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 1

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
- There are *almost always* exceptions

Adjusting Expectations

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

Training Track 1:
Proficiency in Detection of Counterfeit Indicators

Track 1; Part 1

- Provide attendees with an overview of the required visual inspection processes outlined in AS6081and AS5553 and perform a gap analysis against IDEA-1010-B.

- Aid attendees in gaining enhanced proficiency in examining product packaging and labels.

Track 1; Part 1

- Recommend minimum equipment and tools required for visual inspection.
- Demonstrate the role microscopy plays in the identification of suspect counterfeit material.
- Provide guidance relative to magnification aids and lighting.

Track 1; Part 1

- Demonstrate evidence of nonconformities visible at the minimum up to the maximum recommended magnification power.

- Allow ample time to accept and respond to attendee questions, comments and input.

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

Track1; 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.

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.

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

Minimum Equipment

- Digital camera
- Adequately lit microscopy
- Magnifiers and/or eye loupe
- Vacuum pen
- Bar code Scanner
- Calipers
- Micrometers
- Vacuum sealer to seal humidity barrier bags

Table 2 – Equipment and Tools

The tools listed in Table 2, or their equivalent, are required basic tools and shall be part of the handling, evaluation, and verification equipment of any Organization in compliance with IDEA-STD-1010-B.

	1 Delivery	2 Receiving	3 Incoming Inspection	4 Tape & Part Inspection	5 First Inspection	6 Second Inspection	7 Packaging	8 Shipping
Digital Camera with macro capability	✓	✓	✓			✓	✓	
Receiving and Shipping Scales	✓	✓					✓	✓
ESDS Program[25]		✓	✓	✓	✓	✓	✓	
Handling Tools 1. Vacuum Pen 2. Tweezers 3. Knives & Box Cutters 4. Finger cots and/or gloves		✓	✓	✓	✓	✓		
Barcode (symbology) 1. Scanners 2. Printers 3. Information & Standards		✓	✓	✓	✓	✓	✓	✓
Magnifiers 1. Eye Loupes 2. Microscopes 3. Micro photo Systems		✓	✓	✓	✓	✓		
Part Counters 1. Reel to Reel 2. Scales (count by weight)		✓	✓	✓	✓	✓		
Measurement Tools 1. Metal Rule or Scale 2. Calipers 3. Micrometers 4. Grade A Surface Plate			✓		✓	✓		
Humidity Controls 1. Vacuum Sealer 2. Desiccants 3. Humidity Indicator Cards 4. Room Humidity Monitor		✓	✓	✓	✓	✓	✓	

Magnification

STD 1010: Table 3 – Inspection Magnification

IPC, *IPC-A-610D*, 1-6.

Terminal Widths or Terminal Diameters	Magnification Power	Magnification Power
	Inspection Range	Maximum Referee
>1.0 mm [0.0394 in]	1.5X to 3X	4X
>0.5 to ≤1.0 mm [0.0197 to 0.0394 in]	3X to 7.5X	10X
≥0.25 to ≤0.5 mm [0.00984 to 0.0197 in]	7.5X to 10X	20X
<0.25 mm [0.00984 in]	20X	40X

Referee conditions are used to verify product rejected at the inspection range magnification power. For parts with mixed feature widths, the greater magnification may be used for the entire part.

Inspection for Indications of Counterfeit Conditions

When inspecting for indicators of counterfeit conditions, there are no limits on magnification power.

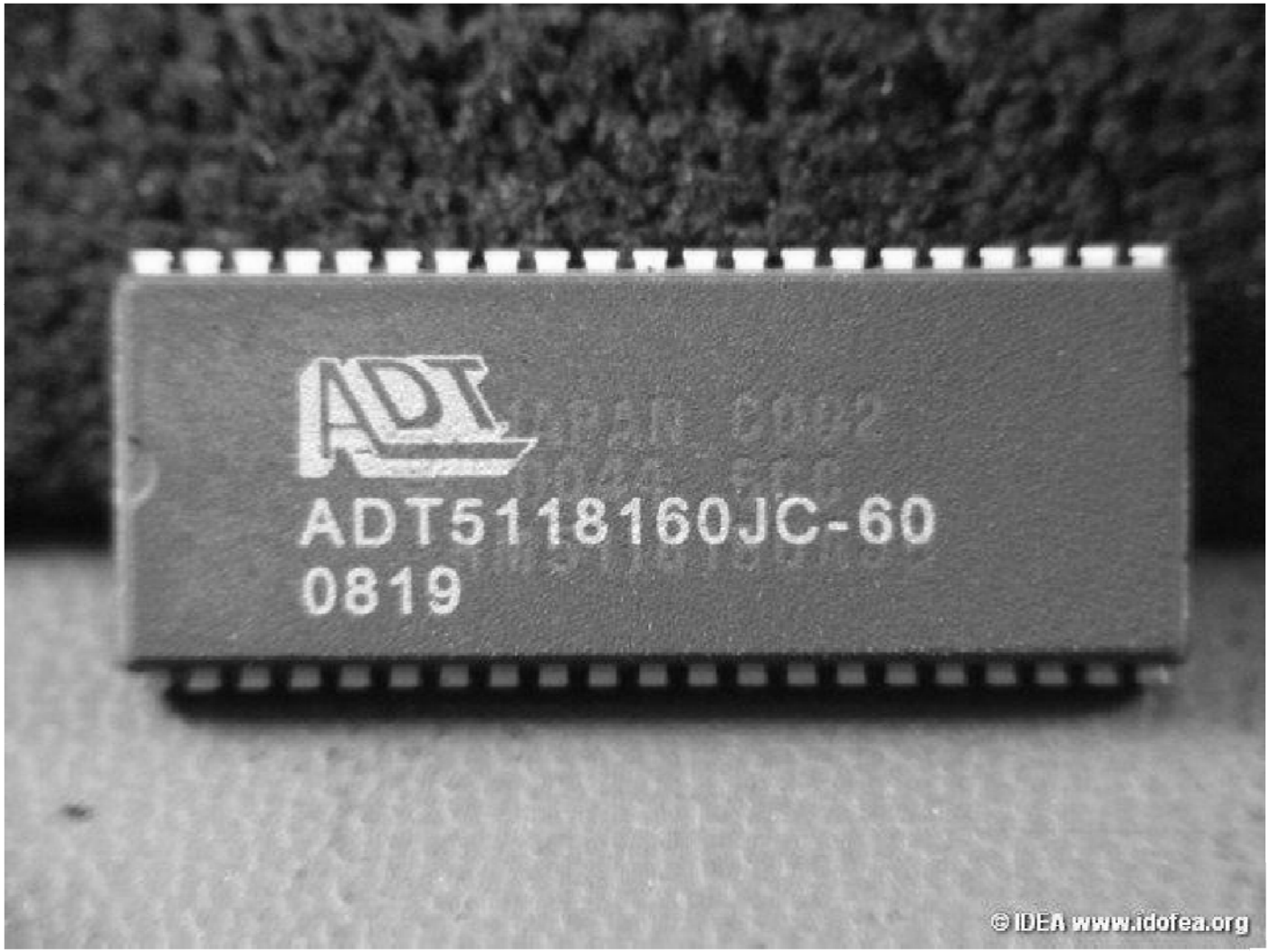
Is Counterfeiting Really a Problem?

- Is it a 6800uF or 2200uF capacitor?

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

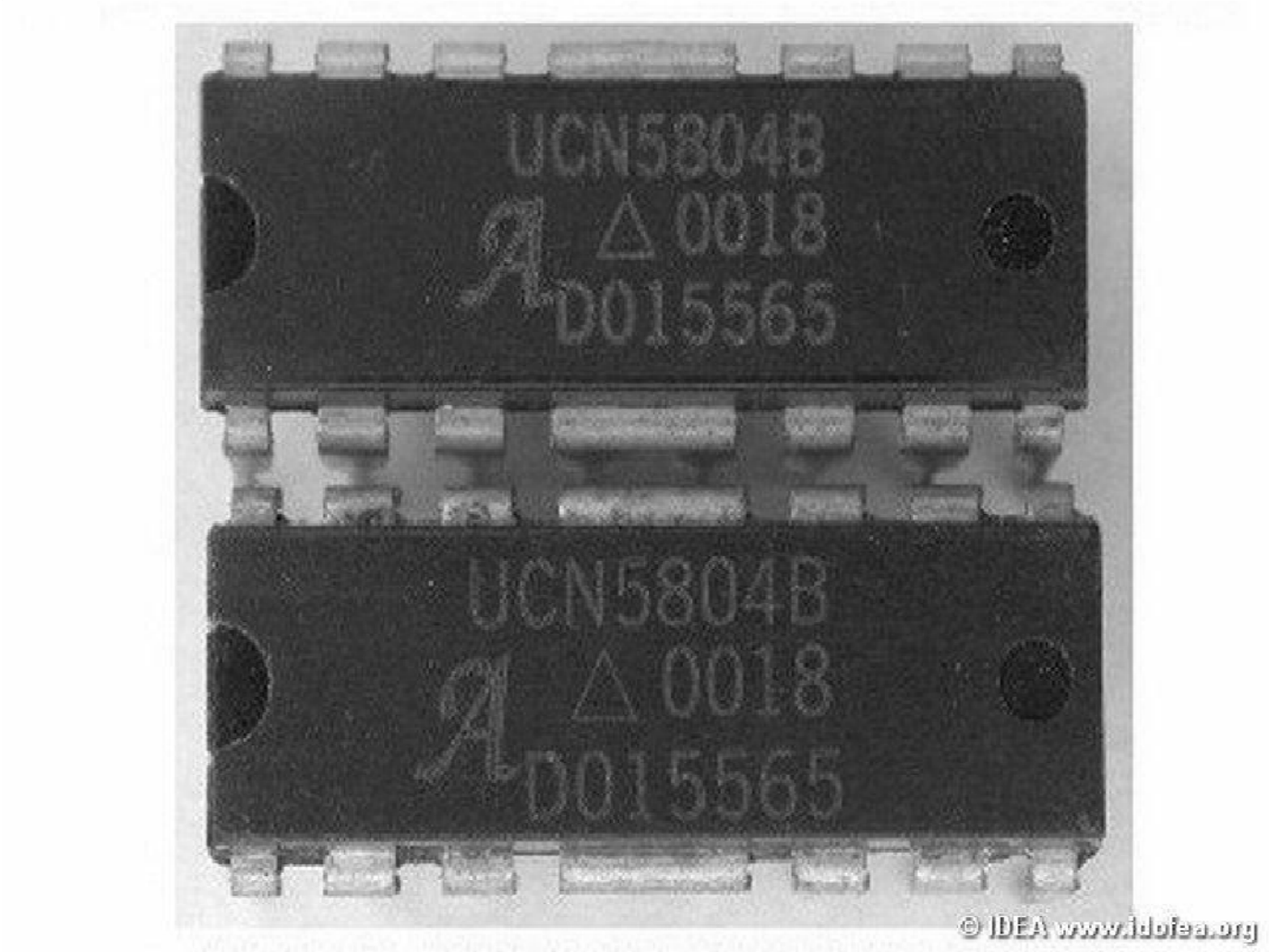
Is Counterfeiting Really a Problem?

- Ghost markings



Is Counterfeiting Really a Problem?

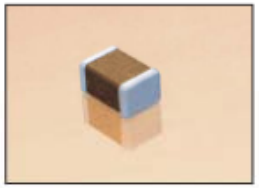
- Marking differences



Supporting Resources

X5R Dielectric

General Specifications



GENERAL DESCRIPTION

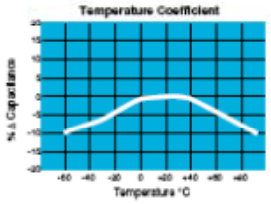
- General Purpose Dielectric for Ceramic Capacitors
- EIA Class II Dielectric
- Temperature variation of capacitance is within ±15% from -55°C to +85°C
- Well suited for decoupling and filtering applications
- Available in High Capacitance values (up to 100µF)

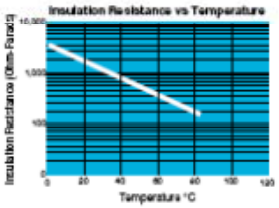
PART NUMBER (see page 2 for complete part number explanation)

1210	4	D	107	M	A	T	2	A
Size (L" x W")	Voltage 4 = 4V 6 = 6.3V Z = 10V Y = 16V 3 = 25V D = 35V 5 = 50V	Dielectric D = X5R	Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros	Capacitance Tolerance K = ±10% M = ±20%	Failure Rate A = NA	Terminations T = Plated Ni and Sn	Packaging 2 = 7" Reel 4 = 13" Reel 7 = Bulk Cass. 9 = Bulk	Special Code A = Std.

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers. Contact factory for non-specified capacitance values.

TYPICAL ELECTRICAL CHARACTERISTICS

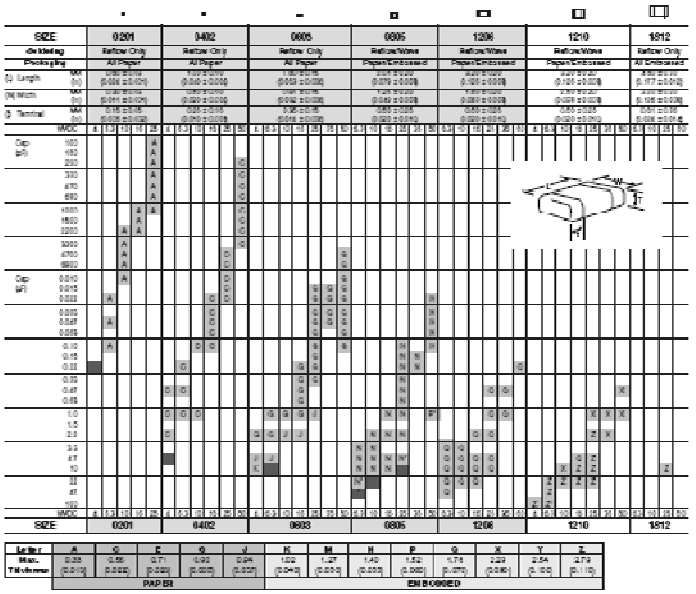




X5R Dielectric

Capacitance Range

PREFERRED SIZES ARE SHADED



= Under Development

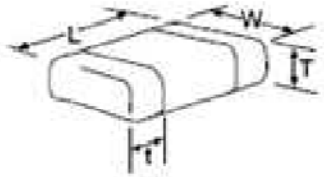
*Optional Specifications – Contact factory

NOTE: Contact factory for non-specified capacitance values

Supporting Resources

- OCMs component specification datasheet
  - Shall be used when performing inspection of components
  - Available
    - Free online at the OCM's website
    - Some through subscription services
  - Some datasheets are proprietary

SIZE		0201	0402	0603	0805	1206	1210	1812
Soldering		Reflow Only	Reflow Only	Reflow Only	Reflow/Wave	Reflow/Wave	Reflow/Wave	Reflow Only
Packaging		All Paper	All Paper	All Paper	Paper/Embossed	Paper/Embossed	Paper/Embossed	All Embossed
(L) Length	MM	0.60 ± 0.03	1.00 ± 0.10	1.60 ± 0.15	2.01 ± 0.20	3.20 ± 0.20	3.20 ± 0.20	4.50 ± 0.30
	(in.)	(0.024 ± 0.001)	(0.040 ± 0.004)	(0.063 ± 0.006)	(0.079 ± 0.008)	(0.126 ± 0.008)	(0.126 ± 0.008)	(0.177 ± 0.012)
(W) Width	MM	0.30 ± 0.03	0.50 ± 0.10	0.81 ± 0.15	1.25 ± 0.20	1.60 ± 0.20	2.50 ± 0.20	3.20 ± 0.20
	(in.)	(0.011 ± 0.001)	(0.020 ± 0.004)	(0.032 ± 0.006)	(0.049 ± 0.008)	(0.063 ± 0.008)	(0.098 ± 0.008)	(0.126 ± 0.008)
(t) Terminal	MM	0.15 ± 0.05	0.25 ± 0.15	0.35 ± 0.15	0.50 ± 0.25	0.50 ± 0.25	0.50 ± 0.25	0.61 ± 0.36
	(in.)	(0.006 ± 0.002)	(0.010 ± 0.006)	(0.014 ± 0.006)	(0.020 ± 0.010)	(0.020 ± 0.010)	(0.020 ± 0.010)	(0.024 ± 0.014)
	WVDC	4 6.3 10 16 25	4 6.3 10 16 25 50	4 6.3 10 16 25 35 50	6.3 10 16 25 35 50	6.3 10 16 25 35 50	4 6.3 10 16 25 35 50	6.3 10 25 50
Cap (pF)	100	A A A						
	150	A A A						
	220	A A A	C					
	330	A A A	C C					
	470	A A A	C C					
	680	A A A	C C					
	1000	A A	C C					
	1500	A A	C C					
	2200	A A	C C					
	3300	A	C					

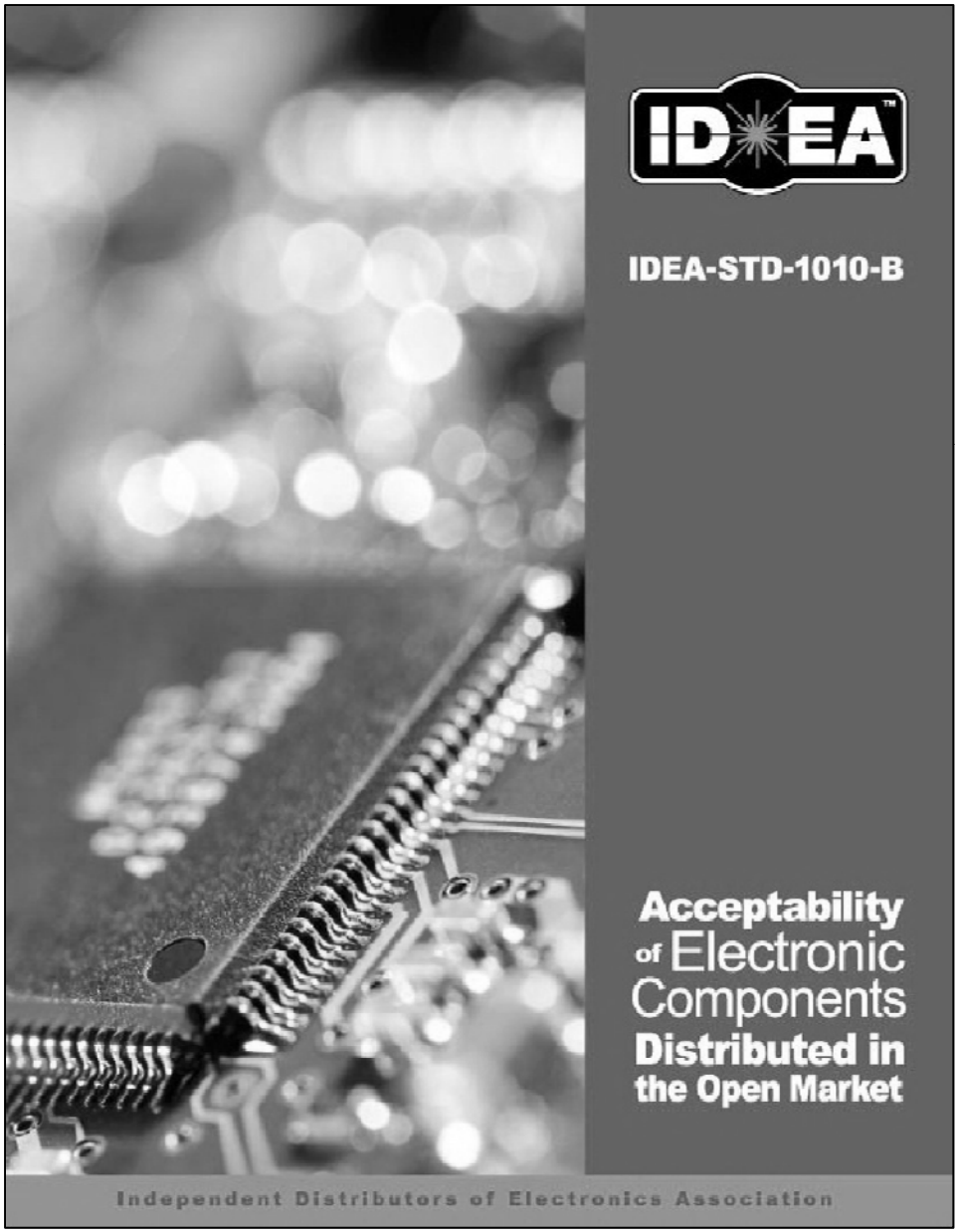


IDEA-STD-1010 Standard

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

1 THE PRINCIPLES OF STANDARDIZATION 1
2 IDEA'S STANDARD DEVELOPMENT PROCESS 1
2.1 Standard Development Principles 1
2.2 Notice 3
2.3 Why is there a charge for this Standard? 3
2.4 IDEA-STD-1010 Adoption 4
3 ACKNOWLEDGEMENTS 5
4 SPECIAL ACKNOWLEDGEMENTS 5
5 FOREWORD 6
5.1 About IDEA 6
5.2 About This Standard 6
5.3 The Format for This Standard 7
5.4 Scope 7
5.5 Introduction 7
5.6 Purpose 7
5.7 Specialized Characteristics 7
5.8 Background 8
5.8.1 Substandard 8
5.8.2 Fraud 8
5.8.3 Counterfeiting 8
5.8.4 Using the Term "Counterfeit" 8
5.8.5 Confusing Terms 9
5.9 Terms and Definitions 9

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.

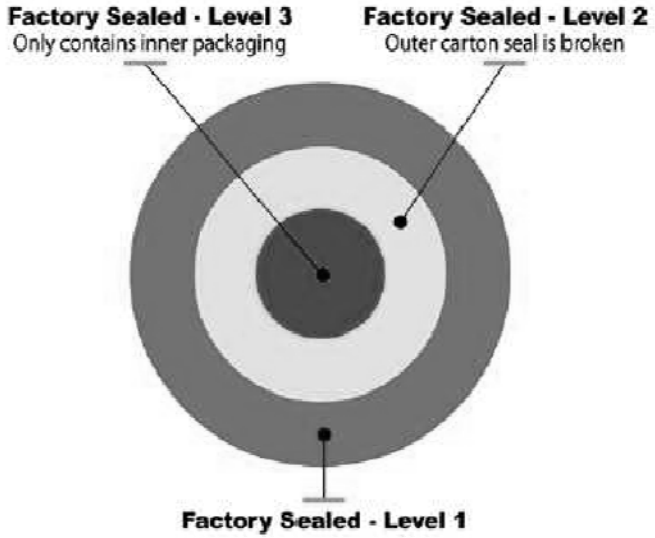
B. It is also important to note that in cases where full factory sealed packaging (see Section 5, Terms and Definitions) is required or received, if direct traceability to the OCM is unavailable, then that seal has to be deemed as unverified. If an unverified, sealed carton is not opened for further 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

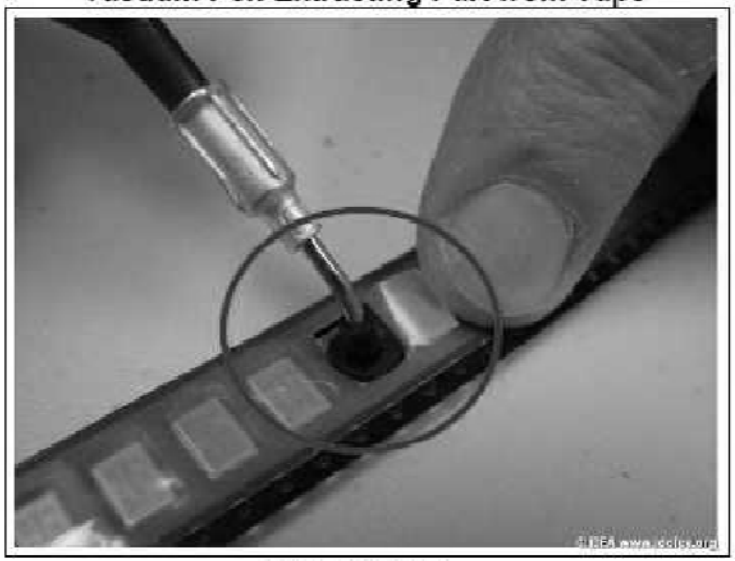


Figure 10-11

Correct Application of ESD Safe Tape

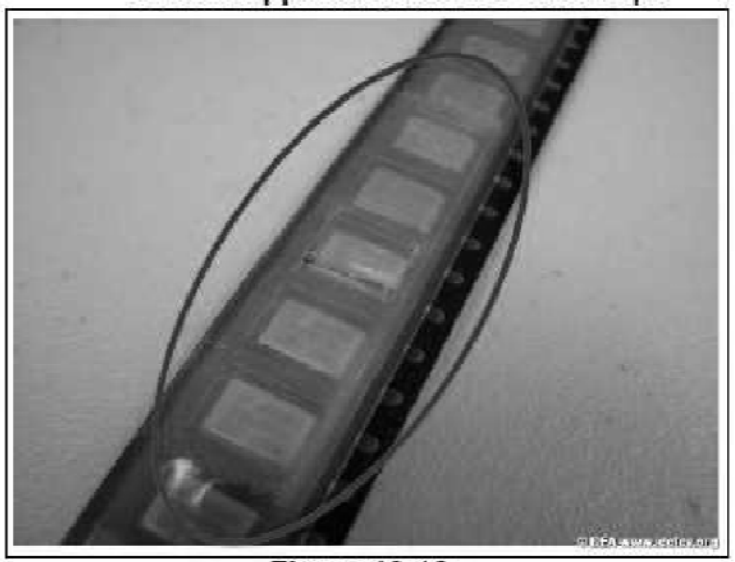
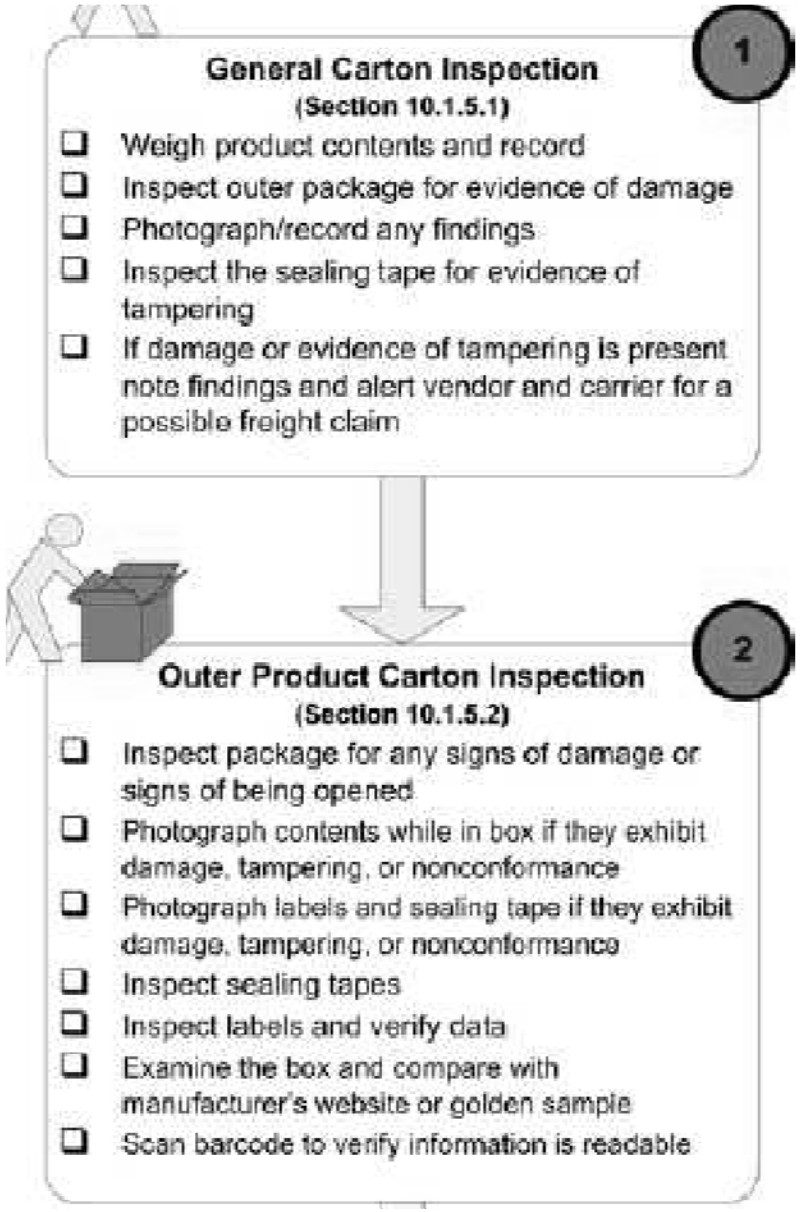


Figure 10-12

IDEA-STD-1010 Standard

- Receiving Inspection process format



Impacts of Counterfeiting

POST 2002

"Something's Wrong!"

Singapope?


SGS-THOMSON
MICROELECTRONICS
ASSEMBLED IN SINGAPOPE
TYPE M27C4001-12F1
240
DATECODE P880K02428
MARKING M27C4001-12F1
TBB301 YA0250F
QC
ACCEPTED
© 2009 IDFA www.idofea.org

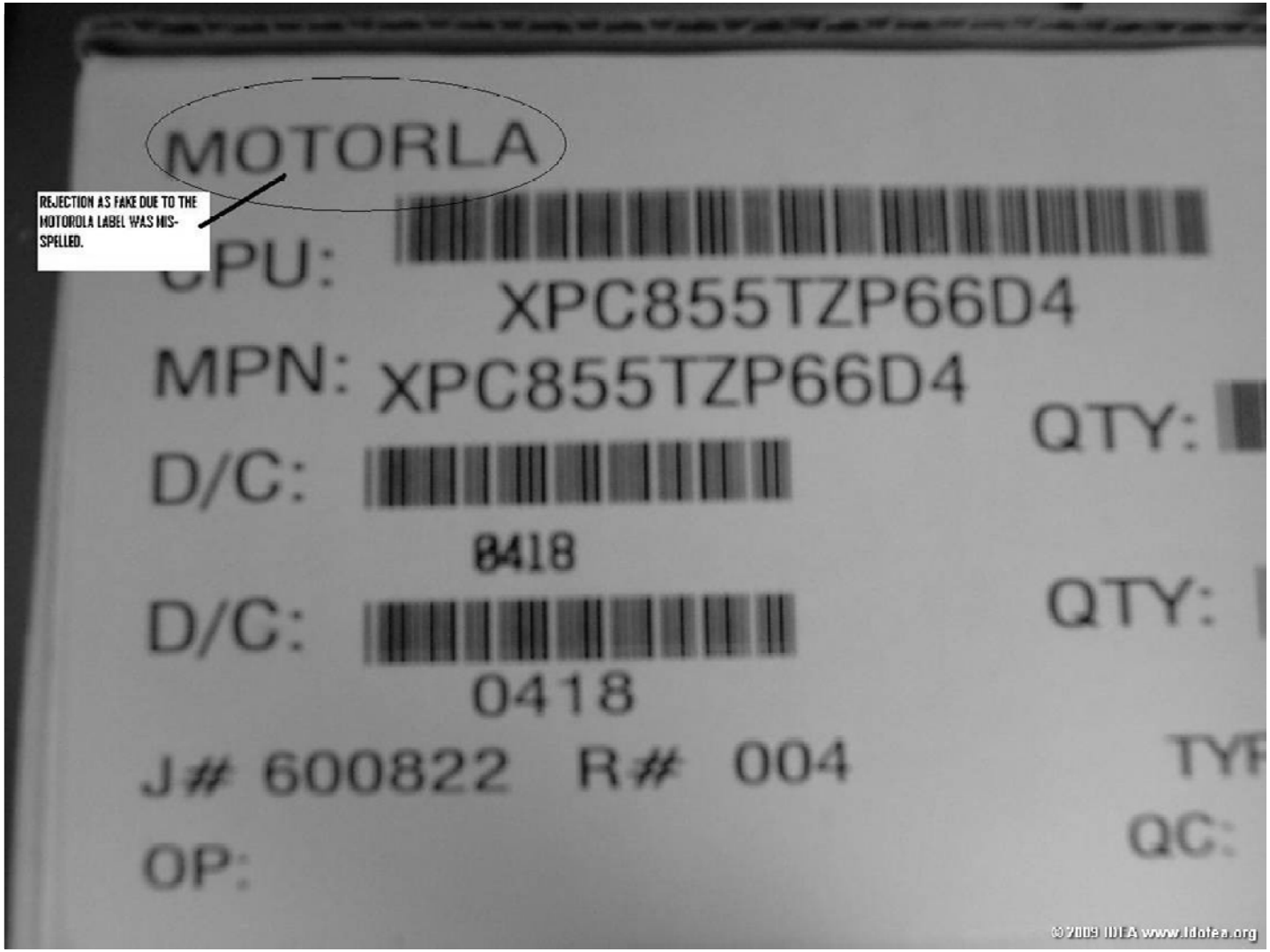
Wrong Spelling, Layout, Format

FAKE LABEL

REFERENCE LABEL

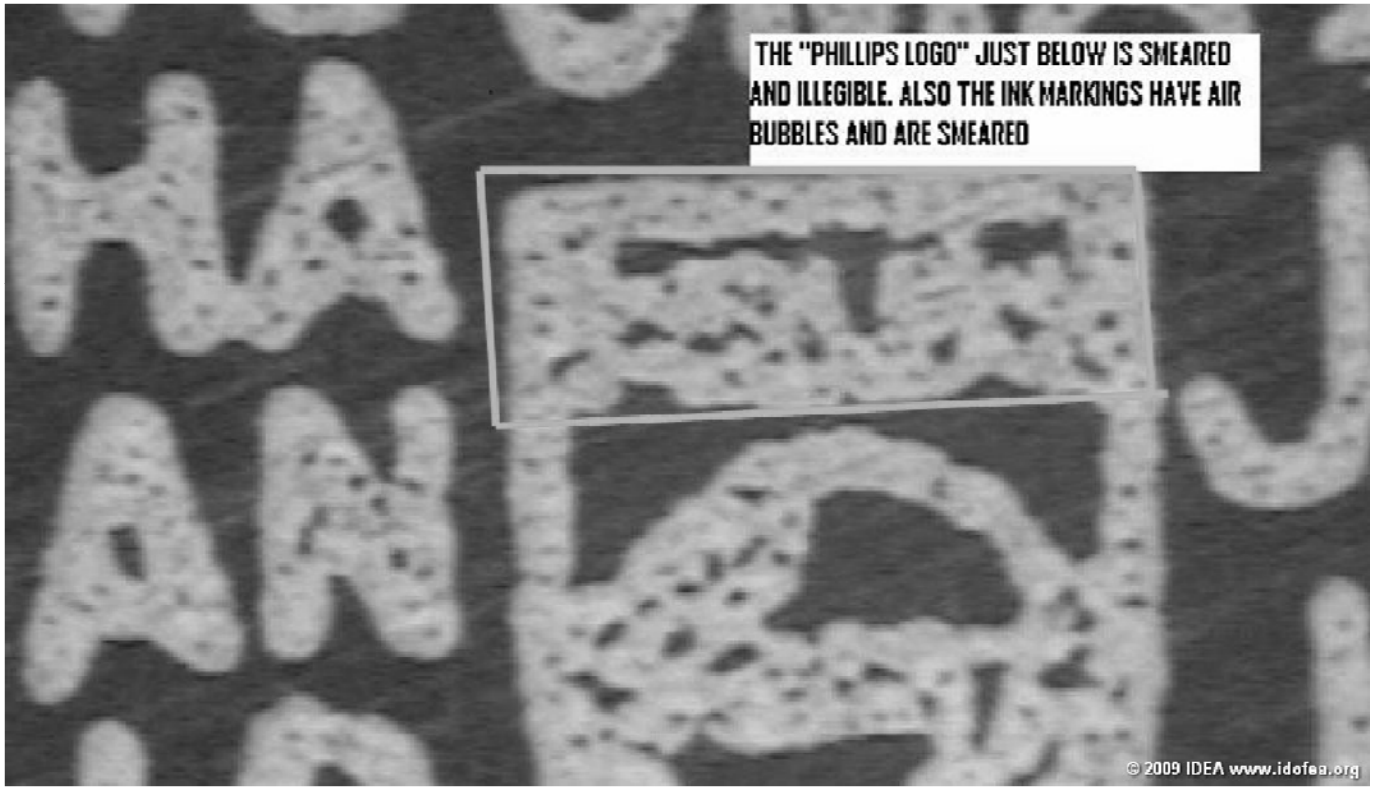
Suspect Label

Claimed “Direct from OEM”



Watch for multiple labels. This box had four layers.

