

IC Failure Analysis Lab

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Failure Analysis Report

F.A. Reference Number:	ICFA-0006
Customer:	
Reference Number:	N/A
Requester:	
Device Number:	AMD / ELANSC410-66AI
Quantity:	30
Report Date:	September 21, 2011
Analyst:	Jimmy Li
Report By:	ICFA Lab

Description

Thirty (30) AMD / ELANSC410-66AI samples were submitted to the IC Failure Analysis Lab for “*Counterfeit Analysis*”.

Device Information

Serial Number	Top Marking	Customer Request
1 - 30	See Photos	Counterfeit Analysis

Background

Thirty AMD microcontrollers P/N ELANSC410-66AI were submitted for counterfeit analysis. These parts, supplied by [REDACTED], had been flagged at receiving inspection for visual discrepancies. The package was a 292-ball plastic BGA. This P/N is listed as an MSL 4 in the Receiving Inspection database. Part number suffix -66AI specifies an industrial temperature range of TCASE = -40°C to +95°C and operating frequency of 66 MHz.

Summary:

AMD microcontroller plastic BGA's had been sanded, top-coated then re-marked. The only original marking found was the letter C. Due to the position of the C, it is believed the microcontrollers were originally rated as commercial temperature grade parts (i.e. 0°C to +95°C) and not industrial grade. The re-marking also brings into question all other markings (e.g. date code, operating frequency). AMD BGA packaging from the supplier was not compliant with an MSL 4 rating.

Analysis

External Visual Examination:

Microcontroller packaging was not suitable for moisture sensitive parts, **figures 1 – 6**. These parts should be packaged with only ESD approved materials, then vacuum sealed with desiccant and humidity indicators.

Microcontrollers (1 tray) were examined on the stereomicroscope for any defects, damage or anomalies, **figures 7 – 9**. Several observations were...

- Unusual discontinuous mound of encapsulation on top surface, **figure 10**
- Top surface light sanding marks, **figures 11 and 12**
- Evidence of black top-coat, **figures 13 – 15**
- Cleaning scratch marks on substrate around encapsulation, **figures 16 – 18**
- Laser markings not uniform in height and alignment is off, **figure 19**
- Original marking indication clearly shows the letter 'C' with top-coat and is located near the end of the part number, **figures 20 and 21**
- Discolored spots on bottom of substrate, **figure 22**

Mark Permanency Test:

Top surface of one part was scrubbed using IPA-, mineral spirits- and acetone-soaked cotton swabs separately. Mineral spirits exhibited slight removal of top-coat; acetone more so, **figure 23**.

Top-coat removal

Top coat was chemically removed from one part. Part was re-examined. No original markings were found, **figure 24**. Chemical stripper also attacked the encapsulation.

2D X-Ray Inspection:

The customer requested no 2D X-Ray.

I-V Curve Trace:

The customer requested no I-V curve trace analysis.

Decapsulation and Visual Inspection:

The customer requested no decapsulation.

Photographs:



Figure 1: Package as received.



Figure 2: Package as received - Opened.



Figure 3: BGA packaging – no vacuum seal, desiccant or humidity indicator cards.

