Counterfeit Parts Mitigation and Inspection Training

Presented by
Debra N. Eggeman
Executive Director
Independent Distributors of Electronics Associations

www.IDofEA.org

For ERAI Executive Conference Track 1: Part 2

Welcome!

I am so pleased you are here!

Training Track 1:
Proficiency in Counterfeit Identification Methods - Verification of Purchased Product

Adjusting Expectations

- The inspection for the detection of counterfeit parts is a difficult task.
- Understanding is a constantly moving target.
- Other than *perhaps* the IP holder one can not authentic or verify that an electronic part is *not* counterfeit.
- One can look for indicators and compare to Industry standards, papers, and experience

Adjusting Expectations

- There for the title of this Track is changed to…

Training Track 1:
Proficiency in Detection of Counterfeit Indicators

Adjusting Expectations

- The based on ALL findings make a determination.
- Today we are focused on blacktopping detection.
- Probably one of the most difficult areas.
  - Dealing with personnel, storage, and use safety due to chemicals-MSDS
  - Dealing with varied applications of blacktop material
  - Dealing with constant more sophisticated means and techniques by counterfeiters.

Track 1; Part 2

- MIL-STD-883, Method 2015.13
- o Acetone
- o 1-Methyl 2-Pyrrolidinone
- o Dynasolve 750
- o Scrape test

Track 1; Part 2

- Discuss the relevance of existing marking permanency and resistance to solvents screening

Track 1; Part 2

- Demonstrate the proper application of the below noted screening processes and reveal evidence (using case studies, photos, etc.) of prior use, refurbishing and resurfacing detected as a result.
  - MIL-STD-883, Method 2015.13
  - Acetone
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Track 1; Part 2

- Provide guidance relative to safety including proper personal protective equipment, ventilation and ignition sources.
- Assist attendees in ensuring false positive or false negative results are not generated during screening and address concerns that have arisen relative to applying certain screening processes to older date code parts.

Track 1; Part 2

- Provide evidence of these processes being applied to known "golden" parts and demonstrate how the results compare to the processes being applied to suspect counterfeit parts.

- Address frequently asked questions and concerns during open discussion relative to the above noted techniques.

Required Inspection Overview

- **STD1010**
- Labels
- Boxing
- Packaging
- Product
  - Package
  - Leads
  - Surfaces
  - Mag
  - Blacktop
  - Substandard
  - Market Concepts
  - Min Equipment

- **AS5553**
- Labels
- Boxing
- Packaging
- Product
  - Package
  - Leads
  - Surfaces
  - Electrical
  - High Mag
  - X-ray
  - XRF
  - Decapsulatation

- **AS6081**
- Labels
- Boxing
- Packaging
- Product
  - Package
  - Leads
  - Surfaces
  - Electrical
  - High Mag
  - X-ray
  - XRF
  - Decapsulatation

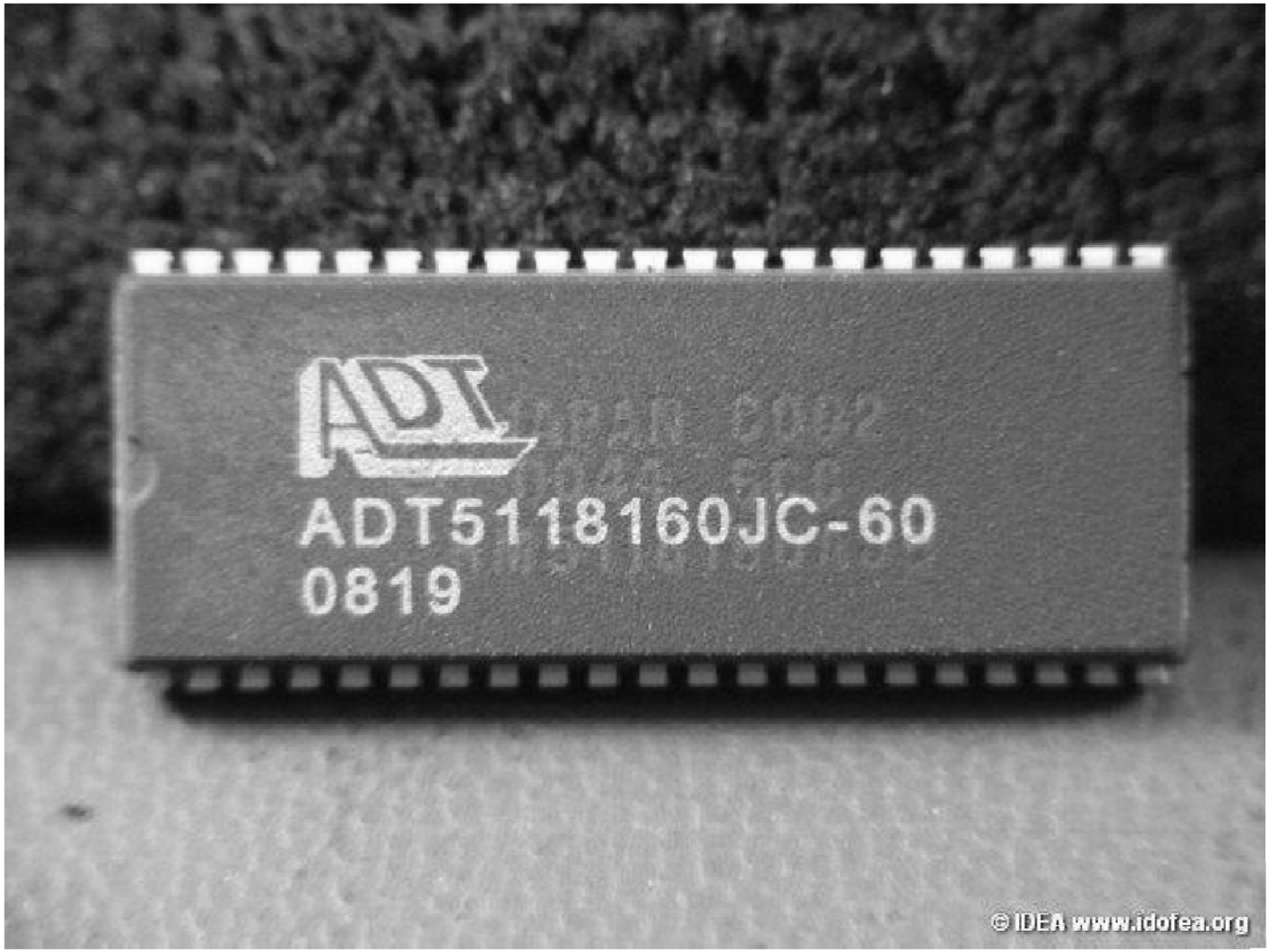
Is Counterfeiting Really a Problem?

- Is it a 6800uF or 2200uF capacitor?

http://blog.makezine.com/archive/2007/12/counterfeit_capacitors.html

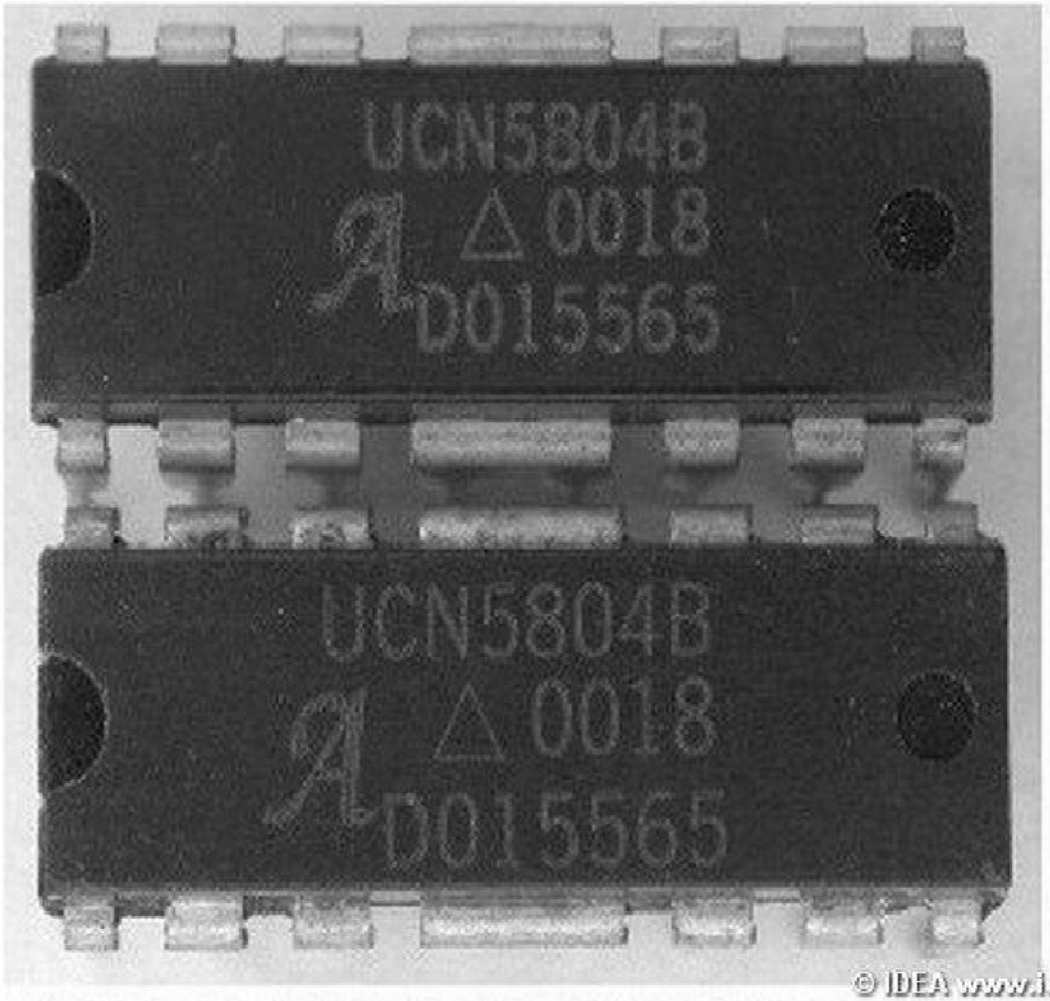
Is Counterfeiting Really a Problem?

- Ghost markings



Is Counterfeiting Really a Problem?

- Marking differences



Terms and Definitions

Acceptable:

Product meets all contractual requirements of the Original Component Manufacturer (OCM) specification(s) and the conditions agreed upon between the buyer and seller

Authorized (Franchised) Distributor:

Distributor authorized by an OCM to distribute its product lines

Blacktopped:

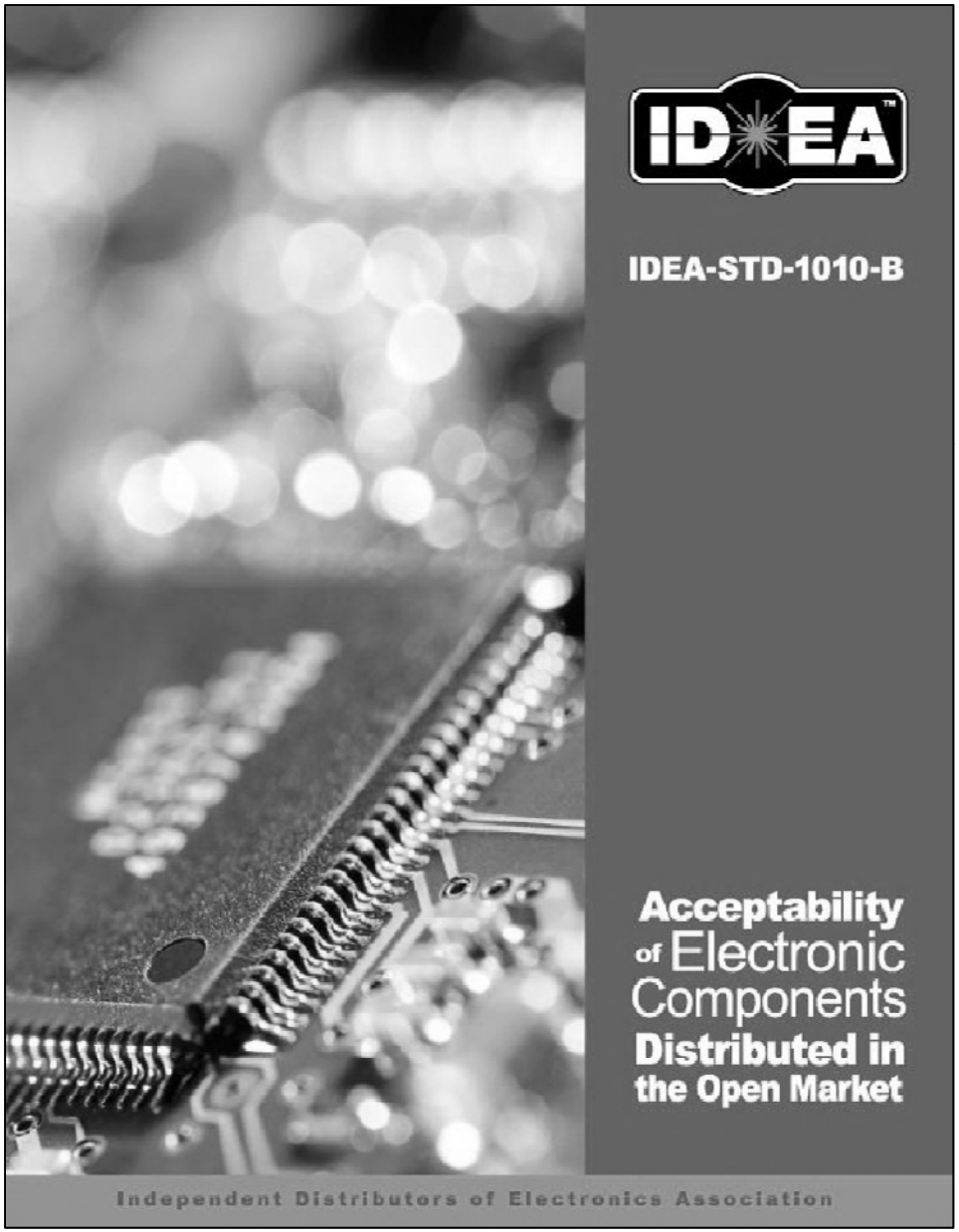
An intentional covering of the OCM part and markings

IDEA-STD-1010 Standard

Introduction to the IDEA-STD-1010 Standard

Acceptability of Electronic Components Distributed in the Open Market

IDEA-STD-1010 Standard



IDEA-STD-1010

Provides inspection policies, processes, and techniques to help mitigate the acceptance of counterfeit and substandard parts

Standardized Inspection Processes and Criteria for:

- Independent Distributors
- Franchised Distributors
- Government (DoD, NASA)
- OCMs
- OEMs
- CMs and EMS Providers

Revision B – published April 2011

IDEA-STD-1010 Standard

- Why a standard?
  - Designed to serve the public interest through eliminating misunderstandings between suppliers and purchasers
  - Allows for
    - Manufacturers
    - Customers
    - Suppliers to better understand the other's expectations
  - Allows Distributors greater efficiencies in
    - Setting up and exercising their processes
    - To meet industry standards
    - Allowing the savings to be passed to their customers

IDEA-STD-1010 Standard

- About the standard
  - It is a deliberated collection of visual requirements to indicate the quality of electronic components which
  - Provides guidance in establishing
    - Inspection capability
    - Determining product quality resulting from
    - Visual and non-invasive inspection as
    - Acceptable or nonconforming
    - Based on technical facts and cosmetic indicators
  - Compiles acceptance requirements of electronic components for the Open Market to
    - Heightened level of confidence that indicates the products authenticity
    - Parts have been stored, handled, and packaged consistent with applicable industry standards
  - Acceptance of product that deviates from the target conditions
    - Agreed upon between the buyer and seller,
    - Which are outside of the scope of this Standard

IDEA-STD-1010 Standard

- Scope
  - This Standard sets forth
    - Practices and Requirements for visual examination
    - Discriminative criteria for electronic components
    - Product purchased and sold in the Open Market

IDEA-STD-1010 Standard

- New Format
  - Electronic industry recognized standards formats were reviewed
    - IPC
    - J-STD
  - To incorporate following attributes
    - Navigation
    - Readable
    - Clear
    - Concise
  - Pictures are worth 1000 words
    - Visual quality characteristics that lend for ease of identification

IDEA-STD-1010 Standard

- Table of contents

Table of Contents

IDEA-STD-1010 Standard

- Two column format

10 The Inspection

10.1 Packaging Inspection

10.1.1 General Packaging Rules and Guidelines

A. The purchase order between buyer and seller should accurately identify in writing the packaging required for the order.

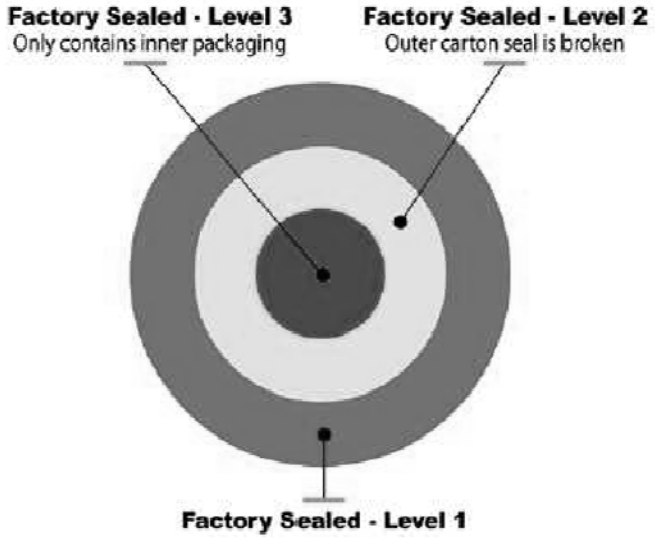
B. It is also important to note that in cases where full factory sealed packaging (see Section 5, Terms and Definitions) is required or received, if direct traceability to the OCM is unavailable, then that seal has to be deemed as unverified. If an unverified, sealed carton is not opened for further inspection and the product is deemed to be factory sealed, this constitutes one of the most speculative determinations a Quality Inspector can make. It is as easy to counterfeit a factory seal as it is the product itself.

C. At a minimum, the factory carton label should contain the lot number, date code, part number, country of origin, and the moisture sensitivity level (MSL) (if a non-hermetically sealed device.)

D. Inner packaging and use of moisture barrier bag (MBB), desiccant, and Humidity Indicator Card (HIC) shall be in accordance with J-STD-033.

10.1.3 Classification/Clarification of Terms

Product can come in factory packaging. This is different than factory sealed (see Section 5, Terms and Definitions). It is important to have a lexicon of levels of packaging. Figure 10-1 shows the levels of package seal from outer to inner pack.



IDEA-STD-1010 Standard

- Visual Inspection process format

10.3.1 The Visual Inspection

EQUIPMENT:	MATERIALS:	DOCUMENTATION:
Microscope (1.5X to 40X magnification) ESD Compliant Workstation	Finger Cots or Gloves Vacuum Pen	Component Datasheet

Microscope set-up:
The tolerance for magnification aids is ± 15% of the selected magnification power. Magnification aids, if used for inspection, need to be appropriate for the item being inspected. Lighting needs to be adequate for the magnification aids used. The magnification used to inspect electronic components is based on the minimum width of the feature under inspection. Unless magnification requirements are otherwise specified by contractual documentation, the magnifications are determined by the item being inspected (see Section 7.3, Table 3).

Component Data:
The component datasheet's revision or date issued should be consistent with the date code of the product being inspected. Markings, dimensions, electrical specifications, or assembly locations could be different depending on the date code and revision of the part.

