



Counterfeit Electronic Parts

NASA/ESA/JAXA

Trilateral Safety and Mission Assurance Conference

- April 2008 -

Brian Hughitt
NASA Headquarters
Office of Safety and Mission Assurance



What are Counterfeit Parts?

Electronics Manufacturing Industry

- **Substitutes or unauthorized copies**
- **A part in which the materials used or its performance has changed without notice**
- **A substandard component misrepresented by the supplier**

Electronics Distributor Industry

- **Items that are produced or distributed in violation of intellectual property rights, copyrights, or trademark laws**
- **Items that are deliberately altered in such a way as to misrepresent the actual quality of the item with intent to defraud or deceive the purchaser.**
 - **Any information omitted or means taken to mislead the purchaser to believe that such items are authentic or lawful**

US Department of Energy

- **A copy or substitute without legal right or authority to do so, or one whose material, performance, or characteristics are knowingly misrepresented**

EIA/G-12 Committee

- **An item whose identity or pedigree has been deliberately altered or misrepresented by its supplier**

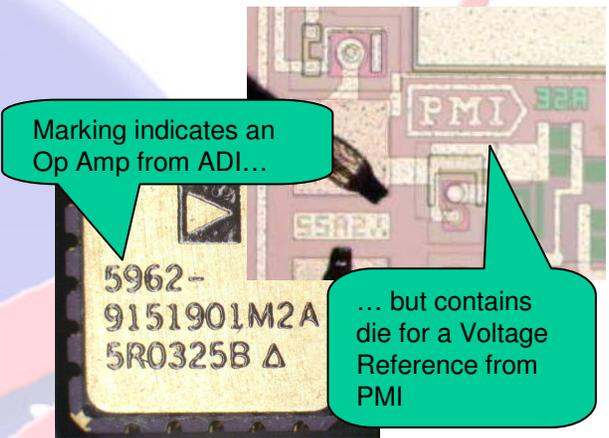


Counterfeit Electronic Parts

- Parts re-topped &/or remarked to disguise parts differing from those offered by the original part manufacturer
- Defective parts scrapped by the original part manufacturer
- Previously used parts salvaged from scrapped assemblies
- Devices which have been refurbished, but represented as new product.

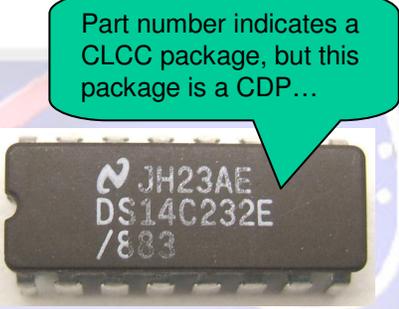


Device lead condition shows parts were used



Marking indicates an Op Amp from ADI...

... but contains die for a Voltage Reference from PMI



Part number indicates a CLCC package, but this package is a CDP...

ANALOG DEVICES MIL-STD-883C

Customer: ETEC
 Date Code: 0522
 Prepared By: C. LEE

Method	Screen	Condition
1000	INTERNAL VISUAL	
1001	TEMPERATURE CYCLE	
1002	CONSTANT ACCELERATION	
1003	HYPERBOLIC PINE LEAK	
1004	PRE BURN-IN ELECTRICAL	
1005	BURN-IN ELECTRICAL	
1006	POST BURN-IN ELECTRICAL	
2008	EXTERNAL VISUAL	
3005	GROUP A INSPECTION	

PROGRAM NAME: A15768-2
 Date: 05-28-04
 Report #: -452K
 Date: 05-28-04

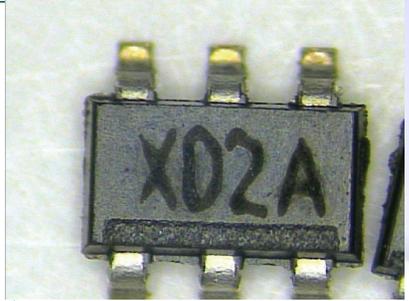
Evidence of prior marking for a part with inferior performance ...

