



# Counterfeit Electronics Basics and Trends

*Fred Schipp, NSWC Crane*

*August 31, 2021*

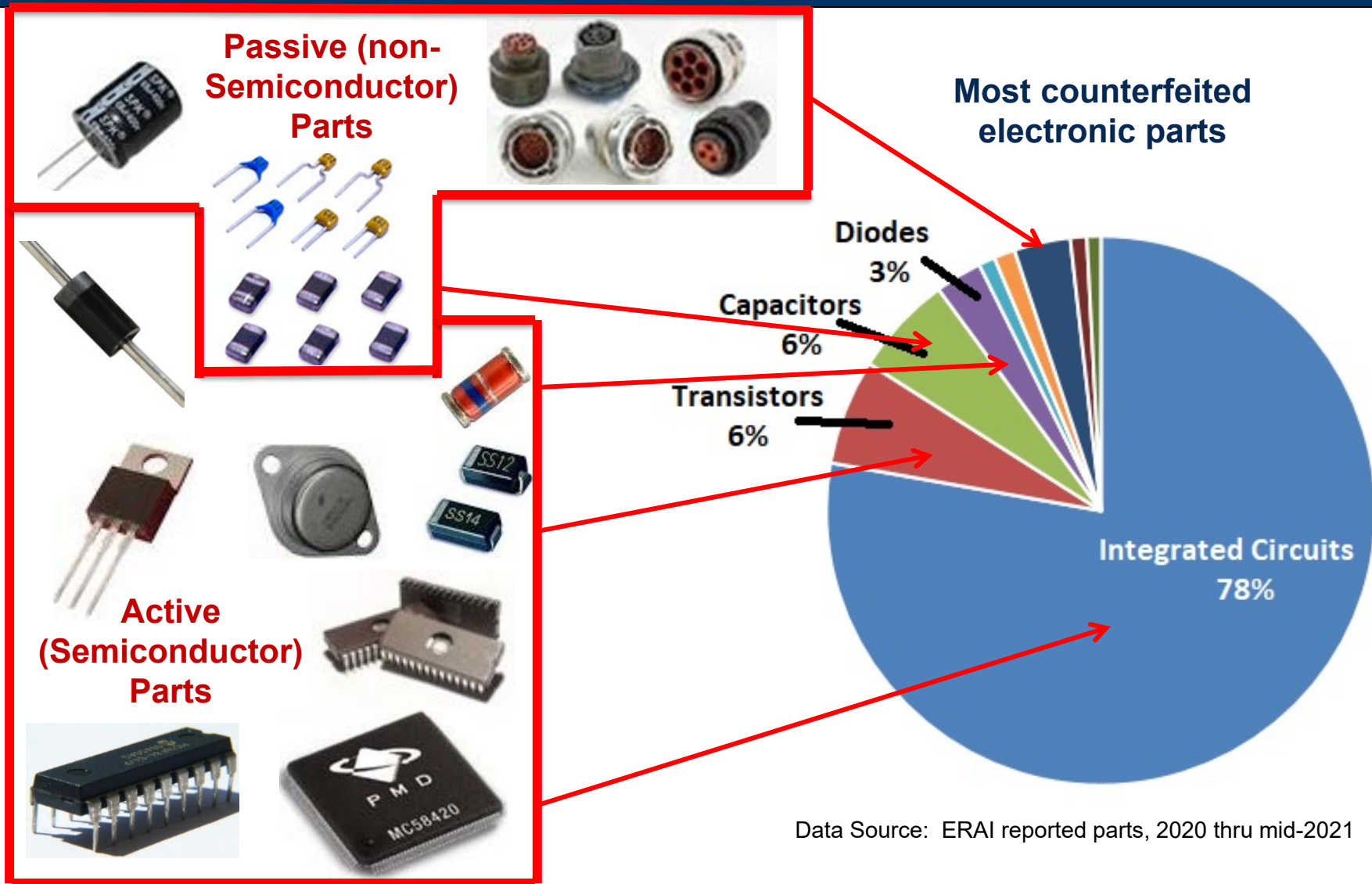


# Counterfeit Electronic Part Basics



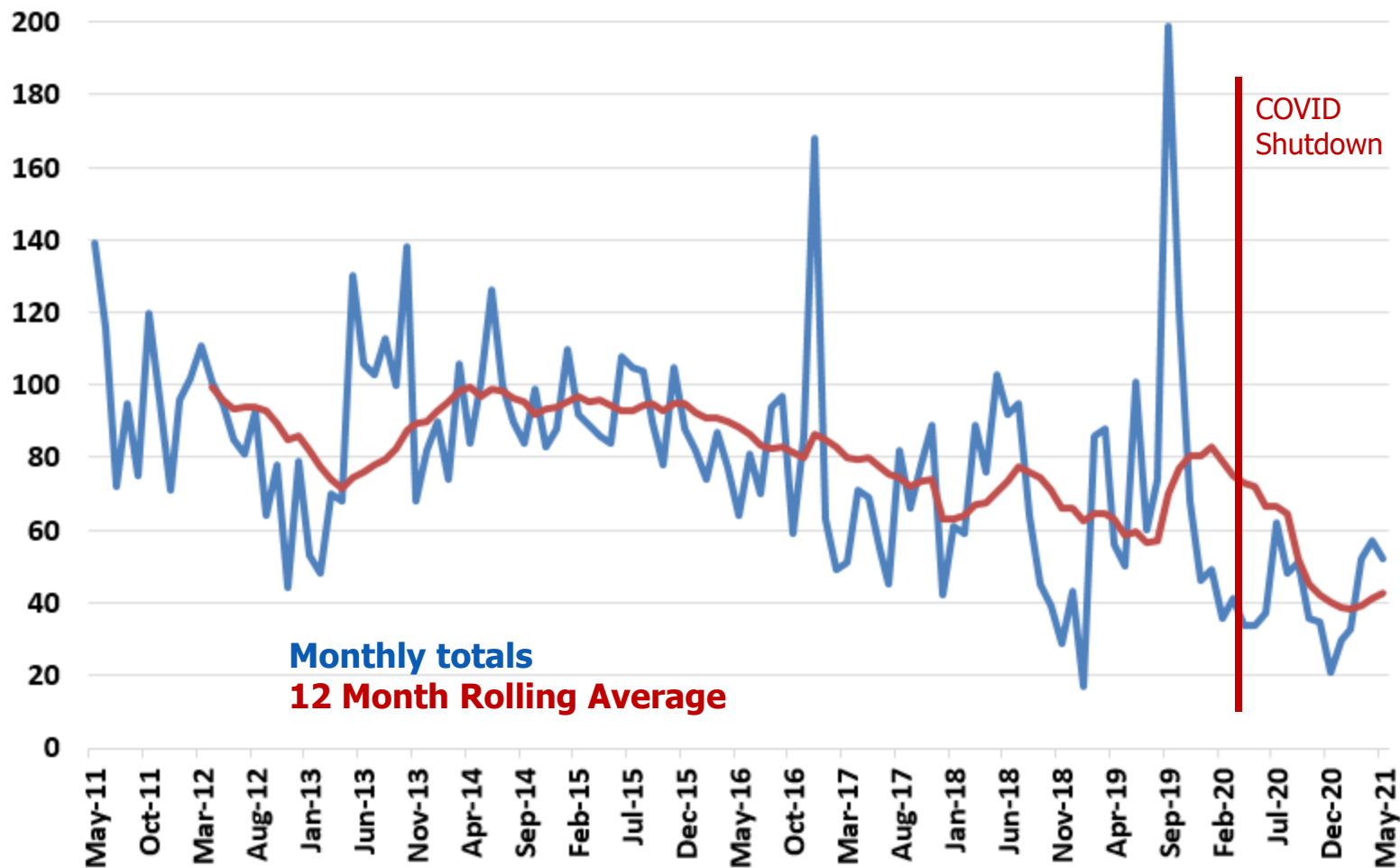
## Basics About Counterfeit Electronic Parts