IDEA-STD-1010 Standard

- Photograph detail format

Vacuum Pen Extracting Part from Tape

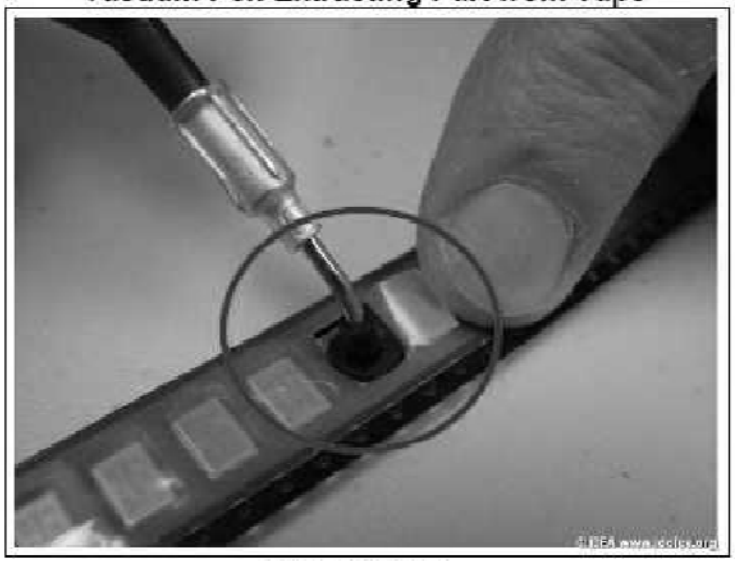


Figure 10-11

Correct Application of ESD Safe Tape

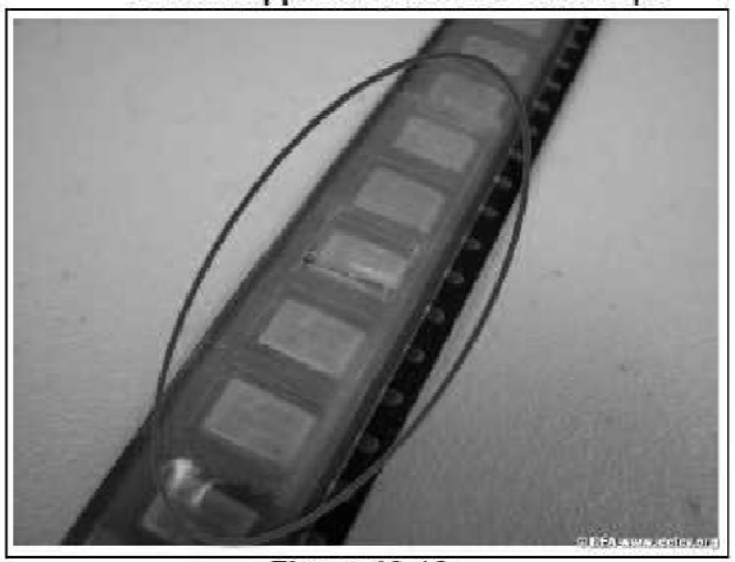
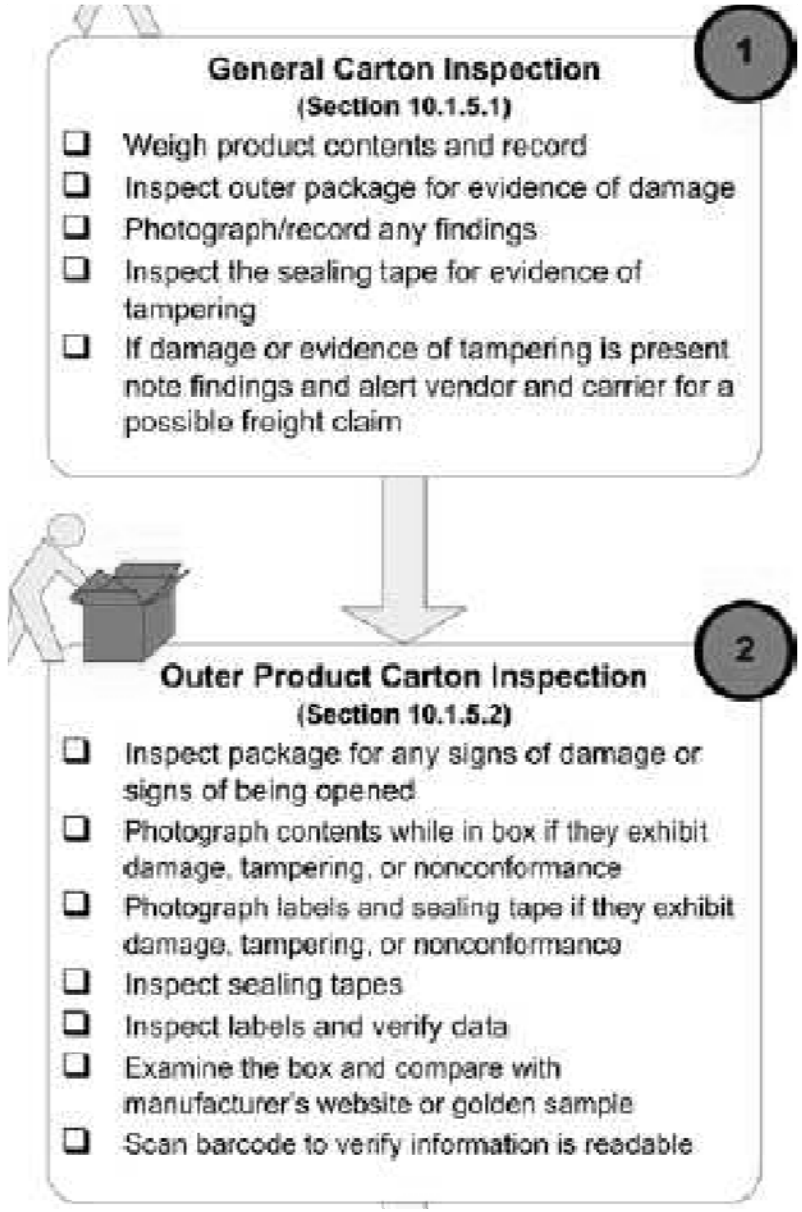


Figure 10-12

IDEA-STD-1010 Standard

- Receiving Inspection process format



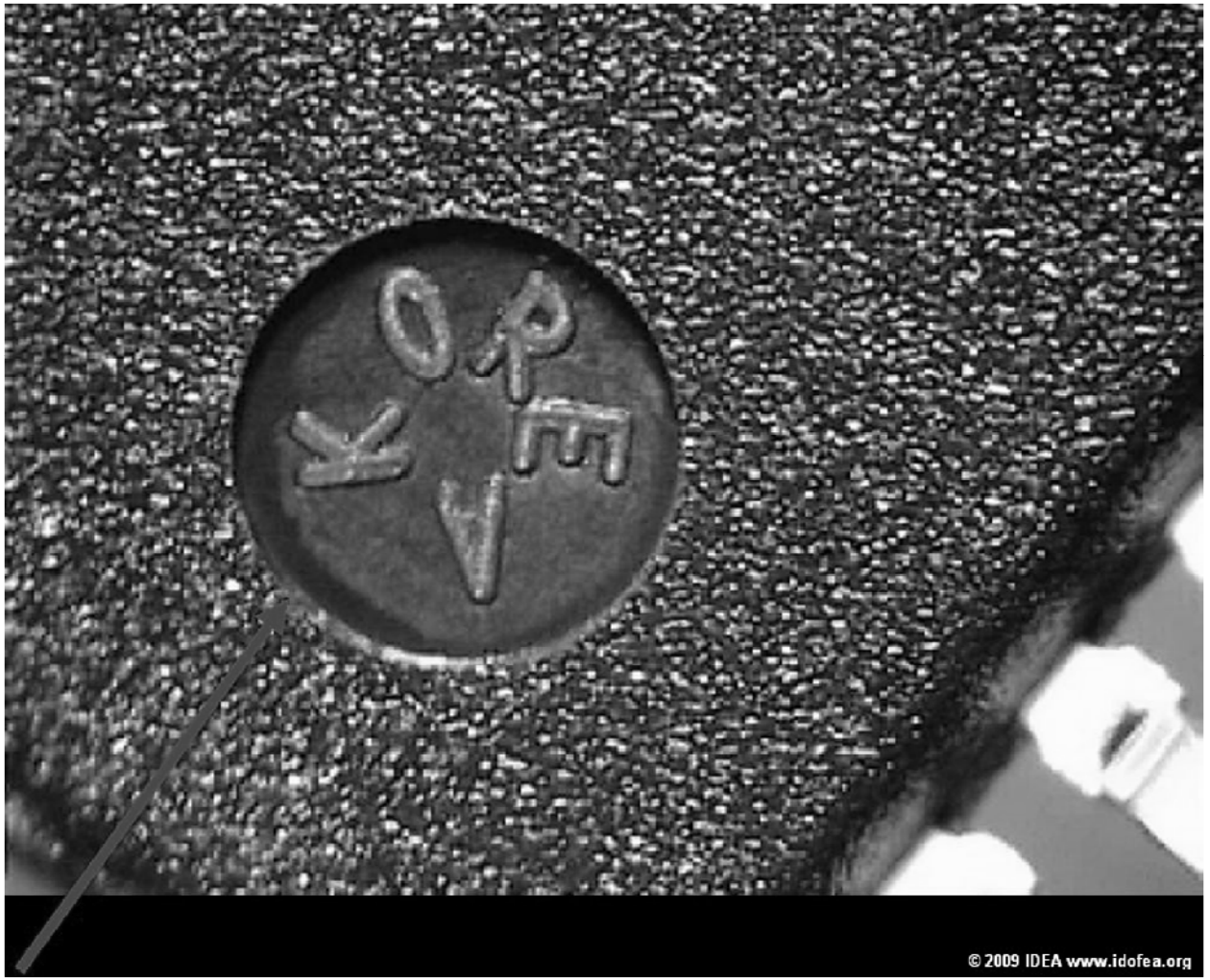
Impacts of Counterfeiting

POST 2002

"Something's Wrong!"

Good Product Example

- Expecting to see an indent (mold mark) with
  - Clean edge
  - No scratches
  - Not rough
  - Not grainy



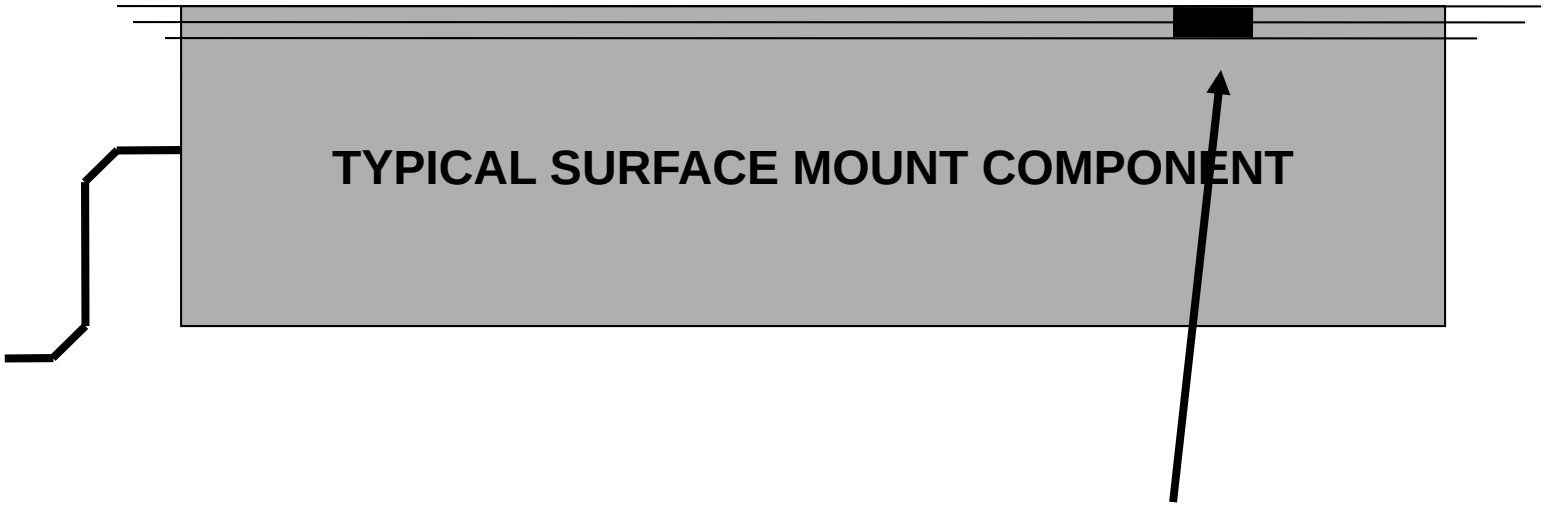
Counterfeit Examples

- Blacktopping evident in mold mark

Counterfeit Examples

- Pin 1 Depth

A Reworked component will have the top surface removed and recoated (Blacktopping) to hide the sanding scratches



If the top surface has been removed, the Pin 1 dimple will be ill-defined and grainy.

Counterfeit Examples

- Indication of surface removed
  - Mold mark almost gone

Inspection Processes

Rule #2

An Open Market inspection program requires increased inspection of parts and packaging materials by comparison to typical OCM and Franchised sources

Inspection Processes

- Nonconforming parts (guilty until proven innocent)
  - Inspectors shall consider parts as nonconforming until conformance is clearly indicated
  - Upon discovery of a substandard part attribute
    - Secure and isolate all suspect parts
    - Record all findings in a discrepancy report for review
  - Document the defect
    - Indicating the chapter and verse of IDEA-STD-1010
  - Have the substandard part and report Referee'd
    - This could be a supervisor, manager…
  - Referee will issue a final disposition
    - Accept the part(s)
    - Accept under conditions
      - With customer written concurrence
    - Reject the part(s)
    - Scrap the part(s)
      - Detailed instructions of how to dispose

Al Messerschmidt, Getty Images

Track1; Part 2

- Solvent tests for remarking and resurfacing are excellent counterfeit identification processes. Altering a part's surface (remarking, resurfacing, blacktopping, etc.) remains the preferred method of deception used by the counterfeiters.
- Being proficient in detecting this type of fraud is essential and is required in STD1010 and AS6081.

Track1; Part 2

- Discuss the relevance of existing marking permanency and resistance to solvents screening.

Track1; Part 2

- Demonstrate the proper application of the below noted screening processes and reveal evidence (using case studies, photos, etc.) of prior use, refurbishing and resurfacing detected as a result.
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Track1; Part 2

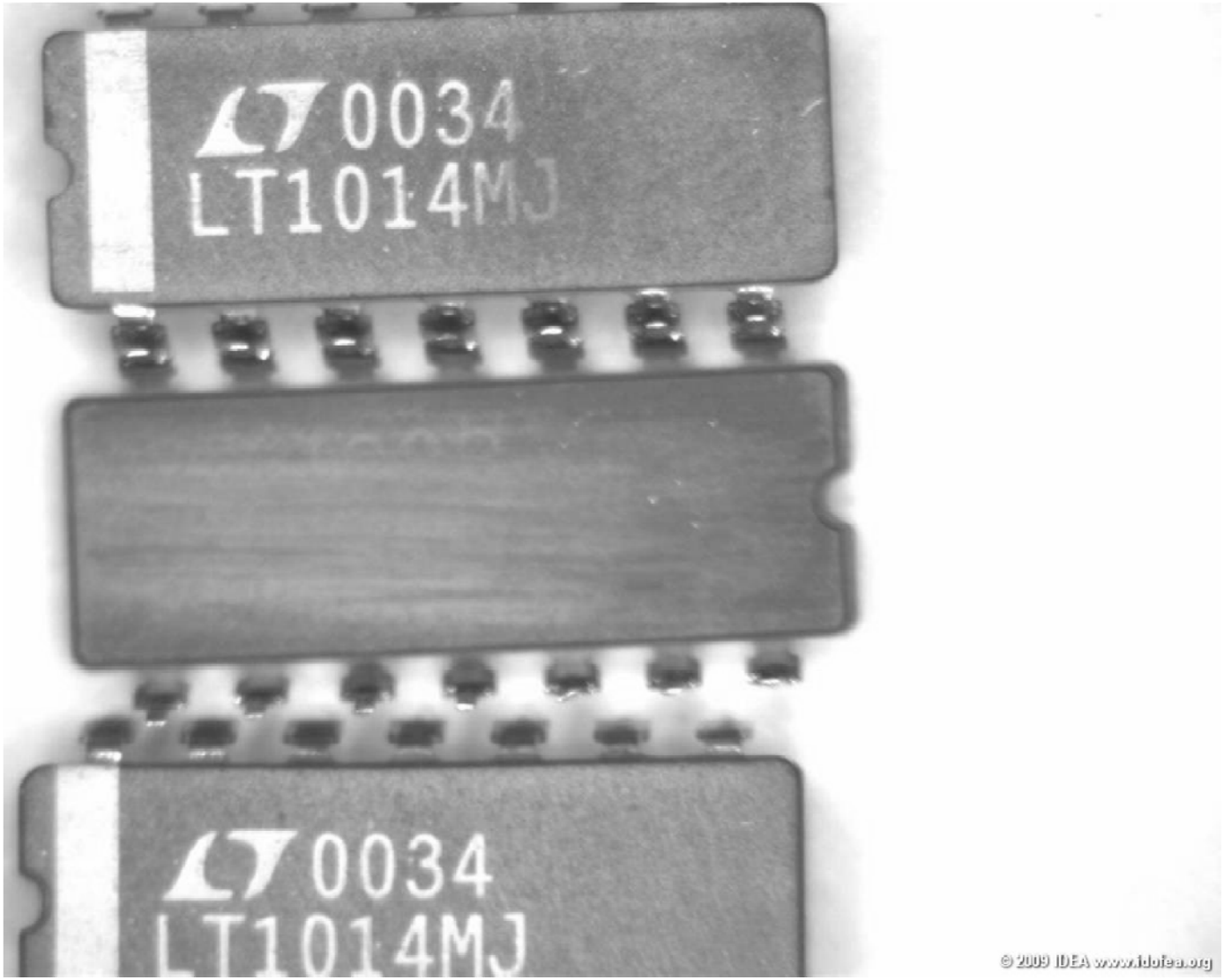
- Provide evidence of these processes being applied to known “golden” parts and demonstrate how the results compare to the processes being applied to suspect counterfeit parts.

Receiving Process

- Device Marking Test
  - Tests the component's marking for permanency
    - Logo, part number, date code, etc.
  - 3 parts mineral spirits, and 1 part IPA solution
    - This solution is not aggressive enough to test for blacktopping
  - Industry accepted marking permanency test
  - This process doesn't cover laser marking testing
  - The Device Marking Test described above is <u>not</u> a replacement for MIL-STD-883, Method 2015.13
  - *Check Federal and statutory environmental laws and Material Safety Data Sheets (MSDS) before purchasing, storing, handling, using, or disposing of any chemicals*

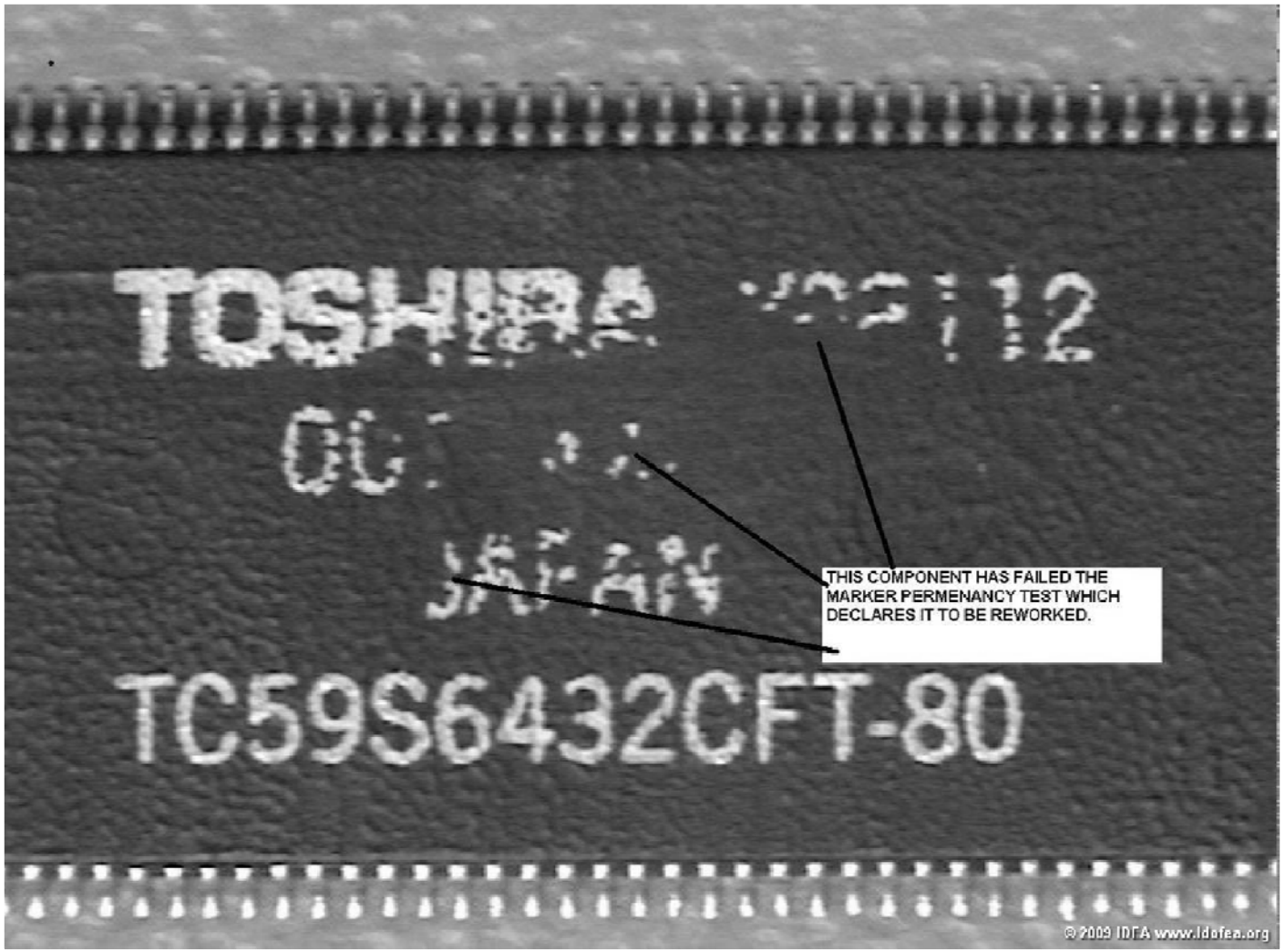
Receiving Process

- Results of the Marking Test



Receiving Process

- Results of the Device Marking Test



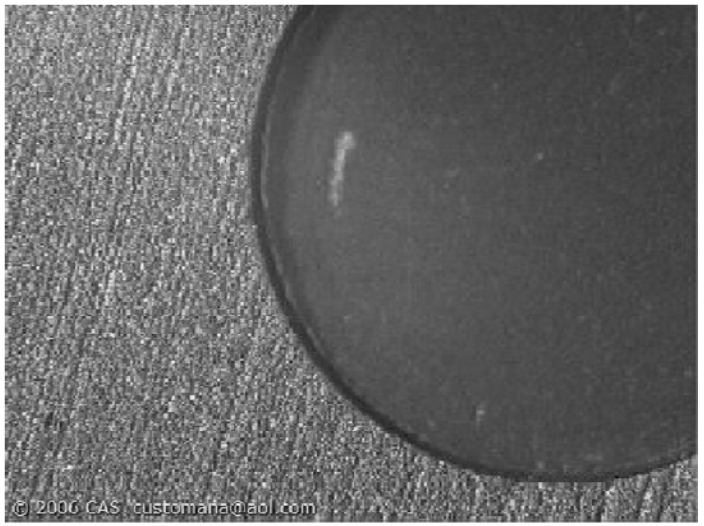
Receiving Process

- Device Surface Test
  - Tests for a “non-epoxy” blacktopping that covers evidence of sanding (resurfacing) and original markings
  - Acetone
  - Acetone has no effect the authentic surface of a plastic part (PEM)
  - Shall not be used as a Marking Test
  - *Check Federal and statutory environmental laws and Material Safety Data Sheets (MSDS) before purchasing, storing, handling, using, or disposing of any chemicals.*

Receiving Process

- Suspect sanded texture on the left side
- Mold pin cavity is filled and of the same texture

- After chemically cleaned
- Sanding witness marks and the clean mold pin cavity (as it should look)
- This part is suspect

