

PICTURE BOOK

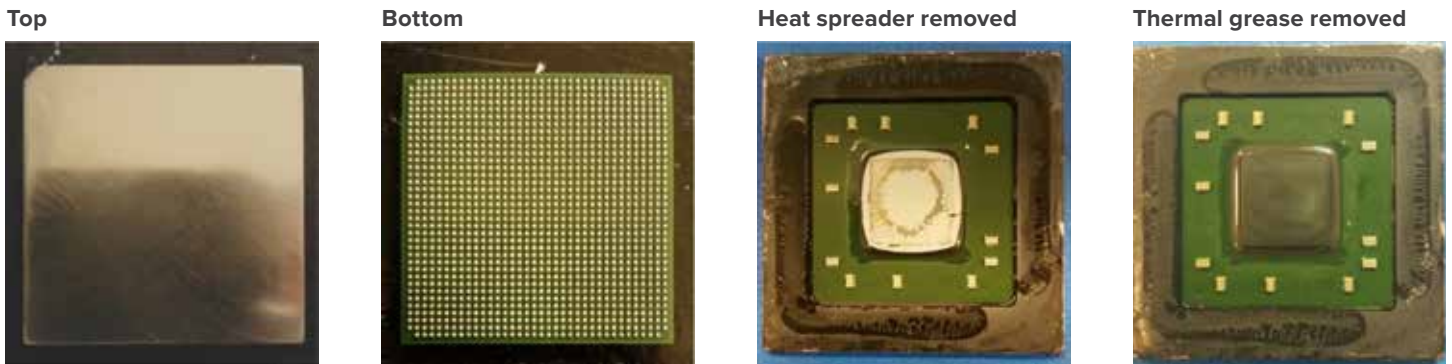
Failure Inspection Post Reliability Stress

**Looking for issues that are present that does not cause failure?
How far from the cliff is the part?**

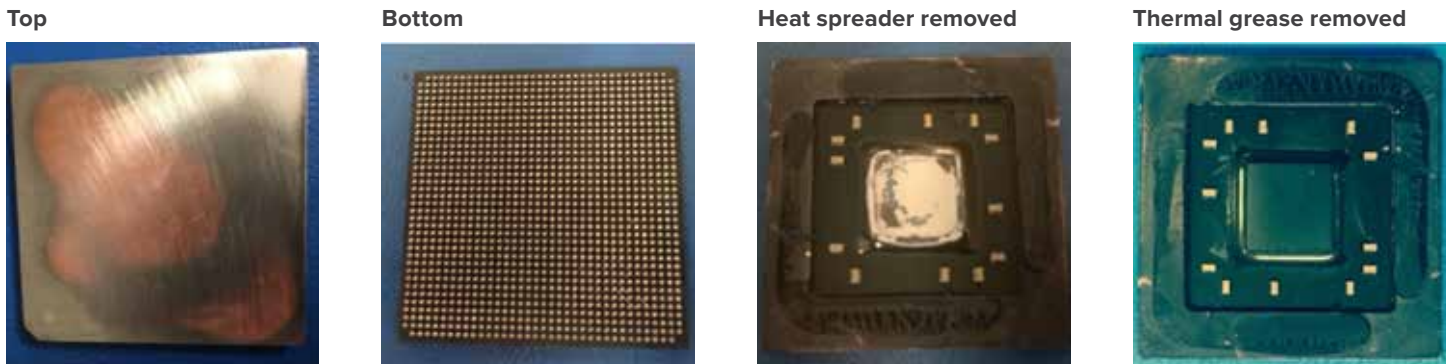
As part of the flow during reliability testing of devices, it is critical to perform a failure inspection under magnification to ensure that no devices have damage such as delaminations, voids, cracks and material density changes. Performing inspection pre-stress and post-stress will help identify issues that result in failure as well as those that don't so you can characterize how close to failure your devices are.

- Die attach voiding and small delamination
- Minor cracking of the solder bumps
- Delamination of the metal layers in the substrate (like is shown on the via image)
- Voiding in the underfil or encapsulant
- Corrosion
- Change in the material appearance of the encapsulant, underfil, substrate
- Thickness of the intermetallic layers
- Just to name a few of the possible issues
- Or are your parts passing so well that some cost cutting materials consideration might be in order?