# What are Electronic Parts?



# What Does ERAI Show?

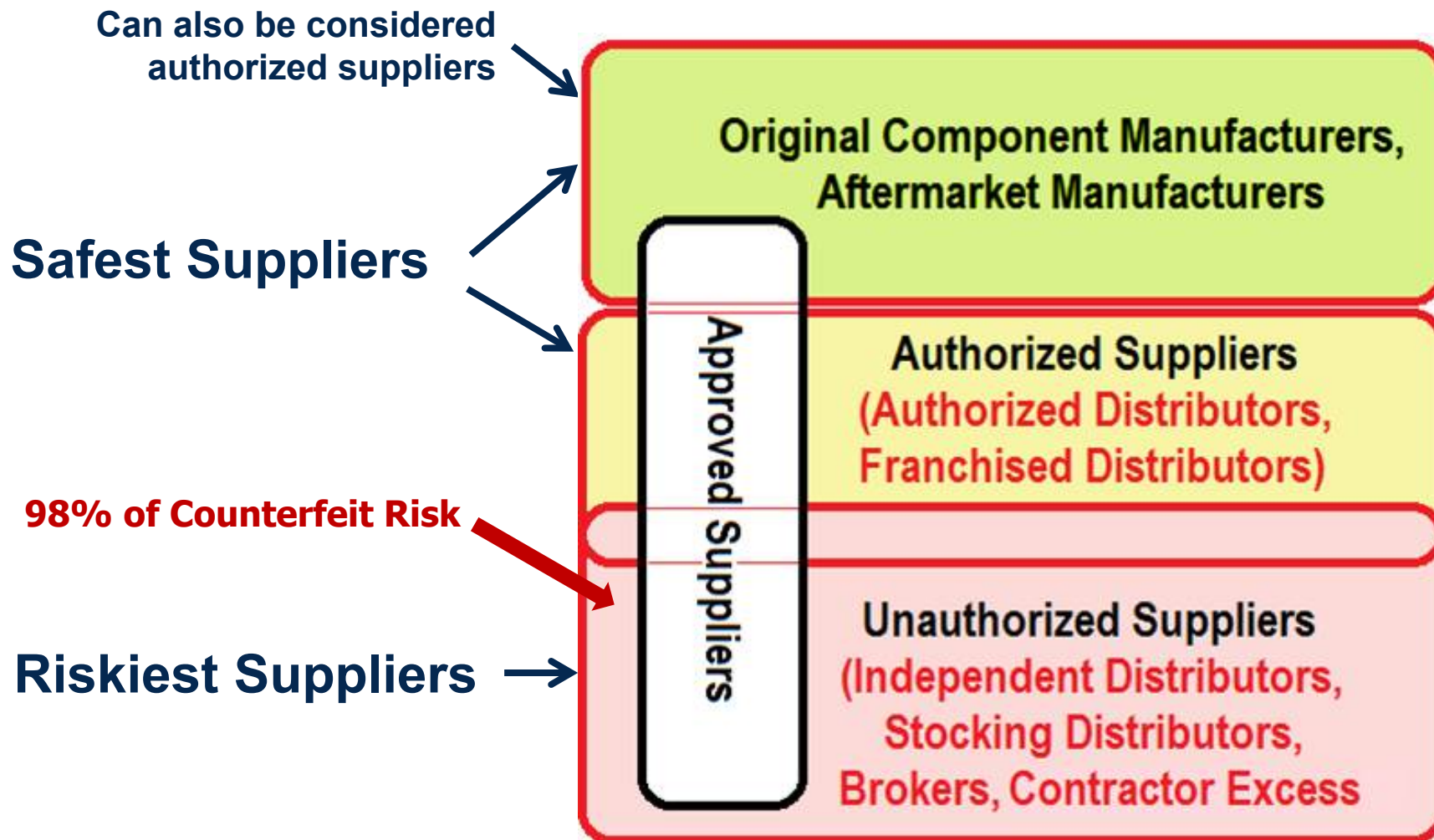
ERAI tracks counterfeit and high-risk electronic part issues reported by its member distributors (9,424 reports, May 2011 thru May 2021).







# Electronic Parts Supply Chain



# SASC Investigation

## Investigation

**Senate Armed Services Committee**  
(Dec 2010 to Nov 2011, electronic parts only)  
Sens. Levin and McCain staff

## Contacted

**Largest DoD Contractors  
and Test Labs**  
(last two years' data on  
suspect counterfeit)

**Government  
Accountability Office**  
(16 obsolete or non-existent  
parts numbers)

## Findings (11/8/11 Hearing)

- **1,800 suspect counterfeit part issues.**
- **Over 1 million affected parts.**

**Installed in  
three aircraft.**

- **Targeting**
- **Display**
- **Ice Detection**

**7 obsolete (valid)  
5 obsolete (invalid)  
4 non-existent  
All found, all counterfeit**

**At least 70% were from  
China!**

**Sold by US companies,  
originally from China!**

**Fastest, cheapest – all  
came from China!**

# China Does Not Like Unsupervised DoD Visitors



**Editorial cartoon from South China Morning Post while SASC investigators pursued approved to visit Shenzhen marketplace.**

# Electronic Waste (E-Waste)



Source: SMT Corporation

**Uncontrolled, careless handling of e-waste subjects parts to excess vibration and shock. Along with potential physical damage to the product, it may cause mechanical damage and compromise the integrity of the package. With cracks in the package, chemical damage can occur when contaminants cause corrosion.**



# Electronic Waste (E-Waste)

Uncontrolled heating during part removal can cause **thermal damage**, leading to immediate or latent failures.



Source: Basel Action Network



Source: SMT Corporation

Mishandling or sanding of parts can cause latent Electrostatic Discharge (ESD) failures or other forms of **electrical damage**.

# How Chinese Counterfeits are Purchased

## Motorola MC12040L Phase/Frequency Detector IC



**This part was discontinued by Motorola (OM) in 1998. Authorized suppliers like Arrow, Avnet, Future, and Digi-Key no longer sell this part. The only place to find replacements is from unauthorized suppliers.**

# Obsolete Parts

The **MC12040L** was discontinued in 1998.

A popular internet search engine shows many parts available produced post-1998.

This screenshot was from 2015.

Results 101-125 for mc12040l (of 241)

Q Advanced Search Show

Part No.	Manufacturer	D/C	Quantity	Region	Action
MC12040L	Motorola	198836	1	U.S.A.	Contact Vendor
MC12040L	Motorola	-	1049	China	Contact Vendor
MC12040L	Motorola	2000+	74	China	Contact Vendor
MC12040L	Motorola	198017	5	China	Contact Vendor
MC12040L	Motorola	-	135	China	Contact Vendor
MC12040L	Motorola	2009+	656	China	Contact Vendor
MC12040L	Motorola	2009+	80	China	Contact Vendor
MC12040L	Motorola	2009+	40	China	Contact Vendor
MC12040L	Motorola	2009+	10	China	Contact Vendor
MC12040L	Motorola	-	128	China	Contact Vendor
MC12040L	Motorola	2006+	1344	China	Contact Vendor
MC12040L	Motorola	2011+	1000	China	Contact Vendor
MC12040L	-	1988+	1	U.S.A.	Contact Vendor
MC12040L	Motorola	197708	9	U.S.A.	Contact Vendor
MC12040L	Motorola	1981	3	U.S.A.	Contact Vendor
MC12040L	Motorola	1987+	1	U.S.A.	Contact Vendor
MC12040L	Motorola	198944	1	U.S.A.	Contact Vendor
MC12040L	Motorola	199014	5	U.S.A.	Contact Vendor
MC12040L	Motorola	1998+	250	Canada	Contact Vendor
MC12040L	Motorola	1999	23	Japan	Contact Vendor

