

SEMI M13-0523

SPECIFICATION FOR ALPHANUMERIC MARKING OF SILICON WAFERS WITH CRYSTAL PROPERTIES

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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.

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.

1 Purpose

1.1 This Specification describes an alphanumeric marking system for silicon wafers. The marking code includes information on the origin, approximate resistivity, dopant species, and crystal growth orientation in addition to a wafer identification number. Use of this Specification ensures the consistency of all wafer marking performed by silicon manufacturers. This consistency allows simplification of the performance requirements of automatic optical character reading (OCR) equipment. In addition, the alphanumeric character size provides for human readability of the mark.

1.2 By defining the basic code used to characterize the individual wafer, this Specification provides the information needed for practical operator interpretation.

1.3 The alphanumeric marking of this Specification is valid for a broad range of wafer products (e.g., polished, epi, SOI, in-process, and patterned wafers, etc.).

2 Scope

2.1 This Specification defines the character set, location, and associated dimensions and tolerances of an alphanumeric code, specifically for identification of flatted and notched silicon wafers.

2.2 This Specification does not address the marking techniques that may be employed when complying with this Standard.

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 M1 — Specification for Polished Single Crystal Silicon Wafers

SEMI M20 — Practice for Establishing a Wafer Coordinate System

3.2 Other Documents

SEMI AUX001 — List of Vendor Identification Codes

SEMI AUX015 — SEMI OCR Character Outlines

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

4 Terminology

4.1 Definitions

4.1.1 *adjacent character misalignment, R_{adj}* — the vertical distance between the character baselines of two adjacent characters on the same line.

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

4.1.3 *character spacing* — the horizontal distance between the character spacing reference lines of the adjacent characters.

4.1.4 *character window* — the rectangular window within which all characters shall be contained.

4.1.5 *front surface of a wafer* — the exposed surface upon which active semiconductor devices have been or will be fabricated.

4.1.6 *line character misalignment, R_{line}* — the vertical distance between the character baselines of the highest and lowest characters on the same line.

5 Shape and Size of Marking

5.1 Solid line or dot matrix method may be used to write characters. The minimum matrix shall be five dots horizontal and nine dots vertical as shown in Figure 1. More dots may be used, up to and including a solid line. Higher density is recommended, especially for use with the larger code size applicable to notched wafers, to achieve improved read reliability (refer to Related Information 1).

5.2 *Character Dimensions and Spacing* — Refer to Table 1 and Figure 1.

5.3 *SEMI OCR Standard Character Set* — Refer to Figure 2 and SEMI AUX015.

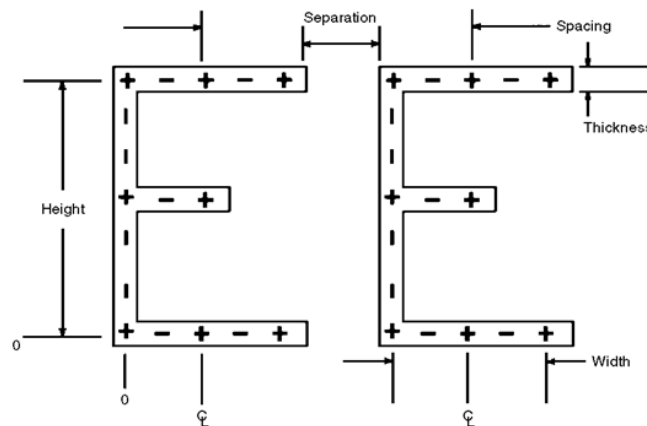


Figure 1
Character Outline

6 Alphanumeric Code

6.1 *Message Content* — The code consists of one line of 18 characters. The first eight characters are an identification number that is unique to the wafer for a given supplier. These characters may be alphanumeric except character 8, which shall be numeric (refer to Table 2). Characters 9 and 10 are the supplier identification code (refer to SEMI AUX001) (refer to Figure 3 and Table 2).

NOTE 1: In the absence of a character at any assigned location, a dash (–) shall be used.

6.2 Character Window Location and Dimensions — The alphanumeric character window location on the front surface of the wafers is shown in Figures 4 and 5 for flatted and notched wafers, respectively. All characters shall be contained within the specified window dimensions.

6.2.1 The option to locate the alphanumeric character window on the back surface of the wafers is also shown in Figures 4 and 5 for flatted and notched wafers, respectively. However for back surface marks it is understood that the figures now represent viewing the wafer backside.

NOTE 2: Back surface marking as an option is based on mutual agreement between user and supplier with clear description as ‘Back Surface Marking’ included in the agreement.

NOTE 3: These figures, together with wafer dimensional characteristics specified in SEMI M1 and use of wafer coordinates (refer to SEMI M20) permit determination of the (x, y) coordinates, within tolerances, of any feature within the alphanumeric character window.

6.2.2 Character orientation, either top-toward-center (shown in Figures 4 and 5) or top-toward-edge, shall be specified by mutual agreement between user and supplier.

6.3 Character Alignment

6.3.1 Character Skew — the maximum allowable angle between the character baseline and a line parallel with the bottom of the character window shall be 3 degrees (refer to Figure 6).

6.3.2 Maximum Character Misalignment — the maximum adjacent character misalignment, R_{adj} , shall be 0.23 mm (refer to Figure 7), and the maximum line character misalignment, R_{line} , shall be 0.46 mm (refer to Figure 8).

Table 1 Character Dimensions

Character	100 mm, 125 mm, and 150 mm Flatted Wafers, mm	200 mm Notched Wafers, mm
Height	0.812 ± 0.025	1.624 ± 0.025
Width	0.406 ± 0.025	0.812 ± 0.025
Thickness	0.100 ± 0.050	$0.200 + 0.025$ or -0.150
Spacing	0.710 ± 0.025	1.420 ± 0.025
Minimum Separation	0.104	0.308

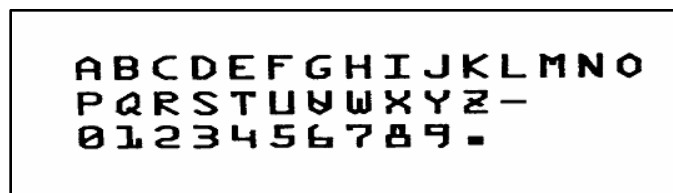
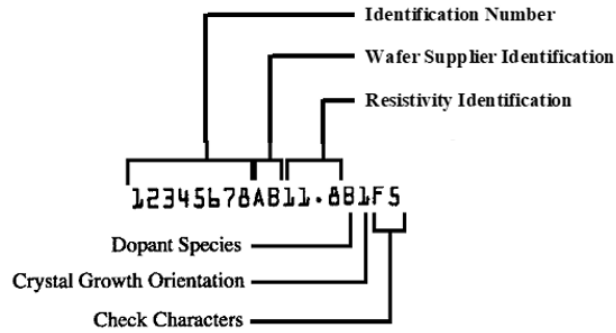


Figure 2
Standard Character Set



Identification Number	12345678
Wafer Supplier Identification	Refer to SEMI AUX001
Resistivity Identification	11.8 $\Omega \cdot \text{cm}$
Dopant Species	Boron
Crystal Growth Orientation	[111]
Check Characters (F5)	Machine input for code acceptance

Figure 3
Example of Code