What to expect when your expecting...to decap in-house

Presented by:

Erik Jordan – erik@nisene.com

Nisene Technology Group
384 Pine Street
Watsonville, California

Decap equipment needed

- JetEtch
- Gaskets/Alignment plates
- Chemical grade fume hood
- Chemical grade storage cabinet
- Lab safety equipment
  - Lab coat, gloves, face protection
  - Eye wash station
  - Emergency shower?
  - Tweezers
  - Beakers
- Compressed air

Facility Requirements, Install, Training

- Dedicated lab space
  - Don’t want your break room to double as a decap room
- Chemical supply/waste supply storage
- Water supply
  - Preferably within same room
- Compressed air
  - System operation as well as device cleaning
- Dedicated decap employee(s)
  - Specific employee titled “general decap manager”
  - Visual inspection staff are great candidates
- Minimum one day, two days preferably for training
  - Mandatory one employee be present from start to finish of training

Equipment maintenance

- JetEtch
  - Once a year water clean out (20 min process)
  - Exterior system wipe down once a month or as needed
  - Preventative maintenance available but not required
- Fume hood filter replacement (ductless)
  - Replace every 12-18 months
- Gasket/alignment plates
  - Wipe down after every use
  - IPA soak overnight for regularly used gaskets

Operator training required/recommended

- None, if you want (not recommended)
- 1 day install/training recommended
  - System use/function
  - Basic decap and advanced decap
  - Basic chemical handling
  - Device handling
- Service manual provided outlines use and maintenance
- Chemical handling 101 (highly recommended)

City/State requirements

- Rule 1: State trumps local laws
- Quantity rule
  - Keep chemicals on hand to minimum
- Permits
  - Depends on location and chemical quantity
- Leasing your space? Check with building owner
- OSHA?!?!

Some quick numbers

- 1 Bottle of nitric acid costs about $200
- Standard bottle contains 500ml
- Typical decap uses 3-4ml of acid

Onsite Testing

- 500 divided by 5 = 100 decap's
- $200 divided by 100 = $2/decap

Lab Testing

- 100 decaps X $100 = $10,000!!

Real life examples

Company A

- Location: Southern California
- Very small chemical consumption
- $400 city application fee and $25 annual renewal
- No on-site visit required (because of small consumption)
- Application approval time – 60 days

- Total start up investment (refurb equipment) - $33,000

Real life examples

Company B

- Location: Southern California
- VERY HIGH chemical consumption
- Application fee/renewal = $0
- Onsite visits required
  - Fire Department
  - Building owner
- Start to finish time 13 months
  - Because of onsite visits and approvals

- Total start up investment - $38,000

Real life examples

Company C

- Location: Singapore
- Average chemical consumption
- Facility set up - $120,000
- Onsite visits required
  - Fire Department equivalent
  - Building owner
  - EPA equivalent
- Start to finish time 12 months

- Total start up investment - $170,000

In-house perks

- Companies with onsite decap saw roughly 20%-25% increase in decap testing
- Stocking distributors can test immediately from their in house stock
- Your database of known good components can be started immediately
- These are just a few of the perks

What about copper?

