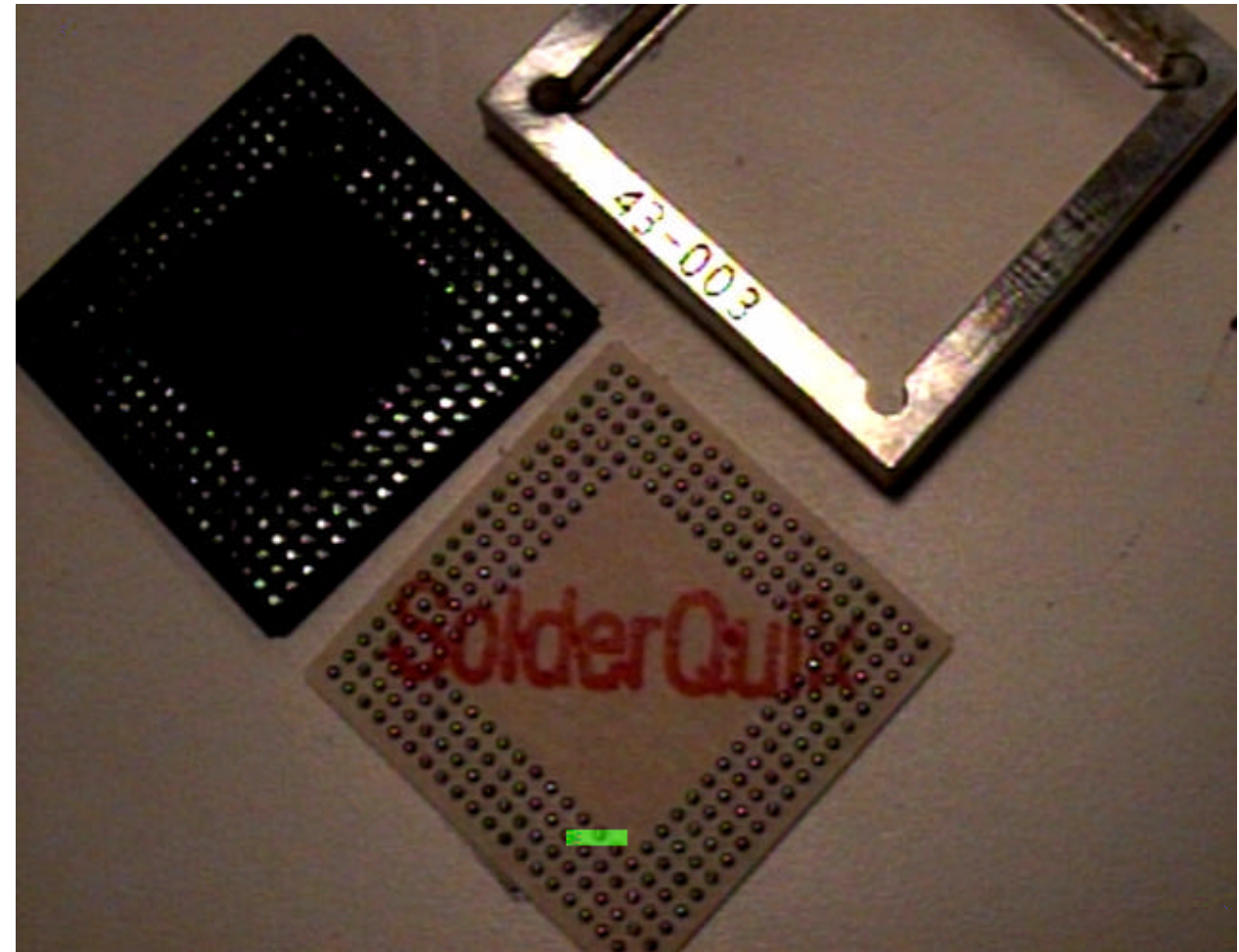


BGA

REBALLING INSTRUCTIONS



Winslow Automation, Inc.
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San Jose, CA 95131
Phone: (408) 526-1213
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<http://www.solderquik.com>



WINSLOW AUTOMATION, INC.

Acknowledgments

SolderQuik™ is a trademark of Winslow Automation, Inc.

Raychem Corporation patented the technology on which the SolderQuik™ BGA, column-grid array, CCMD, and tape products are based. Raychem has granted Winslow Automation an exclusive worldwide right and license under the SolderQuik™ technology patents to make, use, or sell the SolderQuik™ products.

Notice

Mention of third-party products is for informational purposes only and constitutes neither an endorsement nor a recommendation. Winslow Automation assumes no responsibility with regard to the performance of these products.

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Winslow Automation is committed to making the SolderQuik BGA Preform work for you. If you have any questions, concerns, or difficulties with the process, please contact us and we will be glad to help you in any way we can.

Warranty

THIRTY DAY MONEY-BACK POLICY: This SolderQuik™ BGA Reball Starter Kit sold by Winslow Automation, Inc. comes with Winslow Automation's thirty-day money-back policy. If for any reason you are unsatisfied with the BGA Reballing Starter Kit you have purchased, or you do not accept the terms of limited warranties and other terms set forth herein, you may return the product(s) to Winslow Automation for a full refund of the purchase price paid. This policy applies only to Winslow Automation's BGA reballing kits and does not apply to purchases of SolderQuik™ Preforms which are covered by the 90 day limited warranty below. This policy does not include credit for original or return shipping and handling charges. Prior to returning product(s) under this policy, you must obtain an RMA number from Winslow Automation by calling (408) 526-1213 extension 1. Ship the product(s) to Winslow Automation within thirty (30) days from the original date of shipment by Winslow Automation to obtain the refund. Shipped product(s) must be in the original packaging, prepaid and insured by you, with the RMA number clearly identified on the packaging. Please retain the shipping information, including tracking numbers, until Winslow Automation credits your account. This will serve as proof of return. When Winslow Automation receives and verifies that the product(s) are undamaged or altered, Winslow Automation will issue a full refund.

