

8 Step Guide

To Buying Electronic Components With Confidence and Avoiding Counterfeits



8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

Dear *fellow industry professional*,

Counterfeit Electronic Components are the cause of major problems within the electronics industry, putting quality, brand reputation and sales revenue in jeopardy, as well as creating risks to health and safety. Unlike other industries, counterfeiting in the electronics sector may have life or death consequences. Though we know that counterfeit parts enter the supply chain, the time and place of their entry is unpredictable. We must try to reduce the entry of, and effects from, counterfeit parts through increased diligence and active control measures. To accomplish this, it is necessary to have greater collaboration, both within the industry and with government associations.

We have developed this useful guide, containing information on topics which I believe are crucial to help buy electronic components with confidence and avoid counterfeits.

The recommendations made here identify actions as a guide to industry professionals but may require further study and collaboration.

Best Regards



Illustration 1: Beverley Scott

Beverley Scott
Head of Marketing

Table Of Contents

Introduction	4
Background	5 - 6
Background Information	5 - 6
Causes of Counterfeiting	6
Methods of Counterfeiting	6
8 Steps to Buying Electronic Components With Confidence And Avoiding Counterfeits	7 - 12
Step 1 Procurement Supplier Selection	7 - 8
Step 2 Receiving, Inspecting & Examining Goods	8 - 9
Step 3 Quality Specifications	9
Step 4 Traceability Requirements	10
Step 5 Testing For Counterfeits	10 - 11
Step 6 Training & Certifications	11
Step 7 Planning, Systems & Procedures	11 - 12
Step 8 Reporting Counterfeit Components	12
11 Questions To Ask Your Electronic Component Supplier	13
Cyclops Electronics Global Electronic Component Distributor	14
Cyclops Quality Procedures Flow Chart	15
Conclusion	16
Bibliography	17
Copyright and Disclaimer	18

Introduction

This paper presents background information on counterfeit electronic components in the electronics industry and the recommendations you should take to conduct a successful electronic component sourcing strategy. The goal is to raise awareness and mitigate the risks associated with counterfeit parts.

Regardless of how counterfeit parts, whether electronic, mechanical or other, enter the electronics industry supply chain, they can jeopardise the performance, reliability and safety of the end product. Authentic parts have known performance histories and adhere to manufacturers' quality control plans, whereas counterfeit parts have unknown performance reliability and often limited quality controls. The cost of counterfeit parts entering the supply chain is greater than the simple replacement of counterfeit parts. Ramifications could include potential product failure, warranty costs, inspections and testing, product recall, lost revenue, exfiltration of electronic data and even consequential loss.

Counterfeit Definitions

A definition of counterfeit parts can be described as

“A part made or altered to imitate or resemble an “approved part” without authority or right, and with the intent to mislead or defraud by passing as original or genuine” *The FAA Advisory Circular*.

“Counterfeit relates to wilful trade mark infringement - e.g. products or services made in imitation of; not genuine; pretend; fraudulent. A counterfeit is regarded as a specific type of “forgery”. In general, a counterfeiter steals the Intellectual Property of the original owner to produce low cost copies that undermine the originators products and hence profits.” *Component Obsolescence Group 2010*.

For the industry to successfully protect against this risk of counterfeiting, we must understand its causes and how counterfeits find their way into the legitimate supply chain.

“No type of company or organisation has been untouched by counterfeit electronic parts. Even the most reliable of parts sources have discovered counterfeit parts within their inventories.” *Defence Industrial Base Assessment Counterfeit Electronics, January 2010*.

So ask yourself, which one is counterfeit? Would you be able to tell the difference?...

