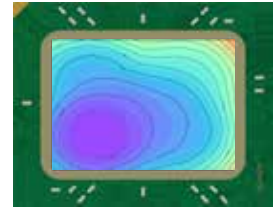
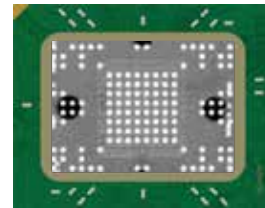


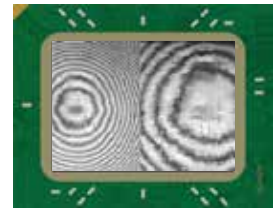
Mesh Modeling



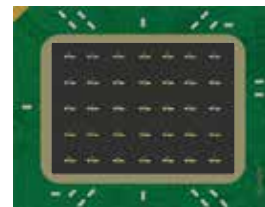
Curvature Compensation



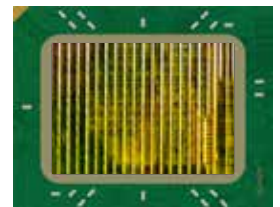
Video Overlays



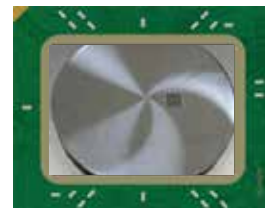
Thermal Relaxation



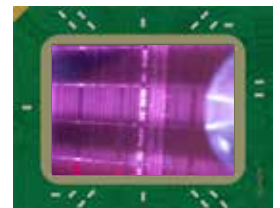
RST Measurement



In Situ Microscope



Wafer SAP



NIR Illumination

*An Expanded Toolkit for the
Sample Prep of ICs...*



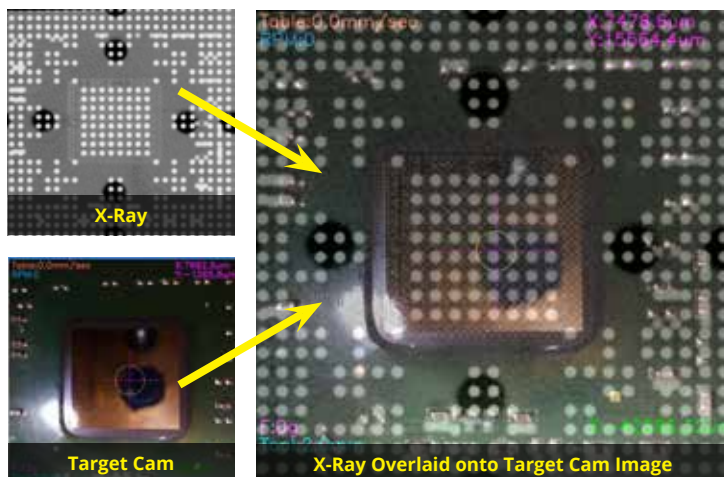
Building on more than 25 years of product development and customer input, ASAP-1® In Situ is our flagship bench-top milling, decapsulation, and sample prep system.

ASAP-1® In Situ includes a new OS, driven by a large touchscreen and/or mouse & keyboard — or even programmed remotely — that allows for control of all process parameters. Stage illumination has been further improved, with the addition of NIR LEDs. Three standard UHD cameras (target, front & side process) ensure the process can be monitored live.

An 'open' physical design allows ASAP-1® In Situ to successfully process the widest size range of IC package — from the tiniest surface mount components, right up to the largest aerospace modules/motherboards and selected areas of a 300mm wafer.

Along with legacy thermal, end-pointing and curvature compensation options, ASAP-1® In Situ can be fitted with a through-silicon RST Measurement System — allowing in situ mapping of remaining silicon across the die without sample transfer — thus avoiding translation errors.

