



How to Spot a Counterfeit: Heated Solvent Testing

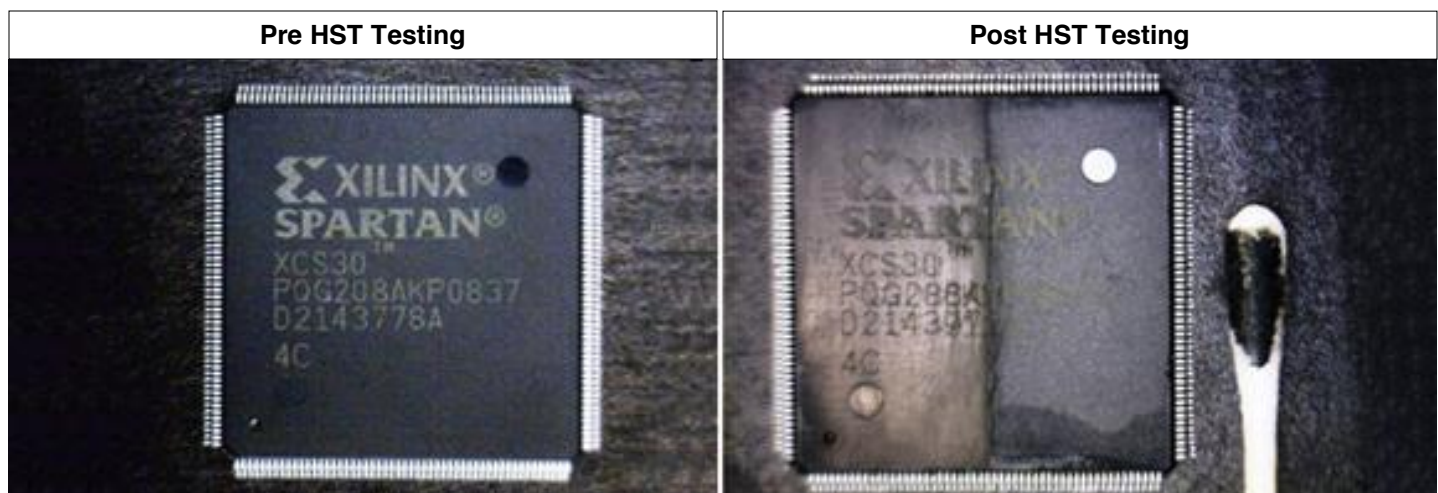
By: Mike Zambito, Director of Operations, **Advanced Component Testing**

Counterfeiters are always implementing new methods of resurfacing a device that are more resistant to solvents. A decade ago they would typically sand the surface of a chip to remove any markings, resurface or blacktop the device, and then remark it with a different part number: Standard acetone testing would normally reveal that. Now they often remove the part markings with acid and then resurface it with an epoxy-based blacktop coating and apply new markings: This process is, by design, resistant to a simple acetone test. As a result the testing industry has developed heated solvent testing (HST), which is a more aggressive and thus more effective method of uncovering a counterfeited device than traditional surface testing.

The two most widely used heated solvent solutions are Dynasolve 750 and 1-Methyl 2-Pyrrolidinone. These solutions are heated to their flash points (105°C or 115°C respectively) to maximize aggressiveness and the device is suspended halfway into the solution. After the allotted period of time (45 or 5 minutes respectively), the device is lifted from the solution within which any resurfacing or remarking should have been removed to expose the sanded or possibly original factory surface of the device. A cotton swab is used to wipe the surface and any evidence of sanding; removal of the surface or transfer to the cotton swab is indicative of an adulterated device. Unless there is a blatant transfer to the swab, the device is then inspected under a microscope at a 45° angle for any ridges that may have been created during the sanding process.