Impossible



Popular search engine



# Obsolete Parts in the Gray Market



Results 1-25 for MC12040L (of 40)

 Advanced Search 

Part No.	Manufacturer	Category	D/C	Qty	Region	
<input type="text" value="MC12040L"/>	<input type="text"/>	<input type="text" value="All Categories"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="All Regions"/>	<input type="button" value="GO »"/>

## Uncategorized

Part No.	Manufacturer	D/C	Qty	Region	Action
MC12040L	Motorola	199211	4	U.S.A.	 Contact Vendor
MC12040L	Motorola	-	10	India	 Contact Vendor
MC12040L	-	1988+	1	U.S.A.	 Contact Vendor
MC12040L	Motorola	197921	1	Belgium	 Contact Vendor
MC12040L	Motorola	199212	25	India	 Contact Vendor
MC12040L	Motorola	199734	25	India	 Contact Vendor
MC12040L	Motorola	1989+	50	India	 Contact Vendor
MC12040L	Motorola	199734	1	U.S.A.	 Contact Vendor
MC12040L	Motorola	199003	305	India	 Contact Vendor
MC12040L	Motorola	1987+	1	U.S.A.	 Contact Vendor
MC12040L	Motorola	198944	1	U.S.A.	 Contact Vendor
MC12040L	Motorola	1987+	5	France	 Contact Vendor
MC12040L	Motorola	198412	25	Germany	 Contact Vendor
MC12040L	Motorola	-	500	China	 Contact Vendor

**This screenshot is from 2021. See any changes from 2015?**





# Anyone Familiar with Epic International?



**Epic International was indicted in 2014 for selling counterfeit parts to Groton sub base. All of the seized parts were provided to NSWC Crane for analysis.**

South China Morning Post EDITION: INTERNATIONAL ▼

## WORLD

CHINA HK ASIA WORLD COMMENT BUSINESS TECH LIFE CULTURE SPORT WEEK IN ASIA POST MAG STYLE .TV

News / World / MILITARY TECHNOLOGY

### Fake semiconductors imported from Hong Kong sold for use in US nuclear subs

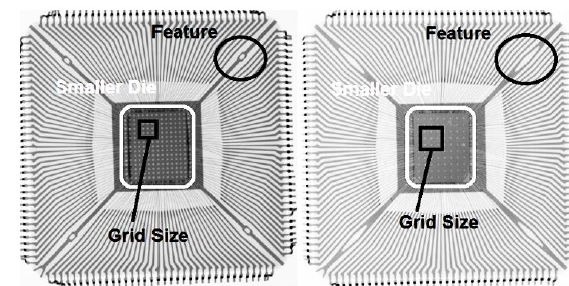
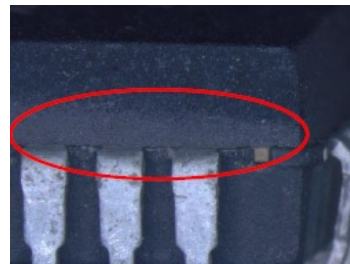
American contractor who supplied counterfeit semiconductors for use in nuclear submarines had been importing them from China for years

PUBLISHED : Wednesday, 04 June, 2014, 9:16pm

UPDATED : Wednesday, 04 June, 2014, 9:16pm



# Anyone Familiar with Epic International?



**NSWC Crane analyzed the seized parts, and filed 24 GIDEP reports.**



# Most Recent – PRB Logics (Press Release)

**PRB Logics** knowingly sold counterfeit parts to DoD contractors for DoD usage. **Chinese suppliers were directed to alter reports** to hide the fact that parts were counterfeit.



## NEWS RELEASE

For Immediate Distribution

May 1, 2018

**Nicola T. Hanna**

United States Attorney  
Central District of California

Thom Mrozek, Public Affairs Officer

[thom.mrozek@usdoj.gov](mailto:thom.mrozek@usdoj.gov)

(213) 894-6947

[www.justice.gov/usao-cdca](http://www.justice.gov/usao-cdca)

@CDCANews

### Orange County Electronics Distributor Charged with Selling Counterfeit Integrated Circuits with Military and Commercial Uses

*LOS ANGELES* – The owner of PRB Logics Corporation, an Orange County-based seller of electronic components, was arrested this morning on federal charges alleging he sold counterfeit integrated circuits, some of which could have been used in military applications.

Rogelio Vasquez is charged in a 30-count indictment that alleges he acquired old, used and/or discarded integrated circuits from Chinese suppliers that had been repainted and remarked with counterfeit logos. The devices were further remarked with altered date codes, lot codes or countries of origin to deceive customers and end users into thinking the integrated circuits were new, according to the indictment. Vasquez then sold the counterfeit electronics as new parts made by manufacturers such as Xilinx, Analog Devices and Intel.





# Most Recent – PRB Logics (Indictment)



THREE	3-10-16	Email sent from California to supplier in China instructing supplier to "please make sure the top surface is remark and parts look good too."
FOUR	3-22-16	Email sent from California to the testing laboratory in China instructing the laboratory to create one test report for defendant's customer and another test report for defendant reflecting "how the parts look like."
FIVE	4-1-16	Email labora labora on the parts a way not ha
SIX	4-4-16	Email labora labora report "ALSO MARKIN

COUNT	QTY.	TRAFFICKED GOOD
SEVENTEEN	3	"Xilinx" IC, part no. XC2S200-5FG456C
EIGHTEEN	480	"Xilinx" IC, part no. XC2V1000-4FGG456C (DC 0725)
NINETEEN	336	"Xilinx" IC, part no. XC2V1000-4FGG456C (DC 0709)
TWENTY	40	"Xilinx" IC, part no. XC2V4000-4BFG957C
TWENTY-ONE	1	"Xilinx" IC, part no. XC2VP40-5FF1152I
TWENTY-TWO	152	"Xilinx" IC, part no. XC2VP40-5FFG1152I
TWENTY-THREE	3	"Xilinx" IC, part no. XC4085XL-3BG560I
TWENTY-FOUR	54	"Xilinx" IC, part no. XC9536-10VQG44I
TWENTY-FIVE	100	"Xilinx" IC, part no. XCS05XL-4VQ100I
TWENTY-SIX	10	"Xilinx" IC, part no. XCS40-4P0240C





# Most Recent – PRB Logics (Impact to DoD)



## PRB Logics' owner pled guilty on January 17, 2019.

In the plea agreement, Vasquez also admitted that in approximately August 2012, he purchased counterfeit integrated circuits from China and sold them to a defense subcontractor located within the United States, which, in turn, supplied the counterfeit parts to a prime defense contractor. The counterfeit parts ended up in a classified weapons system used by the U.S. Air Force. Vasquez also admitted that in April 2016, he sold eight counterfeit integrated circuits that he believed would be used by the United States military in the B-1 Lancer Bomber military aircraft.

