

SEMI T5-1022

SPECIFICATION FOR ALPHANUMERIC MARKING OF ROUND COMPOUND SEMICONDUCTOR WAFERS

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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.

1 Purpose

1.1 The purpose of this Specification is to define standard criteria for the alphanumeric marking of round compound semiconductor wafers, in order to improve the consistency of wafer marking and allow simplification of the performance requirement of automatic optical character recognition (OCR) equipment.

2 Scope

2.1 This Specification defines the geometric and spatial limits of the alphanumeric code, specifically for nominally round, flatted or notched compound semiconductor wafers. It also defines the basic code used to characterize the individual wafer, thereby providing practical operator interpretation. This Specification does not address the marking techniques that may be employed when complying with this Standard nor does it address any health issues associated with those techniques.

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 M12 — Specification for Serial Alphanumeric Marking of the Front Surface of Wafers

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* — the vertical distance, r , between the character baselines of two adjacent characters on the same line.

4.1.2 *character height* — the vertical distance between the lowest and the highest centerpoints of a character.

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

4.1.4 *character skew* — the angle between the character baseline and a line parallel with the bottom of the character window.

4.1.5 *character spacing (also known as pitch)* — the horizontal distance between the character spacing reference lines of the adjacent characters.

4.1.6 *character width* — the horizontal distance between the most left and the most right centerpoint of a character.

4.1.7 *character window* — the rectangular window within which all characters must be contained.

4.1.8 *code field (also known as character window)* — the rectangular window within which all characters must be contained.

4.1.9 *front surface of the wafer* — the surface upon which active semiconductor devices have been, or will be, fabricated.

4.1.10 *line character misalignment* — the vertical distance, R , between the character baselines of any two characters on the same line.

5 Shape and Size of Marking

5.1 Dot matrix method shall be used to write characters. The minimum matrix shall be 5 dots horizontal and 9 dots vertical as shown in Figure 1. More dots may be used up to and including a solid line.

NOTE 1: Double density is recommended to achieve improved readability. An example of double density is shown in Figure 2.

NOTE 2: A solid line is not recommended on some substrates (e.g., GaAs, InP and InSb), since it may increase wafer breakage.

5.2 *Character Dimensions and Spacing* — Refer to Table 1 and Table 2, and Figure 1 and Figure 2.

5.2.1 *Single Density Characters* — Figure 1 shows the SEMI OCR font in single density mode, using a dot matrix of 5 dots horizontal and 9 dots vertical.

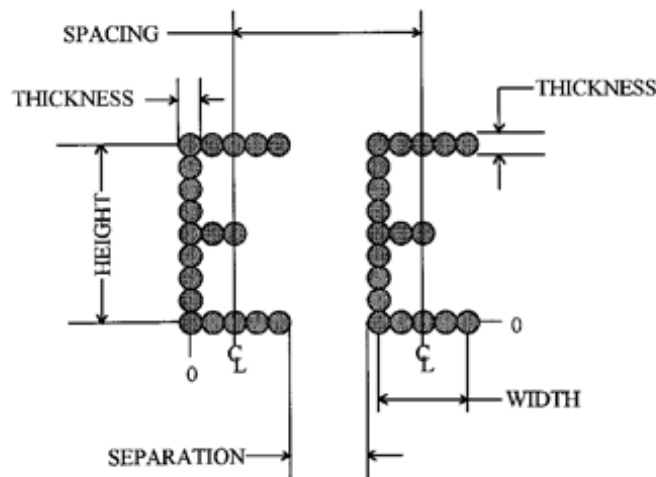


Figure 1
Character Outline for Single Density OCR Font (5 × 9 Dot Matrix)

5.2.2 *Double Density Characters* — Figure 2 shows the SEMI OCR font in double density mode, using a dot matrix of 10 dots horizontal and 18 dots vertical.

NOTE 3: The origin of this matrix is denoted by the intersection of the horizontal and vertical '0' lines. Single-density mode places the matrix origin at the center of a single dot. Double density mode places the matrix origin centered among four dots.