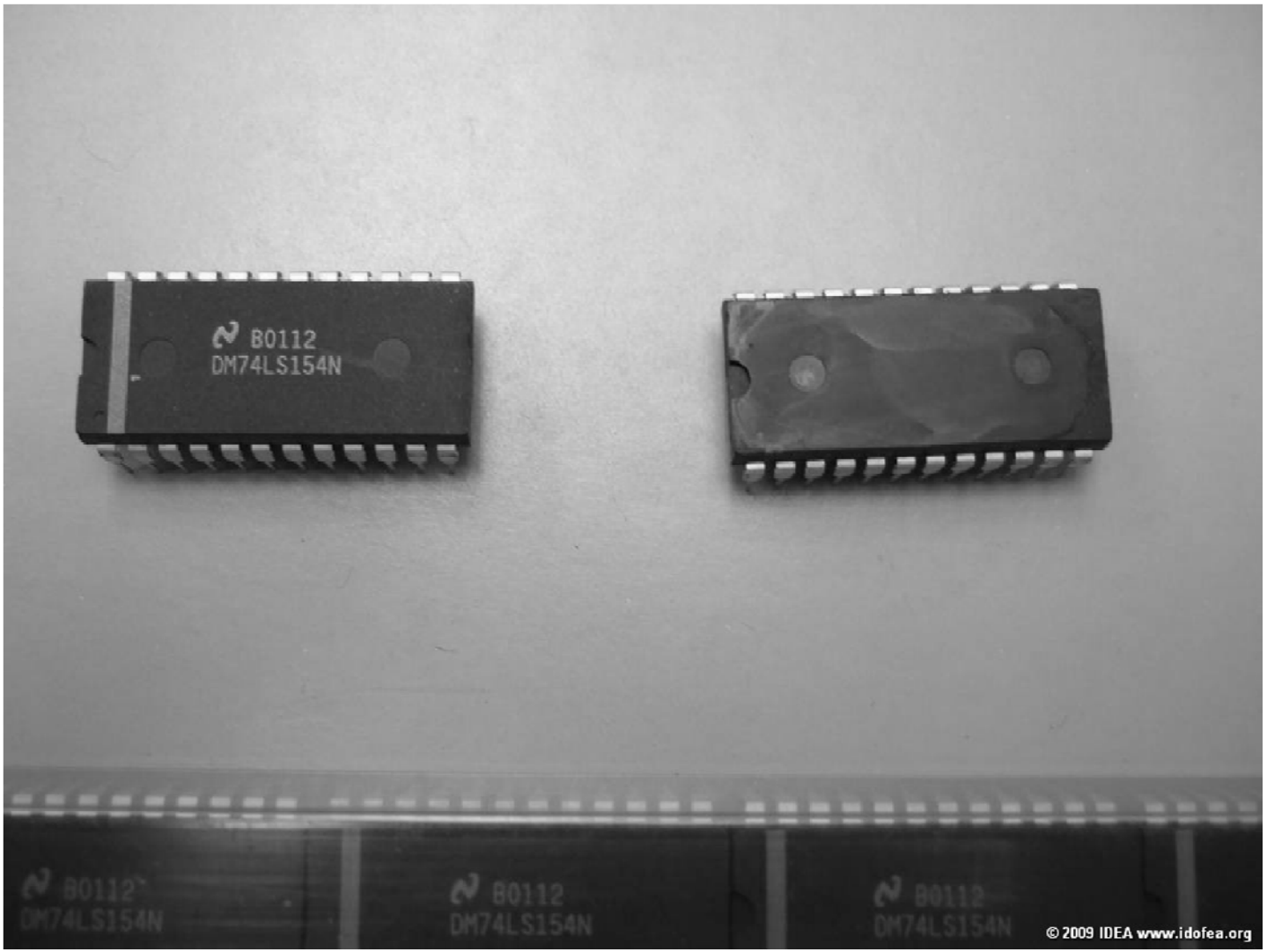


Receiving Process

- Results of a failed Device Surface Test

Receiving Process

- Results of a failed Device Surface Test



Receiving Process

- Counterfeiters are evolving
  - Advanced Blacktopping
    - UV Bake - Impervious to Device Surface Test (Acetone)
      - Epoxy or polyurethane - like substance layer
      - This surface produces a ‘high shine’
      - Should use the “Scrape Test”
        - Using an Exacto blade

http://www.dickblick.com/products/x-acto-1-knife/

Chemicals Elevated Temperatures

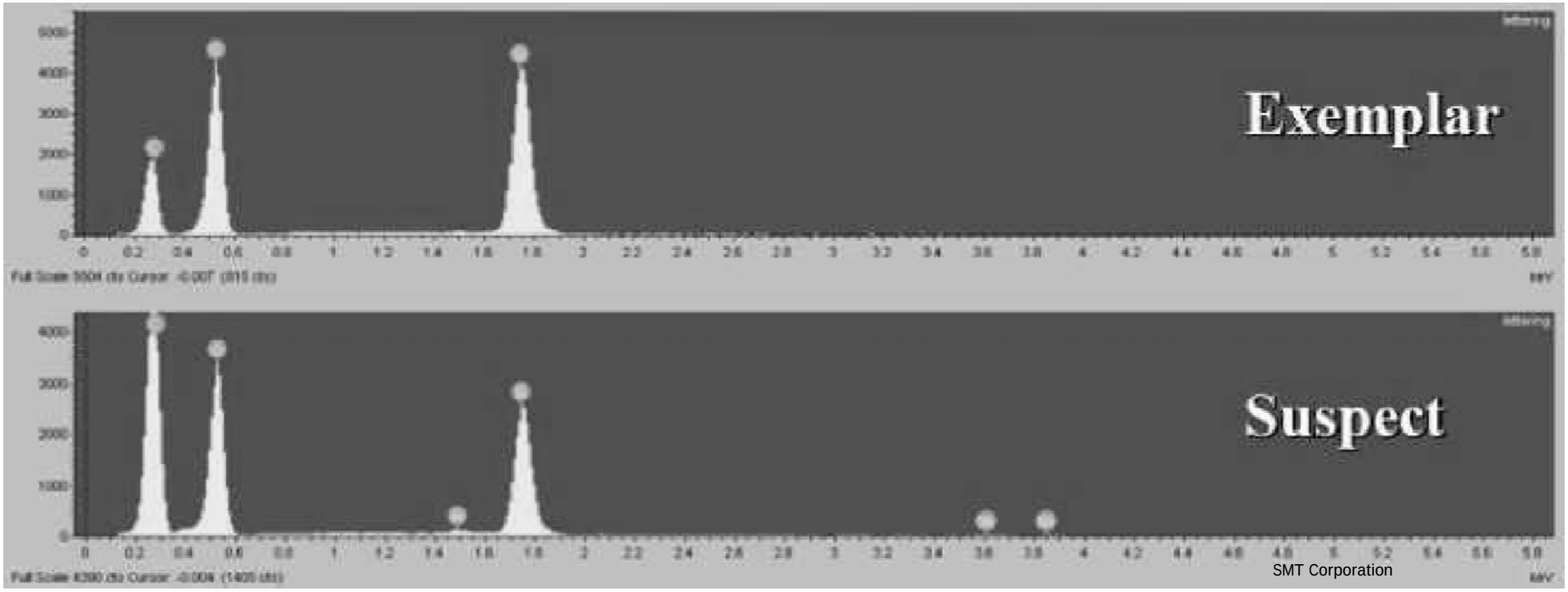
USE CAUTION!

- 1-Methyl 2-Pyrrolidinone
- Dynasolve 750

- Know the information on the Material Safety Data Sheets (MSDS)
- Only trained competent personnel
  - Set up the equipment, materials, process, and teaching instructions
  - Perform either of these tests

Receiving Process

- Cl^- Ion Plasma Etch
  - Removes markings and leaves surface identical to authentic
  - Recovery of sanded-off material
    - "Engineered-Blacktop-Material-Analysis-SMT-Corporation-PP-08-11-09-IDEA" pages 50-58

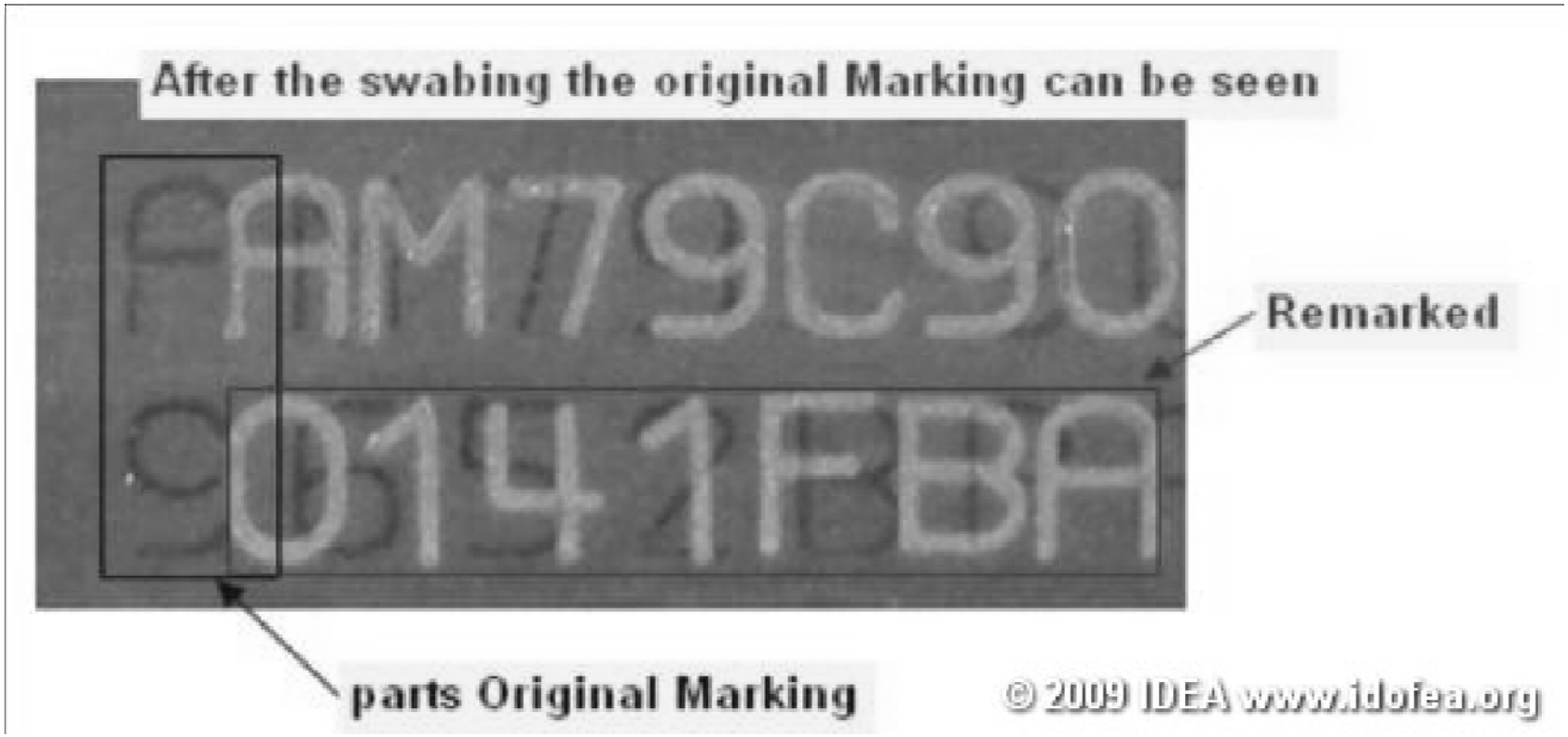


Receiving Process

- Blacktopping evident – Suspect

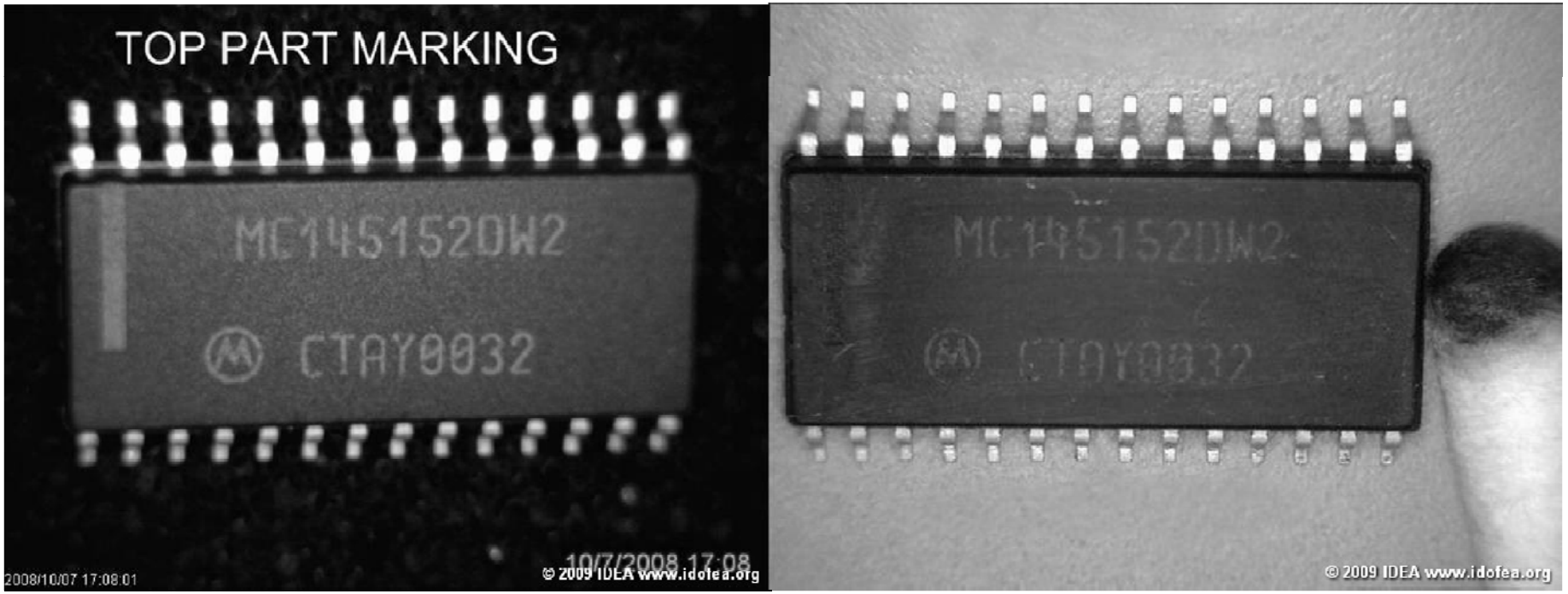
Receiving Process

- Remarked – Suspect



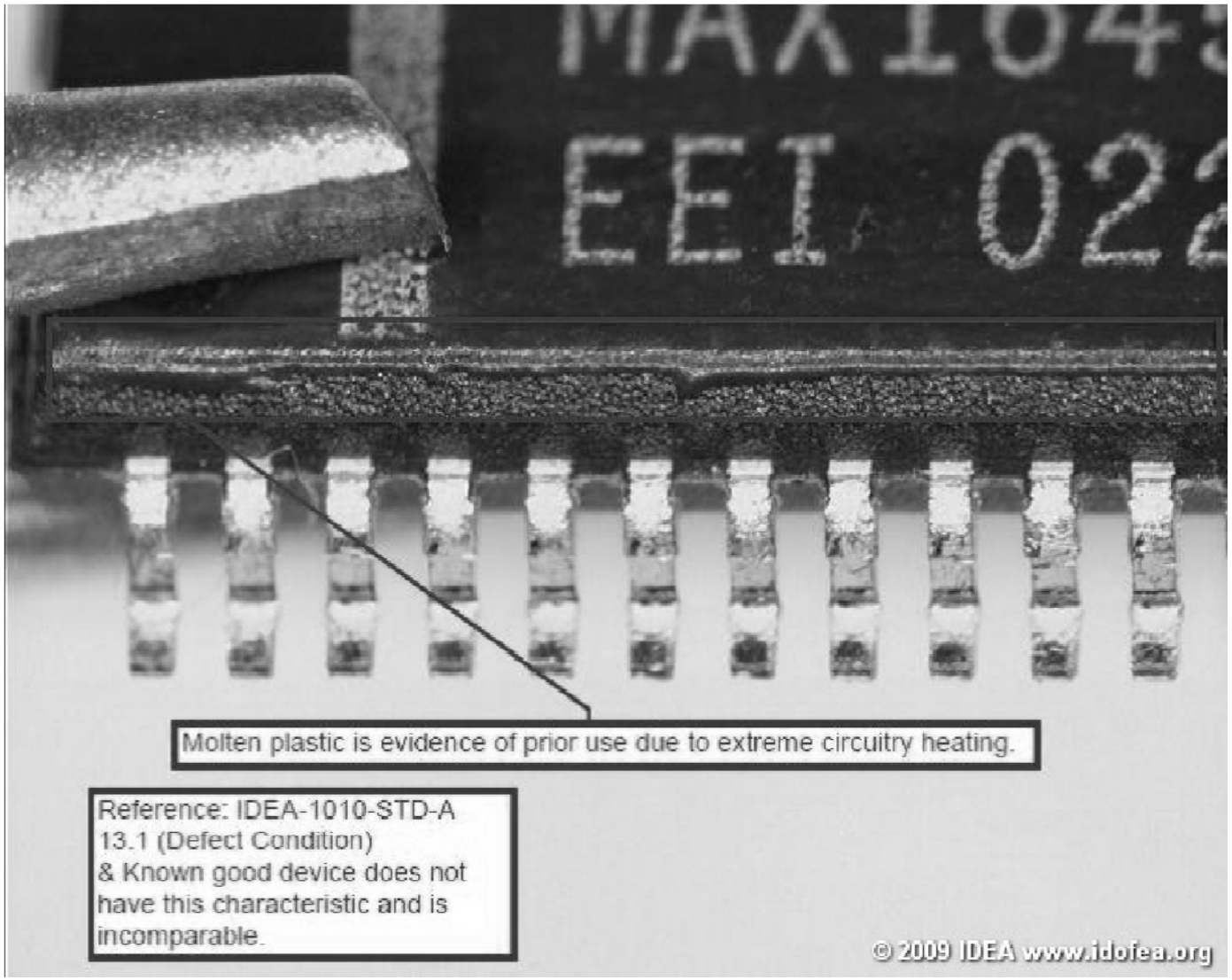
Receiving Process

- Suspect
  - Laser-Etch remarking still visible after black topping has been removed