Verify Logo

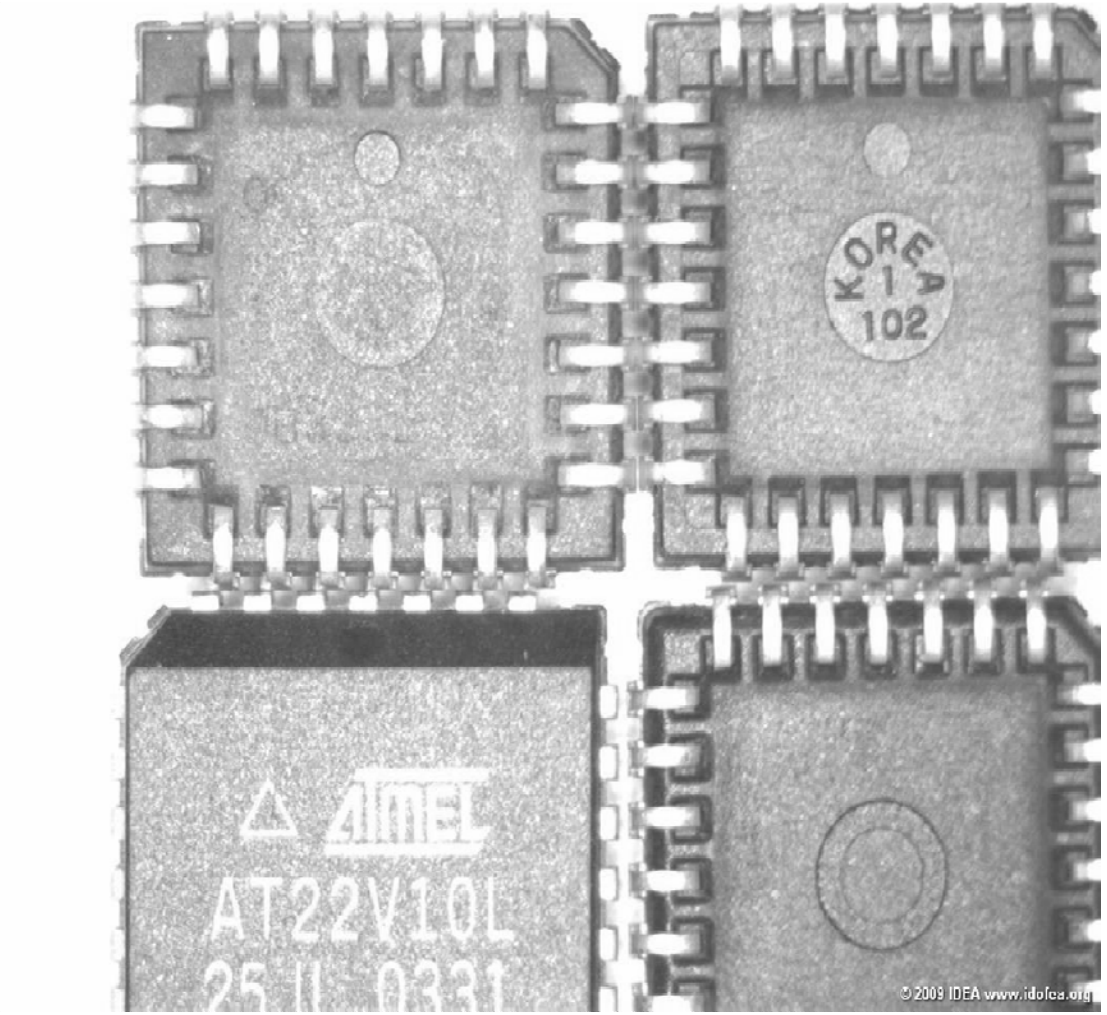


THE “PHILLIPS LOGO” CHANGED TO SQUIGGLY LINES

Counterfeit Examples

- Same Receipt
- Part number
- Date code
- Lot code

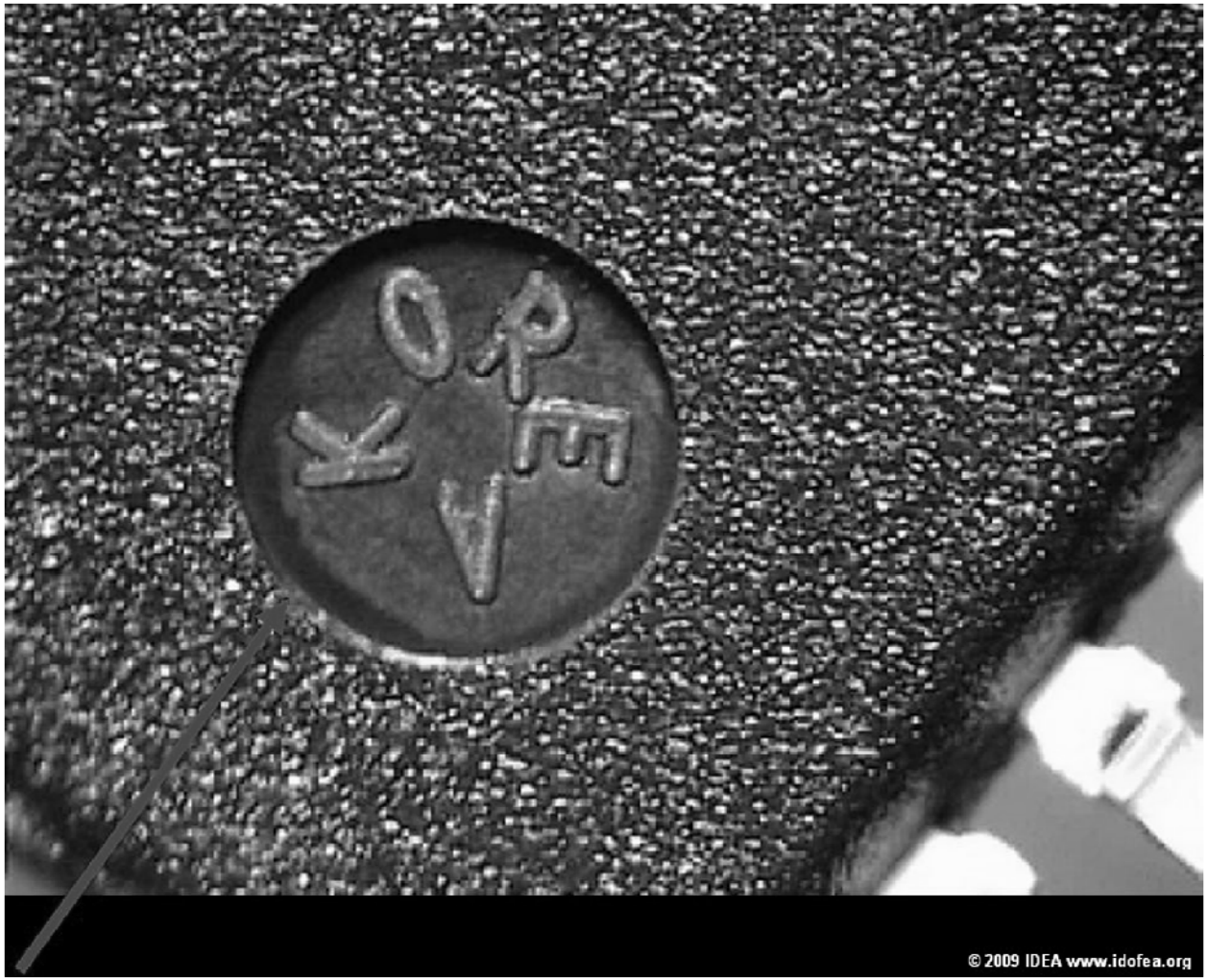
- Three different mold styles



Counterfeit Examples

Counterfeit Examples

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



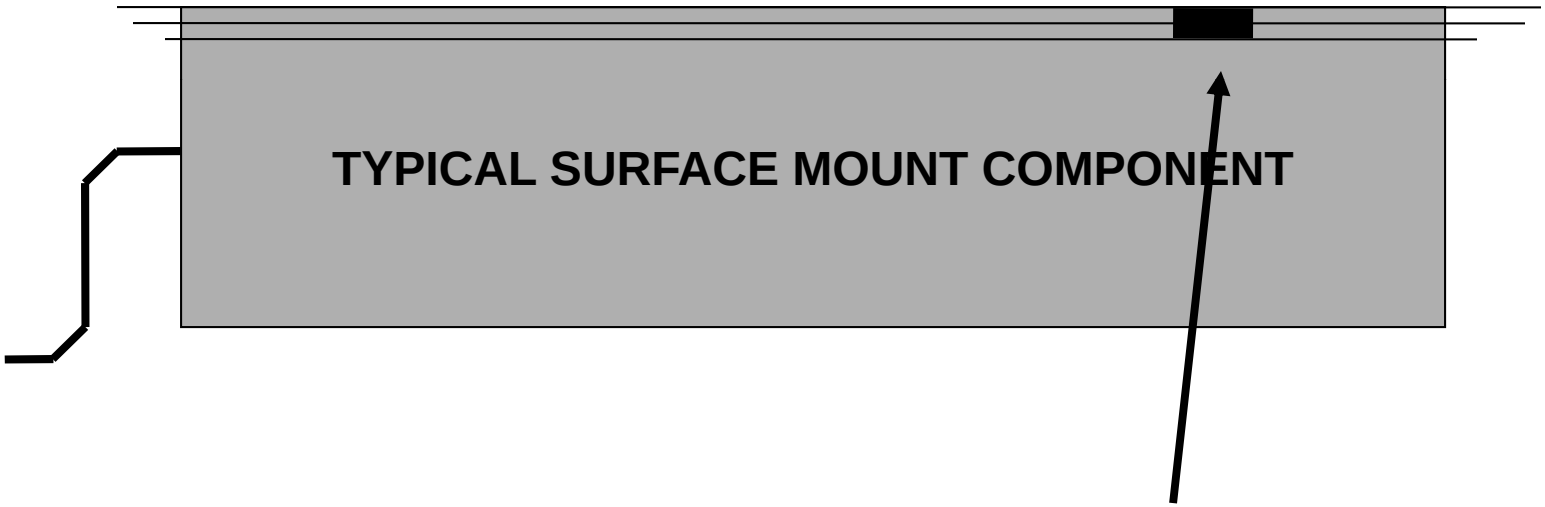
Counterfeit Examples

- 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

E-Waste

- Parts washed in the river

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

Inspection Processes

- Receiving Inspection – Traditional Market
  - OCM and Franchised Sourcing
    - Typically require relatively short and simple inspection
    - "Chain of custody", and the quality controls are virtually known 100%
    - Verification of
      - Purchase order number
      - Part number
      - Date codes
      - Delivery date
      - Quantity
      - Packaging type

Inspection Processes

- Receiving Inspection – Open Market

  - ID Sourcing
    - Warrants an increased critical and intensive visual inspection
    - C of C and quality controls of the parts are largely unknown or unverifiable
    - Open Market visual inspection has developed and evolved to a discipline of highly specialized expertise
    - Requires inspection of the parts and packaging materials
    - Destructive and forensic testing may be required
    - Note: Destructive and forensic testing is beyond the scope of the IDEA-STD-1010 standard

Receiving Processes

- Packaging and Shipping Inspection
  - Damage to shipping boxes
    - Perforation– Debris, product shock, deformation
    - Foreign Substance – Water, petroleum, acid, alkaline, paint, ink
  - Check for evidence of tampering
    - Factory sealed?
    - Sealed multiple times?
  - Authentic logos and OCM markings?
    - Other symbols of authenticity
  - Validate ESD and MSD packaging materials
    - Or reject them


http://www.kingsolutionsusa.com/Services/?P=5

Receiving Processes

- Packaging and Shipping Inspection
  - Inspect the packaging
    - (Packaging = The manner in which electronic components are packaged in preparation for use by electronic assemblers. This includes but is not limited to…
    - Trays – Bent or warped
    - Tubes – Cut, excessive internal scuff and scratches
    - Sponges – Contamination of any kind; non-ESD
    - Consistent with OCM – paper or plastic, color?
    - Bags – ESD compliant and consistent with type the OCM uses
    - Missing parts?
    - Orientation per OCM data sheet?
    - Jewel Cases/Boxes – Cracked case, hinges or locking tabs

Receiving Processes

- Packaging and Shipping Inspection
  - Inspect the packaging
    - OCMs or 3rd party reels?
    - Reels
      - Warped
      - Bent (excessive vacuum)
      - Cracked
      - Broken
      - Inconsistent color or size
    - Tape
      - Broken
    - Sprocket holes
      - Open
      - Deformed
      - Crushed
      - Repaired
      - “Broke out”
    - Pockets
      - Skipped
      - Stretched
      - Repaired
    - Leader or tail damage?
    - Tape cover – twisted, failing?
    - Using a reel counter
      - All parts orientated the same?
      - Same markings, color, font, intensity, clarity consistent with OCM?

Receiving Processes

- Packaging and Shipping Inspection
  - Verify part numbers and quantities
    - Pin count, and package style
  - Validate RoHS status
  - For MSDs labels (2)
    - Expiration date of shelf life
    - Read the HIC and record
  - Weigh contents and record
  - Photograph contents in and out of the box
    - Evidence of spilled contents - photograph and document
    - Scan or photograph label for database

Receiving Processes

- Packaging and Shipping Inspection
  - Verify country of origin
    - Multiple countries of origin for identical date codes/lot codes
  - Inspect for any signs of rework
    - Body
    - Leads
    - or Remarking
  - Acquire OCM datasheet
  - Utilize GIDEP, ERAI and other resources

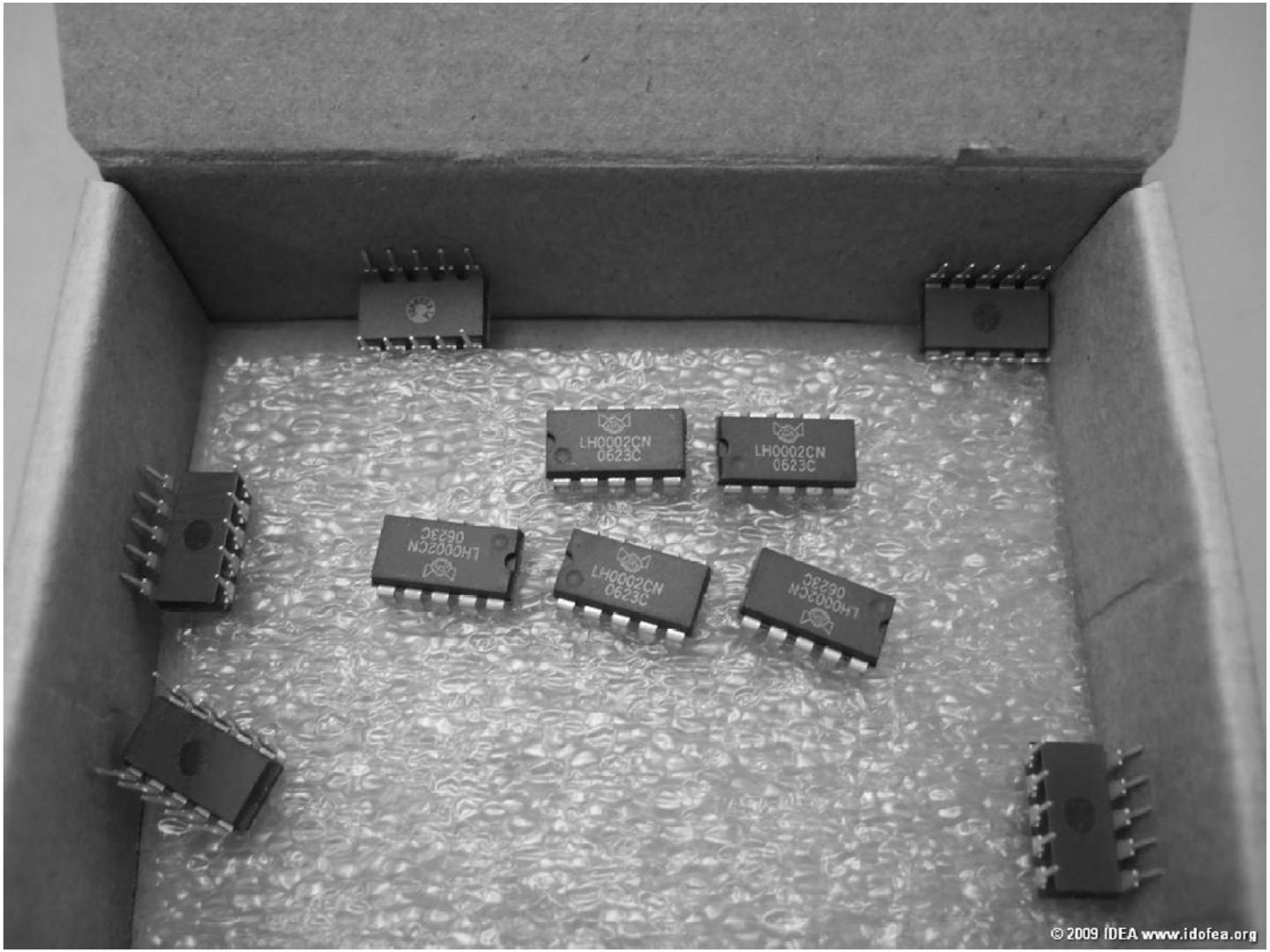
Receiving Processes

- Defects: ESD, MSD, and unsecured

Receiving Processes

- Improper Packaging: incorrect tray size

Receiving Processes

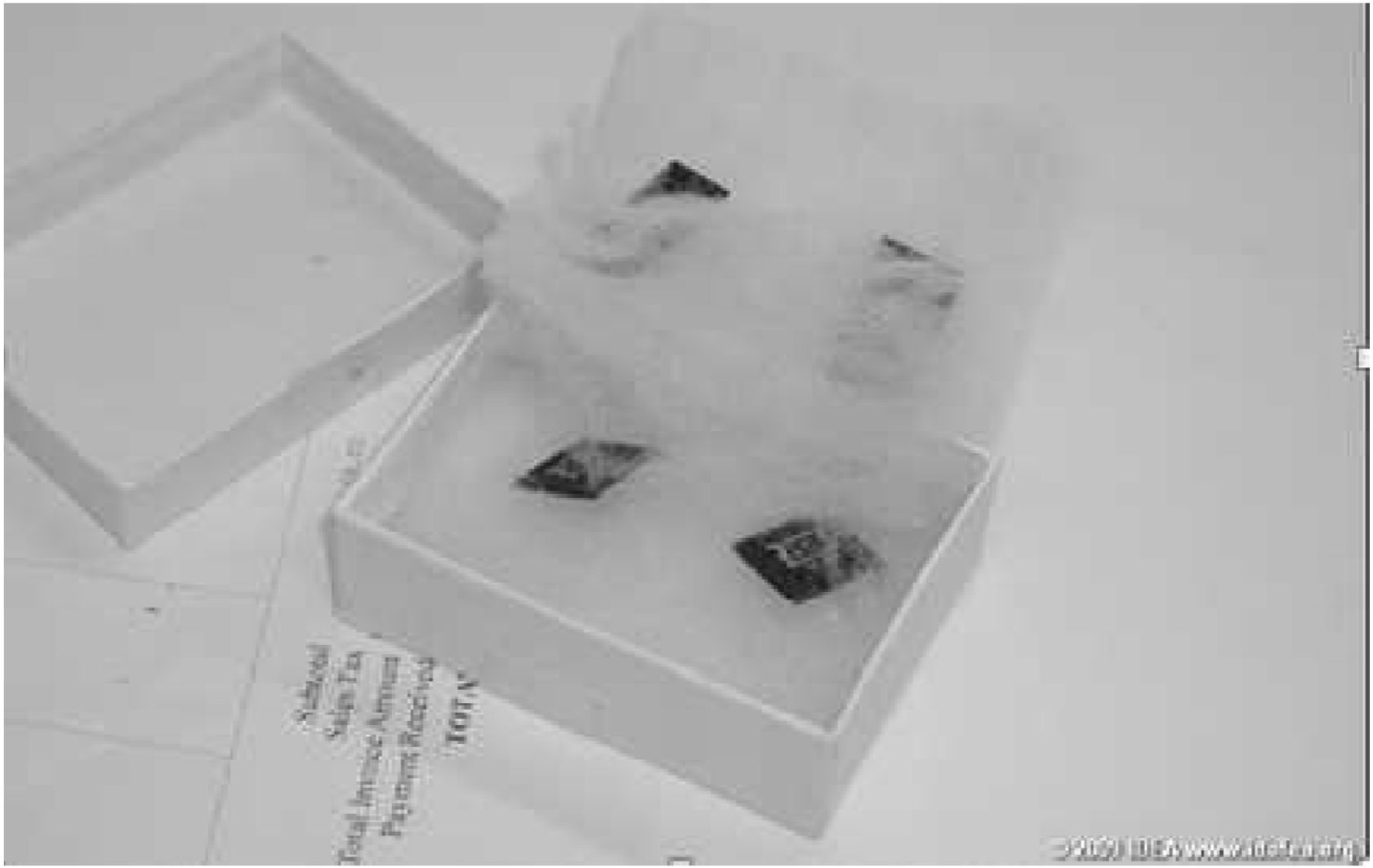


- Improper Packaging

Receiving Processes

- Improper Packaging

Receiving Processes



- Improper Packaging

Receiving Processes

- Unsecured trays

Receiving Processes

- Secured with masking tape

Receiving Processes

- Claimed to be “Direct from the OCM”

Receiving Processes

- Suspect Product

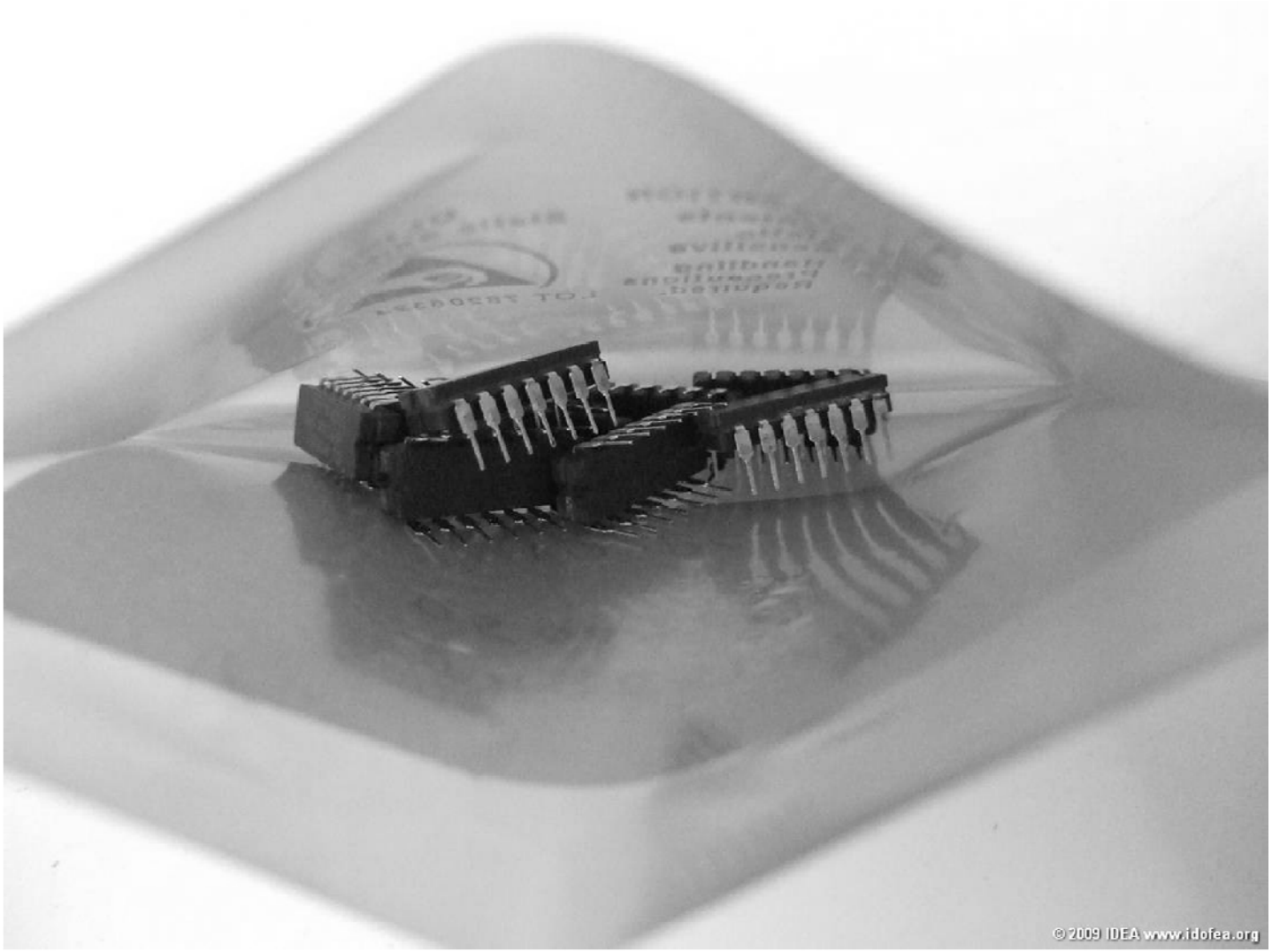
Receiving Processes

- Improper Packaging

Receiving Processes

- "Parts on floor" – Broker cart

Receiving Processes



- Improper Packaging

Receiving Processes

- Improper Packaging

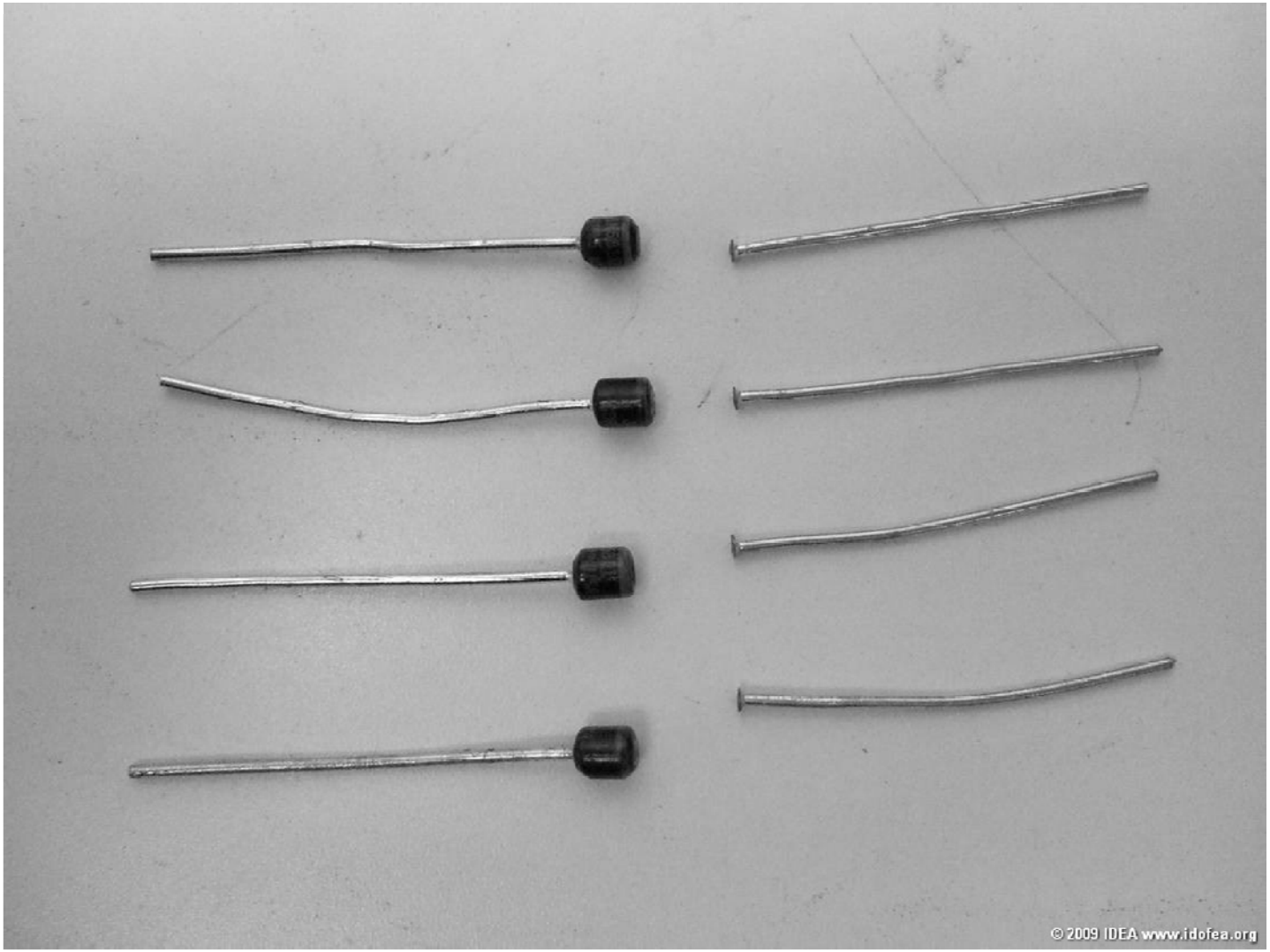
Receiving Processes

- Improper Packaging

Receiving Processes

- Improper Packaging

Receiving Processes



- Result of improper packaging

Receiving Processes

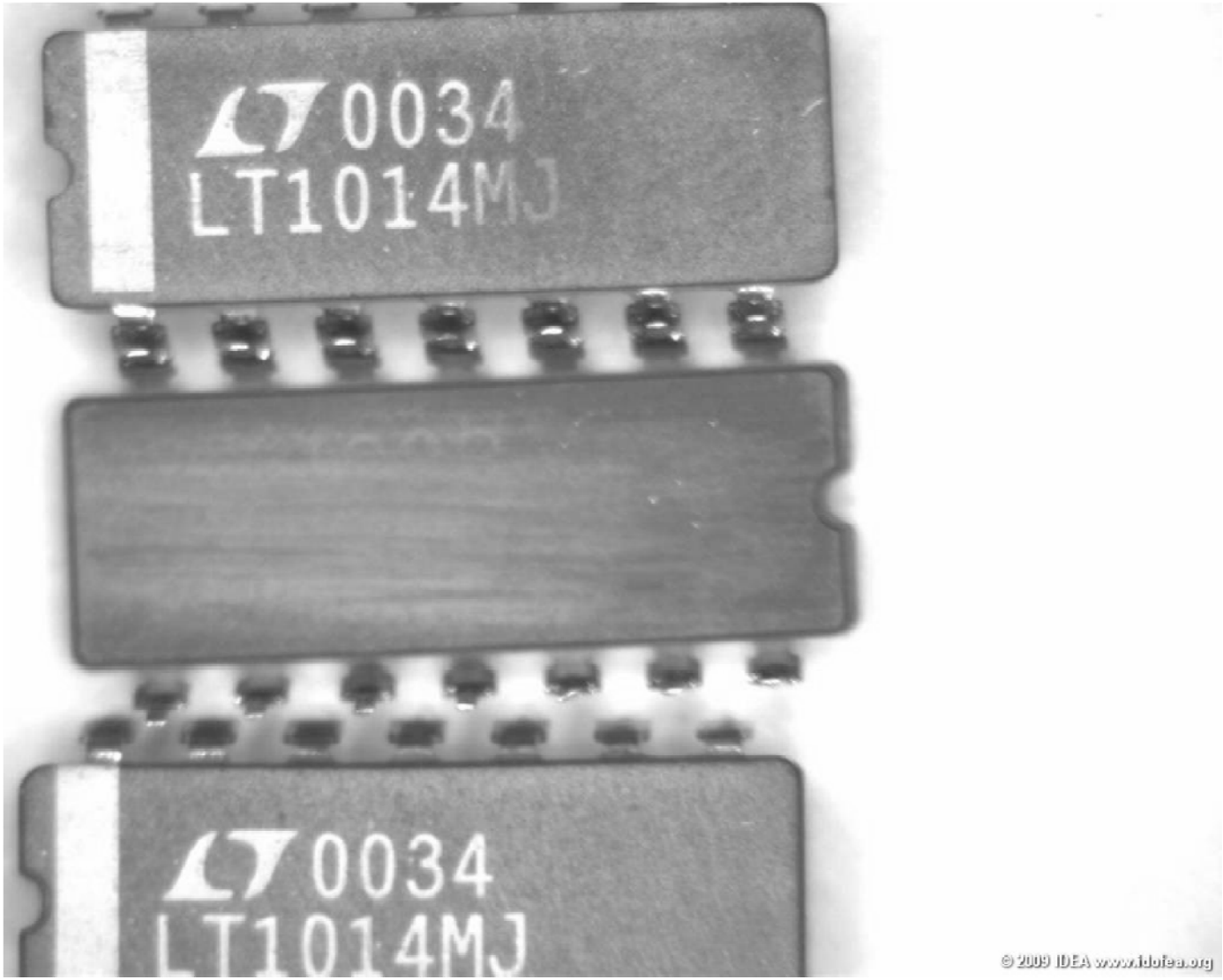
- Non-OCM packaging and reel type

Magnification Inspection

- Demo
- A little bit about microscopes
- Why we are using the scope we are today
- Lighting

