.

5.1.2 *Dot Size* — The nominal shape of the dot produced in the matrix may be circular or square. Its diameter or edge length (after polishing) shall be 100 μm + 10 μm – 20 μm .

5.1.3 Border Rows and Columns

5.1.3.1 One border row and one border column shall contain a dot in each cell. These are identified as the primary border row and the primary border column. These are used by the code reader to determine the orientation of the matrix.

5.1.3.2 The opposing (secondary) border row and column shall contain dots in alternating cells.