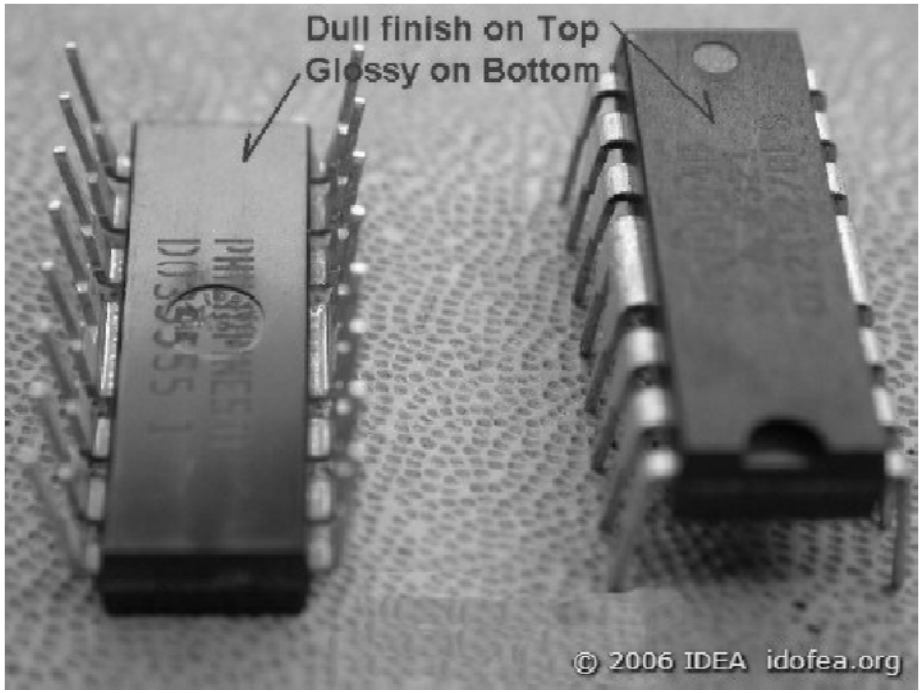


Receiving Process

- Resurface – Suspect



Receiving Process

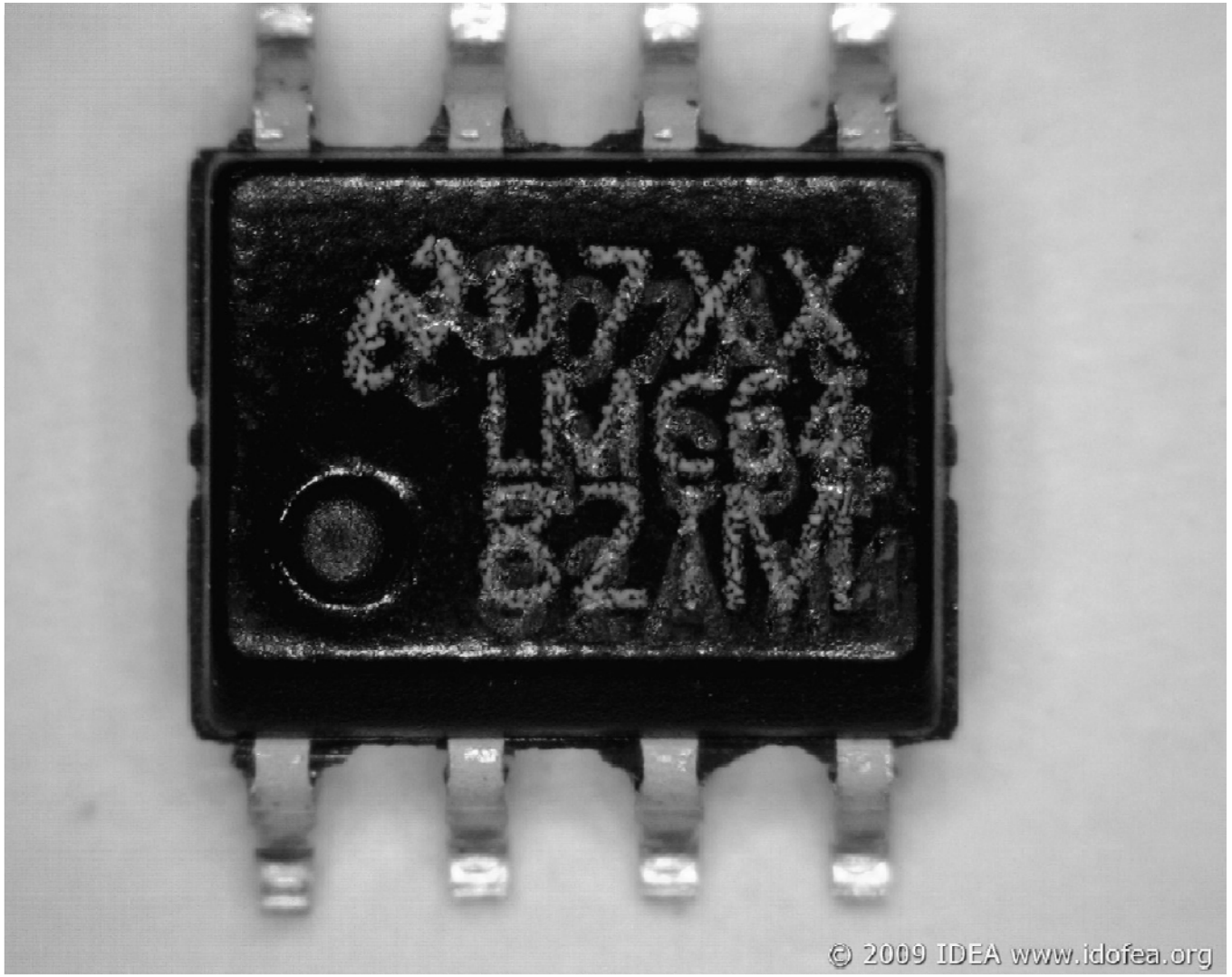


- Inconsistent surface textures
  - Indicates remarking
  - Suspect

Part 2 – G65SC22P-1

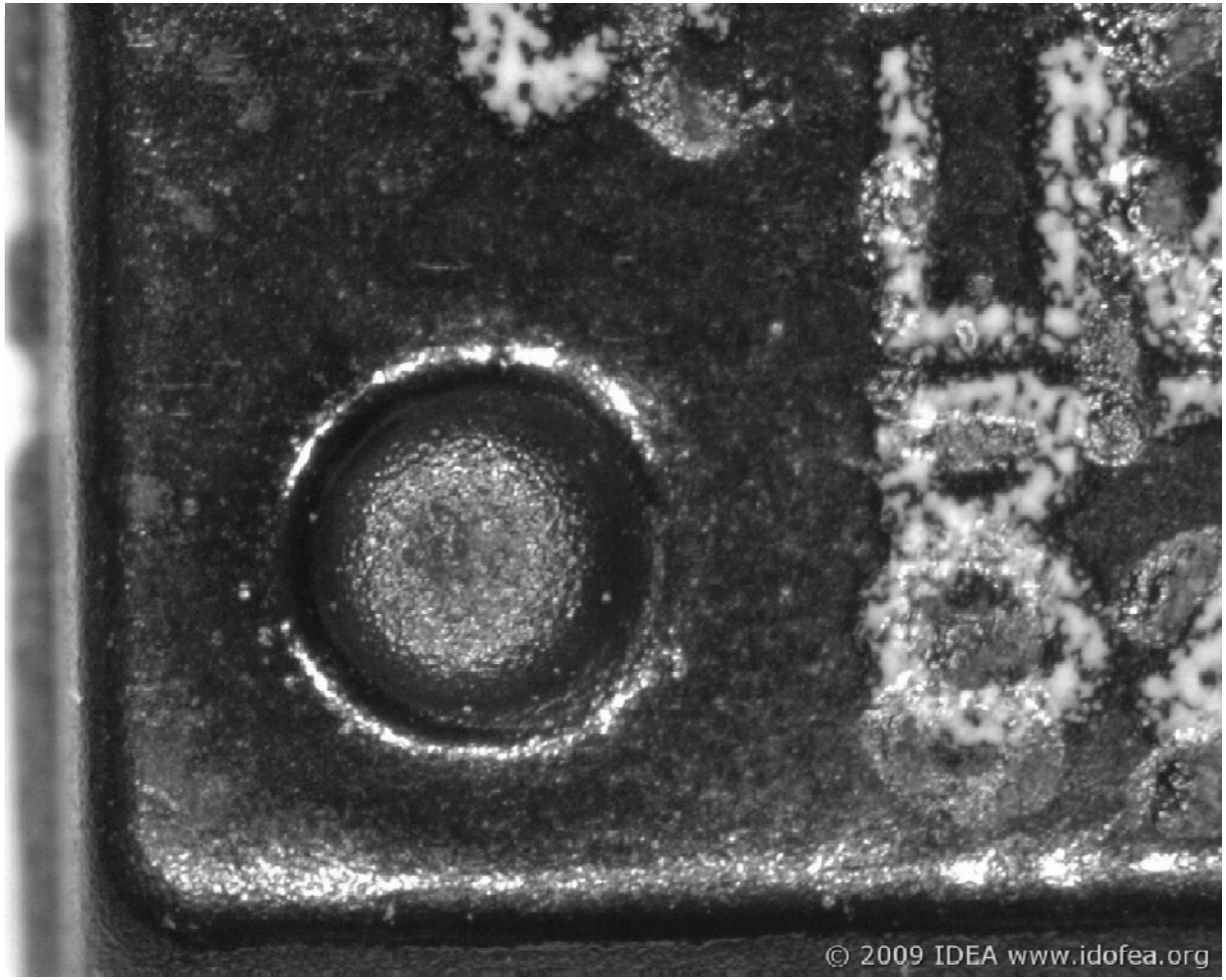
Fails – Marking and blacktop test

Part 3 – N07XXLMC64



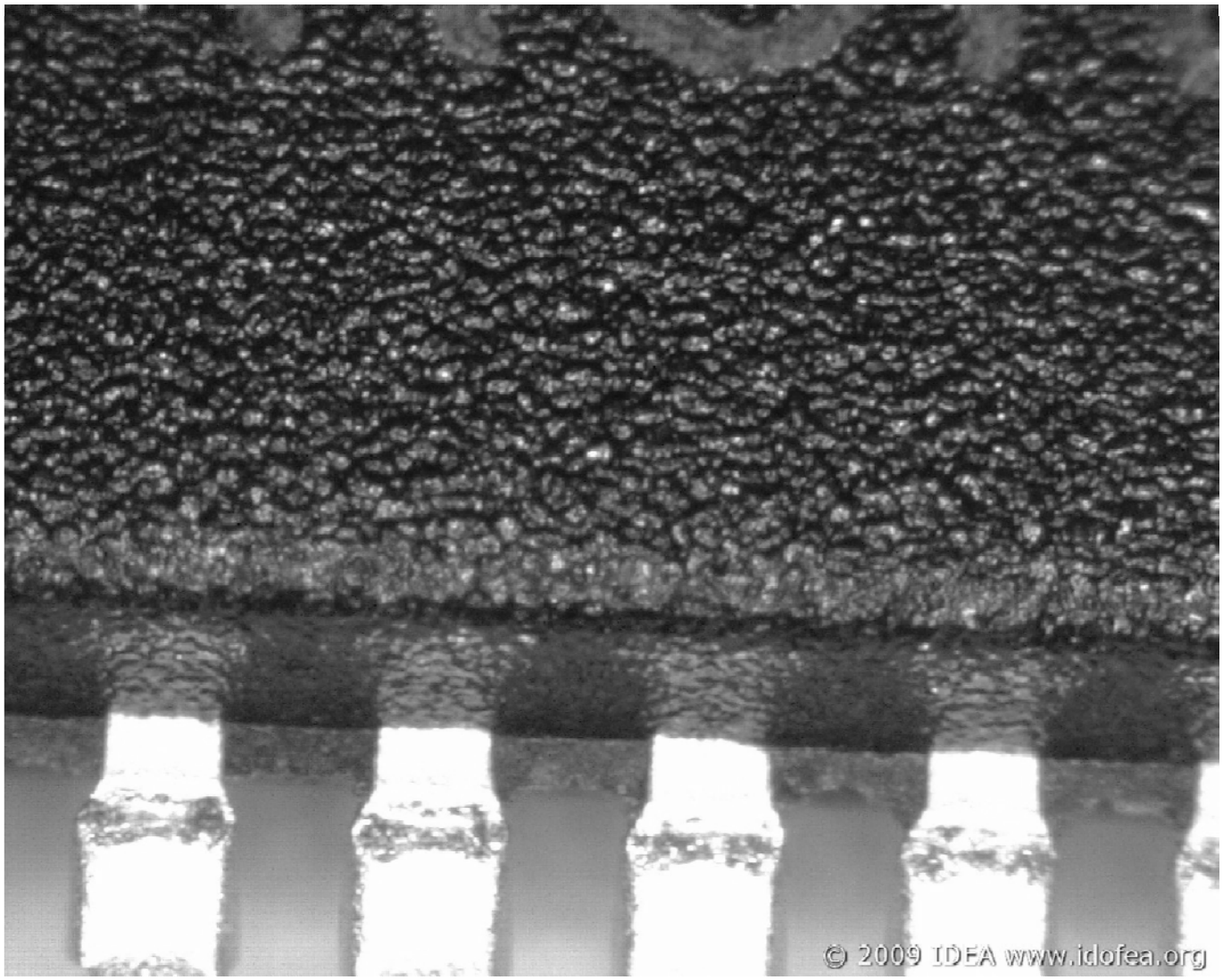
Exhibits Two Nomenclatures

Part 3 – N07XXLMC64



Pin 1 filled in (absence of sharp edges)
Exhibits Two Nomenclatures

Part #4 – QPSK DMOD CX24123

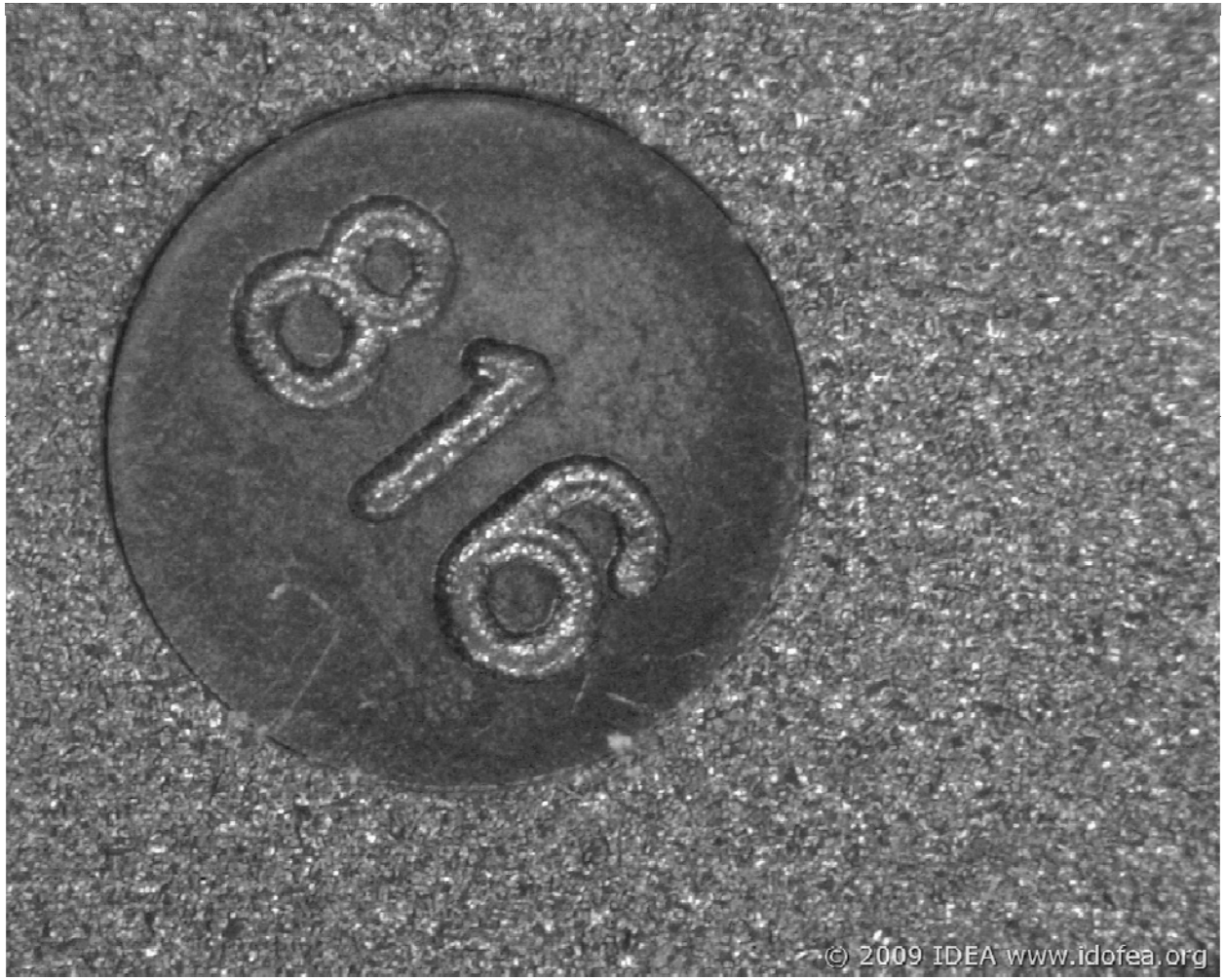


Appearance of a thick glossy coating

Part #4 – QPSK DMOD CX24123

Appearance of re-topping at a mold mark

Part #4 – QPSK DMOD CX24123



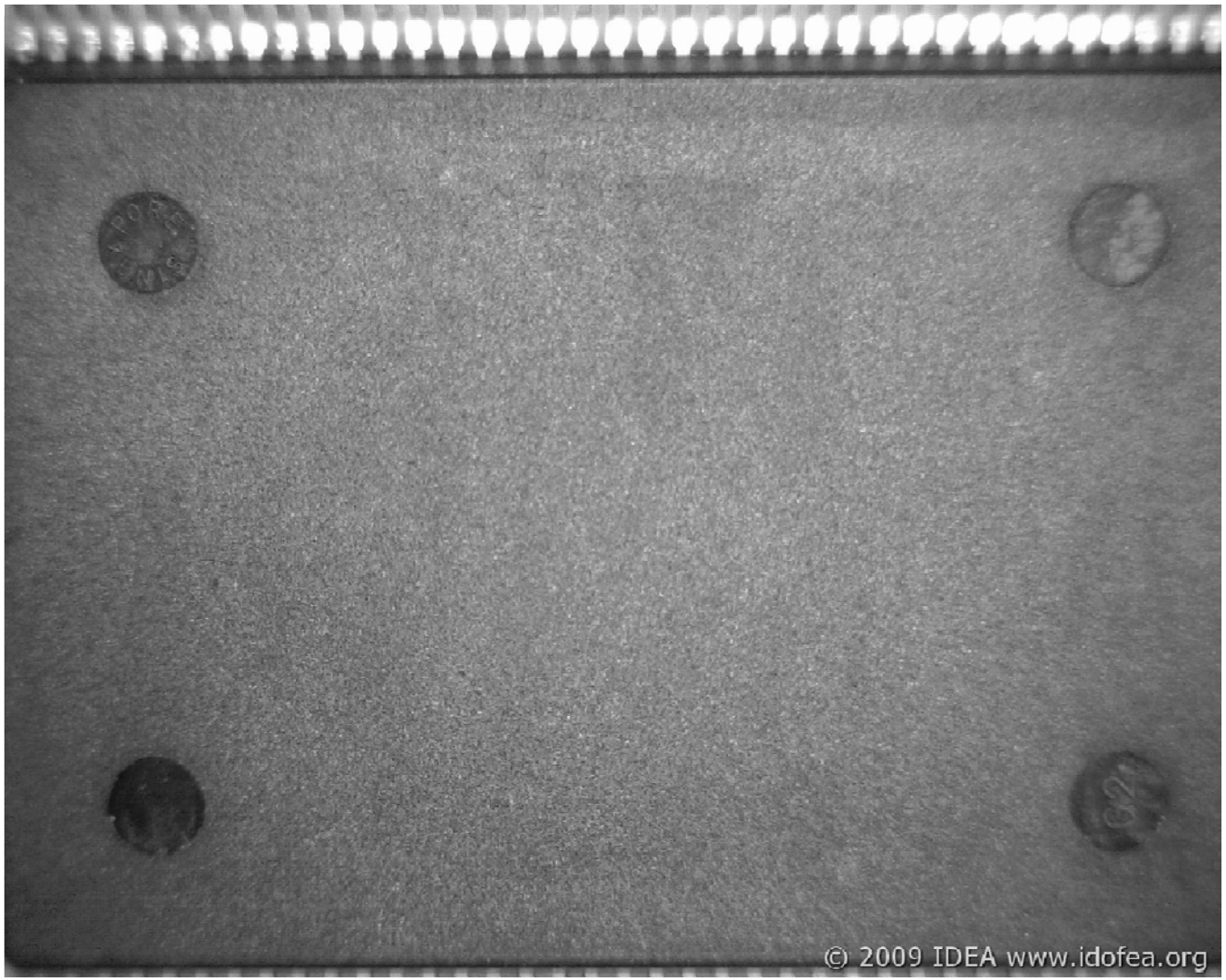
Scratch marks in mold cavity.
However, numbers appear to be the same texture as part body