FLIP CHIP - AS RECEIVED: OPTICAL, X-RAY, C-SAM AND CROSS SECTION



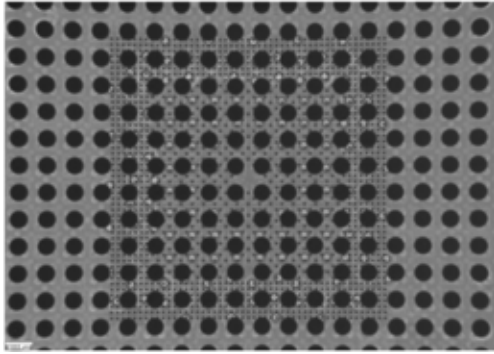
POST HAST



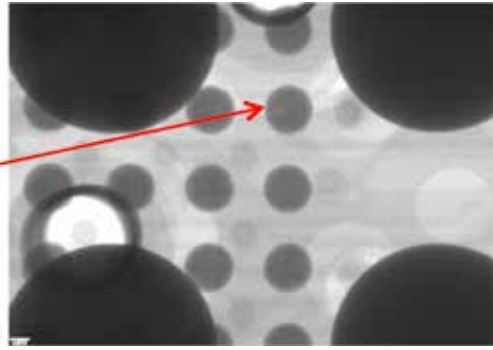
Typically looking for corrosion, discoloration of the substrate, cracking or chip outs on the die

Failure Inspection Post Reliability Stress

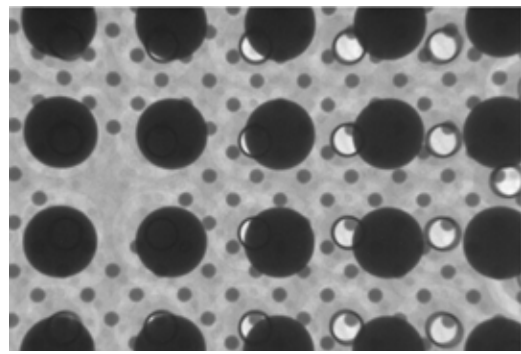
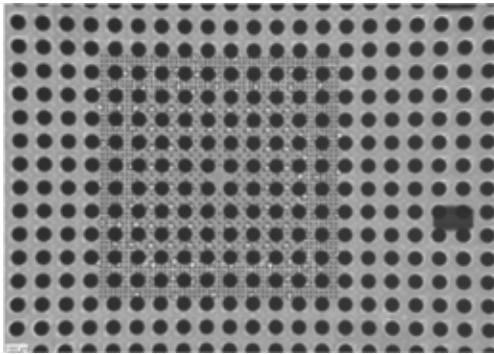
FLIP CHIP - AS RECEIVED: X-RAY



Small voids observed, they do not increase after HAST

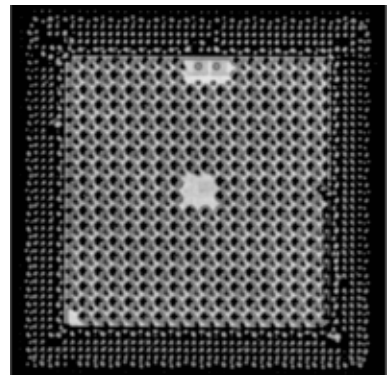
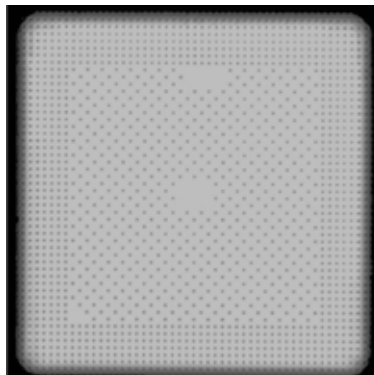
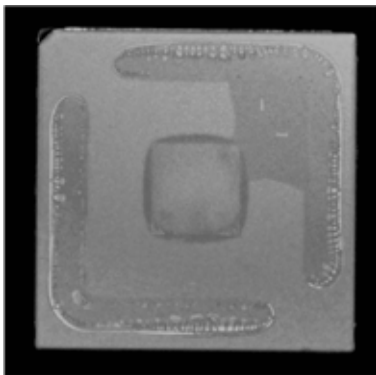


POST HAST

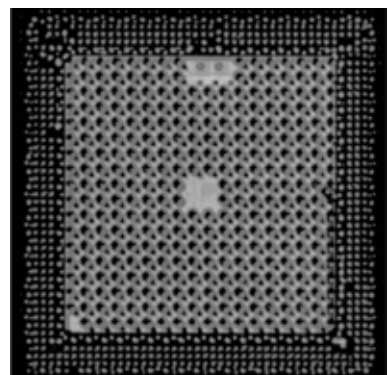
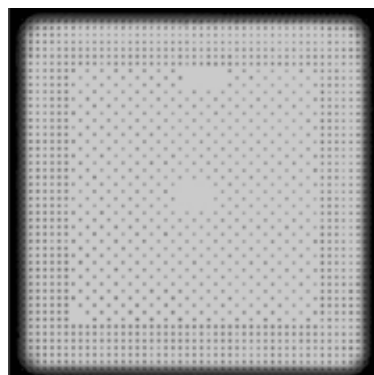
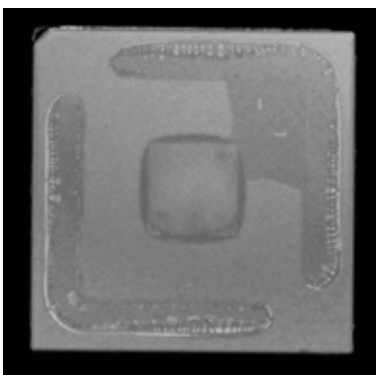


