

SEMI T14-0705

SPECIFICATION FOR MICRO ID ON 300 mm SILICON WAFERS

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NOTICE: The designation number of T14 was updated during the 0705 cycle to reflect the creation of T14.1.

1 Purpose

- 1.1 The purpose of this document is to specify a new means of identification with the Micro ID on 300 mm polished monocrystalline Silicon wafer with polished edge for process control.
- 1.2 The objective of the Micro ID is to keep unique information to be assigned in the device manufacturing process on the location defined on the wafer bevel.

2 Scope

- 2.1 This document assumes that the Micro ID is implemented under the responsibility of Device Manufacturers.
- 2.2 A two-dimensional data matrix code symbol consists of the microdots marked on the bevel of a semiconductor wafer.
- 2.3 Although this specification does not specify the marking techniques that may be employed when complying with its requirements, it is assumed that the microdots will be obtained by laser irradiated individual dots.
- 2.4 The data matrix code symbol is applicable to a broad range of wafer products (un-patterned or patterned wafers) with mirror polished bevel surface.
- 2.5 The format and algorithms of this code are based on two-dimensional symbology specified in ISO/IEC ISS 16022.

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

3.1 SEMI Standards and Safety Guidelines

SEMI M1 — Specifications of Polished Monocrystalline Silicon Wafers

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

SEMI T1 — Specifications for Back Surface Bar Cord Marking of Silicon Wafers

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

3.2 ISO/IEC Standard¹

ISO/IEC ISS 16022 — Information Technology – International Symbology Specification – Data Matrix

3.3 Other Documents

SEMI AUX001 — List of Vendor Identification Codes

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

¹ International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland; Telephone: +41.22.749.01.11, Fax: +41.22.733.34.30, <http://www.iso.org>

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. [ISO/IEC ISS 16022]

4.1.2 *binary values* — a protrusion 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 center point, of an array* — the point at which the centerline of a row intersects the centerline of a column.

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

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. [ISO/IEC ISS 16022]

4.1.11 *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. [ISO/IEC ISS 16022]

4.1.12 *Micro ID* — Micro ID consists of the data matrix code symbol, which is formed with some protruding marks on the silicon wafers.

4.1.13 *protrusion dot* — a locally protruded region with a reflectance which differs from that of the surrounding surface.

NOTE 1: 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.

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

5 Requirements

5.1 Shape and Size of the Data Matrix Code Symbol

5.1.1 Each square data matrix code symbol shall be composed of an array of 16 rows and 16 columns as defined in ISO/IEC ISS 16022. (As shown in Figure 1.)

5.1.2 Cell spacing shall be 6.25 μm , center to center. (As shown in Figure 2.)

5.2 Shape and Size of the Microdot Mark

5.2.1 A microdot mark is formed by laser irradiation and consists of a single dot mark on each laser-irradiated point.

5.2.2 The mark has a single protrusion, which includes a concave portion provided around the protrusion and lower than a surface of the wafer and whose center portion protrudes upward so as to be higher than the surface of the wafer.

5.2.3 The length of each dot mark along the surface of the article to be marked should be 6.0 μm + 10% – 20%. (As shown in Figure 3.)

5.3 Border Rows and Columns

5.3.1 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. They are used by the code reader to determine the orientation of the matrix.

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

5.3.3 The reference point shall be the physical center point of corner cell common to the primary border row and the primary border column. (As shown in Figure 4.)

5.3.4 The maximum dot misalignment within a cell is 1.4 μm . This ensures that a minimum size dot covers a cell central area of radius 1 μm .

5.4 Content of the Data Matrix Code Symbol

5.4.1 Each square data matrix code symbol shall contain 16 message characters, together with the error checking and correcting (ECC200) code characters, encoded in accordance with ISO/IEC ISS 16022.

5.4.2 The message characters shall include the following: A–Z, 0–9, and dash (–).

5.5 Location of the Data Matrix Code Symbol

5.5.1 With the wafer positioned front surface up and with the primary fiducial (notch) toward the operator, the origin of the data matrix code symbol shall be located as specified below. (As shown in Figure 5.)

5.5.1.1 *Circular Position* — the reference point shall be located along the perimeter by $3.0 \pm 0.1^\circ$ counterclockwise from the axis of the notch fiducial bisector. (As shown in Figure 5.)

5.5.1.2 *Radial Position* — the mark position of Micro ID is decided by the responsibility of Device Manufacturers on the bevel area where the Micro ID is survived even after the CMP processing and the backside grind. (Related Information in Figure R1-2.)

5.5.2 The primary border row of the data matrix code symbol shall be placed toward the periphery of the wafers, and the primary border column of the data matrix code symbol shall be placed toward the center of the wafers, originating from the reference point.

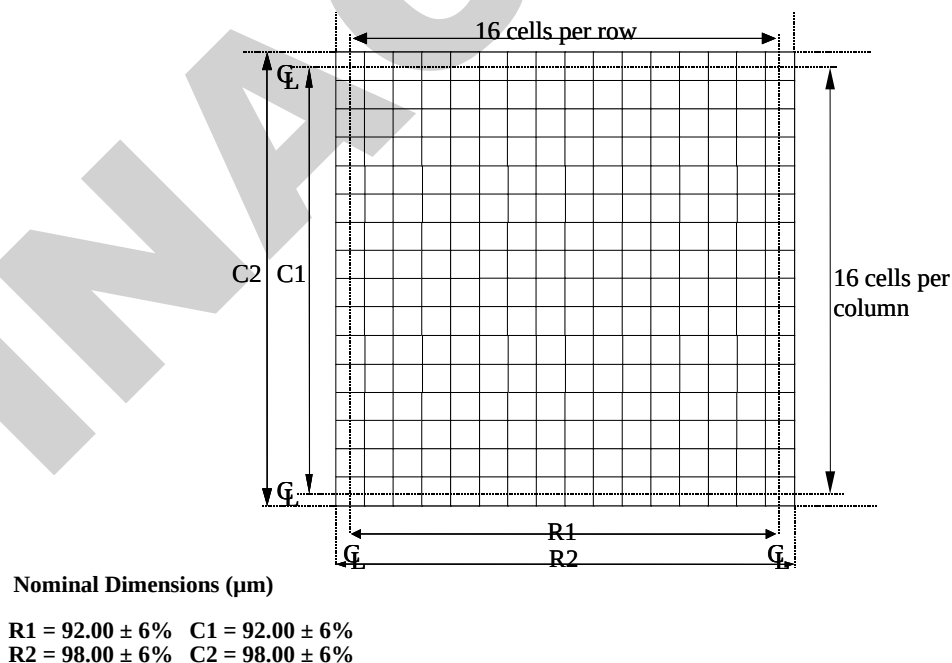


Figure 1
Data Matrix Field Dimensions
ECC200 - 16 rows $\times$ 16 columns