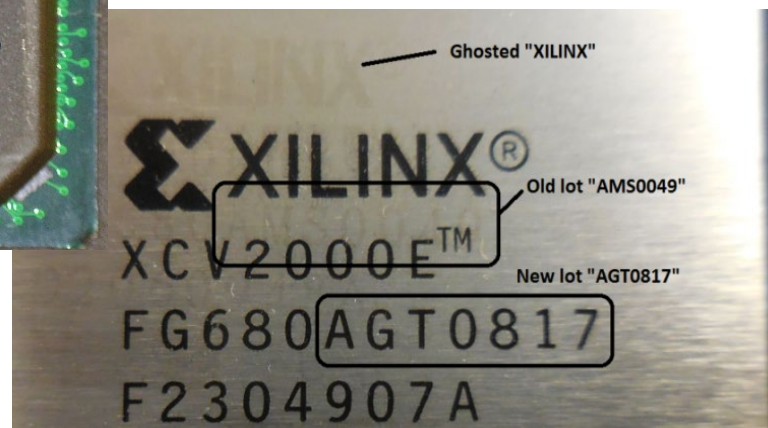
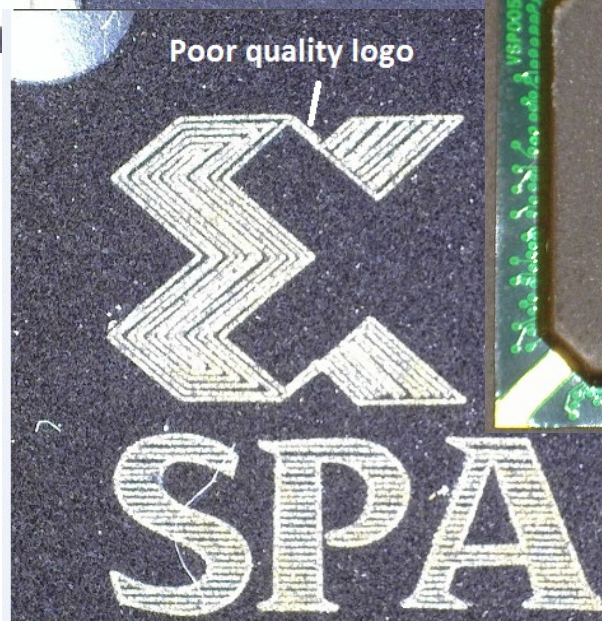
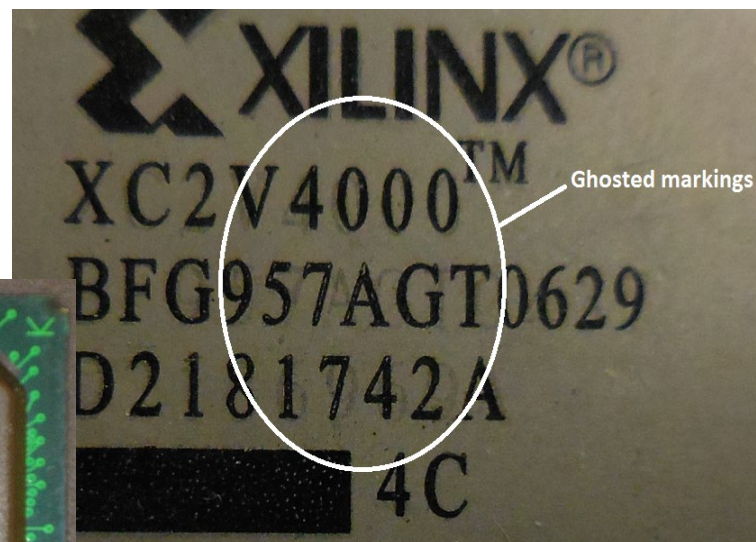
Vasquez further admitted that in April and May 2016, he sold approximately 8,000 counterfeit integrated circuits to a company, which resold most of them to a defense contractor that does business with the U.S. military. The defense contractor bought the parts to use in products for numerous customers, including the U.S. Army, the U.S. Navy, and the U.S. Marine Corps.

Vasquez also agreed to forfeit \$97,362 in cash and over 160,000 counterfeit and suspected counterfeit integrated circuits seized during the investigation. Vasquez is scheduled to be sentenced on May 10, 2019, before District Judge Staton.

## He was sentenced to 46 months in jail.

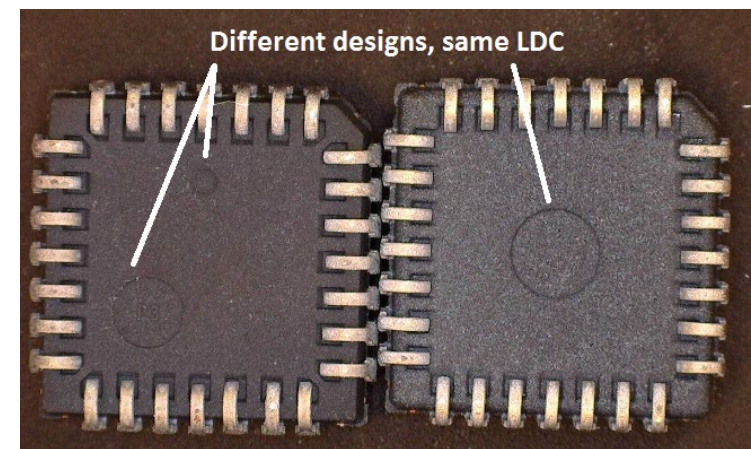
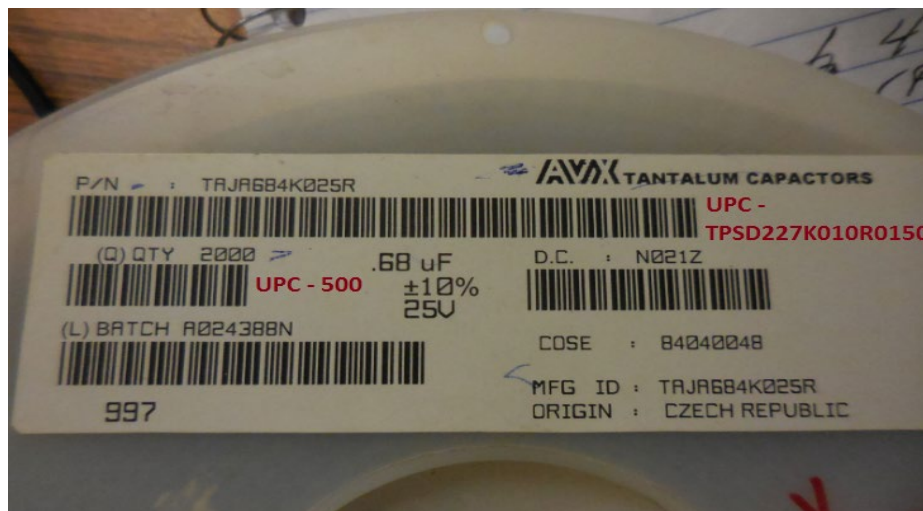
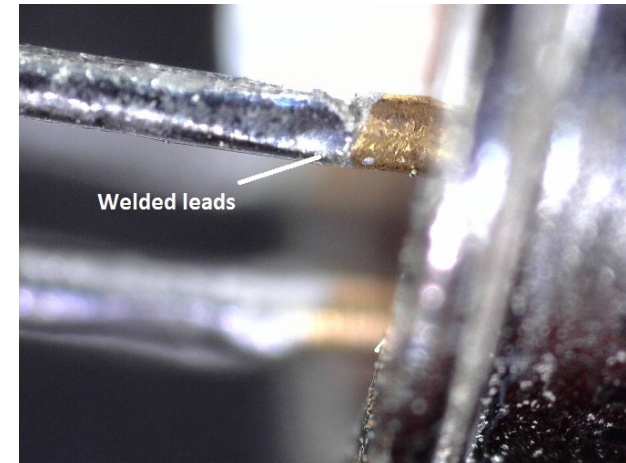


