FIFTEENTH ANNUAL BiTS 2014
Burn-in & Test Strategies Workshop

Session 1

Monday 3/10/14 10:30am

A CLEAN START

There's no doubt about it, clean contacts in contactors and sockets work a lot better than dirty ones. So what better place to start looking at burn-in and test strategies than with a close look at contamination control and cleaning processes to improve yields, test time and re-test reduction? This session begins with three hypotheses of the causes for contact contamination, Along with guidance on procedural changes for improved performance. The next presentation offers a solution to the havoc high temperature burn-in can wreak on devices under test (DUTs) with a specialized coating process to prevent solder contamination of contacts and deformation of the solder bumps on the DUT. The final two presentations examine online cleaning processes. The first focuses on a characterization tool that determines the effectiveness of online cleaning, while the second is directed at an automatic cleaning solution for a bowl fed handler used with a RF contactor. Hey, it's a dirty job, but somebody's got to do it.

Contamination Mechanisms of Contact Probes
Jon Diller, Kevin DeFord—Smiths Connectors | IDI

This Paper

Special Coating Cleans-Up a Mess
Paul Ruo—Aries Electronics, Inc.
Erik Orwoll—Contact Coatings, LLC

Unique Methodologies for Investigating On-line Cleaning Process Parameters and Recipe Optimization
Jerry J. Broz, Ph.D., Soheil Khavandi, Bret Humphrey—International Test Solutions

Yield and Test Time Improvement via Automated Online Cleaning
Brent Edington—TriQuint

Special Coating Cleans-Up a Mess

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Erik Orwoll--Contact Coatings, LLC

2014 BiTS Workshop
March 9 - 12, 2014

Probes Get Dirty

- Each time a ball/bump/pad from an IC "contacts" a probe, residue/deposits can form.
- This residue manifests itself in ANY/EVERY type of situation (burn-in, test or characterization).

Where does this occur?

- RF Test and Characterization
- High Temp Operating Life (HTOL)
- Highly Accelerated Sress Test (HAST)
- Burn-In (125°C)
- High Temp Burn-In (150°C)
- IC Programming

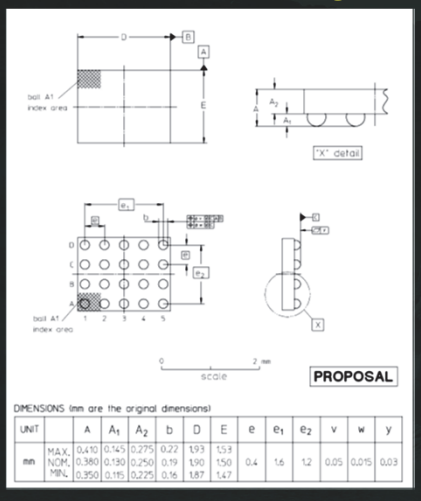
What are the typical problems?

- Burn-In--Residue and “stickiness”
- RF & Programming--CRes consistency

Here is our Specific Problem (and Solution)

- Device package
- Socket
- Environment: Burn-In (HTOL)
- Problems encountered
- Solution rendered

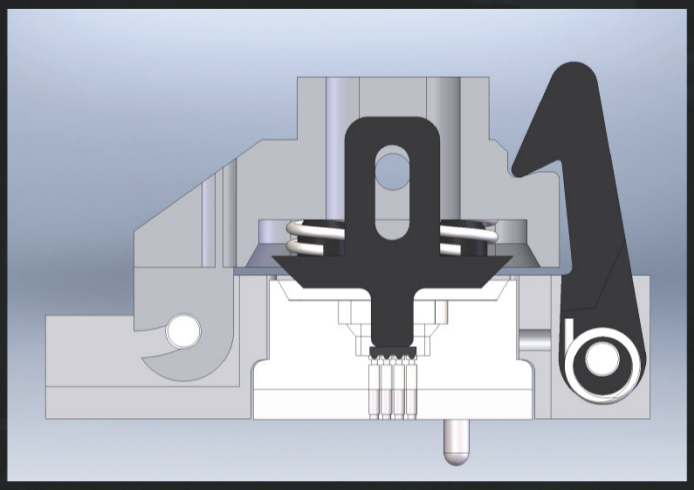
Device Package



DIMENSIONS (mm are the original dimensions)

UNIT		A	A_1	A_2	b	D	E	e	e_1	e_2	v	w	y
mm	MAX.	0.410	0.145	0.275	0.22	1.93	1.53						
	NOM.	0.380	0.130	0.250	0.19	1.90	1.50	0.4	1.6	1.2	0.05	0.015	0.03
	MIN.	0.350	0.115	0.225	0.16	1.87	1.47						

Socket

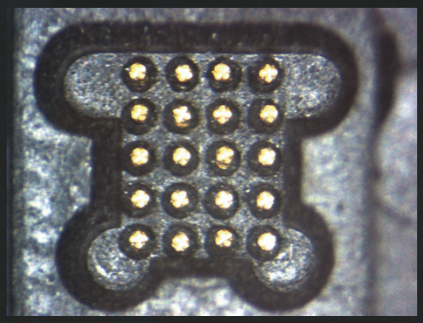


Environment: Burn-In (HTOL)