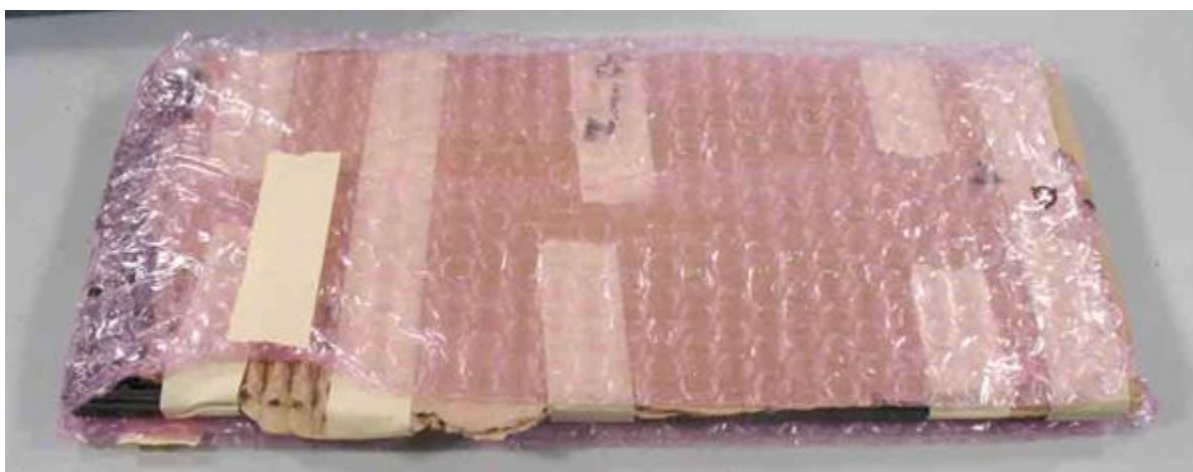


Figure 4: AMD BGA packaging.



Figure 5: AMD BGA packaging – cardboard on parts.



Figure 6: AMD BGA tray



Figure 7: AMD BGA's



Figure 8: AMD BGA – Top View

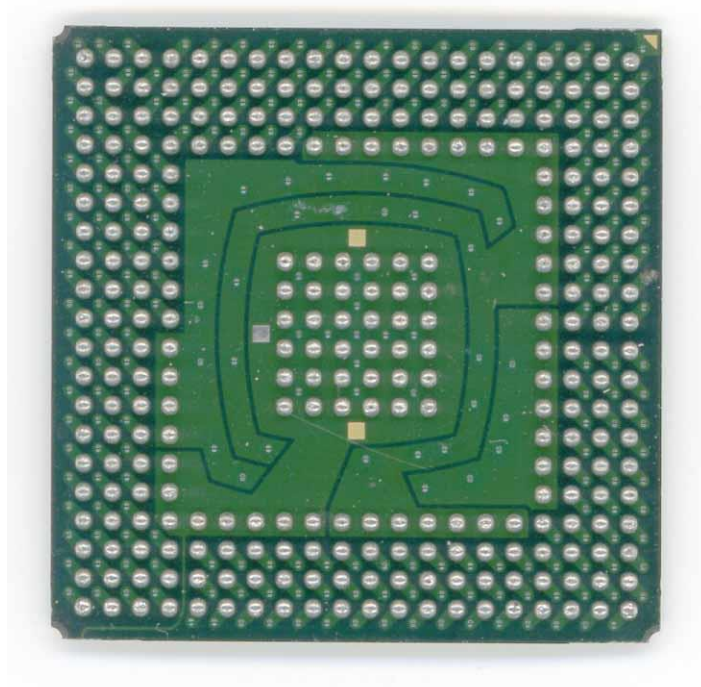


Figure 9: AMD BGA – Bottom View.