Part #4 – QPSK DMOD CX24123

Failed – Markings and Blacktop test

Part #6 – BCM5325A2KQM

Part #6 – BCM5325A2KQM

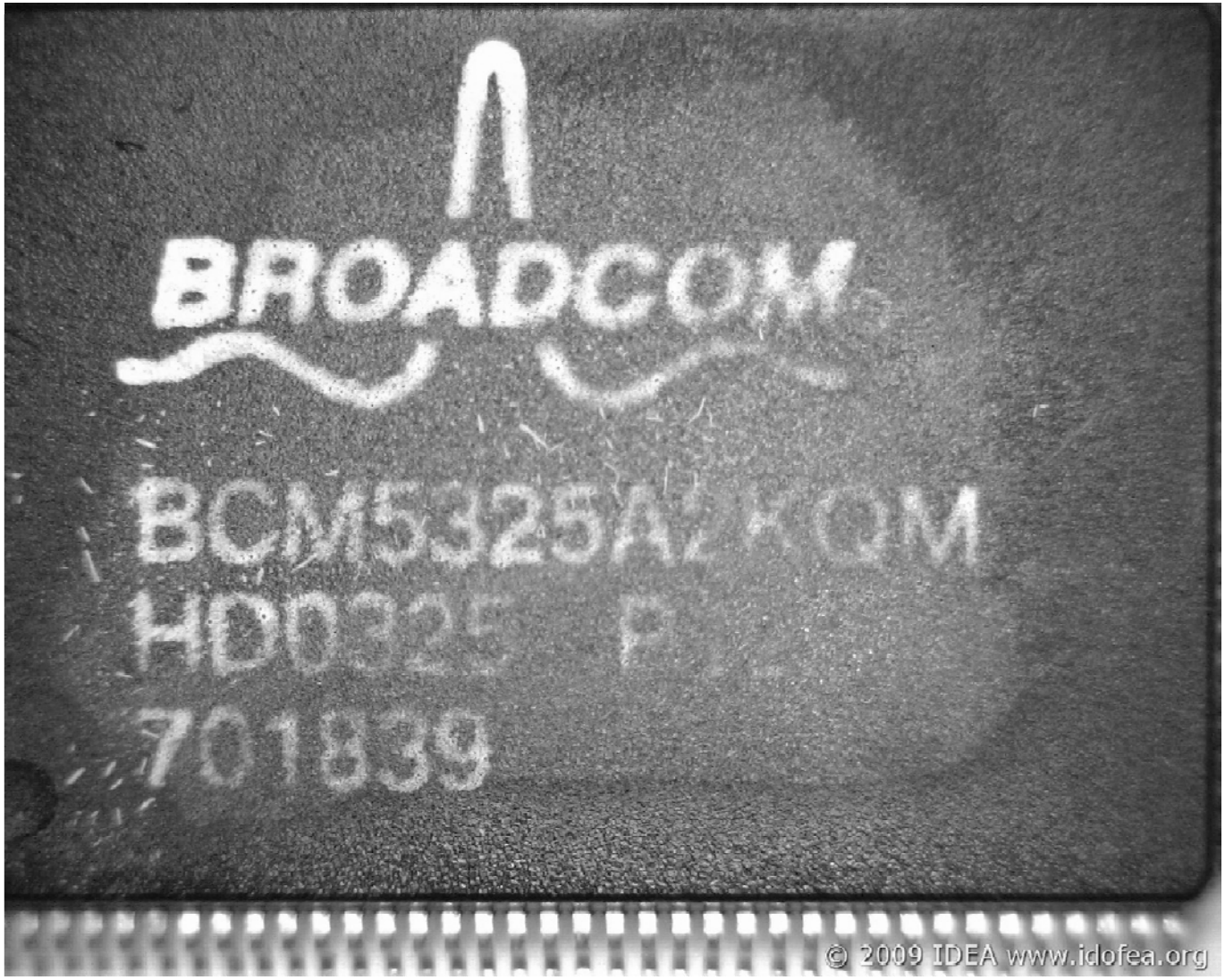


Backside is different texture than front

Part #6 – BCM5325A2KQM

Two different textures in mold and debris

Part #6 – BCM5325A2KQM



Fails - Marking Test

Part #6 – BCM5325A2KQM

Fails – Blacktop test

Part #7 – MT48LC4M32B2

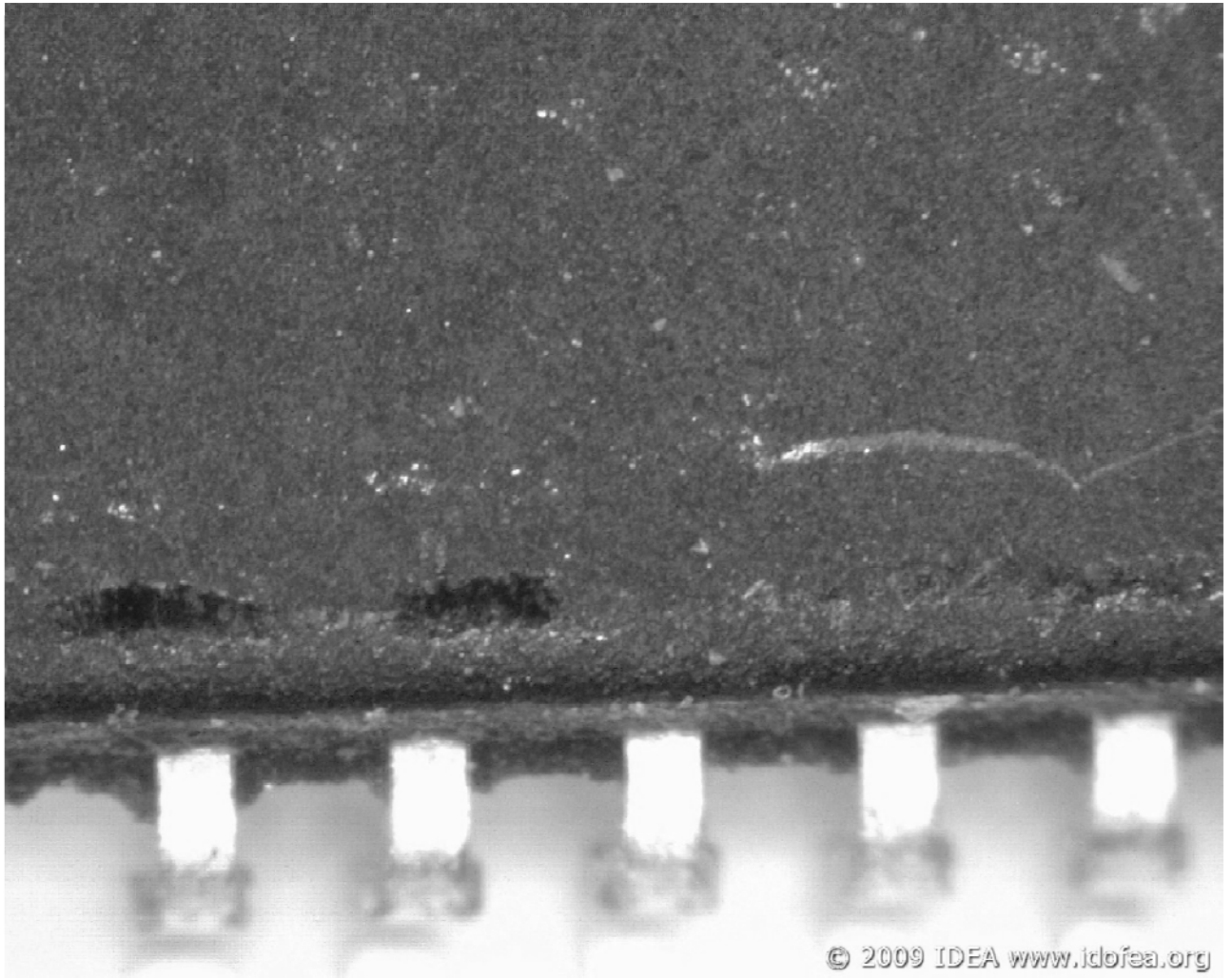
Scratches indicate compromised quality

Fails – Marking test

Part #7 – MT48LC4M32B2

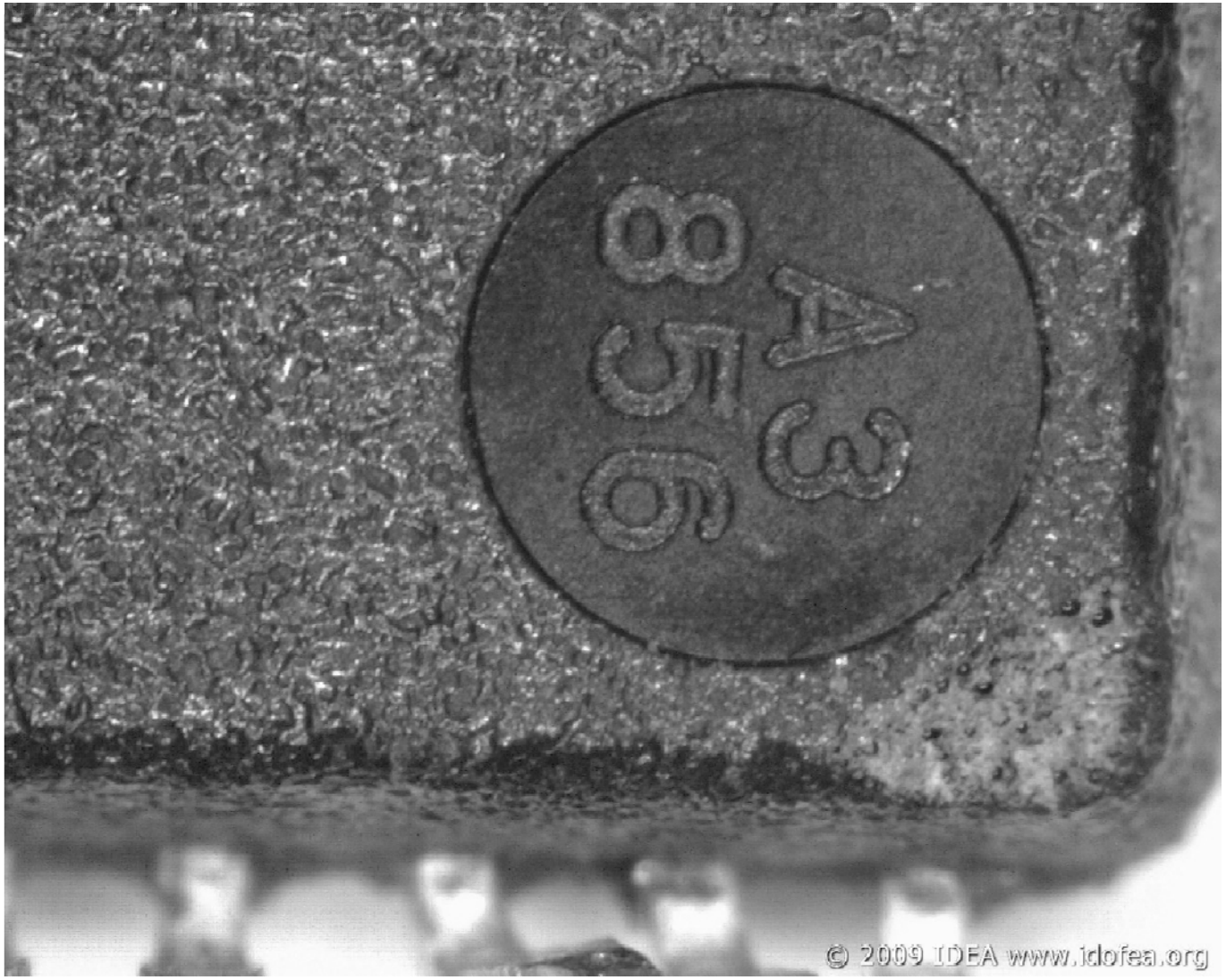
Surface texture appears “weave/cloth like”, not typical

