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## **Electronics Engineering Management - Counterfeit Electronics Components.**

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### **Abstract**

Counterfeit products are often produced with the intent to take advantage of the superior value of the imitated product. Counterfeit consumer products have a reputation for being lower quality (sometimes not working at all) and may even include toxic elements

An unauthorized copy or substitute part that has been identified, marked, and/or altered by an unauthorized source and has been misrepresented by any source to the end-user as meeting the performance requirements for the intended use.

**Key words** :-Counterfeit Electronics Components, current estimates place the global losses, consumer goods, FMCG product.

### **Counterfeit products .**

Most counterfeit goods are produced and manufactured in China, making it the counterfeit capital of the world. In fact, the counterfeiting industry accounts for 8% of China's GDP.

Joining China are North Korea and Taiwan. Some counterfeits are produced in the same factory that produces the original, authentic product, using inferior materials. Another strange new trend in counterfeiting, especially seen in consumer electronics, is the manufacture of entirely novel products using poor quality materials or, more often, incorporating desirable features not present in a brand's authentic product line and then including prominent and fake brand names and logotypes to profit from brand recognition or brand image. An example would be imitation "Nokia" cellular phones with features like Dual-SIM slots or TV, which are unavailable in authentic originals. Another example would be imitation "iPod" MP3 players whose power cells or batteries are removable and replaceable, whereas in authentic originals the power cells or batteries are permanently installed.

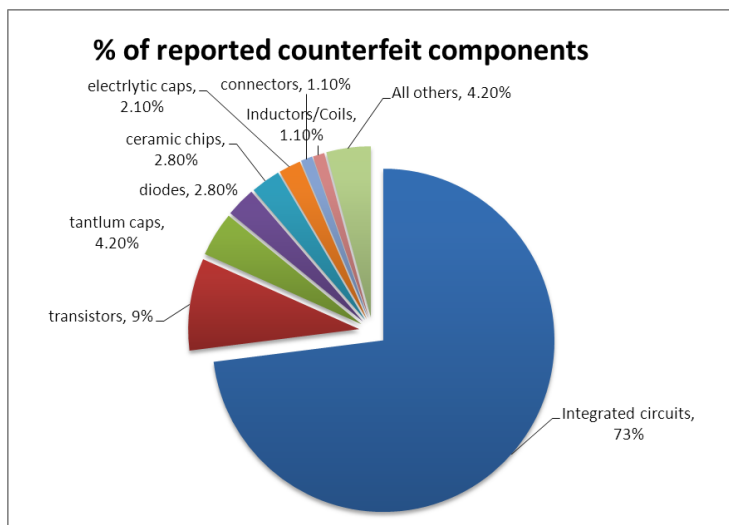
In a detailed breakdown of the counterfeit goods industry, the total loss faced by countries around the world is \$600 billion, with the United States facing the most economic impact\*

When calculating counterfeit products, current estimates place the global losses at \$400 billion.

### What is Counterfeit ?

An unauthorized copy or substitute part that has been identified, marked, and/or altered by an unauthorized source and has been misrepresented by any source to the end-user as meeting the performance requirements for the intended use.

- Global economic value of counterfeit products is estimated as \$650 billion .
- Estimates that it can shoot up to \$1.77 trillion by 2015.