# Most Recent – PRB Logics (Seized Parts)





# Most Recent – PRB Logics (Seized Parts)





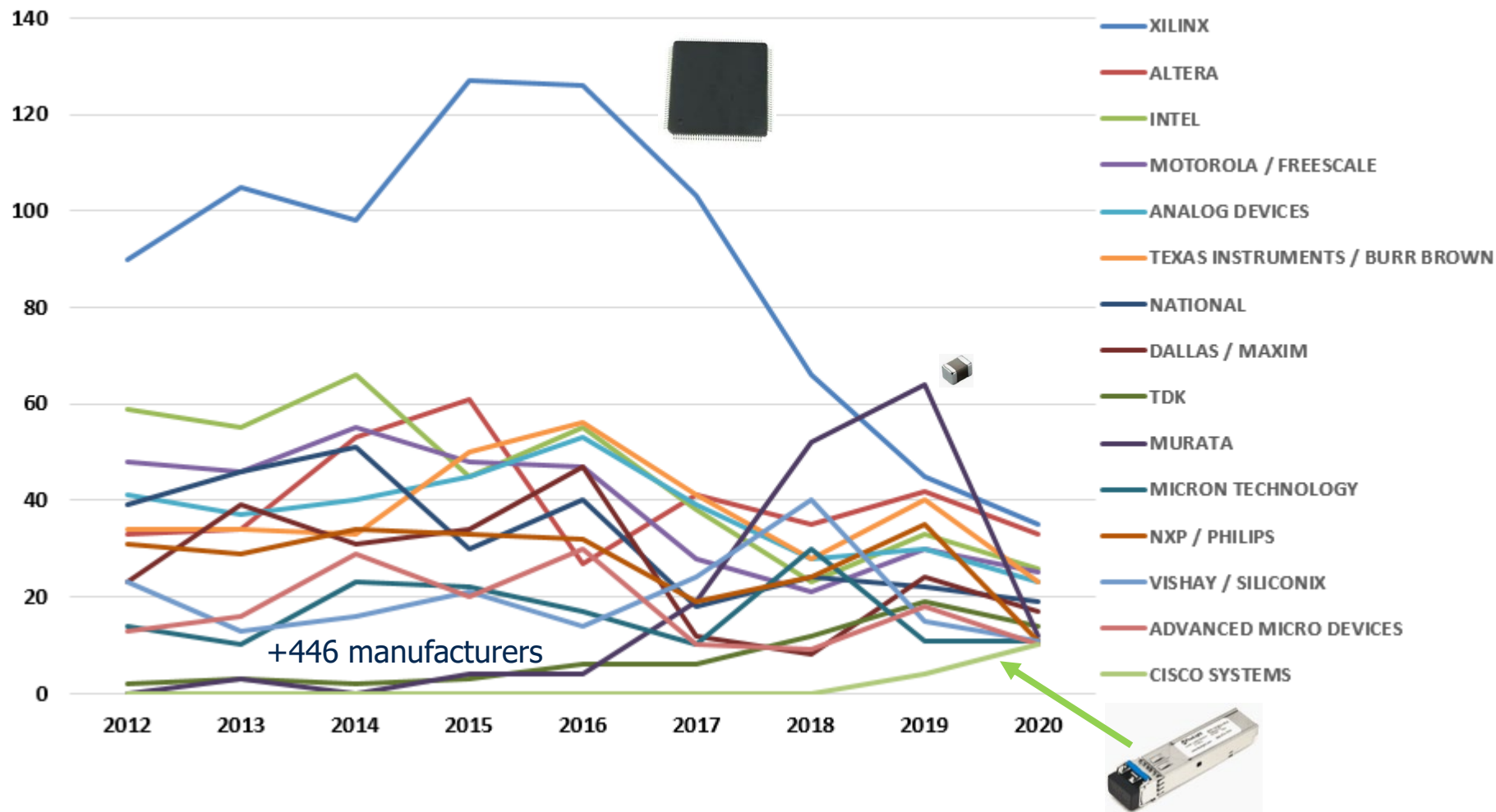
# Recent Counterfeit Trends



## Recent Counterfeit Electronic Part Trends



# Changing Trend in Counterfeited Manufacturers\*



\* Manufacturers are not at fault when their parts are counterfeited.

Used by permission, ERAI

# Dangers of Counterfeited Assemblies

Taskforce seizes \$76 Million in counterfeit Cisco network hardware

By [Layer 8](#) on Fri, 02/29/08 - 10:08am.

An example of a  
counterfeit COTS\*  
assembly



Source: Andover Consulting Group

\* Commercial-Off-The-Shelf



# Dangers of Counterfeited Assemblies



CYBERSECURITY | AVENTURA EXECUTIVES ARRESTED FOR FRAUD AND MONEY LAUNDERING IN LONG ISLAND RAID

## Aventura executives arrested for fraud and money laundering in Long Island raid

Seven defendants, including managing director Jack Cabasso, charged with selling Chinese-made security products falsely claiming them as U.S. made

STEVE LASKY NOVEMBER 8, 2019

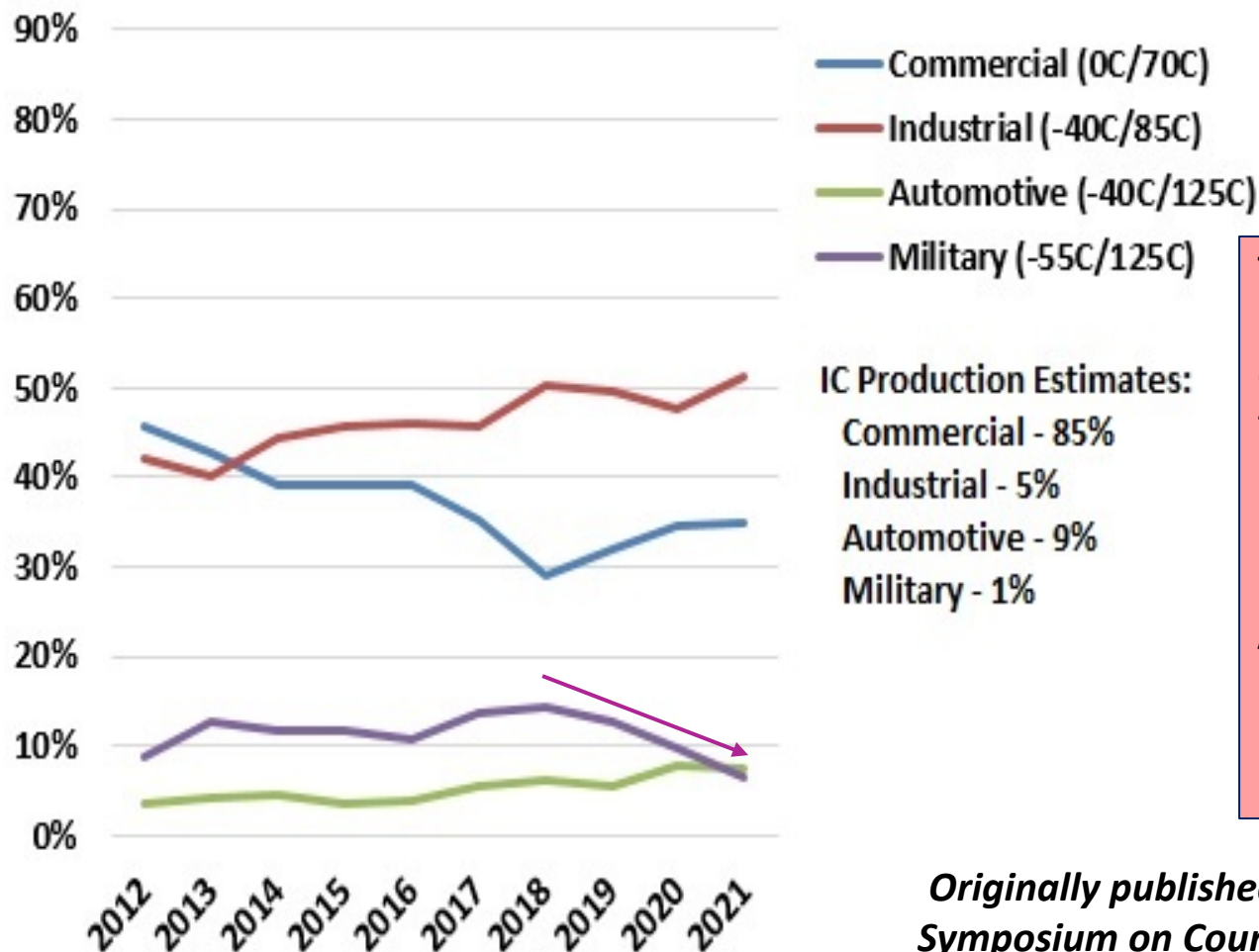
SECURITYINFOWATCH.COM

### Aventura charges:

- Largest customers are government and government contractors.
- Since 2006, sold Chinese-made security assemblies disguised as American-made.
- Some Chinese suppliers had known vulnerabilities (e.g., accessing cameras remotely).
- "Made in USA" labels attached after receipt from China.
- Requested Chinese manufacturers replace their markings/labels with Aventura ones to fool customers.