Part #7 – MT48LC4M32B2



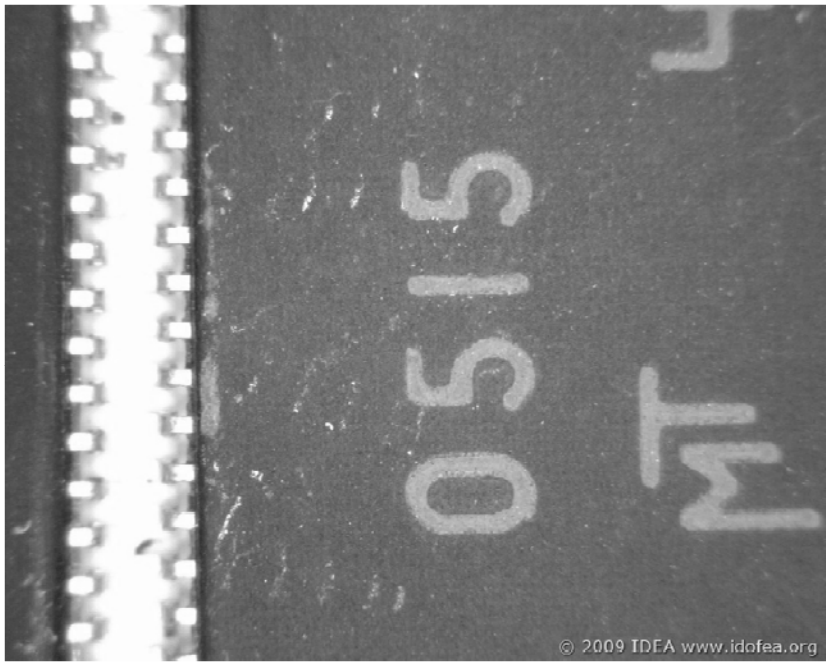
Debris and scratches

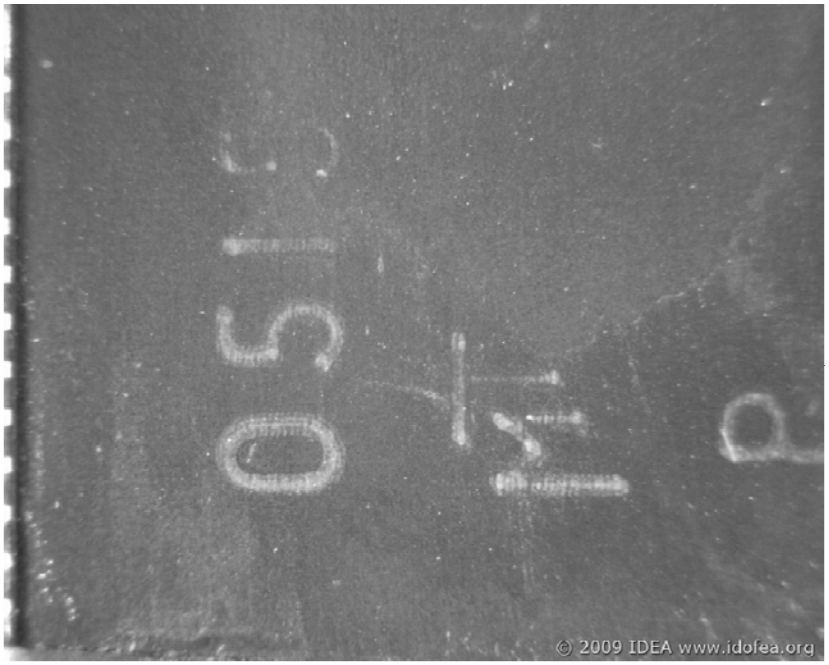
Part #7 – MT48LC4M32B2



Contamination

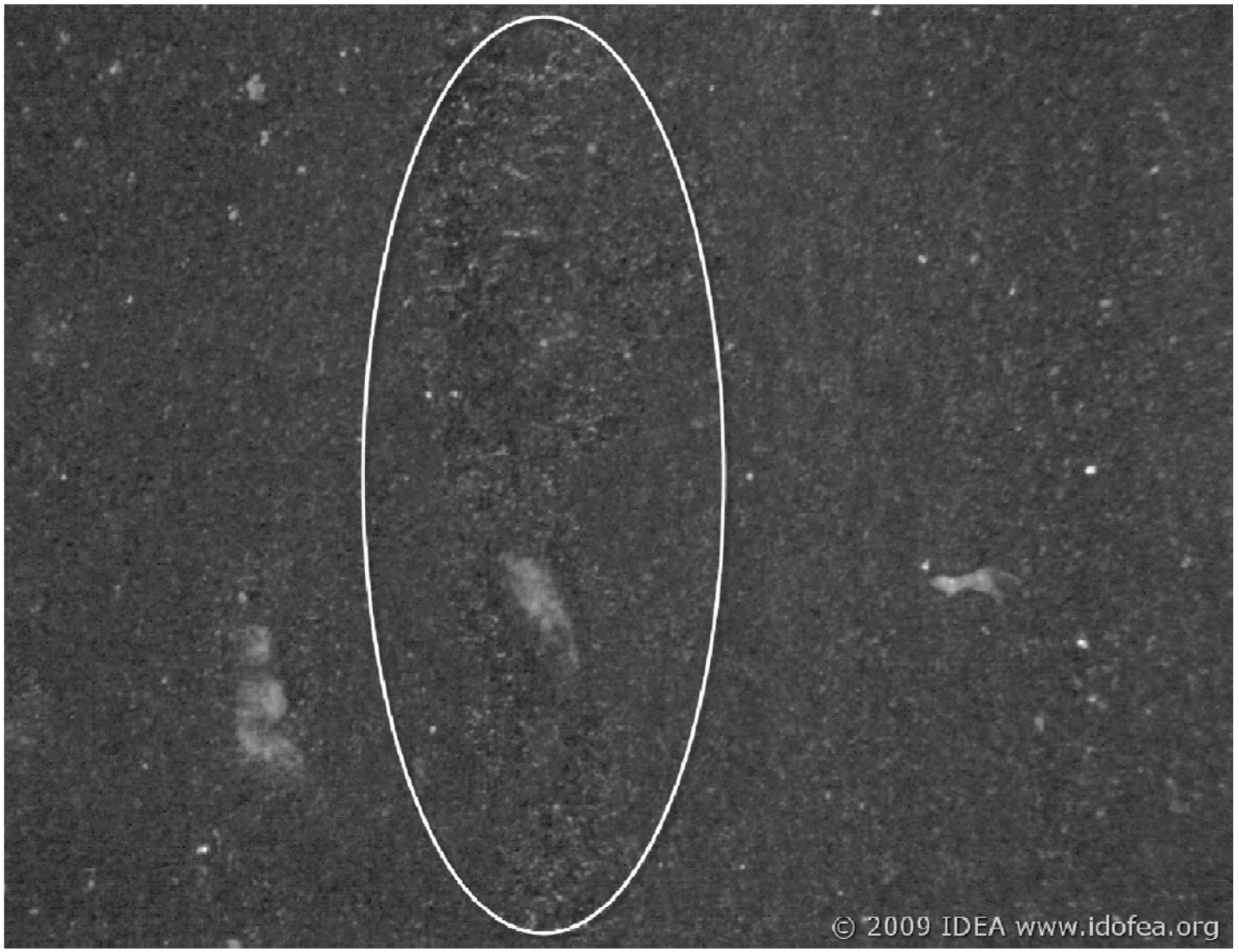
Part #7 – MT48LC4M32B2





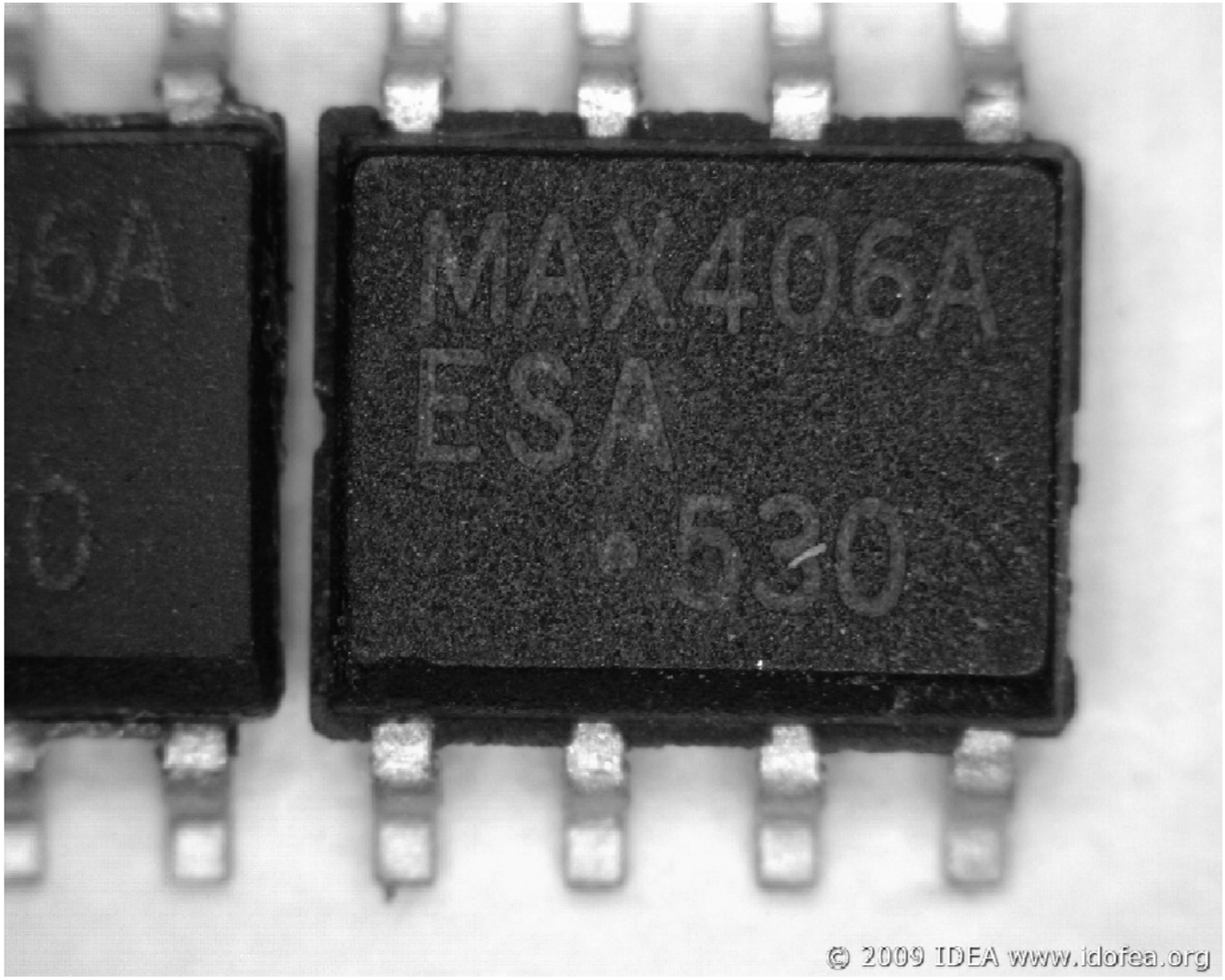
Fails-Blacktop test

Part #7 – MT48LC4M32B2



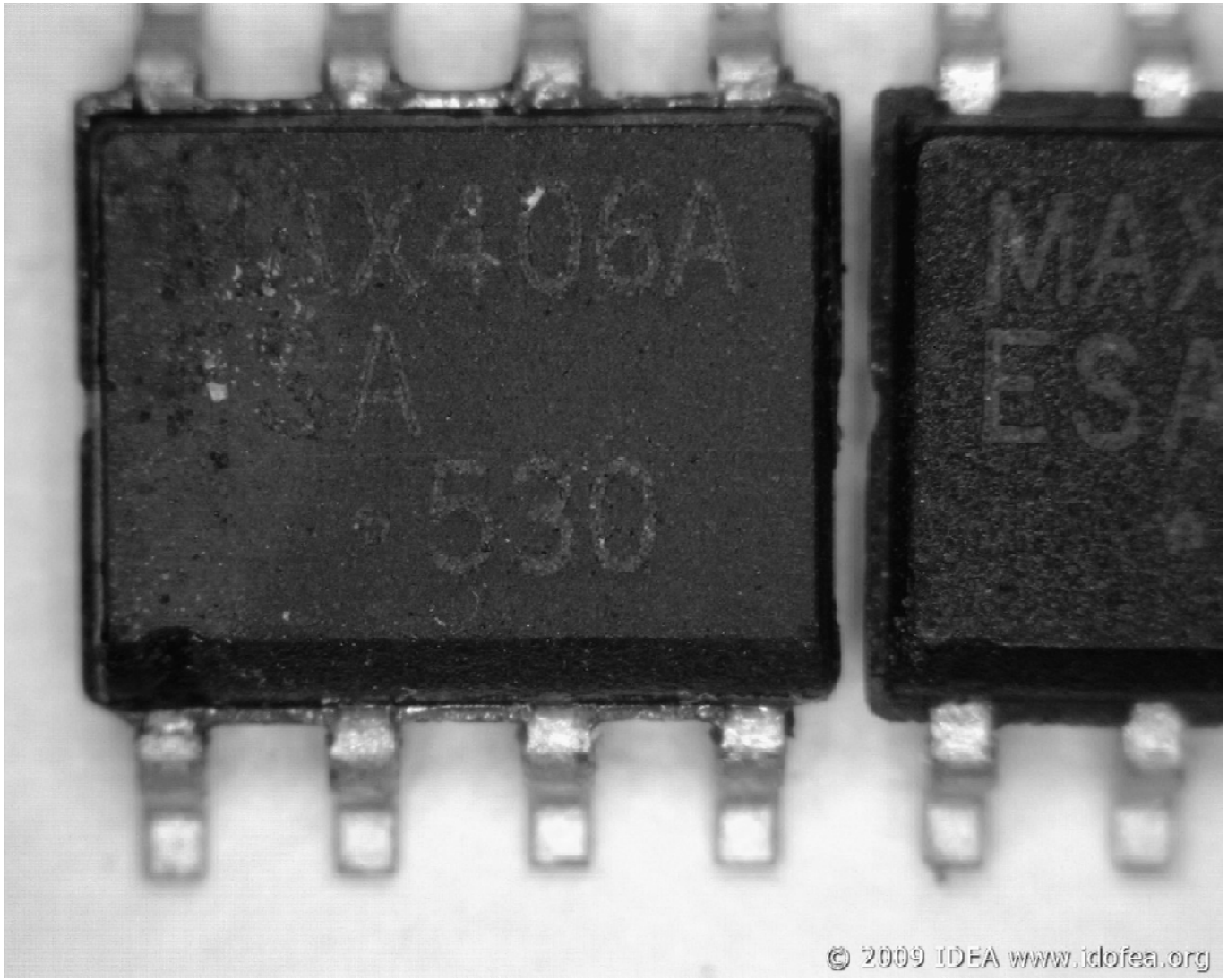
Removed Black-top

Part #8 – MAX406A



Before Acetone test

Part #8 – MAX406A



After Acetone test

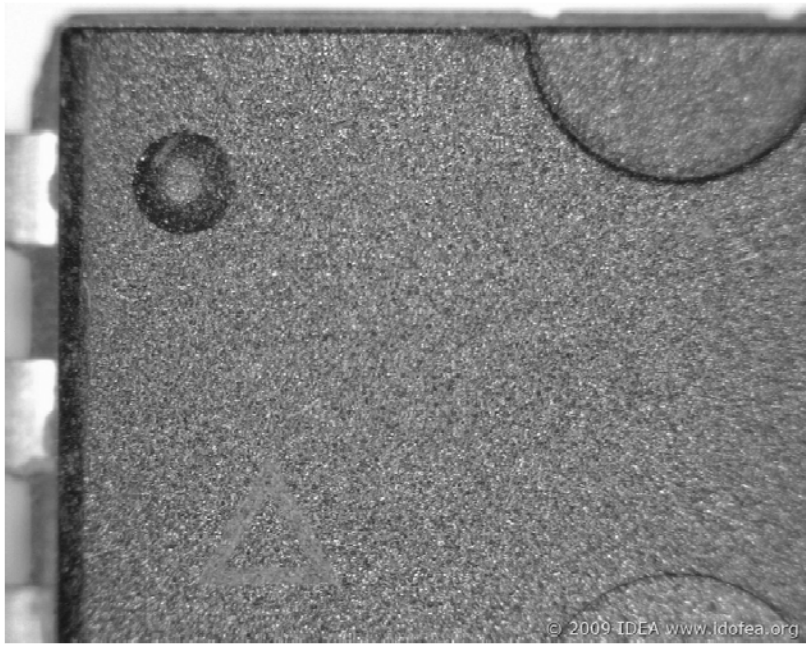
Part #8 – MAX406A

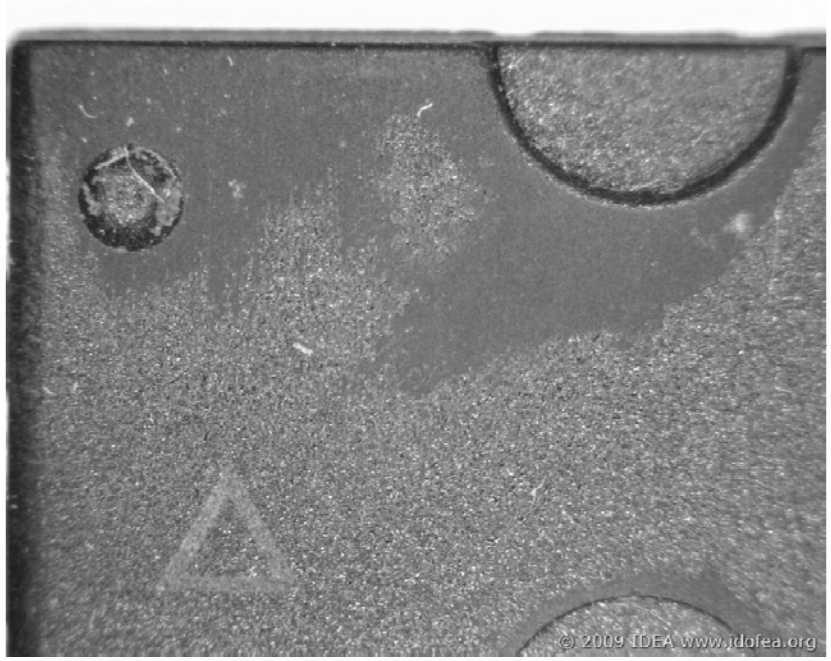
Before vs. After Blacktop test

Passed – Markings test

Failed – Blacktop test

Part #9 – AT29C010A

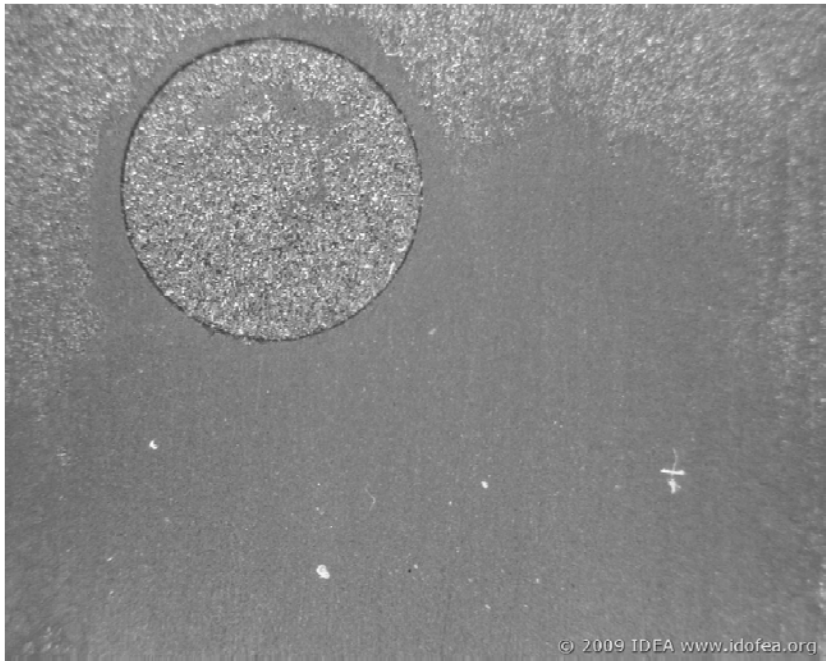




Before and after Acetone test

Fails – Blacktop test

Part #9 – AT29C010A



Before and after Acetone test

Part #10 – AM29DL323DT

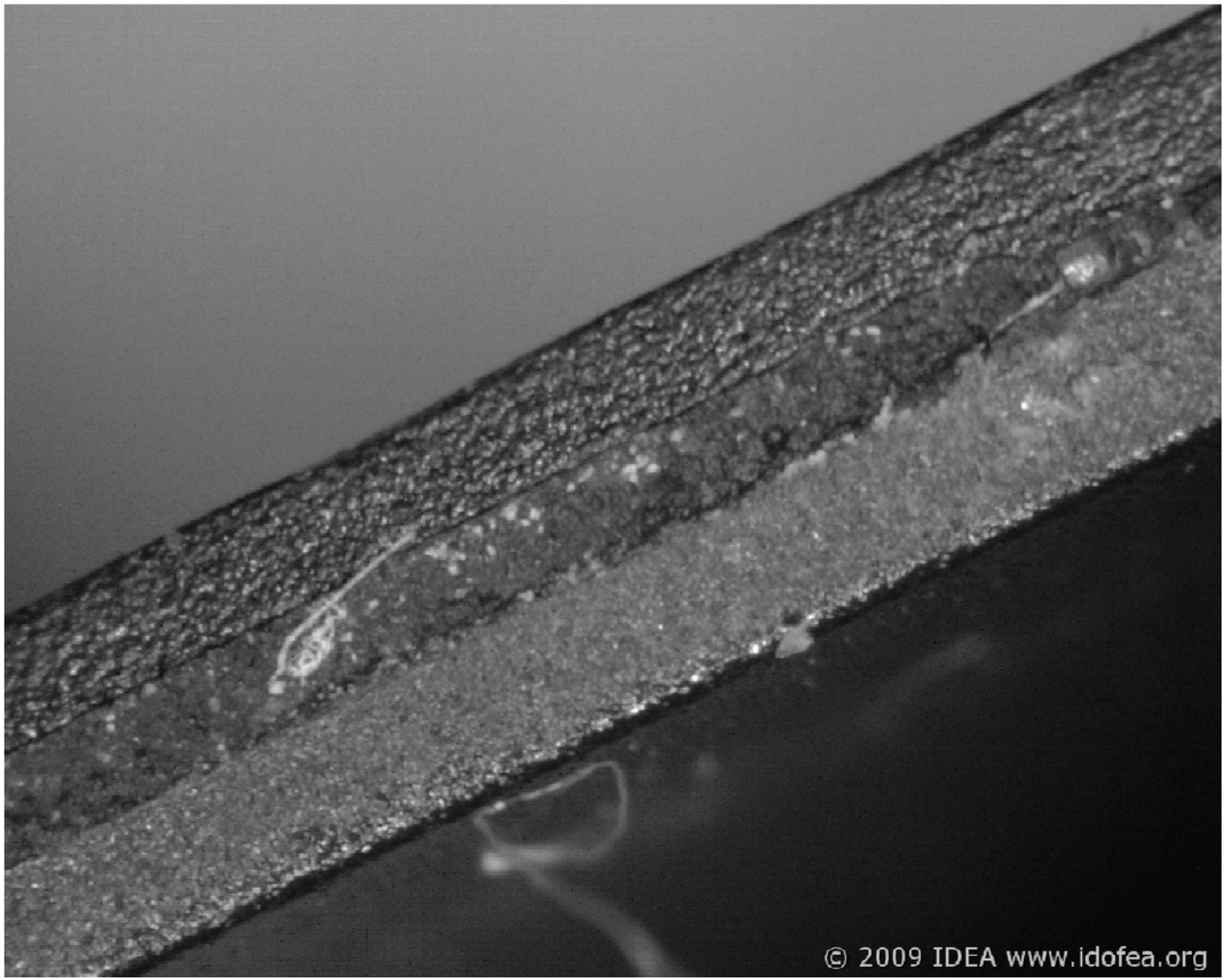
Passed – Markings test

Part #10 – AM29DL323DT

Crude ablation/erosion marking process

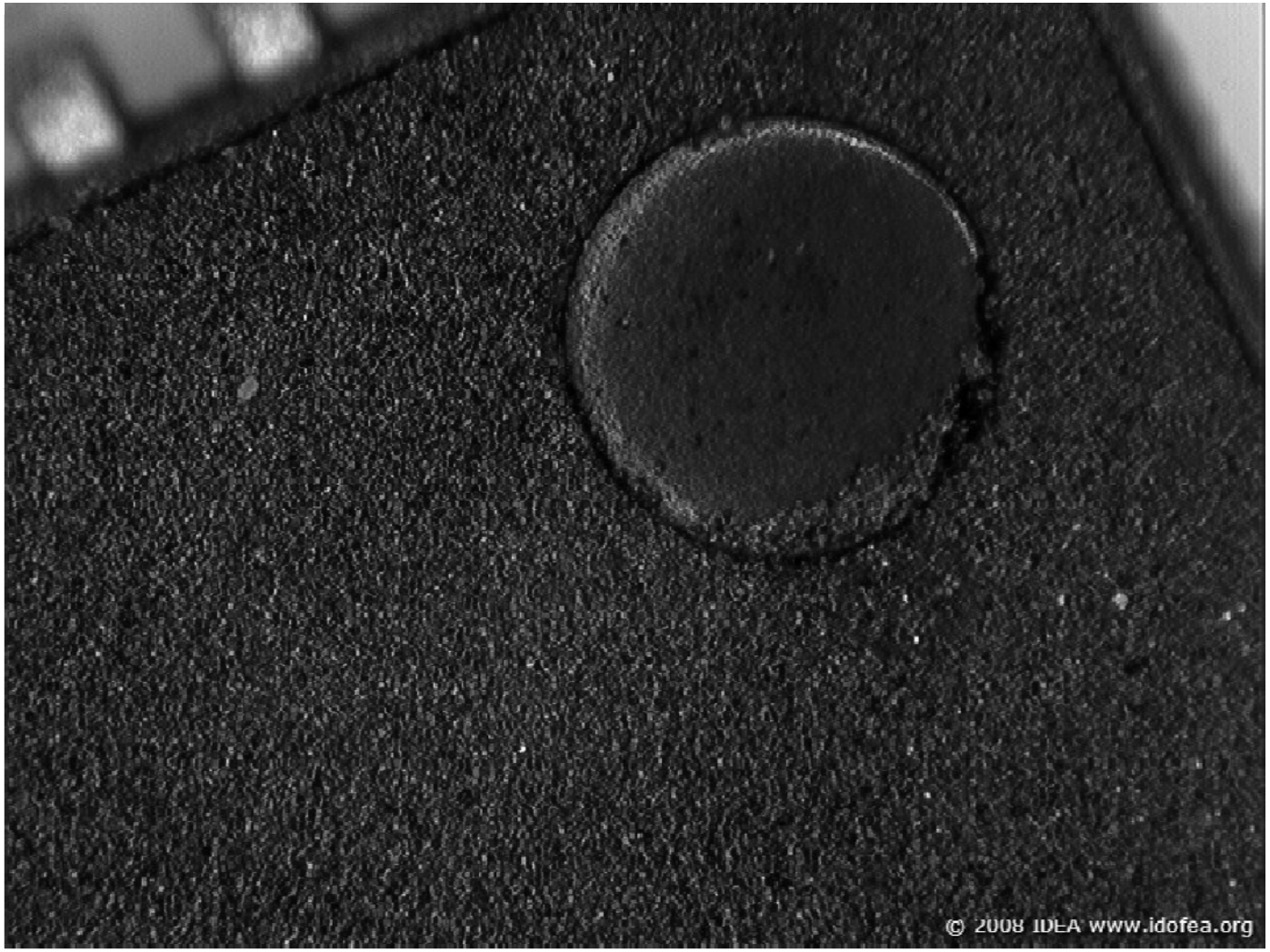
Part #10 – AM29DL323DT

Part #10 – AM29DL323DT



Three different surface textures

Part #10 – AM29DL323DT

