INTRODUCTION 1

GENERAL DESCRIPTION

This document presents a general summary of the Avanti Model 472 wafer polisher (hereinafter referred to as the wafer polisher), user procedures, and wafer polisher operational overview.

The wafer polisher surfaces (planarizes) silicon (and other types) of wafer to remove semiconductor materials from the patterned wafer surface. It was designed to prepare wafers in an environment that requires automated, high precision, operational and processing flexibility with repeatable results.

This wafer polisher is a fully automated, single-wafer polisher designed to accommodate four through eight inch (100 through 200 mm) diameter wafers. It features automatic wafer loading/unloading and is capable of two step polishing processing to maximize wafer processing capability and quality.

The wafer polisher consists of a support structure/enclosure, a polish arm with attached wafer carrier assembly, a pneumatic system, a deionized (DI) water/slurry fluid system, a power (low and high voltage) system, a Disk Operating System (DOS)-based computer control system, and five stations used to accomplish wafer processing:

- Load Station
- Primary Polishing Station
- Final Polishing Station
- Clean Station
- Unload Station

The load station loads the wafer from the load cassette into the vacuum assisted wafer carrier assembly to begin the polishing process, using the wafer handler (shuttle tray). The primary polishing station accomplishes the major material removal, the final polishing station performs the final polishing step, and the clean station provides DI water/brush and spray cleaning action for the wafer carrier assembly. The wafer carrier assembly unloads the wafer onto the water track of the unload station after the polishing process. Completed wafer unload onto the DI water track to allow transfer into the unload station cassette that is immersed in DI water.

The optional Advanced Pad Profiler (APP1000) and advanced sweep-arm pad conditioners provide the capability to recondition the polishing pad. The APP1000 pad conditioner provides the capability to concurrently recondition the primary polishing pad. An advanced sweep-arm pad conditioner can also be added as an option to recondition the primary or final polishing pads. Reconditioning polishing pad surfaces reduces the wafer removal rate variation, wafer non-uniformity, and prolongs the polishing pad life. Additional options are available and are detailed in Chapter 2, Equipment Options. Figures 1-1 and 1-2 identify the wafer polisher component locations.

EQUIPMENT DESCRIPTION 2

OVERVIEW

The single-wafer polisher provides automatic wafer loading/unloading and can provide two-step polishing processing to maximize wafer processing capability and quality. It can polish four through eight inch (100 through 200 mm) diameter wafers using a chemical mechanical planarization (CMP) process. This process removes excess oxides and metal materials by surfacing the wafers to achieve flatness and uniformity using a colloidal slurry solution (Refer to ATTACHMENT 1 for a typical Material Safety Data Sheet (MSDS).

Wafers are transferred from the load cassette to the load cup by the wafer handler (shuttle tray), with the side to be polished face down. The load cup then rises to the lowered polish arm/wafer carrier assembly, and positions the wafer into the wafer carrier assembly. The wafer is held in the wafer carrier assembly using vacuum. The polish arm rotates over the primary polishing station and lowers the wafer onto the polishing pad to which slurry is being supplied. The downforce exerted on the wafer, the relative motions between the wafer and the polishing pad, and the temperature of the polishing pad accomplish the wafer material removal. The downforce exerted on the wafer for polishing is user selectable from 0 to 750 pounds (lb). Vacuum can be removed and back pressure provided to the wafer to prevent uneven material removal during the polishing operation. The polishing pads mount onto aluminum (22.5 inch (571 mm) primary and 20.5 inch (520 mm) final) polish platens containing passageways for ethylene glycol flow. The ethylene glycol is temperature controlled to provide for polish platen temperature control from 85 to 150F (29.4 to 66C), static. Polish platen rotational speed and temperature, wafer carrier assembly rotational and oscillation speed, and polish arm downforce are adjustable. When primary polishing is accomplished, the polish arm rotates to the final polishing station for the final polishing process. After final polishing, the polish arm rotates to the unload station where the wafer is ejected onto the water track and transported into the unload cassette.

STRUCTURE/FEATURES

The polisher structure consists of a cast frame used to mount equipment and outer wafer polisher surfaces. The frame is cast iron and provides mount and support provisions for all components and features of the wafer polisher. The wafer polisher consists of 10 major features:

- Load/Unload Stations
- Polish Arm/Wafer Carrier Assembly

- Primary Polish Platen and Drive
- Final Polish Platen and Drive
- Vacuum system
- Clean station
- Fluids System
- Slurry System
- Electrical system
- Process Enclosures

This wafer polisher can be factory configured to accept wafer cassettes in the normal, upright (handle up) position or inverted 180 degrees. The wafer polisher can be configured to use standard 1 to 25 slot wafer cassettes, with any pitch, for four through eight inch (100 through 200 mm) diameter wafer sizes. The major features of the wafer polisher are detailed in the following sections.

LOAD/UNLOAD STATIONS

The load/unload system is a simple design that provides an automated method for loading the wafer from the load cassette into the wafer carrier assembly, and from the wafer carrier assembly (after wafer processing) onto the water track and into the unload cassette which is submerged in the DI water cascade rinse tub (to keep the wafer wet). The automatic wafer loading and unloading system only touches the outer edge of the polished wafer surface during the load/unload operation. The load/unload stations mount on a structural mount attached to the front of the wafer polisher. Load/unload station cassette elevators raise or lower the wafer cassettes to allow the wafer handler (shuttle tray) to move the wafer from the load cassette to the load cup and to allow transfer of the wafer from the water track into the unload cassette (same or sequential slot position). A single-motion load cup positioning system provides accurate load cup to wafer-carrier-assembly positioning. Load/unload station electronic fiber optic sensors and switches monitor wafer position/location. The load/unload station fluid valves and redundant sensor components are on a pull out maintenance bay located in front of the wafer polisher, accessible through an external access door.