

SEMI D32-0303 (Reapproved 0709) SPECIFICATION FOR IMPROVED INFORMATION MANAGEMENT FOR GLASS FPD SUBSTRATES THROUGH ORIENTATION CORNER UNIFICATION

This standard was technically approved by the global Flat Panel Display – Factory Automation Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 13, 2009. It was available at www.semi.org in June 2009 and on CD-ROM in July 2009. Originally published March 2003.

1 Purpose

1.1 This specification provides the location, dimensions, and message size of the marking symbol that consists of a two-dimensional code symbol and related alpha numeric characters (capable of being read visually through the reader camera and display) and is located outside of the quality area of glass flat panel display (FPD) substrate.

1.2 The marking symbol in this specification allows the inclusion of identification information for each individual substrate together with the additional information previously provided by various orientation corner (OC) cut shapes.

1.3 Thus, this specification allows suppliers of glass substrates for FPDs to simplify substrate information management by marking such information in one location around the OC on the substrate, before shipping. In addition, use of this marking symbol will facilitate the future elimination of the numerous types of OC cut shapes presently in use.

1.4 The marking symbol covered by this specification is intended for use by suppliers and purchasers of glass substrates for FPDs.

2 Scope

2.1 This specification provides for a standardized OC location in support of future unification of the OC cut shape as well as location. When this is done, the provisional nature of the specification can be removed.

2.2 This specification covers the content, dimensions, and surface positioning of the marking symbol located outside of the quality area of glass substrates for FPD use.

2.2.1 This marking symbol is marked in a manner and location to avoid affecting the user patterning process.

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

2.3 Marking symbols are applicable across all stages of FPD processing, from virgin substrates to fully patterned substrates. The format and algorithm for the Data Matrix code is based on two-dimensional symbology specified in ISO/IEC 16022.

NOTICE: 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 and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 Since the symbol is marked in a region of the substrate outside of the quality area, it is not available for use after this area is cut off.

3.2 Since only a single symbol is marked on each substrate, the marking symbol is not directly applicable for management of individual panels in multi-panel displays.

4 Referenced Standards and Documents

4.1 ISO/IEC Standard¹

ISO/IEC 16022 — International Symbology Specification – Data Matrix

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 alphanumeric characters are as follows:

5.2.1 *character separation* — the horizontal distance between the adjacent boundaries of any two adjacent characters.

5.2.2 *character separation, vertical* — the vertical distance between the adjacent boundaries of any two adjacent characters.

5.2.3 *character spacing* — the horizontal distance between the character centerlines of two adjacent characters.

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

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 dots occur.

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

5.3.4 *TIR* — total indicator reading, the difference between the maximum and minimum distances of a line from a reference line.

6 Ordering Information

6.1 Content information of mark, as agreed to between purchaser and supplier.

6.2 Number of message characters (up to a maximum of 20, see ¶ 7.7.1), as agreed to between purchaser and supplier.

7 Requirements

7.1 *Orientation Corner* — The OC location shall be the lower left corner of the substrate with the pattern surface up and the long edge at the bottom. Since the necessary information is encoded in the identification marks, it is not necessary to distinguish the shapes of the other corners of the substrate. OC cut shape is not specified at this time, but it is expected that in the future a single shape will be established for the next generation of substrates.

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7.2 Shape, Size, and Location of Marking Symbols

7.2.1 The location of the mark field relative to the orientation corner and the adjacent edges of the substrate shall be as shown in Figure 1. The reference point of the two-dimensional code symbol, together with a parallelism requirement, locates the entire mark field.

7.2.2 The mark field dimensions and the symbols within the mark field shall be as shown in Figure 2.

7.2.3 Overall mark area dimensions shall be as shown in Figure 3.

7.2.4 The values of the dimensions shall be as defined in Tables 1 and 2.

7.3 Data Matrix Code Symbol Dimensions

7.3.1 Each rectangular Data Matrix code symbol shall be composed of an array of 18 rows and 18 columns, as shown schematically in Figure 4.

7.3.2 Cell spacing shall be 80 μm , center to center.

7.3.3 The Data Matrix code symbol shall be constructed such that it can be read in accordance with ISO/IEC 16022.

7.4 Alphanumeric Symbol Dimensions

7.4.1 Use of the modified SEMI OCR Character Set as defined in Table 3 is recommended.

7.4.2 Characters shall be marked in a dot matrix format, contained within a character window 0.72 mm high $\times$ 0.40 mm high.

7.4.3 Character window separation shall be 0.24 mm horizontally and 0.16 mm vertically.

7.5 *Reference Point* for all symbols shall be the center point of the cell common to the primary border row and primary border column of the Data Matrix code symbol.

7.6 *Mark Field Dimensions* shall be in accordance with the dimensions D and F given in Table 2. Parallelism (T) of the top of the mark field within dimension L , relative to the nearest edge, shall be ≤ 1.0 mm TIR.

7.7 Message Characters

7.7.1 Up to 20 alphanumeric characters in the character set listed in Table 3 shall be encoded in the two-dimensional code symbol, and alphanumeric characters with the same content shall be placed symmetrically around the two-dimensional code symbol as shown in Figure 2. The message content is not defined, but it does not include any check sum characters. It may include information provided by the glass substrate supplier, and the remainder of the message characters, if any, can be used to insert information agreed on between supplier and purchaser. If the message contains less than 20 characters, a dash (–) may be inserted for the unused characters, at the supplier's discretion.

7.7.2 The Data Matrix code symbol shall be encoded with error checking and correcting characters in accordance with ECC 200 in accordance with ISO/IEC 16022.

7.7.3 Alphanumeric characters shall:

7.7.3.1 Be positioned such that their lower part faces toward the nearest edge of the glass substrate.

7.7.3.2 Contain message characters identical to those encoded in the Data Matrix code field.