Typically looking for void growth in the solder bumps/balls, or deformation

FLIP CHIP - AS RECEIVED: C-SAM



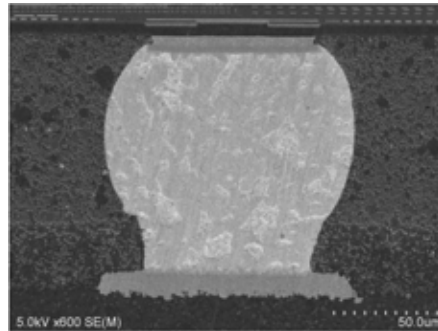
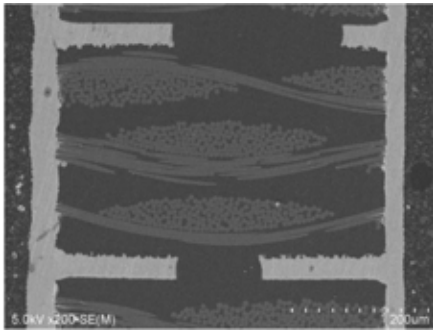
POST HAST, NO DEGRADATION OBSERVED AFTER HAST



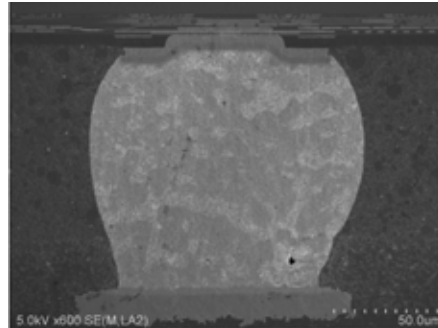
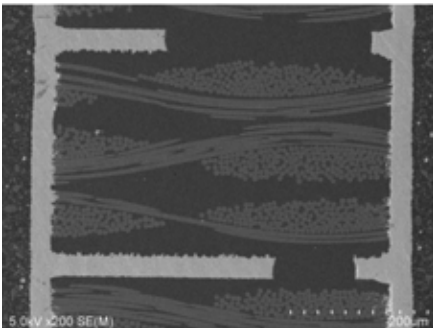
Typically looking for small delamination areas, heat spreader glue adhesion gaps and thermal grease attach area

Failure Inspection Post Reliability Stress

FLIP CHIP - AS RECEIVED: CROSS SECTION

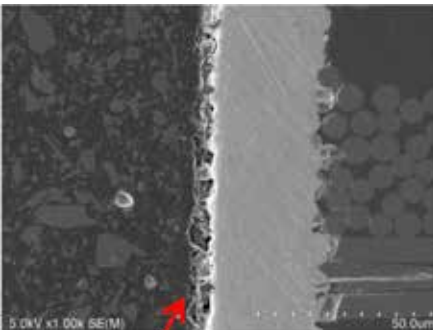


POST HAST

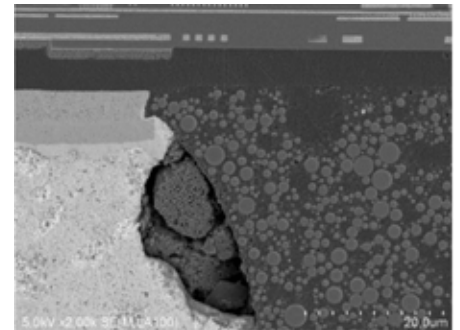
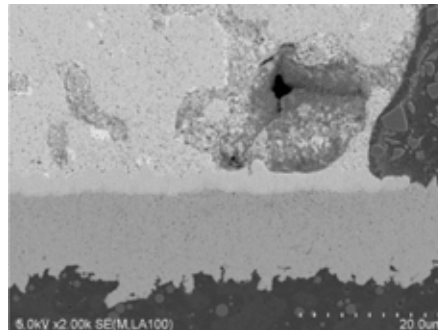


Typically looking for small cracking of the solder, intermetallic thickness, voiding/delamination in the weave or along the vias.

FLIP CHIP - CROSS SECTION, ISSUES POST HAST



Side of vias in substrate have some pull away spots



A few more voids in the solder balls are observed on the post HAST than the fresh unit, this is unlikely to be a result of the HAST but does provide a larger number of solder balls/bumps to be viewed