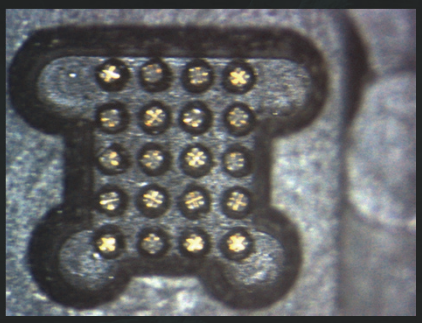
- 20 Balls: SAC 405 Pb-free Tin/Silver/Copper (95.5%/4%/0.5%)
- Ball pitch: 0.35mm
- Temperature: 150°C
- Burn Time: 168/300/1000/1500 hours
- 44 sockets per Burn-In-Board (BIB)
- 9 BIBs

Problems Encountered

- SAC 405 residue deposits on probes



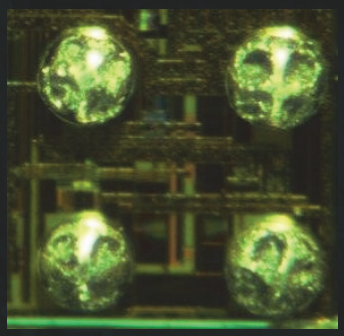
Before HTOL



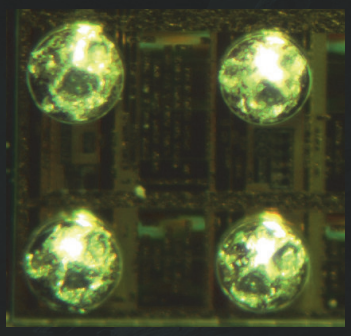
After HTOL Stress 24-168 hrs

Problems Encountered

- SAC 405 ball condition



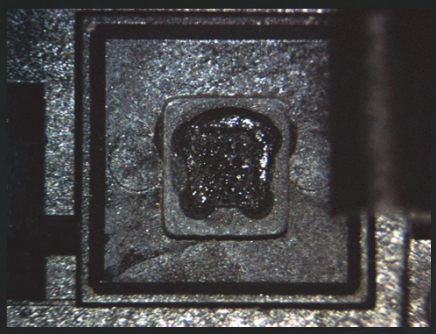
60 hours Sample 1



60 hours Sample 2

Problems Encountered

- Causes device to “stick” to probes



Stuck probes can easily short-out, which can melt the device

Problems Encountered

- Probes or pans? Residue is a problem.

Problems Encountered

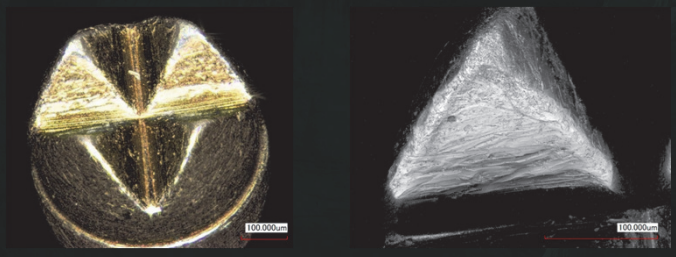
- Cleaning becomes necessary

Problem/Solution

- But what if the residue was reduced?
- Or (better yet) if it doesn't occur?
- What happens then?

Solution

- Current solution:
- Cleaning/brushing of probe pins



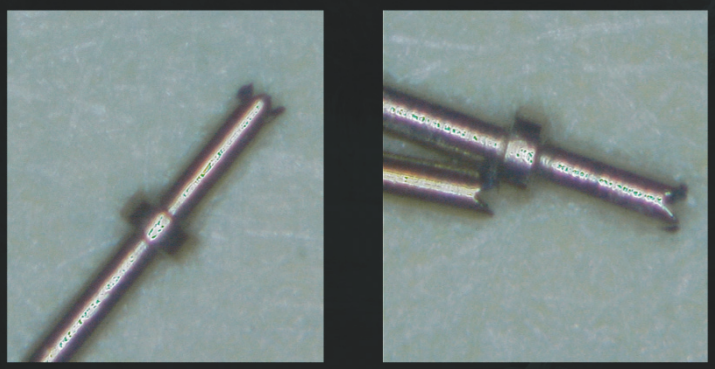
Solution

- Our better solution:
- “Teflon” for your probes….

