



SEMI M12-0998

SPECIFICATION FOR SERIAL ALPHANUMERIC MARKING OF THE FRONT SURFACE OF WAFERS

1 Scope

1.1 This specification defines the geometric and spatial limits of the alphanumeric code, specifically for serial identification of flatted and notched silicon wafers. It also defines the basic code used to characterize the individual wafer, using database systems. This specification will ensure the consistency of all wafer marking performed by wafer manufacturers. This will allow simplification of the performance requirements of Automatic Optical Character Reading (OCR) equipment, provide unassisted and immediate human readability without wafer handling, and facilitate resolution of wafer level process variations. This document does NOT address the marking techniques that may be employed when complying with this standard. The marking code is intended to be valid for a broad range of wafer products (i.e., epi, SOI, processed polished wafers).

2 Applicable Documents

2.1 American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. Character Set and Print Quality for Optical Character Recognition (OCR-A) x 3.17-1981.

3 Selected Definitions

3.1 *adjacent character misalignment* — The vertical distance, R, between the character baselines of two adjacent characters on the same line (see Figure 6a).

3.2 *character separation* — The horizontal distance between the adjacent boundaries of any characters (see Figure 1).

3.3 *character spacing* — The horizontal distance between the character centerlines of the adjacent characters (see Figure 1).

3.4 *character window* — The rectangular window within which all characters must be contained as shown on Figures 3 and 4 with dimensions of 18.5 mm long and 2.8 mm high as located on these figures.

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

3.6 *line character misalignment* — The vertical distance, R, between the character baselines of two characters on the same line (see Figure 6b).

4 Shape and Size of Marking

4.1 Solid line or dot matrix method may be used to write characters. The minimum matrix shall be 5 dots horizontal and 9 dots vertical. More dots may be used, up to and including a solid line. Higher density is recommended to achieve improved read reliability (see Appendix 3).

4.2 *Character Dimensions and Spacing* — (see Table 1 and Figure 1)

Table 1. Character Dimensions

Character	mm
Height	1.624 ± 0.025
Width	0.812 ± 0.025
Thickness (See NOTE 1)	$0.200 +0.050/-0.150$
Spacing	1.420 ± 0.025

NOTE 1 — The thickness of the diagonal in the letter "N" is 0.138 ± 0.05 mm for single density dot matrix.

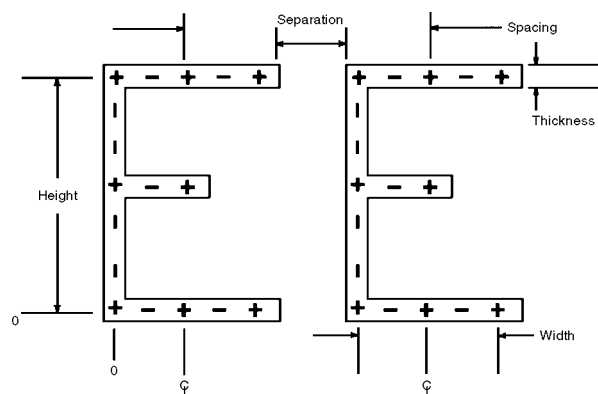


Figure 1
Character Outline



Table 2. Code

Character Location	Character Style	Parameter	Code		Definition
1	Alpha/Numeric	IDENTIFICATION NUMBER	ABCD	0 1	Vendor-Assigned (see NOTE)
2	Alpha/Numeric	IDENTIFICATION NUMBER	EFGH	2 3	Vendor-Assigned (see NOTE)
3	Alpha/Numeric	IDENTIFICATION NUMBER	IJKL	4 5	Vendor-Assigned (see NOTE)
4	Alpha/Numeric	IDENTIFICATION NUMBER	MNOP	6 7	Vendor-Assigned (see NOTE)
5	Alpha/Numeric	IDENTIFICATION NUMBER	QRST	8 9	Vendor-Assigned (see NOTE)
6	Alpha/Numeric	IDENTIFICATION NUMBER	UVWX		Vendor-Assigned (see NOTE)
7	Alpha/Numeric	IDENTIFICATION NUMBER	YZ		Vendor-Assigned (see NOTE)
8	Numeric Only	IDENTIFICATION NUMBER			Vendor-Assigned (see NOTE)
9	Alpha Only	VENDOR IDENTIFICATON	A through Z		See Table A1-1 for Vendor Identification (see NOTE)
10	Alpha Only	VENDOR IDENTIFICATION			See Table A1-1 for Vendor Identification (see NOTE)
11	Alpha Only	CHECK CHARACTERS	A through H		Error-Detecting Method (see Section 13)
12	Numeric Only	CHECK CHARACTERS	0 through 7		Error-Detecting Method (see Section 13)

NOTE — In the absence of information at any assigned location, a dash (-) must be used.

