

SEMI MS1-0307 (Reapproved 0812) GUIDE TO SPECIFYING WAFER-WAFER BONDING ALIGNMENT TARGETS

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NOTICE: This Document was reapproved with minor editorial changes.

1 Purpose

1.1 This Guide provides a framework for specifying the dimensions, location, quantity and characteristics of alignment targets that are placed on each wafer of a pair of wafers. Such targets are used to align two patterned wafers prior to an operation that bonds them together.

2 Scope

2.1 This Guide applies to targets that can be used with two common alignment processes—inner surface alignment and outer surface alignment.

2.2 This Guide covers specification requirements, mark characteristics and applications.

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 Limitations

3.1 This Guide does not specify the dimensions and locations of alignment targets. Such values are established by the user. These values should accommodate the capabilities of the alignment systems to be employed.

3.2 This Guide does not address alignment precision of the wafer-bonding systems.

3.3 Mark asymmetry, which can affect alignment accuracy and precision, is not addressed in this Standard.

3.4 This Guide does not address the bonding of un-patterned wafers.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI M20 — Practice for Establishing a Wafer Coordinate System

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *IAS* — inner surface alignment system

5.1.2 *OAS* — outer surface alignment system

5.2 Definitions

5.2.1 *inner surface alignment* — an operation in which the illumination and viewing axes observe alignment marks on the opposite, adjacent (inner) surfaces of the two wafers to be aligned.

5.2.2 *outer surface alignment* — an operation in which the illumination and viewing axes observe alignment marks on the opposite, non-adjacent (outer) surfaces of the two wafers to be aligned.

6 Specifications

6.1 Specifications or wafer-bond alignment targets should include:

- 6.1.1 Illumination/viewing axes,
- 6.1.2 Alignment target dimensions,
- 6.1.3 Number of targets on each wafer,
- 6.1.4 Location of each target on each wafer surface, and
- 6.1.5 Other items as agreed upon between supplier and user.

7 Mark Characteristics

7.1 The alignment targets described below are cross-shaped. Other alignment target configurations may employ the location conventions used in this Guide.

7.2 Two nominally identical marks are placed on one wafer. Two other differently-dimensioned marks are placed on the other wafer. The dimensional differences permit both manual and auto-align bonding systems to determine whether the first wafer or second wafer is being aligned.

7.3 The two sets of mark dimensions accommodate the conventional 'cross in cross' alignment that can be accomplished on a wide range of wafer-wafer bonding systems. The bonding sequence using two different sets of mark dimensions typically involves the following.

NOTE 1: Not all bonder systems utilize the crosshairs mentioned below. For example, in situ alignment bonders align the two targets directly against each other.

7.3.1 The bonder crosshairs are aligned to the marks on the first wafer.

7.3.2 A second wafer is loaded and aligned to the crosshairs.

7.3.3 The wafers are bonded.

7.4 Targets may be formed by etching the surface of, or patterning metal film on each wafer.

7.5 MEMS devices that use wafers having neither metal nor other deposited films require dry- or wet-etched targets.

7.5.1 Wet-etched marks need to be rectilinear.

7.6 The locations and dimensions of the mark sets are user-specified.

7.7 The alignment target dimensions need to be consistent, and with sufficient contrast to permit auto-align optics.

8 Application Examples

8.1 Two nominally identical marks are placed on one wafer. Two other similarly-shaped but differently-dimensioned marks are placed on the other wafer.

8.2 Illumination/viewing axes should be specified as one of the following:

8.2.1 *Outer Surface Alignment System (OAS)*

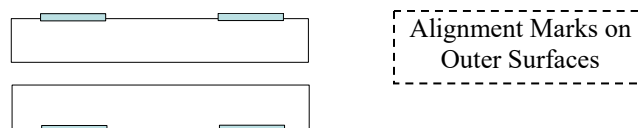


Figure 1
Outer Surface Alignment System (OAS)