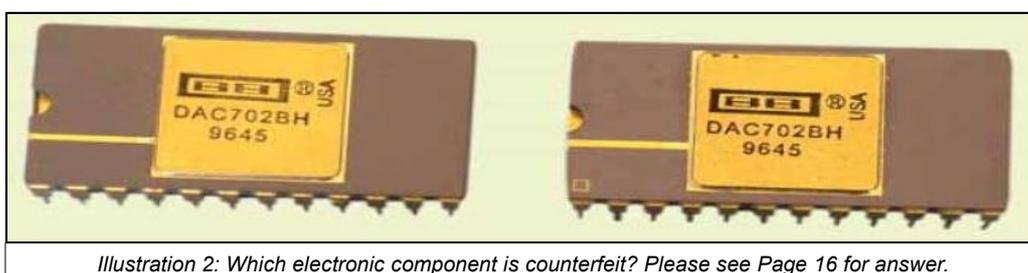


Illustration 2: Which electronic component is counterfeit? Please see Page 16 for answer.

Background

The rise of counterfeiting in recent years has been astounding. Over the last 10 years, various countries, governments and industries have undertaken studies on the proliferation and economic impact of counterfeits.

According to a recent study by the US Department of Commerce, Bureau of Industry and Security the number of counterfeit incidents reported grew from 3,868 in 2005 to 9,356 in 2008. Respondents to this survey cited the two most common types of counterfeit components were blatant fakes and up-screened functional product.



Illustration 3: World Map

This survey had 387 respondents representing all facets of the electronic component supply chain and all reported instances of counterfeit product. The World Semiconductor Trade Statistics estimates the global Total Available Market (TAM) for Semiconductors will be in excess of \$200 Billion, thus the 387 respondents provide quantitative results for only a small portion of the total market.

The International Chamber of Commerce & World Customs Organisation estimated that the value of counterfeit products may have reached **\$1 trillion globally in 2010!**

Profit is the primary incentive for counterfeiting. Typically aerospace and defence products are susceptible to counterfeiting because they have long life cycles with diminished manufacturing sources and material shortage issues.

In times of allocation, shortages and obsolescence, buying electronic components either from the Original Component Manufacturer (OCM), Franchised Distributor or Independent Distributor (ID) can be a minefield. So who can you turn to?

China and the Far East seem to offer a great source until you find that in reality this can mean you often end up with counterfeit, refurbished or quality defective components. As payment is often required in advance this means you could end up losing your money, having to source replacements and suffering production stoppages. Although China is the chief source of counterfeit electronic components, it will not necessarily remain so in the longer term. There are now growing supply chain networks that are working together building strong trading relationships to help eliminate counterfeit parts. The Chinese legislators have also laid down framework laws to reduce or stamp out this illegal trade. So as long as you are cautious and have the correct checks and partners in place China can still be a good source of supply.

Research has shown that you can still be exposed to a lower level of risk by buying directly from the Component Manufacturer or their Franchised Distributor - there still remains a small risk that suspect devices have entered their supply chain.

Background

According to the Independent Distributors of Electronics Association (IDEA): “While fraudulent, substandard and counterfeit components continue to find a place in the industry, when using quality certified independent distributors, the customer's risk of encountering such a product is diminished significantly. In fact, because quality assurance is a 'must', ISO-registered ID's go the extra mile, hiring and training inspection and engineering teams to examine and validate their incoming and outbound products.”

Causes of Counterfeit

There are several routes that can lead to you receiving counterfeit parts.

- Outsourced manufacturing to China has meant counterfeiters have easier access to the most modern tools and techniques.
- More and more manufacturing has moved towards lean production methods which ultimately can mean shortages occur more frequently within the market. This leads to a higher risk of counterfeiting when parts are in greater demand.
- The electronic components market is becoming more and more volatile and counterfeiters are quick to keep up and take advantage of any technology or manufacturing developments.
- Convenience of the internet and a globalised market to new sectors means that companies are at increased risk of shortages, allocation and counterfeits.

Methods of Counterfeiting

Here are a few of the methods used to change the appearance of a device.

