Application Note

4″ GaAs Wafer Backthinning

GaAs after polishing with a Logitech system

1. Introduction

The semiconductor industry uses a variety of wafer sizes. In the processing of GaAs, 4″ wafers is the most common size by our client base.

Logitech systems are well respected in the production of lapped or chemo-mechanically polished GaAs wafers, delivering repeatable surface finishes of the highest quality.

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Logitech systems provide the ideal solution to today's increasingly demanding industry requirements.

2. Application requirements

The system is based upon the LP50 machine for the lapping process, using PP6GT jigs as the holding fixtures. The chemo-mechanical polishing process is carried out using additional PP6GT(C) jigs on either a second PM5 or a LP50 or, alternatively, on the same machine once the processing plate has been changed using the mechanical hoist. In addition, a 4″ Wafer Substrate Bonding Unit (WSB2) is recommended for bonding wafers to glass substrates.

Once bonded, the wafers are mounted by vacuum chucking on to the PP6GT jigs for lapping of the LP50's glass plate. A digital gauge indicator on the jig shows the material removal during the process. This enables the user to automatically process their wafers to a pre-determined, programmed thickness without having to supervise the process and provides a continuous display of material removed to within one micron. The PSM's audible alarm activates prior to the completion of wafer processing, allowing the user to carry out additional tasks, while the PSM's optional automatic cut-out switches the lapping machine off when the preset thickness has been reached.

For subsequent polishing operations, the substrates are mounted on PP6GT(C) jigs and polished on the LP50 using a Chemlox polishing solution.

3. System specification

The system described in this Application Note enables the operator to take their product from the initial lapping stages straight through to the final polish using Logitech equipment that has been produced specifically for their processing needs.

A. LP50 System

The LP50 has a 350mm (14″) diameter processing plate with three workstations capable of working simultaneously, housing three lapping / polishing fixtures holding 4″ (100mm) diameter wafers. The unit is operated from a touch panel display, giving the operator fingertip control of particular machine functions.

The operator is thus in full command of all the processing variables, enabling the repeatable production of high quality wafers.

Operation of the abrasive autofeed system is regulated from the touch panel display positioned to the left of the processing plate. The continuous slow rotation of the abrasive cylinder agitates the lapping suspension and ensures a constant flow of fluid onto the processing plate, via the adjustable slurry chute.

A micro-switch mechanism ensures that the plate stops rotating when the drip rate slows as the cylinder empties, thereby avoiding any damage to the wafer by running it on a dry plate. The screen indicates that the cylinder is empty by displaying as specific abrasive autofeed screen to alert the operator.

Spent abrasive is channelled into a waste slurry pipe and fed into a 25 litre tank situated in the cabinet beneath the processing area.

Once the lapping process has been completed the wafers will require to be either moved from the dedicated lapping LP50 onto the dedicated polishing LP50 or removed from the process area while the cast iron lapping plate is exchanged for the chemlox polishing plate. The LP50 used for polishing the wafers incorporates a sodium hypochlorite resistant body making it ideal for polishing GaAs wafers with a Chemlox solution.

B. Holding Fixtures

The PP6GT(C) Precision Lapping and Polishing Jig will accept wafers up to 4″ in diameter and allow the operator to both lap and polish their wafers to a high degree of parallelism.

C. Bonding

The elimination of cleavage in ultra-thin wafers, repeatability of bond thickness and production of excellent dimensional accuracy are achieved through precise control of the flexible diaphragm within the bonding chamber of the Wafer Substrate Bonding Unit.

The diaphragm ensures that the wafer is pressed into the wax layer in a controlled manner, providing a uniform parallel cushion to protect the wafer and its devices. The unit has been designed to ensure that the sample and device architecture do not come in contact with the support disc.

Using a series of screen options, accessed by soft keys from the process data display, the operator can programme the unit to bond samples over a wide range of temperature and applied loads. Enabling the user to bond either single or three wafers at a time, the WSB2 is a highly automated machine that incorporates both vacuum and pressure bonding facilities.

The bonding process - evacuation of the wafer chamber, heating, pressure bonding and cooling - can be completed automatically by the machine in 45 minutes, depending on the bond temperature chosen.

Jig training at Logitech's purpose built laboratories

4. Operator training

The purchase of each machine system from Logitech entitles the purchaser to receive free operator training at our purpose built laboratory facilities in the United Kingdom.

Each training and process technology trial at Logitech covers equipment and sample handling, cleaning, bonding, gauging and process adjustments with which the operator must become fully familiar in order to achieve optimal processing results.

Over the years, experience has shown that instruction manuals alone do not provide the operator with the necessary subtle details.

Only an intensive programme of personal training and experience provides a solid basis for the continued efficient and successful use of Logitech systems.

5. Sample specification

The following forms a useful guide to the results available using the Logitech 4″ GaAs Wafer Backthinning System:

Thickness uniformity (TTV):
+/-2 microns over a 100mm (4″) diameter wafer.

Flatness:
+/-2 microns over a 100mm (4″) diameter wafer.

Surface roughness:
< mnm Ra over a 2mm dektak trace.

Minimum thickness:
100 microns
(process results will vary slightly according to the quality of sample being used)

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