

What's Your PCB IQ?

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Counterfeit Quiz 1

Can you get fooled by fakes? Take the PCB Girls and Geeks 10-Question Pop Quiz to find out!

We hear about counterfeit components all the time these days. How big is the problem? Based on our readers' requests, we began investigating, and – Wow! Were we ever surprised at what we found. There is so much to learn about counterfeit components that it fills two quizzes: this one on the scope of the problem and the next one on detection and avoidance.

QUESTIONS

1. What is a counterfeit component? Is an electronic part considered not genuine if it:
 - a) is an unauthorized copy
 - b) does not conform to the Original Component Manufacturer's (OCM) design, model, and/or performance standards;
 - c) is not produced by the OCM or is produced by unauthorized contractors;
 - d) is an off-specification, defective, or used OCM product sold as "new" or working
 - e) has incorrect or false markings and/or documentation
 - f) all of the above
2. Where do counterfeit components originate and what forms do they take?
 - a) Removal from used PC boards
 - b) New, unused parts that are re-marked
 - c) OCM scrap
 - d) Functional knockoffs
 - e) All of the above
3. What is the estimated size of the counterfeit component market?
 - a) \$5 billion
 - b) \$7.5 billion
 - c) \$10 billion
 - d) \$15 billion
 - e) None of the above
4. In the past two years, the number of reported counterfeit electronic component incidents has:
 - a) Doubled
 - b) Tripled
 - c) Quadrupled
 - d) Quintupled
 - e) None of the above
5. What is the most commonly counterfeited component type?
 - a) Integrated Circuits (ICs)

- b) Transistors
- c) Capacitors
- d) Diodes
- e) None of the above

A large percentage of counterfeits are used components that have been removed from discarded electronics, or e-waste. They are sorted by size and cleaned up, then disguised as genuine parts and resold as new. Most of this illegal "reprocessing" occurs in developing countries. While there are laws prohibiting the export of hazardous e-waste from industrialized nations to emergent ones, this smuggling practice is very common, and it feeds the counterfeit industry with what are essentially its raw materials.

In 2008/2009, the television news magazine 60 Minutes investigated illegal e-waste. If you watch this 12-minute video (<http://www.cbsnews.com/video/watch/?id=5274959n>), you'll know the answers to the next four questions....

- 6. How many cell phones do Americans discard every year?
 - a) 25 million
 - b) 50 million
 - c) 75 million
 - d) 100 million
 - e) None of the above

- 7. How many computers does America discard every day?
 - a) 25,000
 - b) 50,000
 - c) 75,000
 - d) 100,000
 - e) Less than 25,000
 - f) Over 100,000

Now don't you wish you watched that video? There's still time to get help on the next two questions...

- 8. What city is considered the epicenter of component counterfeiting by reprocessing e-waste?
 - a) Mumbai, India
 - b) Monrovia, Liberia
 - c) Guiyu, China
 - d) Sao Paulo, Brazil
 - e) Fargo, North Dakota

- 9. How much e-waste do they process annually?
 - a) 100,000 tons
 - b) 500,000 tons
 - c) 1,000,000 tons
 - d) 2,000,000 tons
 - e) None of the above

10. What weighs 4 billion pounds?
- a) a line of Ford Fiestas, parked bumper to bumper, stretching from New York City to Los Angeles, CA, and then from LA up to Seattle, Washington
 - b) 55" flat screen TVs wrapped end-to-end around the earth at the equator, twice
 - c) enough iphones to fill the entire Empire State Building
 - d) 900 fully loaded space shuttles at takeoff, including the payloads, rocket boosters, external tanks and a million pounds of fuel
 - e) all of the above (individually, of course!)
 - f) this hint to the answer for Question 9
 - g) none of the above

ANSWERS

1. f; all of the above. This definition was developed by the U.S. Defense Industrial Base Assessment, Counterfeit Electronics, January 2010, and enumerates the number of ways that electronics components can be misrepresented to their buyers. It's included in their 243-page report (http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/final_counterfeit_electronics_report.pdf), which can be downloaded for free.

If you don't have the bandwidth for 243 pages, Gary M. Beckstedt, Jr, Director of Global Quality, World Micro, gave a very concise 15 slide Power point presentation on it at the 2011 Counterfeit Electronic Parts and Electronic Supply Chain Symposium. "Supply Chain Management and Internal Inspection: Techniques to Mitigate Counterfeit Component Impact," can be downloaded from the SMTA knowledgebase (<http://smta.org/knowledge.cfm>). It's free for SMTA members or \$10 for non-members.