- **Blacktopping and Remarking**
The top surface is covered with black paint and then the counterfeit part number and company logo that the customer requires is over printed. “Black Top” is easily removed revealing the original markings but counterfeiters have become aware of this method used and now use epoxy ink as a marking agent which matches that of most of OEM suppliers. Another cheaper method is to dissolve the original markings away using an aggressive solvent.
- **Sand Down**
A counterfeiter may “Shave” or “Sand Down” the top surface of the device to remove the original markings. This will also remove indents from mould marks used by a specific manufacturer.
- **Spelling and Date Codes**
The counterfeiter sometimes misspells the original manufacturer's name or adds date codes and type sizes that look suspicious.

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

So, how does an electronic components purchaser buy parts, with minimum risk of receiving counterfeits whilst maintaining the desired cost savings, quality specification and suitable delivery schedules they need to meet their business objectives?

There are several ways in which you can reduce, but not completely eliminate, the chances of receiving counterfeit devices. Here are 8 Steps to Buying Electronic Components With Confidence and Avoiding Counterfeits.



Illustration 4: Electronic Component Purchasing

Step 1 - Procurement Supplier Selection

Procurement policies and the selection of suppliers create an opportunity to significantly reduce the risk of counterfeit parts from entering the supply chain. Different sources of supply have different levels of risk, here are some considerations...

- **Manufacturer, Franchised Distributor or Agent**
Although these supply routes may contain the least risk of receiving counterfeit components, there still remains a small risk. In some instances, counterfeit devices may have invaded the production flow of the genuine manufacturer. In other instances, a fraudulent product may have been returned to a genuine distributor by less honest users. Despite trying their best, the Distributor cannot always detect such defects and is likely to re-sell these parts.
- **Independent Distributors**
Before you put your trust and your reputation in the hands of any distributor you must consider the more enlightened ID. Some American ID have formed an association of their own - IDEA (Independent Distributors of Electronics Association). This association has created specifications and guidance documents for its members to follow in order to reduce the incidence of counterfeit and fake components flowing through their organisations.

In the UK the United Kingdom Electronics Alliance was formed to pull together a diverse group of trade associations within the electronics sector, presenting a unique opportunity for the electronics sector to speak with a co-ordinated voice. In recent years it has helped its members with counterfeit issues which include an anti-counterfeit forum and seminars.

All information on members can be found on each website
<http://www.idofea.org> and <http://www.ukelectronicsalliance.org.uk>.

- **Small Unlicensed Distributors**
It is known that most counterfeit devices enter the market through the smaller unlicensed distributor network, mainly bought through other brokers or via the internet from unknown and uncontrolled sources.

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits



Illustration 5: Internet Trading

The US and Far East market varies somewhat from the European market in that there are a very large number of small operations acting as brokers procuring product.

Internet trading has opened up the electronics market which can be both positive and negative. The number of potential suppliers is now almost infinite which makes it harder to express a more personal judgement and help cement long lasting relationships, as one would have done 10 years ago.

IDEA recommends doing business with companies that have been established for a while, have a good reputation and stand by the products they sell.

A good supplier will have a long track record in the industry and will instill you with the confidence that your requirements will be completed to meet your exact requirements - right first time

Step 2 - Receiving, Inspecting & Examining Goods

When parts are first received, the first 'screen' or procedure that should be conducted is purely visual which can save you considerable problems further down the production line! Visual inspections are recommended for any organisation dealing with electronic components and are the front line of counterfeit screening. Inspection starts with the delivery paperwork then the outer packaging/labelling and continues down to the component level.



Illustration 6: Inspection Process

Paperwork Considerations...

- Does it look genuine?
- Are there any signs of changes been made to amend quantities, screening levels?
- Are there any strange font sizes which do not line up with the general layout.
- Soiled documents can cover up all sorts of modifications.

Packaging Considerations...

- Is the correct packaging used to protect components from electro static discharge?
- Humidity indicator cards and dry packaging is required if parts are moisture sensitive.
- Are the labels genuine and do they contain the correct information and bar codes?
- Are the dimensions of the package correct?

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

Component Considerations...