90 DAY LIMITED WARRANTY: Winslow Automation warrants its SolderQuik™ BGA products to be free from defects in materials and workmanship, under normal use and service, for 90 days from the date of purchase from Winslow Automation or its authorized reseller.

If a product does not operate as warranted during the applicable warranty period, Winslow Automation shall at its option and expense 1) repair the defective product or part, 2) deliver to the customer an equivalent product or part to replace the defective item, or 3) refund to the customer the purchase price paid for the defective product. Product(s) replaced will become the property of Winslow Automation. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

RETURN PROCEDURES: You are responsible for returning products to Winslow Automation at your expense. Obtain standard warranty service for Winslow Automation products by telephoning Winslow Automation's customer service group, within the warranty period. Products returned to Winslow Automation must be pre-authorized by Winslow Automation with a Return Material Authorization (RMA) number. Mark the number on the outside of the package and send, prepaid, insured, and packaged appropriately for safe shipment. Winslow Automation ships repaired or replaced items to the customer at Winslow Automation's expense, not later than thirty (30) days after receipt. All costs of insurance, import and export duties, and all other fees imposed by government or quasi-governmental agencies or officials must be paid by you.

WARRANTIES EXCLUSIVE: If a Winslow Automation product does not operate as warranted above, the customer's sole remedy shall be repair, replacement, or refund of the purchase price paid, at Winslow Automation's discretion. The foregoing warranties and remedies are exclusive and are in lieu of all other warranties, express or implied, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose. Winslow Automation neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale, installation, maintenance or use of its products.

Winslow Automation shall not be liable under this warranty if its testing and examination disclose that the alleged defect in the product does not exist or was caused by the customer's or any third persons misuse, neglect, improper installation or testing, unauthorized attempts to repair, or any other cause beyond the range of the intended use, or by accident, fire, lightning, or other hazard.

LIMITATION OF LIABILITY: In no event, whether based in contract or tort (including negligence) shall Winslow Automation be liable for incidental, consequential, indirect, special, or punitive damages of any kind, or for loss of revenue, loss of business, or other financial loss arising out of, or in connection with the sale, installation, maintenance, use, performance, failure, or interruption of its products, even if Winslow Automation or its authorized reseller has been advised of the possibility of such damages.

A "full refund" as used above shall include only the purchase price paid by the customer. All costs of shipping, insurance, import and export duties, and all other fees and charges imposed by government or quasi-governmental agencies must be paid by you.

No variation or exceptions in the terms stated herein can be made without written authorization by the president of Winslow Automation.

Some jurisdictions do not allow the exclusion of implied warranties or the limitation of incidental or consequential damages for certain products, so the above limitations and exclusions may not apply. This warranty gives you specific legal rights which may vary from jurisdiction to jurisdiction.

GOVERNING LAW: This limited warranty shall be governed by the laws of the State of California. The customer hereby consents to the jurisdiction and venue of the state courts of California to resolve any and all customer disputes with Winslow Automation, and the customer waives all defenses to such jurisdiction and venue including, but not limited to, any defense based on inconvenient forum.

Warranty

Winslow Automation makes no warranty of any kind with regard to this material, including the implied warranties of marketability and fitness for a particular purpose.

Winslow Automation shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

The information contained in this document is subject to change without notice.

The warranty section of this document includes the specific warranty terms applicable to this product.

Winslow Automation is committed to making the SolderQuik BGA Preform work for you. If you have any questions, concerns, or difficulties with the process, please contact us and we will be glad to help you in any way we can.

Table of Contents	page
Inventory of kit items	1
Introduction	4
Before you begin	5
BGA deballing process	7
BGA reballing process	11
Cleaning fixtures	16
Bake and dry packaging	18
Flexible fixture setup - optional	20
Reflow temperature profile	22
Frequently asked questions	25
Glossary	26
Safety precautions	29
Warranty	31

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For the latest news and information about SolderQuik™ BGA visit our web site at:

<http://www.solderquik.com>

VER 2.0 PART NO. 41-132



BGA REBALL STARTER KIT



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San Jose, CA 95131
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<http://www.solderquik.com>

Inventory of Kit Items	Qty.	Part No.
SolderQuik™ Preform (customer specified)*	10	41.xxx
BGA Fixture*	1	43.xxx
Instruction Booklet, BGA Reballing Starter Kit	1	41.132
BGA Reballing - Quick Guide	1	41.134
Flux syringe w/plunger	1	41.144
Brush, horsehair w/Alum. handle	1	41.125
Tweezers, sharp	1	41.126
Cleaning tray, conductive	1	41.149
Conductive rigid mat	1	41.143
De-ionized water bottle, 250 ml.	1	43.302
Desoldering braid, 0.210" wide	2	41.123
Acid brush	2	41.129
IPA wipes	20	41.130
Test tube (disposable with cap)	1	41.133
Black plastic case	1	41.150

* BGA preforms and fixtures are part dependent.

Safety Precautions

SOLDERING PASTE FLUX

WARNING: Harmful if swallowed, can cause skin irritation. Avoid contact with eyes, skin, and clothing. Avoid breathing smoke when soldering or desoldering. Keep in tightly closed container. Use with adequate ventilation. Wash thoroughly after handling.

PRECAUTIONARY STATEMENT: Breathing flux fumes may cause respiratory system irritation or damage. Prolonged or repeated skin contact can result in a rash. Breathing vapors can result in headache and irritation of the mucous membranes.

FIRST AID PROCEDURES: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If contacted, immediately flush eyes or skin with plenty of water for at least 15 minutes. If swallowed, and victim is conscious, have victim drink water or milk.

Consult MSDS for further health and safety information.

SOLDERQUIK™ PREFORMS

WARNING: This product contains a chemical known to the State of California to cause cancer or reproductive toxicity.

