Designation: F 534 – 02a

Standard Test Method for Bow of Silicon Wafers[1]

This standard is issued under the fixed designation F 534; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

When this test method was developed in the 1970s, non-contact bow and warp gages employing manual positioning, which are the basis of this test method, were in routine use. More recently, faster, automated instruments have replaced these manual gages for most common uses in the semiconductior industry. In these automatic systems, microprocessors or microcomputers are used to control wafer positioning, operate the instrument and to analyze the data. See Test Method F 1390.

Despite the fact that this test method is not commonly used in its present form, it embodies all the basic elements of this test method and a simple analysis of data. Thus, it provides useful guidance in the fundamentals and application of differential non-contact wafer bow measurements.

1. Scope

1.1 This test method covers determination of the average amount of bow of nominally circular silicon wafers, polished or unpolished, in the free (non-clamped) condition.

1.2 This test method is intended primarily for use with wafers that meet the dimension and tolerance requirements of SEMI Specifications M1.

1.3 This test method can also be applied to circular wafers of other semiconducting materials, such as gallium arsenide, or electronic substrate materials, such as sapphire or gadolinium gallium garnet, that have a diameter of 25 mm or greater, a thickness of 0.18 mm or greater, and a ratio of diameter to thickness up to 250. Wafers to be tested may have one or more fiducial flats provided they are located in such a way that the slice can be centered on the support pedestals (see 7.1.2) without falling off.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

F 533 Test Method for Thickness and Thickness Variation of Silicon Slices[2]

F 657 Test Method for Measuring Warp and Total Thickness Variation on Silicon Wafers by Noncontact Scanning[2]

F 1390 Test Method for Measuring Warp on Silicon Wafers by Automated Noncontact Scanning [2]

2.2 *SEMI Standard:*

M1 Specifications for Polished Monocrystalline Silicon Wafers[3]

2.3 *Federal Standard:*

Fed. Std. No. 209E Controlled Environment Clean Room and Work Station Requirements[4]

2.4 *ISO Standard:*

ISO 14644-1 Cleanrooms and associated controlled environments—Part 1: Classification of airborne particulates[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *back surface—of a semiconductor wafer,* the exposed surface opposite to that upon which active semiconductor devices have been or will be fabricated.

3.1.2 *bow—of a semiconductor wafer,* the deviation of the center point of the median surface of a free, unclamped wafer from a median-surface reference plane established by three

[1] This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.06 on Silicon Materials and Process Control.

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[2] *Annual Book of ASTM Standards,* Vol 10.05.

[3] Available from Semiconductor Equipment and Materials International, 3081 Zanker Road, San Jose, CA 95134 (www.semi.org).

[4] Available from GSA Business Service Centers in Boston, New York, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, Seattle, San Francisco, and Los Angeles.

[5] ISO Central Secretariat, C.P. 56, Ch-1211 Geneve 20, Switzerland; available in the U.S. from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.