- Component dimensions.
- Does the date code of the part match up to the date code on the label?
- Spelling errors printed on the manufacturers label.
- Are the parts neatly packed?
- Are all the tubes full or are they split?
- Is the marking consistent?
- Incompatible date codes or those with future dates.
- Are the solder joints to standard?
- Are there any discolourations?
- Is there evidence of black topping? (Often if you look at the edge of the parts you can see the change in texture from the black topping. You may see how the top of the part is shiny and the bottom has a duller finish).
- Is there any corrosion or peeling evidence?
- Are the date codes consistent?
- Do the parts conform to the data sheet and have the correct number of pins?
- Do the parts match up to the packing slip, invoice, purchase order and C of C? (if required).

Step 3 - Quality Specifications

When choosing your electronic components supplier it is essential they have the correct quality procedures in place. Not only do they provide quality assurance when purchasing, but they can also help mitigate the risk of counterfeit electronic components entering supply chains.

It is recommended that electronic component suppliers should have the necessary processes in place to be able to mitigate the risk of receiving, storing and shipping potential counterfeit devices. Some of their quality processes may include the following quality certifications...



Illustration 7: ISO:9001

- **ISO 9001:2008**
This enables suppliers to demonstrate their commitment to service quality and customer satisfaction, as well as continuously improving their quality management systems and integrating the realities of a changing world.
- **AS5553**
This standard was created at the request of NASA, who were concerned about the rising number of counterfeit electronic parts within the supply chain. It provides uniform requirements, practises and methods to mitigate the risks of receiving counterfeit electronic parts. This standard is recommended for use by organisations that procure electronic parts, whether such parts are procured directly or integrated into electronic assemblies or equipment.
- **IDEA-STD-1010B**
This is the American inspection standard that helps address the importance of inspection of electronic components within the open market.

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

Step 4 - Traceability Requirements

Suppliers must maintain accurate records regarding the purchase of material that can be easily accessed when required by customers. It is vital your supplier is open and honest, divulging their origin. By providing traceability according to quality standard procedures (such as ISO 9001:2008 certification) customers can follow the origin of the electronic component, ensuring the highest level of accountability and control.

Step 5 - Testing For Counterfeits



Illustration 8: Component Testing

Suppliers should offer electronic component testing to include 100% inspection guarantee to international standards on critical visual and physical criteria to verify the origin and condition of the device. Tests could include any number of conventional techniques that are commonly used today in the fight against counterfeiting, (a fee may be paid for some testing).

- **Electrical Testing**

The ABI electrical SENTRY testing machine is able to identify components that have a different internal die structure or no die at all through a complex PinPrint test algorithm. A wide range of packages can be tested, DIP, SOIC, PLCC and BGA's. A test against a 'Known Good' device gives the customer a report to help, but is not a guarantee, whether the part is a counterfeit or defective component. Other electrical testing such as resistance, capacitance, voltage or a basic pin-to-pin examination can be done to check if parts meet full manufacturer's specifications.

- **X-Ray Inspection**

X-ray Inspection of electronic components gives a simple view of the internal structure. This process is usually performed prior to decapsulation to determine the exact die location i.e. if the package contains a die, the die size and if the die has any wire bonds. Similar to the electrical testing, X-Ray inspection is even more effective when suspect components can be compared to a known authentic part.

- **Decapsulation**

This process removes the packaging material that covers the electronic circuit to expose the die. There are many different methods available which include; manual, fully automated, plasma, chemical or laser etching. By analysing the die we can verify if the device is activated to conduct electrical measurement. As counterfeiters' have become more knowledgeable at what they do, currently the only way to become 100% certain a part is authentic is to check the die, as they haven't yet gone to the extreme of producing a fake die!

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

- **Scanning Electron Microscopy (SEM)**
SEM is an extremely powerful microscope that uses electrons rather than light to determine a microscopic image of the electronic components internal structure. As it has a shorter wavelength of electrons it can magnify up to 100,000X.
- **XRF Analysis**
X-ray fluorescence X-rays from gamma rays is used to determine the chemical make up of a component. It is mainly used throughout the electronics industry to identify the part's RoHS status.
- **Permanency Markings / Acetone Test**
The 'acetone test' tests parts to detect if there are any false coatings on the part. The test is conducted by wiping the components surface with a cotton swab that has previously been immersed in acetone solution. The acetone should not remove properly formulated and processed original component manufacturer markings.