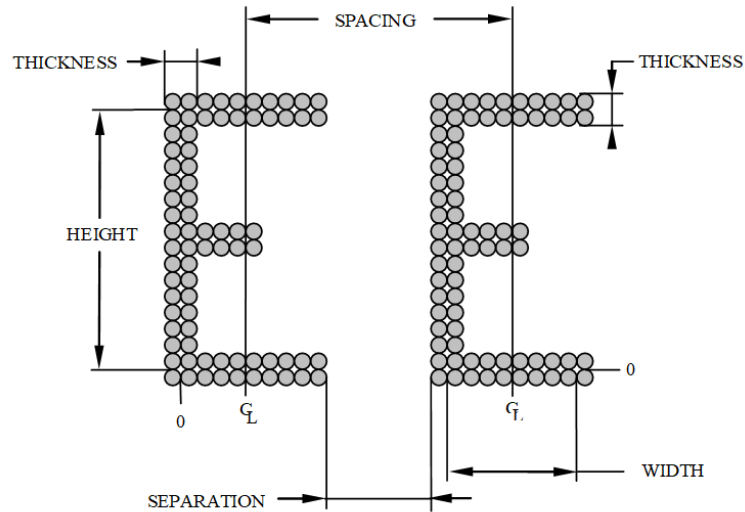


Figure 2
Character Outline for Double Density OCR Font (10 × 18 Dot Matrix)

Table 1 Character Dimensions and Spacing — Configuration A — 3 inch, 100 mm, 125 mm, 150 mm, 200 mm, Option for 2 inch Wafers

Character	(mm)
Height	1.624 ± 0.025
Width	0.812 ± 0.025
Thickness	0.200 + 0.050 – 0.150
Spacing	1.420 ± 0.025
Minimum Separation	0.400

Table 2 Character Dimensions and Spacing — Configuration B — 2 inch, Option for 3 inch Wafers

Character	(mm)
Height	0.812 ± 0.025
Width	0.406 ± 0.025
Thickness	0.100 ± 0.050
Spacing	0.710 ± 0.025
Minimum Separation	0.104

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

5.3 SEMI OCR Standard Character Set — Refer to Figure 3 and SEMI AUX015.

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 .

Figure 3
Standard Character Set

6 Alphanumeric Code

6.1 *Code* — For GaAs, InP and InSb, the code is limited to one line of 20 characters maximum; for 150 mm SiC, GaN, and AlN, the code is limited to one line of 18 characters maximum (refer to Figure 4, Figure 5, Figure 6, 7 and 8, and Table 3 for examples). Fewer characters may be used without using leading or trailing dashes. The first five to ten characters are an identification code that is unique to the ingot for a given supplier. This is followed by a dash, which is followed by two or three digits that indicate the wafer number, as numbered starting from the seed end of the ingot. The next two alpha characters identify the vendor according to SEMI AUX001. The last optional characters are specified by the vendor or customer (refer to ¶ 6.2 and Table 4). For 200 mm SiC, the code consists of one line of 12 characters. The first eight characters are an identification code which is unique to the wafer for a given vendor. These characters may be alphanumeric except character 8 which must be numeric (refer to Table 5). Characters 9 and 10 comprise the supplier identification code (refer to SEMI AUX001). Characters 11 and 12 are check characters (refer to SEMI M12). These check characters are machine generated for code acceptance and reading verification.

NOTE 4: The maximum total number of characters is fewer for SiC, GaN, and AlN because optional characters indicating surface orientation and doping are not used for these materials.

Table 3 Format Requirements of ID-String for Laser Marking of Wafers with Diameters ≤150 mm

<i>Parameter</i>	<i>Definition</i>	<i>Character Style</i>	<i>Number of Characters</i>	
Ingot ID Code	Supplier-assigned	Alphanumeric	5–10	Required
dash	A spacer		1	Required
Wafer number	Number of wafer within ingot	Numeric only	2–3	Required
Vendor Identification Code	SEMI AUX001	Alpha only	2	Required
Specification Characters	Supplier- or customer-specified	One Numeric or Dash; followed by One Alpha	0 or 2	Optional (for GaAs, InP and InSb only)
Checksum		One Alpha; followed by One numeric	0 or 2	Optional
Maximum Total Number of Characters for GaAs, InP, InSb			20	
Maximum Total Number of Characters for SiC, GaN, AlN			18	

Table 4 Special Code Characters for Wafer Diameters ≤150 mm

<i>Character Location</i>	<i>Parameter</i>	<i>Code</i>	<i>Definition</i>
First Optional Character	Checksum Character	A ... H	Refer to SEMI M12
	Front Surface Orientation	0	(100)
		2	(100) 2 deg off
		3	(100) other off orientation
		4	Other orientation
		5	Other flats
		6	(100) >2 deg off
		7	(111) A
		8	(111) B
		- (Dash)	Missing information if character indicating dopant is used
Second Optional Character	Checksum Character	0 ... 7	Refer to SEMI M12
	Dopant	U	No dopant
		C	Carbon
		R	Chromium