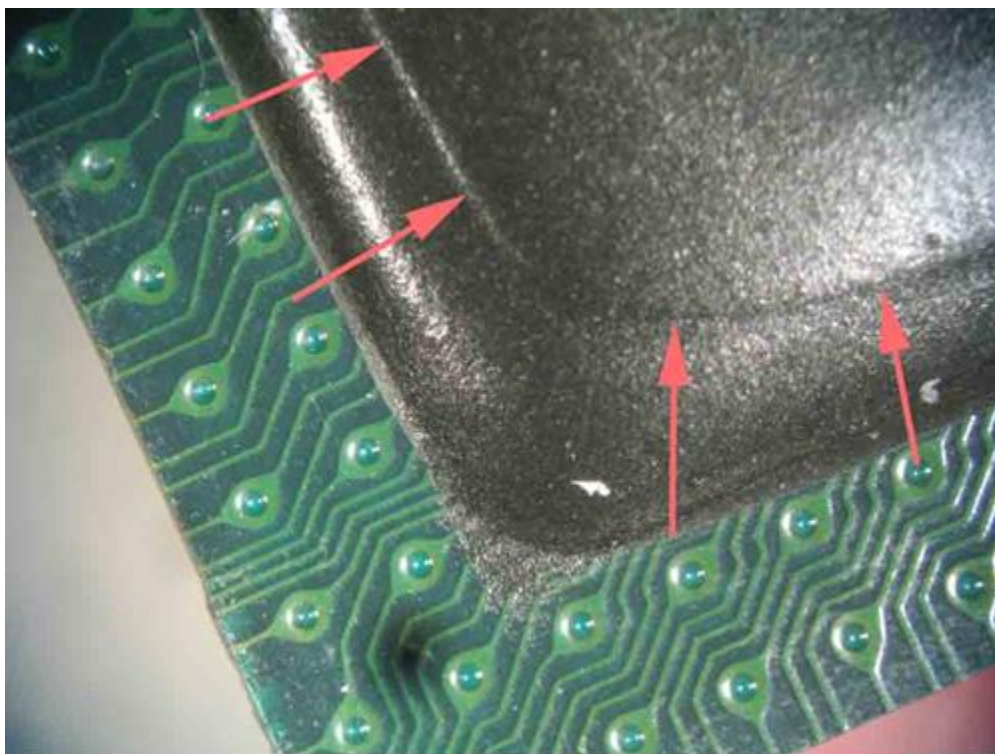


Figure 10: Top-surface mound of encapsulation.



Figure 11: Sanding Marks.