Step 6 - Training & Certifications

As there seems to be no sign of improvement regarding the counterfeiting issue within the electronic component industry there is a need for training courses and certifications. Organisations should be pro-actively developing and conducting regular training for employees in the areas of procurement, detection, reporting and disposition of counterfeit parts. Companies can take advantage of the resources from industry organisations to learn about counterfeit parts and how to prevent them from entering the supply chain, these organisations include:

- AIA (*Aerospace Industries Association*)
- The CACP (*Coalition Against Counterfeiting & Piracy*)
- JEDEC (*Joint Electron Devices Engineering Council*)
- IDEA (*Independent Distributors of Electronics Association*)
- UKEA (*UK Electronics Alliance*)

Step 7 - Planning, Systems & Procedures

Companies dealing with electronic components should develop a counterfeit parts control plan to outline what systems and processes they will use in mitigating the risk, disposition and reporting of counterfeit parts. By planning and controlling it will help to mitigate counterfeit parts going into your manufacturing process or sold onto other parties.

Within the plan it is recommended that companies include the following items:

- Assess availability of authentic parts.
- Conduct an obsolescence program to manage life cycle of their products.
- Assess potential sources of supply to determine risks.
- Maintain a list of approved suppliers.
- Develop a component quality plan that assures detection of counterfeit parts, including minimum inspection and test requirements.

8 Step Guide To Buying Electronic Components With Confidence and Avoiding Counterfeits

- A documented process to initiate an investigation once counterfeit parts have been detected.
- A documented process to report suspected counterfeit product to customers and government organisations.

Step 8 - Reporting Counterfeit Components



Illustration 9: Reporting Counterfeits

If the unfortunate event occurs and a counterfeit electronic component is received by your company, it is vital you collate as much evidence as possible.

Your immediate reaction may be that you decide to send the parts back to the supplier demanding your money back. However, when sending the parts back, you are inviting them to send those same parts to another unfortunate purchaser.

By returning counterfeit parts to the supplier you will highlight counterfeits have been detected, which could lead to more intricate developments by the counterfeiter in the future. In this instance you could opt not to pay for the parts unless they have been passed by your independent screening procedures and reports have been approved.

If the part is found to be counterfeit later on within the manufacturing process, it is recommended that you collect evidence on the received parts and have them either impounded or destroyed in order to 'break the circle' of counterfeiting.

Suspected counterfeit parts can be reported to the following associations:

- FAA's (Federal Aviation Association) Suspect Unapproved Parts Program
- ERAI (Electronic Resellers Association International)
- IDEA (Independent Distributors Electronics Association)
- UKEA (United Kingdom Electronics Alliance)
- GIDEP (Government Industry Data Exchange Program)

Reporting of counterfeits is crucial, especially for safety critical components as it allows them to search their inventory for possible receipt of suspected counterfeit parts.

Hopefully when buying electronic components from a reputable supplier you will never experience any counterfeit issues.

11 Questions To Ask Your Electronic Component Supplier...

“No type of company or organisation has been untouched by counterfeit electronic components. Even the most reliable of parts sources have discovered counterfeit parts within their inventories” Defence Industrial Bas Assessment: Counterfeit Electronics, January 2010.

The escalating infusion of counterfeit parts means that when sourcing new suppliers of electronic components it is best practise to stay vigilant, reviewing and implementing strategies to help mitigate the risks associated with counterfeiting.

Companies can sometimes be reluctant to tackle uncomfortable questions that involve key stages of the buying process. A basic checklist of things to look out for when choosing your supplier of electronic components includes...