Solution

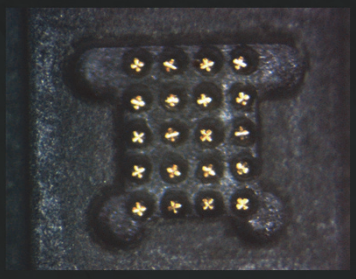
- Proprietary Gold (Au) alloy
- Resists Sn diffusion into Gold
- Uniform coating over entire probe
- Good for 10 (or 10 million) pieces
- Non-porous/anti-diffusion properties

Solution: Extended Burn-In

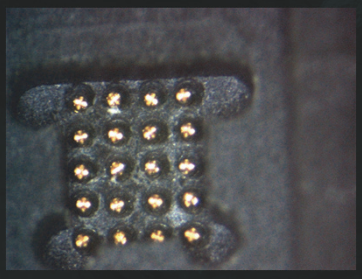


Probe Pins Coated with Au Anti-Diffusion Coating

Solution: Extended Burn-In

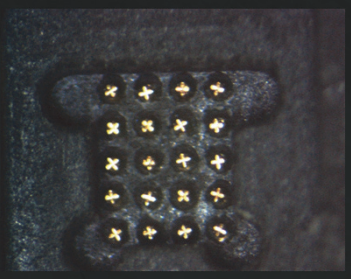


Probes after 168 hours

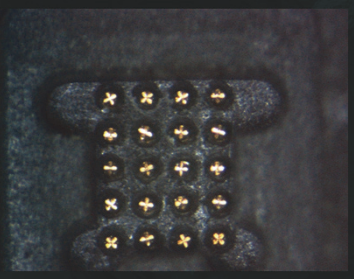


Probes after 300 hours

Solution: Extended Burn-In



1000 hours (PCB #1)



1000 hours (PCB #2)

Solution: Standard Burn-In

- 135ºC
- 20 Hour Cycle
- QFP Device
- Average 250 mA Applied

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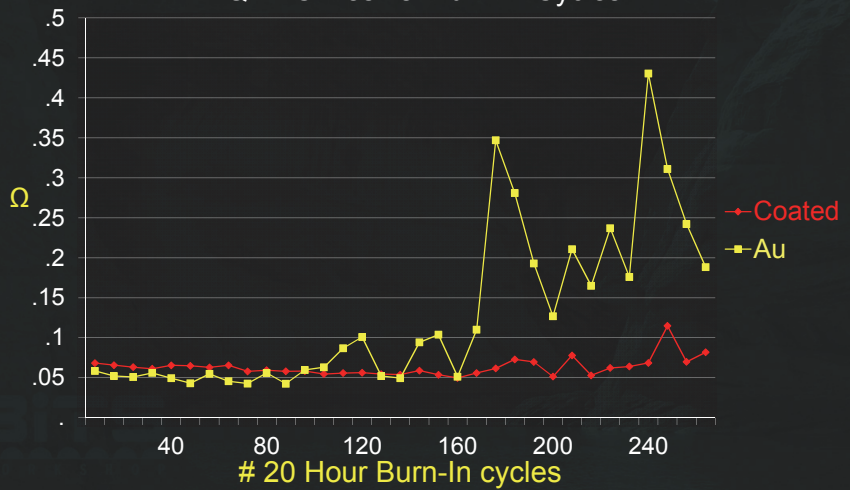
Solution: Standard Burn-In

QFP C-Res vs. Burn-In Cycles



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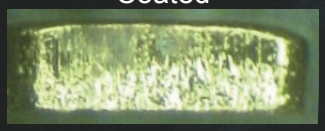
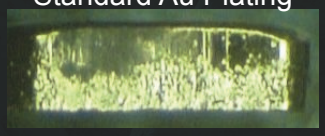
Solution: Standard Burn-In

- 2000 Hours

Coated

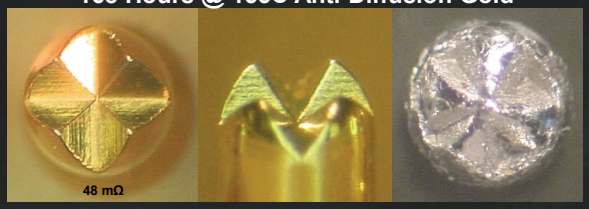


Standard Au Plating

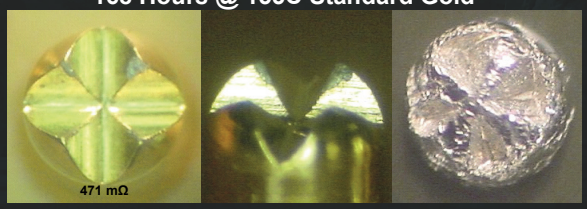


Solution: 1.00mm Probe

168 Hours @ 155C Anti-Diffusion Gold



168 Hours @ 155C Standard Gold



Benefits for Burn-In Apps

- No ball sticking/easy device removal
- Good for apps at 150°C+
- No shorts or socket melting
- No "dead" sockets on BIB
- More efficient BIB oven utilization
- Less downtime = less cost

Benefits for Test Apps

- No ball sticking/easy device removal
- Ensures max current carrying capability
- CR is more consistent, longer
- Less (or no) contact cleaning required
- More efficient testing throughput
- Less cleaning time = less cost