Figure 12: Sanding Marks. – Close up



Figure 13: Black top-coat

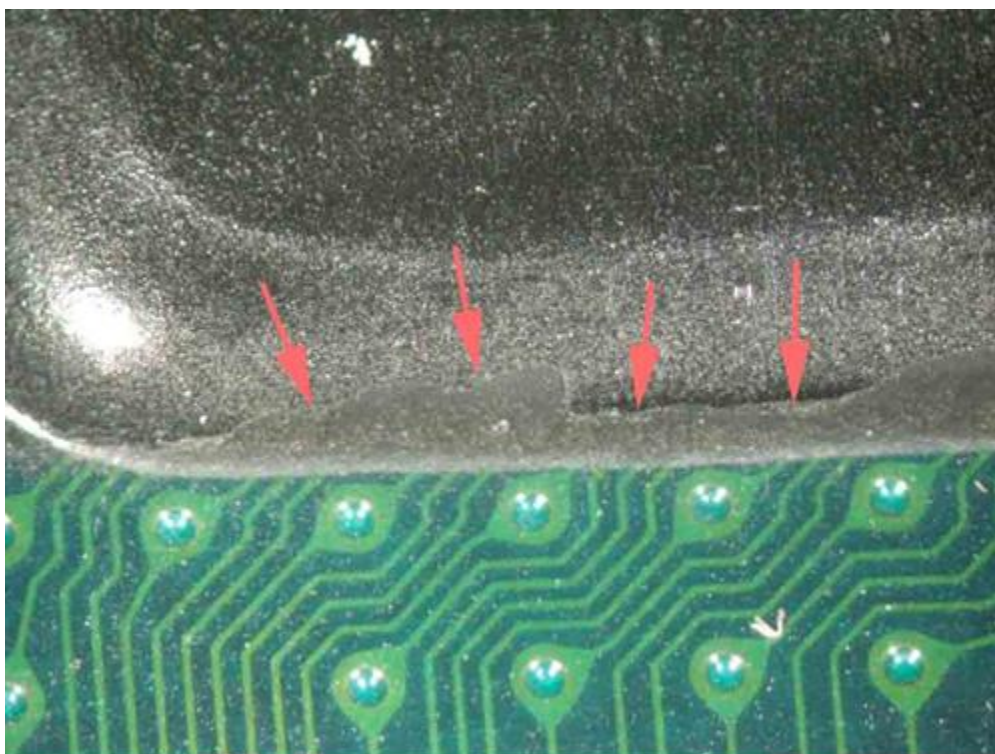


Figure 14: Black top-coat – Close up

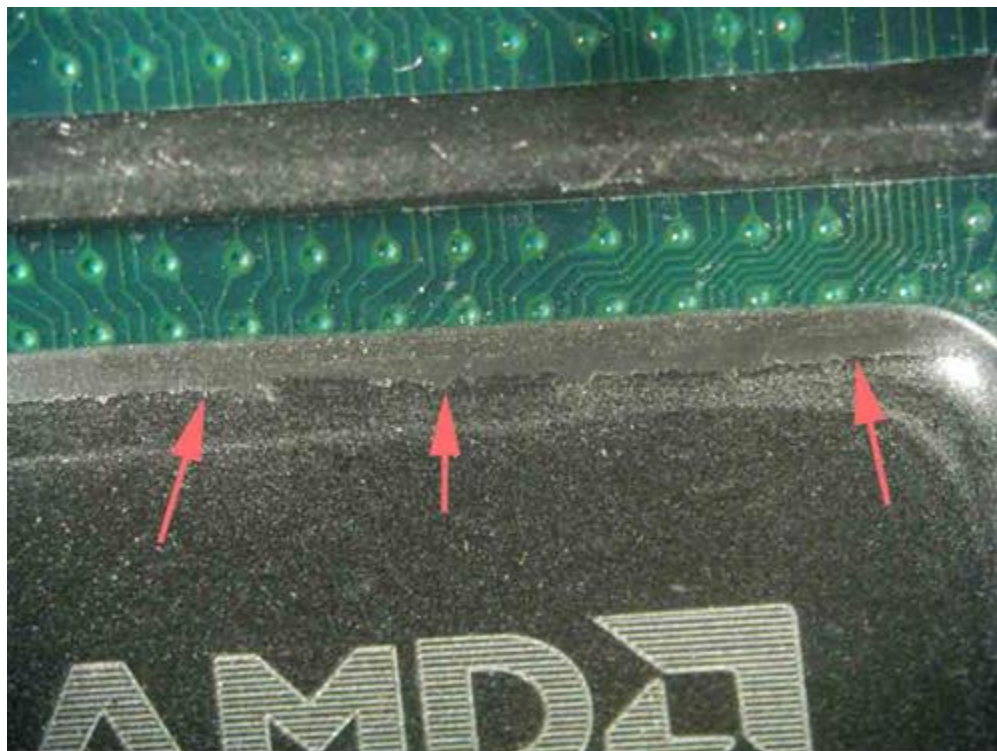


Figure 15: Black top-coat – Edge