PRECAUTIONARY STATEMENT: May be toxic if ingested. Repeated inhalation or ingestions of lead can result in systemic poisoning. Ingestion of lead metal can affect kidneys, gastrointestinal, reproductive and neurological system. **FIRST AID PROCEDURES:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If contacted, immediately flush eyes with plenty of water for at least 15 minutes. If swallowed and thought to be overexposed, the person should have a blood lead analysis done.

Consult MSDS for further health and safety information.

Available BGA Fixtures

Fixture part no.	Package size
43-001	21 x 21 mm
43-002	23 x 23 mm
43-003	27 x 27 mm
43-004	31 x 31 mm
43-005	35 x 35 mm
43-006	40 x 40 mm
43-007	42.6 x 42.6 mm
43-008	15 x 15 mm
43-009	25 x 25 mm
43-010	29 x 29 mm
43-011	45 x 45 mm
43-012	19.5 x 19.5 mm
43-013	32.5 x 32.5 mm
43-014	37.5 x 37.5 mm
43-015	42.5 x 42.5 mm
43-016	26.9 x 26.9 mm
43-017	42.8 x 42.8 mm
43-018	33 x 33 mm
43-100	Flexible Fixture

If the specific dimensions of the package being reballed are not listed above, call Winslow Automation for custom orders and the latest available sizes.

* The flexible fixture is adjustable from 5mm to 57mm square (or rectangle).

Customer Supplied Items

Oven (recommended for moisture removing bake)

Hot air reflow system, convection oven, or conveyor reflow oven.

Soaking beaker (recommended for cleaning fixtures)

Soldering iron (or other tool for BGA ball removal)

Static safe workstation

Microscope (recommended for inspection)

DI water

Finger cots

base metal.

MSDS: Material Safety Data Sheets

TLV: Threshold Limit Value; a term used to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects.

Humidity indicator card: A card containing chemically impregnated, humidity sensitive, color changing spots used to detect the approximate relative humidity of air.

IPA: Isopropyl Alcohol

JEDEC: Joint Solid State Products Engineering Council

Moisture barrier bag: A bag or pouch used to provide a dry environment for moisture sensitive items during shipping and storage.

Non-wetting, Solder: The partial adherence of molten solder to a surface that it has contacted; base metal remains exposed.

Pad: The electrical contact area on a package substrate.

Pb: Lead, a heavy, soft, malleable, metallic element that is bluish gray in color.

Popcorning: Catastrophic loss of BGA package due to moisture within the package converting to steam from applied heat and rupturing the package.

Porosity: A condition of a solder coating with a spongy, uneven surface that contains a concentration of small pinholes and pits.

Pinholes and voids: Holes penetrating entirely through the solder layer.

Semiconductor die: The actual integrated circuit that has been imprinted on silicon or another semiconductor.

Sn: Tin, a low melting, malleable, ductile metallic element nearly approaching silver in color.

Solder: A metal alloy used in numerous joining applications in microelectronics. The most commonly used solders are tin-lead alloys.

Solderability: The ability of a metal to be wetted by molten solder.

Solder mask: Protective coating applied to electronic components to protect the area from deposits of solder.

TBGA: Tape Ball Grid Array

Via: An opening in the dielectric layer(s) through which a conductor passes upwards or downwards to subsequent chip or package conductive layers for electrical interconnections or for heat transfer.

Wetting: The formation of a relatively uniform, smooth and unbroken film of solder, adhering to the

Introduction

About Winslow Automation, Inc.

Winslow Automation has been providing innovative soldering and lead conditioning solutions to the semiconductor industry since 1986. If your company has used high-reliability semiconductor packages, you have undoubtedly seen our products. Our subcontract division, SIX SIGMA, has been providing hot solder dip lead finish services for military and space-qualified semiconductors since its inception in 1990.

In 1996, Winslow Automation acquired the SolderQuik™ product line from Raychem Corporation. The SolderQuik™ BGA Preform used in this kit is only one of four products in the SolderQuik™ family. SolderQuik™ Tape, SolderQuik™ CCMD (Chip Carrier Mounting Device) and SolderQuik™ CCGA (Ceramic Column Grid Array) round out the product family developed for fine pitch surface-mount soldering and rework.

SolderQuik™ Technology

Originally developed by Raychem Corporation as a method for attaching solder columns to leadless chip carriers, SolderQuik™ technology has been chosen as the ultimate solution for reballing ball grid array (BGA) packages.

Since its introduction, this patented technology, in the form of the SolderQuik™ BGA Preforms, has become the undisputed choice among leading semiconductor and board assembly manufacturers.

SolderQuik™ BGA Preforms Simplify BGA Reballing

The SolderQuik™ BGA Preform provides a unique BGA reballing solution. The Preform consists of an array of solder spheres embedded in a water soluble/polymer carrier. The beauty of the preform process lies in its simplicity. After applying flux, simply align the component to the preform with an inexpensive fixture. After reflow, just moisten the carrier and peel it off. SolderQuik™ Preforms eliminate the need for stencils, loose solder balls and solder paste in the reballing process. Reballing a component with preforms requires only a few seconds of labor and very little operator skill, which translates to throughput improvements. This process works well with most reflow equipment and alongside any rework station. Preforms are currently available in over 160 array patterns, including various ball sizes and center cut designs (for cavity down components). Our pattern database grows daily to meet customer demand.

To find the latest information about SolderQuik™ BGA visit us at:
<http://www.solderquik.com>.

Before You Begin

Safety Considerations

Prior to the use of this product, review all safety markings and instructions including Material Safety Data Sheets.

WARNING: A warning denotes a hazard that can cause injury.

CAUTION: A caution denotes a hazard that can result in loss to property or equipment.

Do not proceed beyond a **WARNING** or **CAUTION** notice until you have understood the hazardous conditions and have taken appropriate steps.

Ventilation:

Flux fumes from soldering and desoldering can be harmful. Use general or local exhaust ventilation to meet TLV requirements. Consult Material Safety Data Sheets (MSDS) for Threshold Limit Value (TLV) numbers.