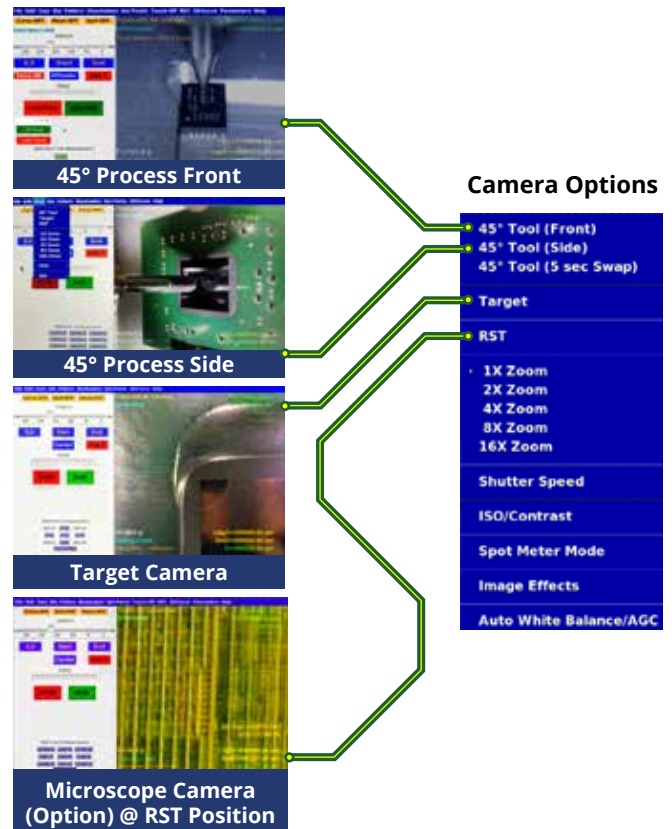
Image Overlays



The live Target Cam view can be overlaid with saved X-Ray, C-Sam, a previously saved part, or bonding/design images to further improve targeting. Image manipulation, such as scaling and rotation, can be made with the In Situ software.

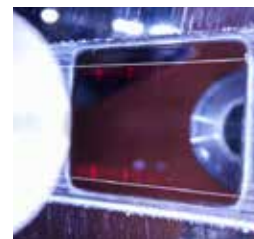
Advanced In Situ Imaging

Three UHD cameras are fitted as standard. A fourth camera is added with an RST upgrade.

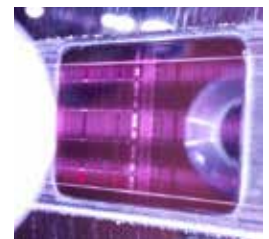


Enhanced Stage Illumination

An array of controllable visible light LEDs illuminate the stage area. We have recently added NIR LEDs to enhance backside visibility during final processing. NIR illumination can also assist with viewing underfill and epoxy materials.



Visible LEDs

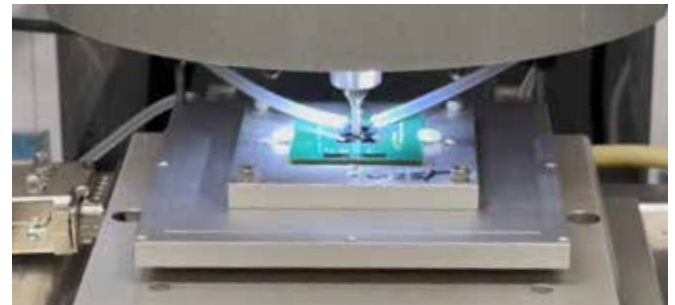
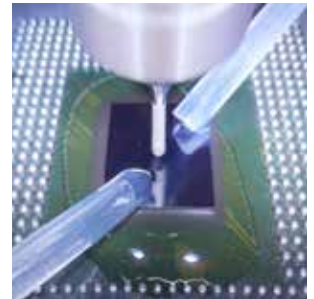
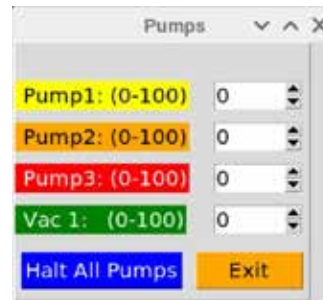


NIR LEDs

On an ultrathinned die, the visible LEDs start to reveal circuitry (shown left). With NIR Illumination, circuitry can be seen in the complete thinned area.