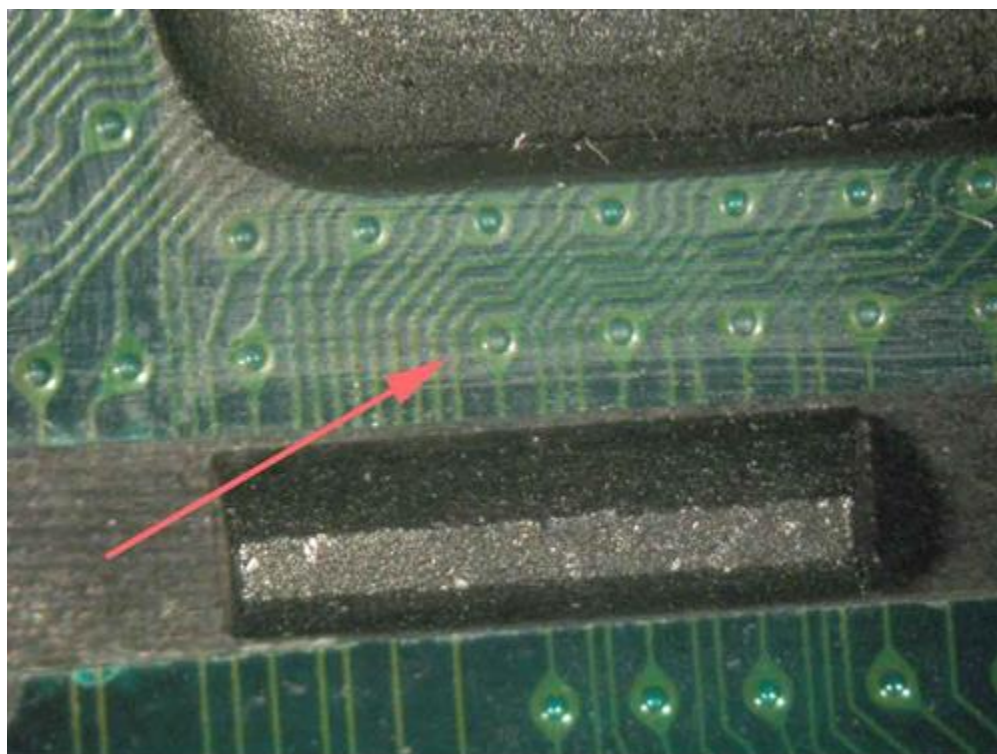


Figure 16: Scratch marks from cleaning action

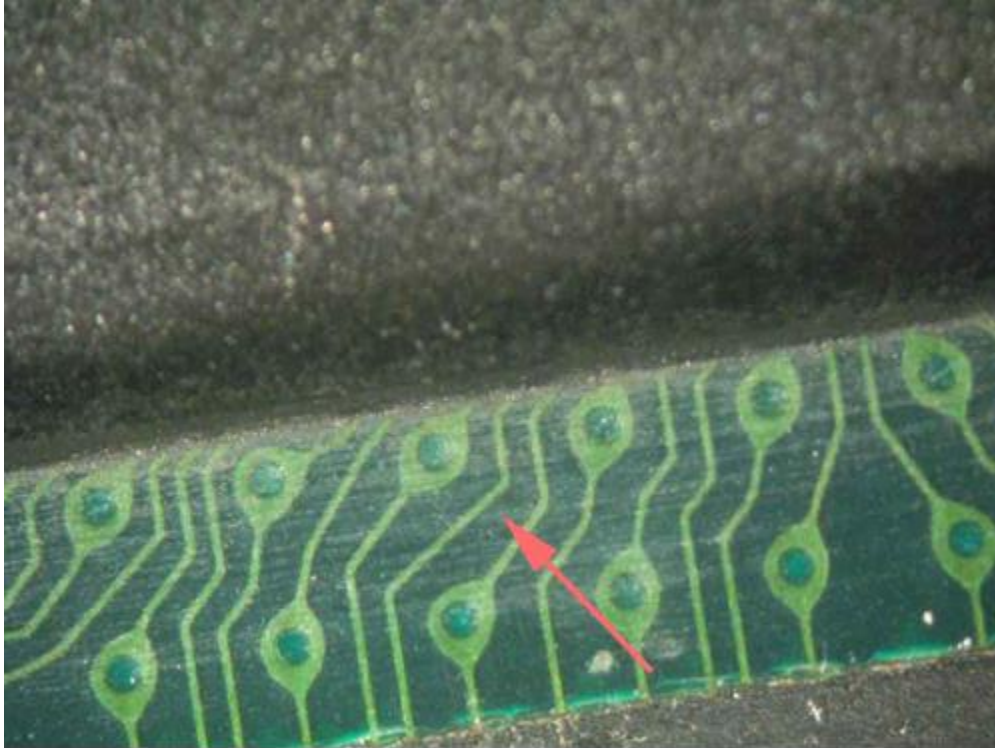


Figure 17: Scratch marks from cleaning action

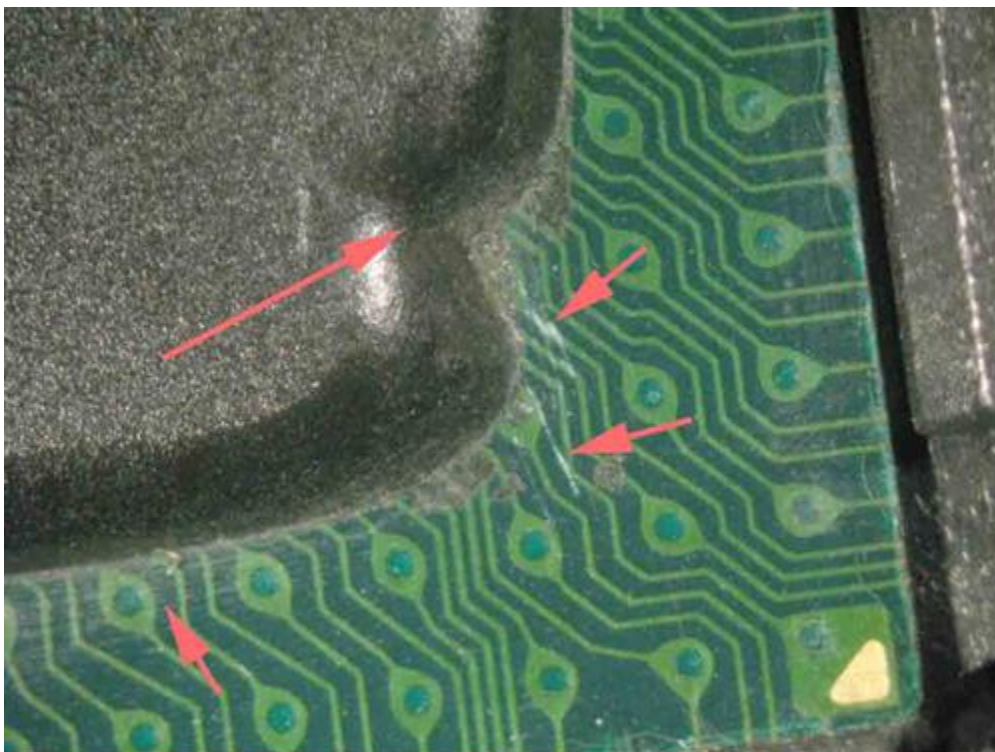


