Performance Expectations for Early Test Wafer Generation Tools
ISMI Working Draft
First Supplier Workshop

Purpose

This document conveys the IC Maker expectations of process and metrology equipment for the generation of test wafers needed to enable Suppliers as they begin development of 450 mm equipment. In this initial release, the requirements focus on those early tools identified by customers that would provide necessary capabilities for developing a significant starting set of wafer fab tools and prepare for demonstrating their capabilities.

Introduction

IC Makers want to work with Suppliers of wafer fab equipment to achieve capability for pilot lines in 2012 and prepare for manufacturing their products on 450 mm wafers. They have determined that their technology targets for the period coincide quite well with the ITRS definitions for contacted metal half pitch at the 32 nm and 22 nm generations.

> For development beginning in 2009 and the initial demonstration phase, Suppliers should focus on 32 nm capability for early testing of process and metrology equipment.
>
> Equipment maturation thereafter must achieve High Volume Manufacturing (HVM) cost/performance to support production ramp while technology scales to 22 nm and beyond.

The development of 450 mm process and metrology equipment requires silicon wafers, with and without processing, for engineering wafer handling systems and process or metrology capability. It is expected that generating these test wafers will require processing sufficiently sophisticated to enable Suppliers to achieve capability indicated above, which is detailed in a separate document for 32 nm / 22 nm equipment performance metrics.

> This document is to set tactically-relaxed performance expectations for test wafer (TW) generation capability that is intended to be deployed by the end of 2009 and run thereafter by ISMI in support of Supplier tool development and demonstration.

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Tools Needed for Test Wafer Generation
Initial List

Early Patterning Capability

Oxide Vertical Furnace

PECVD Dielectric

Dielectric Dry Etch

Dielectric CMP

PVD Metal

LPCVD Nitride

Wet Cleans

Dry Strip Asher

Bare Wafer Particle Detection

Thin Film Thickness

Optical CD Measurement

Subsequent updates may encompass additional tools and requirements to generate test wafers for the development of a full wafer fab tool set.

I. Applicable Guidelines and Standards

Since the early test wafer generation tools are needed while such standards may still be under development, it is recognized that they may not comply with all guidelines and standards.

Progress toward compliance with S2 Safety and S8 Ergonomics standards is expected, but ***it is a requirement that all equipment must be safe to operate and maintain at any stage of maturity.***

It is desirable that early TW tools are able to load and unload wafers from Front Opening Unified Pods (FOUPs) with 10 mm slot pitch, and have E15.1 load ports and Equipment Front End Modules, but it will be acceptable to substitute manual wafer handling to some degree.

II. General Requirements

Personal Guided Vehicles (PGVs) will be required at inception for FOUP transport and for loading and unloading of FOUPS on tools.

A separate document details expectations 32 nm and 22 nm performance metrics for tools during the later demonstration and production launch period. While the specific tools deployed for TW generation will not need to achieve that more mature performance in 2009, it is expected that the capabilities of the same tool types will be improved so as to meet the metrics for those later stages.

III. Performance Expectations for Early Test Wafer Generation Equipment

It is recognized that TW tools in 2009 will not be as capable with regard to either process or productivity goals as the metrics presented in the companion document that gives 32 nm and 22 nm performance metrics for tools during the later demonstration and production launch periods.

Key parameters will be specified through consultation with Suppliers for this starting phase. The following guidelines will be a starting point for those discussions:

- Process capability will generally be expected to match the current level of 300 mm tools, roughly corresponding to 45 nm technology.
    - Certain tools are known to have significant challenges associated with scale up, e.g. uniformity may degrade; such a scale-up penalty may be acceptable in the initial period.
- Defect densities for these tools at 45 nm in the Yield Enhancement section of the ITRS should be targeted.
- Availability of 50-60% is assumed to be sufficient to support TW generation; no MTBI or MTTF metrics are specified at this stage.
- Throughput for most tools should be the same as 300 mm tools.
    - Area-scanned tools may potentially have throughput reduced by as much as the wafer area ratio; i.e. 40% of the 300 mm tool throughput may be adequate for TW tools of this description in 2009.

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