Fluid Control System (FCS)

Available for dispensing and collection of polishing fluids, abrasives, and lubricants. Effective control of lubricants and particulates greatly improves the quality of live process visual monitoring.



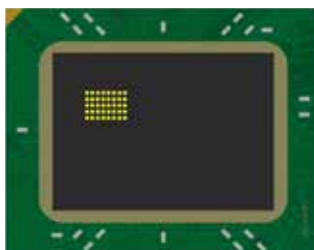
The acclimation plate ensures that fluids are dosed to the tool/die interface at the correct temperature.

In Situ Through-Silicon RST Measurement Options

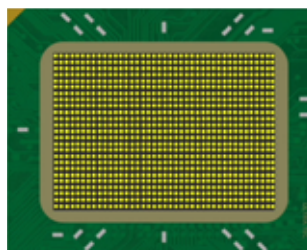


Code	Spectrometer	Minimum RST Measurement	Application
UT-F3	NIR	8 microns	Standard thinning
UT-VIS	Visible Light Extension	8 nanometers	Ultrathinning (<10 microns)

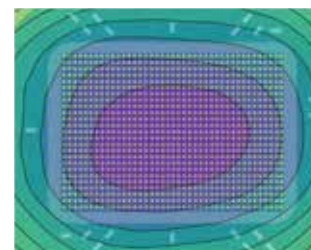
Two In Situ options are available for measuring and mapping remaining silicon thickness (RST).



Pocket Area Mesh



Whole Die Mesh

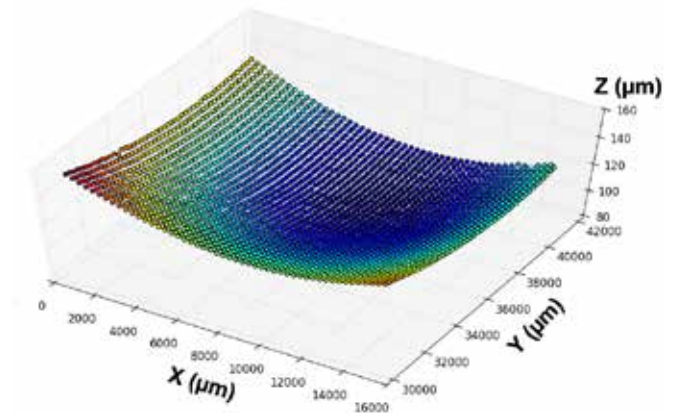


Mesh overlaid onto the measured package curvature profile

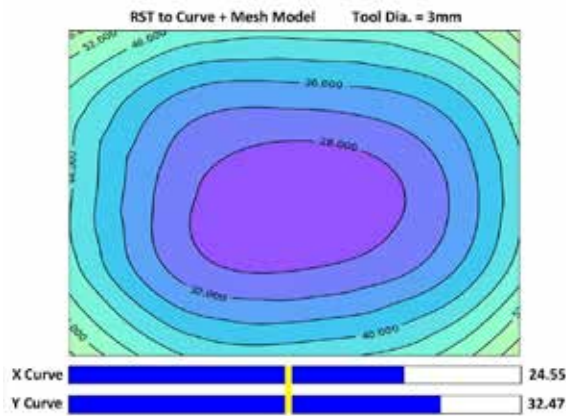
Working with Curved & Warped Die

Die warpage occurs due to mismatch in the coefficient of thermal expansion (CTE) between the various components used in the manufacture of semiconductor packages. Complex models exist to predict stresses, however a straightforward analogy is to view warpage as resembling a bimetallic strip. The degree of warpage varies widely part-to-part, manufacturer-to-manufacturer and even batch-to-batch.

A BGA's warpage is generally convex ('frowning silicon') at ambient temperature, with the convexity often increasing further as the silicon is thinned. Curvature models that can be applied throughout the thinning process to maximize uniformity across the die.



High Resolution In Situ Mesh Scan of 2,500 RST Data Points



The System OS provides the user with **Interactive Plots** to compare the **Actual RST map** to the **adaptive 3D Curve Model**.