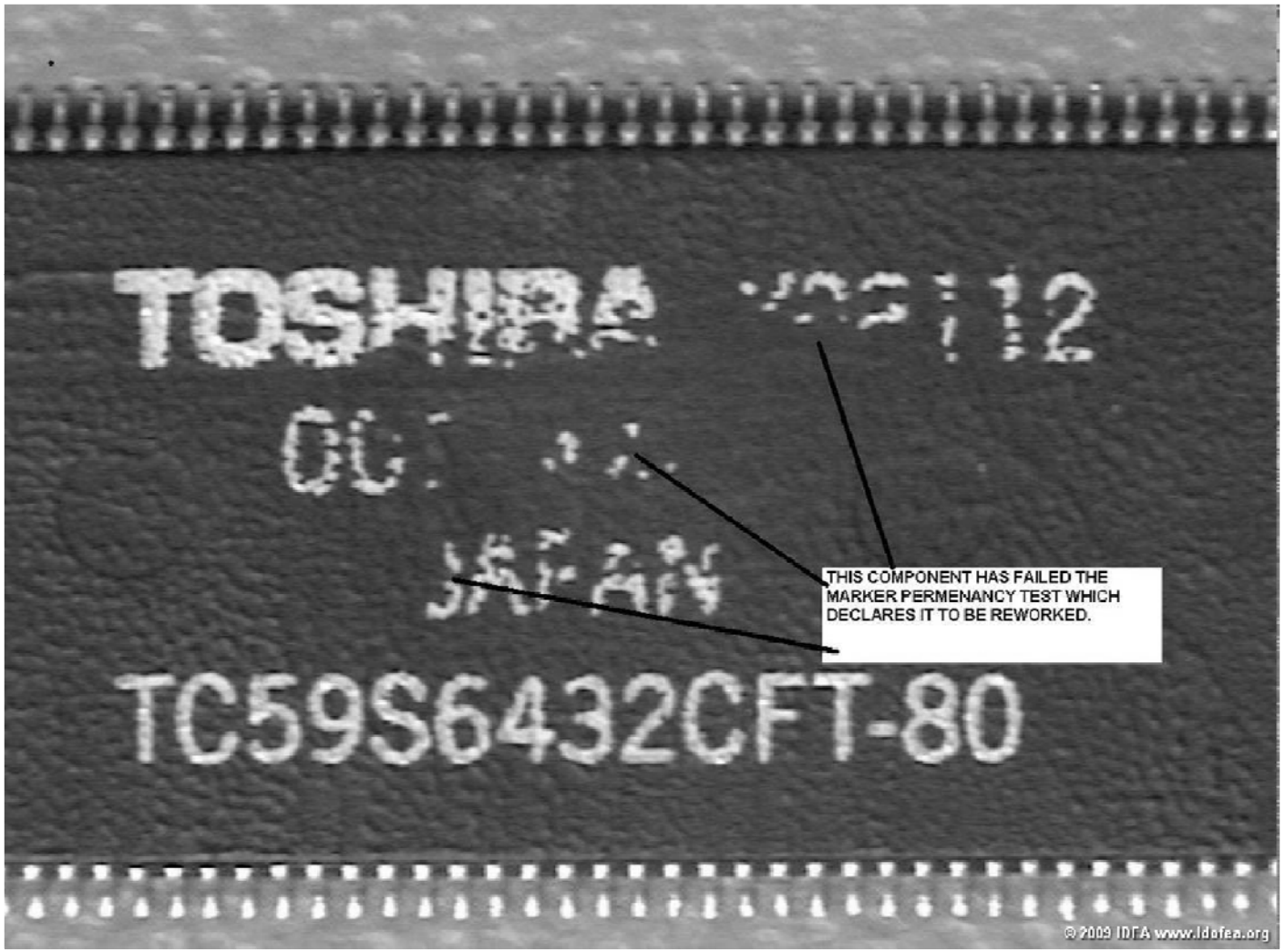
Receiving Process

- Results of the Marking Test



Receiving Process

- Results of the Device Marking Test



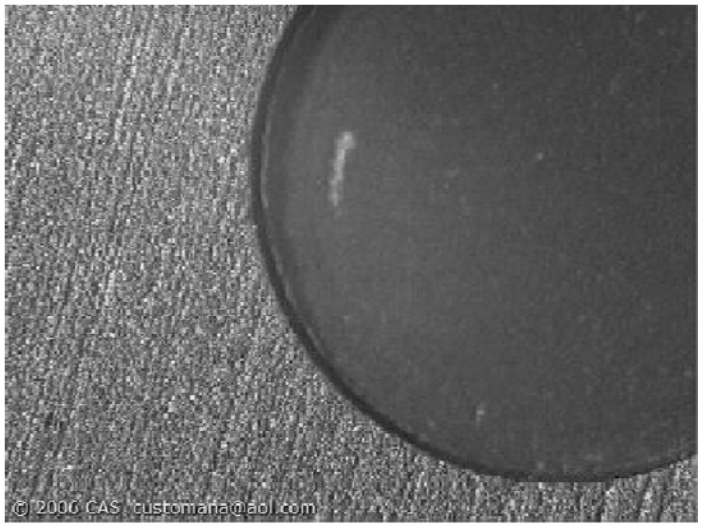
Receiving Process

- 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

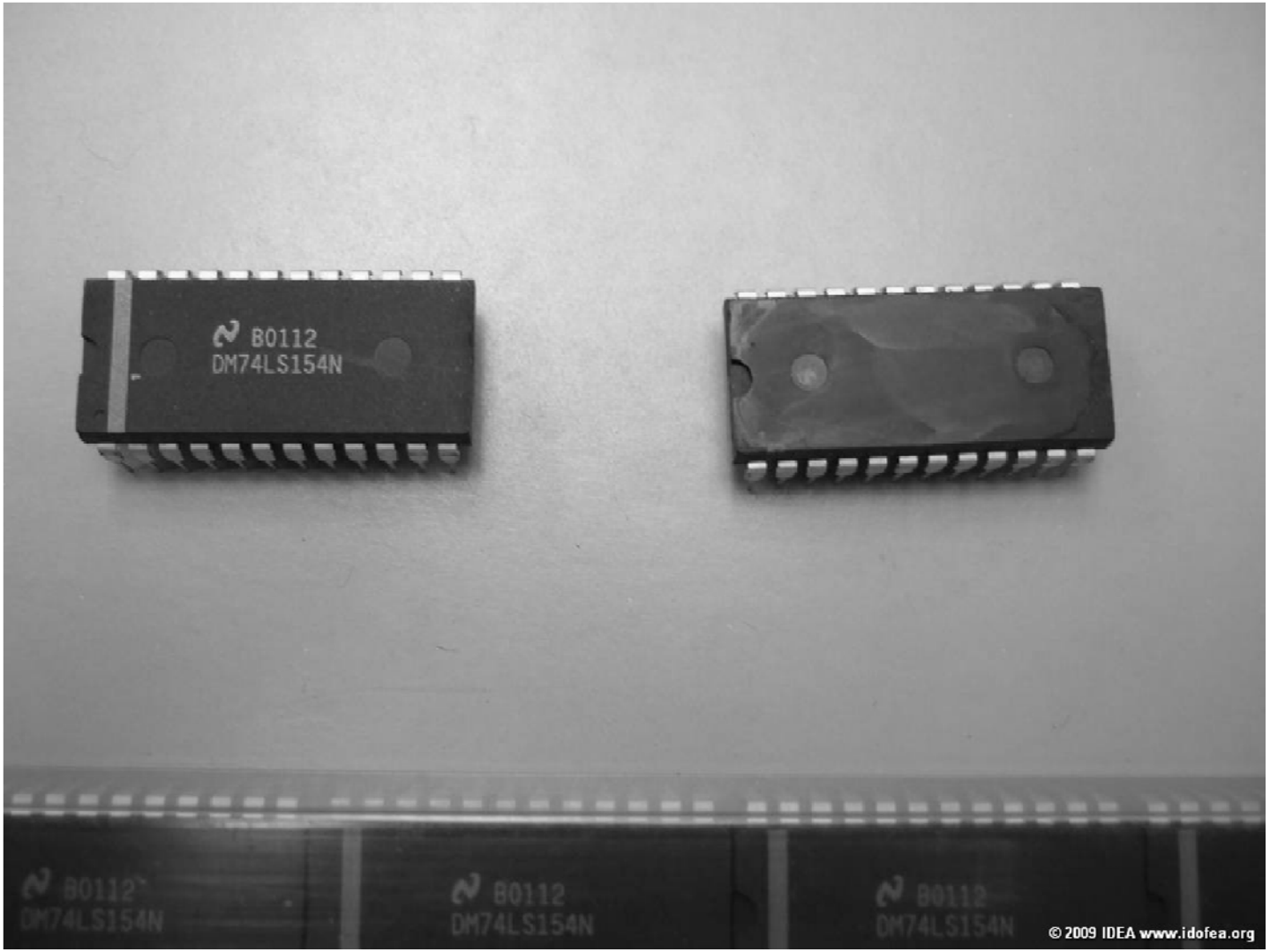


Receiving Process

- Results of a failed Device Surface Test

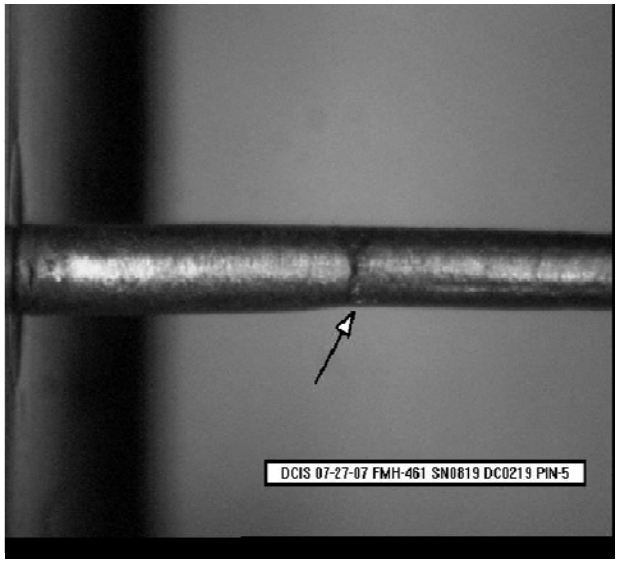
Receiving Process

- Results of a failed Device Surface Test



Receiving Process

- Inspection with magnification
  - Leads
    - Bent
    - Broken
    - Missing
    - Tooling marks (inside or outside)
      - Indicating previous use or mishandling
    - Pull, scratch or witness marks
      - Used in a socket
    - Gloss/shine/texture
      - Too shiny for an older date code
    - Oxidized
    - Discolored (burns)
    - Corrosion
    - Re-tinning
      - Excessive solder
    - Contamination



Receiving Process

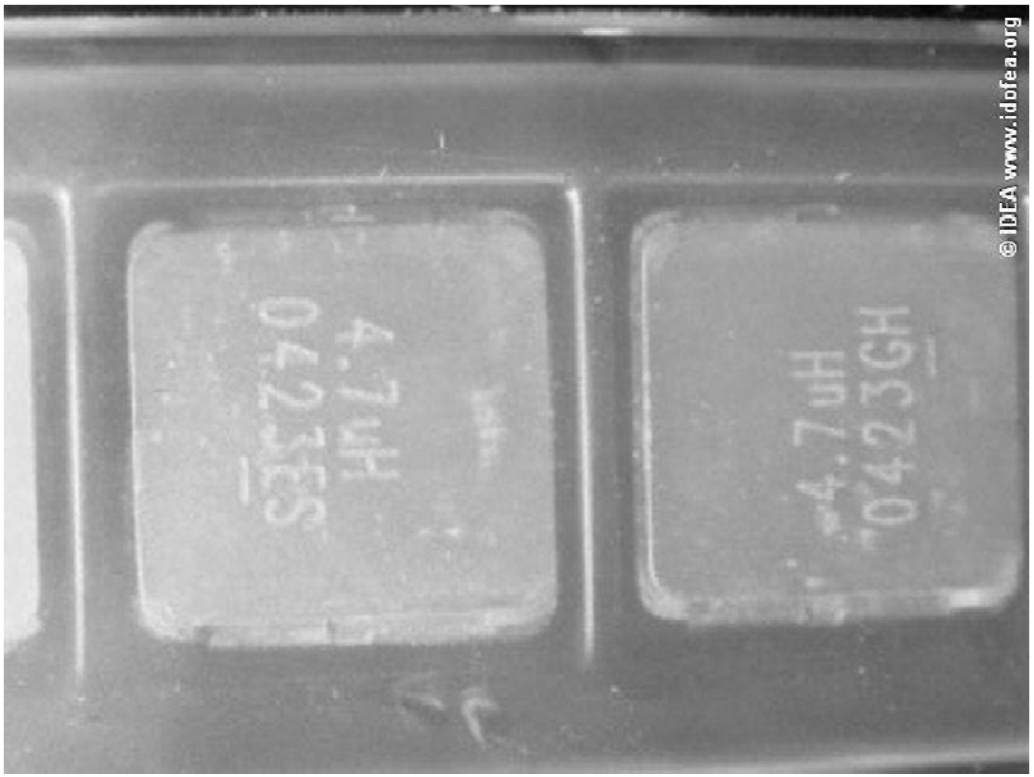
- Inspection with magnification
  - Traces of glue or adhesive
  - Burns
  - Surface cracks
  - Directional scratches (abrasions)
    - Typically on the top of the parts
  - Part Markings
    - No colored dots or ink marks
      - Indicates previous programming
      - Testing
    - Consistent, top and bottom
      - Easily missed for tape and reel components
    - Clear and concise (not blurred)
    - Same font, print color and marking placement
    - Conform to the norm for the OCM
    - Validate parts within the same tube/reel/package
      - Consistent date codes, lot codes/numbers

Receiving Process

- Inspection with magnification
  - No stickers or adhesive residue
  - Underlying etching on the part package (ghost markings)
  - Oriented correctly and consistently in the packaging
  - From the OCMs datasheet:
    - Number of leads
    - Part dimensions
    - Part weight, if applicable
- Photograph all
  - Packing
  - Packaging
  - Markings
  - Nonconformances

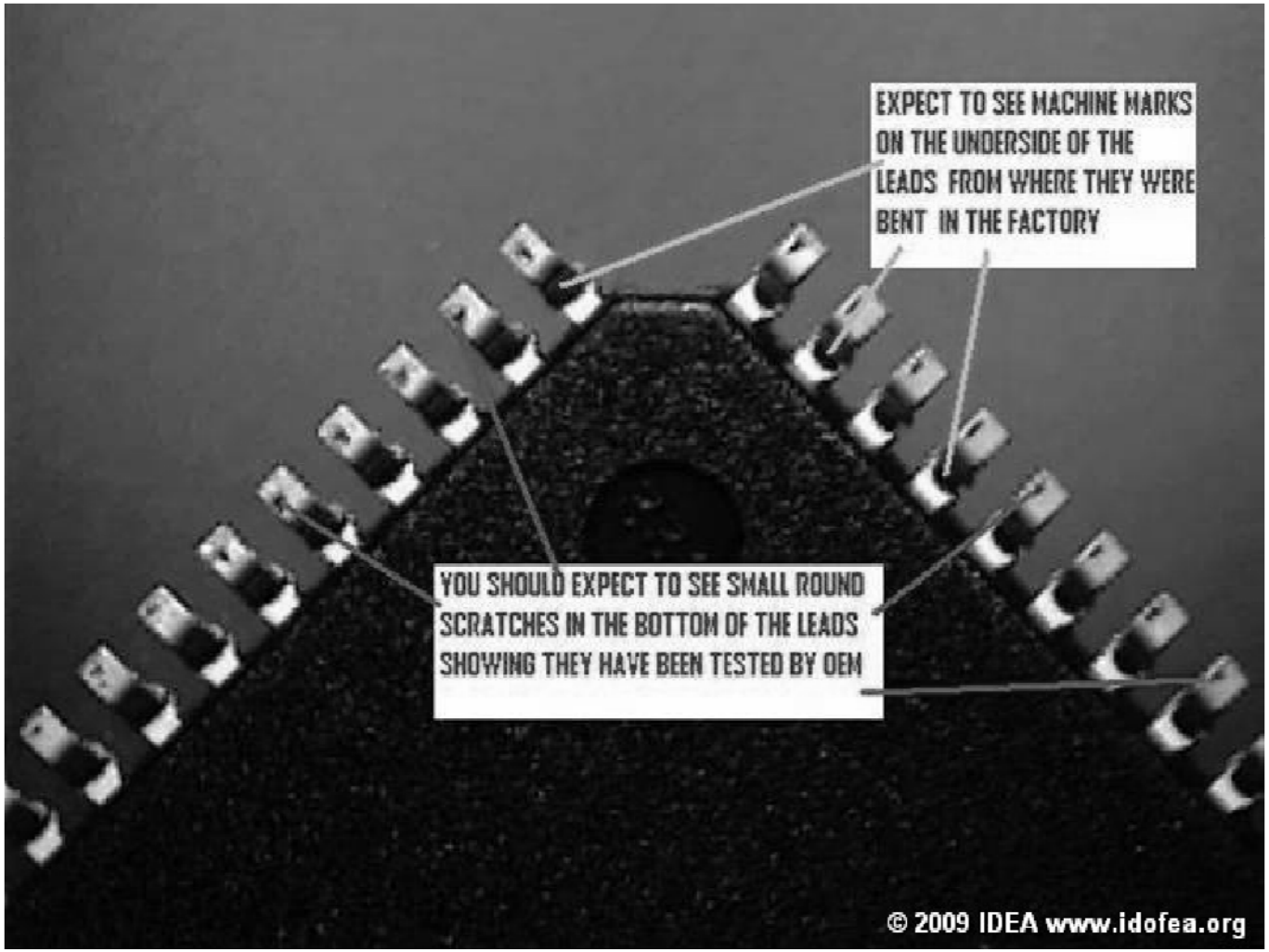
Receiving Processes

- Incorrect orientation

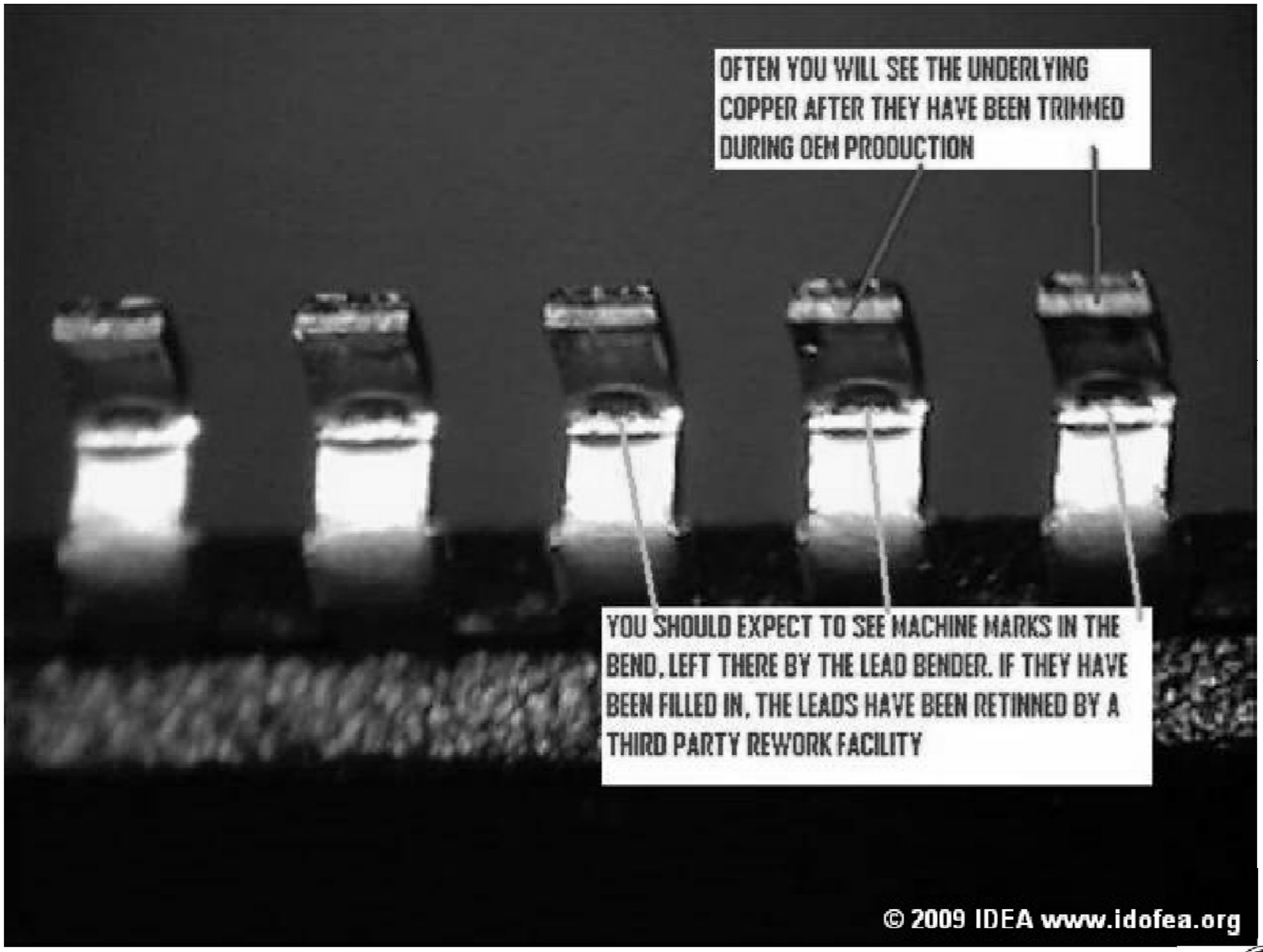


Receiving Process

- Example of an acceptable part
  - Small test probe indention (witness marks)

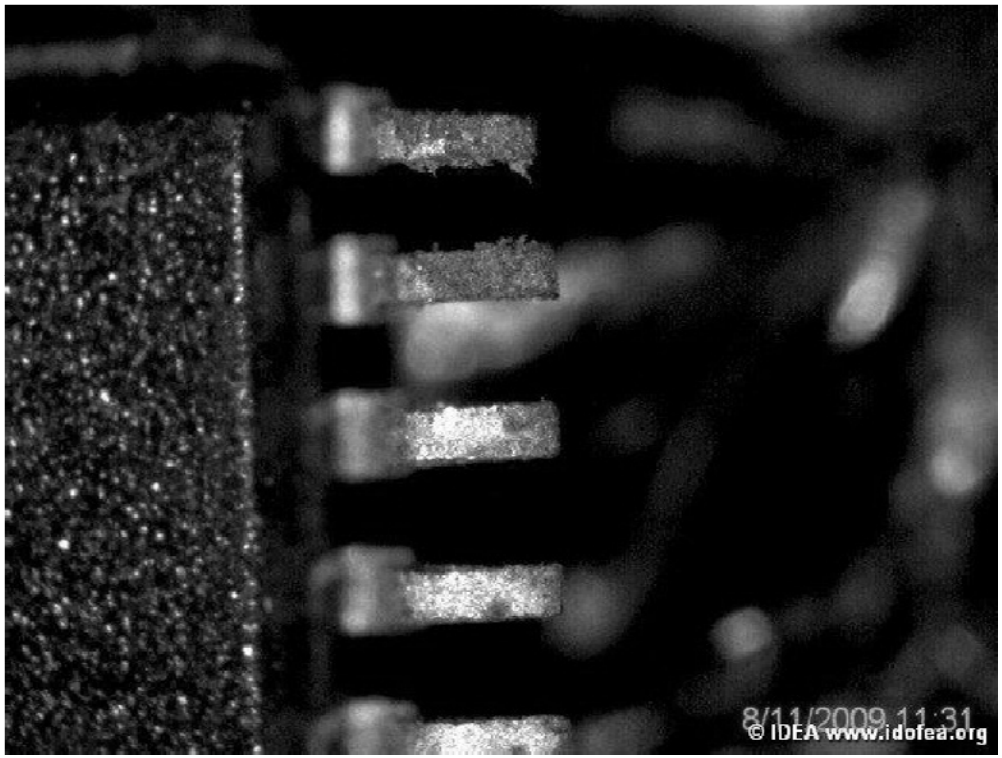


Receiving Process



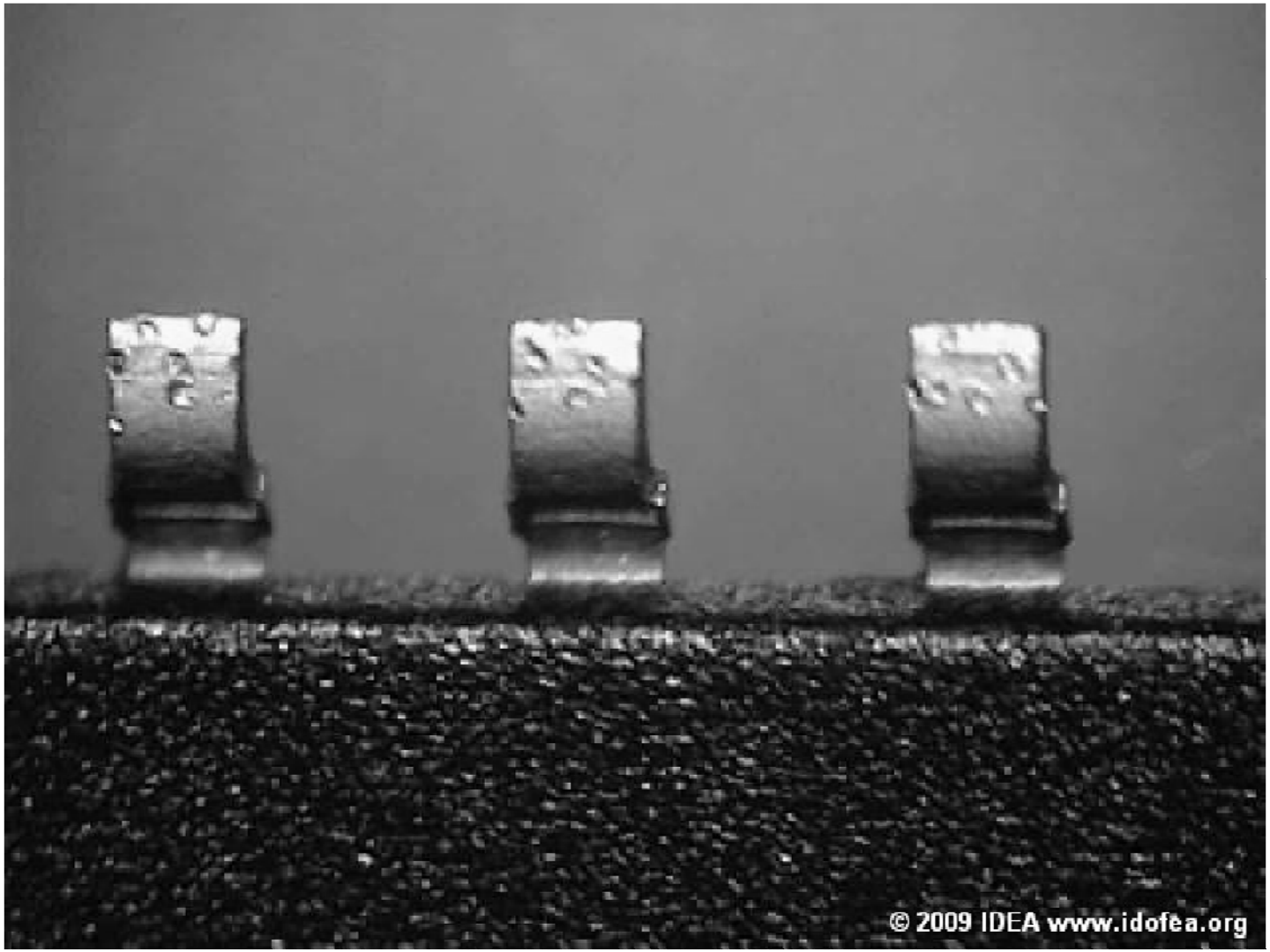
Receiving Processes

- Contamination



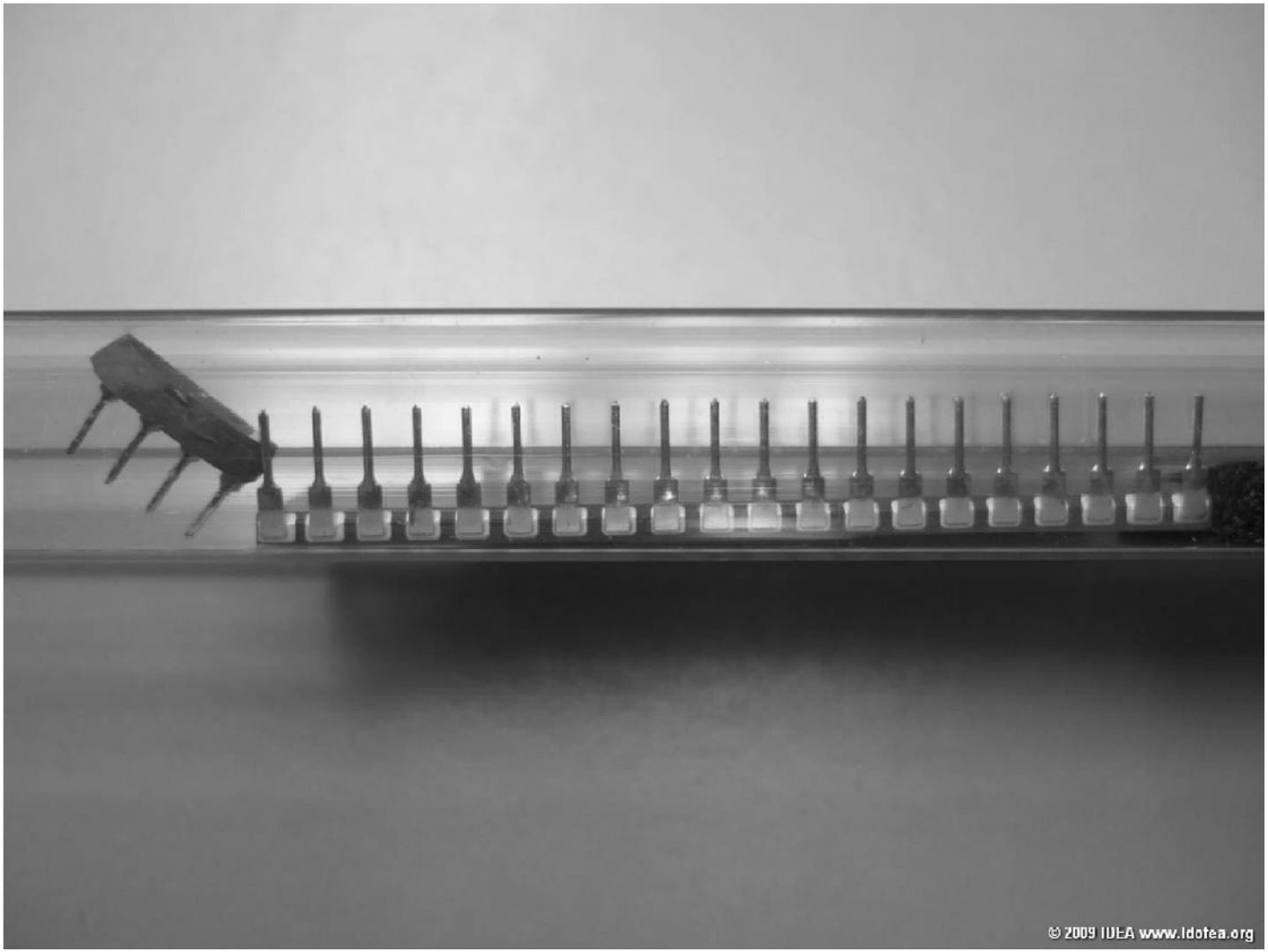
Receiving Process

- Multiple witness marks - Suspect



Receiving Process

- Damaged part - Suspect

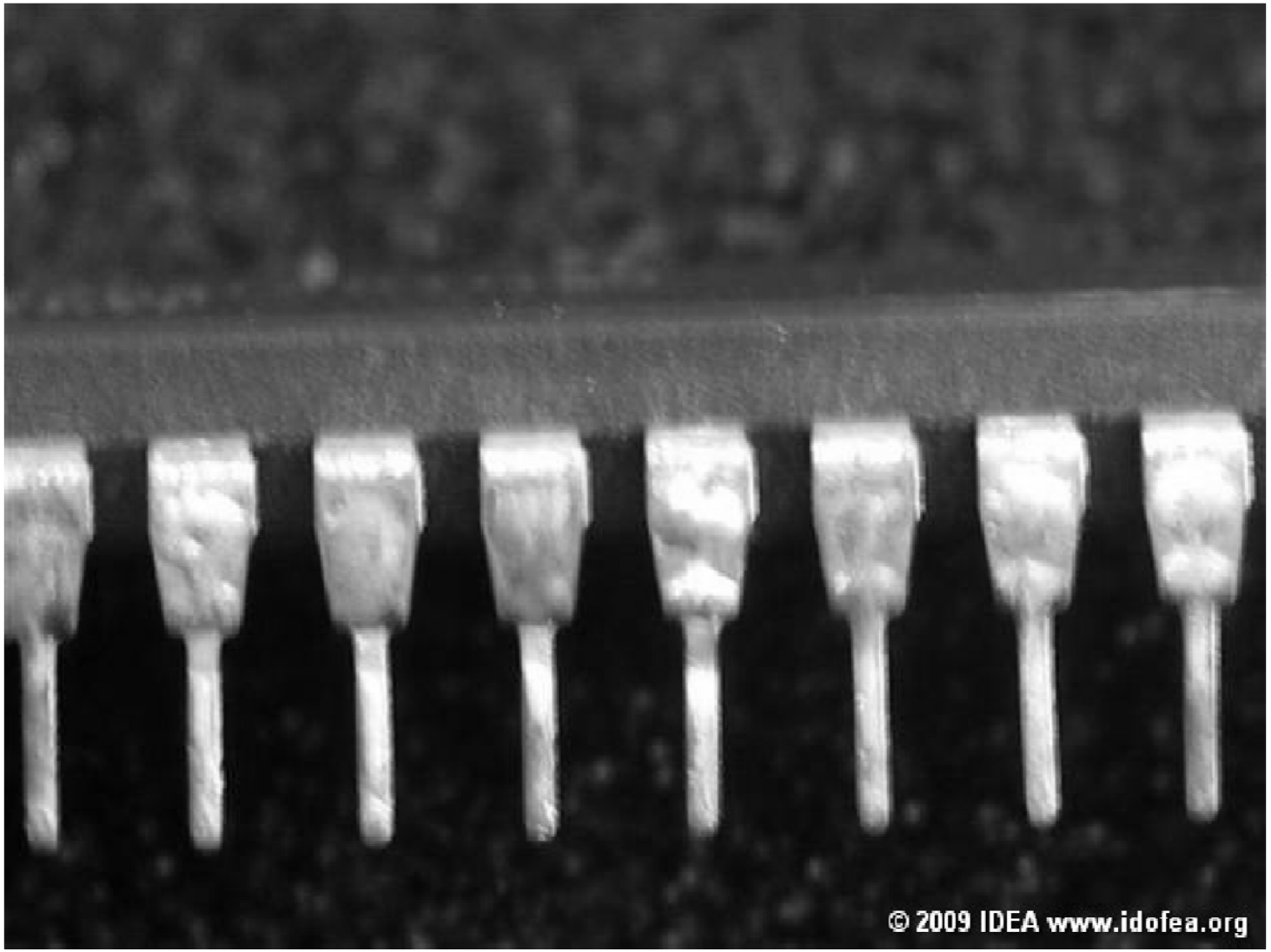


Receiving Process

- Bent leads- Suspect

Receiving Process

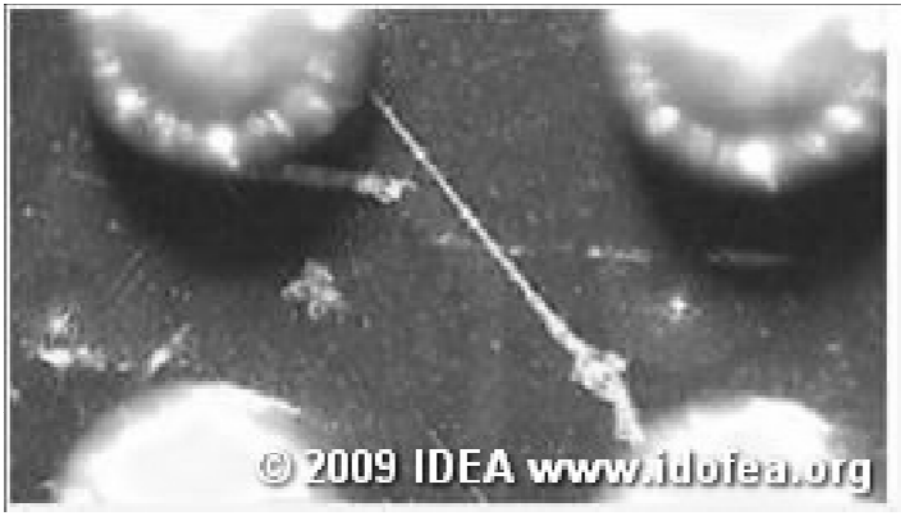
- Tinning - Suspect



Receiving Process

- “Pulled” part - Suspect

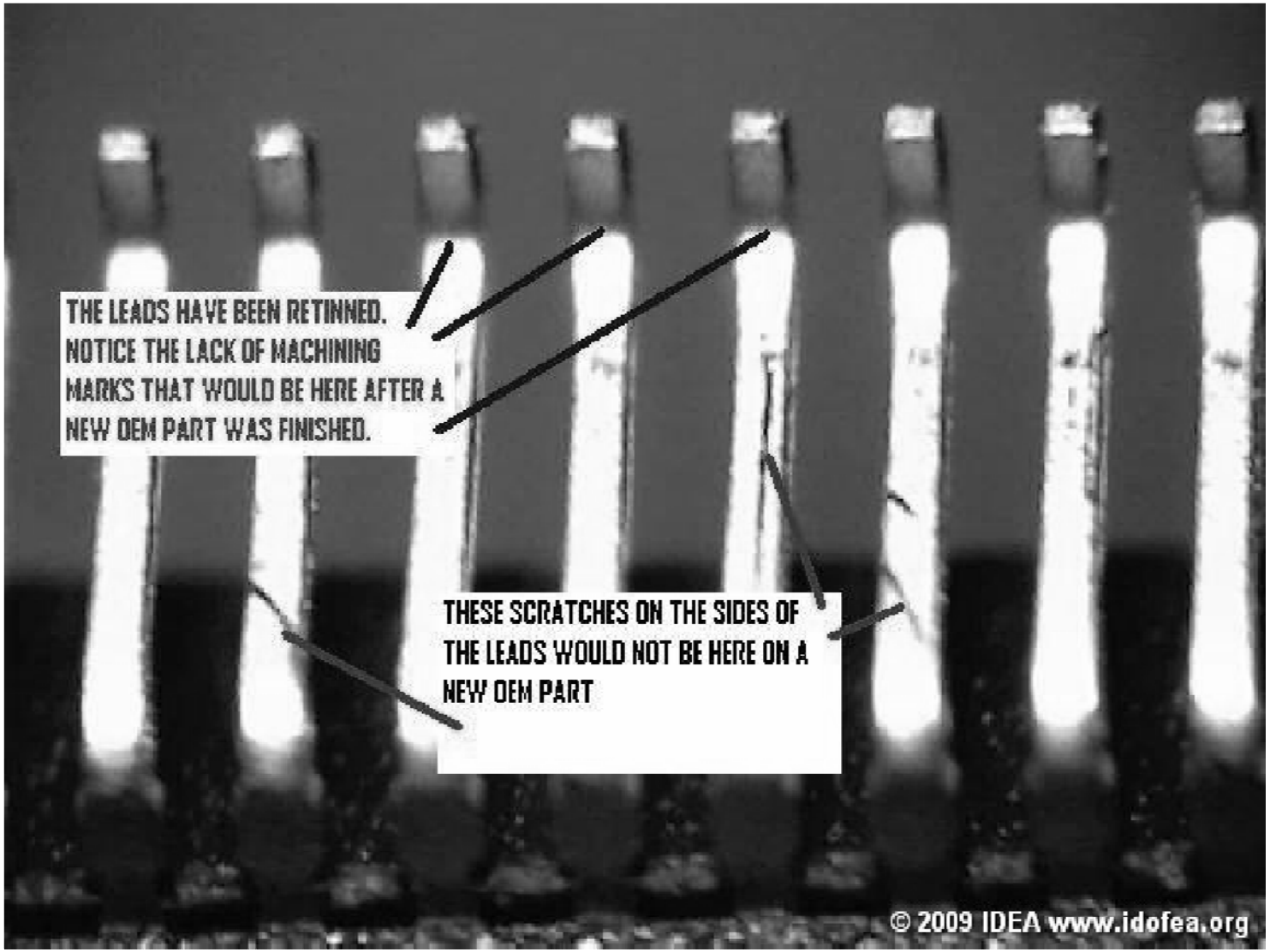
Receiving Process



- Evidence of refurbishment
  - Solder ball defects
  - Scratches and cracks in the substrate