Figure 18: Scratch marks from cleaning action. Molding anomaly (Long Arrow)



Figure 19: Laser marking not uniform in height. Alignment is off

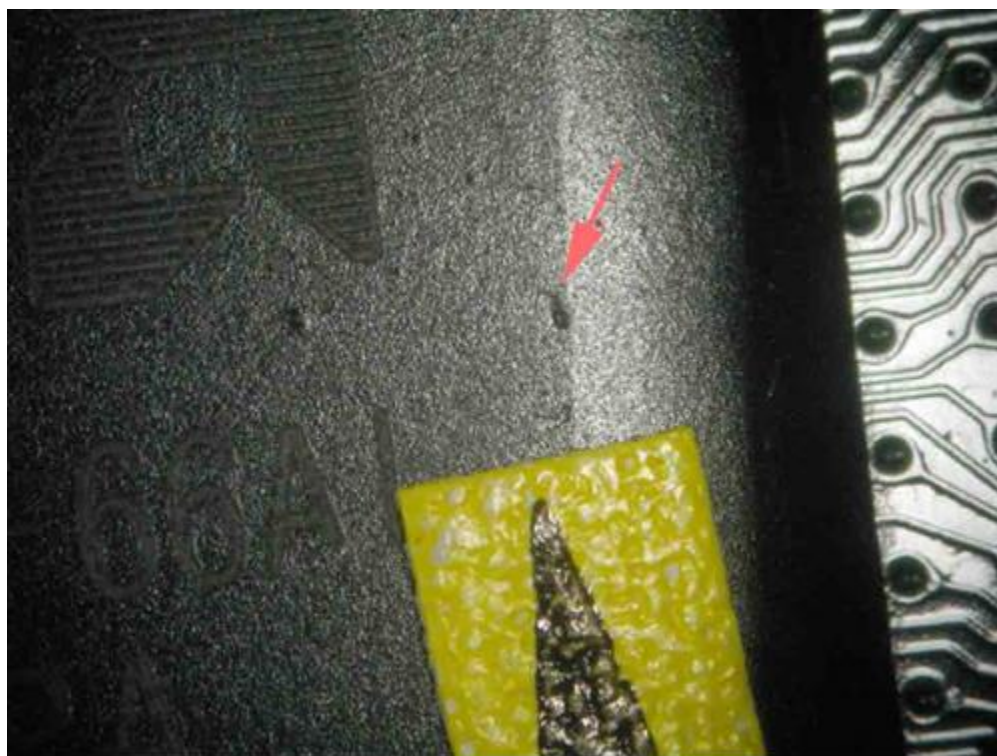


Figure 20: Original marking – the letter c (partial)