# Military Parts are Popular Targets



Trend in military temp range parts is down. All other temp ranges are trending up.

Regarding military *qualified* parts (5962, /883, JANTX, etc.):

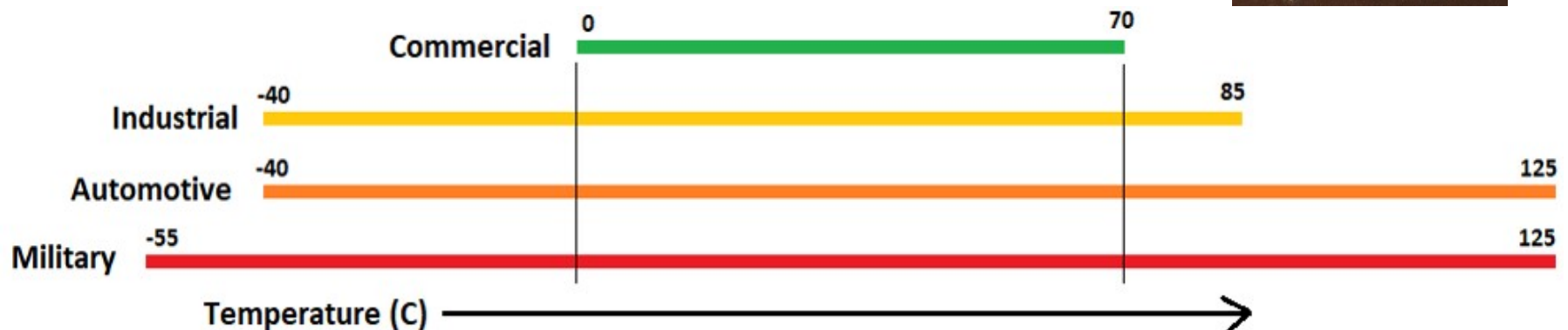
- IC's -- 3.7%
- Transistors -- 4.8%
- Diodes -- 6.0%

*Originally published in the proceedings of the Symposium on Counterfeit Parts and Materials on August 3-5, 20*

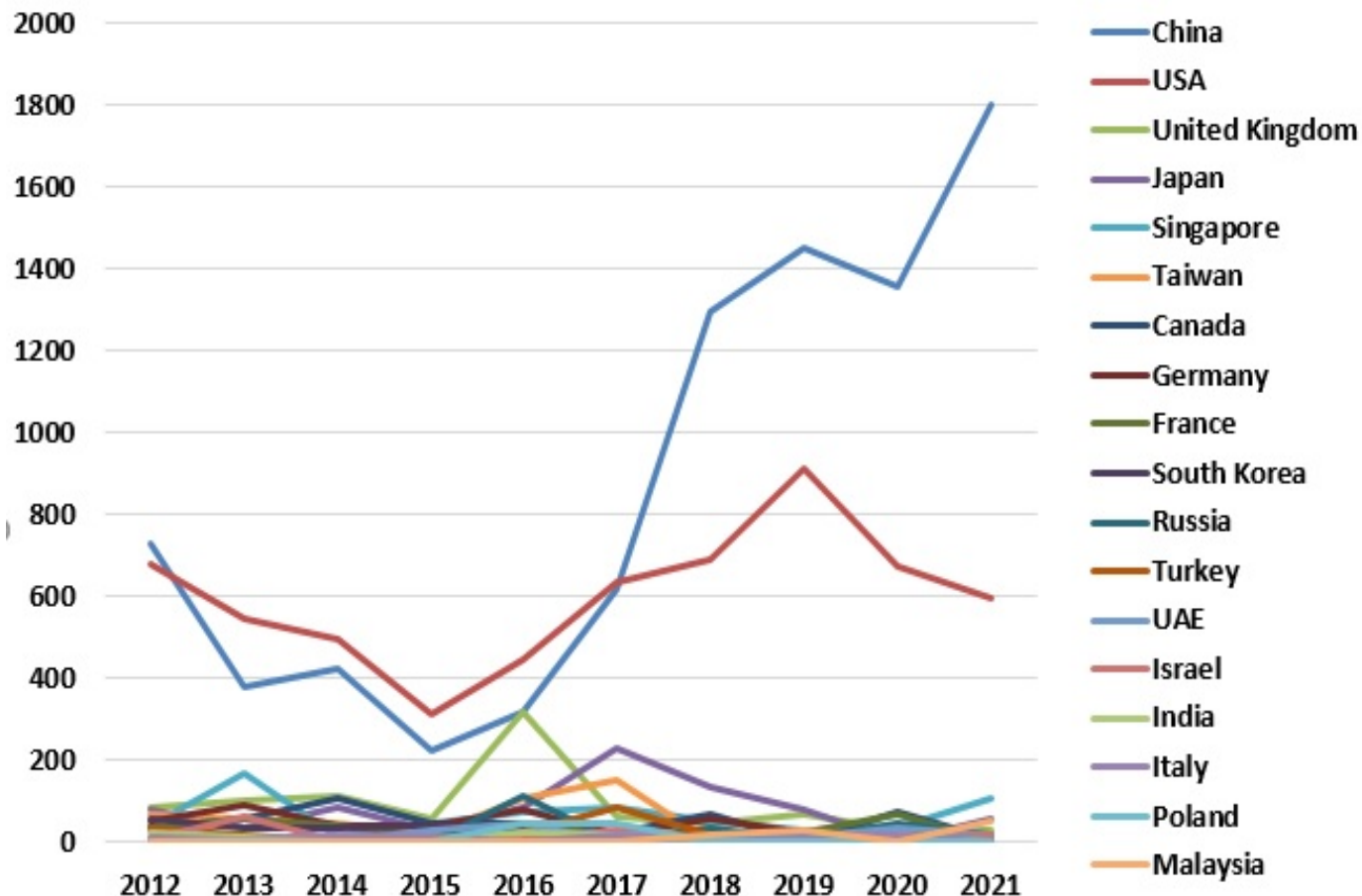
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# How Is There Profit in Counterfeiting?

- Used obsolete parts cleaned up and sold as new parts (can be 100x markup).
- Commercial temperature (32F to 158F) parts remarked to industrial (-40F to 185F), automotive (-40F to 257F), or military (-67F to 257F) temperature ranges.
- Slow parts remarked to appear faster.
- Etc.



# Counterfeit Suppliers by Country (Weighted)



China and the United States continue to be the main source of counterfeit parts and other major issues. This data is somewhat dependent on how far back in the supply chain the parts are traced.