... accompanied by bogus test report

Re-topping



Remarking





Counterfeit Part Examples

Example 1: Reclaimed (i.e. removed from circuit boards) SRAMs that were sold as new devices on the open market. The reliability of these parts is suspect. The documentation received with these parts did not include certificates of conformance from either the previous distributors or the original manufacturer.

Device Top Side



Device Bottom Side





Counterfeit Part Examples

Typical Condition of Leads On These Devices

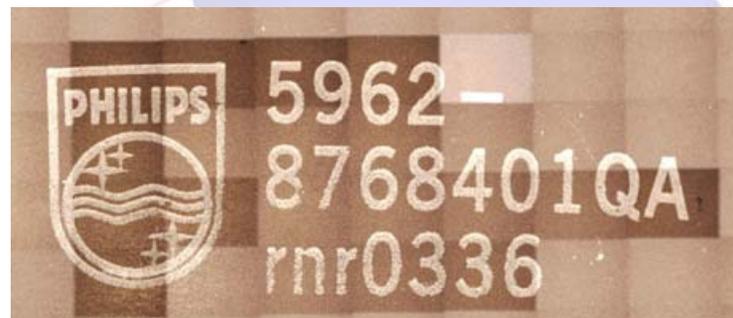




Counterfeit Part Examples

Example 2: A DPA revealed that the internal semiconductor die did not match the supplier listed on the packaging. It should be noted that the supplier listed on the packaging stopped manufacturing this product in 1997.

Package Marking



Die Marking





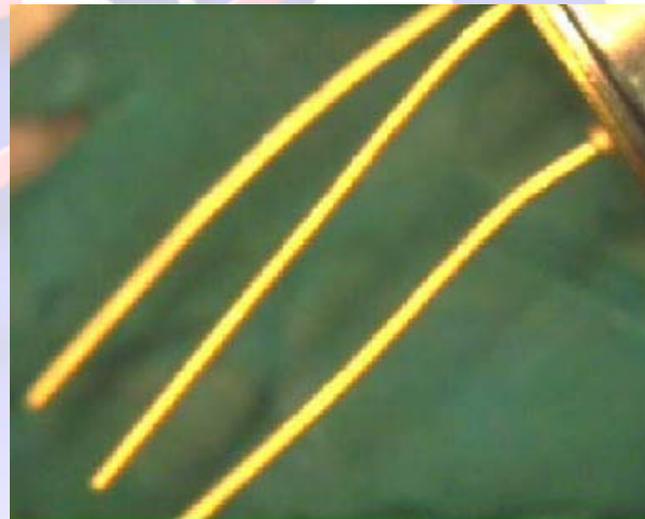
Counterfeit Part Examples

Example 3: Counterfeit devices with incorrect device leads and incorrect internal die

Non-gold leads



Gold leads on real device





Counterfeit Part Examples

Example 4: Counterfeit device with dual markings (i.e. ink marking stamped over the laser etching).





Counterfeit Part Examples

Example 5: Counterfeit parts that failed a programming sequence. Counterfeits had a three line marking sequence while the known good parts had only two lines of marking.