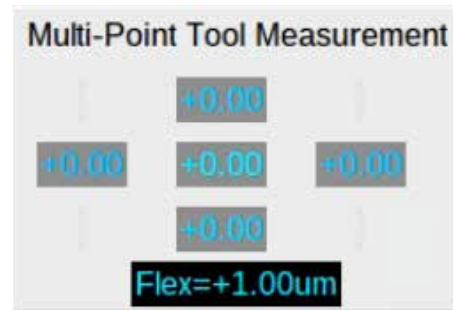
Thickness variations are nullified during the thinning process by using a combination of 3D Curvature measurements and RST map, overlaid with an adaptive Mesh. Through subsequent polishing iterations — with attendant modifications of the Mesh Model — the ACTUAL sample thickness and uniformity converges with the final requirement after final polishing.

Tilt & Curvature Measurement

Initial Measurement

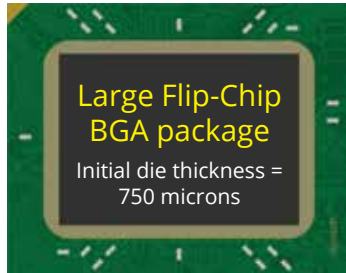


After Tilt-Table Auto-Align



The **Auto-Tilt function** physically measures a five-point or nine-point matrix to measure tilt and package curvature in X and Y. Another new feature is the measurement of a device's **Flex** during touch-off measurement procedures. Flex is an indicator of the quality of sample mounting and/or the seating of a board-level component.

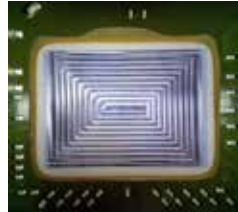
A Starting Point - Initial Thinning



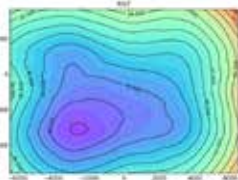
Thinning Process Conditions

Die size X = 15 mm
Y = 10 mm
5260.3 3mm dia fine diamond tool
Spiral polishing pattern
Thermal relax at 80°C
Curvature compensation
Tool force = 300g

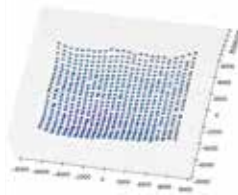
B Process Mid-Point (50-100 microns RST)



Target Camera View of Die @ 50 microns +/- 5



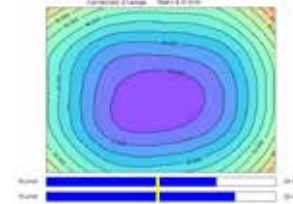
Contour Map of RST Points



Graphical Plot of RST

C Standard Final Thinning (~50 microns to ~20 microns RST)

3mm Tool Model



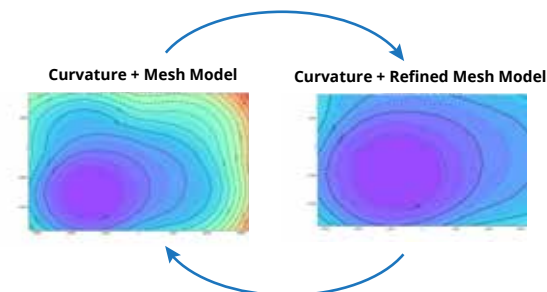
Note: The map selected has calculations for tool convolution to minimize radius error.



Process Conditions

5260.3 3mm dia fine diamond tool
5265.3 3mm dia superfine diamond tool
Mix of Spiral and ASAP-1® polishing patterns
Curvature compensation
Polishing force = 300g

D Ultra Thin and Polish - Adaptive (~20 microns to ~5 microns RST)

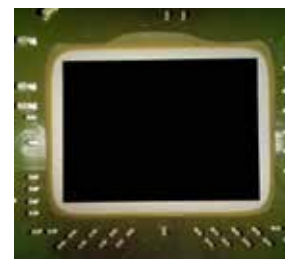


Note: Additional polishing passes may be required. RST is measured and the 3D mesh is refined after each cycle.