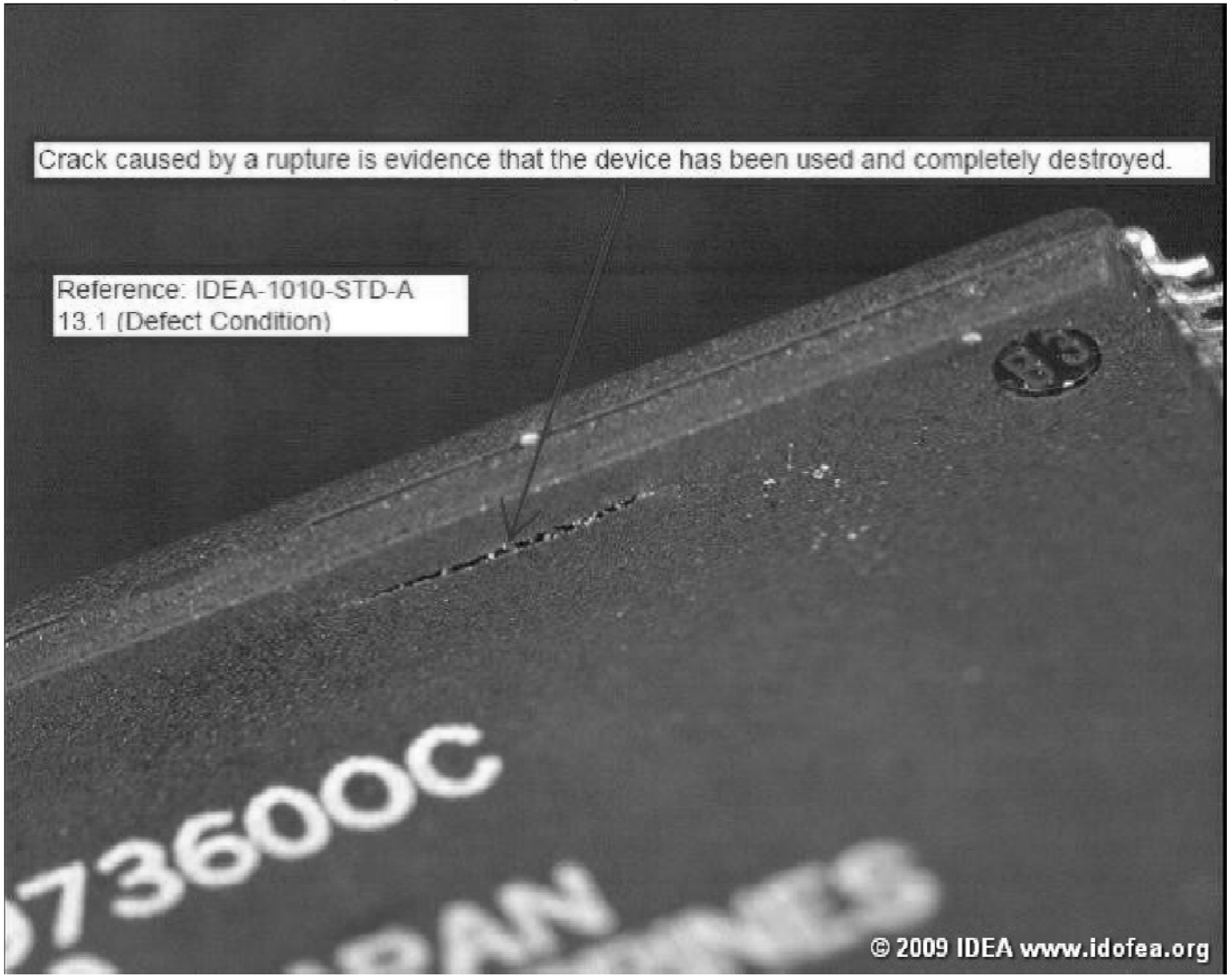
Receiving Process

- Scratches – Suspect



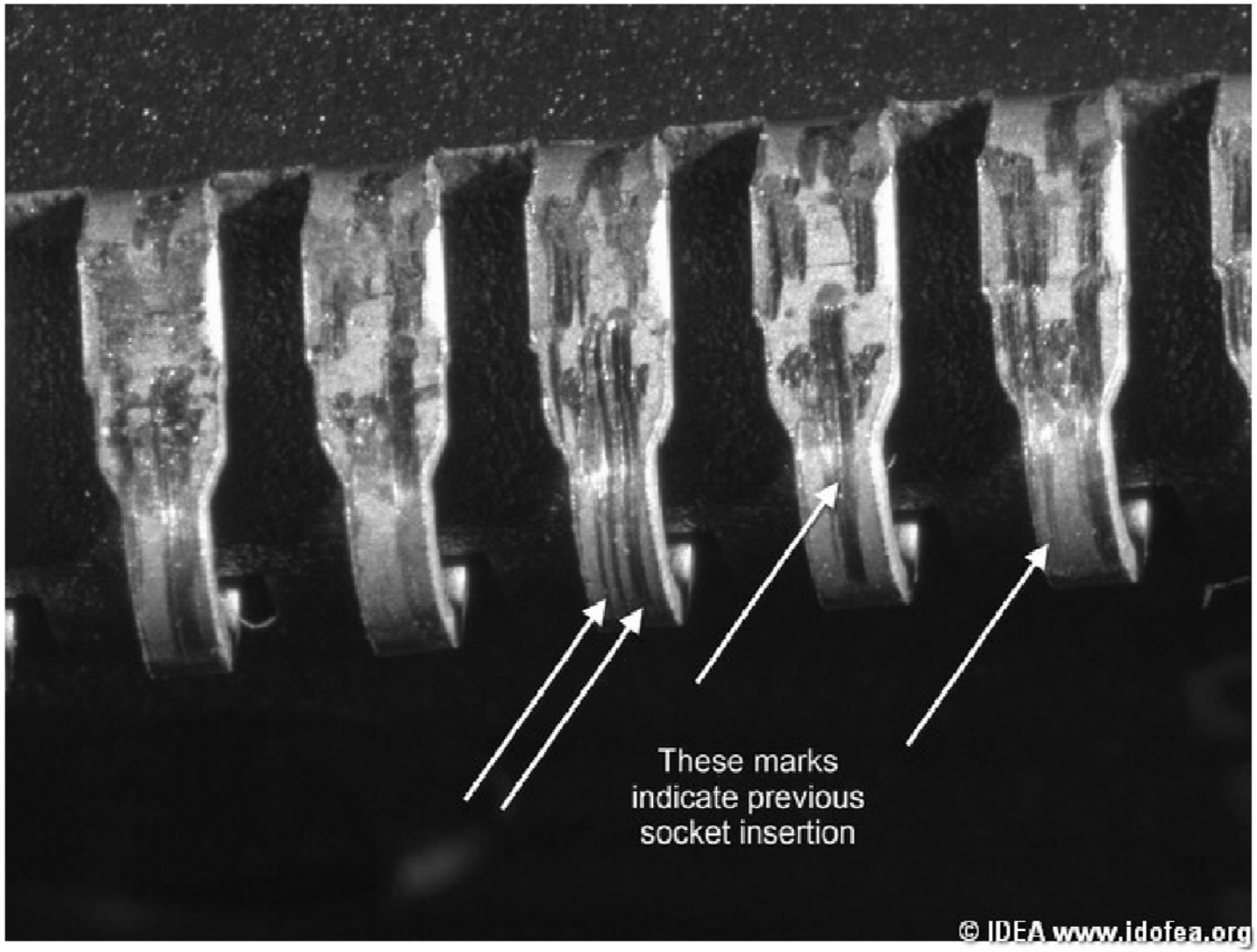
Receiving Process

- Cracked Body (bottom) – Suspect



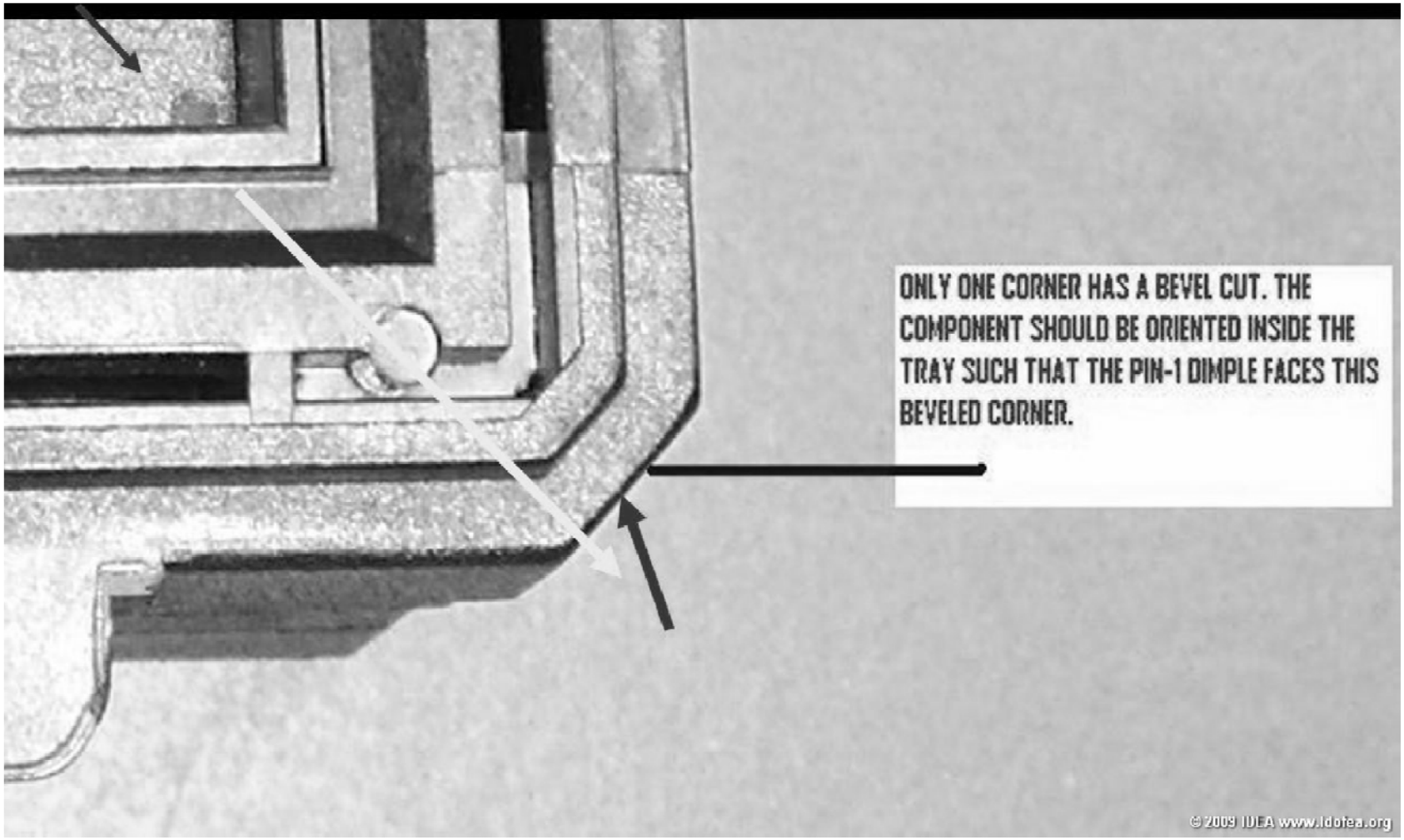
Receiving Process

- Witness marks – Suspect



Receiving Process

- Pin 1 and tray orientation



Receiving Process

- HIC Cards can be counterfeited too!

Inspection Equipment

- Must possess the following minimum inspection equipment and capability
  - Digital camera
  - Adequately lit microscopy
  - Magnifiers and/or eye loupes
  - Vacuum pen
  - Bar Code Scanner
  - Calipers
  - Micrometers
  - Vacuum sealer to seal humidity barrier bags
    - HIC cards and desiccants

http://www.metropostx.com/

Equipment and Tools

- Standards of Measurement
  - Tools used to evaluate and determine product compliance
  - Shall meet ISO 9001 requirements
    - Preventative maintenance and
    - Calibration programs
- Magnifiers
  - Eye Loupes, microscopes
  - Micro-photo systems
- Part Counters
  - Reel to reel
  - Scales (count by weight)
- Measurement Tools
  - Metal rule or scale, calipers, micrometers

Equipment and Tools

- Magnification aids and lighting
  - Appropriate magnification
    - Determination via the width/thickness of the lead
    - IDEA-STD-1010, 7.3, Table 3, unless otherwise agreed to
  - Lighting shall be adequate
    - 100w light bulb, 3 feet away, no shadows
- Magnification and Counterfeits
  - No magnification limitations when inspecting for
    - Indications of fraud
    - Counterfeit characteristics

Equipment and Tools

Size of Lead Decreases

Terminal Widths or Terminal Diameters	Magnification Power Inspection Range	Magnification Power Maximum Referee
>1.0 mm [0.0394 in]	1.5X to 3X	4X
>0.5 to ≤1.0 mm [0.0197 to 0.0394 in]	3X to 7.5X	10X
≥0.25 to ≤0.5 mm [0.00984 to 0.0197 in]	7.5X to 10X	20X
<0.25 mm [0.00984 in]	20X	40X

Magnification Increases

Table 3 Inspection Magnification

If something suspect is found at the Inspection Range; increase magnification towards up to the Maximum Referee power. Components with mixed feature widths; the greater magnification may be used for the entire part

Non-Destructive Analysis (NDA)

- Equipment and Processes Overview
  - X-Ray – Film, live, Fein Focus, or CT
  - X-Ray Flourescence – XRF – spectral analysis
    - NOT the same as X-Ray
  - C-Mode Scanning Acoustic Micocroscopy - CSAM
  - Dye Penetrant
  - Scanning Electron Microscopy (SEM)

Destructive Physical Analysis (DPA)

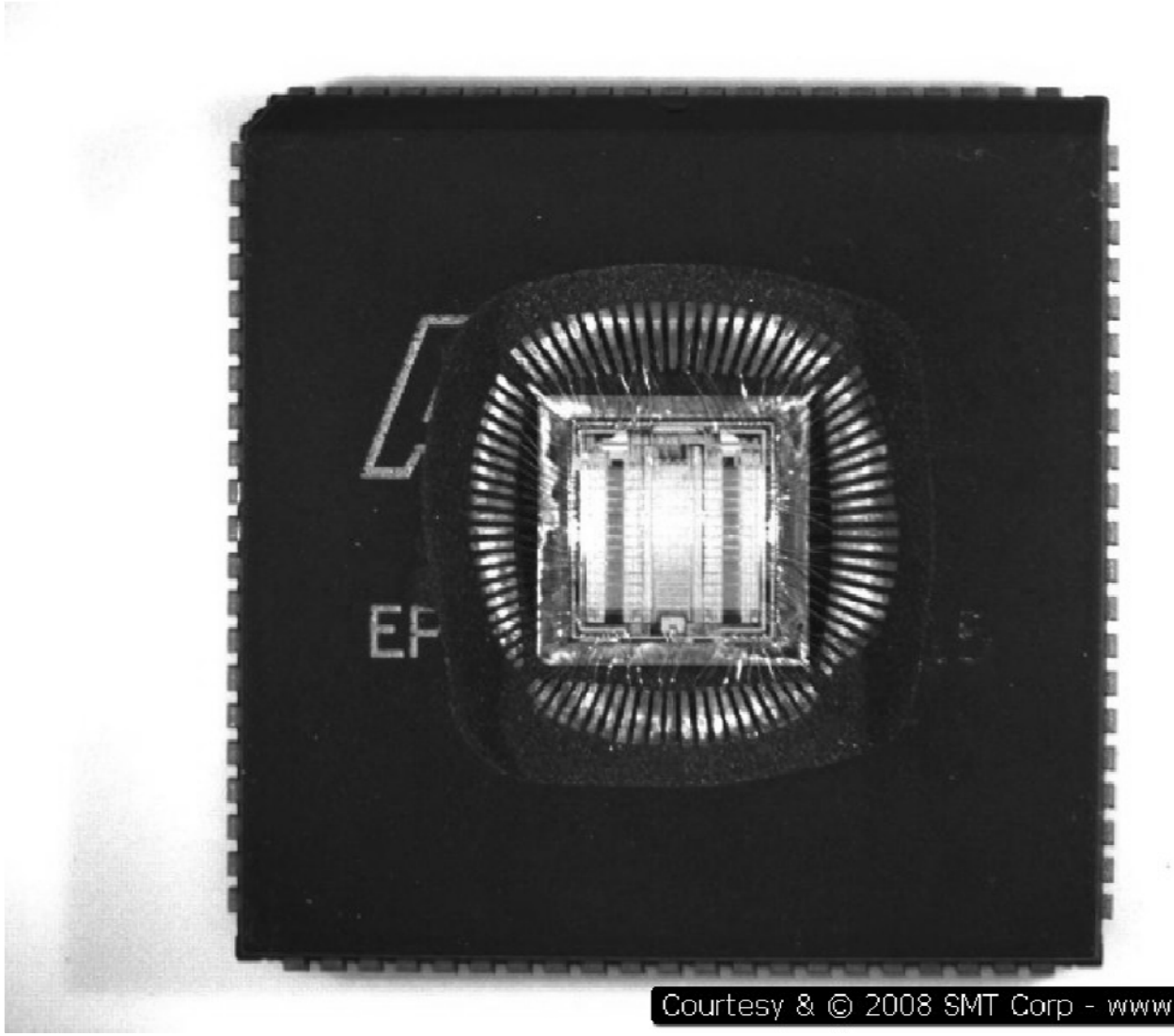
- Equipment and Processes Overview
  (MIL-STD-1580 (or 750))
  - EVI (External visual inspections)
  - DeCapsulation (DeCap)
  - Internal Visual Inspection
  - PIND (Particle impact noise detection)
  - RGA (Residual gas analysis)
  - Bond Pull
  - Die Shear

Destructive Physical Analysis (DPA)

- DeCap component EPM7096

Destructive Physical Analysis (DPA)

- DeCap component EPM7096 die exposed



Destructive Physical Analysis (DPA)

- DeCap component EPM7096 die nomenclature

Quality Independent Distributors

- Databases include, as a minimum
  - OCM logos
  - Logo changes relative to date codes
  - Labeling fonts and formats
  - Introduction dates pertaining to barcode labeling use
  - Product country of origin
  - Packaging and packing details
    - Such as MSL, and RoHS markings relative to date codes and
    - Other necessary and evolving information
  - Dates OCM changed names or ceased business

- The quality of any database is dependent on
  - The time and effort invested
  - Dedication to maintenance of data
  - Consistent utilization of the data
  - Indexing and the ease of accessing the data

Quality Independent Distributors

- Continually improve inspection expertise and efficiencies

- Share learned experiences
- Continual improvements made to their QMS systems

- Continued training of
  - Inspectors
  - Quality Management and
  - Procurement personnel

http://www.montekservices.com/services/corporate-training/

- Capital equipment investments
- Reference information and findings have been
  - Documented and preserved

Quality Independent Distributors

- Customer Satisfaction Driven
- Significantly invested in their quality infrastructure
  - Processes, equipment, skills training and personnel
- Providers of expertise in
  - Acquisition
  - Inspection
  - Preparation of electronic components
- Openly cooperative with all parties to find solutions

Quality Independent Distributors

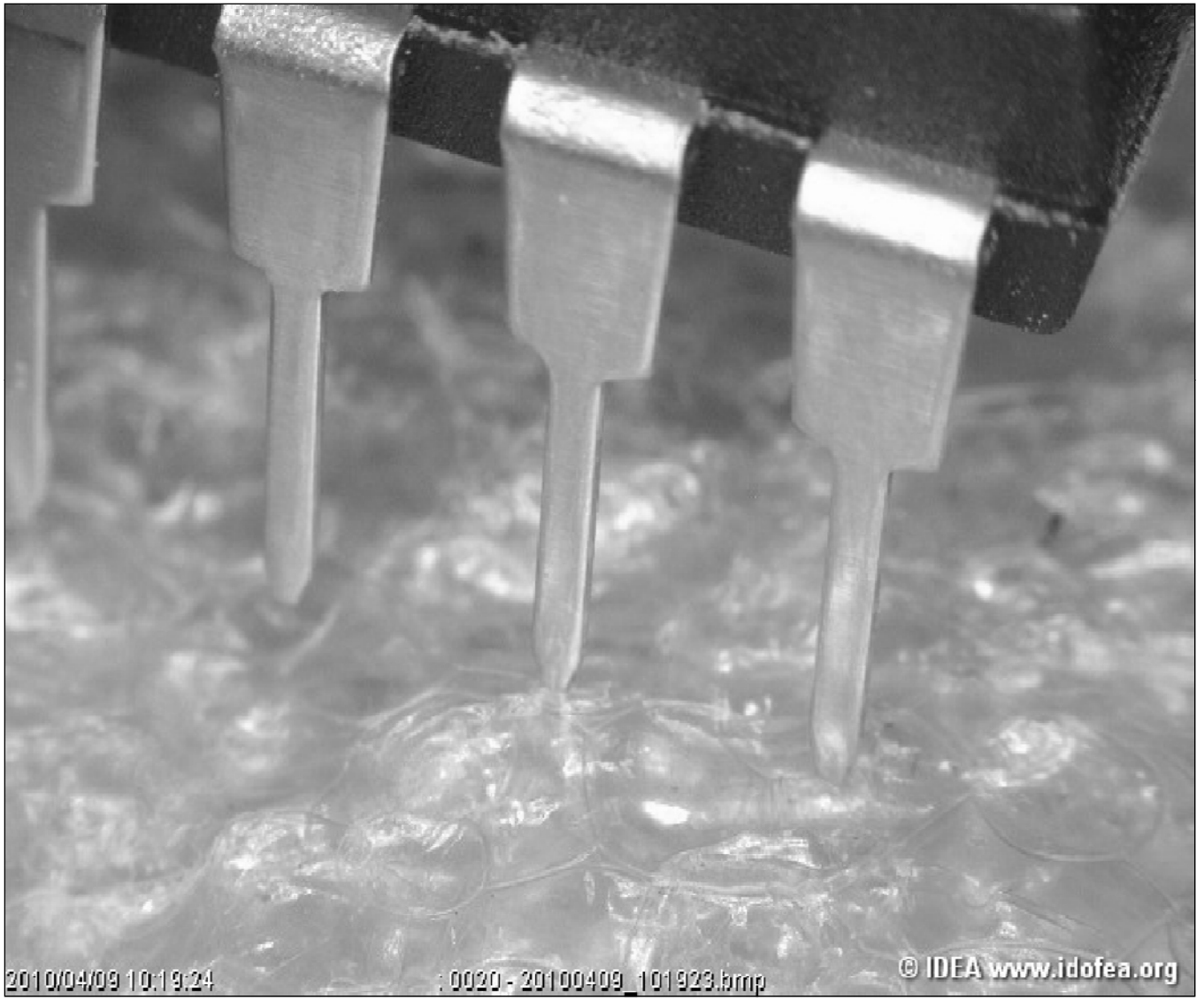
- Cautions utilizing an ID
  - Counterfeits can be obtained from any channel within the supply chain
  - Can they objectively demonstrate to meet industry expectations?
  - Require that all parts are inspected to IDEA-STD-1010
  - Designed and implemented robust
    - Procurement and inspection processes
  - Insure procurement and quality personnel
    - Cooperate with all trusted parties to find solutions
  - Inspectors certified to IDEA-ICE-3000