5 Alphanumeric Code

5.1 The code consists of one line of 12 characters. The first eight characters are an identification number which is unique to the wafer for a given vendor. These characters may be alphanumeric (except character 8 which must be numeric — see Table 2). Characters 9 and 10 are the vendor identification (see Table A1-1). Characters 11 and 12 are check characters (see Sections 8 through 13). These check characters are machine generated for code acceptance.

5.2 In the absence of a character at any assigned location, a dash (-) must be used.

5.3 An example of the code is given in Figure 2.

5.4 SEMI-OCR Standard Character Set — See Table 3 and Appendix 2.

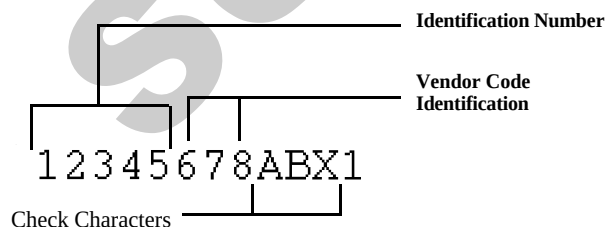


Figure 2
Example of Code

Table 3. Standard Character Set

A B C D E F G H I J K L M N O
 P Q R S T U V W X Y Z -
 0 1 2 3 4 5 6 7 8 9 .



6 Character Window

6.1 Character window must be located on the front surface of the wafers.

6.2 All characters must be contained within the character window dimensions specified in Figures 3 and 4 (dashed lines).

6.3 The top of the characters is toward the side of the character window nearest to the flat or notch.

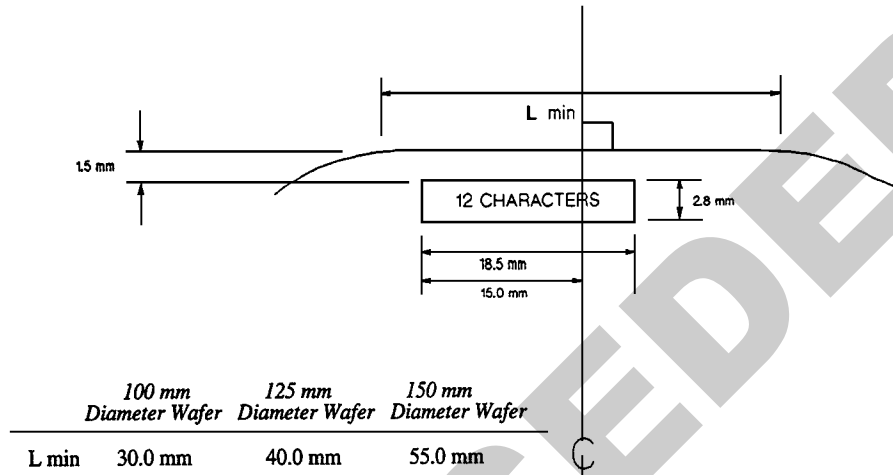


Figure 3
Character Window Location for Flatted Wafers

NOTE: The vertical center line referenced in Figure 3 is the bisector of the primary fiducial (flat).