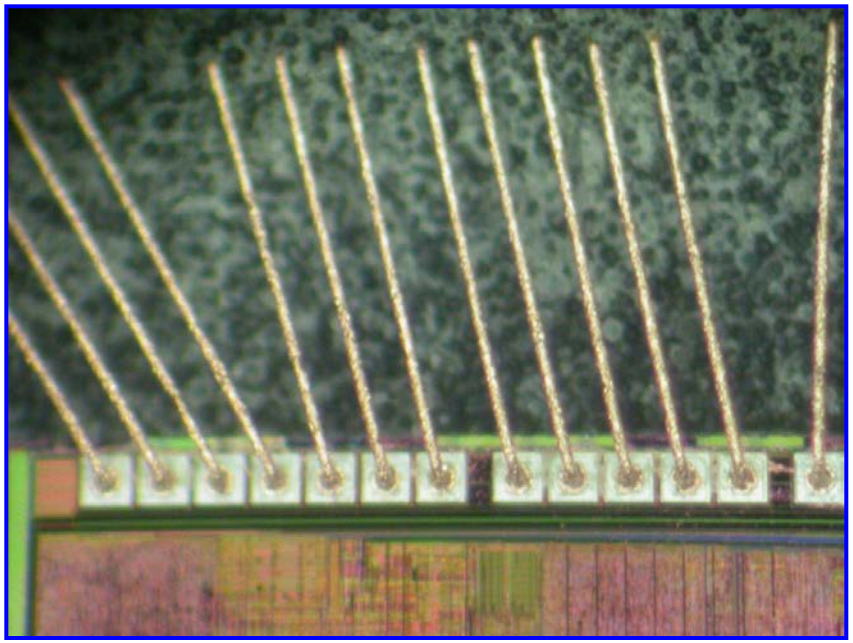
- Currently roughly 90% of ICs are made using gold
- Gold prices are at all time highs
- Copper is the most favorable replacement
- Copper is cheaper in cost, more efficient, and more plentiful
- By 2013 up to 70% of the market could be made up of copper bonded components
- With this change more and more independent distributors will see copper bonded components in their stock

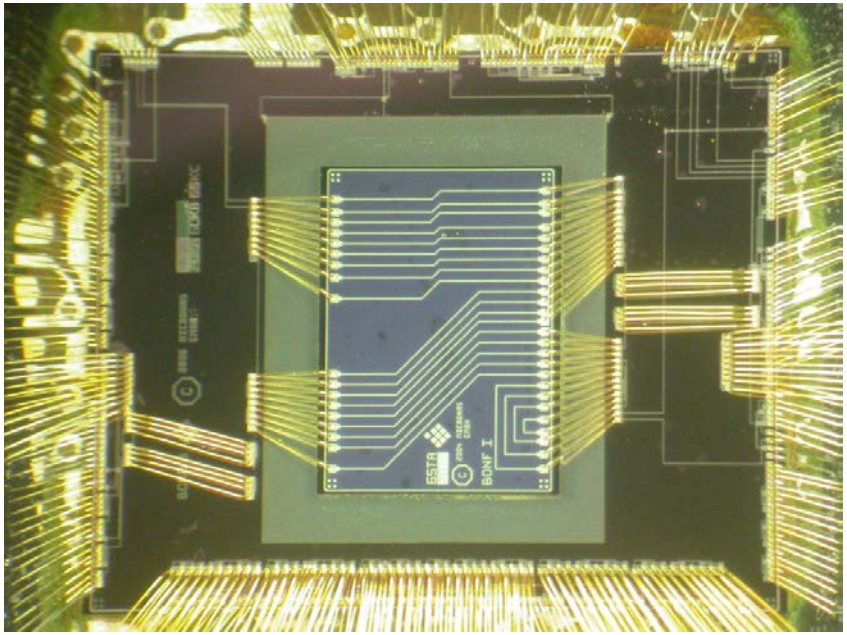
How this change affects you

- More of your stock will start becoming copper
- Copper components are much more tedious to test
- Decapsulation must be reworked to be done properly
- Without prior knowledge of the internal components you must open a part to first see what it is
- Testing can take a lot longer per part when compared to a gold bonded component.
- Test houses do charge more for copper component testing

Nisene
Technology Group

Can you see the difference?





How do you know if it's copper?

- As with other components, unless prior knowledge of the component is in hand you will have to open a part and inspect
- Gold used in components don't react with nitric and sulfuric as harshly as copper
  - Copper wiring will not look as "clean" after decap
- If no wires are present that could be a clue
- General rule – start with nitric acid on all decap since it is a less aggressive chemical

Want more info on how to decap copper, talk to me after.