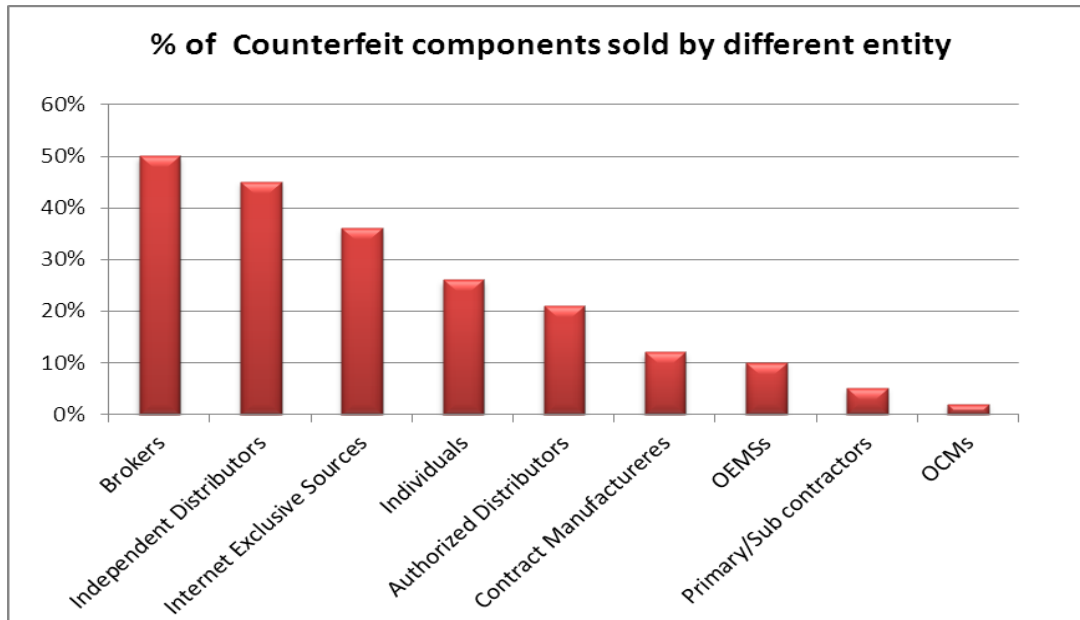


**Figure Distribution of different type of counterfeit electronic components**

*Source: % of reported counterfeit from ERAI database, 2004 to present*

### Survey Results : Source of counterfeits.

Sourcing via internet : Online trading platforms, gives rapid access to millions of parts .

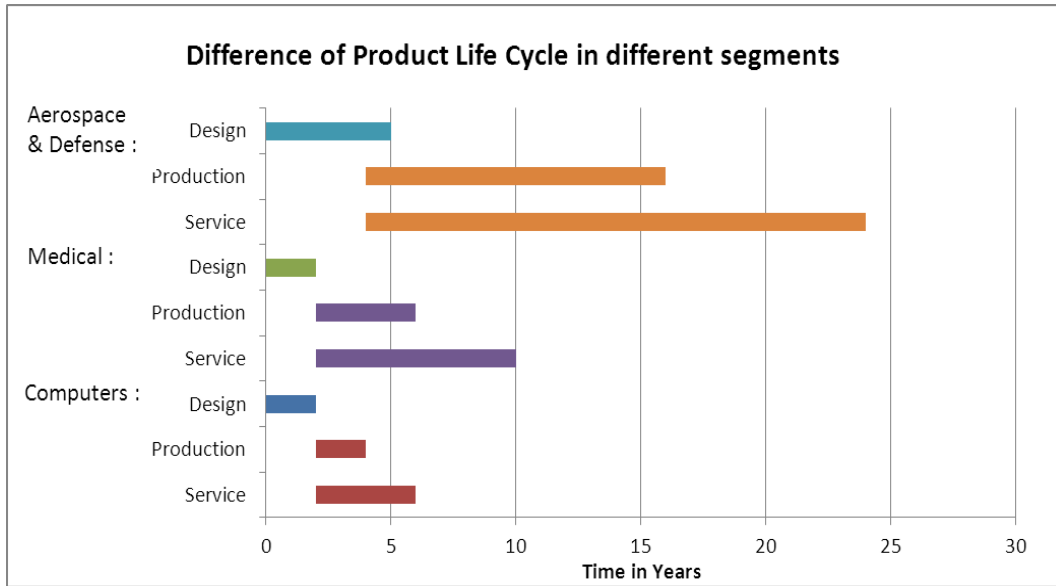


**Figure: represents % of counterfeit components sold by different entities. (only includes companies who have encountered Counterfeits).**

*Source: U.S. Department of Commerce, office of technology Evaluation, Counterfeit Electronics survey, Nov 2009.*