Workshop Examination

What to look for in the
Workshop…

Workshop Examination

Example of acceptability



Workshop Examination

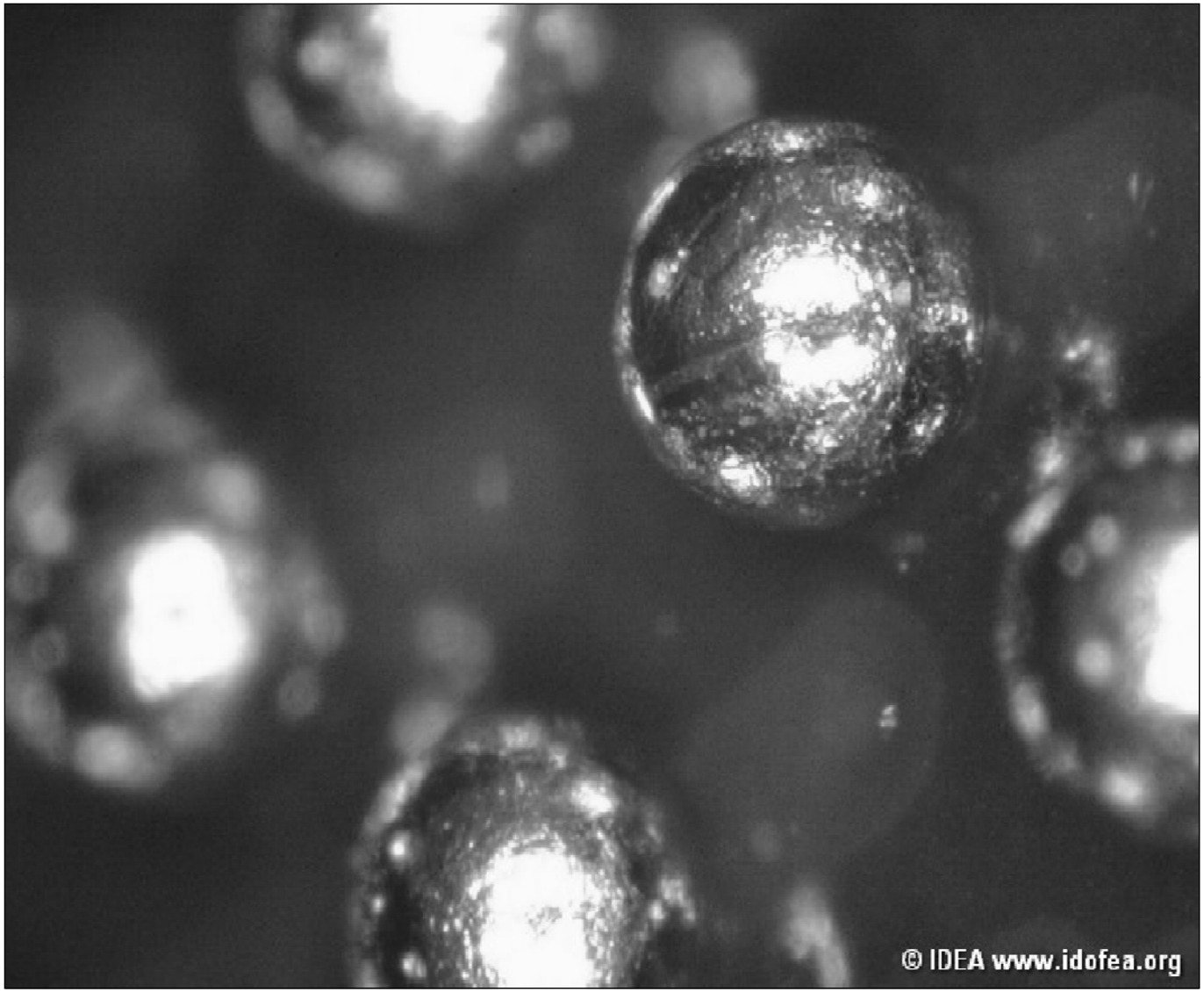
Example of acceptability

Workshop Examination

Example of acceptability

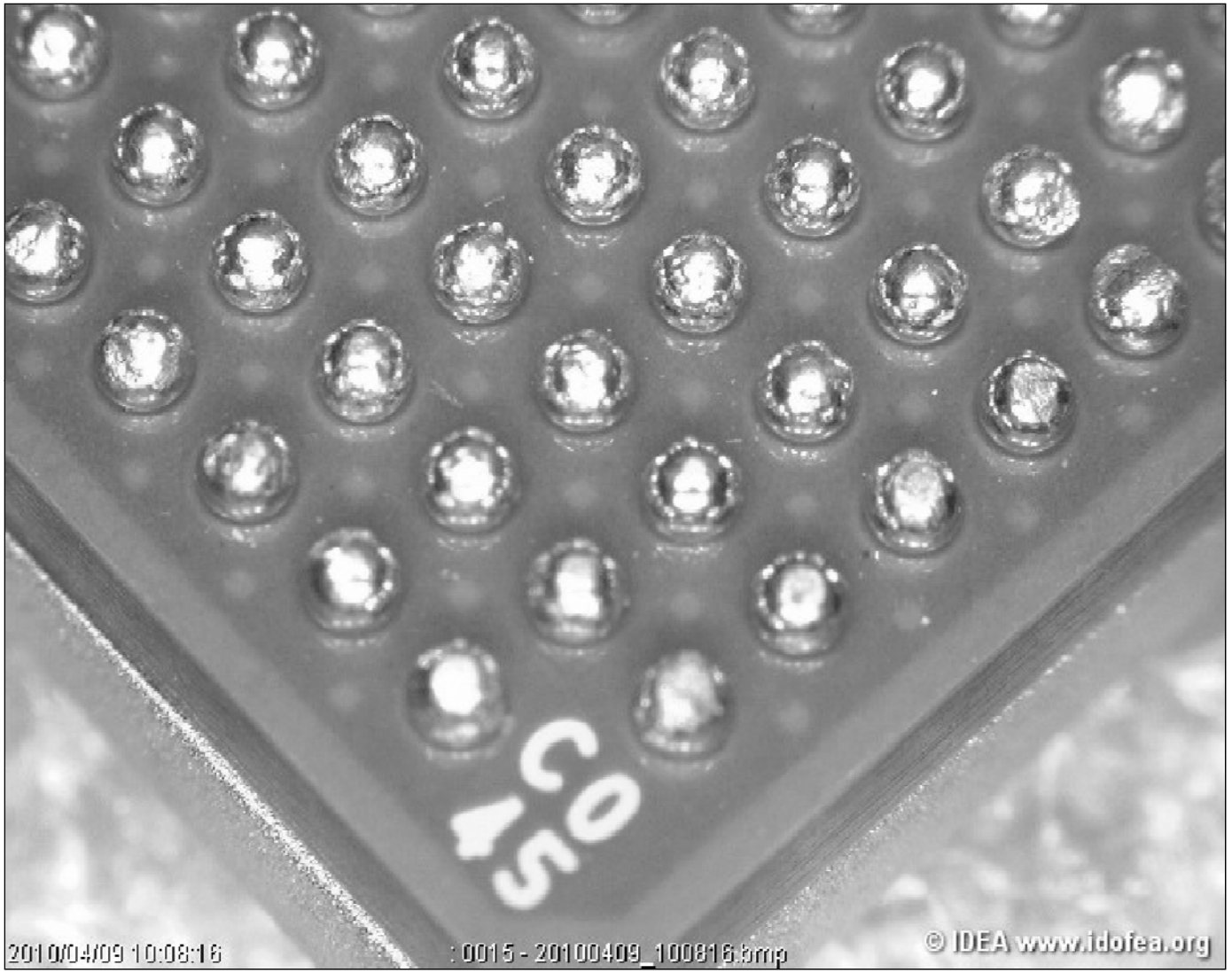
Workshop Examination

Example of acceptability



Workshop Examination

Example of acceptability

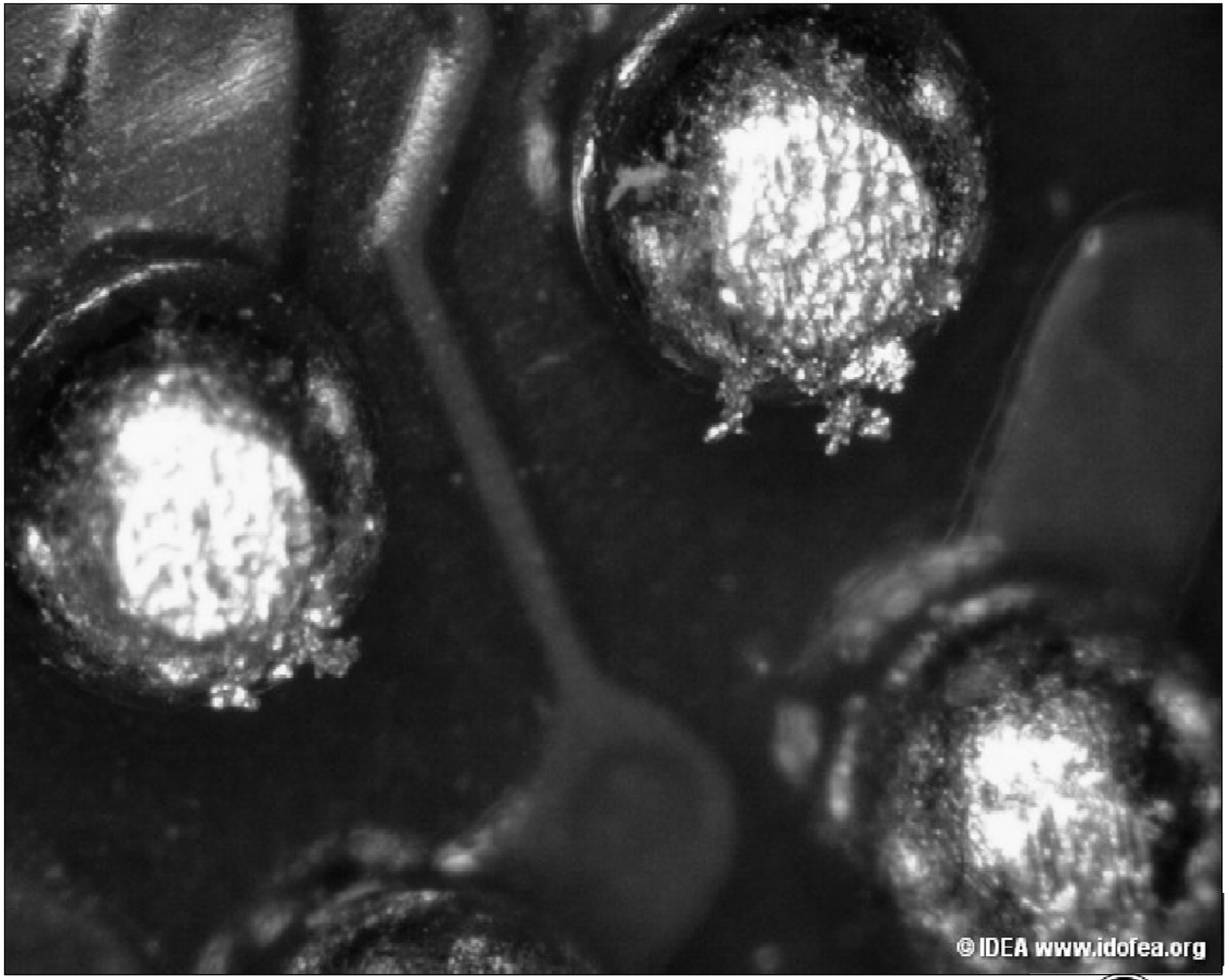


Workshop Examination

Example of Defect Conditions

Workshop Examination

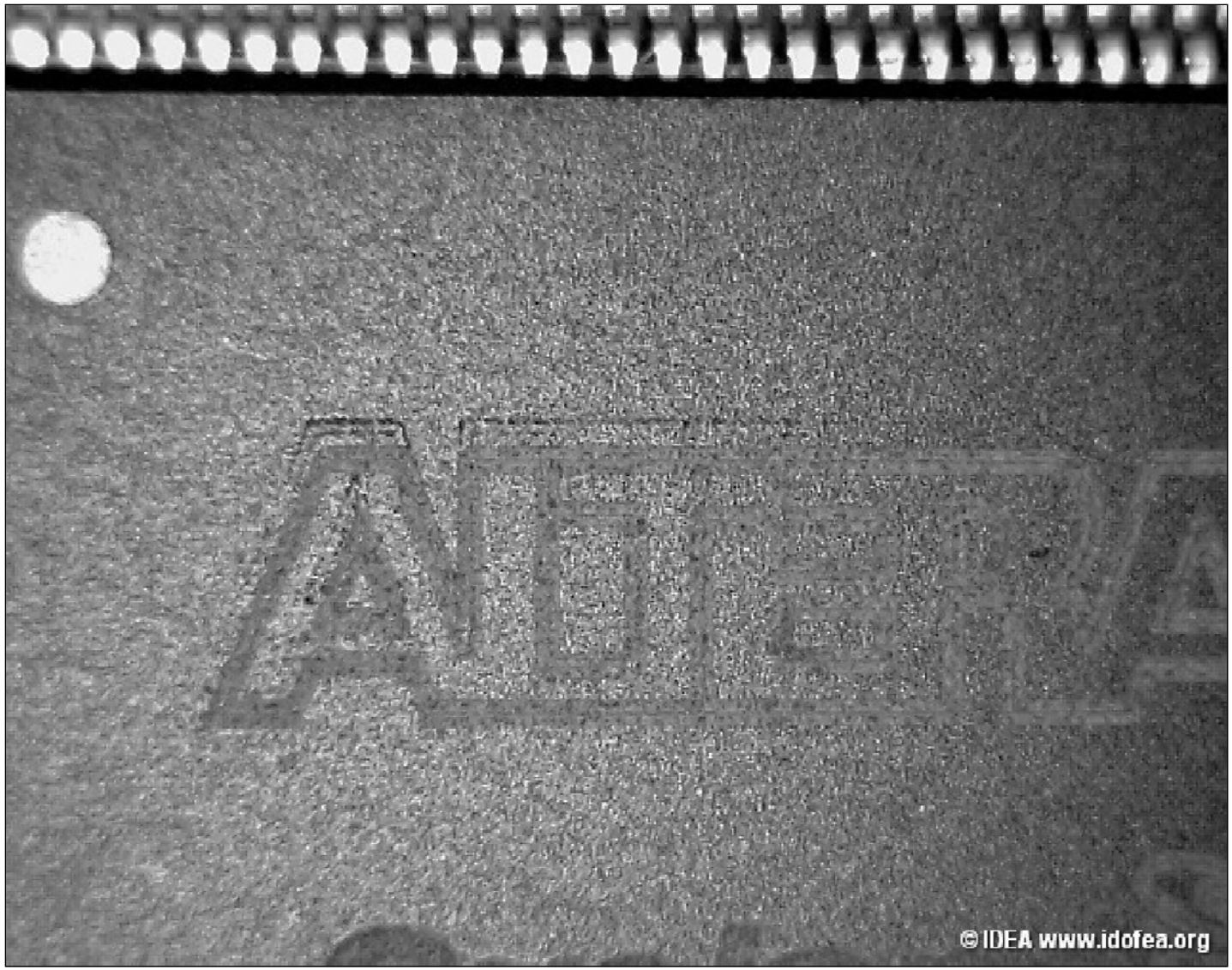
Example of Defect Conditions



Workshop Examination

Example of Suspect Counterfeit

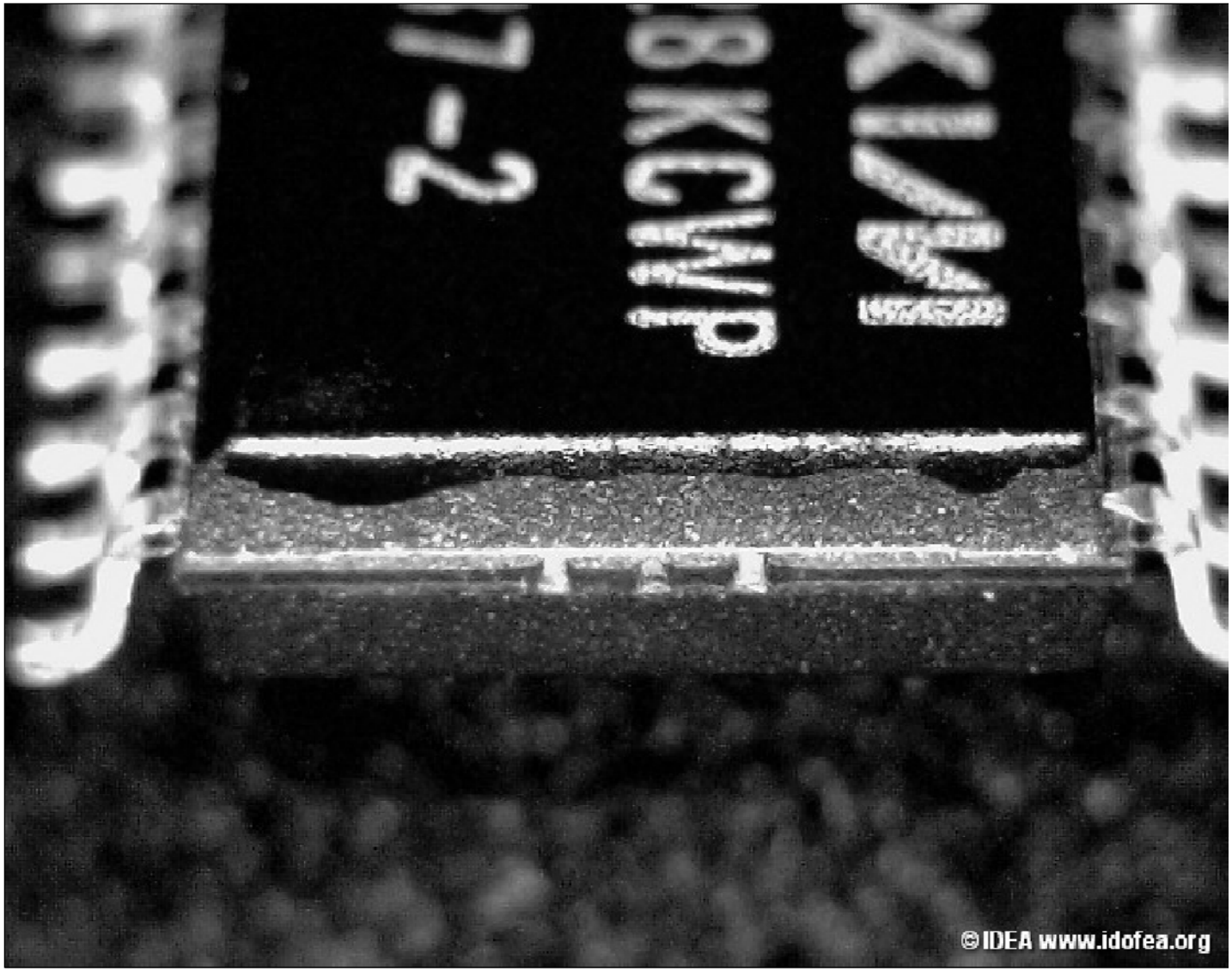
- Remarking



Workshop Examination

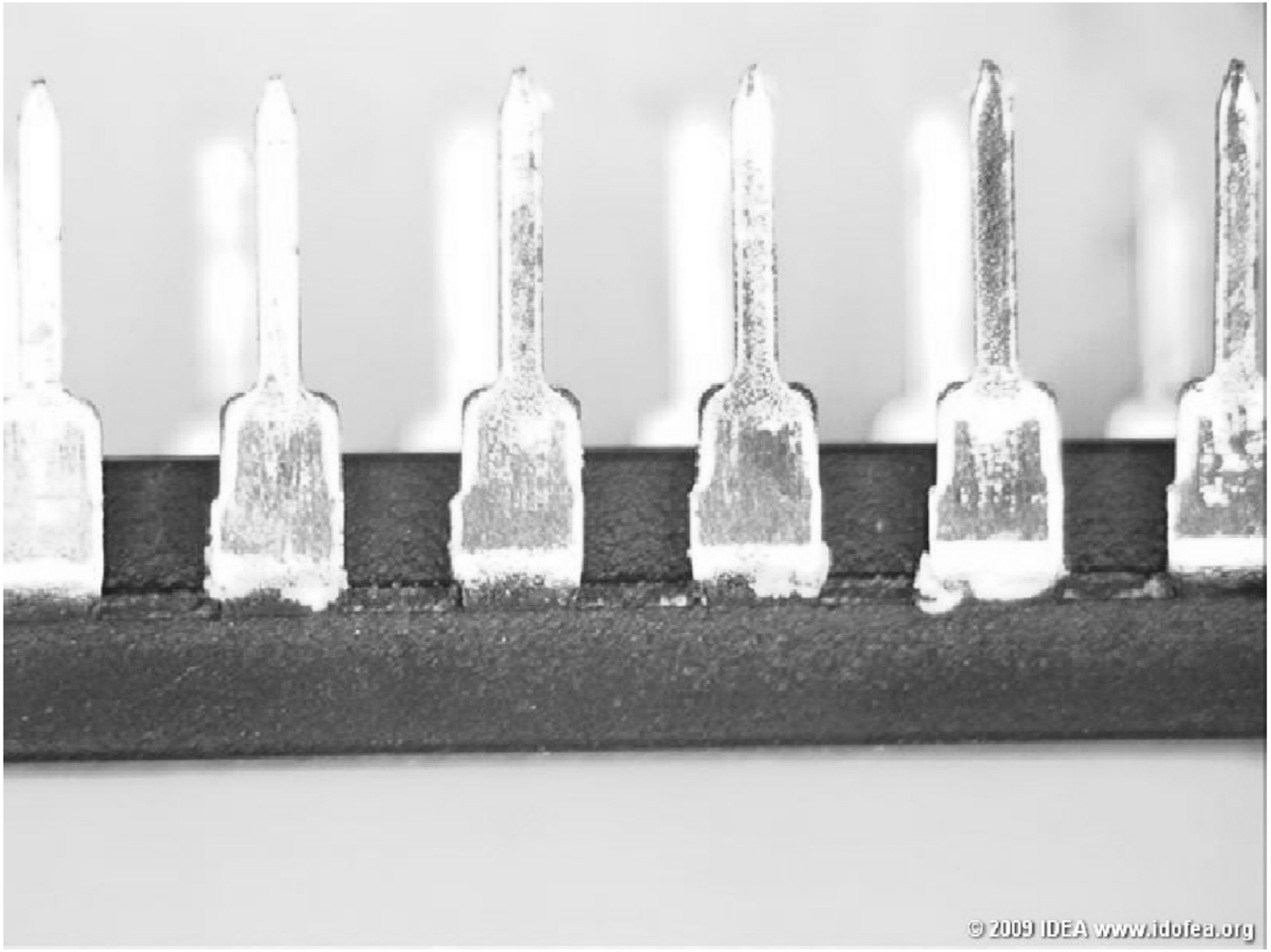
Example of Suspect Counterfeit

- Evidence of remarking
- Blacktop overspill or overflow



Part 1 - SN74S85N

Part 1 - SN74S85N



Oxidation

Part 2 – G65SC22P-1

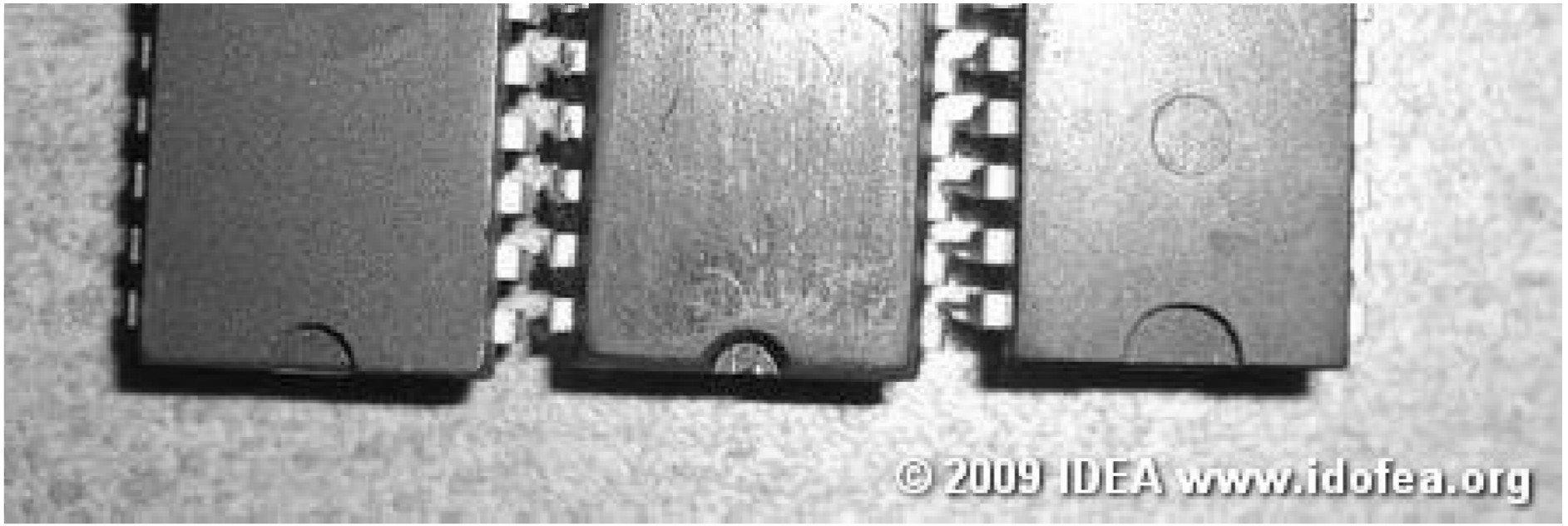
Part 2 – G65SC22P-1

Damaged leads

Part 2 – G65SC22P-1

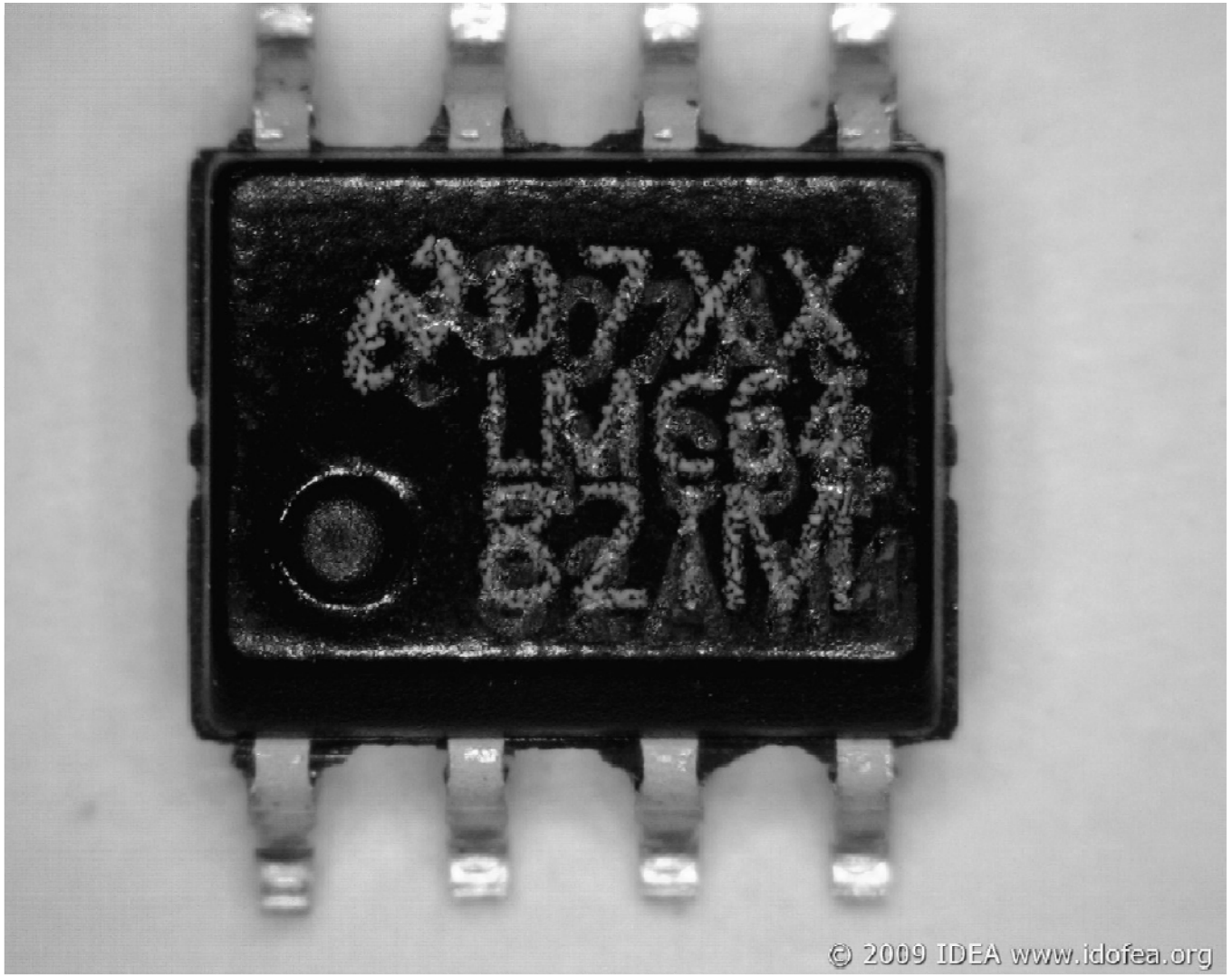
Broken and chipped body

Part 2 – G65SC22P-1



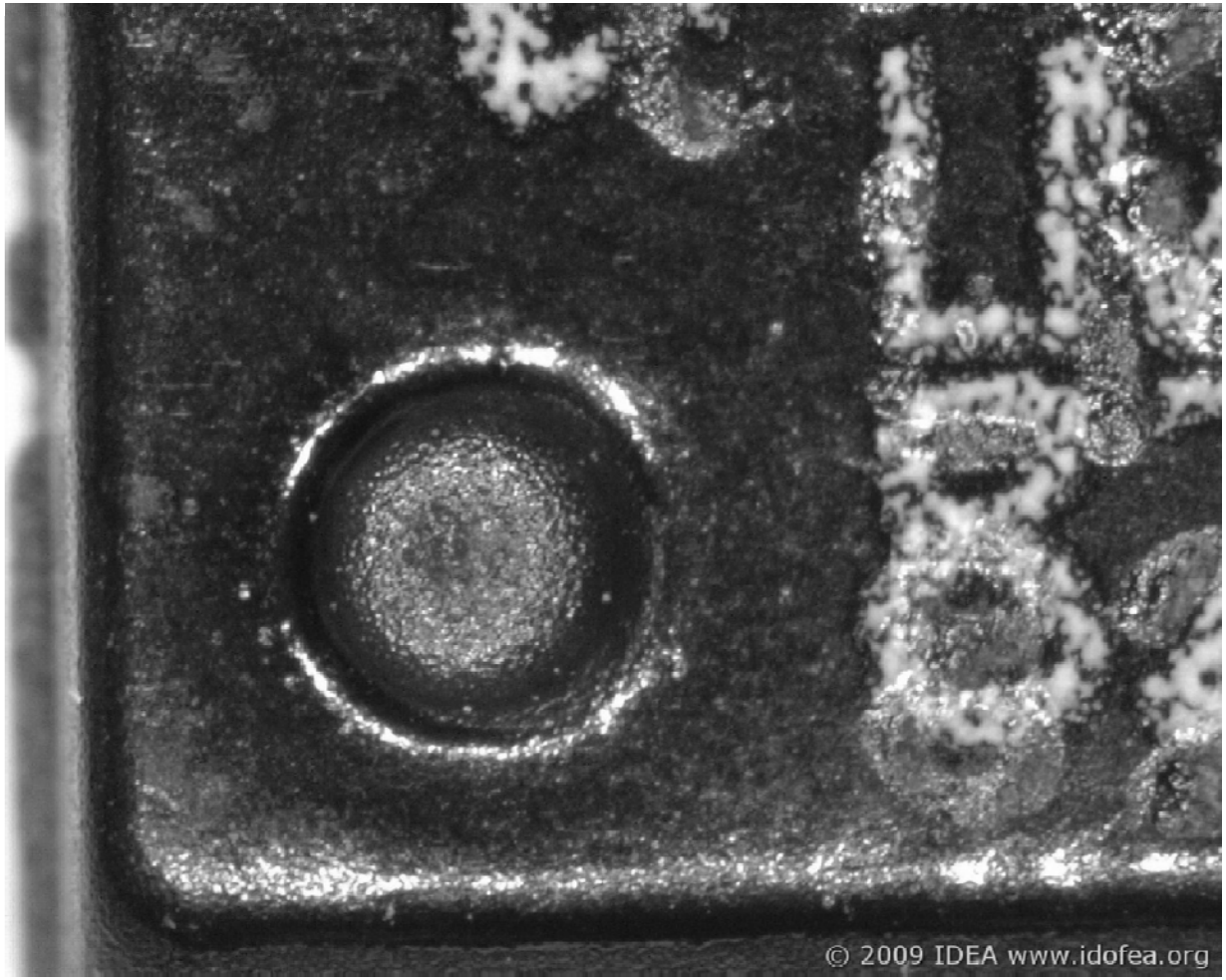
Same Lot, three different Pin 1 styles

Part 3 – N07XXLMC64



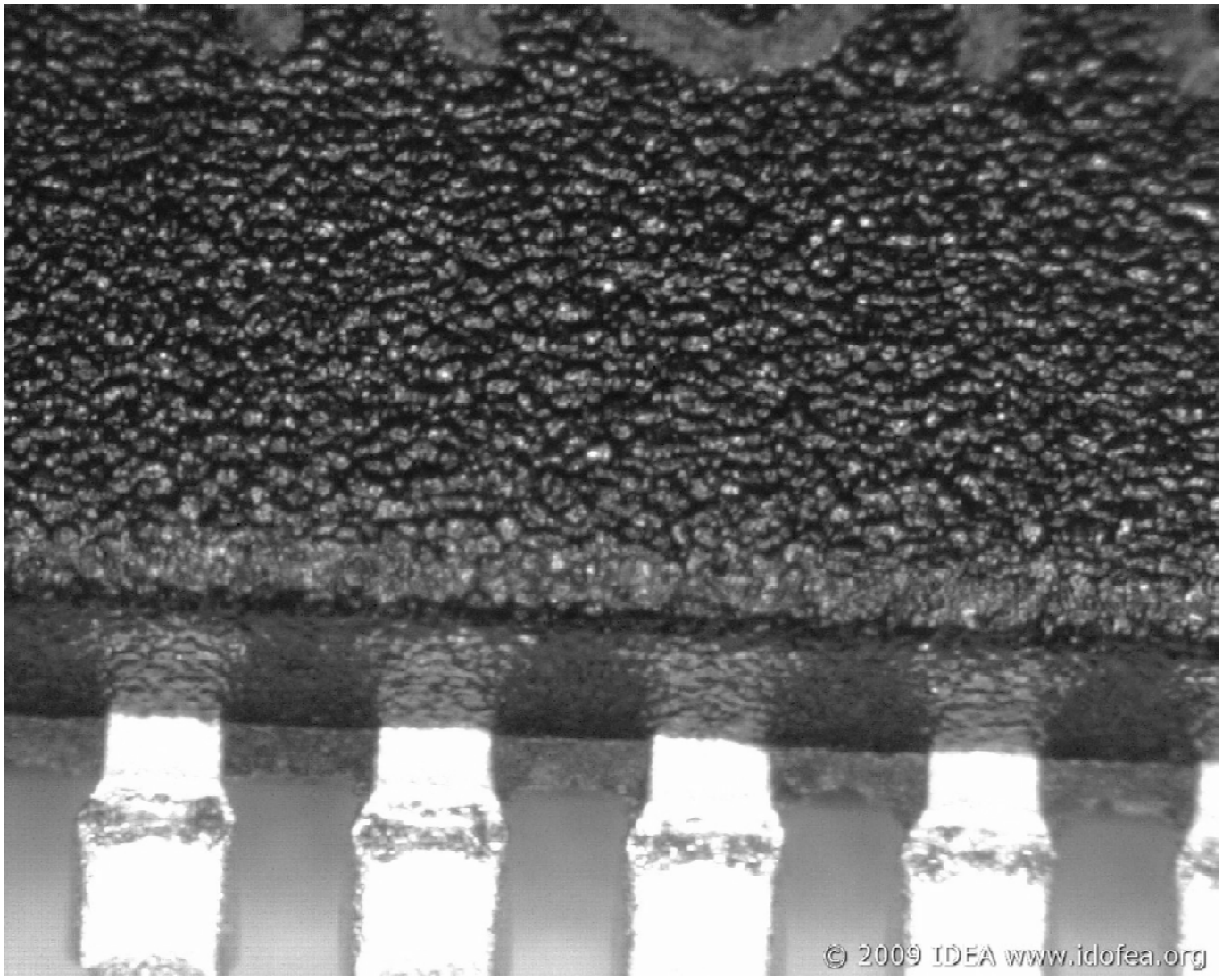
Exhibits Two Nomenclatures

Part 3 – N07XXLMC64



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

Part #4 – QPSK DMOD CX24123

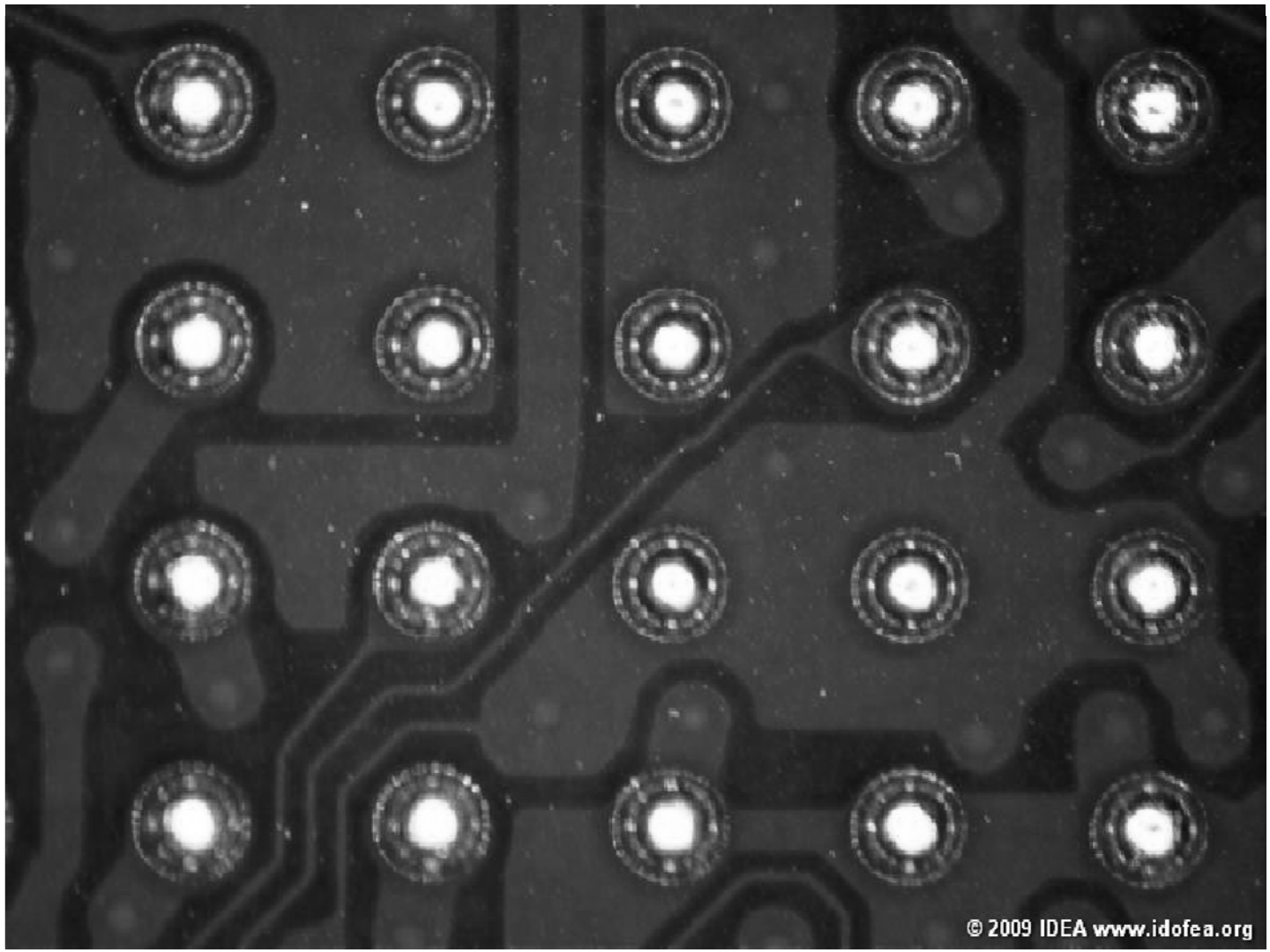


Appearance of a thick glossy coating

Part #4 – QPSK DMOD CX24123

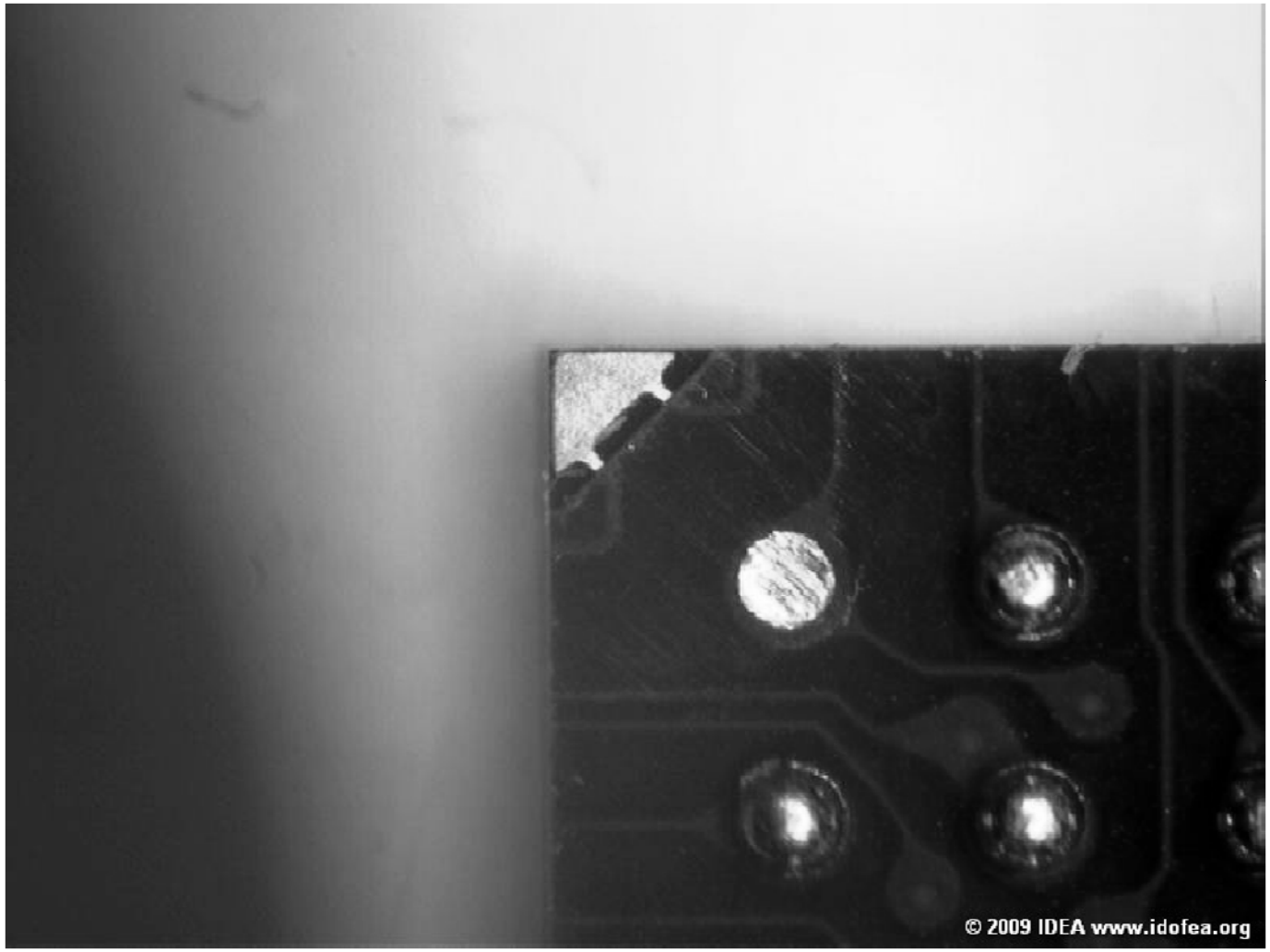
Failed – Markings and Blacktop test

Part #5 – EH412ES



Contamination

Part #5 – EH412ES

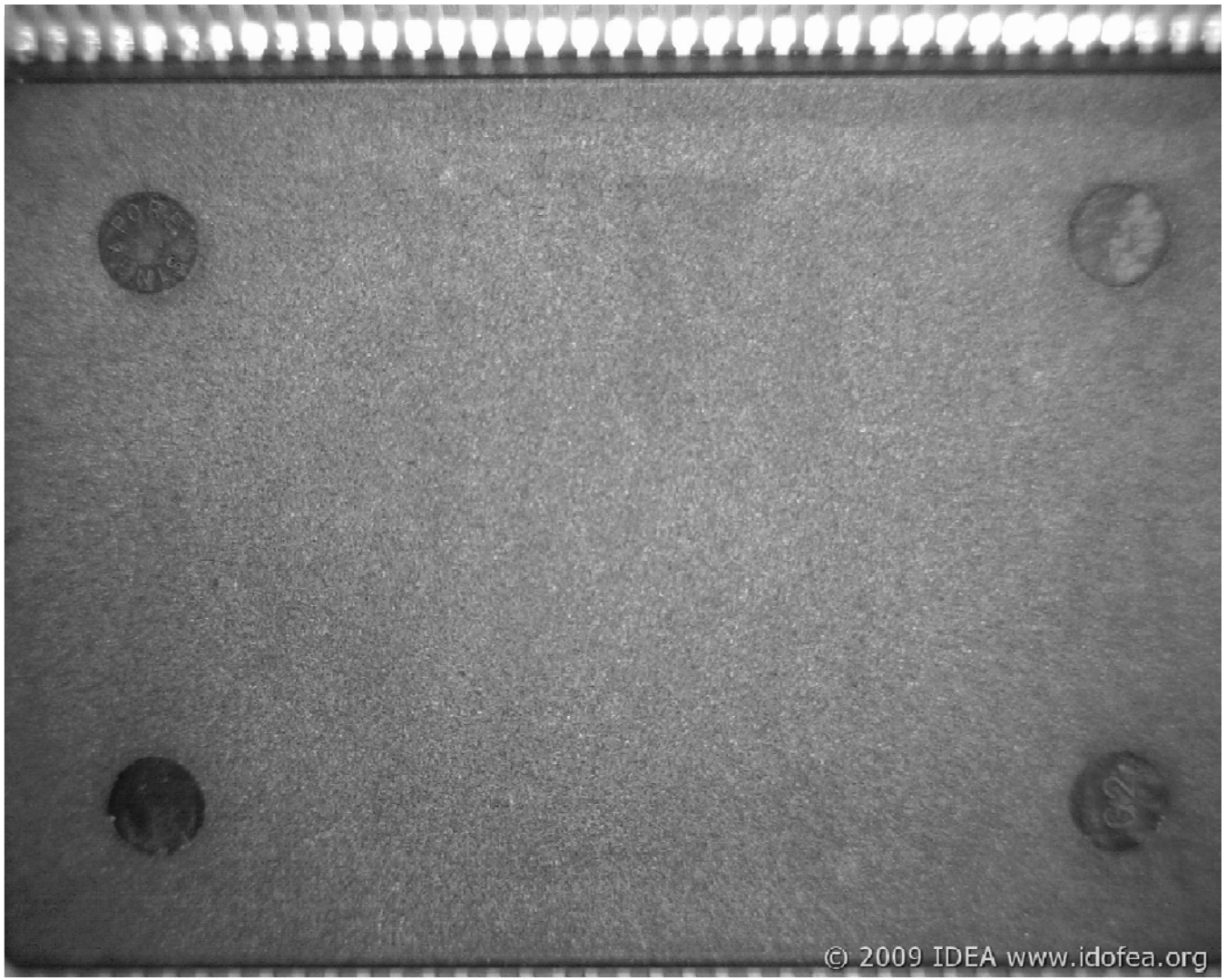


Missing solder ball

Passes – Markings and Blacktop test

Part #6 – BCM5325A2KQM

Part #6 – BCM5325A2KQM

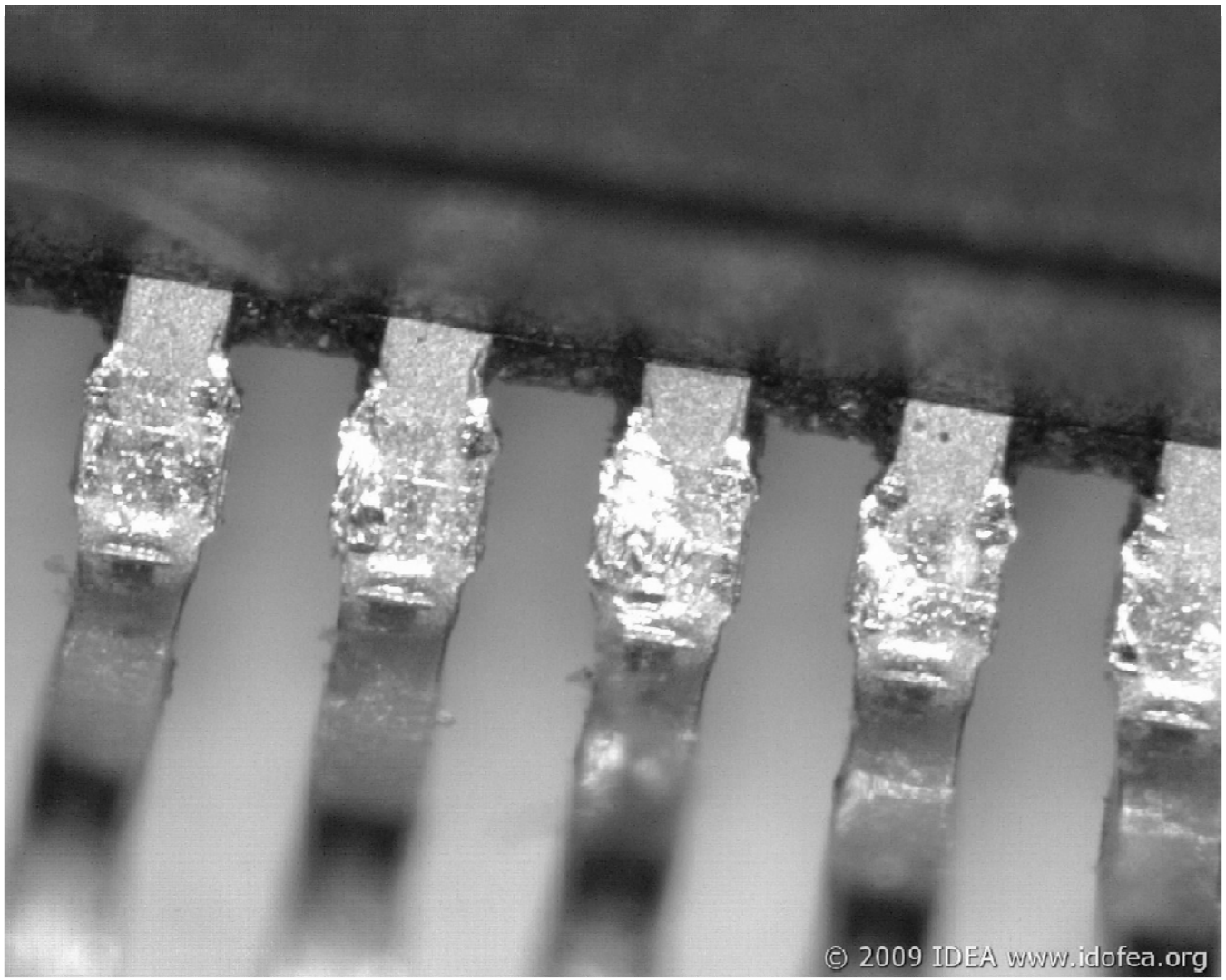


Backside is different texture than front

Part #6 – BCM5325A2KQM

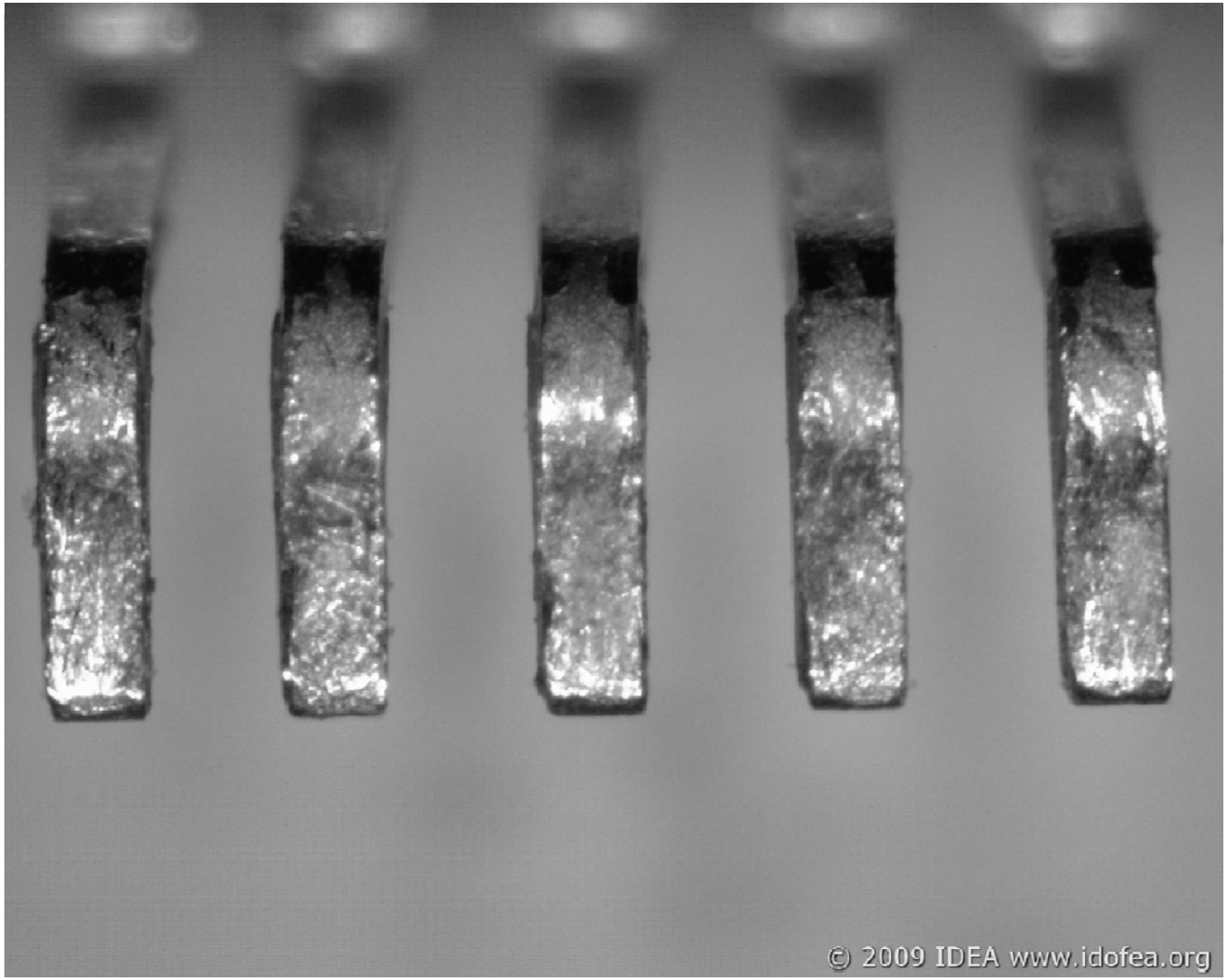
Two different textures in mold and debris

Part #6 – BCM5325A2KQM



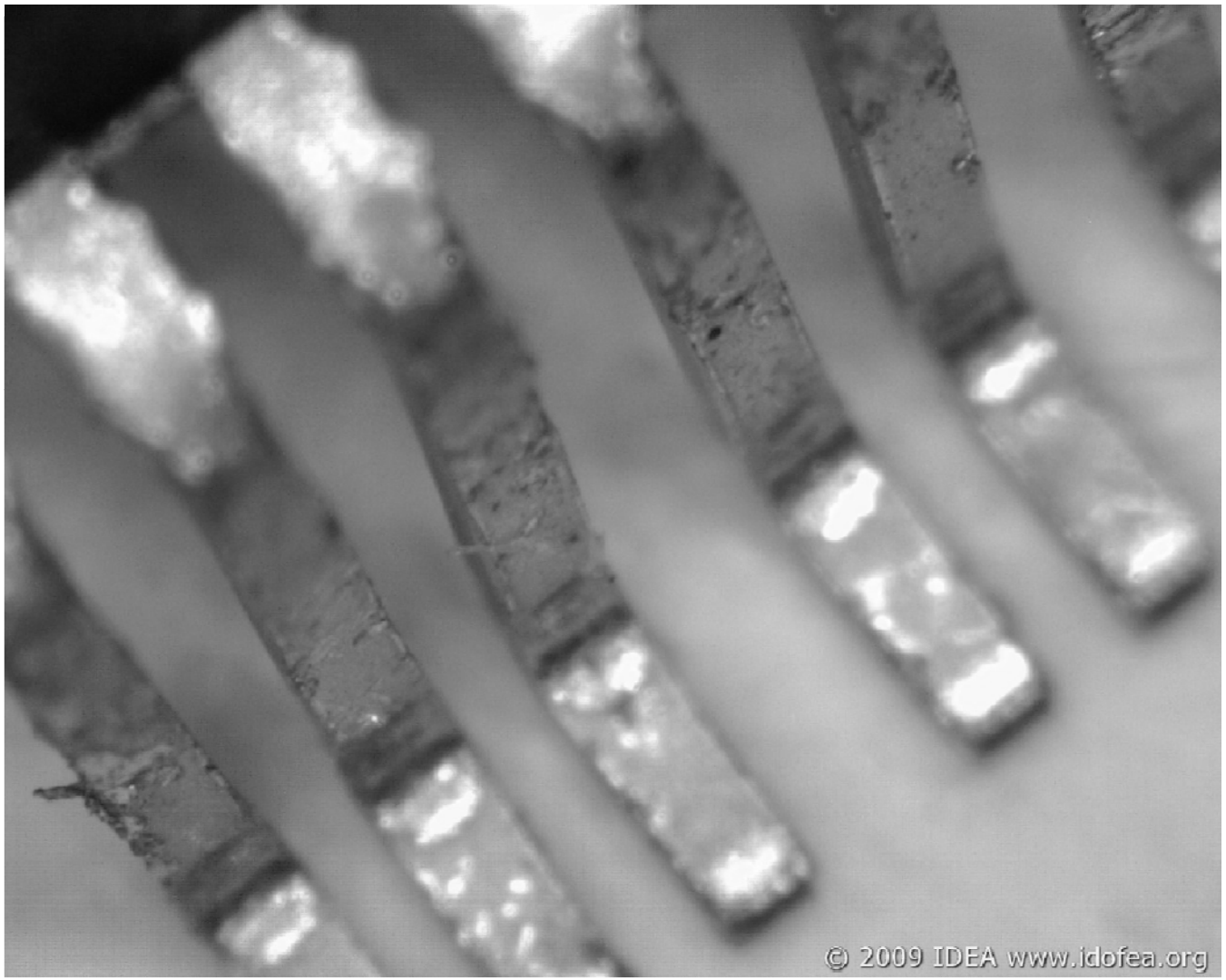
Evidence of use

Part #6 – BCM5325A2KQM



Evidence of use

Part #6 – BCM5325A2KQM



Evidence of use

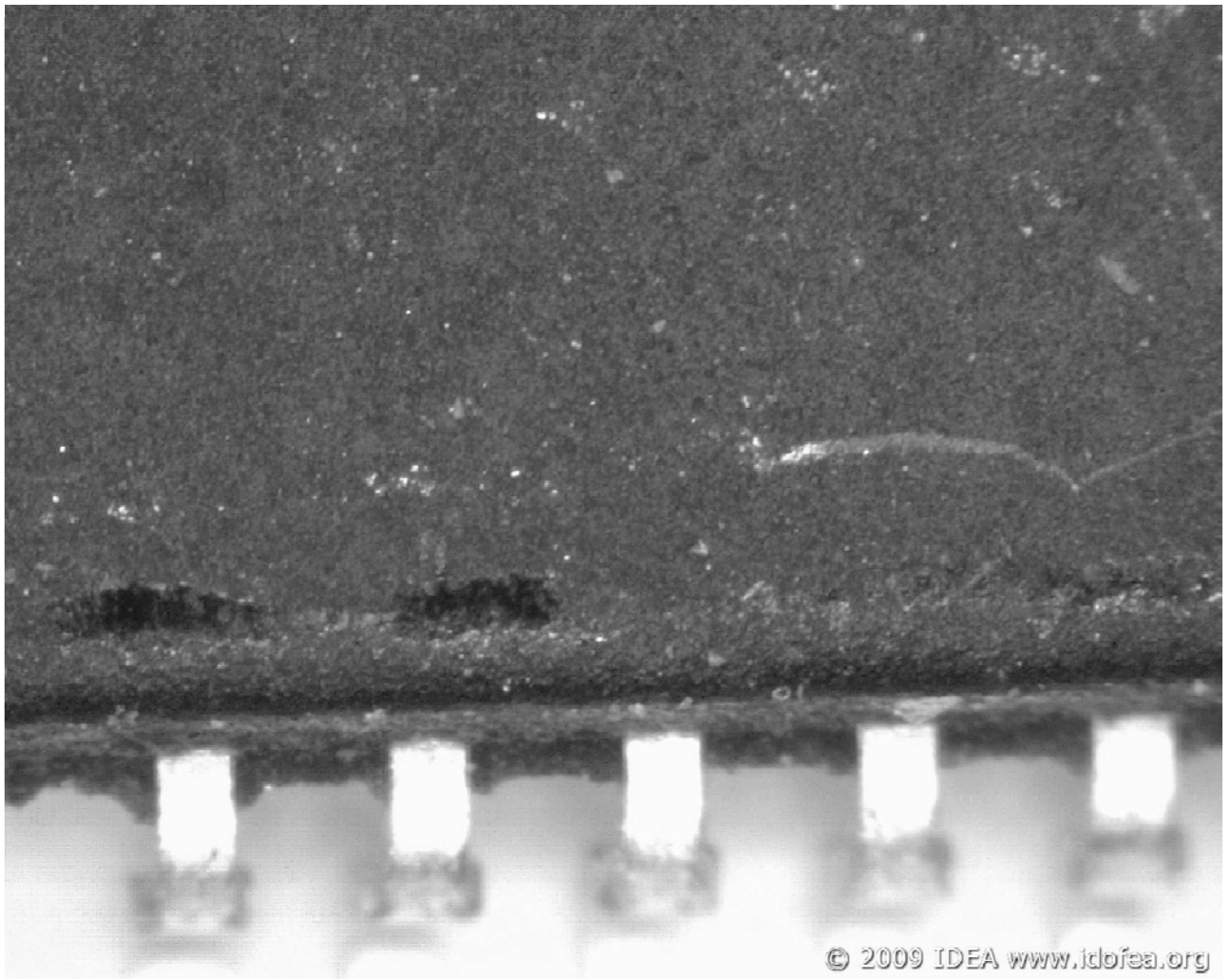
Part #6 – BCM5325A2KQM

Debris

Part #6 – BCM5325A2KQM

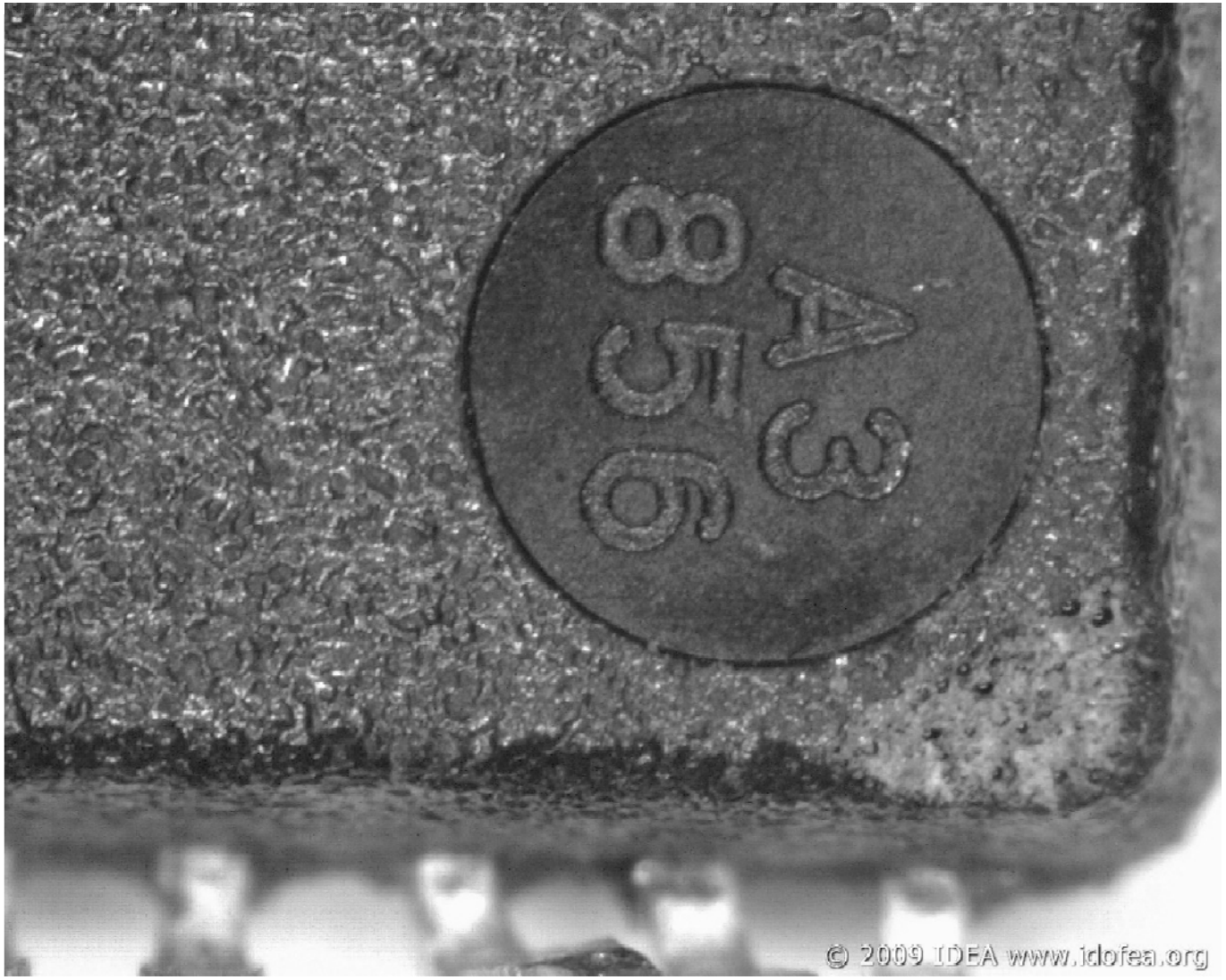
Fails – Blacktop test

Part #7 – MT48LC4M32B2



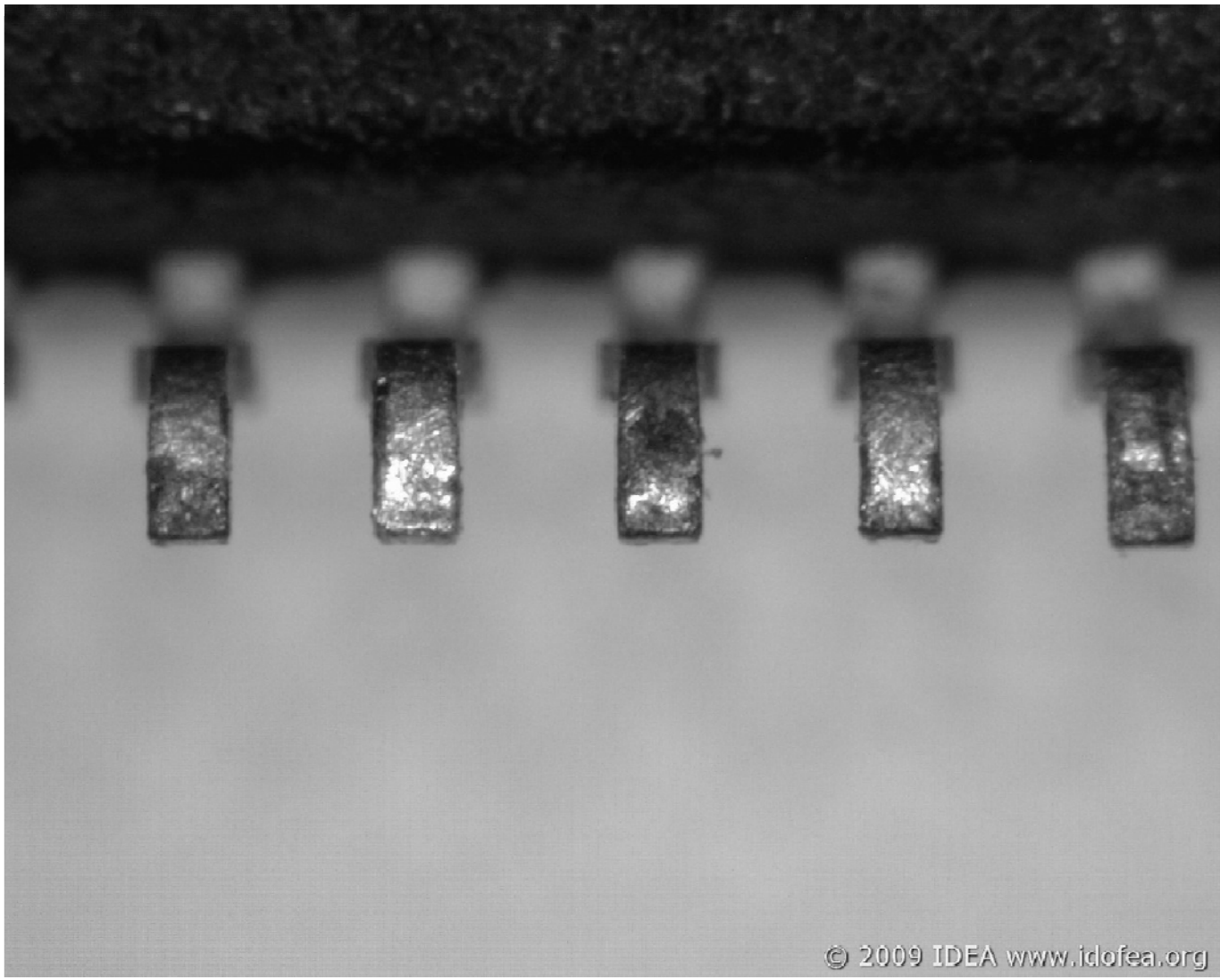
Debris and scratches

Part #7 – MT48LC4M32B2



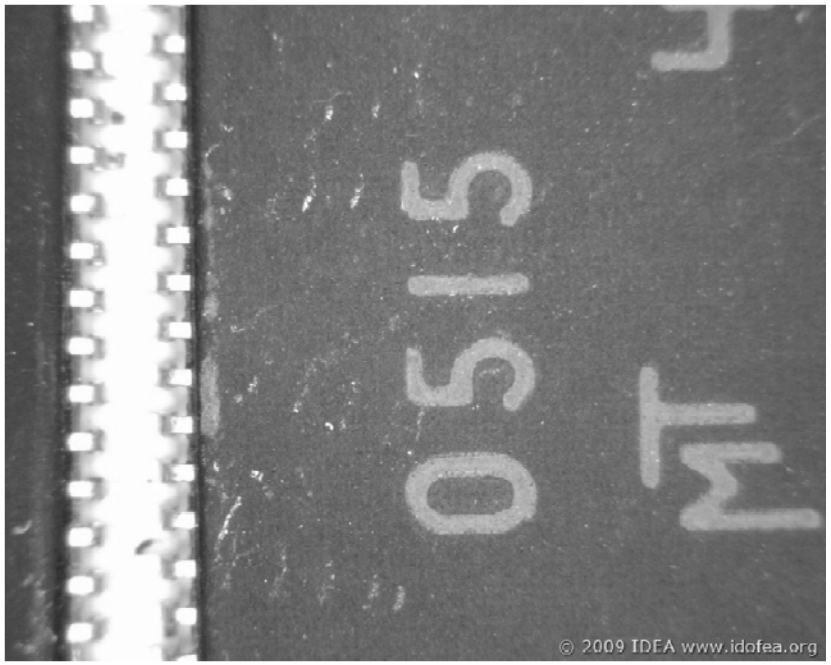
Contamination

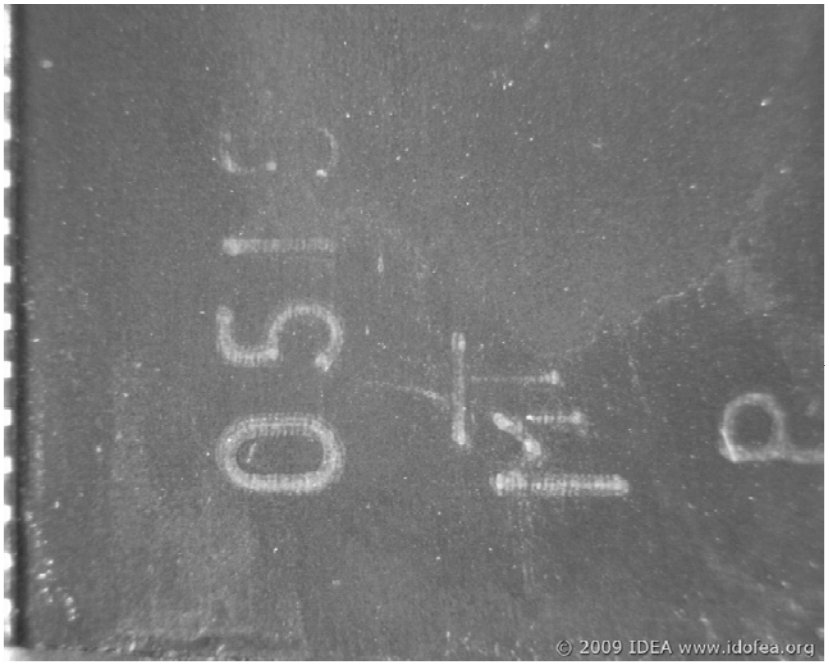
Part #7 – MT48LC4M32B2



Contamination

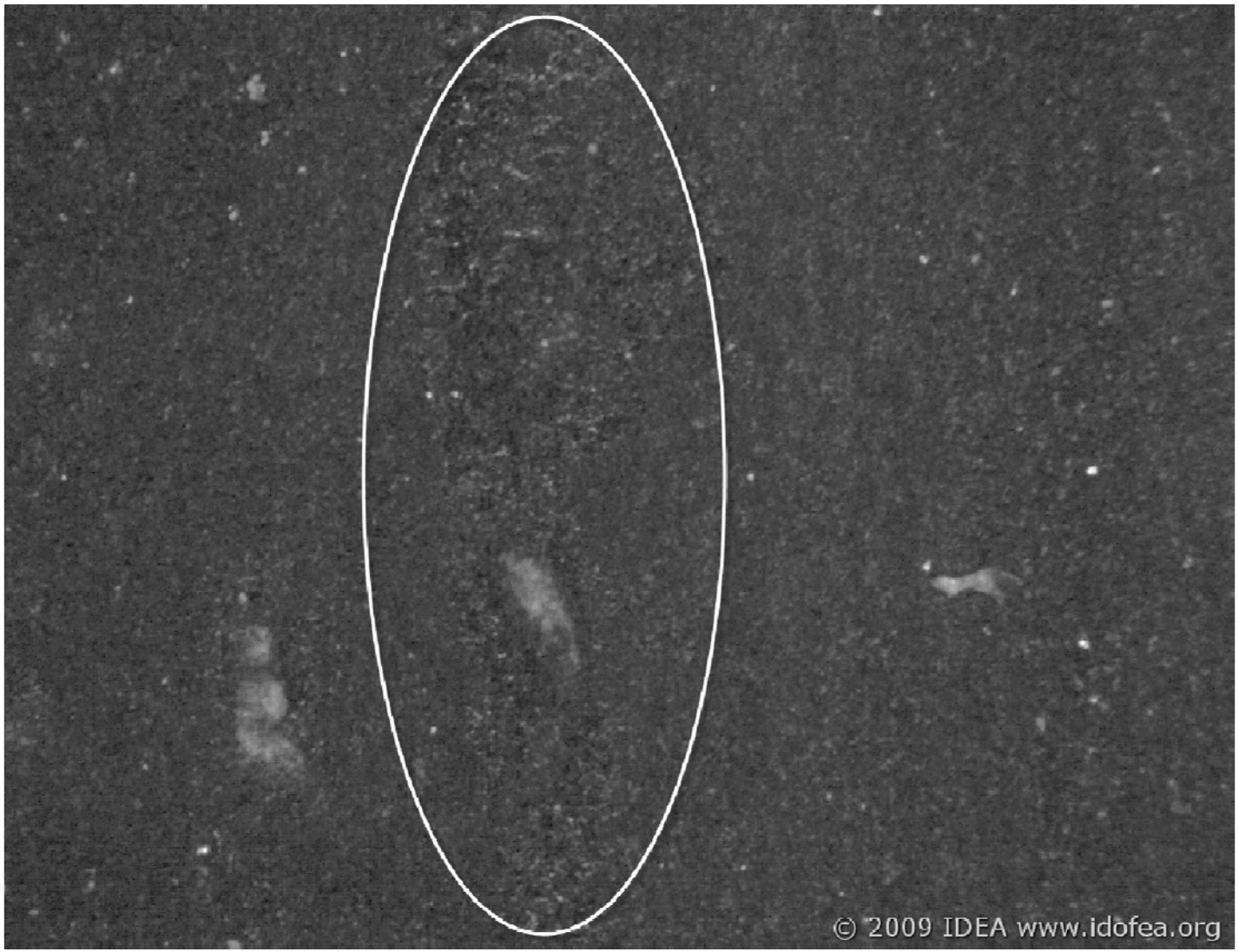
Part #7 – MT48LC4M32B2





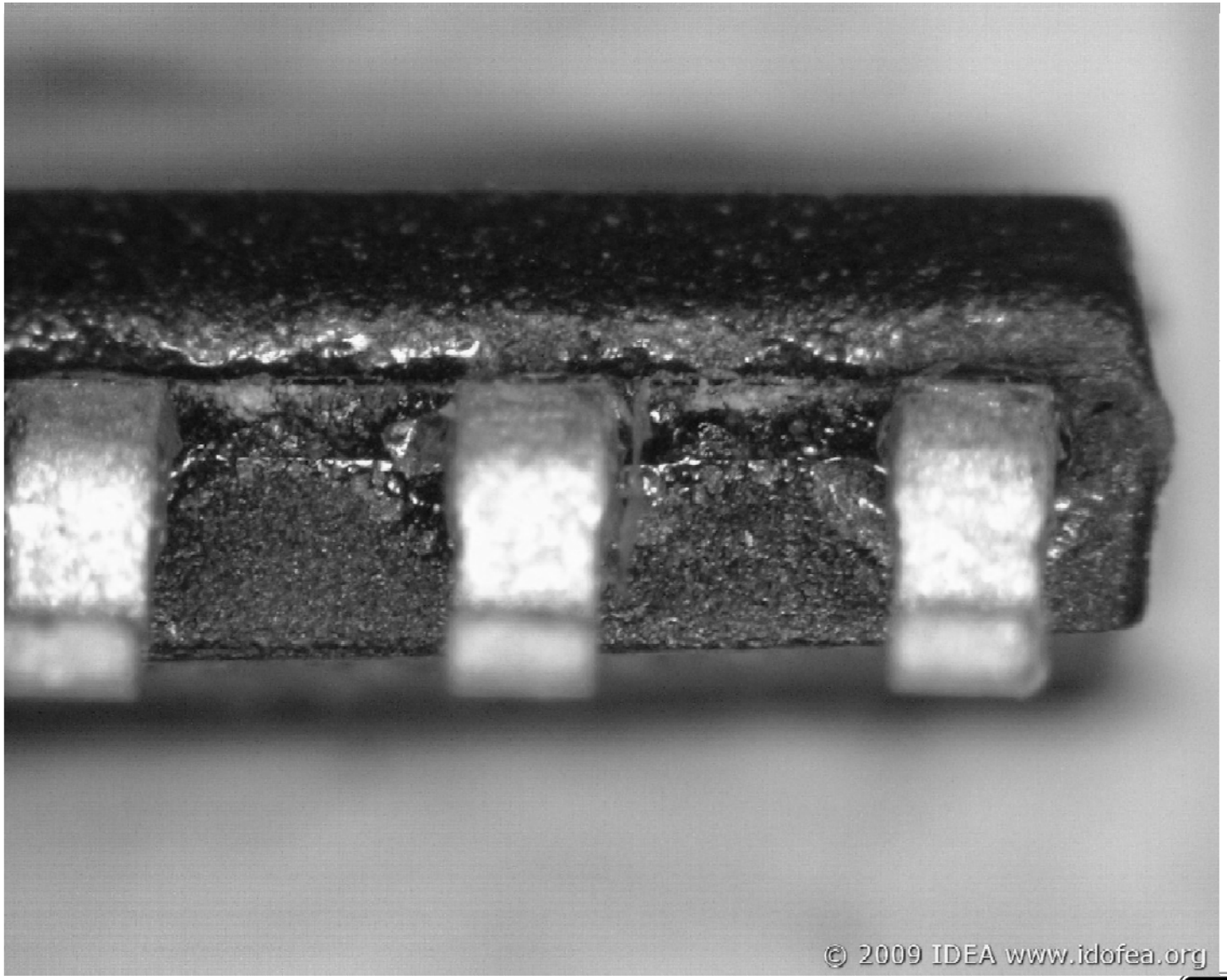
Fails-Blacktop test

Part #7 – MT48LC4M32B2



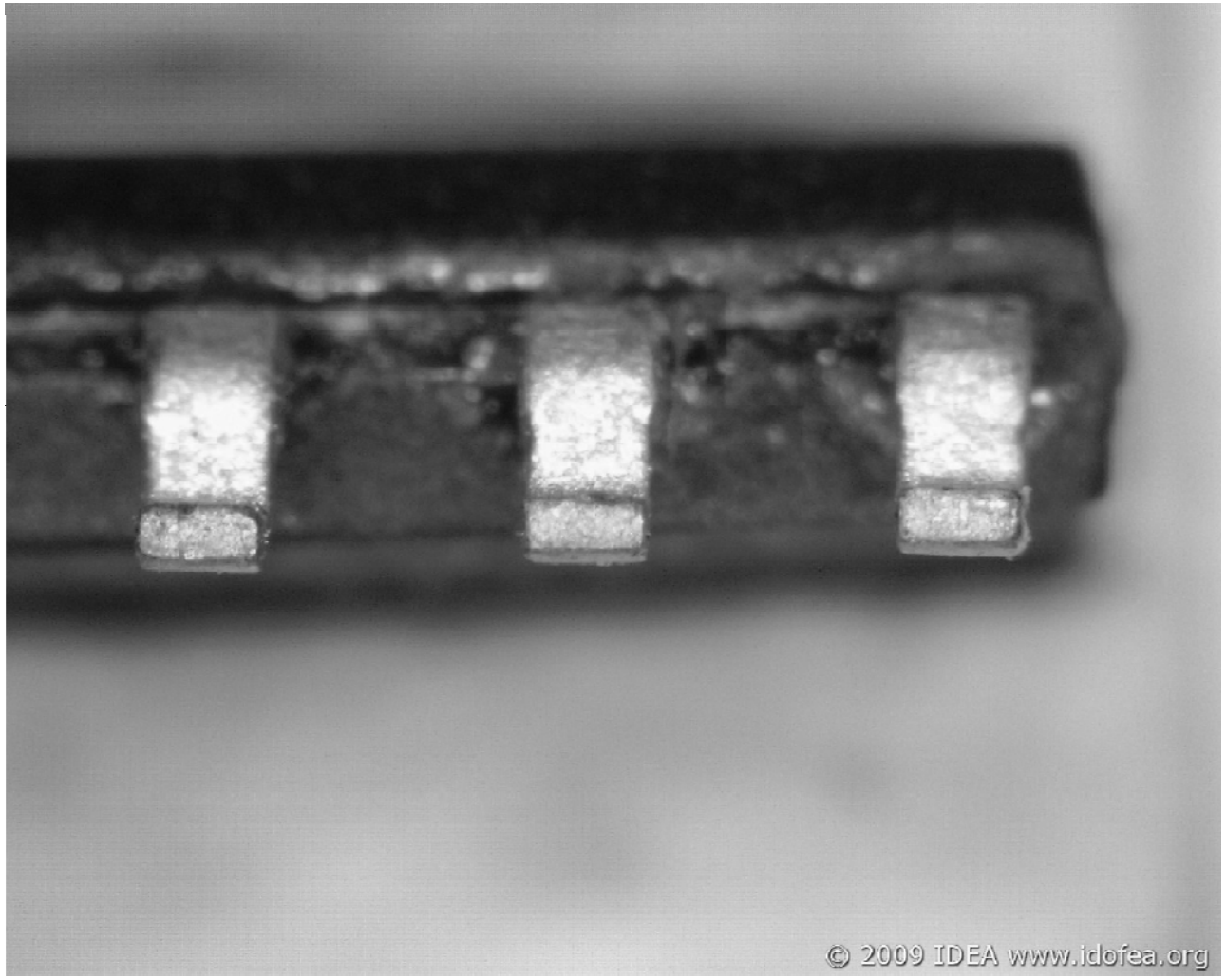
Removed Black-top

Part #8 – MAX406A



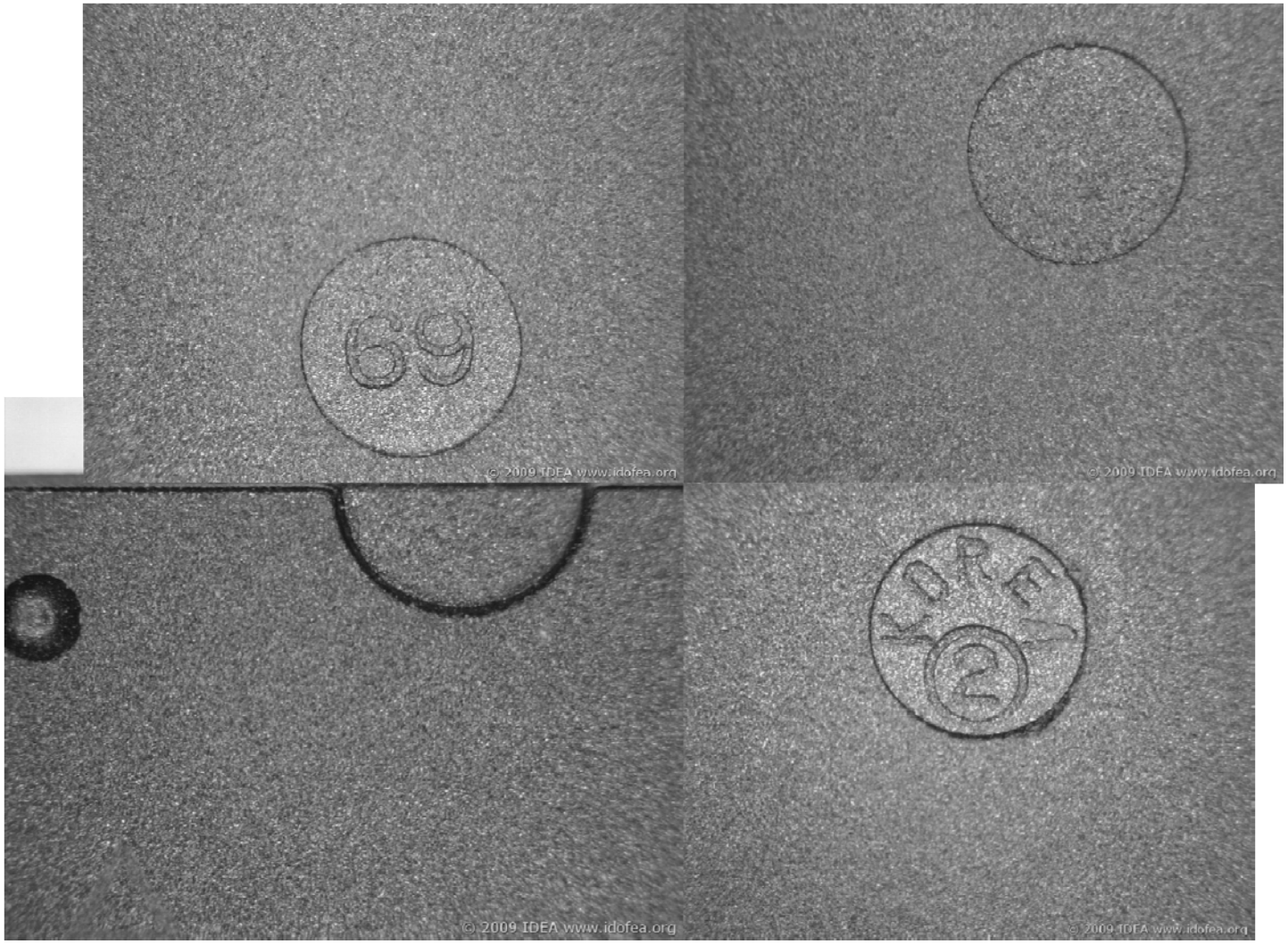
Contamination

Part #8 – MAX406A



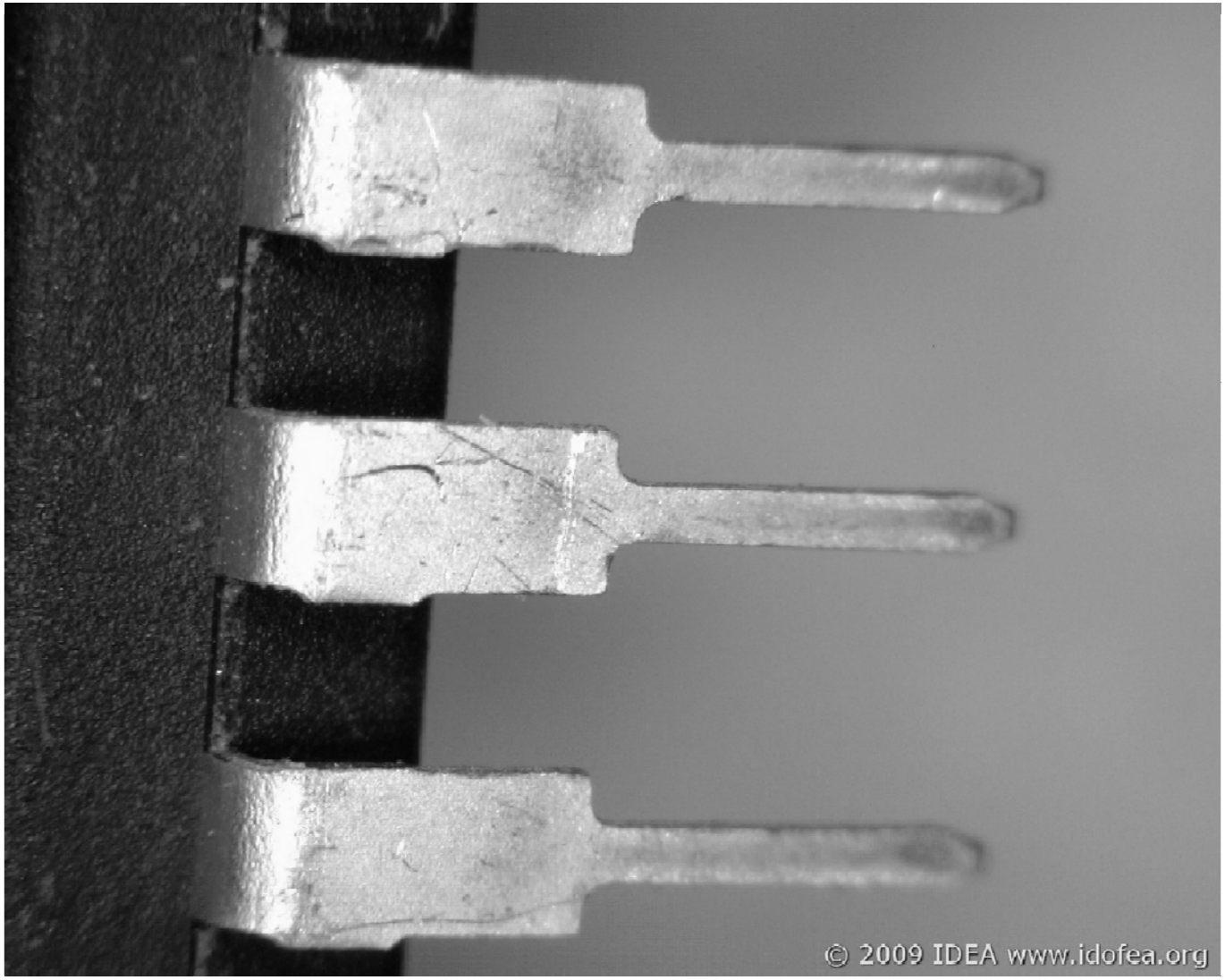