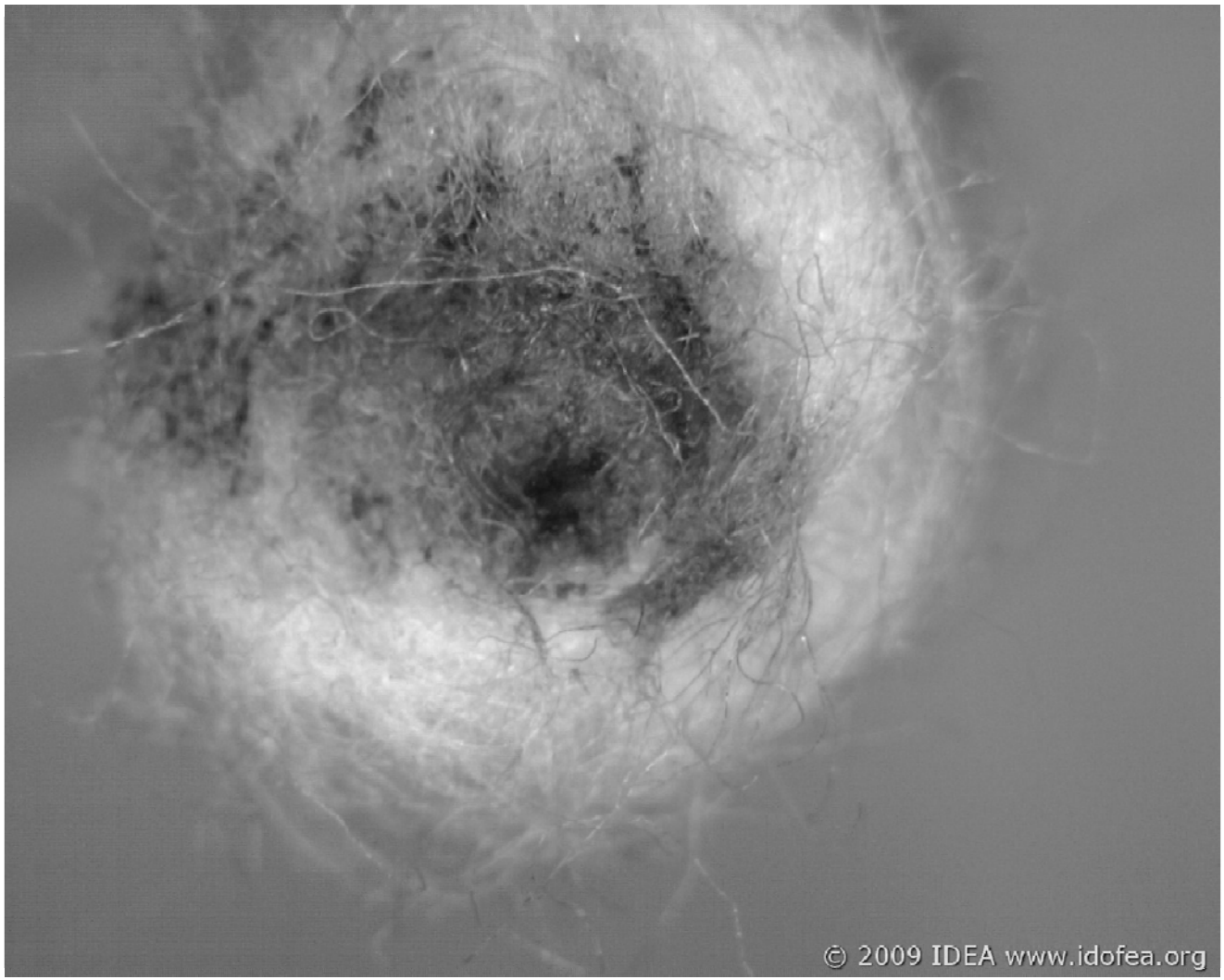


Appears that blacktopping material has spilled into Pin 1 dimple

Part #10 – AM29DL323DT

Results of Acetone test

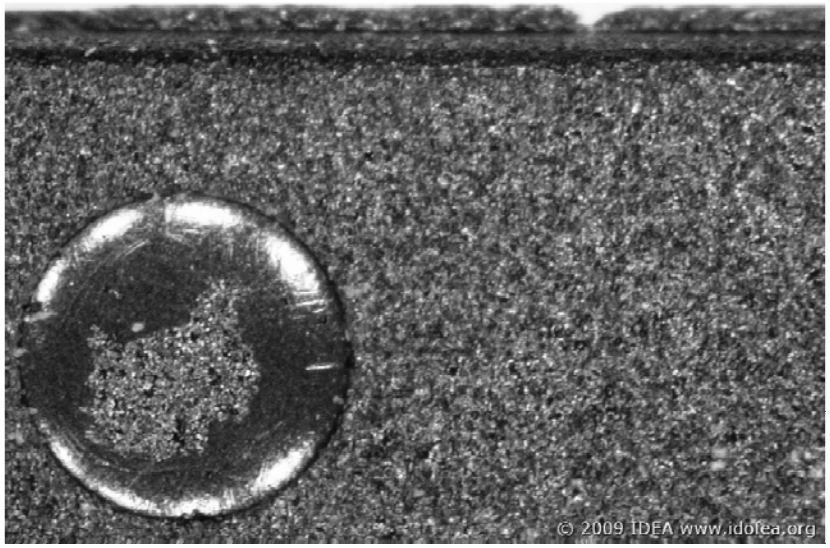
Part #10 – AM29DL323DT

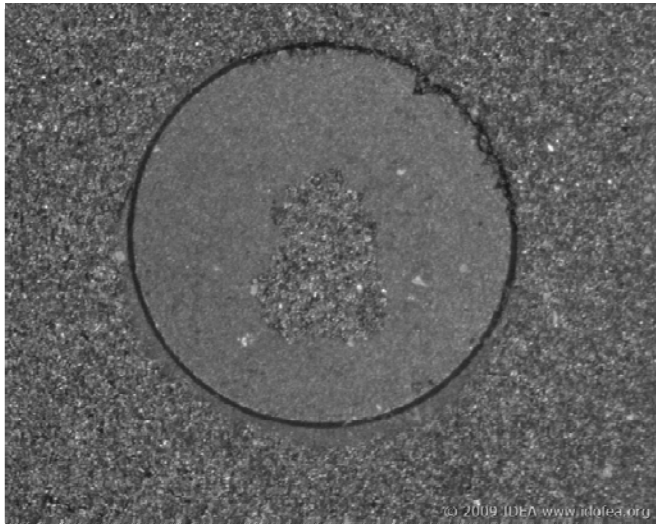


Evidence of Black-topping on the cotton swab

Failed – Blacktop test

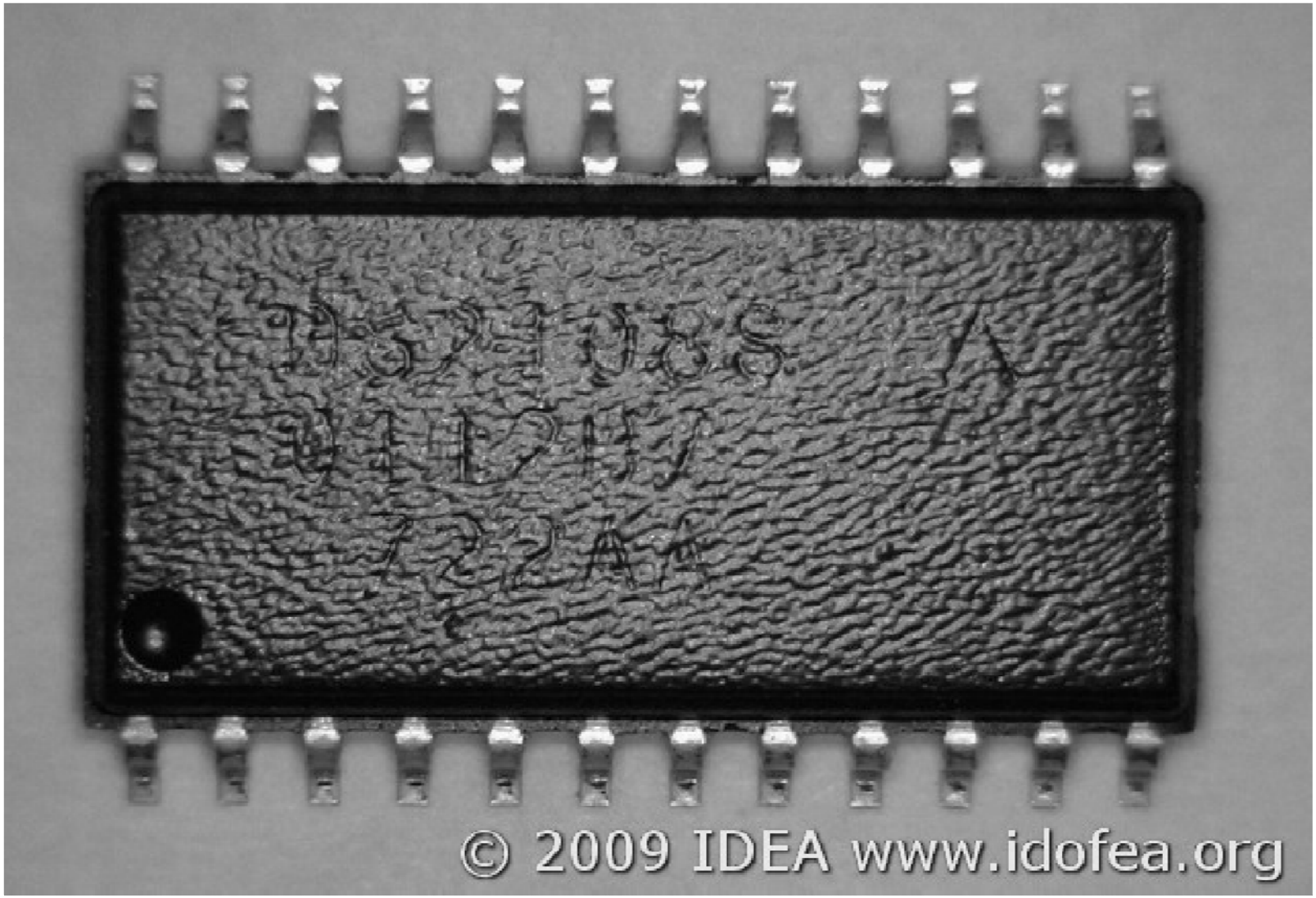
Part #10 – AM29DL323DT



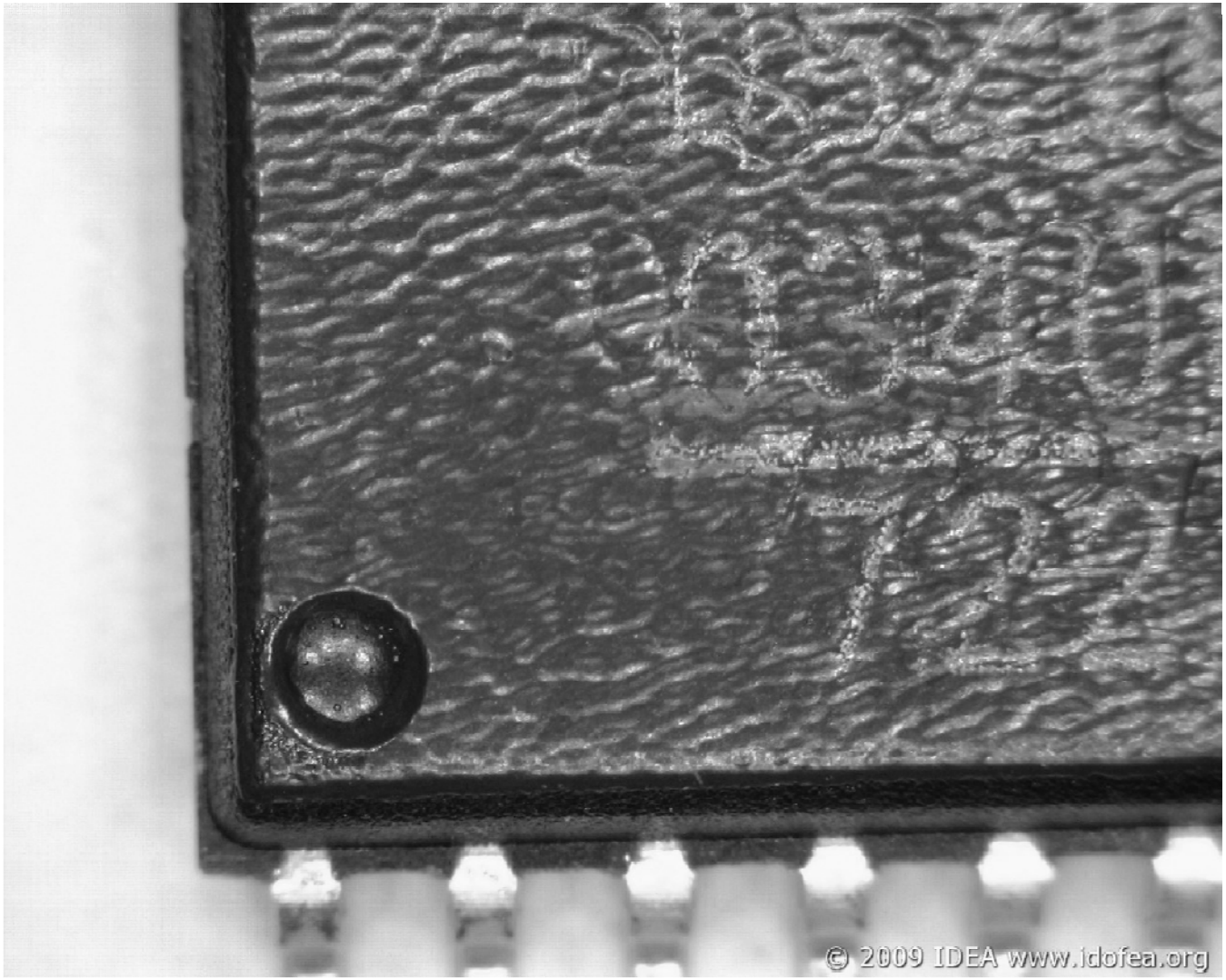


After Acetone Test

Part #11 – DS2108S



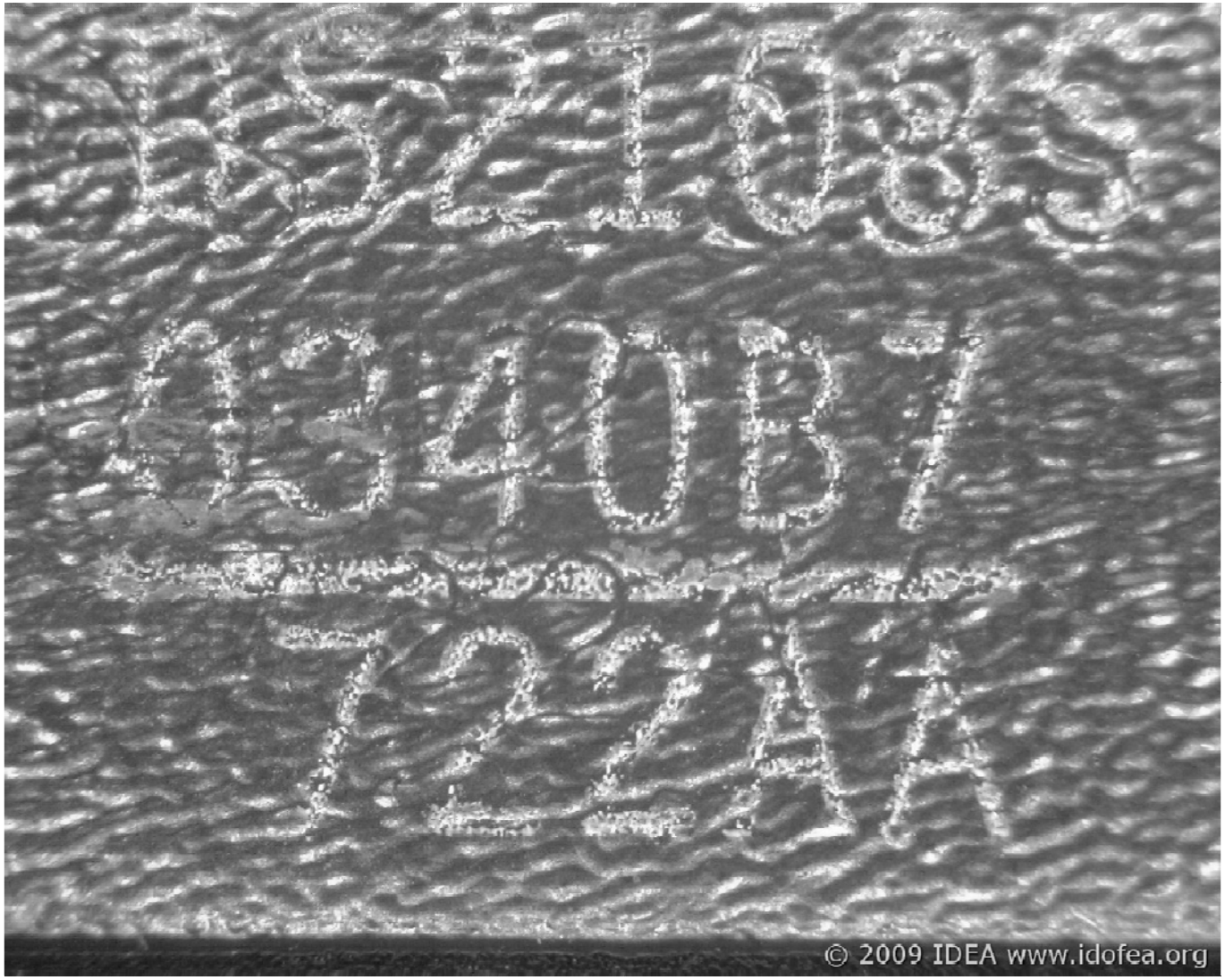
Part #11 – DS2108S



Filled in Pin 1 dimple

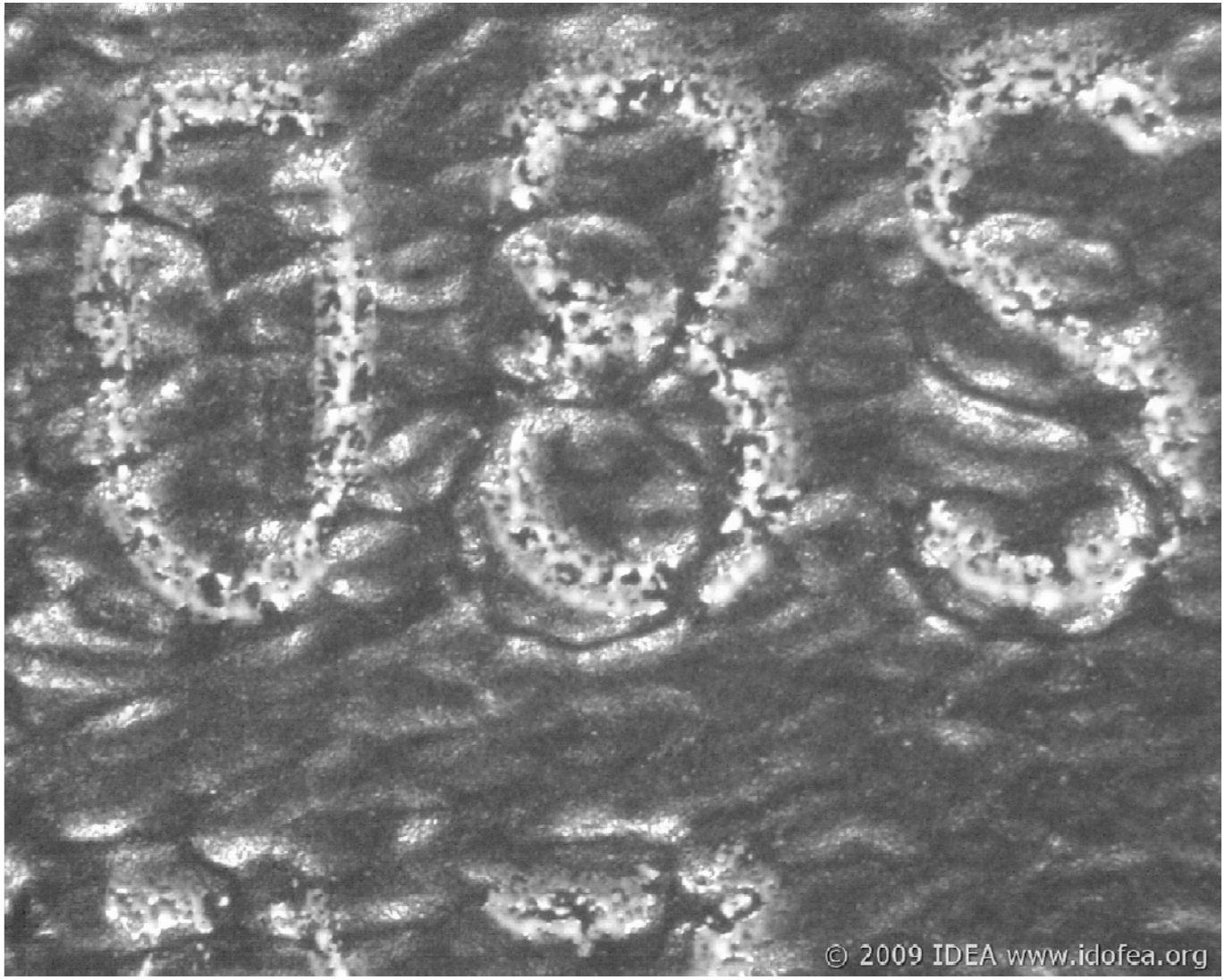
Part #11 – DS2108S

Part #11 – DS2108S



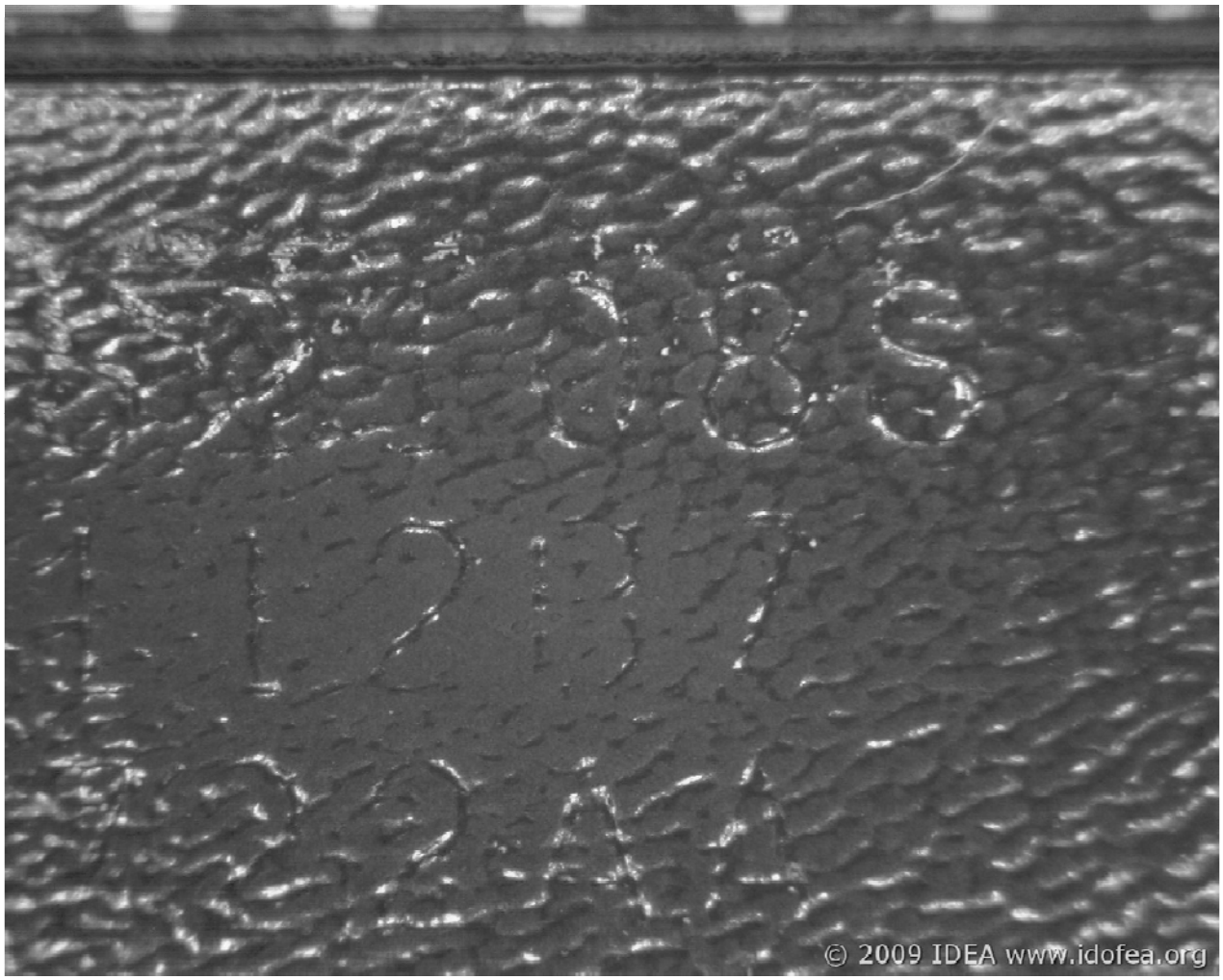
Double Marking; Magnification 70X

Part #11 – DS2108S



Double Marking; Magnification 200X

Part #11 – DS2108S

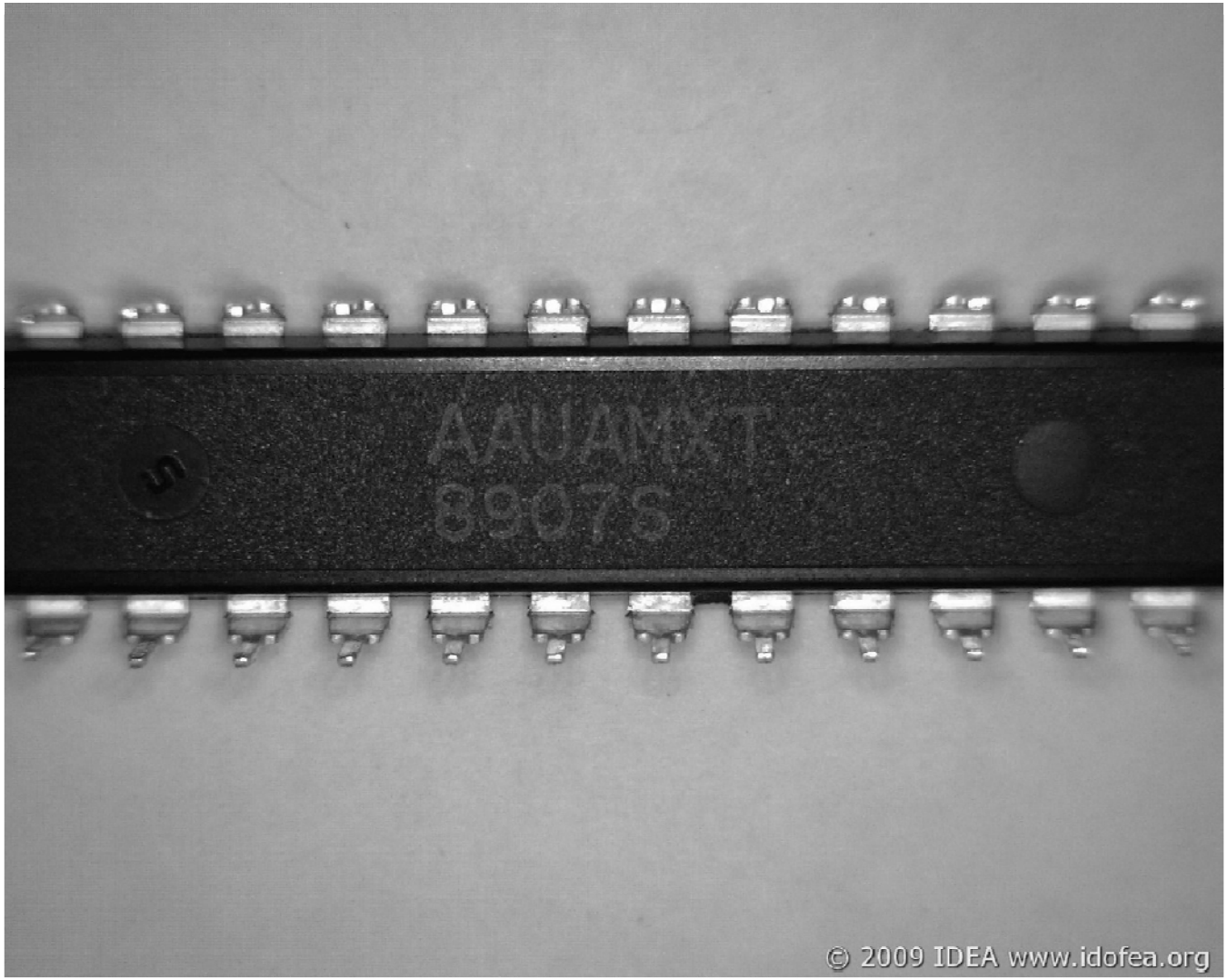


Passes – Marking test

Fails - Blacktop test

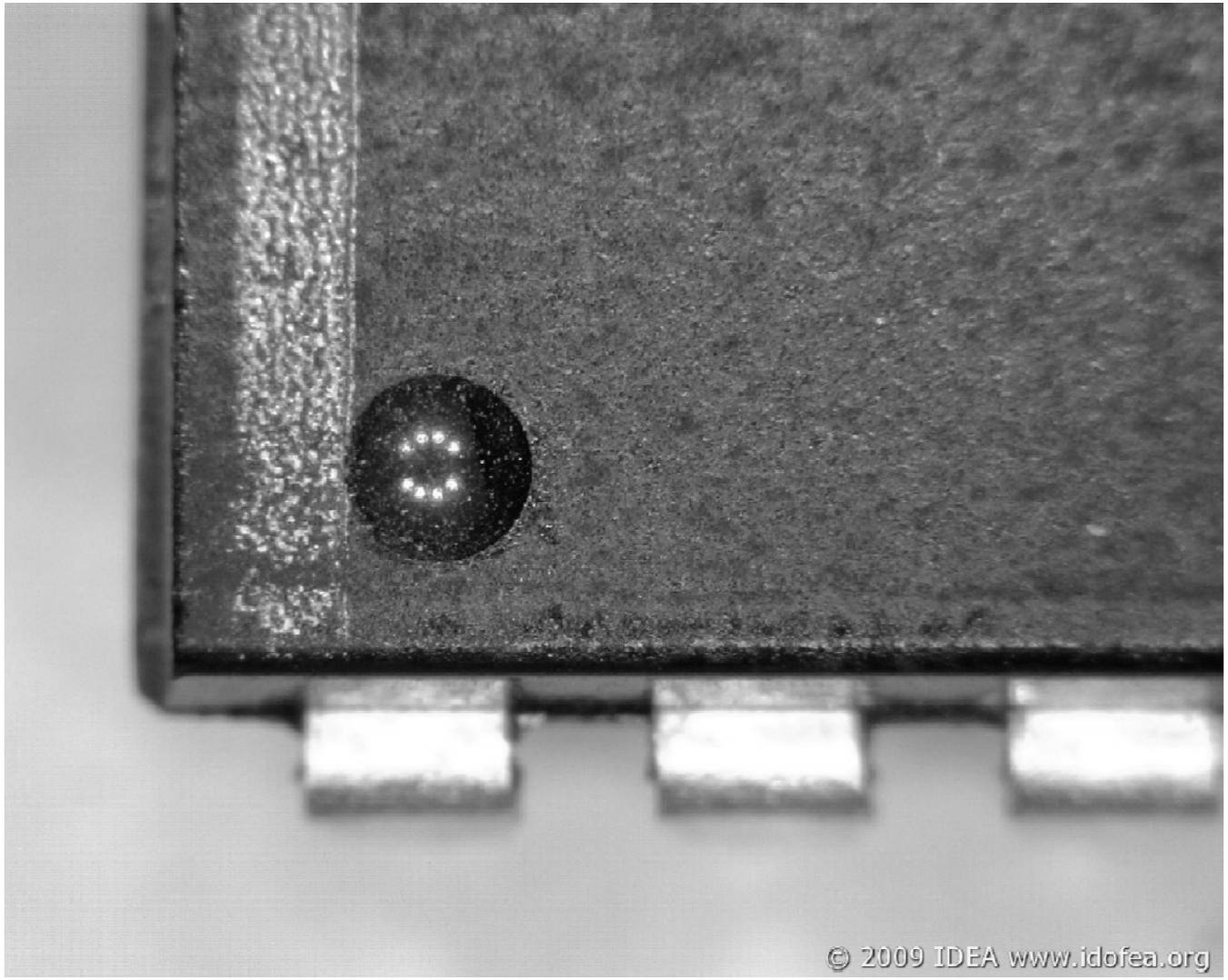
Part #12 – MAX173CNG

Part #12 – MAX173CNG



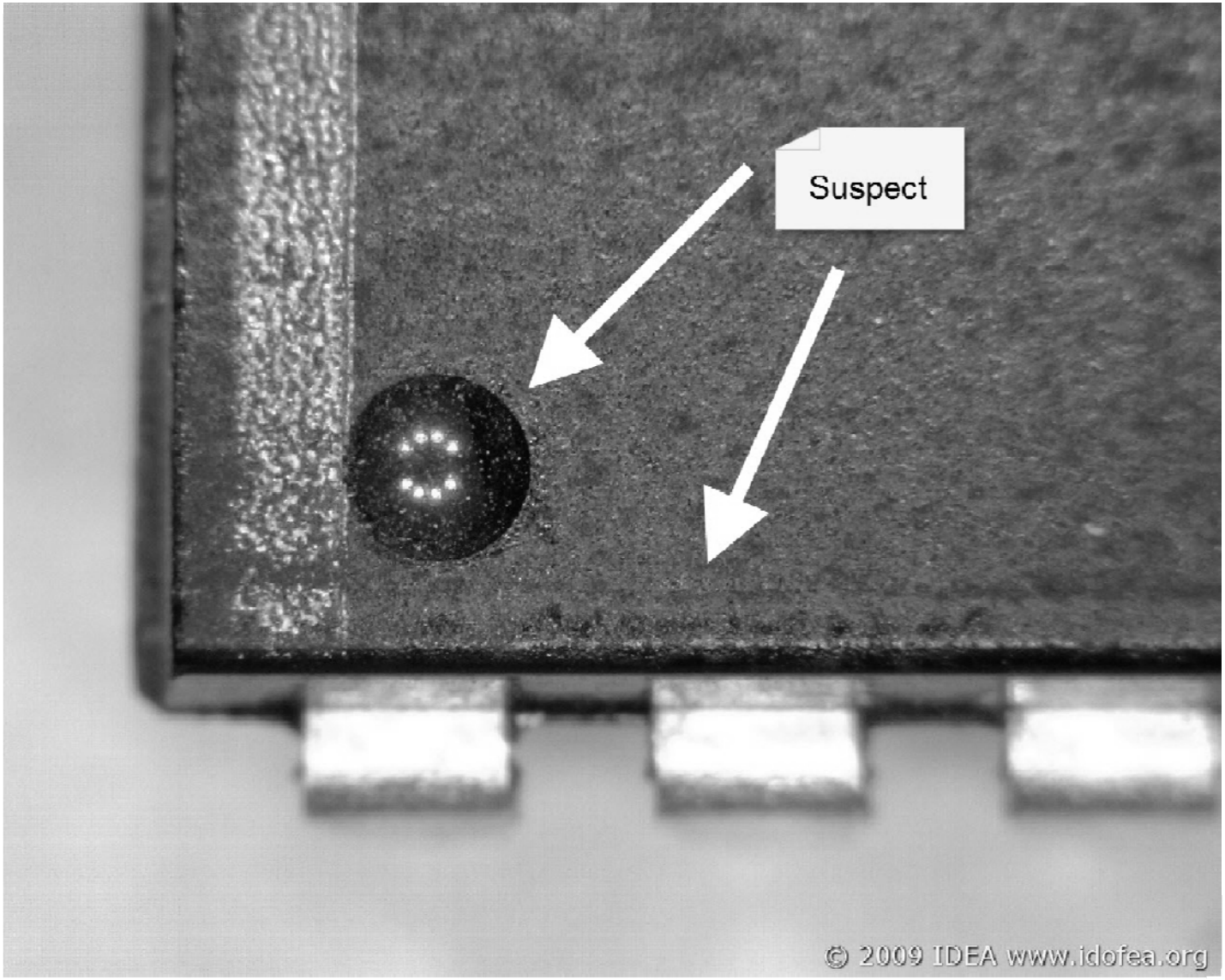
Bottom side texture different from the top

Part #12 – MAX173CNG



What do you see?

