DIGITCONCEPT

Microelectronics & HighTech Equipment

ASIA - AMERICA - EUROPE

Sesame 707 / 777Cu

Automated Dual Acid IC Decapsulator

- +10°C to +250°C
- innovative software
- dynamic etch time adjustment
- multiple acid rinse options
- smallest footprint

www.digit-concept.com

About us

Since 1992 DIGIT CONCEPT has been supplying tools for semiconductor Failure Analysis. DIGIT CONCEPT also invests considerable time and effort in the development of new and innovative techniques for the semiconductor industry, but also in developing new techniques and improvements for existing technologies.

20 1992-2012 ANNIVERSARY

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DIGIT CONCEPT offers the following:

- Extensive knowledge of Failure Analysis:
  - All techniques used before and after IC decap
- Decapsulation Knowledge:
  - 12 years experience with LASER decapsulation
  - 19 years experience with ACID decapsulation
  - 19 years experience with PLASMA decapsulation
- Worldwide Support: 5 Sesame Labs
- Technology Leader: 10 international scientific papers
- German and USA quality and robustness

Sesame707, a new tool?

Yes, and No! The first patent for decapsulation apparatus was granted to Ben Wensink in 1982. At that time he worked for National Semiconductor. This patent was in turn licensed to Bert Wagner who developed the first commercial acid decapsulator. From his pioneering approach to IC package decapsulation until now there have been only a few minor improvements, but no real breakthroughs in decapsulator design - until now.

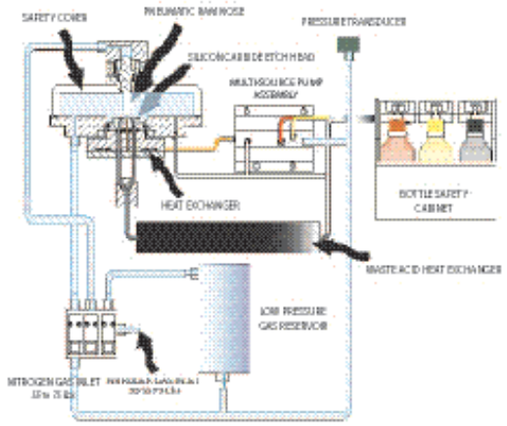
Kirk Martin, now with RKD Engineering, has patented many techniques with IC decapsulation. His first patent was awarded in 1998. The most recent patent is pending for current technology improvements (2010). Kirk Martin, from RKD Engineering, introduced the EliteEtch early in 2000. This unit utilized new pump technology, developed by Mr. Martin that achieved substantially greater turbulence in the etched cavity, thereby reducing both process times and acid consumption. RKD Engineering also pioneered the use of a cooling system for the waste acid allowing the use of a single waste bottle. The Sesame707 is based on EliteEtch from RKD Engineering and this design has been in use for many years.

About Sesame777Cu

As you may know DIGIT CONCEPT published its first technical paper at IMAPS2003 with the Freescale France Team researching problems with Aluminium Corrosion following chemical decapsulation. This was the beginning of our studies and the impetus for exploring lower decapsulation temperatures. For a long time we used 44°C, then 27°C in order to preserve copper bond wires. A few years ago we have been working on trials with sub room temperature acid decapsulation. The results were very promising. The Sesame777Cu Dual Acid Decapsulator is the result of our work in this area with Kirk Martin.
RKD Engineering has patented this technique.

SESAME 707/777CU

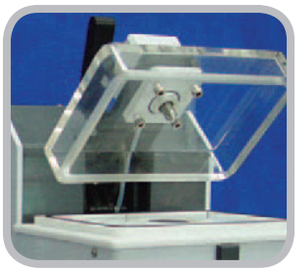
Schematic of System plumbing



SAFETY COVER

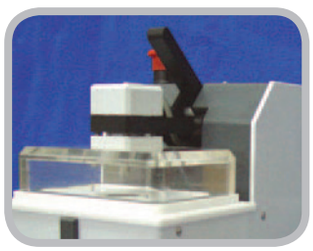
The device hold down assembly (ram nose) is pneumatically activated and is designed for a large amount of travel. The ram nose is normally retracted and only extends after the safety cover is fully closed. The vertical movement of the ram nose secures the device to the etch head thus eliminating movement of either the package or its fixturing.