Figure 21: Original marking – the letter c -- Top coating covers the original laser marked C

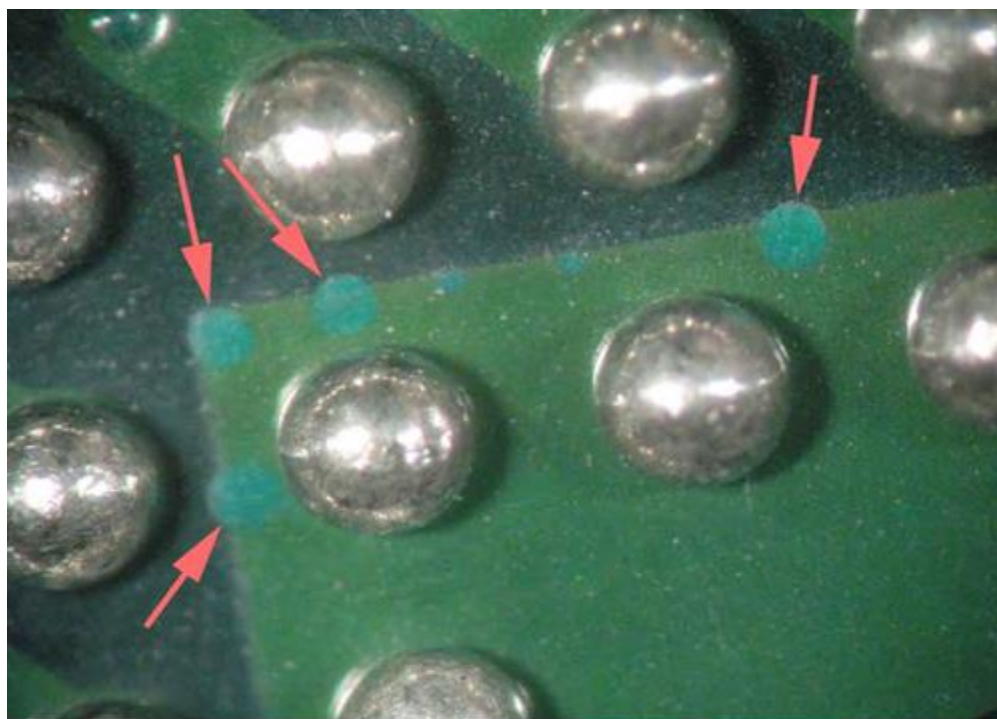


Figure 22: Discolored spots on bottom surface

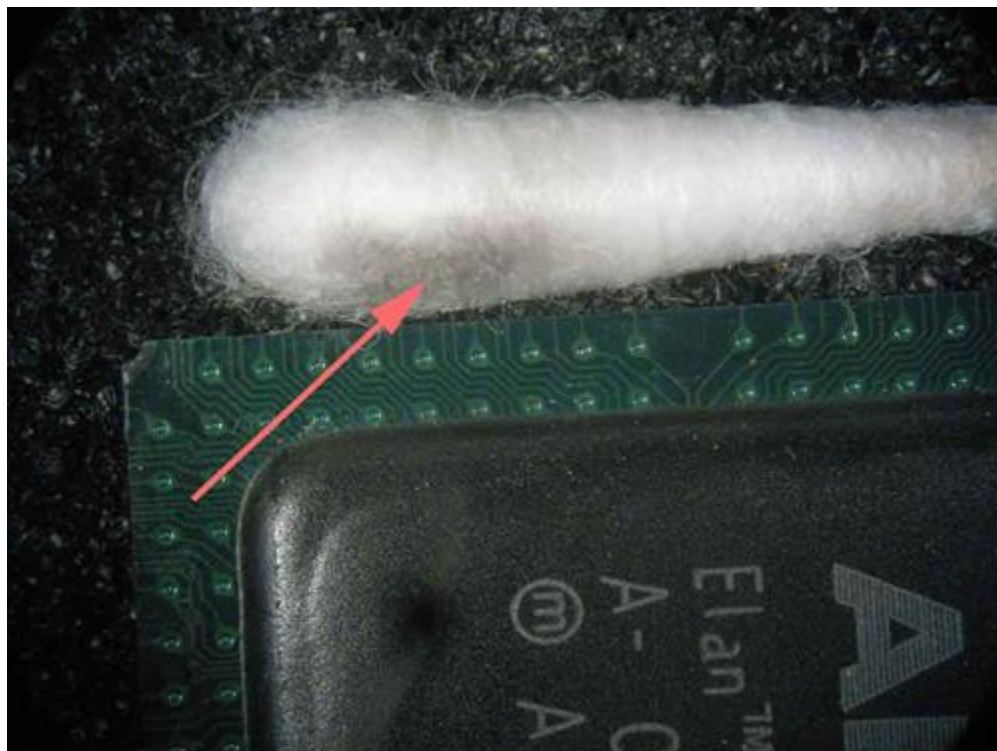