2. e; all of the above. As implied by the definitions in question 1, counterfeit components can take on a wide variety of forms:
- "Board pulls" are used components that have been removed from their original circuit boards (usually over an open flame as seen below, not on a calibrated hot nitrogen rework station), their original identifying markings are removed or covered over, new markings are added, and their leads are often re-pressed and re-tinned. These fakes take on a close resemblance to the genuine parts; they can sometimes be detected by visual examination and comparison to the real thing, but the counterfeiters' disguising techniques seem to get more sophisticated every day. These fakes often slip into production at levels of 1 to 2%, because sporadic component failure rates that low can easily fly under the quality radar.



PCB Heating Technique for Removal of Used ICs to be Resold on Counterfeit Market

- New, unused components that are remarked may sometimes be given different part numbers, but usually “re-marks” are original parts that have been fraudulently uprated to higher performance and reliability standards. Uprated re-marks are not built to handle the electrical, mechanical or thermal loads of the applications into which they are placed. This class of components is particularly dangerous, as they can pass functional test and even burn-in, but may not perform to specification in mission-critical applications, like the airplanes we fly in.
 - OCM electrical test failures should be destroyed; however, they often find their way into the gray market at discounted prices. This class of counterfeits is partially functional, each device’s failure mode may be different, and their genuine OCM markings make them very difficult to detect by visual inspection alone.
 - Functional knockoffs also look identical to the Real McCoys, and perform the exact same functions as the genuine parts – but they’re not. They’re usually made of cheaper materials and built to lower quality standards. Some of them come from the same factory that builds the genuine parts, getting produced during off-shifts, weekends, or production slowdowns. Others come from shops dedicated to the fine art of making fakes.
3. b; \$7.5 billion. Senator Carl Levin, Chairman of the Senate Committee on Armed Services, recently cited the worldwide counterfeit component market as a \$7.5 billion business (<http://www.youtube.com/watch?v=Jsz6Xa5Xeq4>). How big is that? About the size of well-known brands Hertz, Campbell Soups, Kodak or CableVision. Why does Sen. Levin care? Because 40% of the U.S. Department of Defense’s supply chain is adversely impacted by fake or defective parts.

Other estimates of the market run as high as \$15 billion – that’s the size of Texas Instruments, Jabil Circuit or EMC.

4. c; Quadrupled! Market research organization isuppli recently reported (<http://www.isuppli.com/Semiconductor-Value-Chain/News/Pages/Reports-of-Counterfeit-Parts-Quadruple-Since-2009-Challenging-US-Defense-Industry-and-National-Security.aspx>) that the

number of recorded and confirmed counterfeit incidents multiplied fourfold from 324 in 2009 to 1363 in 2011.

“Incidents” can involve any quantity of a specific component type; last year’s 1300+ incidents involved over a million parts. Recording organizations include Electronics Retailers Association International (ERAI), and the Government-Industry Data Exchange Program (GIDEP). It’s often estimated that only about 50% of the counterfeits in the supply chain are reported, so the problem may be up to twice as large as the current data indicates.

5. a; ERAI reports that ICs make up 81% of the counterfeit components. Transistors make up 8% of the reported counterfeits; caps and diodes are reported at 4% each, and inductors and other miscellaneous component types make up the remaining 3% of the pie.
6. d; see next answer for details
7. f; 100 million mobile phones are discarded each year and 130,000 computers every day. In a November, 2008 interview with 60 Minutes’ Scott Pelley, Alan Hershkowitz, Senior Scientist at the Natural Resources Defense Council (NRDC), revealed these startling numbers. 130,000 computers every day – that’s 47 million computers per year!

100 million cell phones and nearly 50 million computers **every year** - does that seem like a lot? We hear statistics with ginormous numbers (“ginumbers”) all the time, and we never know when to believe them. So we looked for some form of corroboration on the ginumbers. Here’s what we found:

The CTIA, a Washington, DC-based Wireless Industry Association states that there were 250 million mobile phone subscribers in the US in 2010. The USA’s 2010 population was around 310 million; 250 million is about 80% of that. So, 8 out of 10 Americans carry mobile phones - that sounds pretty reasonable. With 250 million users, 100 million turn-ins every year also seems reasonable - that’s basically each user getting a new phone every 2.5 years – shortly after the typical two-year contract expires.