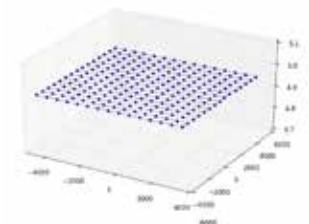
Process Conditions

5295.3 3mm dia Xylem tool
2382.5 blue diamond paste
2385.5 yellow diamond paste
ASAP-1® series polishing patterns
Polishing force = 300g
Final polish with 5299.3 Xybove 3mm tool with colloidal silica/alumina

E Final Results



Target camera image of final 5 micron RST surface

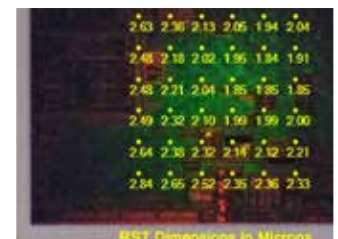
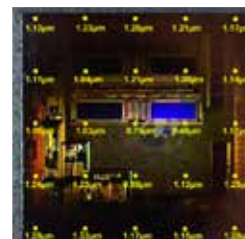


Final RST Map

Typical Process Time = 1 to 4 hours

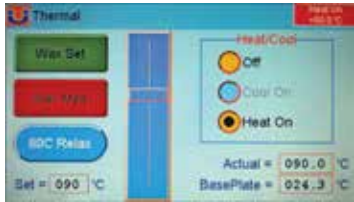
Note: For ultimate thinning requirements, the final process is extended in D. Shown right are die thinned to 1 to 2 microns RST.

Examples of Ultrathinning

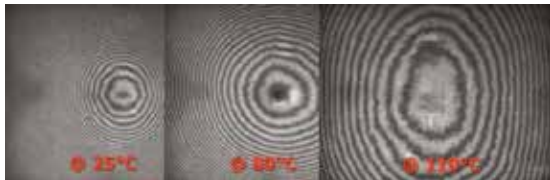
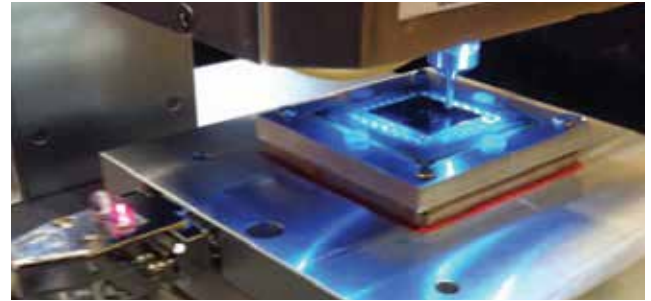


Thermal Relaxation

In Situ thermal modification of the packaged device, during sample prep, has been long proven as a safe and effective tool to optimize the ultimate silicon die uniformity. Thermal relaxation can be used either alone, or more frequently in conjunction with supplementary methods such as Curvature Compensation and 3D-Mesh.



The Thermal Stage (6686.1) is a standard upgrade. It also incorporates a Hot Plate Mode for sample mount/demount with Crystal Wax.



Moiré patterns on identical devices prepared at increasing temperatures show an increase in final thickness uniformity.



A chiller cools the stage and adds system thermal stability.

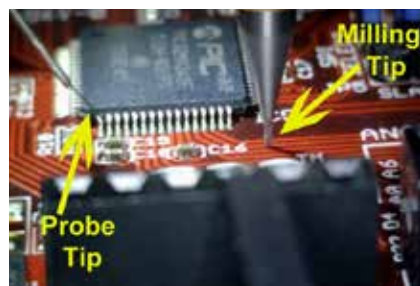
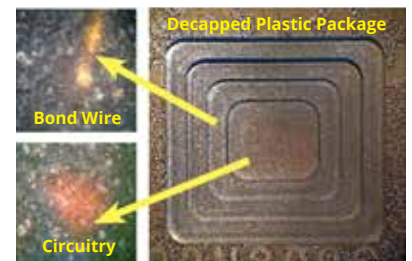
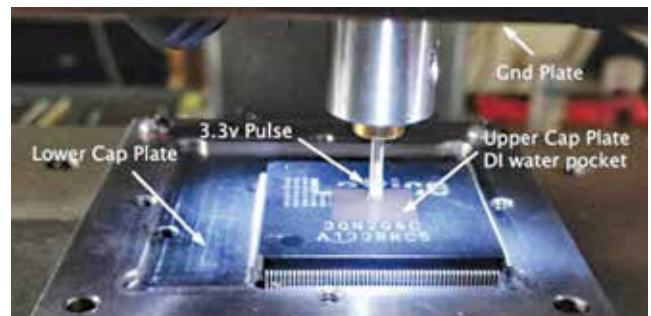
End-Point Techniques

