

SEMI T11-0703 (Reapproved 0921) SPECIFICATION FOR MARKING OF HARD SURFACE RETICLE SUBSTRATES

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NOTICE: Paragraphs entitled ‘NOTE:’ are not an official part of this Standard or Safety Guideline and are not intended to modify or supersede the official Standard or Safety Guideline. These have been supplied by the global technical committee to enhance the usage of the Standard or Safety Guideline.

NOTICE: The section symbol (§) is used to reference a numbered section, paragraph, or header and all subordinate paragraphs, headers, and embedded material (i.e., EXCEPTIONs, lists) therein. The paragraph symbol (§) is used to reference a particular numbered paragraph and embedded material therein. When duplicated (i.e., §§ and §§) the symbols are used to reference more than one section or paragraph, respectively.

1 Purpose

1.1 This Specification provides a symbology for marking hard surface reticle substrates within the edge exclusion area of the substrate.

2 Scope

2.1 This Specification defines the geometric and spatial relationships and content (including error checking and correcting code) of square two-dimensional, machine-readable, Data Matrix symbols for pattern-surface marking of resist-coated 6 inch reticle substrates that comply with the specifications of SEMI P1.

2.1.1 This Specification addresses only the Data Matrix field characteristics and location. This Data Matrix field may contain the information previously contained in various bar code symbols on 6 inch reticles. The format of such information is not detailed in this Specification.

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 This Specification does not cover any other code fields on the reticle. These might be stepper-specific or user-specific or both. The location, symbology, and content of these other fields, if they exist, are determined between reticle supplier and user.

NOTE 1: Data Matrix symbology is applicable to a broad range of semiconductor products including virgin wafers, processed and patterned FPD substrates, lead frames and reticles. The format and algorithms of this code are based on two-dimensional symbology specified in ISO/IEC 16022.

3.2 Although this Specification does not specify the marking techniques to be employed when complying with its requirements, it is assumed that the symbol will be obtained by exposure of individual dots in a resist coating with an e-beam, laser, or other pattern-generation tool.

NOTE 2: An experiment executed by International SEMATECH found such e-beam marks to be suitable for the application.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI P1 — Specification for Hard Surface Photomask Substrates

4.2 ANSI Standards¹

ANSI MH10.8.2 — Data Application Identifier Standard

4.3 ISO/IEC Standards²

ISO/IEC 16022 — Information Technology – Automatic Identification and Data Capture Techniques – Data Matrix Bar Code Symbol Specification

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

5 Terminology

5.1 Terms relating to the Data Matrix code symbol characteristics are defined in ISO/IEC 16022.

5.2 Definitions of terms relating to the marking area are as follows:

5.3 Definitions

5.3.1 *mark area* — a rectangular area containing the mark field(s) and the surrounding quiet zone.

5.3.2 *mark field* — an area within which all mark elements occur.

5.3.3 *quiet zone* — an unpatterned, unmarked area that surrounds a mark field.

6 Ordering Information

6.1 Purchase orders for substrates furnished to this Specification shall specify the following optional items:

6.1.1 Number (15 to 91) of message characters.

6.1.2 Content of Message Characters 16 and up, if present.

7 Requirements

7.1 Data Matrix Code Symbol Dimensions

7.1.1 Each square matrix code symbol shall be composed of an array of 32 rows and 32 columns (see Table 1 and Figure 1) as defined in compliance with ISO/IEC 16022.

7.2 Cell Dimensions

7.2.1 Cell spacing shall be 100 µm, center to center.

7.2.2 Cell shape shall be square.

7.2.3 Cell size shall be 100 ± 5 µm.

7.2.4 *Dot Misalignment* — The symbol shall be readable in accordance with ISO/IEC 16022.

7.3 Border Rows and Columns (see Figure 1)

7.3.1 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.

7.3.1.1 The opposing (secondary) border row and column shall contain dots in alternating cells, as shown in Figure 1.

7.3.2 For square Data Matrix code symbols, the reference point of the symbol is generally the physical centerpoint of the cell common to the primary border row and the primary border column. However, for the present application it is more convenient to reference the location of the Data Matrix code symbol to the bottom left corner of the cell containing the reference point, identified in the figures as the ‘reference corner.’

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7.4 Quiet Zone

7.4.1 The quiet zone surrounding the Data Matrix code symbol shall be four cells (400 μm) wide.

7.4.2 The area between the quiet zone and the nearest side of the pellicle frame shall be filled with an unpatterned chrome film.

7.5 Content of the Data Matrix Code Symbol

7.5.1 Each square Data Matrix code symbol shall contain between 15 and 91 message characters, together with error checking and correcting (ECC) 200 code characters, encoded in accordance with ISO/IEC 16022.

7.5.2 The message characters may include any of those designated as EDIFACT in ISO/IEC 16022.

7.5.3 The first 15 message characters shall contain supplier-assigned 8-character substrate identification code, followed by a 7-character supplier (manufacturer) identification code defined by UCC as a six-digit company identification, preceded by a zero (0).

7.5.4 The remaining message characters, if any, shall contain information as agreed between the supplier and user. This may require field identifiers and field concatenators (see ANSI MH10.8.2).

7.6 Location of the Data Matrix Code Symbol

7.6.1 With the substrate positioned front surface up and with the substrate's reference corner toward the operator and to the operator's left, the lower left corner of the Data Matrix code symbol shall be located 139.6 ± 0.5 mm to the right and 110.4 ± 0.5 mm above the substrate's reference corner.

7.6.2 This places the 32 row $\times$ 32 column square Data Matrix code symbol entirely within a 14 mm wide edge exclusion area (see Figure 2).

7.6.3 The primary border row of the symbol shall be parallel with the adjacent edge of the substrate $\pm 10.0^\circ$. The primary border column of the symbol shall be nominally perpendicular to the same edge.

7.6.4 *Mark Area Dimensions* — The mark area shall be 4.0 mm $\times$ 4.0 mm.

Table 1 Data Matrix Code Symbol Dimensions

Type of array	Square
Cell spacing (center to center)	100 μm (nominal)
Dot size (diameter or edge length)	100 ± 5 μm
Dot misalignment	10 μm , max.
Number of cells in row	32
Number of cells in column	32
C_1	3.100 mm
R_1	3.100 mm
C_2	3.200 mm
R_2	3.200 mm
Width of quiet zone	400 μm (nominal)