OPEN



Safety cover open to shown ram nose linear motion of travel that eliminates the possibility of package/ gasket movement so often found in other systems where the ram travels through an arc

CLOSED



Safety cover closed, to show closure onto cover seal that eliminates the

~~SAFETY COVER ERROR~~

problem so frequently found in less sophisticated designs.

Versatile System Configuration

HANDHELD KEYPAD

Operational simplicity results not only from software that continually checks and protects the system against operator error, but control from the Handheld Keypad is simple and intuitive. Anyone who can use a mobile phone can run an Sesame 707/777Cu Decapsulator. The remote control can be placed outside of the Fume Hood increasing the life time of the electronics parts and increasing the safety of the operator.

Fume Hood space is always at a premium so we have designed the smallest footprint in the industry while enhancing every possible safety feature. The incorporation of a separate heat exchanger for cooling waste acid below 90^{O}C permits this size reduction. Now we only need a single waste bottle all are small and with high reliability!

LookAhead software eliminates the danger of waste bottle overflow by preventing operation of the Sesame 707/777Cu if the waste bottle does not have sufficient space in it for the programmed etch process to complete.

FIXTURES and ACCESSORIES

Sesame 707/777Cu can use all the accessory kits, gaskets and alignment plates. However, for significant cost savings and the advantage of always having the ability to design and cut gaskets for each and every package type, we recommend to use our material sheet. You can easily produce your gasket with the Sesame 500 or 1000, or by our large choice of standard Gaskets and alignement plates.

DIGITAL PERISTALTIC PUMP

Sesame 707/777Cu employs an unique solution to ensure precise pumping of corrosive acids. This revolutionary design, of a multi-chamber fluid-metering module is protected by patents pending for its inventor Mr. Kirk Martin.

SAFETY BOTTLE CONTAINER

The Sesame 707 / 777Cu is the only Decapsulator to incorporate true double containment for all fluid couplings between the bottle container and the decapsulator.

Interconnects run inside Teflon containment tubing that can be fed from either side of the Bottle Box.

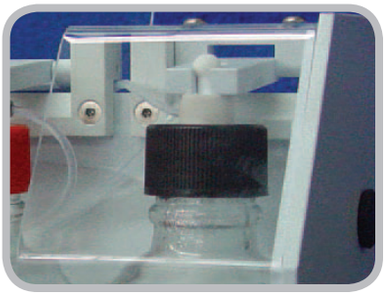
The Bottle Box Assembly and the Etcher Unit contain high reliability fluid sensors (optic fibers) to alert the operator in the unlikely event of an acid leak from any of the bottles or internal fittings.

The Sesame 707/777Cu Decapsulator can use either US standard 500 ml. bottles or Japanese or European bottles.

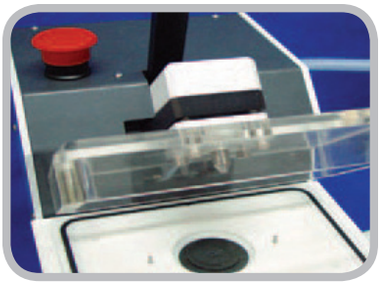
Bottle exchange on any decapsulator includes possible risk to the operator. To minimize this a universal pivoting interconnect that allows simple and trouble free bottle exchange with minimal exposure to residual acid.

SYSTEM SAFETY

Safety is not an option with Sesame 707/777Cu many leak detector optic fibers and an EMO in standard.



Universal Pivot Joint Bottle Connector for either Japanese or European or US standard bottles (as shown)



EMO location on top plate of etcher. The Sesame 707/777Cu can be shut down via EMO with no damage to any internal components and his operator!

SESAME 777Cu

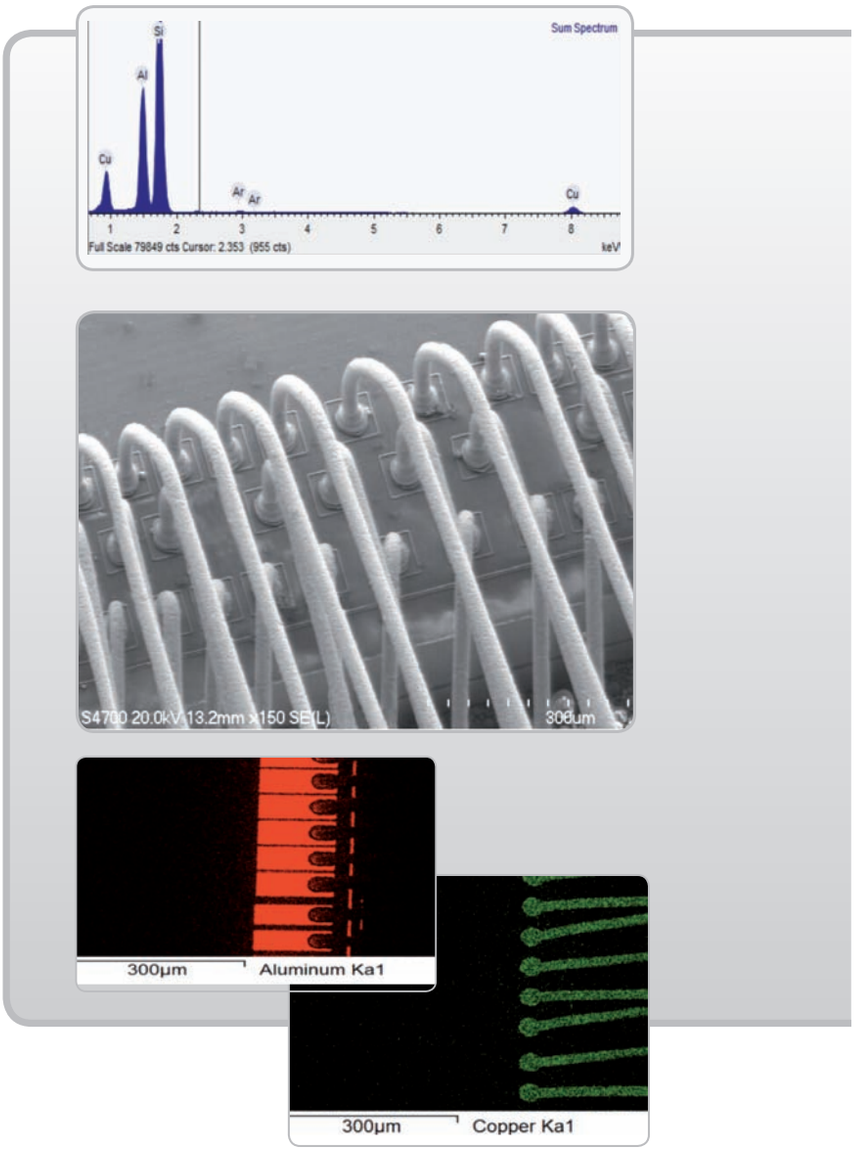
The first acid decapsulator made for copper

The SESAME 777Cu is an Automated Mixed Acid Decapsulator, with advanced feature integration to enable high productivity. This Decapsulator rapidly and easily opens even the most delicate packages by delivering precise, micro-aliquots of nitric, sulfuric, or acid mixes to the package with no sample damage.

The delivery of each micro-aliquot is done with sufficient pressure to create extreme turbulence in the etched cavity that greatly accelerates the rate of encapsulant removal. Very low, precise acid temperatures, combined with high micro-aliquot delivery rates allow for the decapsulation of copper wired devices with no wire or metallization damage.

An exclusive acid delivery function can be selected that delivers the highest pulse rate possible while consuming less than maximum acid volume. The specially designed acid heat exchanger can accurately control acid temperature down to 10°C and up to 250°C, with flow rates to 8 ml. per minute. The high acid pulse rates achieve reasonable etch times even at the lowest temperatures.

The monolithic etch head is machined from premium grade silicon carbide for unsurpassed acid resistance. The etch head is designed to reduce the fuming of any residual acids left on the etch head at the end of the process.



About the use of a LASER for precavitation

In order to reduce the chemicals etch time. We have co-published 9 articles on this subject (ISTFA, IPFA, ESREF, etc.).
As a result of our research, the required use of +250°C for decapsulation of thermal plastic parts 20 years ago has been reduced to +10°C today!

