

Preform Method Simplifies Small Volume BGA Ball Attach/Reattach

There is a vast and constantly growing need for a low to medium volume ball attach method for BGA components. Almost any board assembler or test house working with BGA's has a need to put a new array of solder spheres onto just a few components. Until recently, only a few basic options have been available. Most of these options have involved the use of stencils, solder paste and/or loose solder balls. Typically, these methods are quite tedious, inconsistent, and messy. Winslow Automation's SolderQuik™ BGA Preform delivers an easy, clean, cost effective alternative that is quickly becoming the preferred method for small volume ball attach or reattach among the leading semiconductor and board assembly houses.

BGA Ball Attach Methods

In the past few years, the need for a small volume ball attach method has grown as rapidly as the rest of the BGA market. When BGA components are placed on a board, a variety of failures can occur that would necessitate the removal of the component. Bad solder joints, bridging, or even improper orientation are all common failure mechanisms when mounting BGA's to boards. Because many BGA's are relatively expensive, nobody wants to throw away a component that's only problem is a faulty solder ball array. As a result, companies are incorporating reballing techniques into their standard rework line.

For large scale production purposes, an array of solder balls is usually attached using expensive solder ball dispensing machines. The tooling alone for such a machine can cost as much as \$10,000 and is typically only good for one package type. In addition, the purchase price of a machine starts at about \$100,000. These ball attach machines work quite well for large volume production. However, because of their cost, they are not a practical solution for low volume attach or reballing.

Most small volume processes for placing a new array of solder spheres onto a part involve either stenciling on solder paste or loose solder spheres. Any manual process involving a stencil requires proper line up and fixing the stencil to the BGA component. Screening solder paste manually through a stencil can be very messy and gives poor volume control. Placing loose solder spheres into a stencil is tedious and time consuming. One method for using stencils requires a full application of flux to the pad side of the component. With this process, balls tend to migrate and combine at reflow. Another method using stencils calls for screening flux onto pads and then reflowing unconstrained loose balls on the fluxed pads. Since proper cleaning and care of a stencil is extremely important to an effective process, they must be cleaned between each application of flux adding to the process time. Finally, stencils don't lend themselves to flexibility. A different stencil will likely be needed for each different package type adding to the overall cost of the process.

The Preform Alternative

Winslow Automation's SolderQuik™ BGA Preform is a simple, repeatable, cost effective low to medium volume ball attach solution. The patented SolderQuik™ BGA Preform, which was originally developed by Raychem, consists of an array of solder spheres embedded in a carrier material. The carrier controls pitch, progression, and

alignment. In the case of SolderQuik™ Preforms, the carrier is made of a water dispersible paper laminate that is easily removed after reflow.

The process to attach an array of solder spheres using a preform is simple. The BGA component is fluxed, placed against the preform, and then they are placed through reflow. Typically an inexpensive fixture is used to properly align the preform to the component. The new array of solder spheres has been attached when the reflow cycle is complete, and one simply needs to remove the carrier material. The water soluble carrier of SolderQuik™ Preforms allows for several removal techniques: e.g., let a few drops of DI water soak into the carrier for a few seconds and peel away with tweezers or it also can easily be removed using most aqueous spray rinse or batch cleaning systems.

A ball attach system using preforms allows for significant advantages over any process using solder paste or loose solder balls. Many reballing methods require the purchase of special tooling, but preforms work with almost any reflow and rework equipment. An inexpensive fixture to control alignment by edge registration is the only tooling required for preforms. Preforms are extremely flexible and cost effective with availability in any array pattern, including various pitches, ball sizes, and ball alloys at under 1.5 cents per ball for most patterns.

When using preforms, flux can simply be brushed onto the entire pad side of the package without any concern of ball migration. The carrier keeps the balls in the proper pitch and progression, so ball migration and bridging is not possible. The carrier is disposable so it can be removed and discarded after reflow. There's no clean up required.

Using preforms, the time to put balls on 20 parts, is only a few minutes more than the time to put balls on 1 part. Using preforms, those parts could also all have different pitches, array patterns, ball diameters, and even ball alloys.

Conclusions

Anyone doing small volume ball attach, whether for rework or initial attach, could benefit by using the preform solution. The SolderQuik™ Preform process is simple, clean, quick, and cost effective with no investment in tooling or special equipment needed. Preforms tend to work quite well with almost any convection reflow system, and are well suited to use alongside most rework stations.

For more information about Winslow Automation, please call (408)526-1213 or fax (408)943-0447 or write 1940 Concourse Drive, San Jose, CA 95131 or visit at www.solderquik.com.