BGA Reballing for Military and Aerospace Applications

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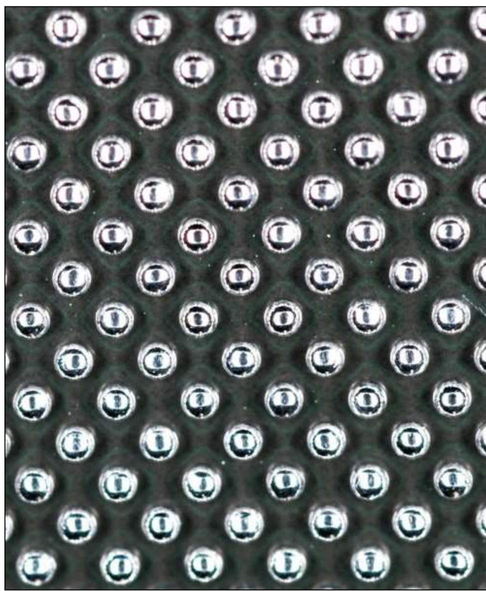
Introduction

- Commercial market rapidly converting to lead-free
- Military and aerospace community not ready for lead-free
- Reduced availability of tin-lead Ball Grid Array (BGA) components
- Conversions (carefully performed) essential to ensuring availability and reliability of components for rugged applications

The Problem

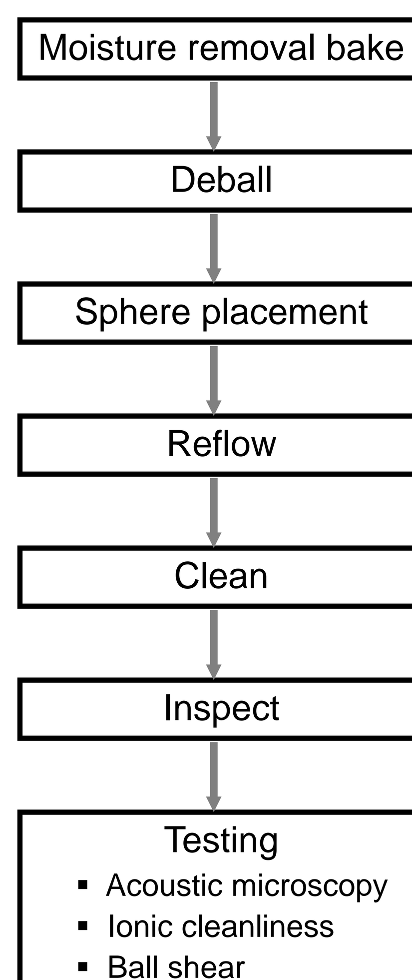


- Diminishing supply of tin-lead BGA components
- Reliability concerns with lead-free
  - High thermal cycle environments
  - Shock and vibration
  - Tin whiskers?
- Reballing requires controlled processes to eliminate reliability risks

The Reballing Solution

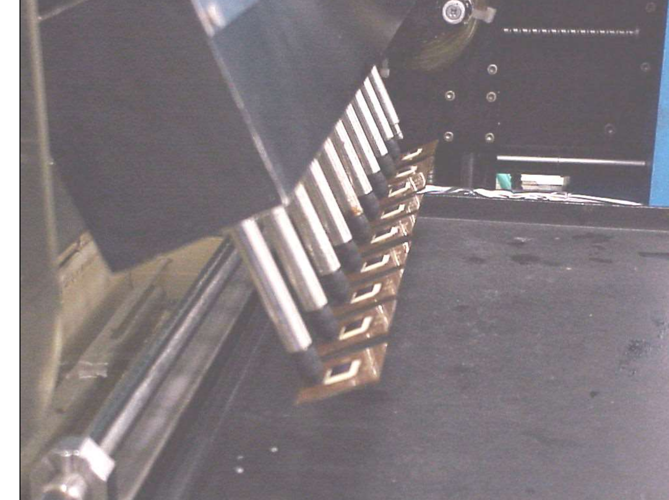
- Component level modifications (including BGA reballing) are essential to the future of military and aerospace industry
- Reballing allows Commercial-off-the-Shelf (COTS) components to be used in high-reliability applications without the concerns associated with mixing of lead-free and tin-lead solders
- Reballing with high-lead solder spheres can provide even better reliability than standard tin-lead alloys
- High-lead spheres are more ductile and provide a higher standoff, which can significantly improve solder joint reliability

Reball Process Flow



Deball

- Automated sphere removal in FlexLine® robotic solder dip system
- Solder spheres and intermetallics are dissolved and flushed away by passing the component across a low temperature solder wave
- Forced-air preheat / cool down to minimize thermal shock
- Flux, preheat, solder, cool down, and rinse are fully programmable and repeatable
- Controlled, gentle, multi-unit process



Sphere Placement

Low-Volume Solution

- Patented SolderQuik™ preform
- Total pattern flexibility
- Fast turn around (1-3 days)
- Moderate piece-part cost

High-Volume Solution

- Automated handling
- Custom tooling ($)
- Tooling lead time (3-6 weeks)
- Low piece-part cost

Reflow

- Forced-convection reflow
- Controlled process
- Low component temperature maintained
- Component thermal gradient minimized

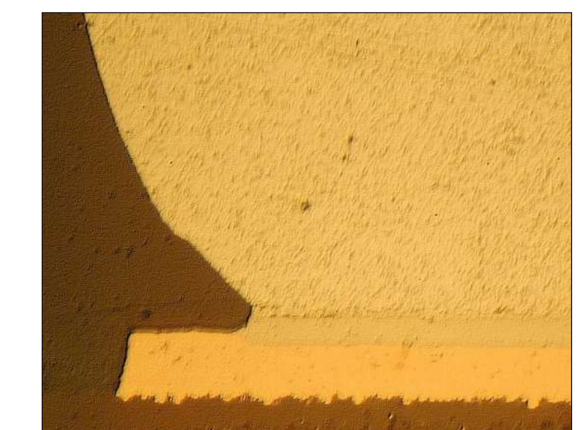
Process Monitors and Controls

- Temperature & humidity controlled environment
- Conductive flooring - ESD safe work areas
- Solder analysis at carefully timed intervals
- 100% acoustic microscopy screening available
- Ball shear testing
- Fully equipped reliability and failure analysis lab

Acoustic Microscopy

SEM / EDS

Ball Shear



Cross-Section & Optical Microscopy

Conclusion

- Commercial components may not always be capable of meeting the environmental requirements of military and aerospace industry
- BGA reballing, with proper controls, resolves:
  - Component availability
  - Mixed solder issues
  - Reliability risks with lead-free

Contact Us

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