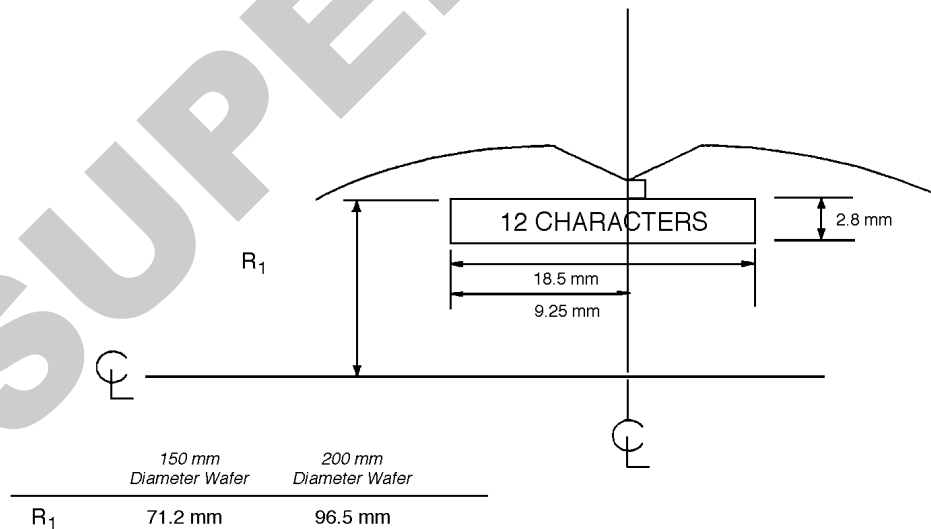


Figure 4
Character Window Location for Notched Wafers

NOTE: The vertical center line referenced in Figure 4 is the bisector of the primary fiducial (notch).

7 Character Alignment

7.1 *Character Skew* — the maximum angle between the character baseline and a line parallel with the bottom of the character window is 3 (see Figure 5).

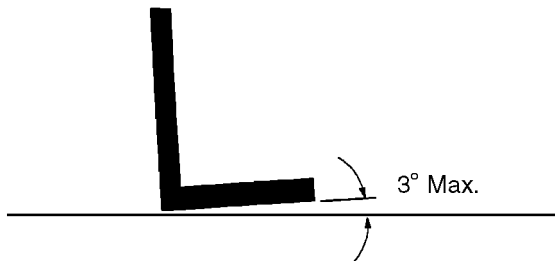


Figure 5
Character Skew

NOTE: This line is parallel to the bottom of the character window.

7.2 *Maximum Character Misalignment* — the maximum misalignment between adjacent characters is 0.23 mm (see Figure 6a), and the maximum line character misalignment is 0.46 mm (see Figure 6b).

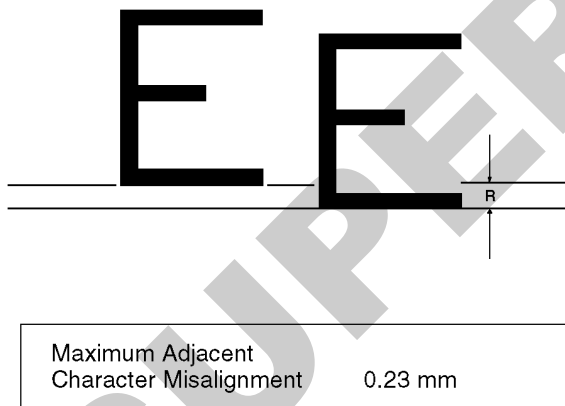


Figure 6A
Character Misalignment

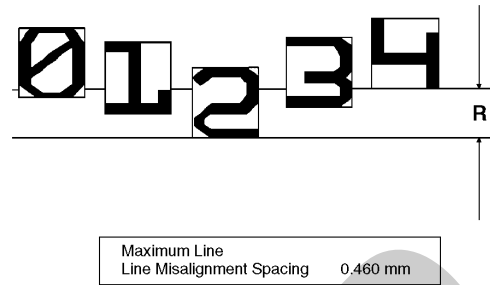


Figure 6B
Line Spacing Misalignment

8 Alphanumeric Error-Detecting Method

8.1 The alphanumeric check characters in character locations 11 and 12 are a required part of the Vendor Code.

8.2 All single-character substitution errors are detected.

8.3 All two-character transposition errors are detected for any message up to 58 characters in length.

8.4 The character set may be expanded to include the first 59 characters of the ASCII 64-character set.

8.5 There exist simple recursive algorithms for error detection and check character generation that do not require the use of multiplication or division.

9 Definition of the Error-Detecting Method

9.1 For the purpose of describing the error-detecting method, we define the following symbols:

A_i represents the i th ASCII character.

a_i represents the numerical value assigned to A_i .

9.2 The characters are numbered from left to right, so that the message is given by

$$A_1 A_2 A_3 \dots A_{12}$$

9.3 A complete description of the error-detecting method is given by the following seven rules:

9.3.1 The numerical value a_i is found by subtracting 32 from the ASCII decimal representation of A_i (refer to Table 4 — Character Values).

9.3.2 An ASCII character A_i is allowed only if its numerical value a_i is one of

$$0, 1, 2, \dots, 58.$$