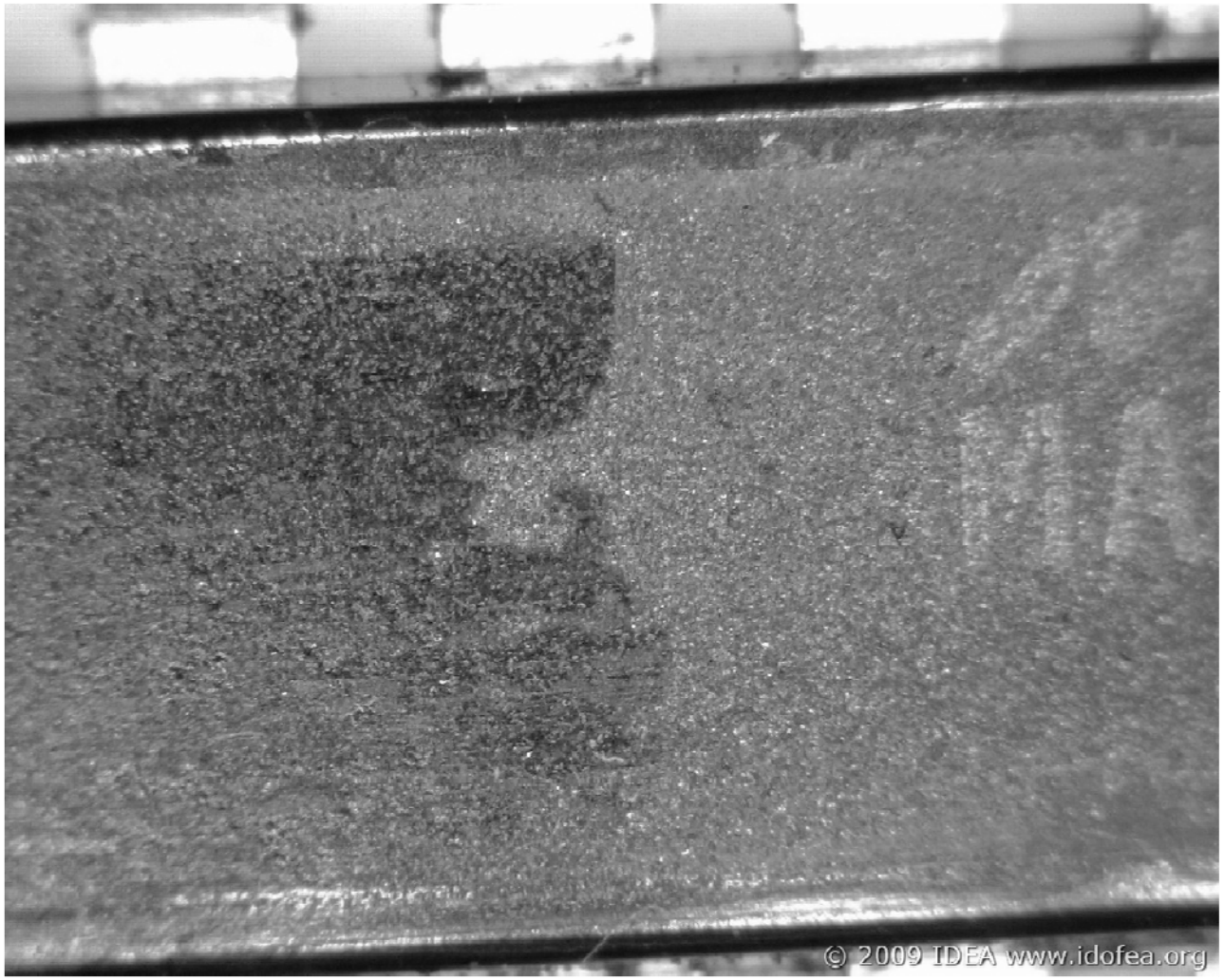
Part #12 – MAX173CNG



Part #12 – MAX173CNG

Acetone removed some topping while requiring vigorous rubbing

Part #12 – MAX173CNG



Scrape Test reveals original surface

Part #12 – MAX173CNG

“3CNG” “9115”

Part #12 – MAX173CNG

After Scraping: “2BCNG” “8829”

Part #12 – MAX173CNG

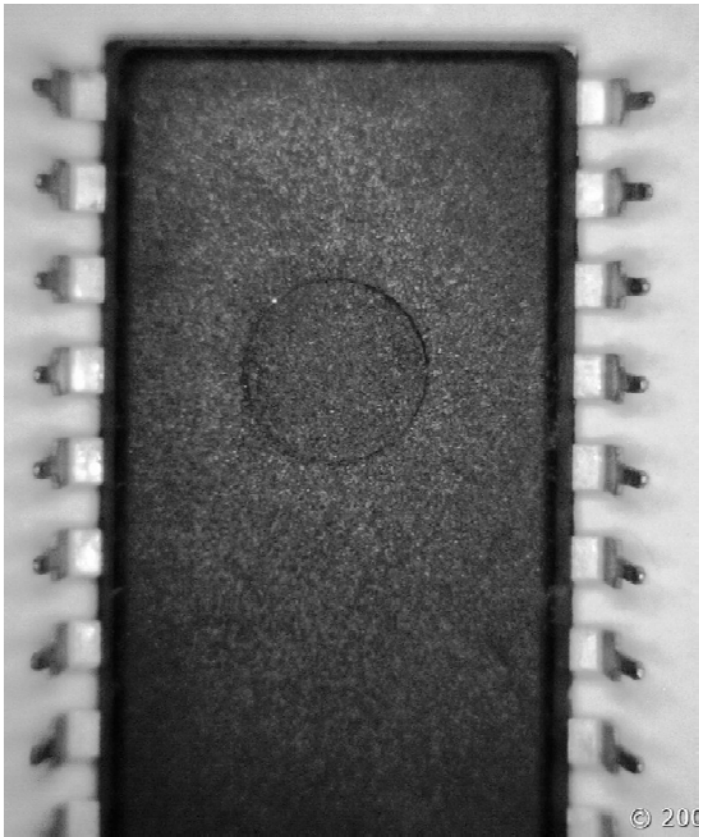
Before vs. After scraping

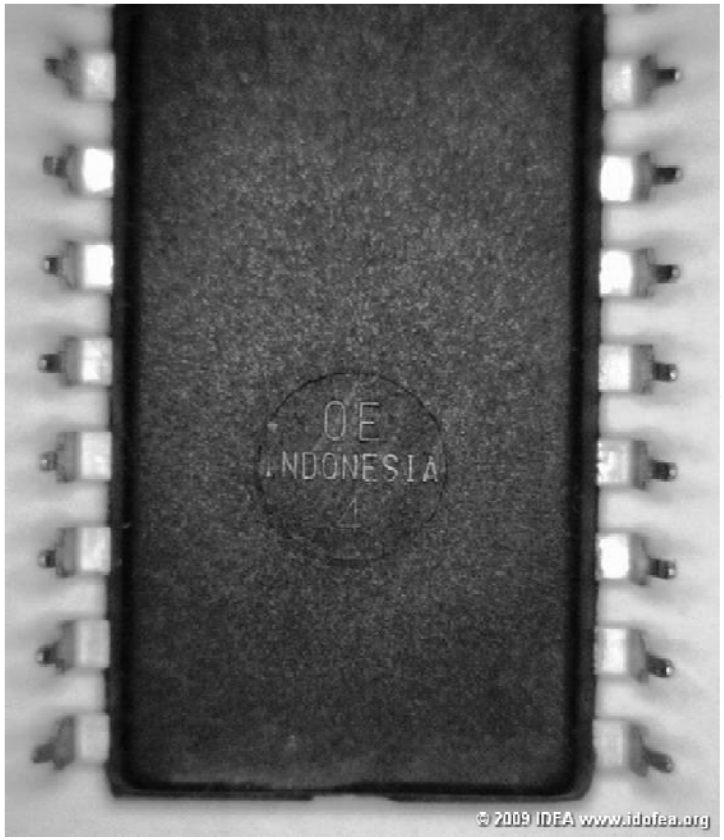
Passes – Marking test

Fails – Blacktop test

Part #14 – LH5164A-10L

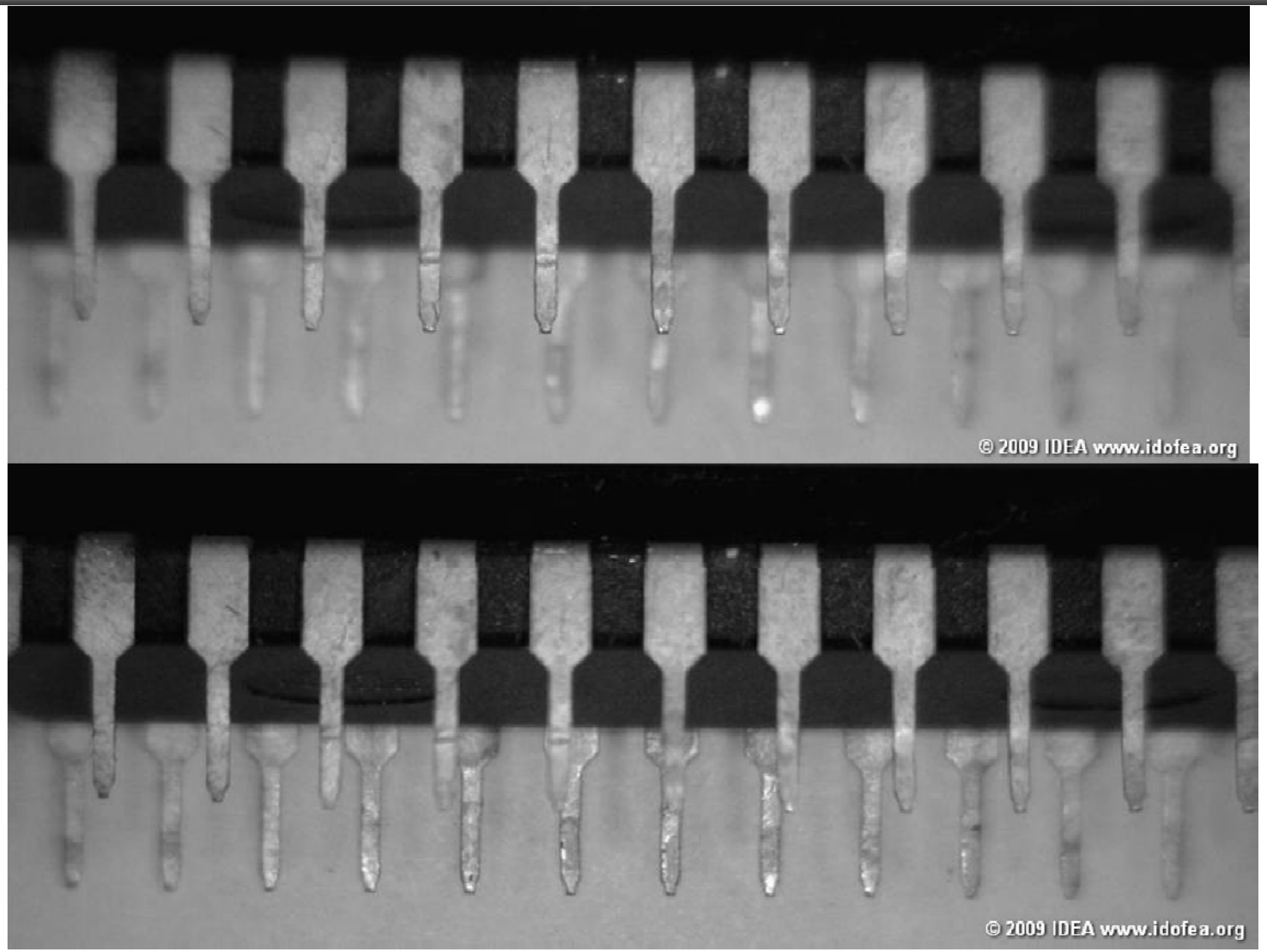
Part #14 – LH5164A-10L





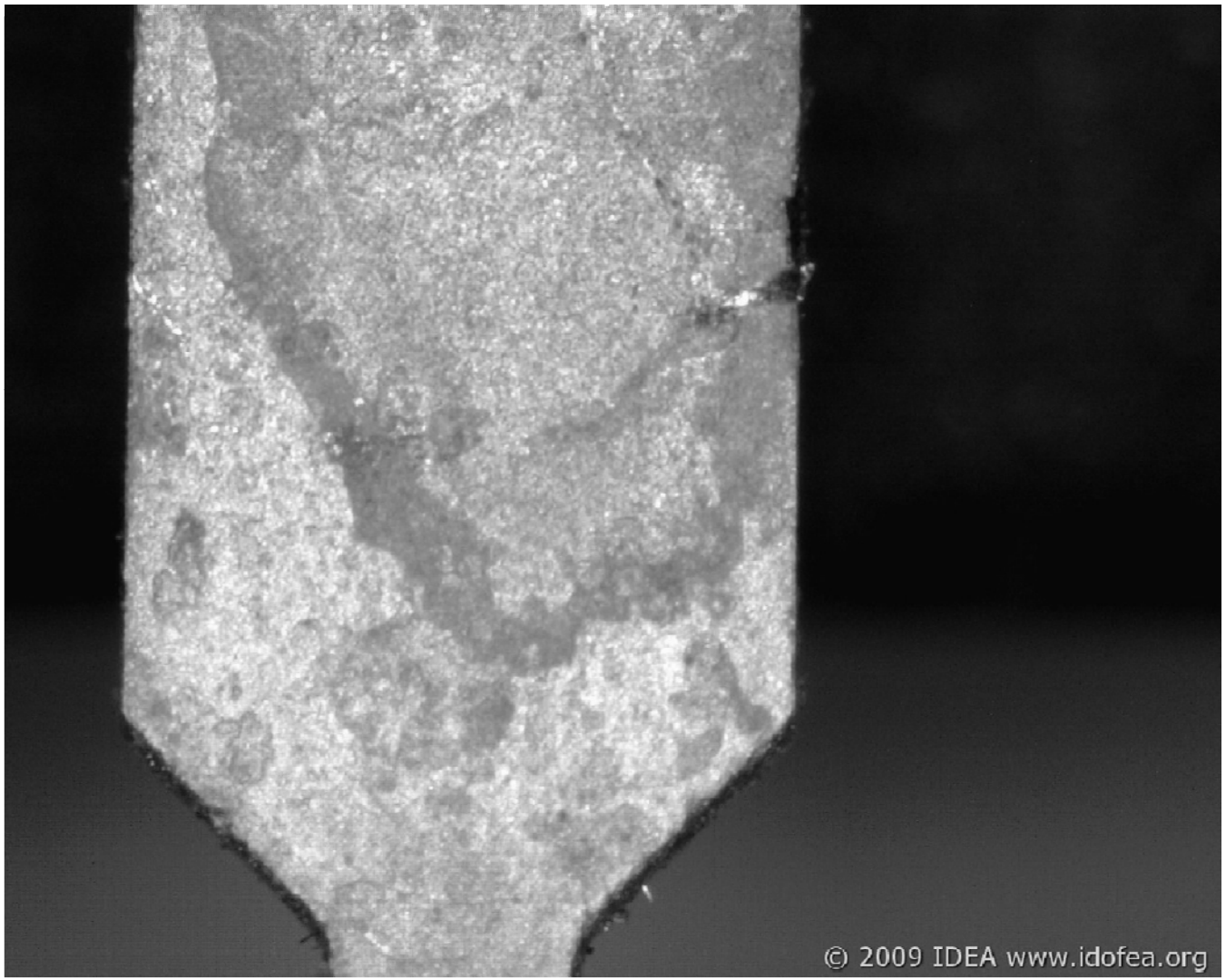
Mold marks are same texture as body

Part #14 – LH5164A-10L



Damaged leads

Part #14 – LH5164A-10L

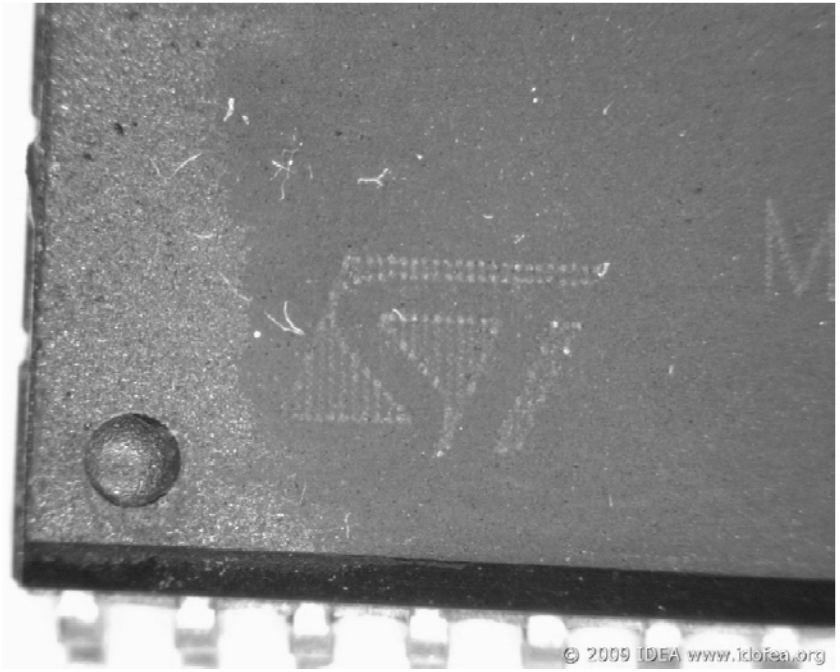


Corrosion of lead

Part #17 – STV5730A

Two different Countries of Origin?

Part #17 – STV5730A



Passes – Marking teset

Fails –Blacktop test

Summary

- Join industry associations such as IDEA & ERAI
- Visit, qualify, and certify your suppliers
- Utilize the IDEA-STD-1010 inspection standard
- Ensure your inspectors receive current training
- Certify your inspectors to IDEA-ICE-3000
- Enlist OCM assistance for suspect counterfeit parts
- Utilize IDEA, ERAI and GIDEP databases

Summary

- Inspect the nice appearing “factory sealed boxes”
- Validate bar code label content
- Utilize an optical microscope for inspection
- Photograph a sample of each component shipped
- Compare at least one component to the datasheet
- Use 3rd party escrow for foreign purchases
- Utilize companies associated with IDEA & ERAI
- Develop “Counterfeit Abatement Procedures”

Summary

- Use XRF to detect lead content for RoHS
- Utilize X-Ray equipment – easiest way to see inside
- DeCap a sample and inspect die markings
- Develop Testing resources relationships

IDEA Course End

End of IDEA Seminar

www.IDofEA.org

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Experience!

Expertise!

IDEA Member Companies

- 4 Star Electronics, Inc.
- Advanced MP Technology
- America II Electronics, Inc.
- American Electronic Resource, Inc.
- Analytical Solutions, Inc.
- Converge
- Crestwood Technology Group
- Defense Suppliers of Electronic Components
- Eagle Technology Solutions
- Electrospec, Inc.
- Florida Circuit, LLC
- FM Electroniques
- Fusion
- Harry Krantz Company, LLC
- Impact Components
- Lintech Components Company, Inc.
- Manistar Electronics, Inc.
- MicroRam Electronics, Inc.
- MIT Distributors, Inc.
- NexGen Digital Inc.
- North Shore Components, Inc.
- Oxygen Electronics, LLC
- PC Components Company, LLC
- PCX, Inc.
- Quest Components
- Rand Technology
- Rotakorn Electronics AB
- Serenity Electronics, Inc.
- SG Industries, Inc.
- Smith & Associates
- SMT Corp.
- SND Electronics, Inc.
- Velocity Electronics, LP
- Vital Source, Inc.
- World Micro

For more information about how to help mitigate the purchase and use of counterfeit parts, contact IDEA at www.IDofEA.org.