



Standard Test Method for Determination of Radial Interstitial Oxygen Variation in Silicon Wafers¹

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1. Scope

1.1 This test method covers test sight selection and data reduction procedures for radial variation of the interstitial oxygen concentration in silicon slices typically used in the manufacture of microelectronic semiconductor devices.

1.2 This test method is intended as both a referee and production test through selection of an appropriate test position plan.

1.3 The interstitial oxygen content may be measured in accordance with Test Methods F 1188, F 1366 or F 1619, DIN 50438/1, JEITA 61, or any other procedure agreed upon by the parties to the test.

1.4 Acceptable sample surface finishes are specified in the applicable test methods. This test method is suitable for use on chemically etched, single-side polished and double-side polished silicon slices with no surface defects that could adversely change infrared radiation transmission through the slice, provided that appropriate test methods for oxygen content are selected.

1.5 *This standard does not purport to address all of 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 Wafers²

F 1188 Test Method for Interstitial Atomic Oxygen Content of Silicon by Infrared Absorption²

F 1366 Test Method for Measuring Oxygen Concentration in Heavily Doped Silicon Substrates by Secondary Ion Mass Spectrometry²

F 1619 Test Method for Measurement of Interstitial Oxygen Content of Silicon Wafers by Infrared Absorption Spec-

troscopy with p-Polarized Radiation Incident at the Brewster Angle²

2.2 DIN Standard:

DIN 50438/1 Test of Materials for Semiconductor Technology; Determination of Impurity Content in Silicon by Infrared Absorption; Oxygen³

2.3 JEITA Standard:

JEITA 61 Standard Test Method for Interstitial Atomic Oxygen Content of Silicon by Infrared Absorption⁴

2.4 ANSI Standard:

ANSI/ASQC 21.4⁵

3. Summary of Test Method

3.1 Instruments are selected and qualified according to the test procedure chosen.

3.2 Measurements are made at the specified test locations and a relative oxygen variation is calculated by one of four available plans.

4. Significance and Use

4.1 The presence of oxygen can be beneficial to certain manufacturing operations by preventing the formation of process-induced defects. To the extent that this is true, it becomes important that the oxygen be uniformly distributed over the entire slice.

4.2 Multiple test plans are included to satisfy a variety of requirements. The characteristic shape and magnitude of oxygen concentration distributions in crystals are functions of the crystal growth process. Although the specified test plans are intended to cover oxygen concentration distributions which are typically found, other distributions may occur. In such cases, it may be necessary to use test positions other than those specified in order to adequately describe the distribution pattern.

4.3 This test method may be used for process control,

³ DIN 50438/1 is the responsibility of DIN Committee NMP 221, with which ASTM F-1 maintains close liaison. DIN 50438/1 is available from Beuth Verlag GmbH, Burggrafenstrasse 4-10, D-1000, Berlin 30, Germany.

⁴ JEITA 61 is the responsibility of the JEITA Silicon Wafer Committee, with which ASTM F01 maintains close liaison. JEITA 61 is available from the Japan Electronics and Information Technology Industries Association, Kikai-Shinko-Kaikan, 3-5-8 Shiba koen, Minato-ku, Tokyo 105-0011, Japan.

⁵ Available from American Society for Quality Control (ASQC), P.O. Box 3005 Milwaukee, WI 53201-9404.

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.