Personal Protective Equipment:

Chemicals used in reballing process can cause skin irritation. Use appropriate personal protective equipment when performing cleaning, soldering and desoldering activities.

Lead Warning:

The USEPA Carcinogen Assessment Group lists lead and its compounds as teratogens and its components to be a Class B-2 carcinogen. IARC. California Proposition 65 requires a posted warning that lead can cause birth defects or other reproductive harm.

When working with ESD sensitive parts make sure your work area is ESD safe by using:

Finger cots
Conductive work mat or table top
Grounding heel strap and wrist strap

Sensitivities

Glossary

Array: A group of elements, for example, solder balls or pads, arranged in rows and columns in one plane.

Bake & dry pack: Bake in an oven for a time based on the JEDEC moisture level table and vacuum pack with a desiccant.

BGA: Ball Grid Array

Base Metal: The underlying metal surface to be wetted by solder.

BT substrate: Substrate used for BGA packages having high heat resistant thermosetting resin of the additional polymerization type with two main components B (Bismaleimide) and T (Triazine Resin)

Crazing: The presence of numerous minute cracks in the referenced material (for example, solder mask crazing).

Desiccant: A drying agent used to lower the moisture content of air inside a closed space.

Dewetting: A condition that results when molten solder coats a surface and then recedes to leave irregularly-shaped mounds of solder that are separated by areas that are covered with a thin film of solder and with the base metal not exposed.

DI water: Water that has had ions in it removed so that it does not conduct electricity well.

Electrostatic discharge (ESD): The transfer of electrostatic charge between bodies or surfaces that are at different electrostatic potentials.

Eutectic solder: The lowest melting point composition possible for a mixture of lead and tin. Eutectic solder is 63% Tin and 37% Lead.

Flux: A chemically and physically active compound that, when heated, promotes the wetting of a base metal surface by molten solder by removing minor surface oxidation.

Foreign material: Any material that is foreign to the microcircuit or package, or any native material displaced from its original or intended position within the microcircuit package.

Hermetic package: A package that provides absolute sealing from external moisture.

High temperature solder: Solder that is 90% lead and 10% tin.

Frequently Asked Questions

Q — *Why doesn't Winslow Automation supply fluxed desoldering braid with their kit?*

A — Winslow Automation purposefully provided paste flux and flux-free desoldering braid so that there will be no chemical intermixing between a fluxed braid and a customer supplied flux.

Q — *How do I know the package is cleaned sufficiently?*

A — The best way to determine if the package has been cleaned properly is to use an Ionograph or equivalent piece of equipment to test for ionic contamination.

Q — *What should the balls look like after reballing?*

A — After reflow, the balls on the package should be spherical and smooth. An orange peel texture to the balls usually signifies too long a time above reflow, too hot a reflow temperature or too slow of a cool-down cycle.

Q — *The paper is sticking to the package during the paper removal step. What can I do?*

A — Applying more water and allowing the paper to soak for a longer time usually solves this problem. Increasing water temperature also has a positive effect. This problem is usually indicative of a reflow cycle that is too hot or too long.

Q — *One ball did not attach during the reballing process? What can I do?*

A — Flux application and thermal profiling are often the cause of ball attach problems. Apply a small amount of flux to the pad and put an individual ball on the flux and reflow. This will attach the ball that did not stick the first time. If many balls did not attach, you will have to deball and start over.

Q — *After several uses, the preforms stop fitting properly into the fixtures. Why is this?*

A — Flux can build up on the inside of the fixture and cause preform fit problems. Clean the fixture with the instructions on page 16-17.

Moisture Sensitivity

Plastic BGA packages are moisture absorbent. The package fabricator designates the sensitivity level of each package design. The sensitivity level has an exposure time limit associated with it. JEDEC used a standard atmosphere of 30°C at 60% relative humidity to develop the time limit of exposure. Included in this instruction booklet is a moisture level table (see page 19).

When the exposure exceeds the allowed time, the JEDEC standard specifies a bake out. The standard baking time is 24 hours at 125°C. Enclosure in a moisture barrier bag with a desiccant should immediately follow the baking. This bake out will prepare the package for a solder process.

ESD Sensitivity

The sequence of package removal, reballing, and remounting on a PCB or other substrate provides numerous chances for ESD damage.

Temperature Sensitivity

BGA packages are sensitive to temperature stresses in three ways:

- Rapid changes in temperature induce stresses due to non-uniformity of internal temperatures. Rapid heating of only one side of a BGA package can induce stresses on a large die.
- Excessive temperature: Plastic BGA packages are much like printed circuit boards. Their substrates are glass reinforced and typically have a T_g (glass transition temperature) of approximately 230°C. Above the glass transition temperature the coefficient of thermal expansion increases, adversely effecting internal stresses. Keeping the substrate below this temperature is very important.
- Non-uniformity of heat application: The hot air system used by Winslow Automation is a convection oven rather than a gun type hot air delivery system. The oven provides uniform heating to parts that is essential for effective soldering. Further, the oven delivers low speed hot air thereby reducing temperature stress due to temperature differentials. The paper of the preform tends to insulate the pads of the substrate from the air. Consequently, the soaking time of the oven allows time to bring the pads up to solder wetting temperature uniformly. When the heating profile is completed, the preform is light brown in color. Higher flow temperature will cause the preform to progress in color to deep brown and even black.
- We recommend that BGA components never exceed 220 degrees C.

Stress Sensitivity

Internal stress arises from temperature gradients and from structural loads. Thermally related stresses are more prominent in reballing packages even though both of these sources exist in the process. Winslow Automation attempts to minimize the risk of temperature induced catastrophic fractures through closely controlled temperature cycling. Uniformity of heat application is critical to minimizing the stresses in a package.

There are many tools on the market which will remove residual solder from BGA components. These include hot air vacuum tools, solder wick, and (our preferred method) low temp wave solder (220deg C.) Any of these tools, if used properly, work well with our Solderquik BGA Preforms. Because good temperature controlled soldering irons are relatively wide spread and inexpensive, a process for deballing using solder wick is detailed below. Be sure to use caution throughout the deballing process, as it contains numerous potentially damaging mechanical and thermal stresses.

