

SEMI P26-0703

PARAMETER CHECKLIST FOR PHOTORESIST SENSITIVITY MEASUREMENT

This checklist was technically approved by the Global Micropatterning Committee and is the direct responsibility of the Japanese Micropatterning Committee. Current edition approved by the Japanese Regional Standards Committee on April 28, 2003. Initially available at www.semi.org June 2003; to be published July 2003. Originally published in 1996.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Purpose

1.1 This checklist identifies the parameters for the measurement of photoresist sensitivity in order to avoid the variations between the supplier and users of photoresist.

2 Scope

2.1 The resists for which this guideline is intended are positive photoresist.

2.2 In discussions between the supplier and the user of the resists, quantitative values should be provided for each parameter.

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 Referenced Standards and Documents

3.1 *SEMI Standards and Safety Guidelines*

SEMI P27 — Parameter Checklist for Resist Thickness Measurement on a Substrate

3.2 *ASTM Standard*¹

ASTM F1059 — Practice for Calculating the Contrast and Threshold Sensitivity of a Positive Photoresist

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

4 Terminology

4.1 *Definitions*

4.1.1 E_{op} (*optimum energy*) — the exposure energy where the mask dimensions can be reproduced faithfully.

4.1.2 E_{th} (*threshold energy*) — the exposure energy where the remained thickness ratio becomes zero on the sensitivity curve.

5 Parameters

5.1 *Substrate* — Silicon wafer.

5.2 *Pre-Treatment of Substrate*

5.2.1 Removal of native oxide on silicon wafer is recommended.

5.2.2 Describe the process when the surface of silicon wafer has been treated with HMDS.

5.3 *Resist*

5.3.1 Trade-name of photoresist.

¹ American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, USA. Telephone: 610.832.9585, Fax: 610.832.9555, <http://www.astm.org>

5.3.2 Film thickness after prebake. (Recommended thickness is 1.0–1.2 μm .)

5.4 *Prebake Condition*

5.4.1 Type of equipment for prebake; contact or proximity-bake.

5.4.2 Measuring position of the temperature in baking equipment and equipment for temperature measuring.

5.4.3 Baking time (s).

5.4.4 Program sequence.

5.5 *Exposure*

5.5.1 Type of exposure machine; stepper or mirror projection.

5.5.2 Wavelength and half width (nm).

5.5.3 Light intensity of the exposed surface (mW/cm^2).

5.5.4 Numerical Aperture and sigma value.

5.6 *Post-Exposure Bake (if performed)*

5.6.1 Type of equipment for post-exposure bake; contact or proximity-bake.

5.6.2 Measuring position of the temperature in baking equipment and equipment for temperature measuring.

5.6.3 Baking time (s).

5.6.4 Program sequence.

5.6.5 Film thickness after post-exposure bake.

5.7 *Development*

5.7.1 Type of developer; commercial name and chemical composition.

5.7.2 Concentration of developer (weight % or molar %).

5.7.3 Dilution factor.

5.7.4 Method; Spray (nozzle type, rotation speed, flow rate of developer), Puddle (program of sequence).

5.7.5 Temperature of developer, room temperature.

5.7.6 Development time (s).

5.8 *Postbake*

5.8.1 Type of equipment for postbake; contact or proximity-bake.

5.8.2 Measuring position of the temperature in baking equipment and equipment for temperature measuring.

5.8.3 Time (s).

5.8.4 Program sequence.

5.9 *Measuring Equipment*

5.9.1 Specify the measurement system for the film thickness measurement.

5.9.2 Specify the measurement system for the pattern width measurement.

5.10 *Other* — Line-width of pattern in the reticle affects to E_{op} . The use of reticle with the width accuracy of $\pm 5/100 \mu\text{m}$ to the pattern, or co-share of reticle for the crosscheck is recommended for the purpose of this guideline.