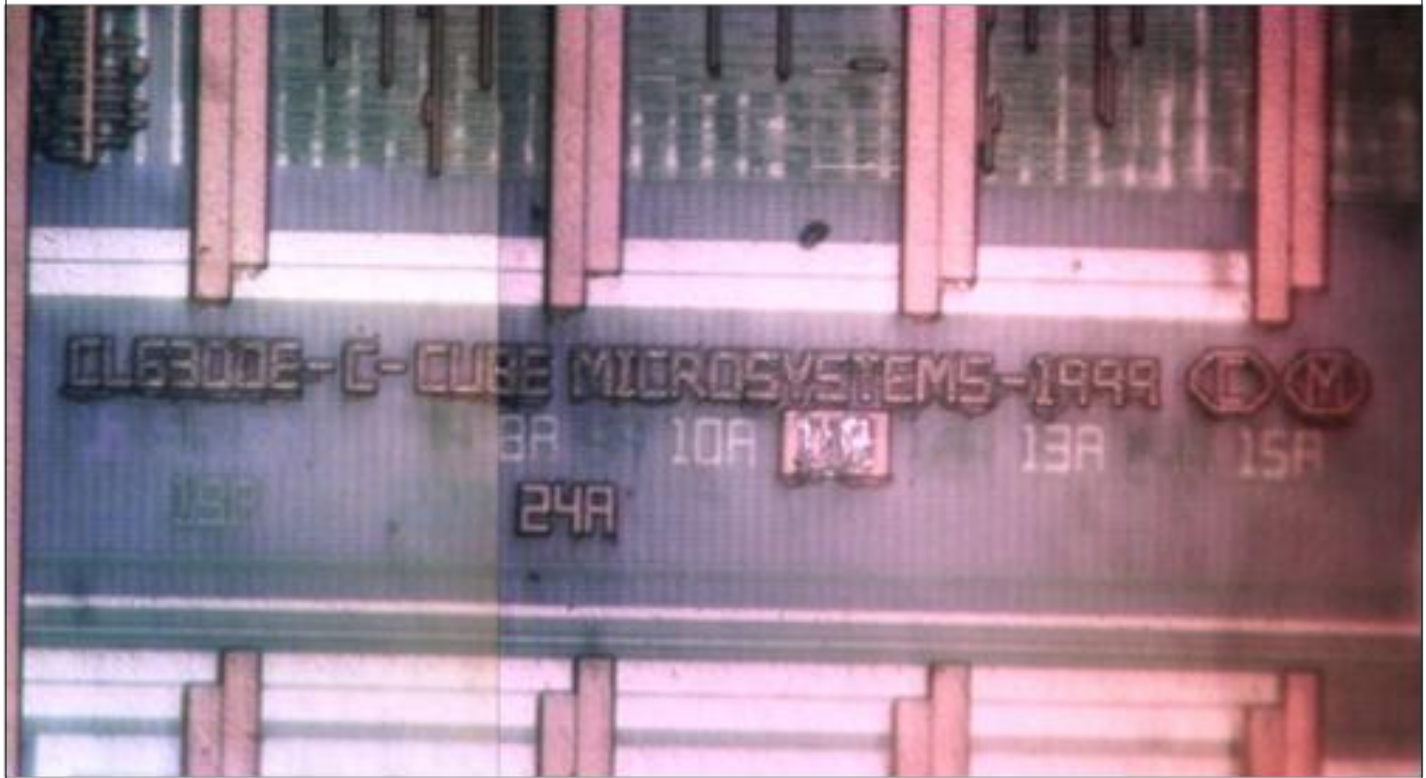
Most counterfeited devices have been created to fulfill a particular customer order placed, for example, through an online storefront or through an unscrupulous or unwitting broker. In many cases, device equivalents are altered so they can be represented as genuine. These similar but adulterated devices may exhibit the same form, fit and even basic functionality; however, they may operate at a different frequency or voltage or differ with respect to long-term reliability and actual lifespan. A device's branding, device type, speed grade, temperature rating and manufacturing information are all commonly counterfeited representations that would be uncovered during heated solvent testing.

Below is an example of a device represented as a Xilinx Spartan XCS30-4PQG208C Field Programmable Gate Array (FPGA). Heated solvent testing revealed that the device markings and lot codes had been altered. Among other adulterations another indicator was revealed: The original marking did not contain the "G" in the part number and the lot code had been changed. This was an immediate authentication failure.



Further evaluation of this counterfeited device revealed that it was not a Xilinx device at all. This device contained a C-CUBE Microsystems CL6300E die but it should have contained a Xilinx 5130 die!

Device Die Markings



The FPGA in this example had undergone a basic solvent test prior to heated solvent testing. Had HST not been performed, this suspect counterfeit device might have found its way into a missile or munitions application. Of course, heated solvent testing is required by all leading authenticity inspection standards including AS6081 and AS6171, as well as every other flowdown requirement I have ever come across. Still, keep in mind that HST results are somewhat subjective and, thus, the reliability of an HST test may be closely linked to the ability of the technician performing it. Substantial hands-on experience and training of the technician executing these tests play an important role in ensuring that suspect counterfeit parts are adequately identified.



Advanced Component Testing (ACT) is an ISO 17025 accredited and DLA QTSL audited and assessed facility for electrical testing, counterfeit detection, material analysis and other engineering services on Mil-Spec and COTS electronic components. Visit www.actestlab.com for more information or call 631-676-6390.