In addition to a range of TIME and PRESSURE based process end-points, ASAP-1® In Situ offers a unique suite of Capacitance/Resistance-derived, ELECTRICAL End-pointing features.



By grounding the part to the end-point stage, the capacitive build-up between the approaching electrically-live diamond tool and an embedded feature of interest (die circuitry, bond wires) can be used as the automatic trip for a decap process.

Use of the method allows for fast, accurate and repeatable process end-points to be achieved without the need for time consuming visits to/from an optical microscope.



Microsurgery with a live 0.4mm dia mill in combination with a probe tip



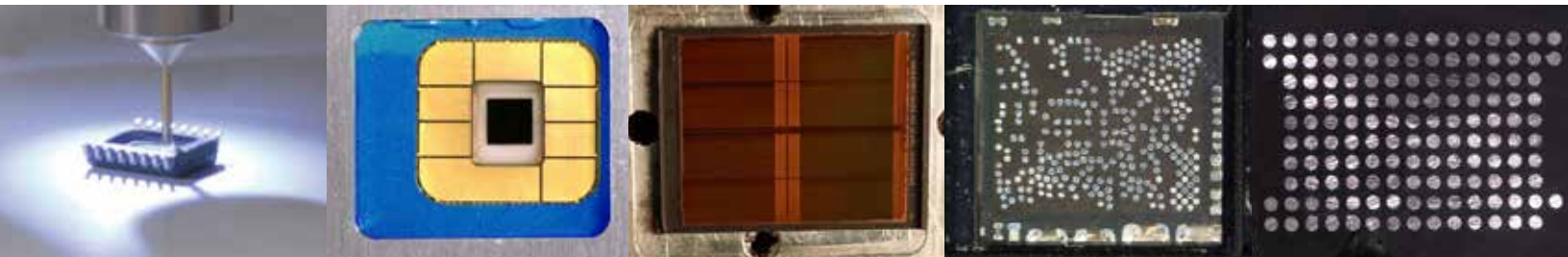
'Breadboard' used to ground the pins of a DIP for decap with electrical endpoint



Feature	Specification
Z-Vertical Direction Precision	0.04 microns (40 nanometers) minimum step-size
Table Precision (X & Y Travel)	0.2 microns (200 nanometers) minimum step-size
Table Travel Amplitude	100mm x 100mm (max.)
Polishing Method	Patented ASAP-1® Float-down head, with Z-lock, enhanced with electronic sensors and tool patterns (ASAP-1® Classic, ASAP-1® X, ASAP-1® Swap, Serpentine, User-defined X-Y, Spiral, Frame, and Relief)
Sample Tilt Control	Automated 2-circle stage tilt control (+/- 5 degrees)
Force Control	1000 grams (max) with 1gram precision. Overall accuracy +/- 10 grams
Video	Realtime 10.1inch (255mm) touchscreen monitor, overlaid with stage and process variables. HDMI Video-Out for (optional) external monitor. 4.25inch (108mm) secondary touchscreen
Programming Input Method	Touchscreen, joystick and 3 physical rotary encoders. Optional wireless keyboard and mouse. File load/save to flash drive. Remote programming
Core Software Features	Drop-down menu interface for File handling, Cam Select, zoom, and image enhancement, Overlays, Tool Diameter, Pattern Select, Force Control, timers, Illumination, Set-points, Touch-off. Additional purchased options unlock menus for RST, 3D controls, thermal, end-point
Process Cameras	Two 4K UHD Cameras provide real-time video at 45 degrees to tool/surface interface at front and side
Target Camera	4K UHD Camera provides top-down video for positional targeting
Power Requirements	Universal: 100-120VAC; 200-240VAC (Single Phase). Power Consumption: 300 Watts Maximum in use
Footprint	19 inches (480mm) Width x 27.5 inches (698 mm) Depth x 27 Inches (685mm) Height
Weight	200lbs (91 kg)