Tools and materials (Included in kit)

- Flux
- Solder wick
- IPA Wipes (isopropyl alcohol)
- Conductive mat

Additional recommended tools

- Microscope
- Fume extraction system to help remove fumes created during desoldering.
- Safety glasses
- Scissors (to cut desoldering braid)

Preparation

- Preheat solder iron
- Put on finger cots
- Pre-inspect each package for contamination, missing pads, and solderability.
- Put on safety glasses

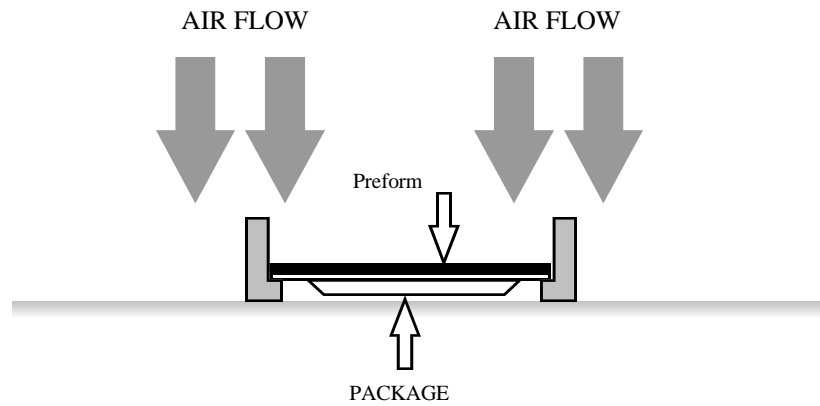
Warning:

The following processes require the use of hot soldering irons that can cause burns. The solder used contains lead, known to the State of California to cause cancer or reproductive toxicity. Solder flux is harmful if swallowed and can cause skin irritation. Avoid breathing solder flux fumes. IPA used in the process is flammable and harmful if swallowed or inhaled. Provide local and general ventilation to meet TLV numbers. See page 29 for more warning information on chemicals used in the processes.

Note: A moisture removing bake is recommended before deballing.

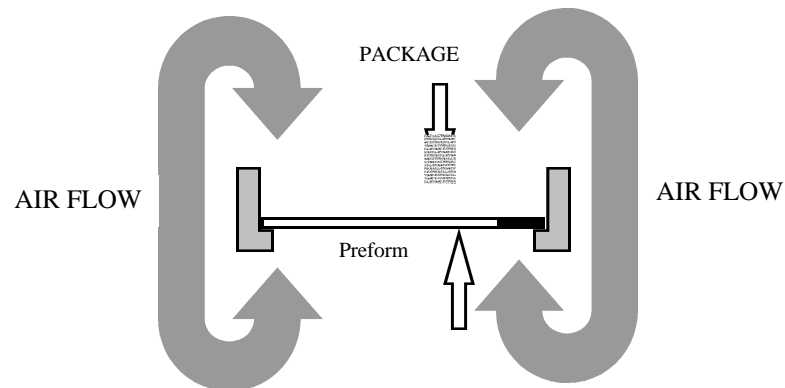
WRONG WAY

FIGURE 10

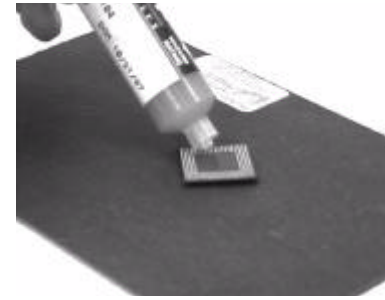


RIGHT WAY

FIGURE 11



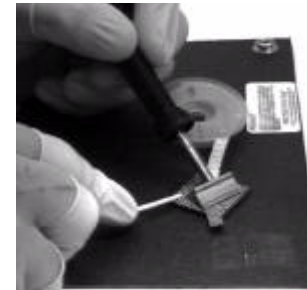
STEP — 1



Step 1 — Flux package

With the package pad side up on top of the conductive mat, apply a small amount of flux onto the balls of the BGA package. Too little flux makes ball removal difficult.

STEP — 2



Step 2 — Ball removal

Using the desoldering braid and soldering iron remove the solder balls from the pads of the package.

Place the solder braid on top of the flux, then place the soldering iron on top of the braid. Allow the soldering iron to heat the braid and melt the solder balls before you glide the desoldering braid over the package surface.

CAUTION: Do not press down on the package with the soldering iron. Excessive pressure may crack the package or scratch the pads. (See Figure 1)

FIGURE 1



To achieve the best results, take one final pass over the package with a clean portion of the desoldering braid. A small amount of solder should be left on the pads to make reballing easier.

Step 3 — Clean package

Immediately clean the package with an isopropyl alcohol wipe. Prompt cleaning of the part will make flux residue easier to remove.

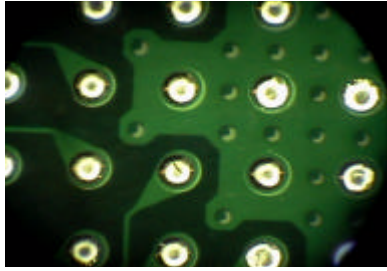
STEP — 3



Remove the isopropyl alcohol wipe from its package and unfold the wipe.

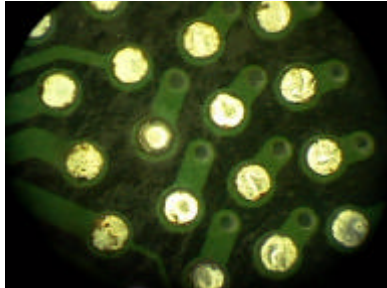
Using a rubbing motion over the surface of the package, remove the paste flux. Keep moving the package to a cleaner portion of the wipe. Always support the opposite side of the package while cleaning. Do not bend package corners.