- *Are they members of the Independent Distributors of Electronics Association (IDEA), United Kingdom Electronics Alliance (UKEA) and ERAI?*
- *Are they ISO 9001:2008 certified?*
- *What testing facilities do they use and which services are performed?*
- *Does the company employ experienced professionals who can add value to our project?*
- *Can the supplier react to requests at short notice?*
- *Does the company invest, and continue to invest, in resources to develop relationships with suppliers and continually monitor product supplied?*
- *Does the supplier have strong links with Original Component Manufacturers and Authorised Distributors?*
- *Have they delivered a counterfeit or sub-standard part to a customer? If so how did they resolve the issue?*
- *What is their policy upon discovery of counterfeit or suspect parts in terms of impounding and reporting to organisations like GIDEP, UKEA and ERAI?*
- *Do they purchase from regions likely to be the source of counterfeits or substandard parts, such as China, India or Africa?*
- *Do they have supplier controls and flow-down clauses regarding counterfeit mitigation requirements?*

Global *Electronic* Component Distributor

Not choosing your supplier carefully can impact on production, warranty costs and safety of aerospace, military, medical electronics and many forms of consumer electronics.



Illustration 10: Cyclops Head Office York

At Cyclops we have opted to take a proactive approach to counterfeits. With the ability to test parts electronically you can be more confident in the goods that you receive. Our extensive experience in managing international supply chains ensures that you get the best balance of innovative and creative solutions, and 20 years of history.

All electronic components testing can include 100% inspection guarantee to international standards on critical visual comparative,

electrical testing, random Decap and X Ray analysis to verify the origin and condition of the device.

In line with our recent quality and testing developments, we have recently invested in the new ABI electrical SENTRY testing machine. This is able to identify components that have a different internal die structure or no die at all through a complex PinPrint test algorithm, against a known good sample.

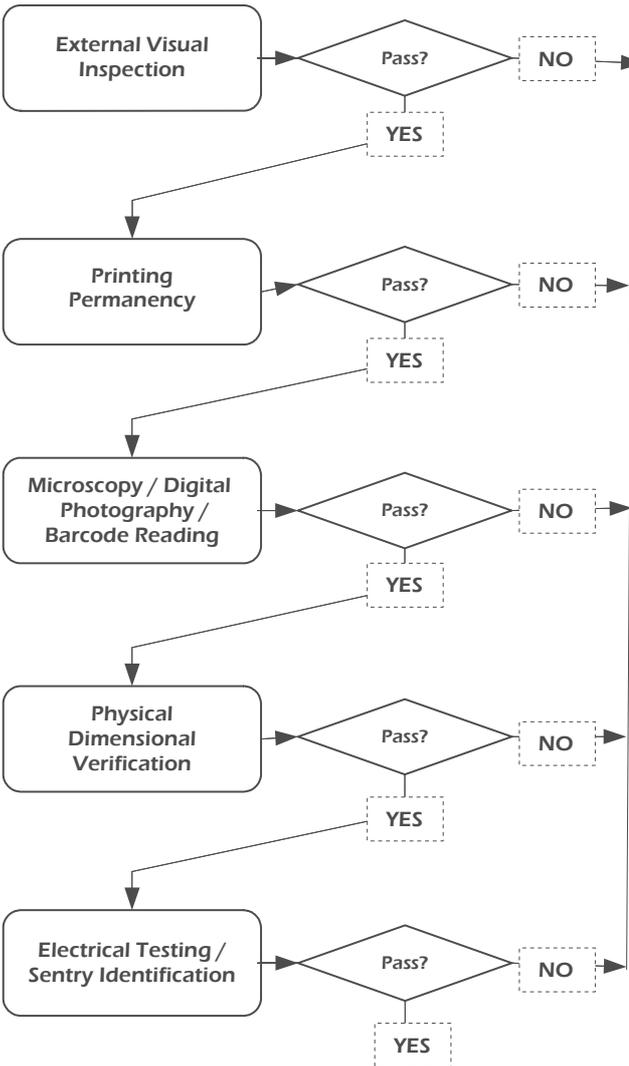
All staff at Cyclops are ESD trained and dedicated to supplying the electronic components you require to the highest quality standards. We have a variety of industry knowledge in many areas; sales, marketing, purchasing, IT, logistics, quality and administration.

Being a member of the ERAI and Electronics Yorkshire, part of the UKEA, and having ISO 9001:2008 quality assurance (Cyclops has been approved to an industry standard for the last 16 years) ensures you will get the right electronic component at an agreed price and more importantly safeguard your business against counterfeit components. For an in depth view of our quality procedures in place here at Cyclops, please [click here](#) or view our next page.

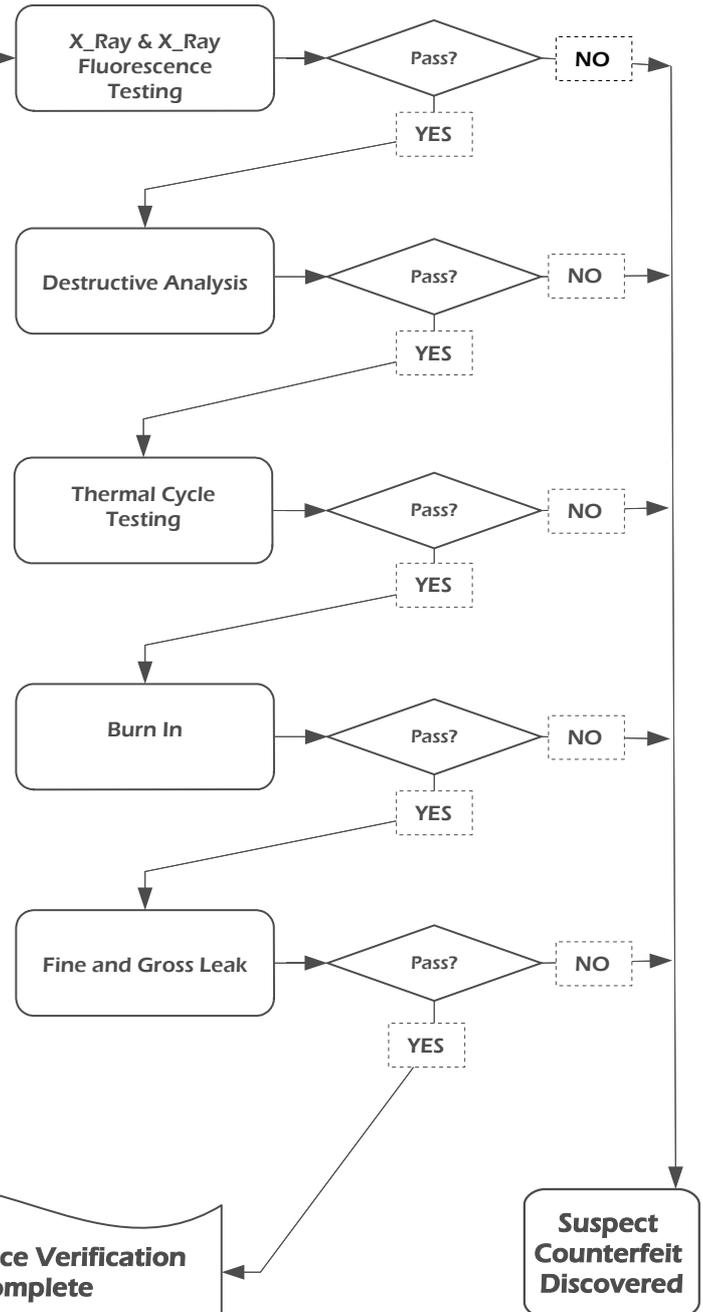
Cyclops Electronics also offer seamless solutions for electronic component buyers with allocation, obsolete and lead time problems. Not only, do we offer a full portfolio of Active, Passive and Electro-Mechanical Components to meet your needs, our Handy Table Of Top 14 Major Manufacturers' Lead Times can help plan ahead and keep you up to date with the latest changes in the electronic components market. To learn more, please call ++44 (0) 1904 436446.

Cyclops Quality Procedures Flow Chart

Cyclops Standard Procedures



Outsourced Procedures



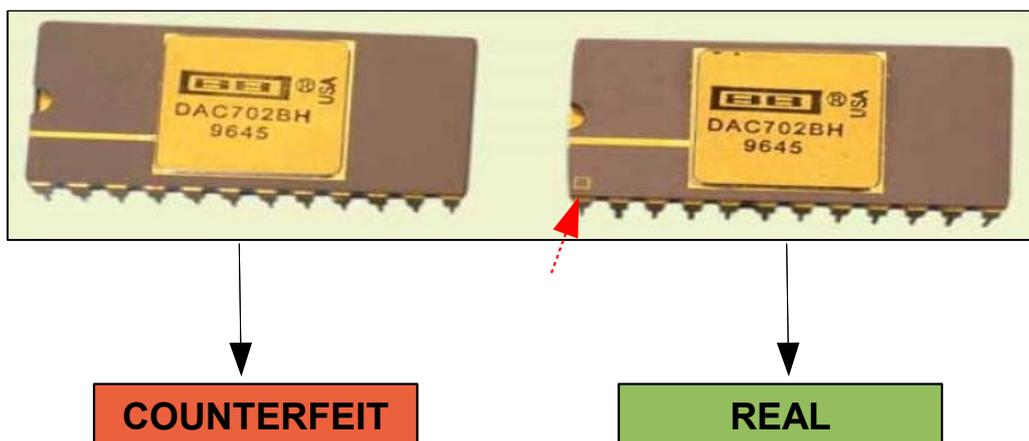
Conclusion

There are a number of suppliers that attempt to protect their customers and themselves in the best possible way. However, there are also many suppliers who don't even bother and it is unfortunate for customers that they have to find out for themselves....this is why quality procedures throughout the electronics industry are a must!

No longer can you 100% trust Googling a part number as the part could show up on any unsafe supplier website. Counterfeiters are increasingly web-savvy and in the past it has been known that they set up their own websites that go to incredible lengths to be seen as 'legitimate'. Always check your supplier source for legitimate contact details and be sure they actually exist!

In conclusion, counterfeit parts will remain a challenge for the electronic component supply chain. However, a disciplined, structured approach to your organisation's processes can help to mitigate the risk of counterfeit parts and determine if the components you are purchasing really are what you think you are buying. On a final warning, when you scour the market for parts, anything goes as far as the fraudster is concerned. Never feel confident that you know all the angles and possibilities, fraudsters will always find new methods and mechanisms to produce counterfeits! It is therefore essential that more companies throughout the world engage with each other, ensuring co-operation with customers to help fight against counterfeits.

So ask yourself, which one is counterfeit? Can you tell the difference now?...



The red arrow indicates the manufacturer's Pin 1 mark on the 'real' component, whereas the 'counterfeit' component doesn't. On visual inspection they both look identical this is why testing components is recommended and should be part of your inspection process.

Bibliography

COG: The Counterfeit Electronic Components Minefield, Version 2, 2010.

Verical: The Real Solution To Fake Parts, October 2010.

AIA: A Special Report Counterfeit Parts: Increasing Awareness and Developing Countermeasures, March 2011.

Supply & Demand Chain Executive, Various Issues.

Printed Circuit Design & FAB / Circuits Assembly.

Counterfeit Components Avoidance Programme Certification (CCAP-101).

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Disclaimer

This booklet is designed to help you buy electronic components with confidence and help you avoid counterfeits. But that said, as any book of this nature must, it carries a warning and disclaimer.

Every effort has been made to ensure this information is 100% accurate, relevant and timely. The information in the book is no guarantee that you will produce results as every business, and every business person is different. These techniques stated within the booklet however, will give you the greatest possible chance of success. As a user of this material, you do need to acknowledge that this cannot guarantee your success.

If you do not wish to be bound by the above, you may return the booklet to the publisher.

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