ORDERING INFORMATION

Code	Item	Description
6760.5	ASAP-1® IN SITU (2024 Model)	DIGITAL Selected Area Preparation System , (100-240V, 50/60Hz). Includes: tool spindle drive with sub-micron Z-resolution, +5/-5 degree automated X-Y tilt-table, integrated real-time machine vision, min 10-inch touchscreen lcd monitor, set of 2mm and 3mm tools, 6389.1 Force Feedback module. Three 4K UHD Cameras (Target & Process Front and Side)
6394.3	3D Module - Curvature & Mesh	System software upgrade to add processing and compensation for sample surface curvature with adaptive mesh overlay
6686.1	Heat & Cool Thermal Relaxation Stage	Hardware and Software Upgrade to add thermal relaxation capability. Touch-Panel screen controls. Peltier-based heating plate, Chiller unit. Includes cables, and two mounting plates. Hot Plate Mode
6675.1	Machine Vision Monitor	24-inch (min) monitor machine vision upgrade for improved In Situ view of polishing tip/sample surface interface, includes stand (VESA mount)
6677.1	Fluid Control System (FCS)	Auto dispense and collect system for polishing fluids and abrasives. Three input lines
6682.1	Thermal Acclimation Plate	Adds ability to allow inlet fluid from FCS to reach required process temperature
Characterization Modules		
UT-F3	RST (Through-Silicon) Measurement System	Non-contact measurement (1280-1340nm) of silicon and other semiconductors. Includes: Thickness-Solving Software. 4K Video camera (microscope); Si thickness standard. Note: Customer supplies own PC/tablet - Windows 10 required. Measures from full wafer thickness down to approx. 8 microns RST
UT-VIS	VIS Extension for thin films	2nd "VIS" Spectrometer addition to the UT-F3 system to allow for ultra thinning applications. Adds film measurement down to approx. 8nm RST
6368.1	Capacitive/Resistive End-Point Module	Hardware and Software Upgrade to add end-pointing for enhancement of decapsulation performance



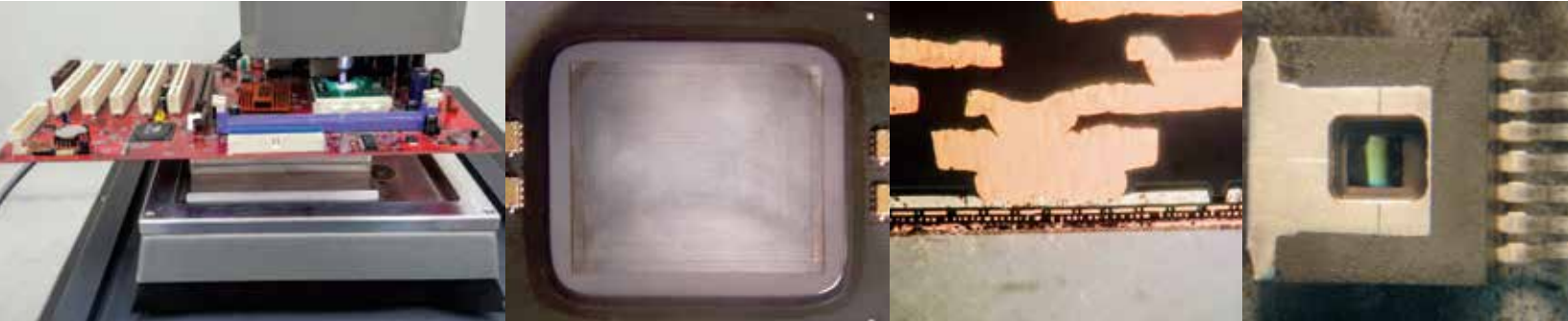
Small Devices

Smart Cards

Stacked Die

Die Removal

Chip Off

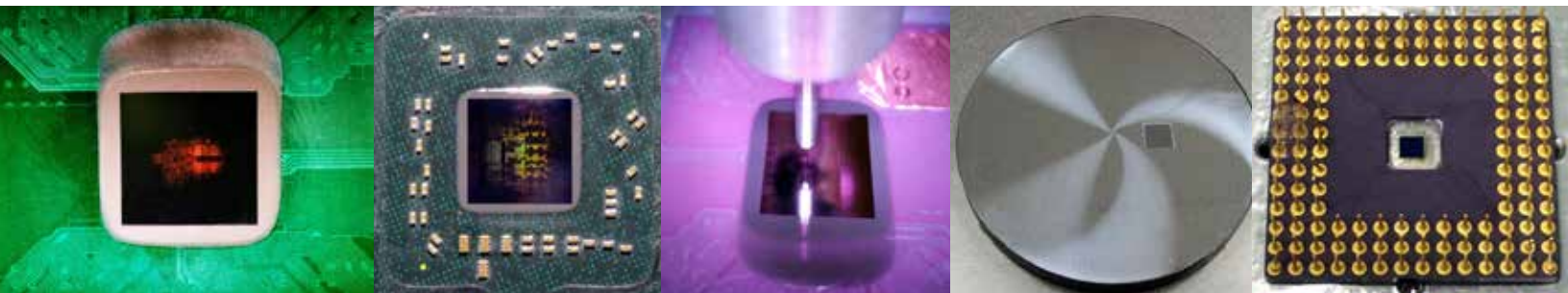


Large Modules/Motherboards

BGA Reveal

Cross-Sectioning

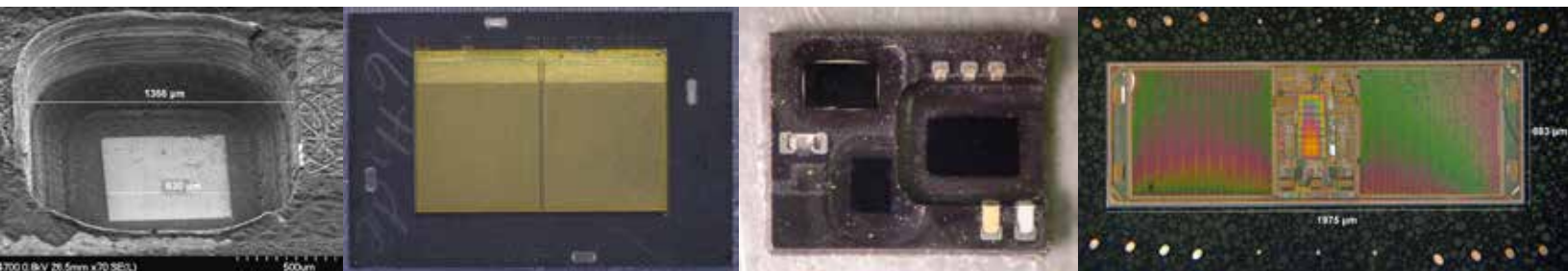
Power Devices (SiC, SiN, Si)



Ultrathinning

Wafers (200 & 300mm ready)

Ceramics



Decapsulation

Stacked Die

Multi-Chip Modules

De-Processing

Ask how we can help with YOUR application

Polishing Technologies, Helping Your Lab to Shine...

ULTRA TEC is proud to operate a continuous product improvement program. Product specifications and appearance are subject to modification without prior notification.

Note: ASAP-1[®] is a Registered Trademark. Portions of the Technology are covered under US and related Worldwide patents - 6,630,369; 6,781,232; 7,066,788; 9,157,935 & 6,245,586. More patents are pending. All other trademarks remain with original trademark holders.

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