



SEMI T5-96

SPECIFICATION FOR ALPHANUMERIC MARKING OF ROUND GALLIUM ARSENIDE WAFERS

1 Purpose

1.1 The purpose of this document is to define standard criteria for the alphanumeric marking of round gallium arsenide 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 gallium arsenide wafers. It also defines the basic code used to characterize the individual wafer, thereby providing practical operator interpretation. This document 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.

3 Referenced Document

3.1 SEMI Document

SEMI M12 — Specification for Serial Alphanumeric Marking of the Front Surface of Wafers - Appendix 2, SEMI OCR Standard Character Set

4 Terminology

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

4.2 *line character misalignment* — The vertical distance, R , between the character baselines of any two characters on the same line (see Figure 7).

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

4.4 *character spacing* — The horizontal distance between the character spacing reference lines of the adjacent characters (see Figure 1).

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

NOTE: This can be either the V-Groove or Dovetail side of the GaAs wafer.

4.6 *code field (also known as character window)* — The rectangular window within which all characters must be contained (see Figure 4).

4.7 *character skew* — The angle between the character baseline and a line parallel with the bottom of the character window (see Figure 5).

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

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

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.

NOTE 1: The 5×9 dot matrix shown in Figure 1 is the minimum number of dots allowed. More dots may be used, up to and including a solid line. A solid line is not recommended, since it may increase wafer breakage.

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

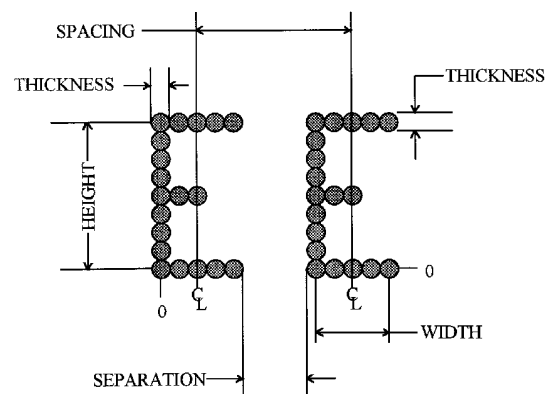


Figure 1
Character Outline



Table 1. Character Dimensions and Spacing — Configuration A — 3", 100 mm, 125 mm, 150 mm

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. Configuration B — 2", Option for 3" 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

NOTE 2: 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 — See Figure 2 and Appendix 2.

ABCDEFGHIJKLMNO
PQRSTUVWXYZ-
0123456789.

Figure 2
Standard Character Set

6 Alphanumeric Code

6.1 *Code* — Limited to one line of 20 characters maximum (see Figure 3 and Table 3 for an example using 15 characters). The first five to ten characters are an identification number which is unique to the ingot for a given supplier. This is followed by a dash, which is followed by three digits which indicate the wafer number, as numbered starting from the seed end of the ingot. The next two alpha characters identify the supplier according to Appendix 1. The last optional characters are specified by the supplier or customer. For example, these characters could be used to differentiate specifications, orientation, or doping. The character string (using a five character ingot as example) is constructed as follows:

Table 3. Supplier Code

Character #	Character Style	Parameter	Definition
1 - 5	Alphanumeric	Ingot number	Supplier-assigned
6	Alpha	dash	a spacer
7 - 9	Numeric	Wafer number	Number of wafer in ingot
10 - 11	Alpha only	Supplier Identification	See Appendix 1, Table A1-1
12 - 15	Alphanumeric	Optional: characters to identify specification(s)	Supplier- or customer-specified

6.2 If the optional special code characters are used to indicate doping, surface orientation, the symbols shown in Table 4 will be employed.



7 Code Field Location

7.1 Code field shall be located on the polished front surface of wafers or on the polished or etched back surface of wafers as shown in Table 5.

7.2 Code field is located as shown in Figure 4 and Table 6.

7.3 All characters must be contained within the code field along the major flat. The top of the characters is toward the side of the code field nearest the flat, see Figure 4.

7.4 *Dimensions* — See Figure 4 and Table 6.

7.5 In the standard specification, the first character of the code line is located toward the left side of the code field.