### **High risk of Counterfeiting in Aerospace and Defense Parts.**

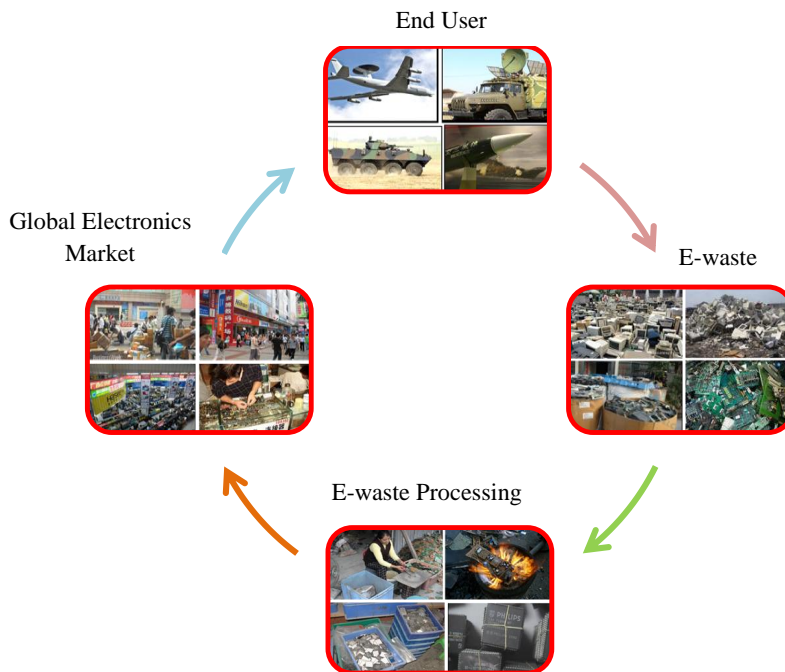
Product Life cycle is measured in three phases i.e. design, production and service. Different life cycle for different product segment [ Aerospace, Computers, Medical] Aerospace & Defense has long life cycle compare to other markets.



**Figure: Differences in the Life Cycle of Aerospace& Defense, Medical & Computers from Design to End of Service.**

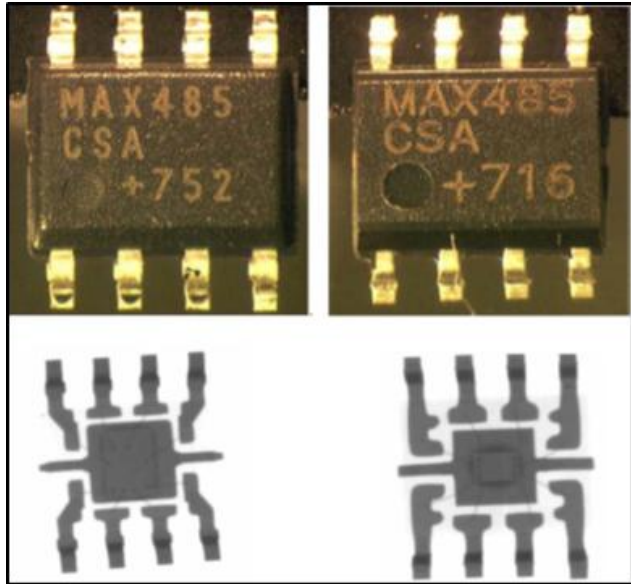
**Two major source of generation of counterfeits.**

E-waste: Component Salvaging & Reprocessing.



**Figure1: Complete process cycle of counterfeit components, Component Salvaging & Reprocessing**

### Reverse engineering of original components.



**Figure2: A genuine (left) and cloned (right) component.  
X-Ray shows the different die sizes. counterfeit die does not have MAXIM markings.**

**E-Waste : Consists of discarded electronic devices and components.**

Feedstock for Counterfeiters

More than 80% of the counterfeit components are recycled and remarked.

### **Component Obsolescence**

System lifecycles are bigger than electronics parts life cycle.

Motivation to buy from other sources.

### **Supply chain control**

Weak supplier selection process

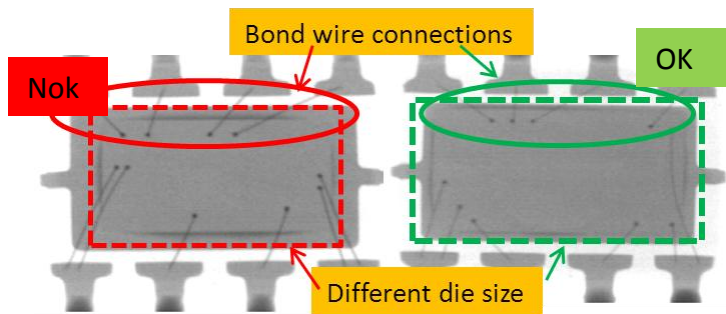
Online trading platforms with few or no rules or regulations.