Figure 23: Acetone swab is discolored after scrubbing top surface

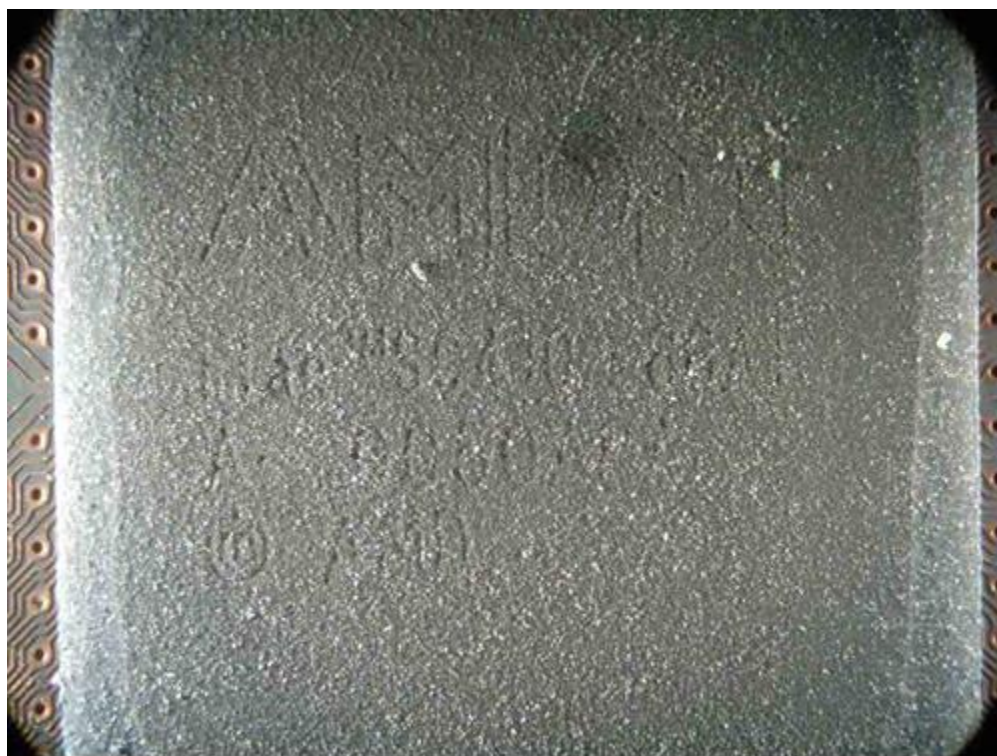


Figure 24: Top-coat removed with chemical stripper – no other marking found