Base metal not visible, indication of prior use

Part #9 – AT29C010A



Same lot, three different part markings

Part #9 – AT29C010A



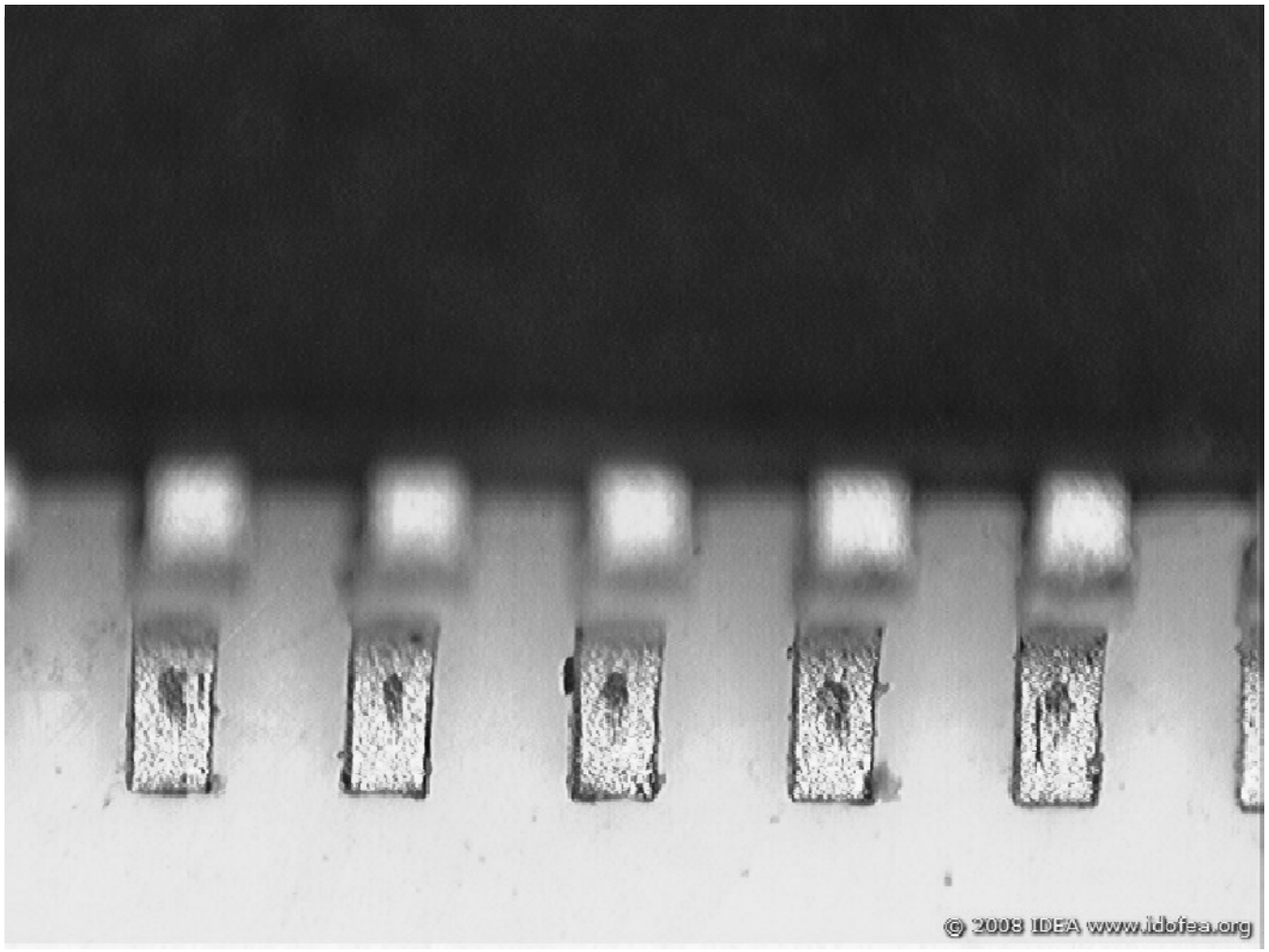
Poor handling

Part #10 – AM29DL323DT

Crude ablation/erosion marking process

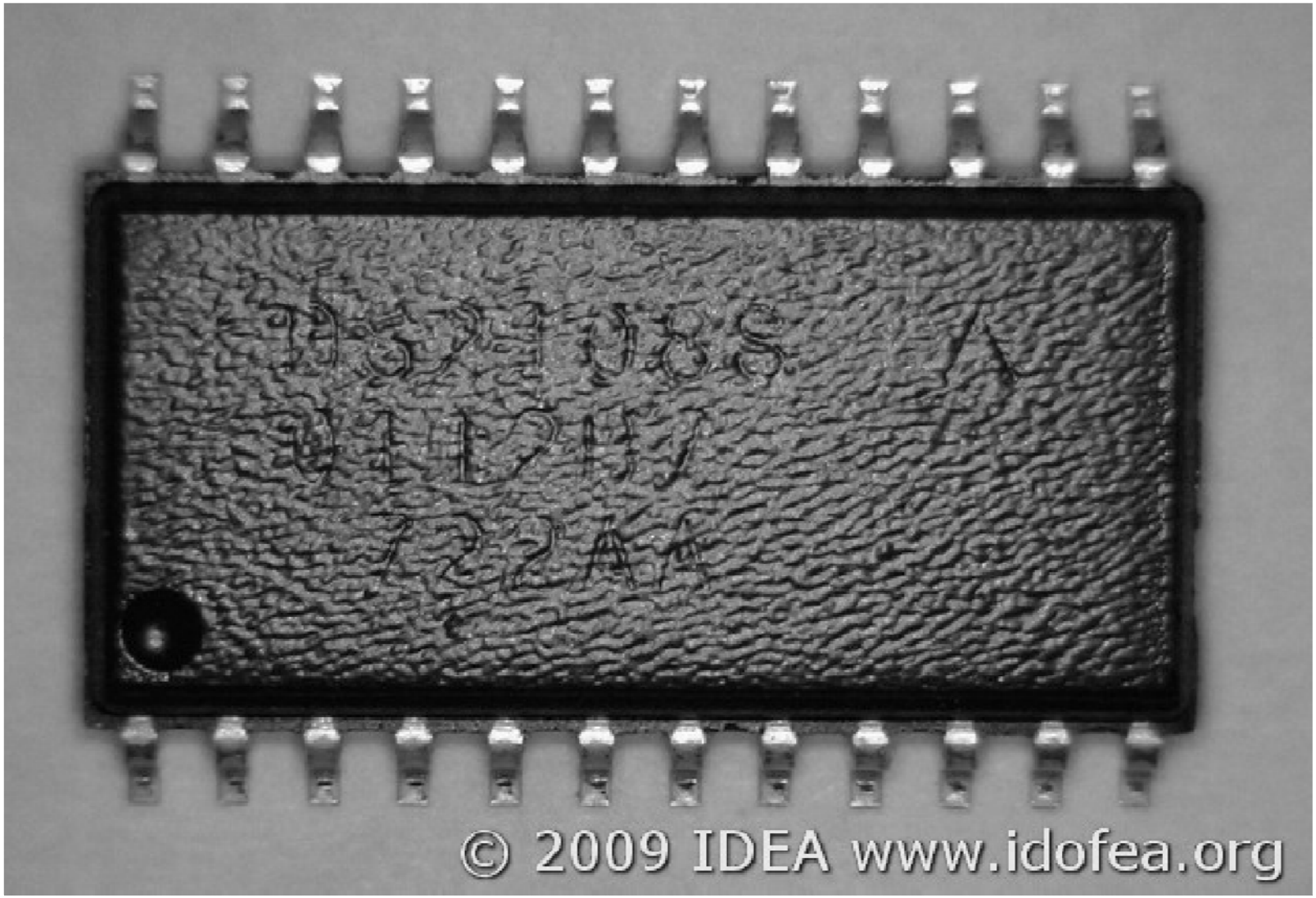
Part #10 – AM29DL323DT

Part #10 – AM29DL323DT

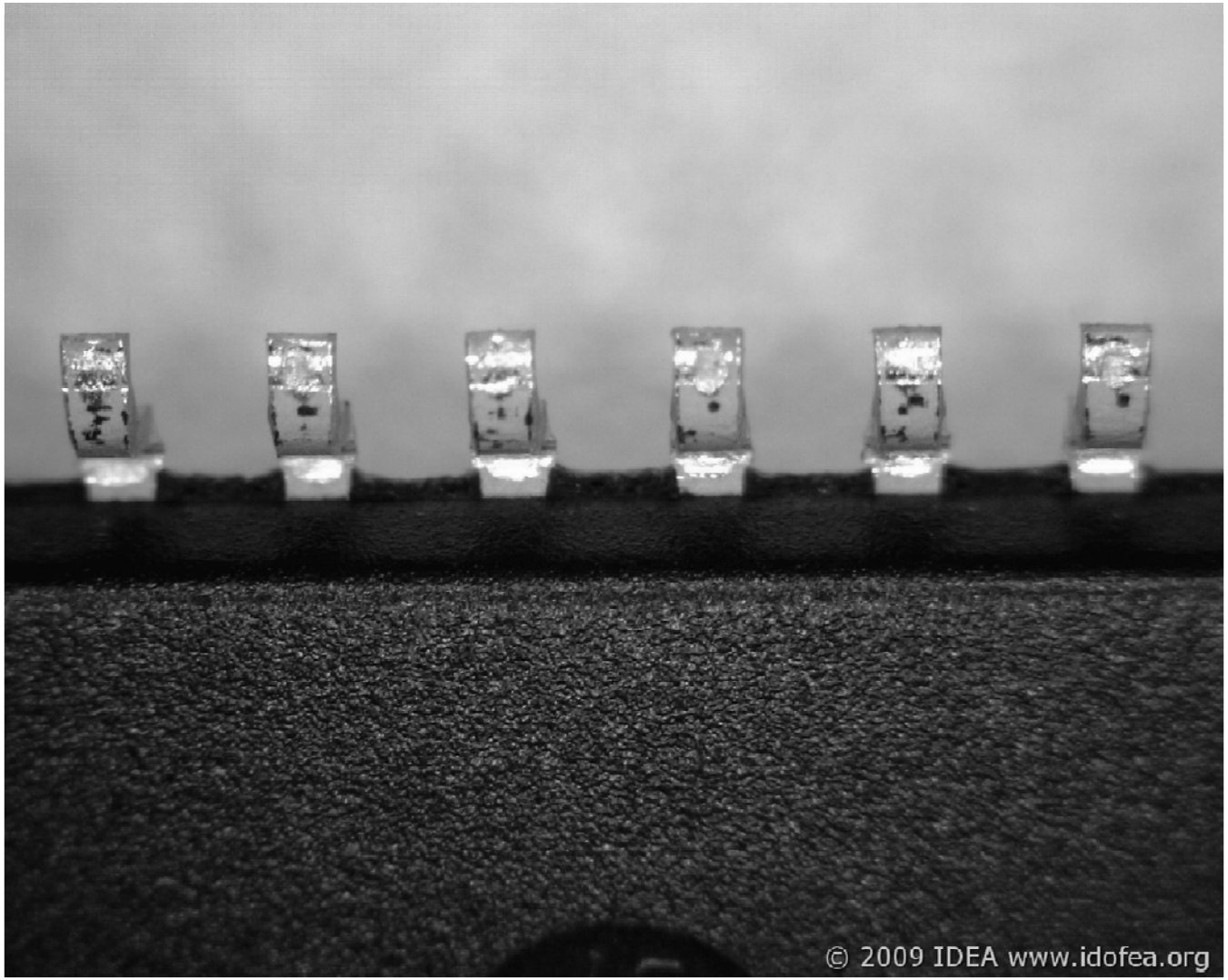


Test witness marks can be acceptable,
Contamination not acceptable

Part #11 – DS2108S



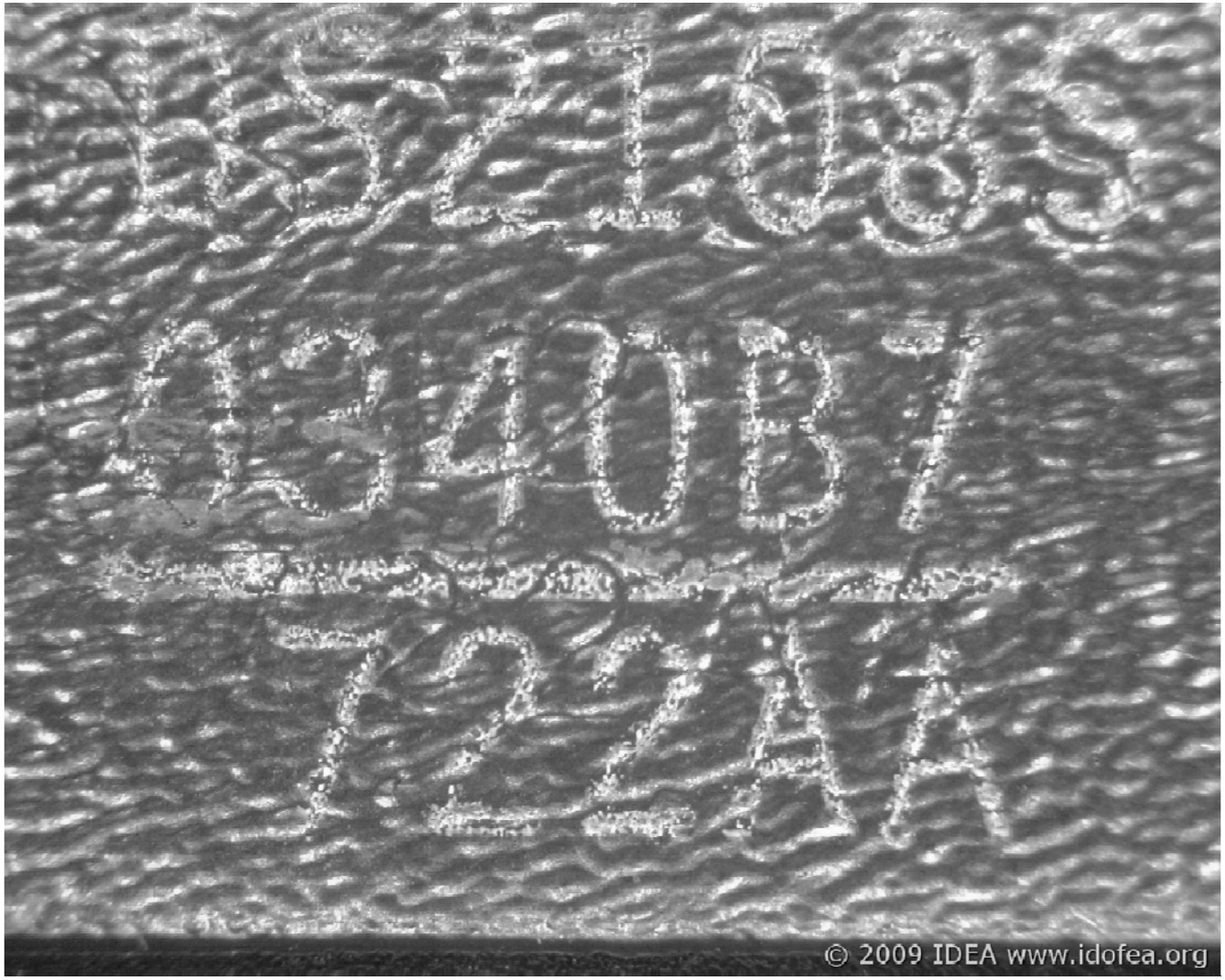
Part #11 – DS2108S



Contaminated leads

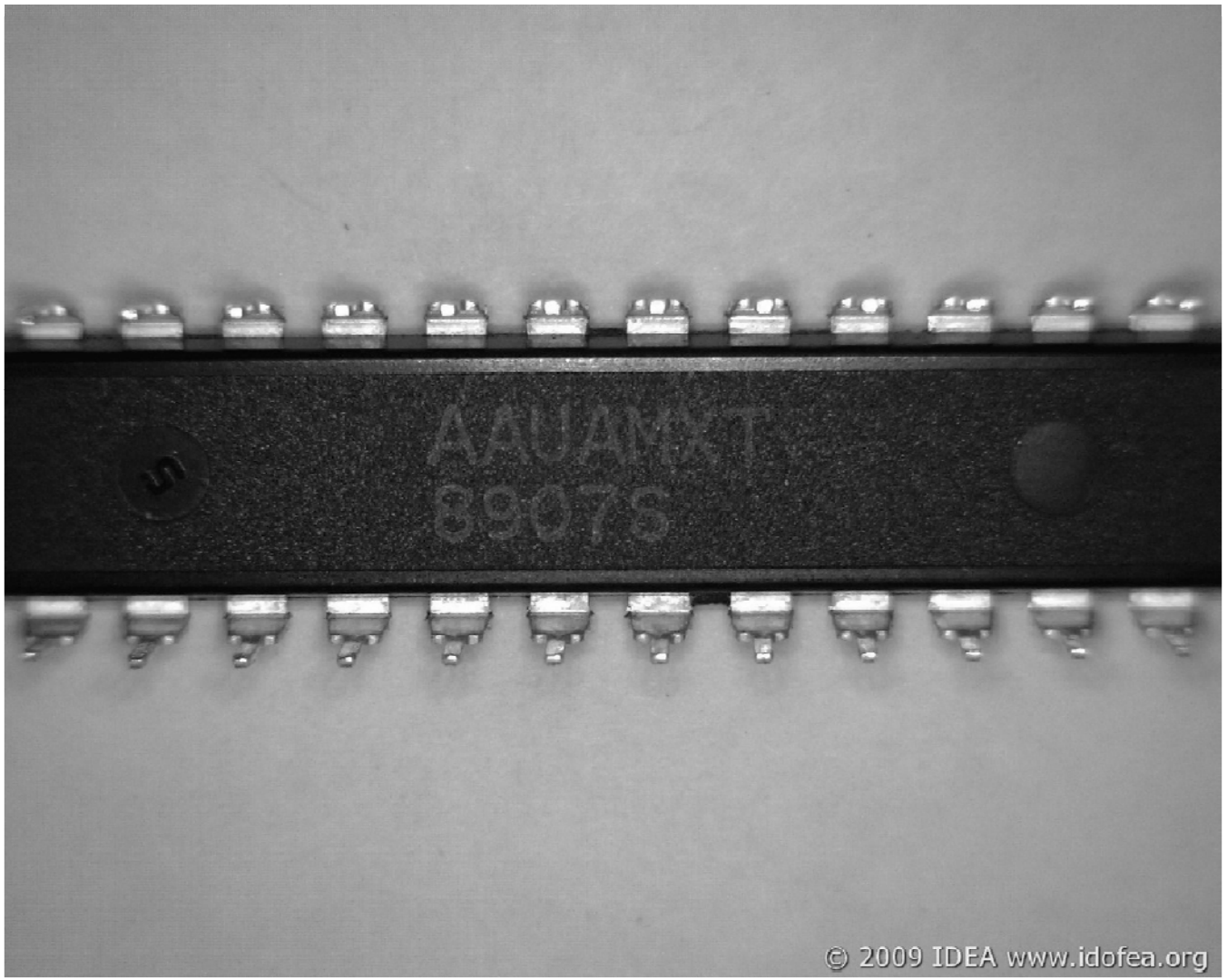
Part #11 – DS2108S

Part #11 – DS2108S



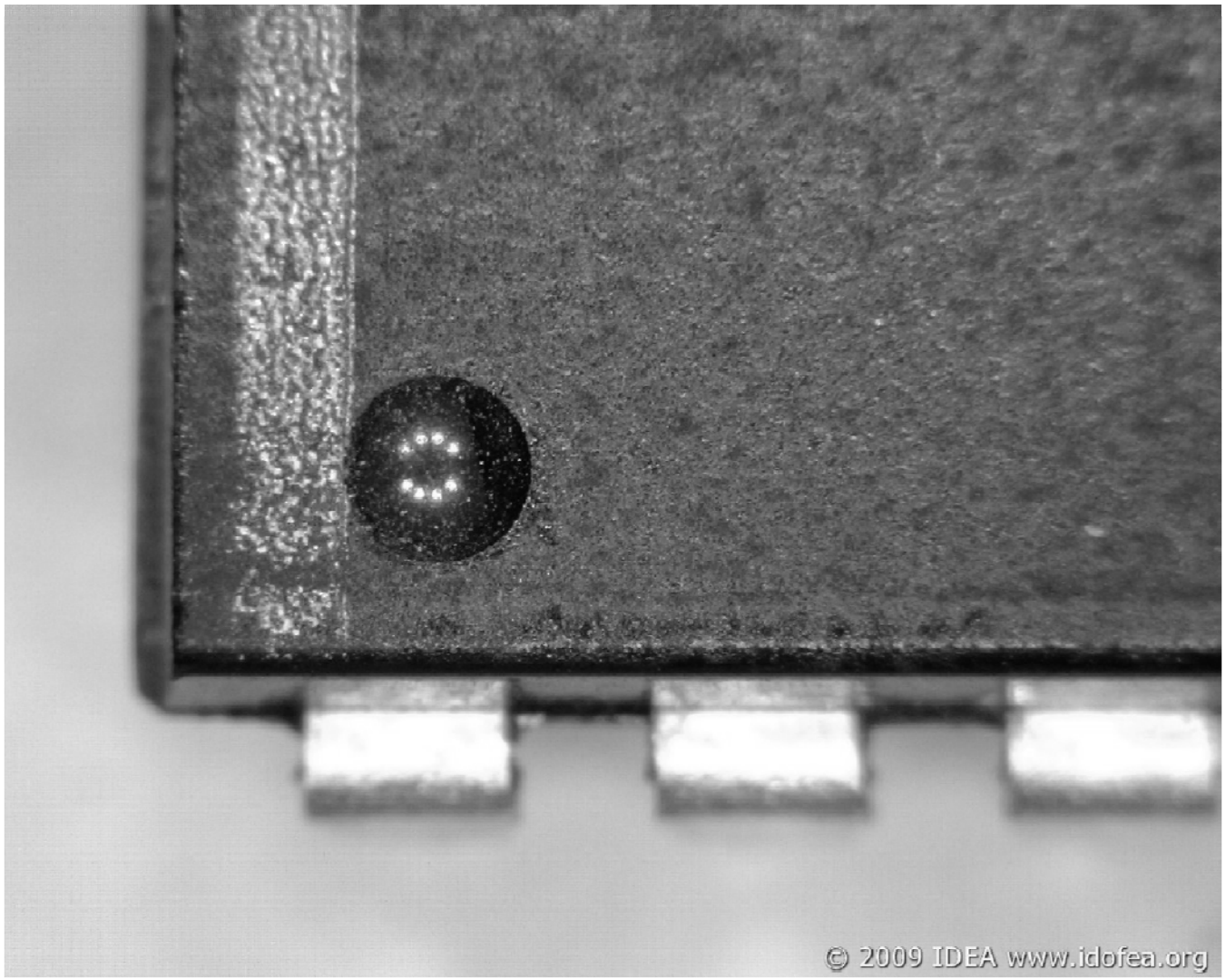
Double Marking; Magnification 70X

Part #12 – MAX173CNG



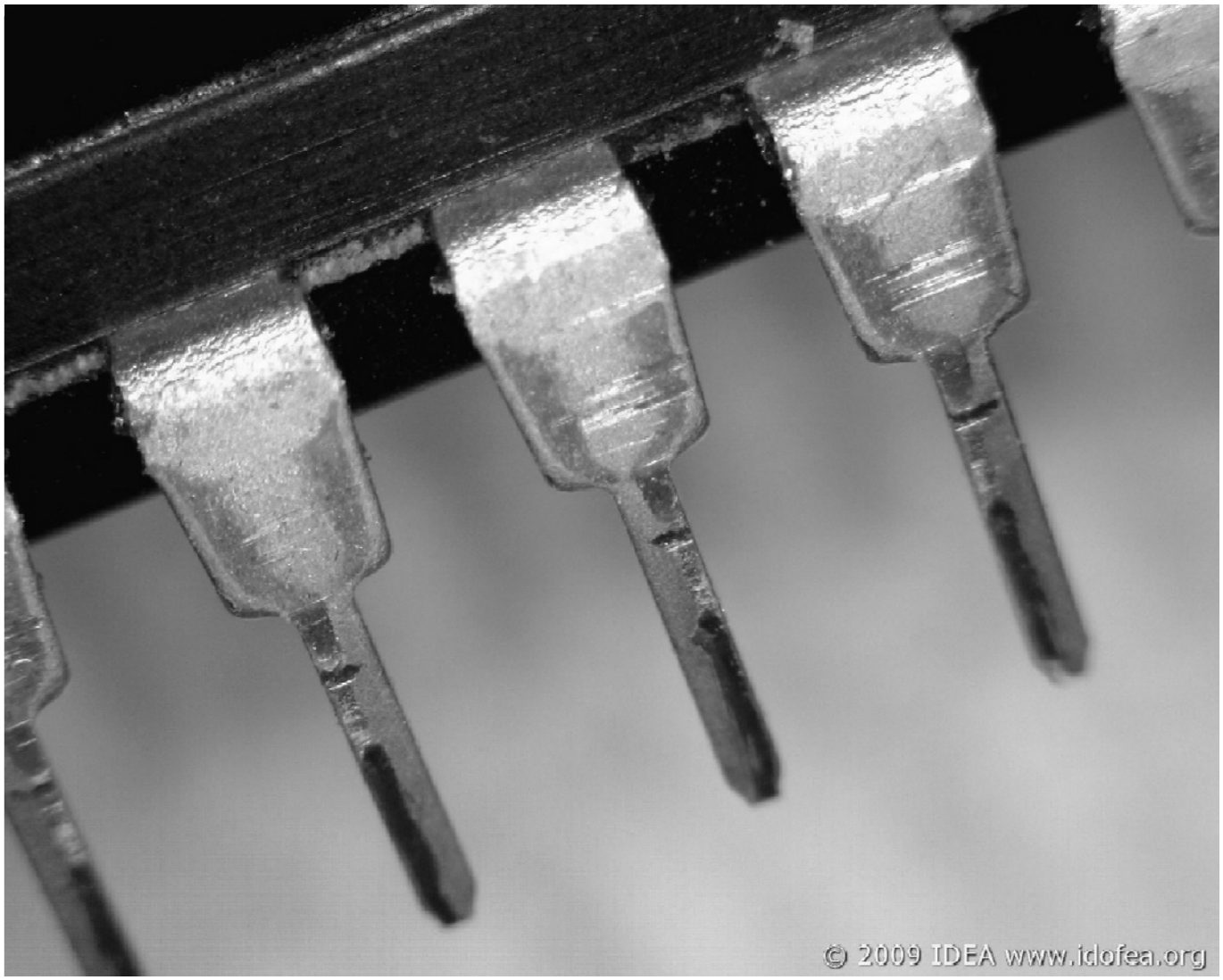
Bottom side texture different from the top

Part #12 – MAX173CNG



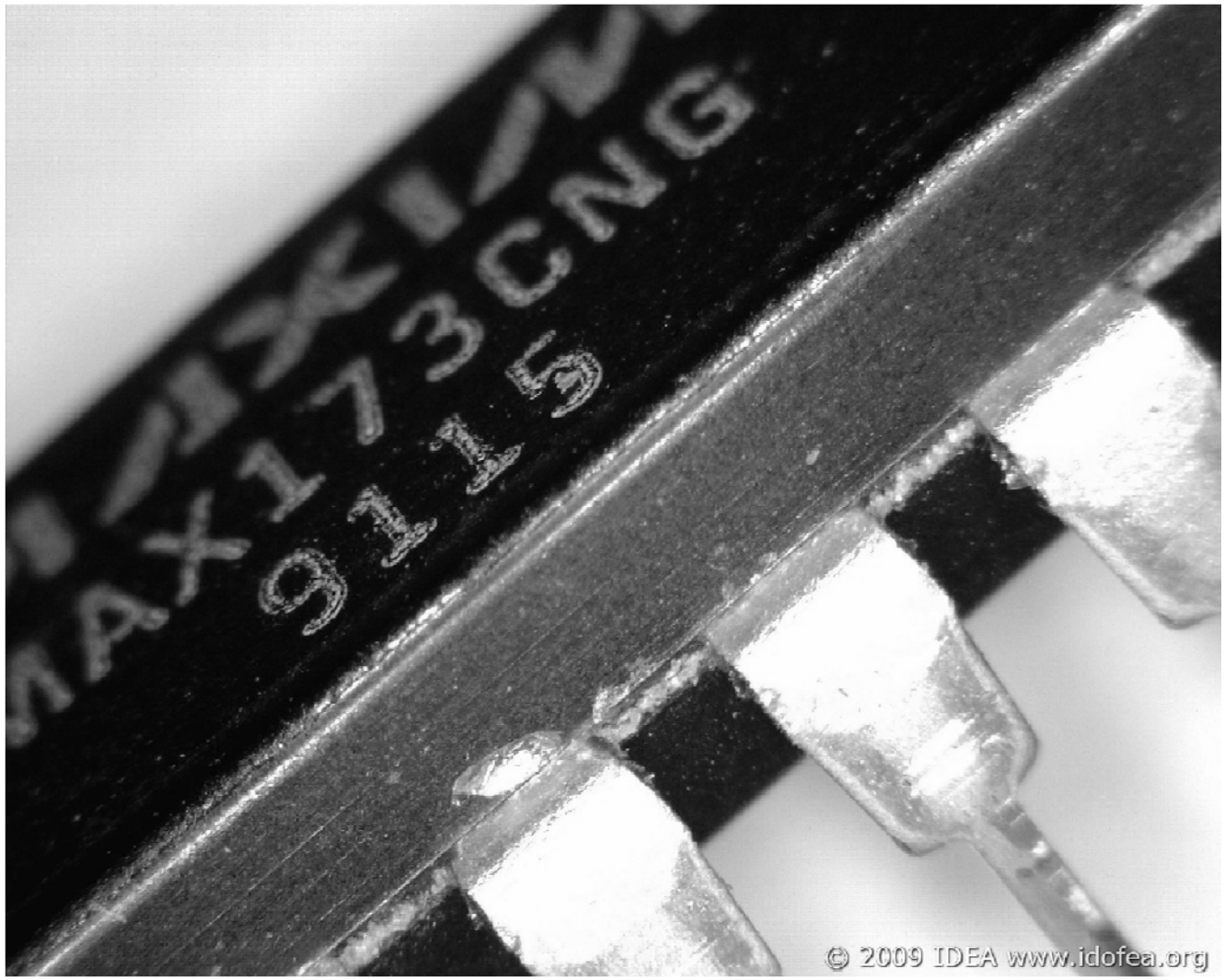
What do you see?