FIGURE 2



CLEAN

FIGURE 3



CONTAMINATION

STEP — 5



STEP — 6



NOTE:

1. Never clean the package with a dirty portion of the wipe.
2. Always use a new isopropyl alcohol wipe for each package.

Step 4 — Inspection

We recommend that inspection be done under a microscope. Look for clean pads, damaged pads, and un-removed solder balls. (See Figures 2 and 3.)

NOTE:

Because of the corrosive nature of the flux, we recommend extra cleaning if the parts are not to be reballled immediately

Step 5 — Extra cleaning

Apply DI water to the pads of the package and scrub the package with the brush that comes with the kit.

NOTE: To achieve the best cleaning results, brush the package in one direction and then turn the package a quarter turn and brush in the same direction. Follow with a circular brushing.

Step 6 — Rinse

Brush well and rinse the package with DI water. This will help flush flux residue from the package. Then allow the package to air dry. Re-inspect the package per Step 4.

If packages are to sit for more than a few minutes before reballing, it is essential to make sure they are very clean. Submerging the package in water for any length of time is NOT recommended.

Reflow Temperature Profile

As with all soldering processes, the temperature profile is the key element to soldering success. Winslow Automation’s BGA reballing process is very simple and repeatable, as long as time is taken to setup a temperature profile for the hot air reflow equipment being used.

Every package type may require a different thermal profile. Starting with the general profile shape below and altering it to account for package material, package mass, and package size should yield satisfactory results.

Remember to adjust the profile based on the measured temperature of the component. The oven temperature will usually be different.

CAUTION: Do not heat packages above 220°C. There could be a chance of damaging the package.

Recommended reflow machine:

- Any hot air machine with:
- Time controlled heating cycle
 - Temperature range 20– 240°C
 - Circulating air flow

General guidelines:

- Temperature ramp up 1°C/second
- Peak temperature should be 200C to 210C
- Remain above liquidus (183C) for 45-75 seconds
- Larger components or heatsinks will necessitate longer heat cycles

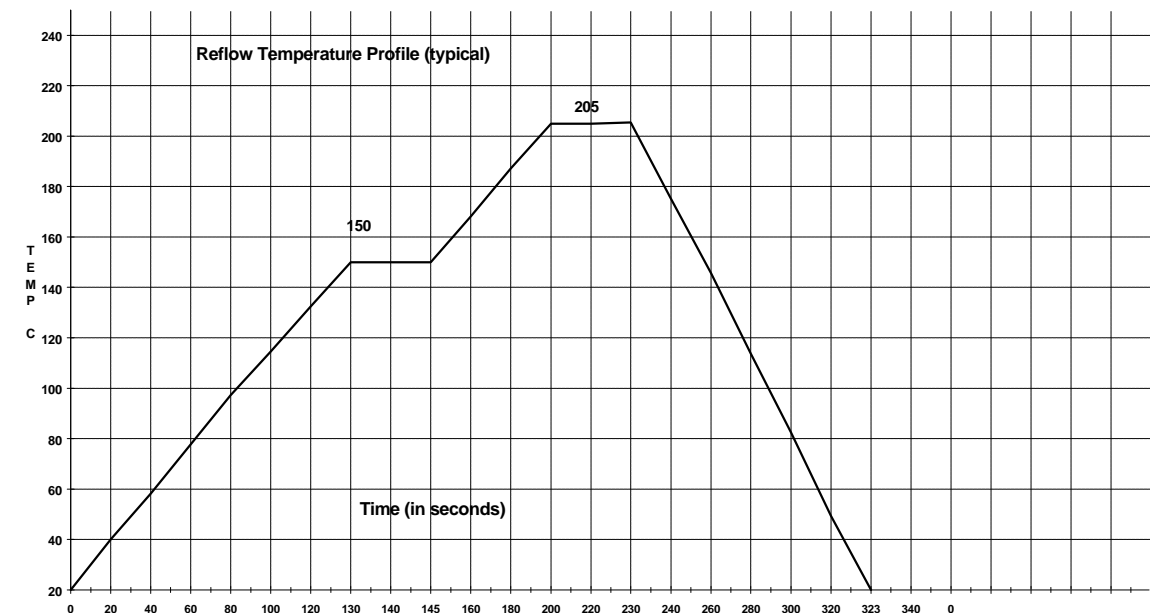


FIGURE 9

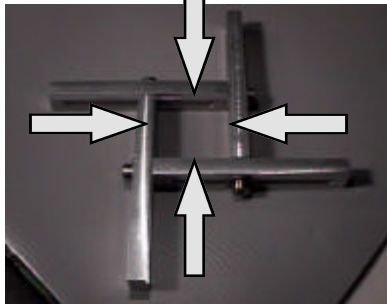
FIGURE 6



Step 2 — Determine the fixture dimension setting

Adjust the fixture so that the package loosely fits in it, and tighten the screws. Step 2 shows the fixture with the arrows pointing to the step. Insert the package to seat on the step of the fixture. The fixture adjustment should allow easy removal of the package.

STEP — 2



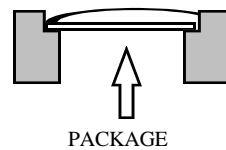
Step 3 — Check BGA preform fit

The last step is to test the fixture with a BGA preform and package in the fixture to ensure a correct fit.

Caution: The preform must not bow or buckle after placing it into the fixture. (For example see Figure 7) If the preform does not fit in the fixture without bowing, re-adjust the fixture.

FIGURE 7

BGA preform



Note: Figure 7 is shown with the preform on top of the package for the purpose of clarity only! During the actual process the package would be on top of the preform.

