

RoHS FAQ

1. What is lead-free and how does it relate to the RoHS Directive?
 2. Are Honeywell Aerospace products bound by the RoHS or lead-free initiatives?
 3. How does Pb-free relate to the no-pure-tin initiative?
 4. Is there any product performance degradation with the use of lead-free materials with respect to...
Vibration?
Temperature extremes?
Long-term durability?
 5. When will we begin to see Pb-free components and CCAs in Honeywell Aerospace products?
 6. How will Honeywell Aerospace manage the identification and segregation of Pb-free components/CCAs/End Items during the transition period?
 7. Are there ISC implications with regards to obsolete parts due to phasing out lead from products?
When will this begin?
 8. How is Honeywell ensuring that our suppliers are properly managing lead free components?
 9. Does Honeywell have analysis available to ensure reliability is maintained when lead free components are implemented?
 10. Do we understand the reliability and life impacts of going to Pb-free? (combine with above)
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1. Did What is lead-free and how does it relate to the RoHS Directive?

RoHS is the European Union's directive prohibiting 6 substances known to have potential health hazards. Lead is one of these substances. Lead-free indicates that this particular substance is absent to a level of less than 0.1% (per the RoHS directive) by weight of homogeneous material. This means that the limits do not apply to the weight of the finished product, or even to a component, but to any single substance that could (theoretically) be separated mechanically.

2. Are Honeywell Aerospace products bound by the RoHS or lead-free initiatives?

Aerospace applications are not within the scope of the RoHS directive. There is no Pb-free requirement for aerospace products. However component suppliers are driven by other industries that do have this requirement and are rapidly converting products with tin/lead finishes to Pb-free. We must be able to deal with this trend.

3. How does Pb-free relate to the no-pure-tin initiative?

One example of a Pb-free lead finish is a pure tin finish; however there are others, such as gold plate, nickel-palladium-gold, and others. A "no-pure-tin" initiative would be the prohibition of pure tin plating (defined as at least 97% tin) because of a tin whisker risk. Some elements of the aerospace business may implement such a mandate; however there are mitigations that can be deployed thereby reducing the risk of failure due to tin whiskers, which may be acceptable. Honeywell Aerospace recognizes this and is implementing distinct part numbers for components using pure-tin finishes so that proper mitigations can be documented.

4. Is there any product performance degradation with the use of lead-free materials with respect to... Vibration? Temperature extremes? Long-term durability?

Industry studies through university resources such as the University of Maryland CALCE and joint company studies such as the E3/E4 initiative have dealt with various aspects of solder joint reliability

and tin whiskers. Honeywell Aerospace has conducted tests on long-term durability (temperature cycle, vibration, and mechanical shock) on various termination finishes using both tin-lead and Pb-free soldering processes. In general, the Honeywell tests for durability of Pb-free components soldered to PWBs using SnPb solder show equal to or better than reliability. Testing has also compared all lead-free assemblies to traditional tin-lead based assemblies with similar results. This result may differ depending on the severity of the application environment, particularly for mechanical shock and vibration.

5. will we begin to see Pb-free components and CCAs in Honeywell Aerospace products?

In commercial operations within Honeywell Aerospace, and many military operations, many Pb-free components have already been in place for many years. Some components, such as commercial Kemet ceramic chip capacitors, have used matte tin (a Pb-free finish) since their inception; others have been introduced more recently. Some other finishes, such as NiPdAu (another Pb-free finish) have been used by TI for some time now in Aero applications. Lately, many more components including microcircuits have made their way into these products. This has been an evolutionary process driven by availability/obsolescence issues at suppliers. Currently Honeywell Aero products utilize Tin/Lead solder for the attachment of components to PWBs. The test results listed in the previous question and other studies in industry indicate that equivalent reliability can be achieved using lead-free assembly processes. Lead-free CCAs will likely start to be built in the coming years for some applications and with customer concurrence.

6. How will Honeywell Aerospace manage the identification and segregation of Pb-free components/CCAs/End Items during the transition period?

Legacy components that may have a mixture of lead finishes allowed on the same Honeywell part number will need to have an associated database with lead finish details listed by supplier part number. New component introductions will be separated, Pb-free components from non-Pb-free components, by part number. Assemblies and end items will be identified as Pb-free once they are 100% Pb-free. Currently nearly all Honeywell Aerospace CCAs are considered "mixed technology," meaning Pb-free components are attached to the PWB using tin/lead solder. No special marking of these assemblies is anticipated; however build process documentation will specify the materials, components and assembly process, as they do currently. Material content by component may be compiled for a CCA using a bill of material analysis process.

7. Are there ISC implications with regards to obsolete parts due to phasing out lead from products? When will this begin?

We are finding that the proper way of dealing with suppliers discontinuing SnPb and moving to Pb-free is through the obsolescence process.

8. How is Honeywell ensuring that our suppliers are properly managing lead free components?

Suppliers can be classified in many categories. For the purpose of this question, let's limit it to component manufacturers and contract manufacturers of circuit cards. Component manufacturers: From a process standpoint, Honeywell manages suppliers of commercial off-the-shelf components through an approval process and preference ratings. Approved suppliers are generally those that have capable processes for controlling and producing quality products. We require information on lead termination finish and certain processing steps. Generally, a single manufacturer part number has only one lead finish material available so that this can be managed by manufacturer part number. Exceptions to this will be handled as they arise. Contract manufacturers: Honeywell provides configuration management information to contract manufacturers and requires that the CM assure

compliance to that configuration. The termination finish material requirements will be imposed through the grouping of allowed manufacturer part numbers on a Honeywell part number. Separation by Honeywell part number may occur down the lines of RoHS compliance, Pb-free, and pure tin. CMs will be required to assure that incoming parts comply with the configuration baseline for the respective Honeywell part number.

9. Does Honeywell have analysis available to ensure reliability is maintained when lead free components are implemented?

Honeywell has done solder joint reliability studies related to the use of Pb-free components in a tin/lead and lead-free solder assembly process. This does not circumvent qualification requirements for each new program, nor does it take the place of component level qualification.

10. Do we understand the reliability and life impacts of going to Pb-free? (combine with above)

The short answer is "not completely" however the Lead-Free Control Plan's purpose is to minimize the risk of use of Pb-free components. There are two main aspects of lead-free components where reliability is concerned: solder joint reliability and tin whisker affects (where the termination finish is pure tin). Of these the most straightforward to address is solder joint reliability. External durability studies have been done that show backward compatibility with tin/lead soldering processes and lead-free processes using various Pb-free components. Tin whiskers (of issue only with pure tin finishes) present a much different problem. The fundamental reasons why tin whiskers form and grow is still being researched and debated. We cannot assure that whiskers will not form in these components. Thus we must choose finish materials in such a way as to minimize the occurrence and length of whiskers. Additional mitigation factors, such as conductor spacing, conformal coat, etc. can help reduce the likelihood of whiskers causing failures. Honeywell Aerospace is following an internal set of requirements for termination finishes and tin whisker mitigation practices. This was compiled using the best available industry studies and guides, and is an important element of the Lead-Free Control Plan.