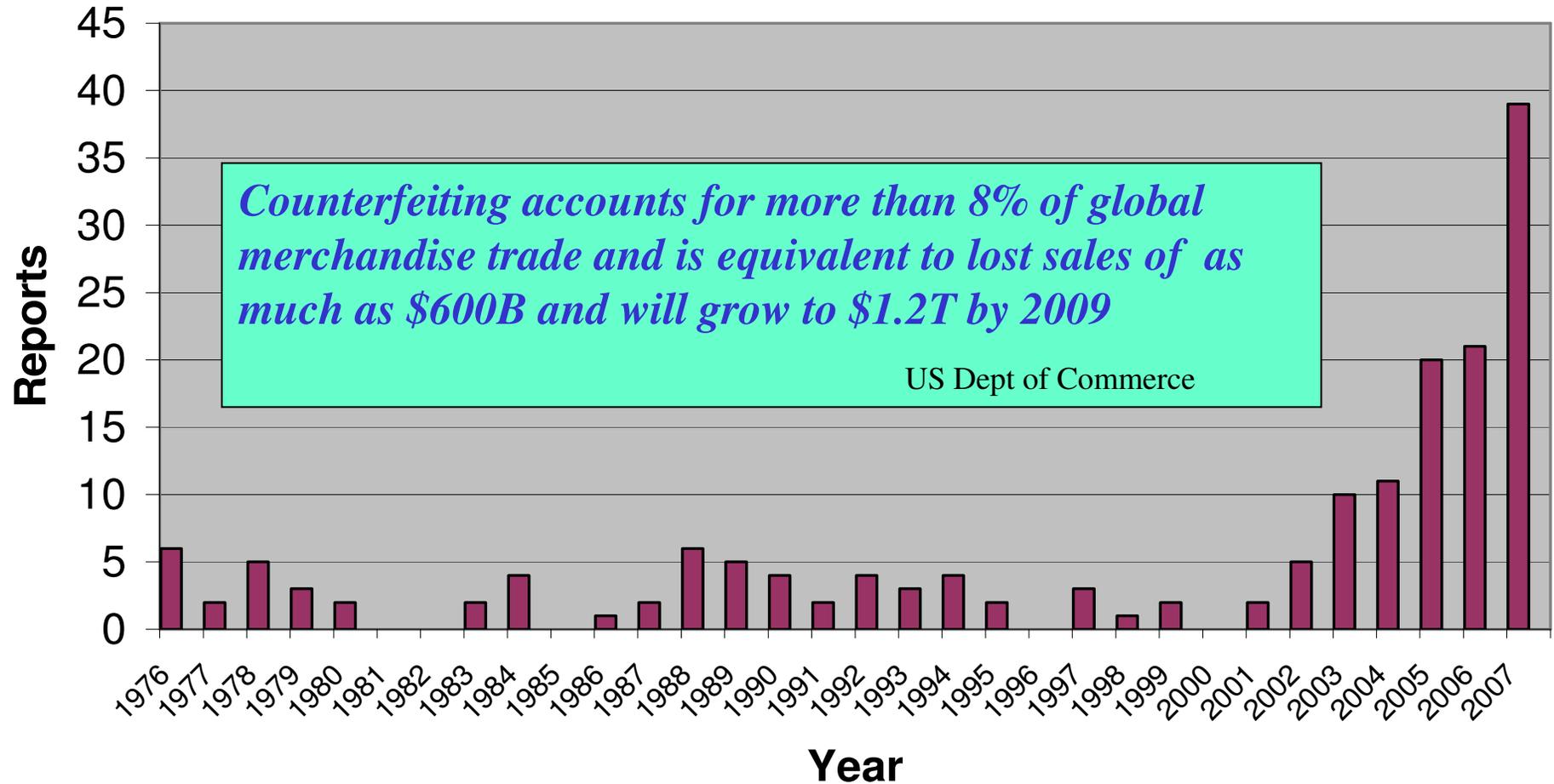
Figure 1: Photo of suspect part.



Figure 2: Photo of Known Good Part



How Big is the Problem ?