Part #12 – MAX173CNG



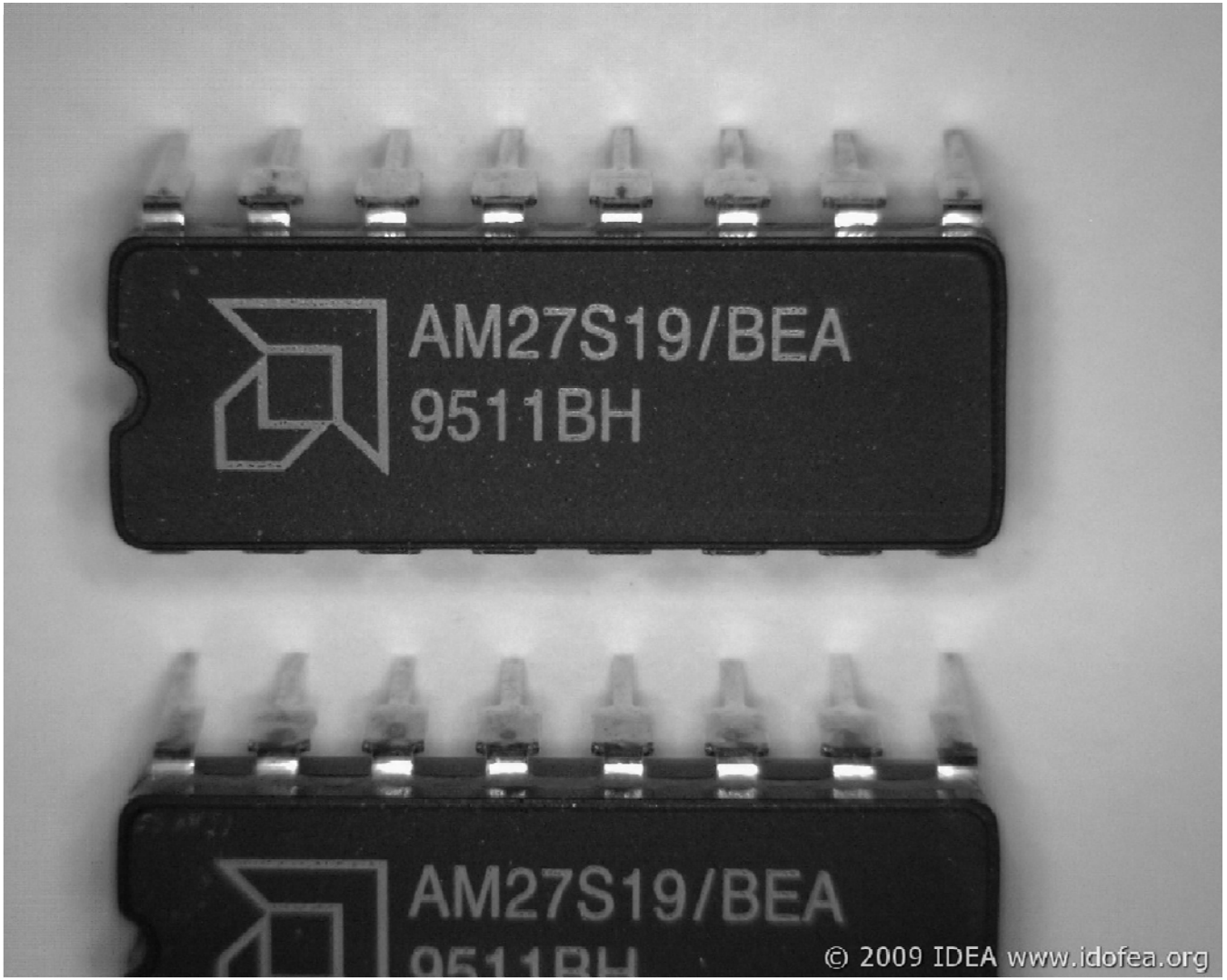
Evidence of prior use

Part #12 – MAX173CNG



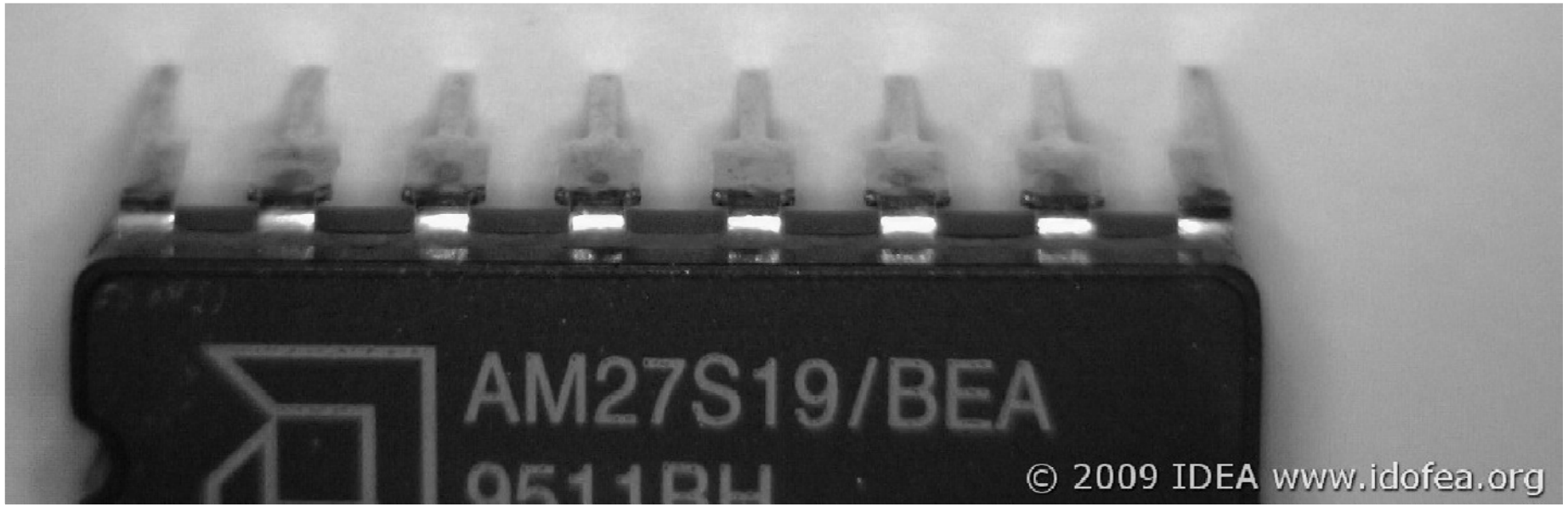
Contamination? Flux residue?

Part #13 – AM27S19/BEA



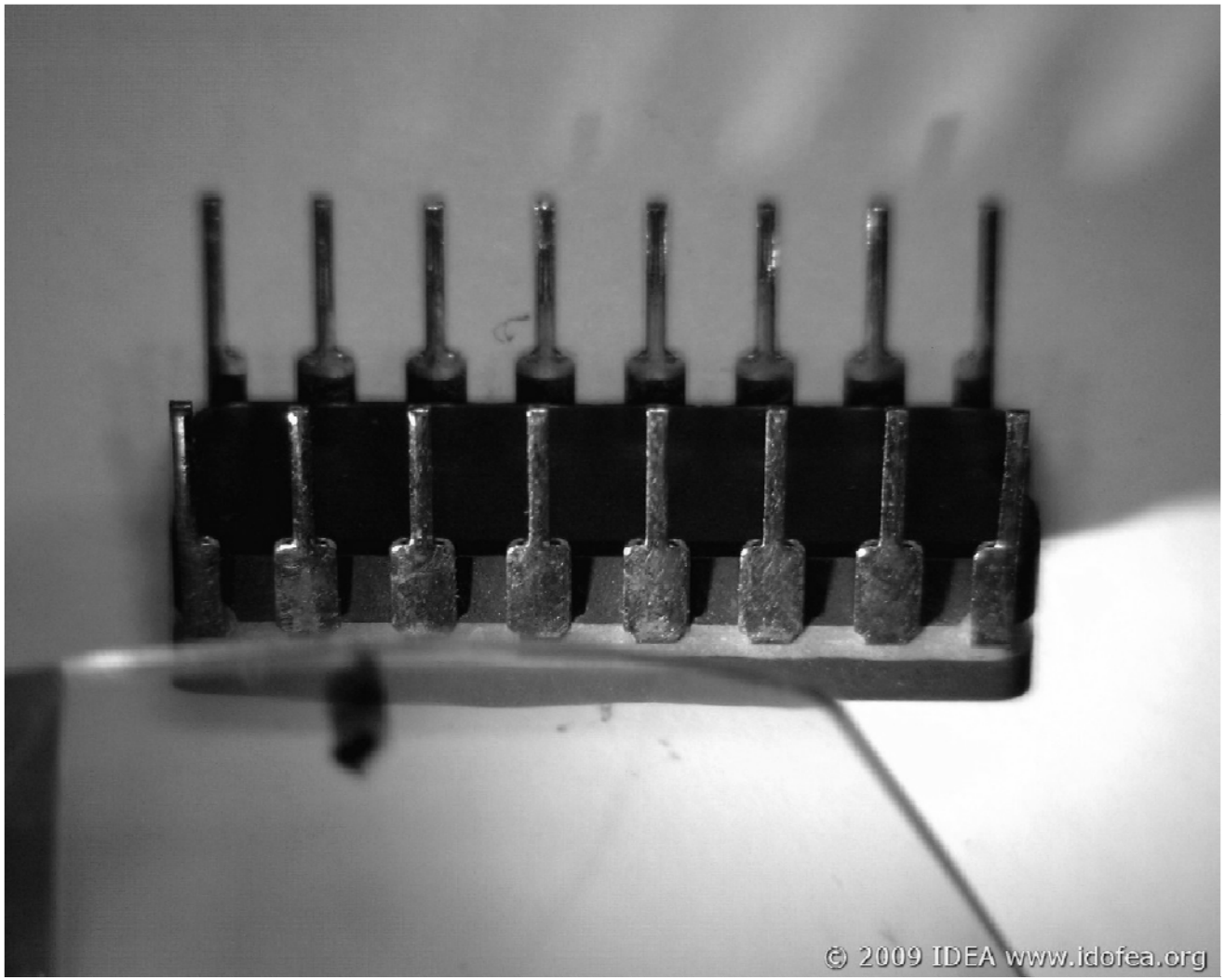
Excessively bright leads, for a 1995 Date Code

Part #13 – AM27S19/BEA



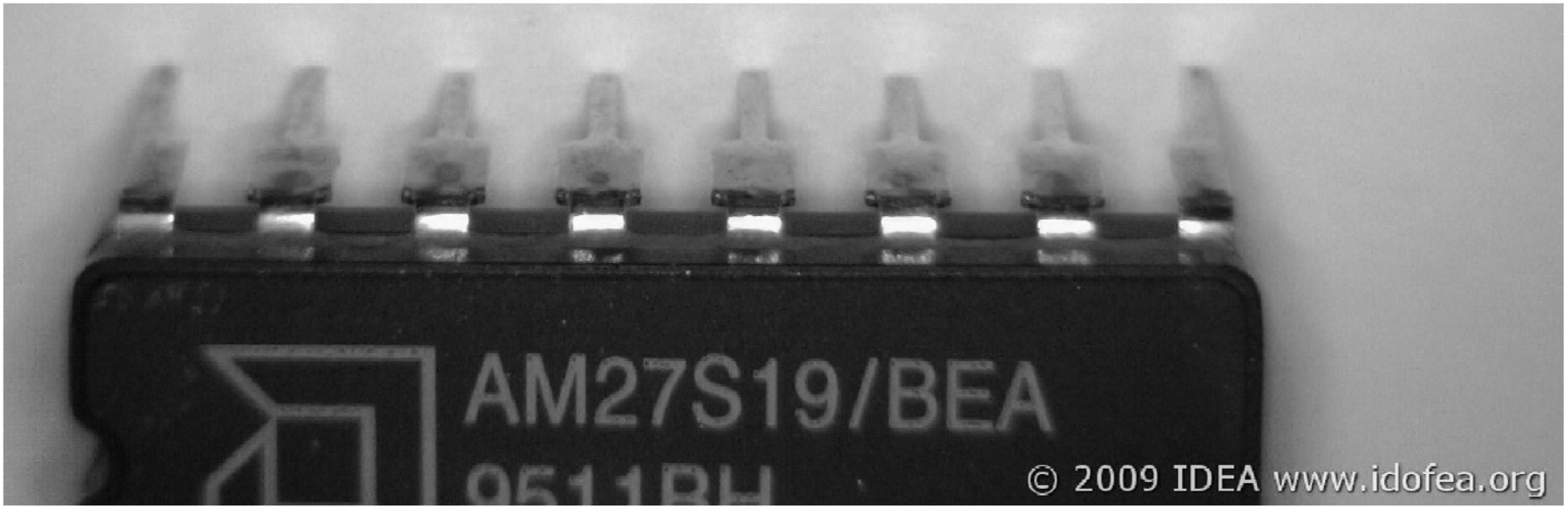
Leads appear thick with solder

Part #13 – AM27S19/BEA



Multi-directional scratches in the finish of the leads

Part #13 – AM27S19/BEA



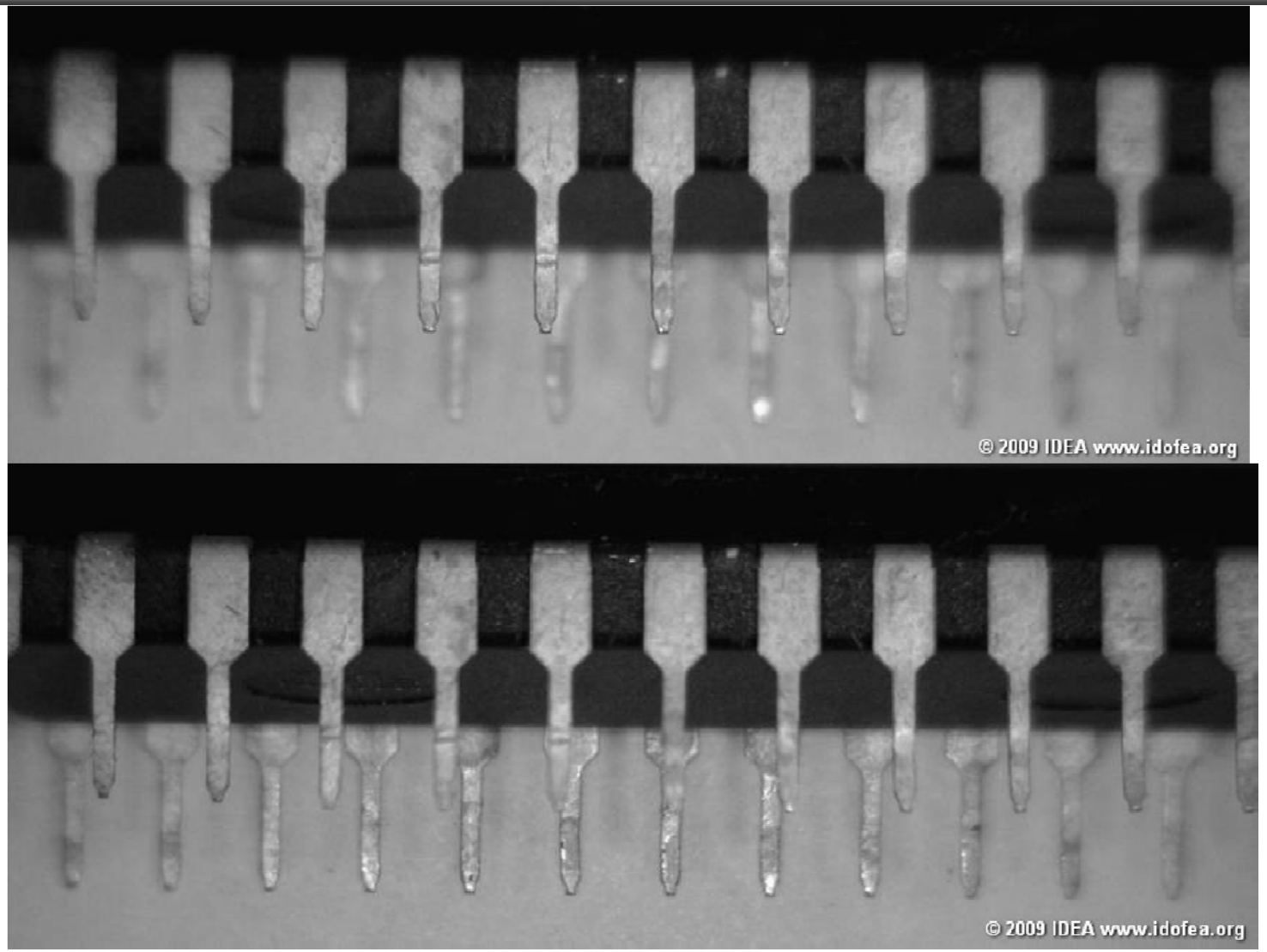
Donor reports:

Sent parts out for DeCap.

Found AMD part w/Motorola Die

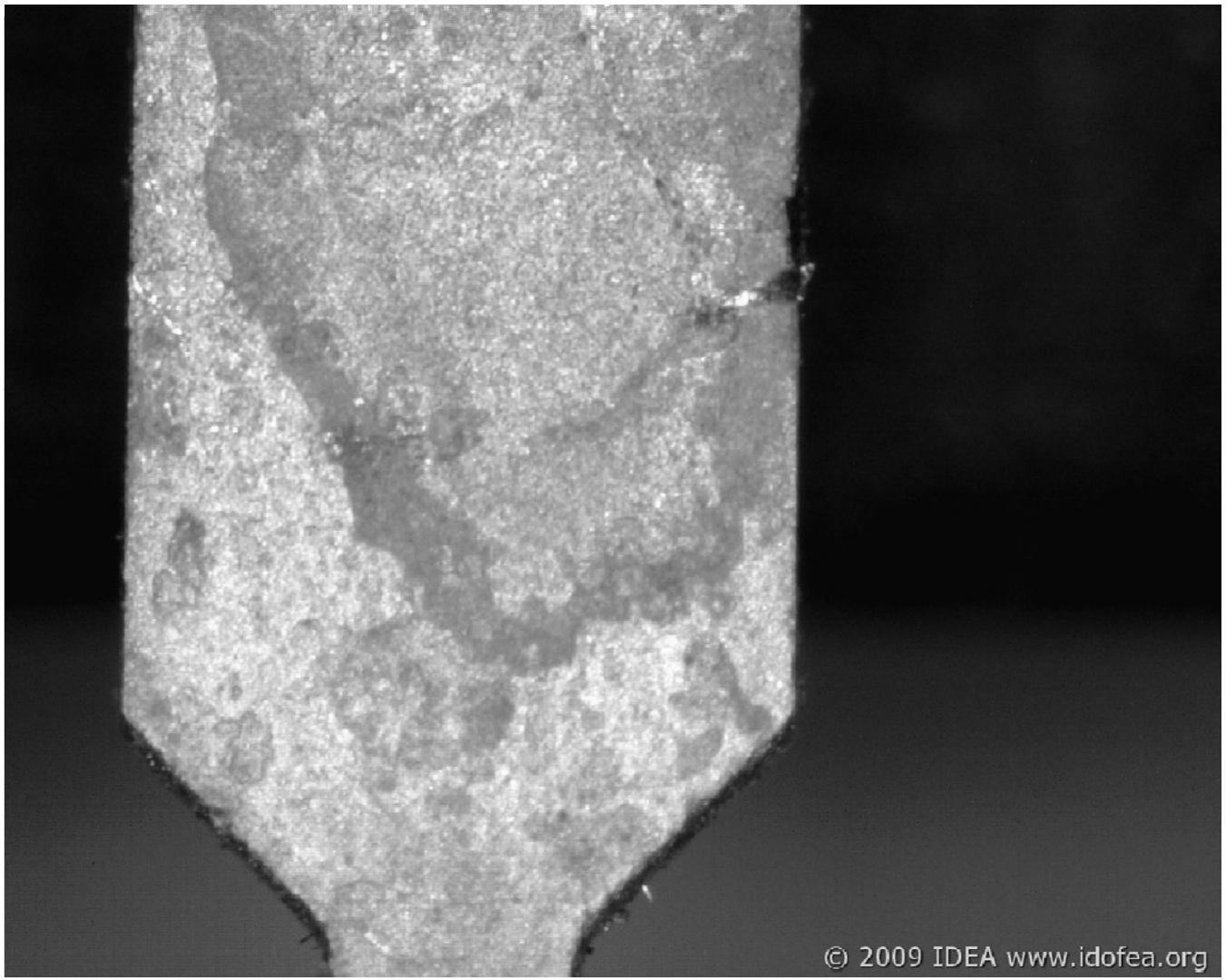
Suspect Fraud/Counterfeit

Part #14 – LH5164A-10L



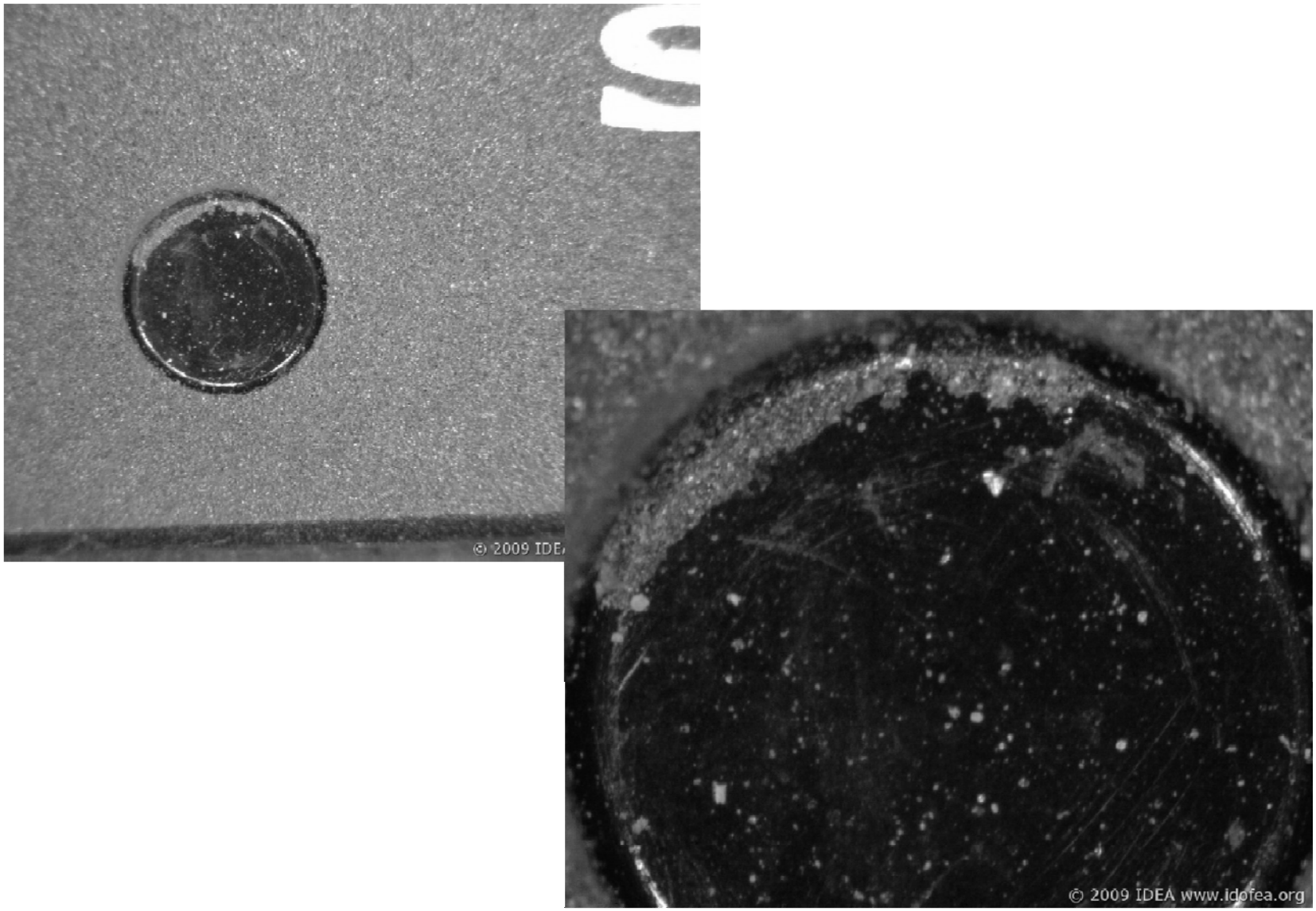
Damaged leads

Part #14 – LH5164A-10L



Corrosion of lead

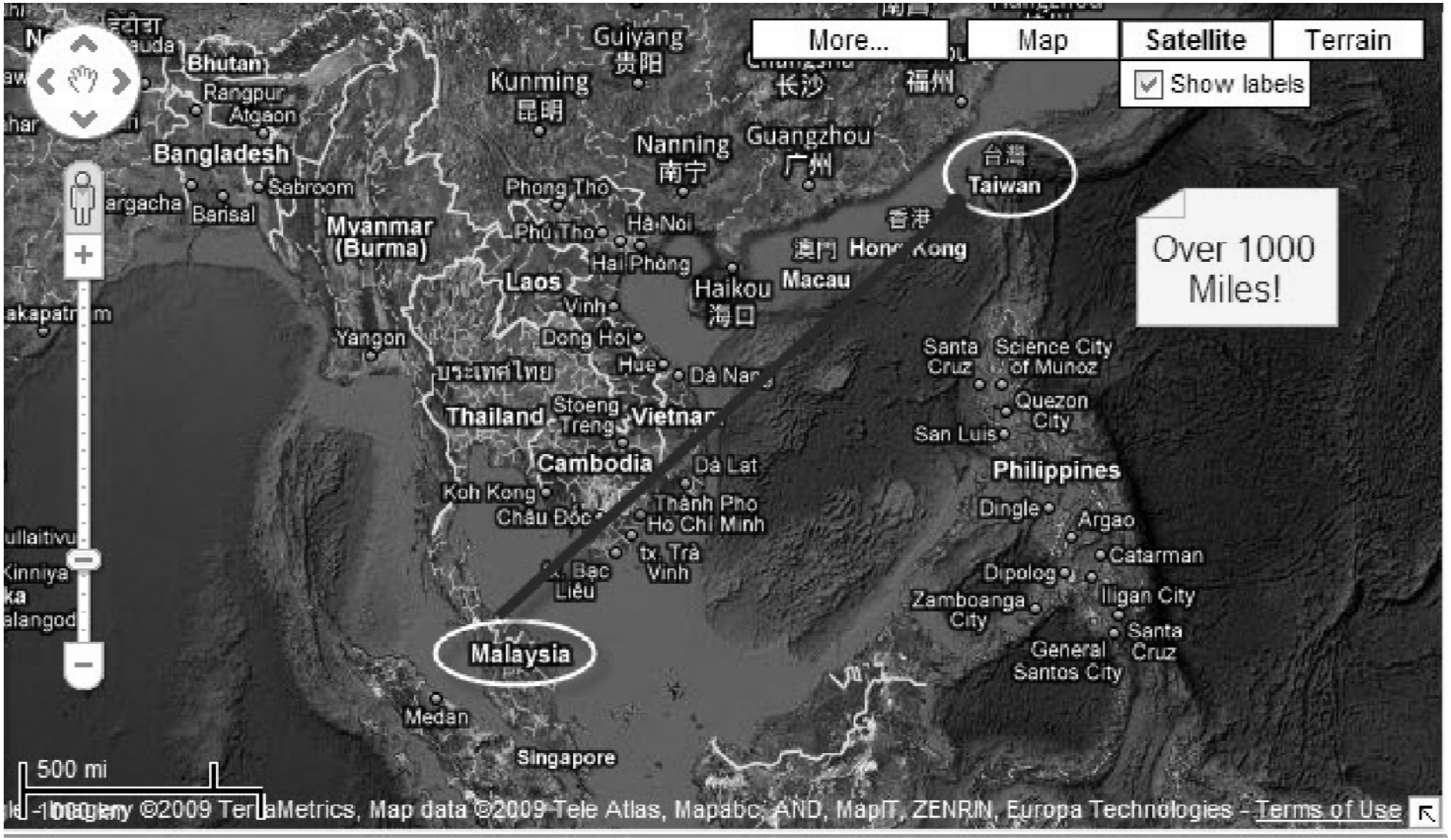
Part #14 – LH5164A-10L



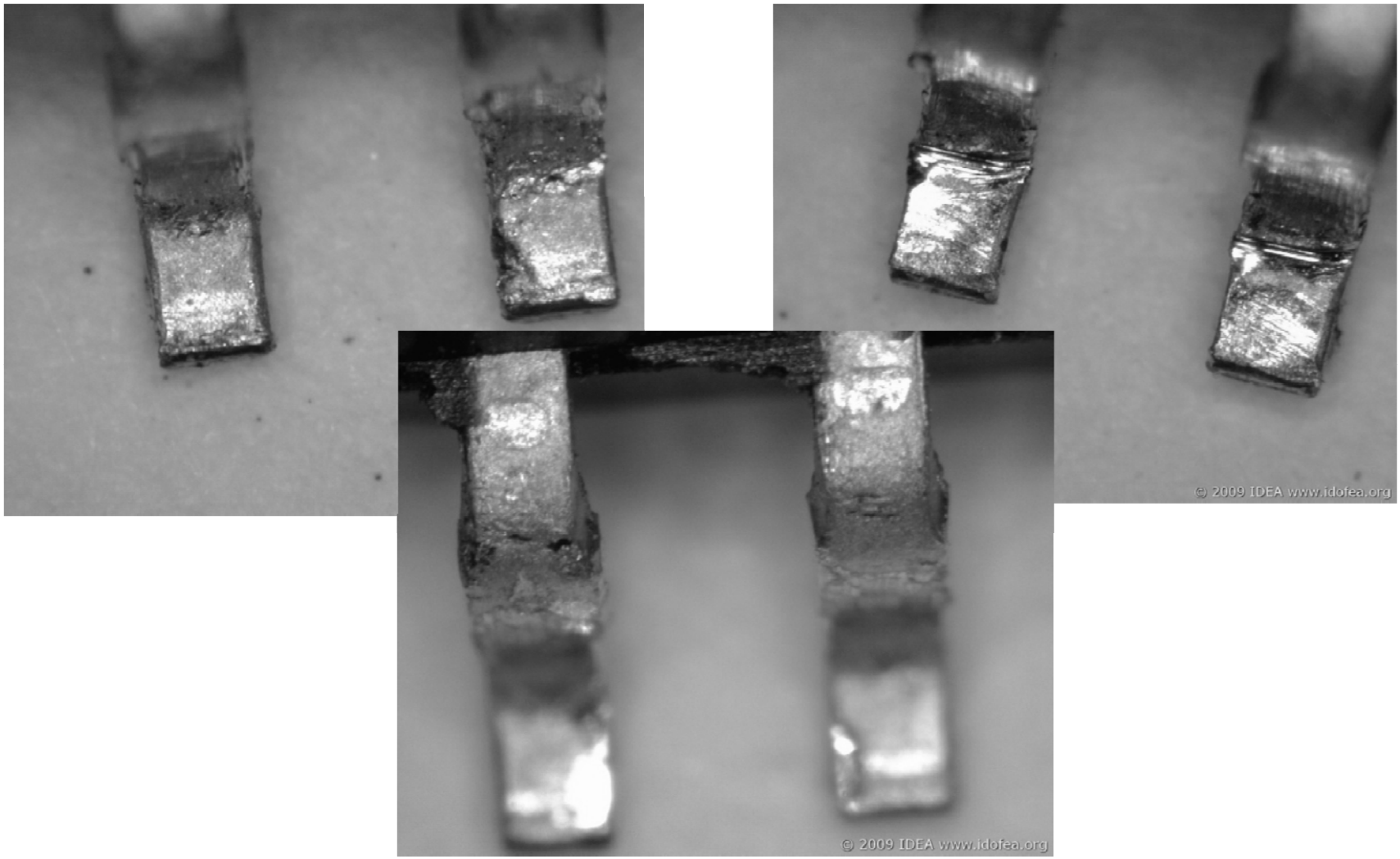
Part #17 – STV5730A

Two different Countries of Origin?

Part #17 – STV5730A

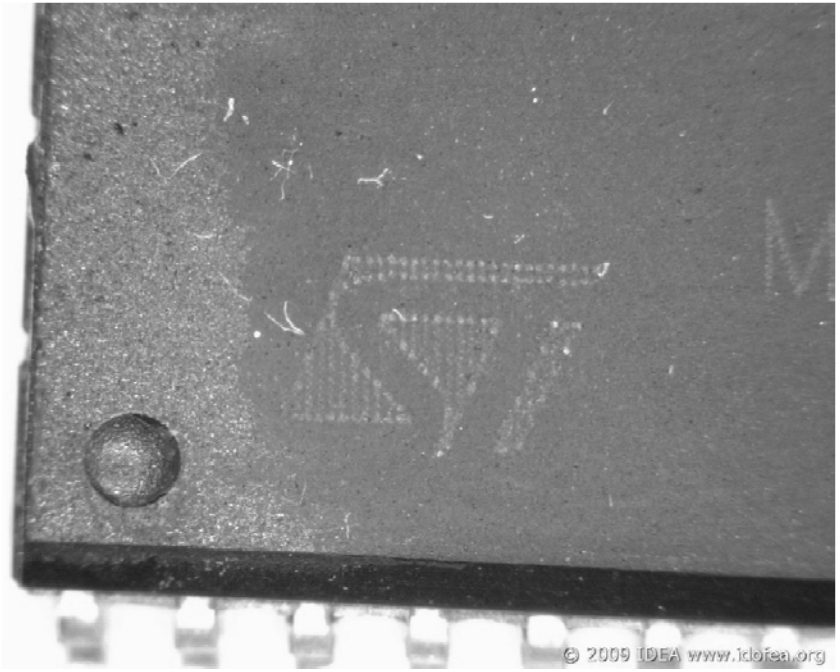


Part #17 – STV5730A



Excessive witness marks

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

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.