Used by permission, ERAI

*Originally published in the proceedings of the Symposium on Counterfeit Parts and Materials on August 3-5, 20*





# What Is NAVSEA Doing About Counterfeit Materiel?



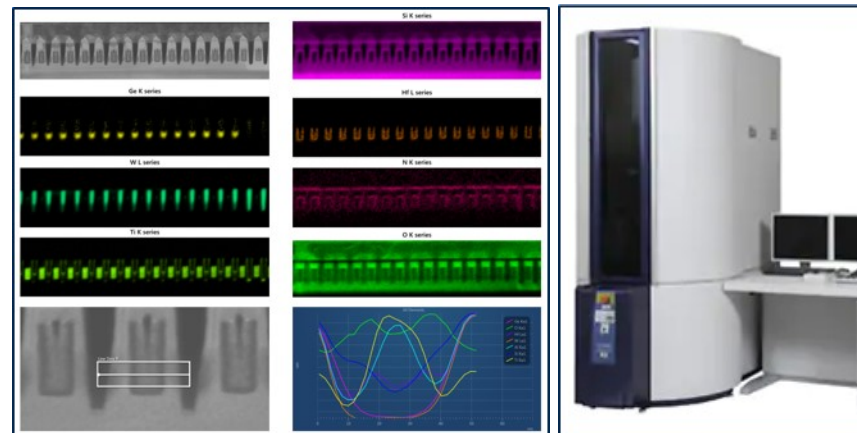
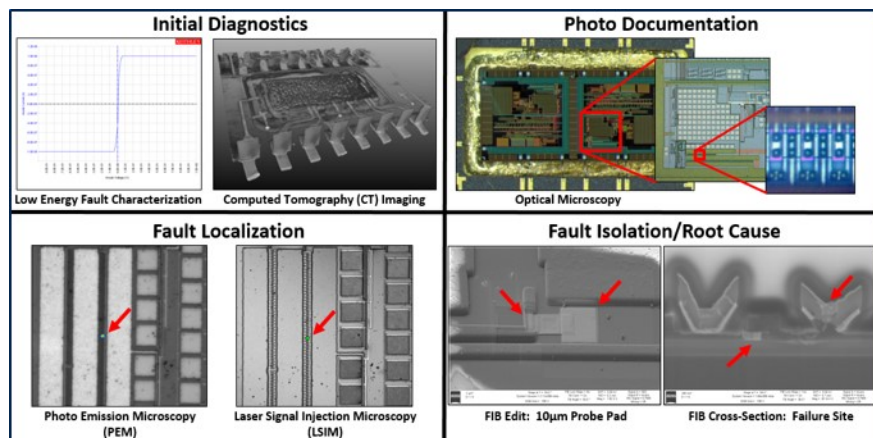
## **NAVSEAINST 4855.40 – Counterfeit Materiel Prevention (Apr 2019)**

- Locally assigned Counterfeit Materiel Coordinator (CMC).
- Critical/High-Risk Materiel
  - Must be purchased from authorized suppliers if possible
  - Is subject to applicable DFARS/FAR clauses
- Suspect counterfeit materiel must be investigated, reported, contained, and dispositioned.
- Part of NAVSEA IG inspections (started FY 2021), every 3 years.
  - Local policies, procedures assessed.
  - Updated training provided.

# NSWC Crane Authentication Capabilities

## Infrastructure/Tools

- Electronic Test Equipment
- Real Time/CT-Scanning X-ray systems
- Optical Microscopes
- Scanning Acoustic Microscopes
- Decapsulation & Cross Sectioning
- SEM / Focused Ion Beam
- X-Ray Fluorescence System
- Fourier Transform Infrared Spectrometer
- Chemical Analysis
- Life Test
- Environmental Testing
- Supply Chain Analysis
- Etc.