**GIDEP Alerts / Problem Advisories Reporting
Counterfeit Electronic Components (as of July 2007)**

GIDEP Counterfeit Case Summaries



GIDEP Alert	Findings ...
J5-A-07-01	Parts marked as Philips QML product with 2003 date code, but contained Intel die manufactured in 1980
J5-A-07-02	Parts marked as Analog Devices QML product, but markings were not consistent with standard Analog Devices markings for the device and device contained die of a different function
J5-A-07-03	Parts marked as Cypress commercial product, but parts were salvaged from scrapped assemblies
J5-A-07-04	Received parts Jan-06 thru May-06 marked as On Semiconductor commercial product, but On Semiconductor did not manufacture these parts
J5-A-07-05 & J5-A-07-07	Received parts marked as Seeq commercial product, but parts were salvaged from scrapped assemblies and remarked to appear as legitimate/unused product
J5-A-07-06	Parts marked as Philips QML product with 9852 date code, but Philips discontinued manufacture 31 December 1997
J5-A-07-08	Parts marked as National QML product, but major discrepancies in marking format and content, including date code and manufacturing location; Die contained in these parts were not manufactured by National Semiconductor
J5-A-07-09	2001 date code, but Intersil discontinued this product in 2000; marking missing country of origin; parts had wrong lead finish
J5-A-07-10	2004 date code, but Linear Tech discontinued this product in 2001
J5-A-07-11A	Parts marked as Analog Devices QML product, but incomplete or absent marking; incorrect lead finish vs part number; reclaimed or refurbished; invalid test report
J5-A-07-12	Part number and date code do not match the lot number identified in Cypress production records
J5-A-07-13	Suspect marking; evidence of remarking; part number and date code do not match Cypress lot number
J5-A-07-14	Parts marked as Analog Devices "883" product, but incomplete or absent marking; incorrect lead finish vs part number; reclaimed or refurbished; invalid test report; evidence of prior marking
J5-A-07-15	Parts marked as Cypress commercial product; leads have been re-soldered; evidence of a resurfacing on device package
J5-A-07-16	Parts marked as Xicor/Intersil QML product, but marking is not compliant to Xicor/Intersil brand layout; die not associated with QML product
J5-A-07-17	discrepancies in device marking, lead finish and lead quality
J5-A-07-18	parts appear to be reclaimed; the surface roughness the devices markings were stripped and remarked.



Semiconductor Manufacturer Survey

In June 2006, the Semiconductor Industry Association (SIA) established the Anti-Counterfeiting Task Force (ACTF) consisting of semiconductor manufacturing company members involved in the investigation of counterfeiting and coordination with law enforcement.

Semiconductor Manufacturer disclosures ...

- Company A: Over 100 part numbers have been counterfeited in last 3 years.
- Company B: 19 cases reported involving 97,000 units.
- Company C: Since June 2006, there have been 4 seizures of counterfeits of our products by U.S. Customs; units seized ranged from 6000 to 60,000.
- Company D: “We estimate that 2-3 percent of purchases of our brand are counterfeit”
- Company E: A broker website indicated 40,000 of our devices available, but our company had only made less than 200 units of that device with the specified date code. If all 40K were available it would result in a \$34 million loss.



Causes of Counterfeiting

- **Design and Logistics**
 - Parts obsolescence
 - Insufficient inventory for product design life
- **Procurement**
 - Failure to procure from trusted/authorized sources (cost/schedule driven)
 - Failure to procure data deliverables for traceability & authentication
 - Failure to invoke rigid quality assurance requirements
- **Manufacturers**
 - Dumping of excess inventory without traceability
 - Excessive lead times
- **Independent Non-Franchised Distributors (Brokers)**
 - Inadequate or Nonexistent Quality Assurance
 - Deliberate misrepresentation of product
- **Governmental Regulations**
 - Electronic parts reclamation (e-waste) & Pb-free solder requirements
- **Quality Assurance**
 - Inadequate test and inspection practices to detect counterfeiting
- **Law enforcement authorities**
 - Insufficient resources for tracking down & prosecuting counterfeiters



Sources of Counterfeiting

“Non-Franchised distributors are supplying almost all of the counterfeit components...”

“Most broker organizations are very small and do not have established quality control procedures in place. We have more than 10,000 brokers in our database. Of those only 200 have more than 10 employees and quality control procedures for their staff. That leaves us 9,800 to fall victim to. Many brokers are working out of their home. All someone needs is a phone, fax and e-mail address and they are in business.”

