SEMICON Japan 2013

Lighting-Edge Technologies: Your 2.5D Packaging Partner

USHIO's Lithography Tools — Providing Advanced 2.5D Packaging Solutions

Since it was established almost 50 years ago, in 1964, USHIO INC. has been delivering to the global semiconductor industry UV lamps for photolithography processes, VUV lamps for surface improvement, and halogen lamps for thermal processes.

From these light sources, USHIO has expanded its proprietary application technologies based on development of new light sources and lighting-edge technologies. It has developed, manufactured, and marketed a wide range of lithography tools for advanced packaging (fine-printed circuit boards), wafer-level packaging (WLP), MEMS, LEDs, and power devices — all of which are the focus of attention in the semiconductor fabrication arena. Today, more than 1,300 units of USHIO lithography tools are operating worldwide.

Among these applications — as 2.5D packaging has become the fastest growing packaging segment rather than merely a transition to 3D packaging, because of its performance and economic advantages — interposer substrates, in particular, are one of the most critical components to increase the applications of 2.5D packaging. While the main material of the interposer today is silicon, both glass and organic substrates have been increasingly considered as promising alternatives.

In order to meet market needs such as those described the above, USHIO successfully developed and has started marketing "Square 70", a large panel stepper dedicated to the manufacture of 2.5D interposers that allows processing of glass and organic substrates, as well as its 2.5D/3D silicon interposer stepper "UX7-3Di LIS 350".

At SEMICON Japan 2013, in addition to the Square 70 stepper, we at USHIO are featuring the high-throughput silicon interposer stepper "UX7-3Di LIS 350" and the high-throughput, maskless scanner "Align 600" (which enables 600 alignment points for fan-out WLP) under the slogan "2.5D Lithography & Packaging Processes."

Providing reliable and high-performance lithography tools, USHIO has made a great contribution to high-volume production of advanced packages such as those described above and achieved significant cost reduction in manufacturing of high-end digital products, including smartphones, tablet PCs, and other mobile devices.

USHIO's Major Lithography Tools and Packaging Applications

USHIO PARTICIPATING IN 2.5D INTERPOSER CONSORTIUM SPONSORED BY GEORGIA TECH 3D SYSTEMS PACKAGING RESEARCH CENTER (GT-PRC)

Based on a partnership agreement with the Georgia Tech 3D Systems Packaging Research Center (GT-PRC) (GT-PRC) in June 2013, USHIO has leased and installed a projection aligner dedicated to developing 2.5D glass substrate interposers at GT-PRC.

GT-PRC has formed a global industry consortium of end users and supply chain manufacturers for further promotion of developing both 2.5D/3D super-thin glass and organic interposers.

As a participant in this consortium, USHIO has installed at GT-PRC a leased projection aligner mounted with the same projection lens as its latest panel interposer stepper “Square 70,” to provide the needed lithography technology for emerging glass and organic interposers. USHIO is now aggressively developing the lithography technology, dedicated to 2.5D/3D glass and organic interposers, including testing of exposure on large and thin glass substrate as well as achievement of the target resolution (L/S) of 1 to 5 μm required to achieve these finer patterns. USHIO also has dispatched an engineer to support reduction of the cost required for developing the glass interposers and packages.

We at USHIO believe that our participation in this program will build momentum to provide our leading-edge lithography technology for the advanced packaging industry. We also expect that it will help to increase the market share of USHIO’s lithography systems, which have a competitive edge particularly for panel substrates, as well as accelerate the development of peripheral technologies for lithography

The details of USHIO’s participation in this consortium will be announced during the release presentation scheduled for 11:00 through 11:20 AM on December 4 during SEMICON Japan 2013.

2.5D Large Panel Interposer Stepper “Square 70”

Allowing the Manufacture of Organic and Glass Interposers for 2.5D Packaging

As a world-premiere provider of photolithography tools of all major exposure methods, USHIO leverages the industry’s most advanced development capabilities to meet the increasingly sophisticated and divergent product requirements of the global semiconductor industry.

The Square 70 stepper system for large panel interposers allows manufacturing of organic and glass interposers for 2.5D packaging that have recently become popular, as well as Si wafers.

Moreover, the Square 70 has the capability to process larger-size interposers without any stitch with a lens field size of up to 70 mm x 70 mm at a high throughput; the use of square substrate materials allows manufacturing of higher-density and lower-cost interposers.

Square 70: 2.5D Large Panel Interposer Stepper

Square 70 Features

- Large lens field size: 70 x 70 mm
- Can process interposer substrates made of a variety of materials other than Si, including glass and organic materials
- Can process large substrates of up to 405 x 350 mm
- Has high overlay accuracy of 500 nm or less
- Optical and transfer systems are optimized for addressing a warp or expansion/contraction of an panel substrate

Square 70 Specifications

Resolution:	Up to 2.0 μm L/S
Wavelength:	365 nm
Overlay Accuracy:	Front <500 nm, Back <500 nm
Lens Field Size:	70 x 70 mm
Substrate Size:	Glass and organic substrates of up to 405 x 350 mm

2.5D/3D Silicon Interposer Stepper “UX7-3Di LIS 350”

Optimum for Manufacturing Large-size Silicon Interposers for 2.5D/3D Packaging

The UX7-3Di LIS 350 stepper is capable of processing large-size interposers at a high throughput, and has the flexibility to allow processing of substrates other than silicon wafers — thus significantly reducing the cost of manufacturing interposers. There has until now been no lithography system available that can achieve this goal.

UX7-3Di LIS 350: 2.5D/3D Silicon Interposer Stepper

UX7-3Di LIS 350 Features

- Large lens field size: 78 x 66 mm
- Can process silicon wafers of up to 300 mm in diameter
- Has high overlay accuracy of 500 nm or less
- Utilizes innovative alignment with IR that transmits Si to allow the bottom alignment required for TSV (Through-Silicon-Via) applications that are indispensable to Si interposers
- High throughput of 120 wafers per hour for 300-mm wafers (approx. double the throughput of conventional stepper systems)

UX7-3Di LIS 350 Specifications

Resolution:	Up to 2.0 μm L/S
Wavelength:	365 nm
Overlay Accuracy:	Front <500 nm, Back <500 nm
Throughput:	300-mm wafers: 120 wph
Lens Field Size:	78 x 66 mm
Substrate Size:	Glass and organic substrates of up to 405 x 350 mm
Substrate Transfer Method:	Automated transfer

Maskless Scanner for Manufacturing Fan-Out WLP “Align 600”

Enables High Resolution of 5 µm L/S and High Throughput of 35 Panels/Sec., Even with 600 Alignment Points

For Fan-Out WLP — a new packaging technology for multi-chip modules — USHIO has succeeded in developing the ultra-fine, high-speed maskless scanner “Align 600” with 600 alignment points, a resolution of 5 µm L/S and throughput of 35 seconds/panel.

The Align 600 maskless scanner allows 600 alignment points to be marked for alignment. It enables alignment and exposure of individual ultra-compact chips arranged in positions that vary when mounted on a wafer, thus making a great contribution to complete finer interconnection patterns.

Align 600: Maskless Scanner for Manufacturing Fan-Out WLP

Align 600 Features

- Maskless direct imaging method
- High resolution of 5 µm L/S to allow exposure of high-resolution printed-circuit boards
- High overlay accuracy of ±5 µm
- Ultra-high precision alignment with 600 alignment points
- High throughput of 35 seconds/panel

Align 600 Specifications

Resolution:	5.0 µm L/S
Overlay Accuracy:	±5 µm
Throughput:	35 seconds/panel
Number of Alignment Points:	600

USHIO Welcomes Demonstration Requests and Inquiries about Its Lithography Tools for Advanced Packaging

We at USHIO offer a lineup of lithography tools using four exposure methods — step-and-repeat, direct imaging, full-field projection exposure, and contact/proximity — to meet your application needs. To inquire about a demonstration or to request detailed information on these UX Series products, please contact:

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