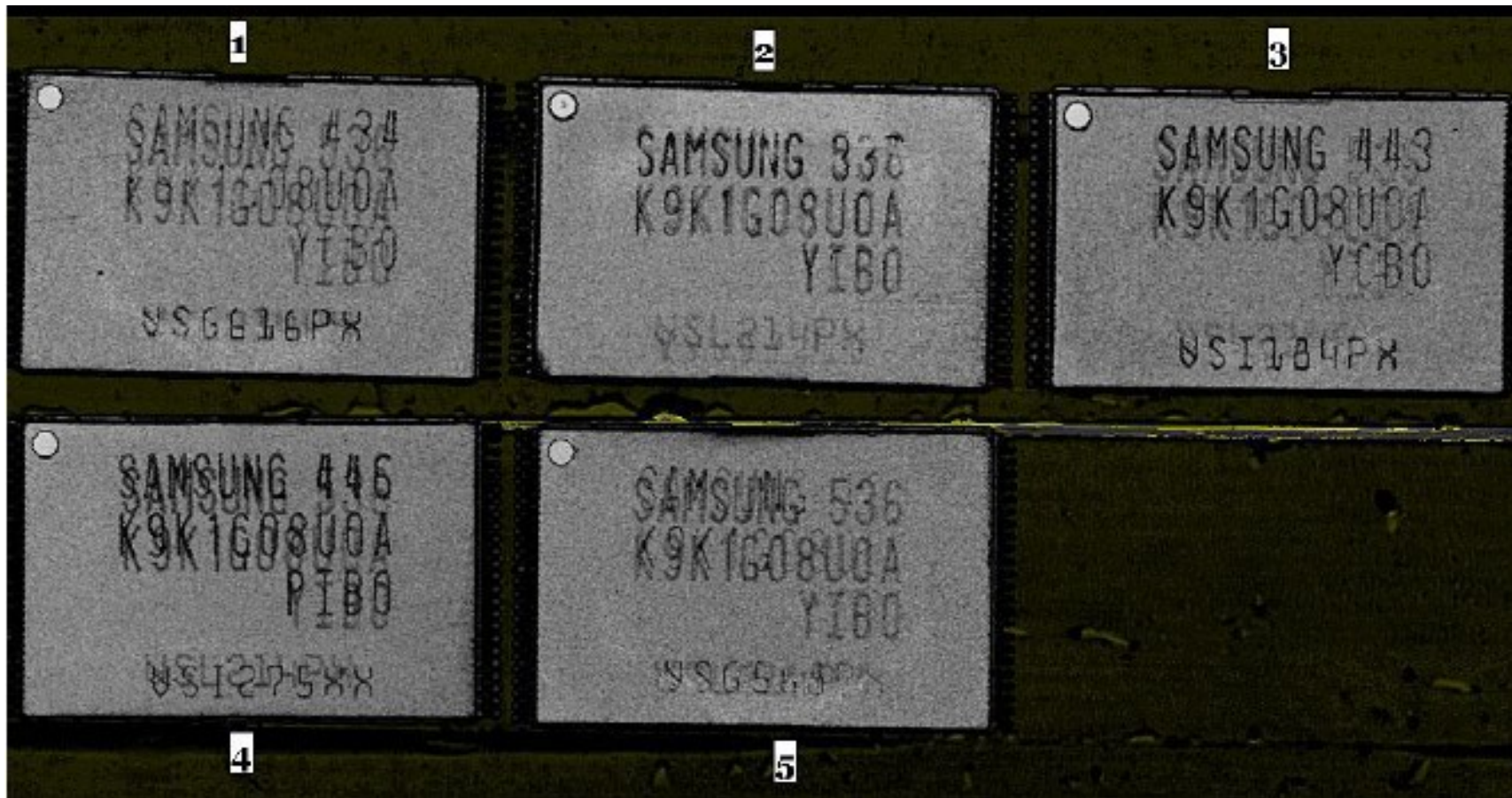
# Counterfeit Electronic Part Examples



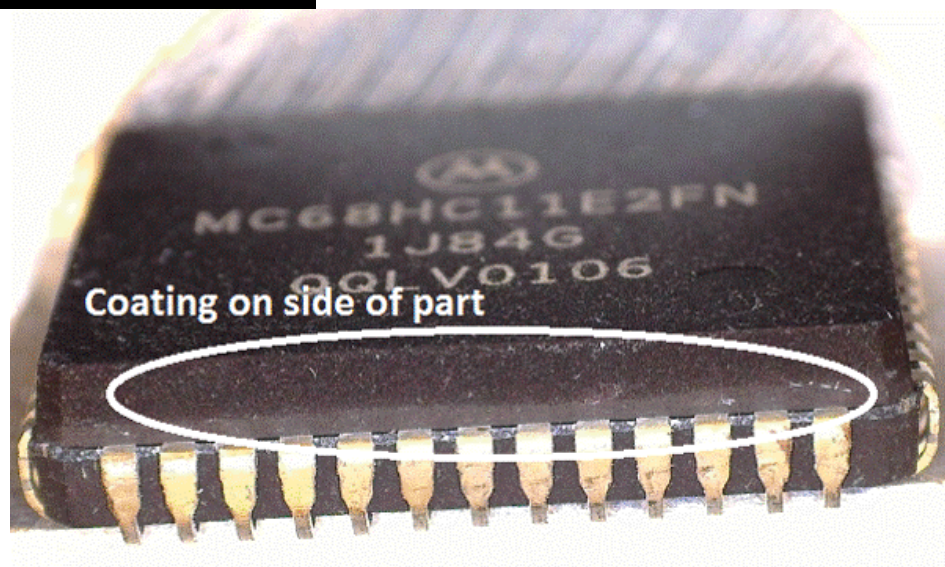
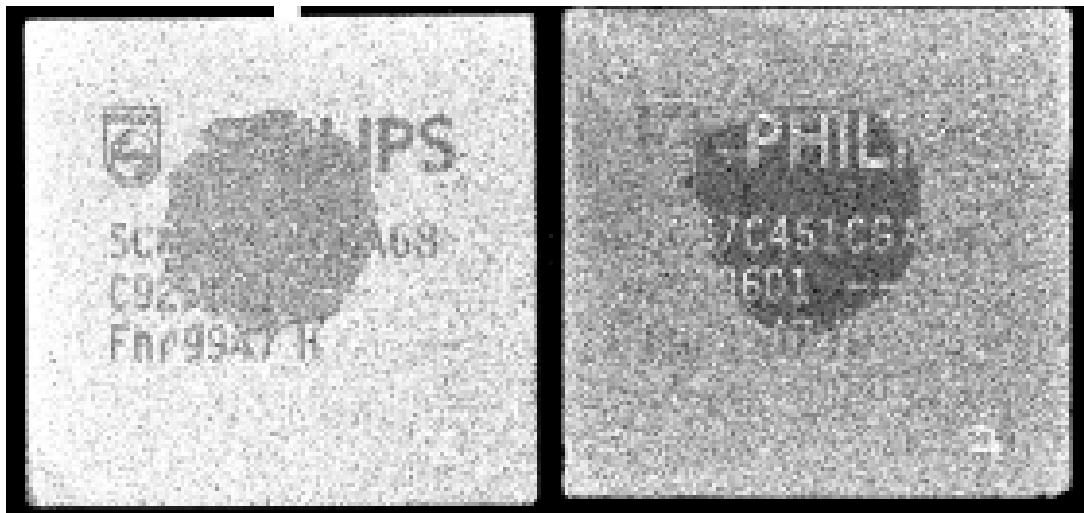
## A Few More Counterfeit Examples



# Counterfeit Electronic Part Examples

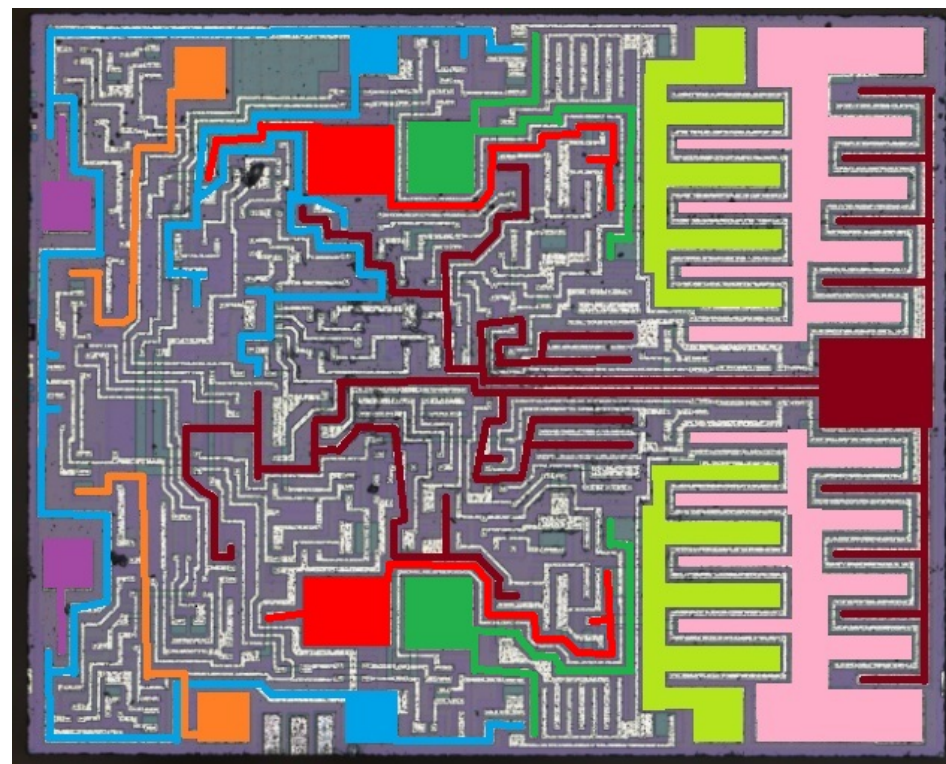
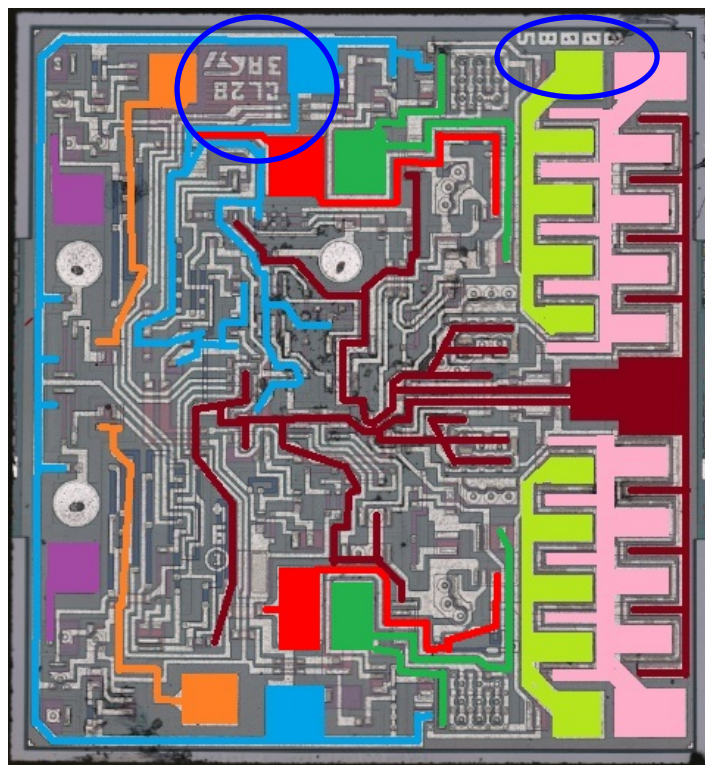
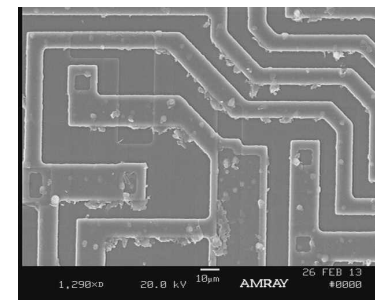


# Counterfeit Electronic Part Examples





# Counterfeit Electronic Part Examples







# The End.



## Questions?

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