American Electronic Resource, Inc.

Scope of Counterfeiting



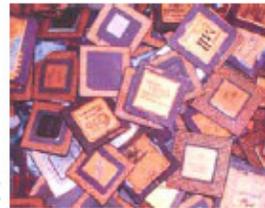
More than a Backyard Industry!



Millions of Scrap Boards



Component Removal



Sorted by size, similarity and lead count



Re-processed





Workers extract plastics from discarded electronics in Guiyu, a few hours' drive northeast of Hong Kong. The city has 5,500 family workshops handling e-waste.
© 2006 The Seattle Times Company



Laborer de-soldering circuit boards over a coal-fired grill. Rock in the box is where boards are hit to remove solder. Pliers are used to pluck off chips which go into various buckets. The boards are then tossed into a pile for open burning. © BAN



Preventive Measures

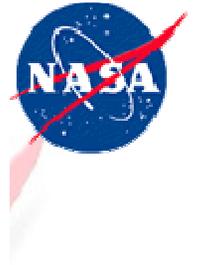
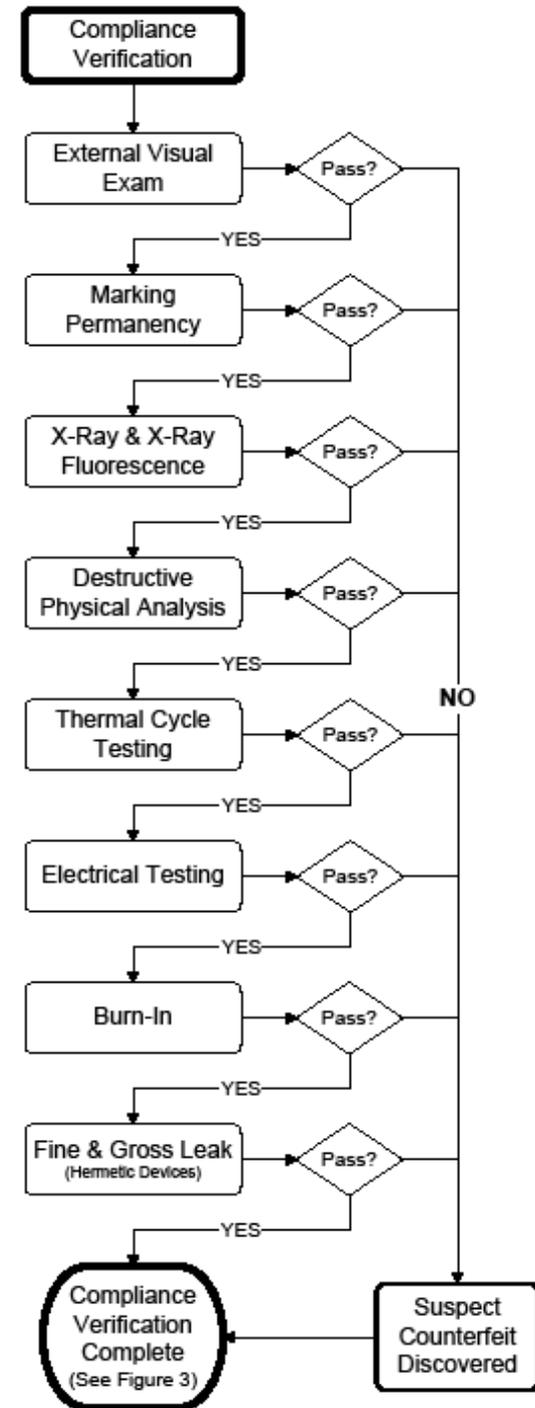
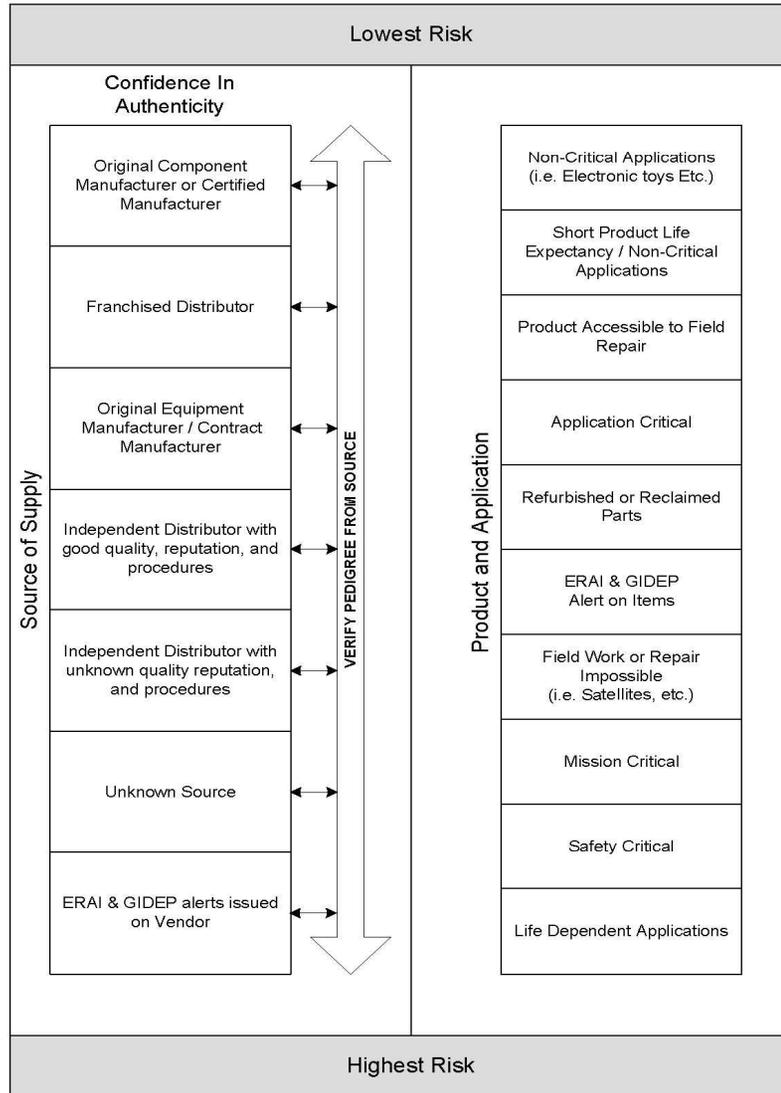
- **Obsolescence prevention**
- **Source selection (in priority order):**
 - Original component manufacturers
 - Franchised distributors
 - Qualified Independent Distributor
- **Procurement Requirements**
- **Quality system audits**
 - Equipment providers (e.g., AS9100)
 - Distributors (e.g., AS9120)
- **Parts authentication tools**



Procurement Quality Clauses

- **Procurement from an Authorized Source**
- **Manufacturer's/Authorized Distributor's Certification**
- **Supply Chain Traceability**
- **Quality System Requirements (e.g., AS9120)**
- **Notification of:**
 - **Impoundment/quarantine**
 - **Seller cost liability**
 - **Reporting to other buyers and criminal investigative authorities (GIDEP, ERAI)**
 - **Criminal penalties associated with falsification**

Risk Stack Chart





Disposition of Counterfeit Parts

- Do not return to seller !
- Impound & Quarantine
- Report to other stakeholders/buyers (GIDEP, ERAI)
- Report to criminal investigative authorities



Counterfeit Parts Available Resources

- NASA QLF Web Site
 - Bulletins
 - Presentations
 - Technical Papers
 - Procurement Clauses
 - Reporting Requirements
 - Legal Statutes
 - Screening Methodologies



- IDEA-STD-1010A, Acceptability of Electronic Components
- ERAI Counterfeit Parts Notifications

ERROR: stackunderflow
OFFENDING COMMAND: ~

STACK: