Minimizing Counterfeit Component Risk: Six Key Steps

By Ray Falkenthal

The infiltration of counterfeit components is a serious and growing risk in the industry. Long lifecycle, mission critical products, such as those found in military and aerospace applications, are particularly at risk because limited redesign options typically translate over time to an increased number of components at or near end-of-life. The costs of counterfeit components can be difficult to fully calculate because issues driven by counterfeiting can include production defects that lower yields increasing rework rates, infant mortality in the field and partial failures which can impact the unit's functionality. There is also a growing administrative cost associated with identifying counterfeit components.

How can the likelihood of counterfeit components sabotaging your product be minimized? Optimum Design Associates focuses on six key steps:

- Identifying obsolescence issues as early in the product development cycle as possible
- Identifying known counterfeiting risk in each product as part of the new product introduction (NPI)/project launch process
- Working primarily with franchised distributors and trusted suppliers
- Carefully screening parts which must be purchased from non-franchised distributors
- Immediately reporting suspected counterfeit parts
- Ensuring an adequate test and inspection methodology is present in production.

Identifying Issues Early in the Product Development Cycle

With new products, the best way to minimize counterfeit component risk is to minimize obsolescence risk by carefully analyzing components in the product development phase. Tools such as Silicon Expert, component suppliers and distributors can provide data on each component's likely lifecycle length and risk of obsolescence during the projected product lifetime.

Where possible, components with established demand in the middle of their lifecycles should be chosen in favor of those with high obsolescence risk.

Identifying Counterfeit Risk as Part of NPI

Unfortunately, even with thorough planning in the design stage, obsolescence happens eventually in most long lifecycle products. Silicon Expert does provide a history of whether or not a component has a high incidence of being counterfeited. This can help identify what types of component modifications are most prevalent and support development of an inspection strategy for parts which must be procured from non-franchised sources. Other tools for this risk identification include: the Government Industry Data Exchange Program (GIDEP), FAA's Suspect Unapproved Parts Program, ERAI and the Independent Distributors Electronics Association (IDEA). A bill of materials (BOM) risk analysis that addresses both obsolescence and incidence of counterfeiting risk, as well as any availability issues, should be performed as part of the NPI process.

Working with Trusted Suppliers

Component manufacturers, franchised distributors and trusted electronic parts suppliers represent the best option for mitigating counterfeit component risk. These companies' reputations and business relationships are based on their ability to supply high quality parts. Comparatively, non-franchised distributors and electronic component suppliers in lower cost labor markets can vary widely in their commitment to identifying and purging counterfeit components from the supply chain.

Optimum Design Associates works with trusted suppliers, when possible. As with most contract manufacturers, customer approved vendor lists (AVLs) dictate which electronic component suppliers are used. When component availability issues dictate the use of non-franchised sources, the customer is advised. Any data Optimum Design Associates obtains on counterfeit component risk related to the actual component or proposed source is shared with the customer. This partnering process provides customers with the data they need to make informed decisions on best options for mitigating obsolescence issues and counterfeiting risk.

Carefully Screening Parts from Non-Franchised Distributors

Component counterfeiting can take many forms. Date codes on parts nearing end of shelf life can be altered. Part labeling on commodity parts can be changed to reflect a high performance part. Actual counterfeit parts with substandard or non-working elements are manufactured in volume. In short, the job of detecting counterfeits has become increasingly difficult, as shown in Figure 1 and 2 below.

Figure 1. Counterfeit Component

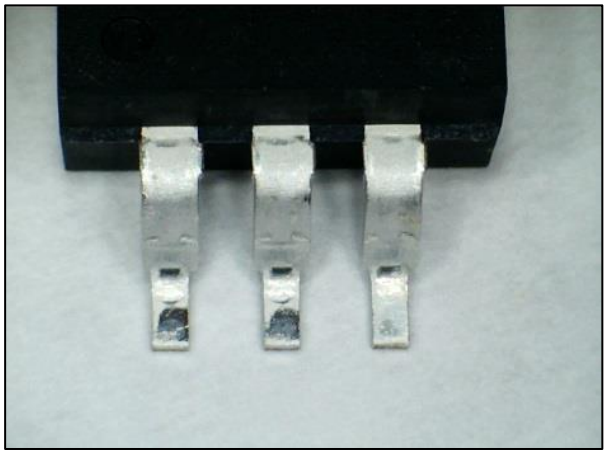

Figure 2. Known good component

Compared side-to-side, the difference in the finish and dimensions of the leads are obvious, but without the comparison to the known good part, the excess solder may not be noticed.

Fortunately, legitimate suppliers have created strong infrastructure to protect their brands. Most component manufacturers have a counterfeit division. When suspect parts are received, component manufacturers are willing provide information and/or samples for a cross comparison of body styles,

markings and logos. They will also review photos for visual evidence of modifications, when provided by the company making the inquiry.

Receiving inspection departments should be trained to look for potential issues as material is received.

Key visual indicators include:

- Broken seals or damaged outer packaging
- Packaging inconsistent with or insufficient for that brand of part
- Variance with part number, manufacturer or quantity listed in documentation
- Variance in country of origin or date codes listed in documentation
- One or more components reversed in tubes or trays
- Logos that vary from that typically used by the manufacturer
- Smudged markings or evidence of re-marking
- Damaged, malformed or bent leads
- Cracks or chips in body of component
- Inconsistencies in component body formation
- Evidence of burn, blister marks, flux or other chemical residue
- Oxidation, corrosion or solder on leads
- Smashed or discolored BGA balls
- Variance in package dimensions from known good parts

If inconsistencies are found, destructive testing of samples should be performed either at the component manufacturer or via a third-party testing firm. These tests may include a mineral spirit and alcohol wipe for evidence of re-marking, acetone wipe for evidence of blacktopping, scrape test, or de-capping to view the die.

Reporting Counterfeit Parts

The reporting databases listed earlier such as GIDEP, FAA's Suspect Unapproved Parts Program, ERAI and IDEA only remain strong if users report all counterfeiting incidents. More importantly, there may be contractual reporting requirements. Most military and aerospace contracts have some level of flow down responsibility relative to nonconforming material reporting within the supply base.

Production Test and Inspection

Production test and inspection represents the final level of due diligence in mitigating counterfeit risk. A robust test and inspection methodology which includes automated optical inspection and/or x-ray, electrical and functional testing can help identify components that vary from either dimensional or performance specifications. In truly mission critical applications, environmental stress screening may also be necessary.

The counterfeit component 'industry' will continue to grow. Taking a multi-faceted approach to counterfeit component identification and elimination is the best way to address this rapidly evolving challenge.

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About Optimum Design Associates

Optimum Design Associates (ODA) is a leading provider of award winning printed circuit board (PCB) layout, engineering, and in-house turnkey electronics manufacturing services (EMS). Established in 1991, ODA continues to meet the challenge of creating complex, high-density printed PCB layouts for some of the world's leading high-tech original equipment manufacturers (OEMs). ODA has offices in California and Australia. Its California facility is ITAR-registered and certified to ISO 9001:2008.