What about the 47 million computers? About a year ago, Reineke Reitsma, Vice President of Market Insights at research firm Forrester, blogged (http://blogs.forrester.com/reineke_reitsma/11-04-29-the_data_digest_how_many_us_households_have_multiple_pcs) that 82% of US households have one computer, and 48% have more than one. There are 115 million households in the US. If we do the math, that’s 94 million houses with at least one computer and 47 million old computers discarded every year. Don’t even need the calculator for that one! That’s one computer discarded every two years per household. That seems a little on the high side, but we’re not considering our work computers in this analysis. Many of us have both. We’ll bet that at least one of yours has been upgraded in the past two years.

The bottom line: we believe both these ginumbers, and are actually a bit awed by them.

8. C; Guiyu, China. Located about 200 miles northeast of Hong Kong in the province of Guangdong, this village’s economy is based almost entirely on e-waste and counterfeit components. Over 60,000 people from 5500 families participate in this local industry that has zero safety precautions or environmental protections. Guiyu’s river water is undrinkable, their air is acrid, the soil contains

over 300 times the lead than surrounding areas, and the majority of the village's children have dangerously elevated blood lead levels.

The fakes that the families of Guiyu turn out for the relatively high pay rate of \$8/day are then wholesaled in organized markets in nearby Shenzhen and work their way back into our supply chain from there. For more info on Shenzhen's bizarre component bazars, check out this Businessweek video (<http://www.businessweek.com/videos#video=hnNXBrMjoStpE8u7t3IJhDRTIFZ2LX7>).

9. d; 2 million tons. That's 4 billion pounds!

First, a reality check on that ginumber: It was provided by NRDC's Hershkowitz, who's got good cred with us because his other stats panned out. He offered that figure in 2008. A 2006 *Seattle Times* report by Tim Johnson cited the mass of e-waste processed in Guiyu at 1.5 million tons (http://seattletimes.nwsourc.com/html/nationworld/2002920133_ewaste09.html). He got that number from a local government website that also said the city pulls in \$75million per year in the "recycling" business. So the numbers jibe, and this appears to be a growth industry - up 33% in 2 years, and growing at a rapid rate. Extrapolating the revenue growth proportionally to 2012 would put Guiyu's e-waste reprocessing business in the neighborhood \$175 million dollars/year.

FYI, although Guiyu might currently hold the Guinness World Record for the most e-waste in a single city, they're not hogging all the action. E-waste reprocessing continues to proliferate into underdeveloped areas of the world, including other locations within China, and cities in India and West Africa. In March of this year, the toxic watchdog group Basel Action Network (BAN) reported (<http://www.ens-newswire.com/ens/mar2012/2012-03-15-02.html>) between 650,000 and 1 million tonnes of e-waste being directed into Benin, Côte d'Ivoire, Ghana, Liberia, and Nigeria. (For the metrically impaired, 1 metric tonne = 2200 pounds.)

10. e; all of the above. 1.6 million cars, 64 million TVs, 29 million iphones, 900 space shuttles...It's really, really hard to imagine, which is exactly why we tried putting it all in context. That's how much e-waste the one village of Guiyu was said to have processed in 2008. The quoted 4 billion pounds doesn't count any of the other illegal e-waste processing going on outside of Guiyu or the e-waste/counterfeit business growth since 2008; nor does it include the legal e-waste recycling performed by legitimate organizations that BAN certifies as "e-stewards."

SCORING

What's your Counterfeit IQ – are you easy to fool? Give yourself one point for every correct answer, and deduct one point for every incorrect answer.

If you scored 8-10, you are Nobody's Fool. Nope; no siree. You are so on top of the counterfeiting problem that you know the business, the risks, the sneaky ways counterfeiterers trick buyers, and what our industry and the government are doing to combat it. You're not getting faked out; no way, no how.

If you scored 0-6, you're just Plain Foolish. You might think you're as cool as Nobody's Fool, but you're actually the brunt of most office jokes. They've probably turned your last name into a verb that's synonymous with screwing up. You're about as savvy as George W. Bush was when he said "Fool me once, shame on you. Fool me – you can't get fooled again." WTF? You probably pretend to understand

and agree with this “foolish” mash-up of an ancient proverb and a classic rock lyric, don’t you? Nice try, fool.

If you scored less than zero, you’re such a Total Fool they named a whole day after you! Yup! Every April 1st we celebrate you and your brethren, mostly by playing practical jokes on ya’ll. You know – the timeless stuff like putting salt in the sugar bowl and plastic wrap over the toilet bowl, or modern digital antics like fraping your facebook page or texting your ex. All in good fun – at your expense! But please don’t get all angry and leave us for that sales job; we thrive on the comic relief you provide. Hey – do you think that if we made a counterfeit you it would be smarter?

No matter how you scored on this quiz, there’s still time to study up and prepare for the next one on counterfeit component avoidance and detection.