Nisene solution to copper

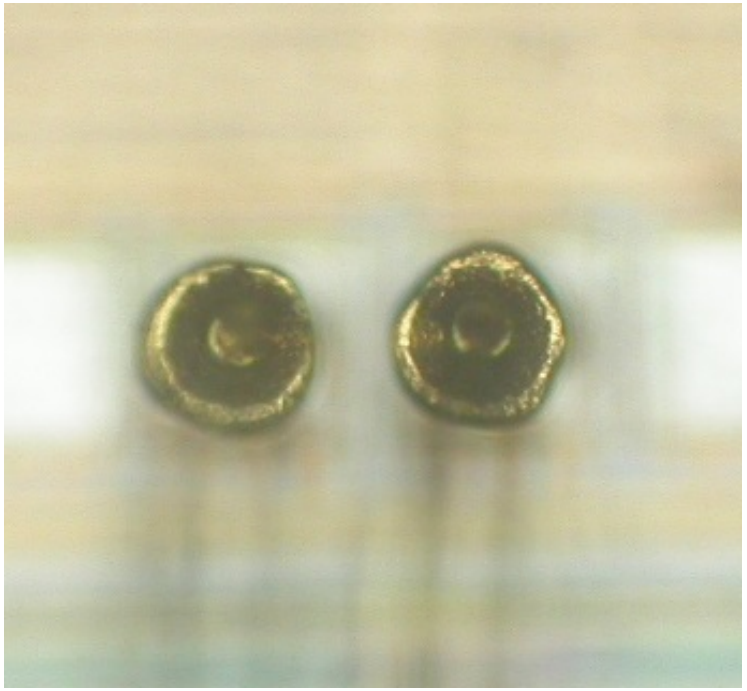
- Nisene recently unveiled a new version of the JetEtch, the JetEtch Cuprotect
- Utilizes an electrical bias during decap that leaves copper wires virtually unetched
- Allows for high temperature decap
  - Which is hard to do because higher temps etch wires faster
- System also allows for general decap on gold and aluminum components

Want more info on how to decap copper? talk to me after.

What about double ball bonds?

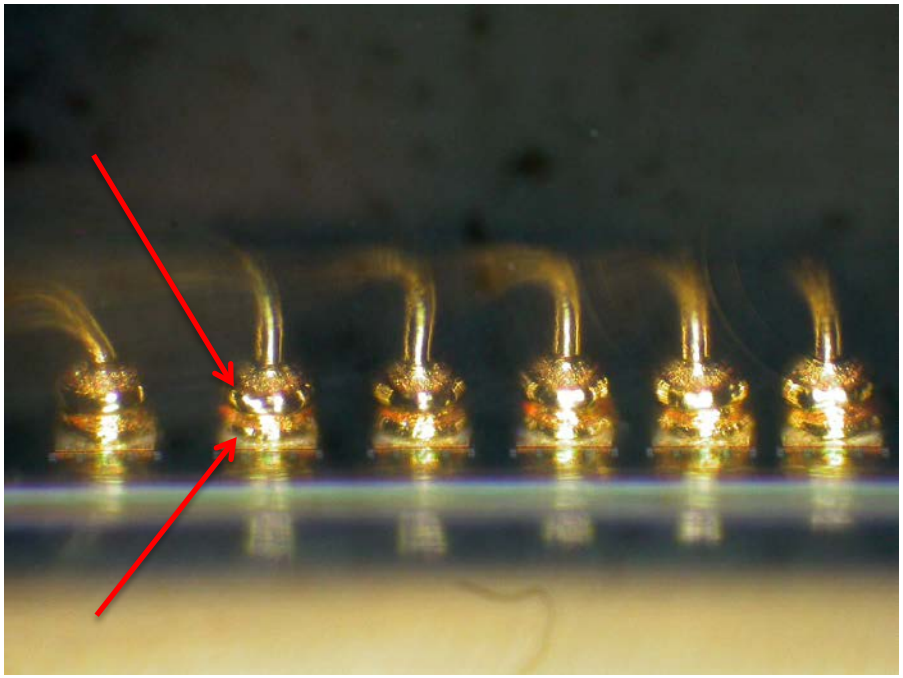
- Double ball bonded parts have grown to become some of the most sophisticated counterfeits out there
- They can pass swab tests, external visual, x-ray, electrical and decap if not inspected properly
- Manufactured counterfeits recap:
  - Remove internal die from one package type and insert it into another package type, refill, remark, then sell as new.
  - Only illegal when intending to sell as new
  - Leaves easy to detect signature if you know what to look for
- How do I inspect for double bonds?