### Non-Destructive techniques to detect counterfeit parts.

Visual Inspection using Optical microscope



Optical Microscope

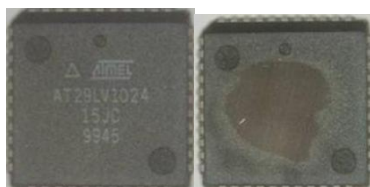


X-Ray Inspection

Electrical Testing [Parametric test/Functional test.

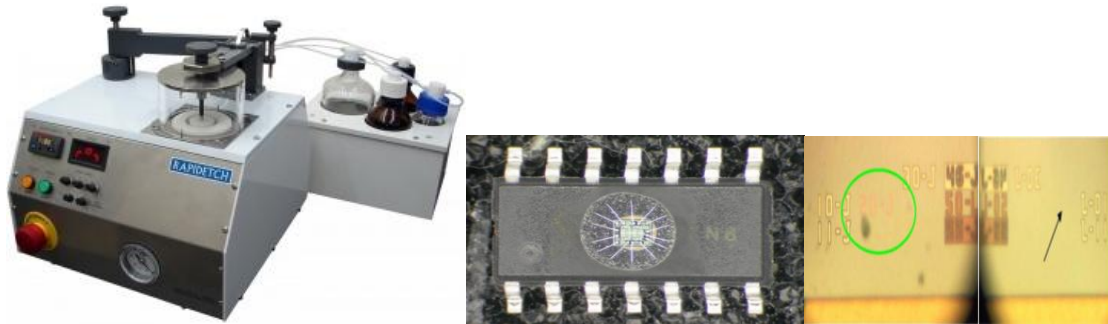
### Destructive techniques to detect counterfeit parts.

Blacktop Examination



Before acetone test After acetone test

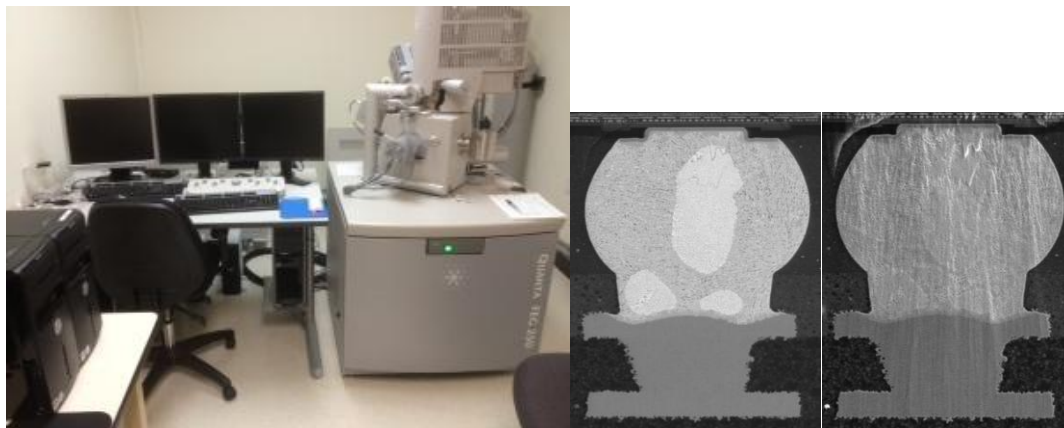
De-capsulation & Die verification Test.



De-apsulation machine.

**Destructive techniques to detect counterfeit parts.**

Scanning Electron Microscope /Energy dispersive X-ray Spectroscope [SEM/EDS] Test.



SEM/EDS testing machine.  
solder bump

Reflected electron

Secondary electron image of

solder bump

## **Prevention**

### **E-Waste Disposition**

Mutilation of scrap

E-waste disposition as per govt. rule “management & handling rules 1989” as amended in 2003.

### **Component Obsolescence Mitigation**

Escrow intellectual property

Last buy policy

### **Supply chain control**

Maintain approved supplier list

Supply chain traceability that includes every intermediary in the supply chain.

Inspection control plan if procuring from other than OCMs or authorized suppliers.

## **Conclusion**

### **Reporting**

It is essential to help authorities identify and prosecute counterfeiters.

All occurrences of counterfeit parts shall be reported to customers, government reporting organizations .

### **Control through Component manufacturer.**

For high military applications : DNA marking on authentic parts

Traceability of components manufacturing data using ECID inside each chip which can be read through JTAG testing.



## References

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