At which temperature is it possible to chemically decap after precavitation made by LASER ? It depends on the following:

- EMC (Epoxy Molding Compound),
- Percentage of Glass ball filler in the EMC (93% or more),
- If the copper wires are or not coated with Pd,
- With or without prior LASER ablation,
- Acid types Used such as HNO3 98%, H2SO4_20%SO3 ...
- Also If there is residual water in the package and in the Acids used
- The rinse recipe

As such, many parameters can affect the sample and the choice of decapsulation and precavitation techniques.

Sesame 707/777Cu System Specification

GENERAL SPECIFICATION

- Dimensions - (W x D x H)
  - *Decapsulator* 7.5 x 12.5 x 12 inch
    190 x 318 x 305 mm
  - *Bottle Assembly* 10 x 5 x 11 inch
    254 x 127 x 279 mm
- Weight — approx. 35 lbs.(16 Kg)
- Gas — 5 bars 70 psi.
  (N_2) or CDA dew point of -40°C
- Power Source — 90 to 250 VAC
- Acid temp. range — Sesame 707 ❯ Room temp 250°C
  Sesame 777Cu ❯ + 10°C to 250°C
- Acid temp. set point — 1.0°C ± 0.1°C
- Etch cavity (up to) — 22 x 22 mm

SOFTWARE OPERATIONAL SPECIFICATION

Acid selection
- fuming or concentrated sulfuric acid
- fuming or concentrated nitric acid
- mixed acids

NOTE: All mix ratios are dynamically prepared within pumping assembly

Acid mix ratios
- 1:0, 9:1, 6:1, 5:1, 4:1, 7:2, 3:1, 5:2, 2:1, 3:2, 1:1, 1:2, 1:3, 1:4, 1:5, 0:1
  (nitric to sulfuric ratios)
  other on request

Post etch rinse options
- fuming sulfuric acid
- fuming nitric acid
- mixed acids
- no rinse

NOTE: Acid rinse temperature settings are automatically calibrated to etch temperature

Etch times
- 1 to 1,800 seconds, in 1 sec. increments

NOTE: Etch time can be dynamically adjusted during etch process

Etch modalities
- Pulse Etch,
- Reciprocating Etch - Acid Pulsation

NOTE: REAP is a superior approach to maximizing the carrying capacity for the etch acid(s) within the package volume. It allows superior etch characteristics when nitric acid or mixed acids are selected.

Etch temperature ranges

Sesame 707	*Sesame 777Cu*	
Room temp to 90°C	+10°C to 90°C	(nitric acid)
Room temp to 250°C	+10°C to 250°C	(sulfuric acid)
Room temp to 100°C	+10°C to 100°C	(mixed acids)

Etchant volume — 1 to 8 ml. per minute for all acids and

Operator program — 100 programs
Storage — stored to non-volatile memory
Software upgrades — via RS232 or USB computer link

SAFETY DESIGN FEATURES

EMO Emergency Power Off Switch

Etch Head Safety — over temperature sensor circuitry in standard

Leak Detection Sensors
- Decapsulator Body
- Bottle Box Assembly

Secondary Containment
- *Real* Secondary Containment

Acid Fume Reduction
- Waste Acid Heat Exchanger to minimize acid fuming

CERTIFICATIONS & INDUSTRY COMPLIANCE
- RoHS
- CE
- SEMI S-2
- SEMI S-2, 93

SYSTEM MAINTENANCE

Routine system maintenance of the Sesame 707/777Cu is simplicity itself. By selecting maintenance routines from the handheld keypad controller most maintenance routines can be run, including
- Temperature Calibration
- Optical Leackage Sensor Calibration
- Valve operation
- Ram Nose operation
- Low pressure gas supply and vent functions

Sesame 707/777Cu uses no pressure regulators at all, it just connects directly to a nitrogen gas line at 5 bars (70 psi.).

WARRANTY

2 years return to factory full system warranty
6 years for the acid transport pump
Lifetime warranty against clogging for the etch head/heat exchanger
Lifetime warranty against chipping and cracking of the etch head under normal use

In cooperation with

RKD ENGINEERING

Distributed in the USA by Left Coast Instruments under the name Elite Etch

Sesame 500

- TableTop Equipment
- Sesame1000 LASER quality
- Cost-effective and Upgradeable to 1000

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