How to inspect for double bonds



- Top down view
  - Double bonds not visible
- Nothing looks out of the ordinary
- With no other anomalies, component could pass inspection

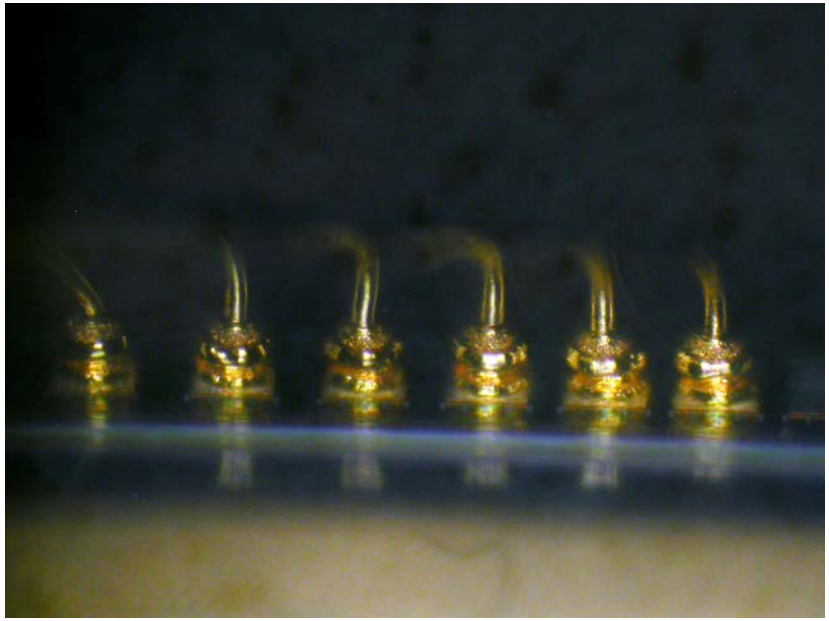
How to inspect for double bonds



- "Pancake" bond effect
- Bottom bond is remainder of original bond
- Only visible through side view optical or SEM imaging
- Acceptable practice for component redesign
- Meets all specifications of a standard refurbished component
- Can be seen with real time x-ray…$$$$

How to inspect for double bonds

- This process requires a double bond in order to work properly
- Bottom bond is from the original package
- New bond must attach above original bond
- With this connection part will have electrical functionality (when done properly)
- Simple tilt inspection of bonds can stop these counterfeits from passing inspection
- Photo documentation can be difficult



Nisene Technology Group

With our “Lab-in-a-Box,” you will receive:

- JetEtch II Decapsulation System
- Ductless Fume Hood
- Specially-rated Acid Storage Cabinet
- Clean Dry Air Filtration System
- Emergency Eye Wash Station
- Specially-rated Waste Container
- Face Shield
- Lab Coat
- Nitrile Lab Gloves
- Pyrex Brand Beaker Set
- Lab Tweezers/Forceps
- 5-gallon Carboy for Solvent Waste

Complete install and training included and ERAI attendee discounts available!

Nisene Technology Group

Decapsulation, like all other inspection practices, should be researched in detail before bringing in-house. Like most other technology, it is only as effective as your knowledge of its use is.

We recommend you contact us to discuss your current testing protocol, your aspirations of testing in-house, and how our equipment fits into that model.

When done properly, our equipment, besides creating a great competitive advantage, can add a protection level otherwise unattainable for your quality control program.

Questions or comments?

One-on-one consultation available in booth #16