Table 4. Special Code Characters

<i>Parameter</i>	<i>Code</i>	<i>Definition</i>
Device surface orientation and flat location	V	V - Groove
	D	Dovetail
Dopant	U	Undoped
	C	Carbon
	R	Chromium
	T	Tellurium
	I	Indium
	S	Silicon
	L	Sulfur
	Z	Zinc
	E	Selenium
Front Surface Orientation	0	100
	A, B	111 A or B
	2	100 (2 degrees off)
	3	100 (other off orientation)
	4	other orientation
	5	other flats

6.3 An example of the code is given in Figure 3.

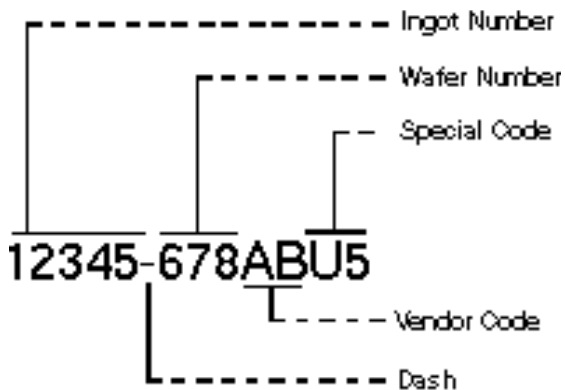


Figure 3
Example of Code for 3" Wafer

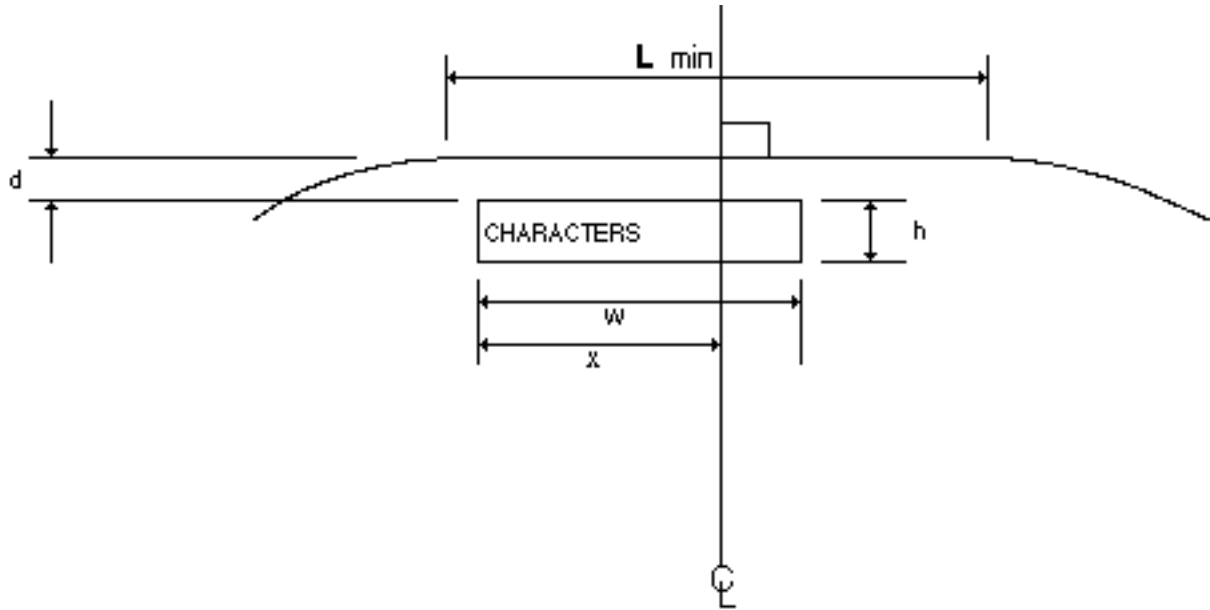


Figure 4
Code Field Location for Flatted Wafers

Table 5. Location of Code Field

Wafer Diameter	Location of Code Field
2"	Front (standard); Back surface (alternate)
3"	Front (standard); Back surface (alternate)
100 mm	Front surface
125 mm	Front surface
150 mm	Front surface

Table 6. Code Field Location and Dimensions

Parameter (mm)	2"	3"	3"	100 mm	125 mm	150 mm
Configuration Character Dimension (See Tables 1 and 2)	B	B	A*	A	A	A
L min	14.23	19.05	19.05	30.0	40.0	55.0
x	7.1	9.5	9.5	15.0	20.0	27.5
w	14.0	14.0	19.0	27.0	27.0	27.0
d	1.0	1.0	1.0	1.0	1.0	1.0
h	1.4	1.4	2.4	2.4	2.4	2.4

* For 3" wafers, only 13 characters are allowed due to limitations on the size of the code field.