

SEMI M37-0699

TEST METHOD FOR MEASURING ETCH PIT DENSITY (EPD) IN LOW DISLOCATION DENSITY INDIUM PHOSPHIDE WAFERS

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1 Purpose

1.1 This Standard provides a method to measure etch pit density (EPD) in low dislocation density InP wafers.

2 Scope

2.1 This Test Method describes a procedure to measure EPD of 50 mm diameter round InP wafers with an EPD of less than 5000/cm².

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3 Referenced Standards and Documents

3.1 *ASTM® Standards*¹

ASTM F140-92 — Test Method for Crystallographic Perfection of Gallium Arsenide by Molten Potassium Hydroxide (KOH) Etch Technique

4 Apparatus

4.1 *Microscope* — Measuring field should be 1 mm² or larger.

NOTE 1: For accurate EPD measurement, accurate area of the measuring field should be measured by a standard scale.

5 Procedure

5.1 Orient the ingot so that the front surface normal direction of the sample is parallel to the <100> within 5°, and then cut a wafer from the ingot.

5.2 Polish the wafer to form a mirror finish. Afterwards, the wafer must be cleaned and dried.

5.3 Mix phosphoric acid (H₃PO₄) and hydrobromic acid (HBr) in a beaker. The ratio of each acid is H₃PO₄: HBr=2:1.

5.4 Immerse the wafer in the mixed acid for 3 minutes at room temperature.

5.5 Rinse the wafer with deionized water and then dry.

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>. ASTM trademark is owned by ASTM International.

5.6 The counting positions are shown in Figure 1. The counting points are located in the center of each mesh. The mesh size is 5 mm and the total number of counting positions is 69. Position 35 is located at the center of the wafer.

5.7 Count and record the number of etch pits for which the cores are in the measuring field. If the pits are crowded and are difficult to count, increase the magnification. After that count the etch pits and record the results as well as the microscope magnification.

5.8 Repeat ¶ 5.7 for all other positions, 2 through 69.

6 Calculations

6.1 The EPD in each measuring field is the number of pits counted divided by the area.

$$\text{EPD} = (\text{Number of pits}) / \text{Area}$$

6.1.1 For example, if the size of measuring field is exactly 1 mm × 1 mm, the area is 0.01 cm².

7 Report

7.1 There are several forms that are possible for reporting the EPD, for example the average EPD of all the positions or the area less than some specified value or map of EPD for the entire wafer, etc. An appropriate report form should be decided between the supplier and the user.

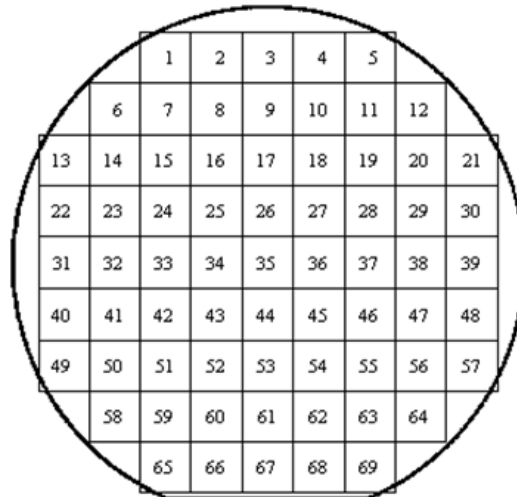


Figure 1
Counting Positions for a 50 mm Diameter Wafer

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