

Benefits of Inert Gas Soldering

With the advent of higher density microelectronics packaging that is required to satisfy the functionality of the newest generation of integrated circuits, the manufacturing concerns of the microelectronics process engineer have increased. This new generation of packages includes Ball Grid Arrays (BGA), flip chip technologies and fine pitch leaded components. The introduction of “no clean” flux chemistries in solder reflow and wave soldering processes, aimed at eliminating ozone depleting cleaning agents, has meant changes in how assemblies are processed. These changes have forced process engineers to use new process technologies, equipment, and materials.

At the end of the day, the engineer needs to establish a process that reduces costs, increases productivity, and improves customer satisfaction. The primary interconnect method of components to the printed circuit board is via soldering. Solder joint quality is largely dependent on the degree of wetting between solder and the materials to be joined. When printed circuit boards are soldered in air, the metal alloy systems used in electronic assembly processes are subject to oxidation. Solder oxides inhibit wetting of the molten alloy to printed circuit board lands and component leads which can result in soldering defects. The use of nitrogen as a process gas provides an inert, oxygen-free soldering atmosphere. By eliminating the formation of solder oxides, wetting is promoted and soldering quality is improved.

Many soldering defects occur due to poor wetting of the filler metal with both the component and substrate. Defects most affected are those related to nonwetting, bridging, and insufficient solder. By using an inert atmosphere, one can typically expect a decrease in this type of defect of up to 65%. This defect reduction can result in higher first pass yields, reduced labor for rework, and increased production rates.

The advantages to using inert atmospheres in microelectronics assemblies are summarized below:

Reflow Soldering

- Reduction in Soldering Defects
- Improvement of First Pass Soldering Yields
- Reduction in Labor Costs and Increase in Production Rates
- Elimination of Metal Surface Oxidation
- Increase in Solder Joint Strength
- Implementation of Low Residue, No-Clean Soldering
- Expansion of Process Window

Wave Soldering

- Dramatic Reduction in Solder Dross Formation
- Reduced equipment maintenance = reduced labor costs
- Reduction of Operator Exposure to Lead-Containing Materials
- Increase in Wetting Force, Decrease in Wetting Time
- Reduction in Overall Soldering Defects
- Enhanced Performance of Low Solids Flux Chemistries
- Expansion of Process Window

Manufacturers of microelectronics assemblies can improve product quality while reducing the overall process costs because nitrogen soldering atmospheres prevent solder alloys from oxidizing. This results in an improvement in soldering performance and a reduction in soldering defect rates. Nitrogen atmospheres complement no-clean soldering by inerting these oxygen sensitive processes. This in turn reduces the need for costly rework. In the case of BGAs and flip chip technologies, nitrogen soldering atmospheres improve wetting, increase first pass yields, and eliminate the need for cleaning of flux residues in a restrictive area and the difficulties of rework.

By using no-clean soldering technology, process engineers can eliminate post-solder cleaning steps. No-clean inert atmosphere soldering is an environmentally friendly process using no solvents and eliminating cleaning equipment, which results in an increase in available floor space, and more importantly, an overall decrease in processing costs.

The use of inert atmosphere soldering technology allows the process engineer to effectively deal with the new packaging technologies while enhancing the process window, reducing costs, improving quality, and increasing productivity.

If you're interested in reducing costs, improving the quality of your process, and meeting your environmental challenges, you can do it with an inert soldering atmosphere. If you would like to be contacted about the potential use of inert gas for soldering for your application, please visit our website at www.airproducts.com and click on the "tell me more" link.

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