BGA Reballing Process

Tools and materials

- Preform
- Fixture
- Flux
- DI water
- Cleaning tray
- Cleaning brush
- Tweezers, blunt 6"
- Acid brush
- Reflow oven or hot air system

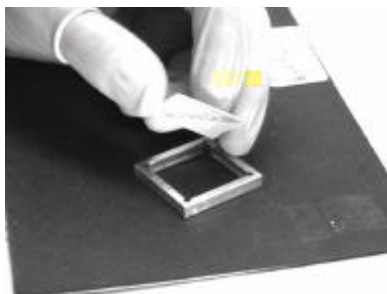
Additional recommended tools

Microscope
Finger cots

Preparation

- Make sure the BGA fixture is clean before you start.
- Preset temperature profile for reflow equipment. Refer to page 22 for temperature profile instructions.

STEP — 1



Step 1 — Insert preform

Place preform into the fixture with the SolderQuik™ logo facing down onto the step of the fixture. Ensure that the preform fits loosely in the fixture. If the preform needs to bend or bow to fit in the fixture the process will not work. These problems are usually caused by dirty fixtures or poorly adjusted flexible fixtures.

Flexible Fixture Setup - Optional

The best fixture to use for most applications is the static fixture because it does not require any setup. However, there may not be a static fixture for every size package being reballed. This is where the flexible fixture comes in handy. The flexible fixture can be setup to fit any size package from 5mm to 57mm, and can also be setup for rectangular size packages.

Tools and materials

- Flexible fixture
- 5/64" hex key driver
- Sample package
- Gauge set

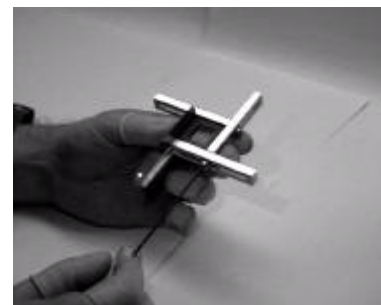
Additional recommend tools

- Metric calipers or accurate ruler



Packages in flexible fixture
Size range 5mm to 57mm

STEP — 1



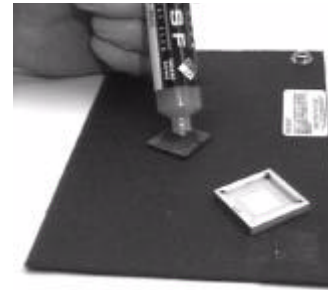
Step 1 — Flexible fixture setup

Loosen all of the shoulder screws until the fixture parts are free to slide but retain right angles.

Note: Do not loosen the shoulder screws too much. If the screws are out too far the fixture is hard to use and keep square (See Figure 6).

Moisture Level Table	
Sensitivity level	Exposure Time 30°C @ 60% RH
Sensitivity level 1	Unlimited
Sensitivity level 2	One year
Sensitivity level 3	168 hours
Sensitivity level 4	72 hours
Sensitivity level 5	24 hours

STEP — 2



Step 2 — Apply flux to package

Use the paste flux syringe to apply a small amount of flux to the package.

NOTE: Make sure package is clean before you begin.
(Refer to page 8 and 9 for cleaning instructions)

STEP — 3

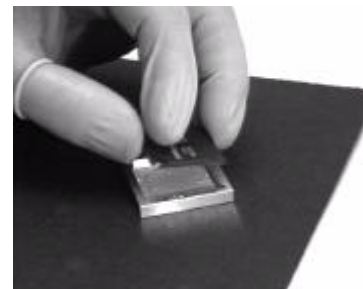


Step 3 — Spread flux

Use the acid brush from the kit to spread the paste evenly over the entire pad side of the package. Cover each pad with a thin layer of flux.

Be sure all pads are covered with flux. A thinner layer of flux works better than a thicker layer.

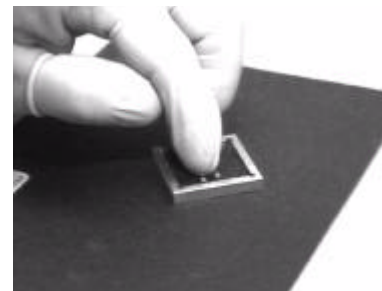
STEP — 4



Step 4 — Insert Package

Place the package into the fixture with the fluxed side of the package against the preform.

STEP — 5



Step 5 — Seat Package

Seat the preform and the package into the fixture by gently pressing down on the package. Make sure that the package sits flat against the preform.

STEP — 6



Step 6 — Reflow

Place the fixture into the hot air convection oven or hot air reballing station and start the reflow heat cycle.

All reballing stations used must have their temperature profiles reset to the developed profile.

(For more information see page 22 for details on the reflow profile.)

STEP — 7



Step 7 — Cool down

Using tweezers, remove the fixture from the oven or reballing station and place it on the conductive tray. Allow the package to cool for about 2 minutes before removing it from the fixture.

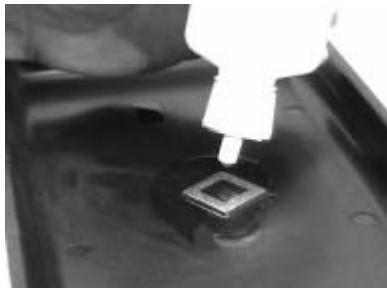
STEP — 8



Step 8 — Paper removal

When the package has cooled, remove the package from the fixture and place it solder ball side up in the cleaning tray.

STEP — 9



Step 9 — Soak

Apply the de-ionized water to the BGA preform and wait about 30 seconds for the carrier to soak before continuing.

Step 10 — Peel back carrier

Bake and Dry-Packaging

The bake out procedure is a very important one to follow to ensure your packages will not “popcorn” during reballing. We highly recommended that you bake your packages before any reflow cycle if exposed to moisture and/or atmosphere for any extended period of time.

Additional recommended tools

- Approved bake out oven
- ESD safe, moisture barrier bag
- Desiccant

Preparation

- Pre-inspect each package for contamination, missing pads, and solderability.
- Check for cleanliness.

