

Fused Wafers

Info

Application Requirements

System Specifications

Processing

Test & Measurement



Introduction

Many research and production facilities increasingly seek successful methods of thinning down the top wafer of a two wafer fusion bonded assembly, to achieve a final thickness as low as 10 microns. (Taking bond in to consideration)

A typical application for such a process includes the use of the ultra-thin wafer as a “flexing” mirror to redirect laser light for high definition screens.

Logitech has responded to the need for such applications by developing a high performance system package that delivers process efficiency and consistently high quality results.

Application Requirements

In order to thin the upper wafer to within the sub 10 micron level, two silicon wafers need to be bonded with a fused silicon oxide coating between the wafers. This silicon oxide fusion bonding process, which is normally undertaken by the customer, typically has a coating of several microns thick.

It is important to characterise the wafer flatness and thickness uniformity of individual wafers prior to bonding. It may also be necessary to lap and polish the wafers to improve upon the initial specification.

Once bonded to a glass substrate (this allows the wafers to be processed without fear of damage), the wafers are mounted by vacuum chucking on to a

PP5GT or PP6GT Precision Lapping and Polishing Jig. The jig(s) are loaded onto a Logitech precision lapping and polishing machine for lapping on a cast iron plate. PP jigs for use on the PM6 are fitted with Bluetooth enabled digital gauges that continuously feeds process data back to the system which can later be exported for analysis. The operator can set a programme a pre-determined thickness and the Bluetooth gauge will signal the system when it has been reached and stop the process automatically. This avoids over-processing.

PP jigs for use on the LP50 are fitted with a digital gauge that shows the material removal during the process. These jigs can also be fitted with a Bluetooth enabled Programme Sample Monitor (PSM) providing real time data collection and feedback also allowing the user to process their wafers to a pre-determined, programmed thickness.

Both of these features allows the process to run without supervision and provides a continuous display of material removed to within one micron.

An audible alarm activates prior to the completion of wafer processing, allowing the user to carry out additional tasks, while the optional automatic cut-out switches the lapping machine off when the preset thickness has been reached.

After lapping, the substrates are cleaned and placed once more onto the appropriate Precision Polishing Jig and polished using a softer polishing plate at controlled speed and sample loading.

Processing

SAMPLE MOUNTING

The double wafer assembly is initially bonded to a parallel, lapped glass support disc. To achieve a flat and parallel bond between the glass support disc and the lower silicon wafer the Wafer Substrate Bonding Unit (WSBU) is used. Using the intuitive touch screen graphical user interface the operator can programme the WSBU to bond samples over a wide range of temperature and applied loads.

Available as either a single or three headed unit, the WSBU can bond up to three wafers at a time and incorporates both vacuum and pressure bonding facilities. For wafers up to 6"/150mm on the WSBU and 12"/300mm of WSB300.

LAPPING

This process involves significantly reducing the upper wafer thickness using the appropriate Logitech lapping plate and abrasive on either a PM6 or LP50 unit.



Single Station Wafer Substrate Bonding Unit

POLISHING

The upper wafer is polished to its final thickness using a colloidal silica polishing solution on either a synthetic or cloth polishing pad. The lapping & polishing systems PM6 or LP50 can again be utilised for this step.

RESULTS

Following the straightforward process outlined above will produce excellent results, including achieving an upper wafer thickness of 10 microns in a relatively short period of time.



GI20 Flatness Measurement System

Test & Measurement

THICKNESS MEASUREMENT

Product target thickness can be verified by using the CG10 Contact Gauge. This unit will provide accurate thickness measurements to within 0.001mm with excellent repeatability and linearity.

FLATNESS MEASUREMENT

During and after lapping or polishing process the GI20 Flatness Measurement System can be used to provide a quick and accurate indicator of the level of flatness being produced during the process. Suitable for use with both lapped (non-reflective) and polished wafers the GI20 is a grazing incidence interferometer.



PM6 Precision Lapping & Polishing System

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