Step 1 — Package moisture level

Select the moisture level from the following table to determine if baking is required for your packages. The BGA fabricator is responsible for specifying the moisture sensitivity level of the package. It is important to know the atmospheric exposure time of your packages. If the exposure time exceeds that for sensitivity levels 2 through 5, then 24 hours of baking at 125°C should follow. (**Note:** When you are not sure of the atmosphere exposure time of your packages, we recommend that you assume that the exposure time has been exceeded.)

CAUTION: Never bake BGA packages in plastic trays that are rated lower than 135°C. Further, do not use trays which are not clearly marked with their maximum service temperature. Do not let solder balls touch metal surfaces during the bake process.

Step 2 — Bake

Preset the oven temperature and time according to the moisture level from Step 1. When the oven reaches operating temperature, place BGA packages in the bake out oven.

Step 3 — Dry packaging

Place the packages into an ESD safe moisture barrier bag along with fresh desiccant after the bake out cycle. The desiccant will help keep the packages dry during storage and shipping.

STEP — 2



Step 2 — Scrub with DI water

Remove fixture from the DI water and scrub the fixture with the brush.

STEP — 3



Step 3 — Rinse Fixture

Rinse the fixture with DI water. Allow to air dry.

STEP — 10



Use the pointed tweezers from the kit to remove the carrier from the package. The best method for removing the carrier is to start in one corner and peel the paper away from the package.

The paper should peel off in one sheet. If the paper tears during removal, stop and add more de-ionized water. Wait another 15 to 30 seconds before continuing.

Step 11 — Remove paper fragments

Occasionally a small amount of paper remains after the preform removal. Remove the paper fragment with the tweezers. Softly run the tweezer points between the balls while lifting the paper away from the package.

CAUTION:

The tip of the tweezer is sharp and could scratch through the fragile solder mask if you are not careful.

Step 12 — Cleaning

Immediately clean the package with DI water after removing the paper preform. Apply a generous amount of DI water and scrub the package with the brush.

CAUTION:

Support the package while brushing to avoid mechanical stress.

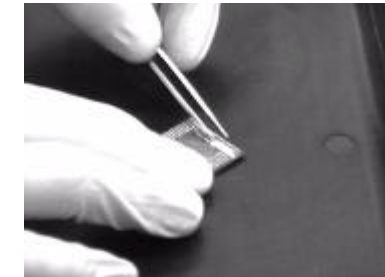
NOTE:

To achieve the best cleaning results, brush the package in one direction and then turn the package a quarter turn and brush in the same direction. Follow with a circular brushing.

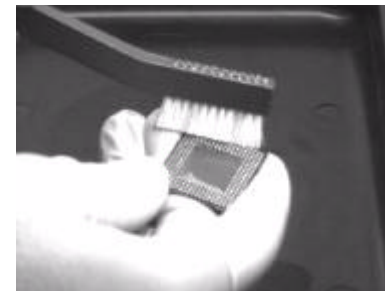
Step 13 — Rinse package

Rinse the package with DI water. This will remove small bits of flux and paper broken loose during the previous cleaning steps. Allow package to air dry. Do not wipe package dry with dry paper towel.

STEP — 11



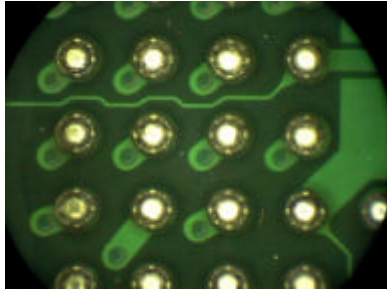
STEP — 12



STEP — 13



FIGURE 4



Step 14 — Inspect package

Use a microscope to inspect the package for contamination, missing balls, and flux residue. Repeat Steps 11 through 13 if the package needs additional cleaning.

Figure 4 shows cleaned solder balls.

FIGURE 5

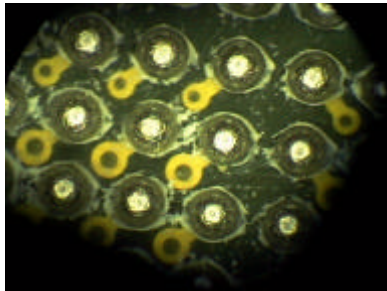


Figure 5 shows corrosive residue around the base of the ball.

CAUTION:

Because the process does not use a no-clean flux, careful cleaning is essential to prevent corrosion and prevent long term reliability loss.

The best way to determine if the package has been cleaned properly is to use an Ionograph or equivalent piece of equipment to test for ionic contamination. At SIX SIGMA, all processes are tested to conform to under 0.75 micrograms of equivalent NaCl per square centimeter of area.

Note: The cleaning process in steps 9 - 13 is only one possible method. Some or all of these steps may be replaced by an aqueous batch clean or spray rinse process.

Cleaning Fixtures

During the reballing process, the BGA fixtures tend to get sticky and dirty after many uses. Figure 10 points out the steps on the fixture. It needs to have the flux residue removed so that the package and preform will seat in the fixture properly. The following process will work on both the flexible and fixed fixtures. An ultrasonic cleaner with DI water also provides an excellent cleaning solution for the fixtures.

Tools and materials

- Cleaning tray
- Cleaning brush
- Beaker
- DI water

Additional recommended tools

- Small beaker or container

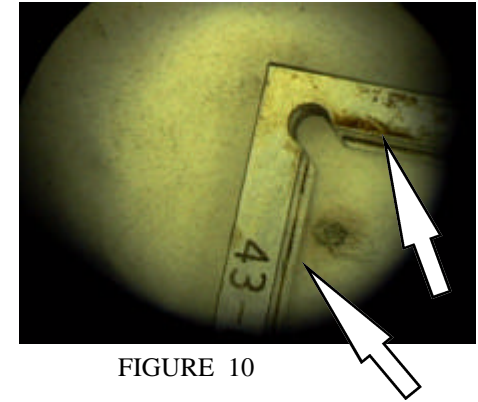


FIGURE 10

STEP — 1



Step 1 — Soak

Soak BGA fixture in warm DI water for about 15 minutes.