

Backwards Compatibility:

Off Into the Sunset ...

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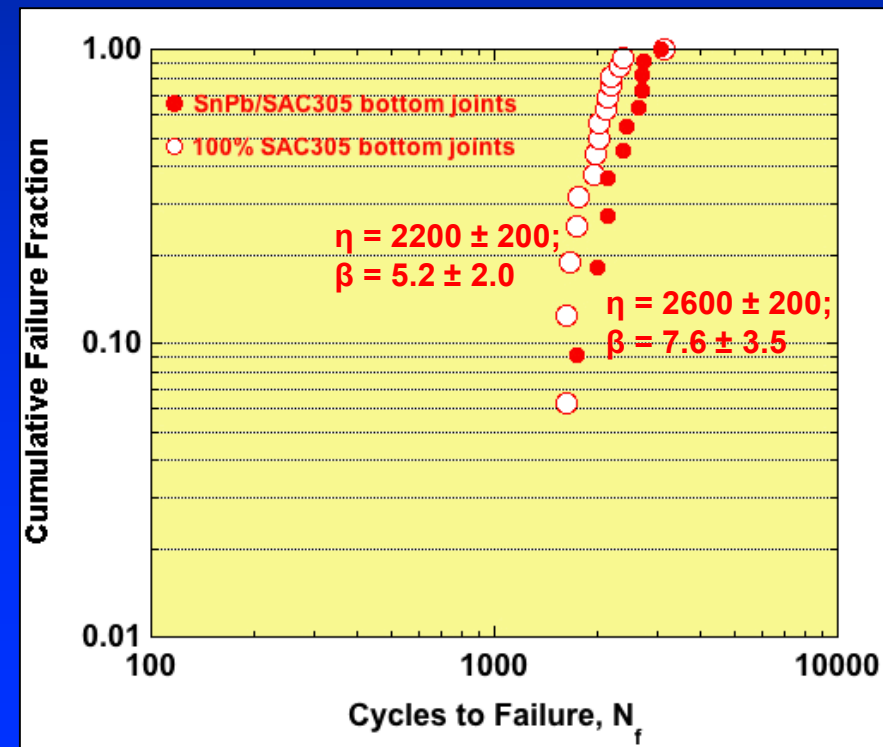
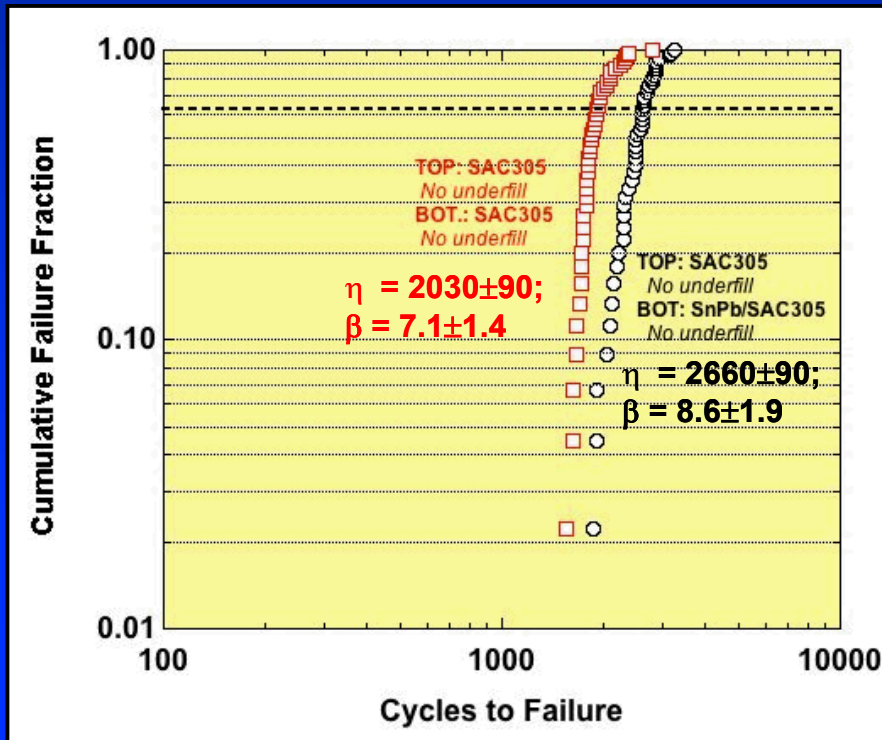
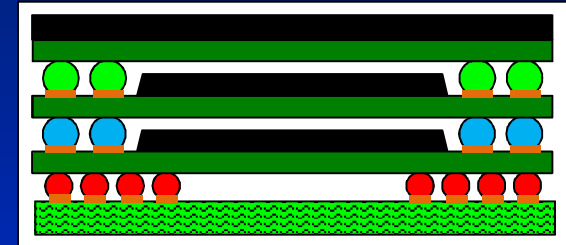
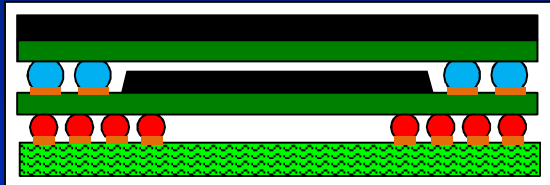


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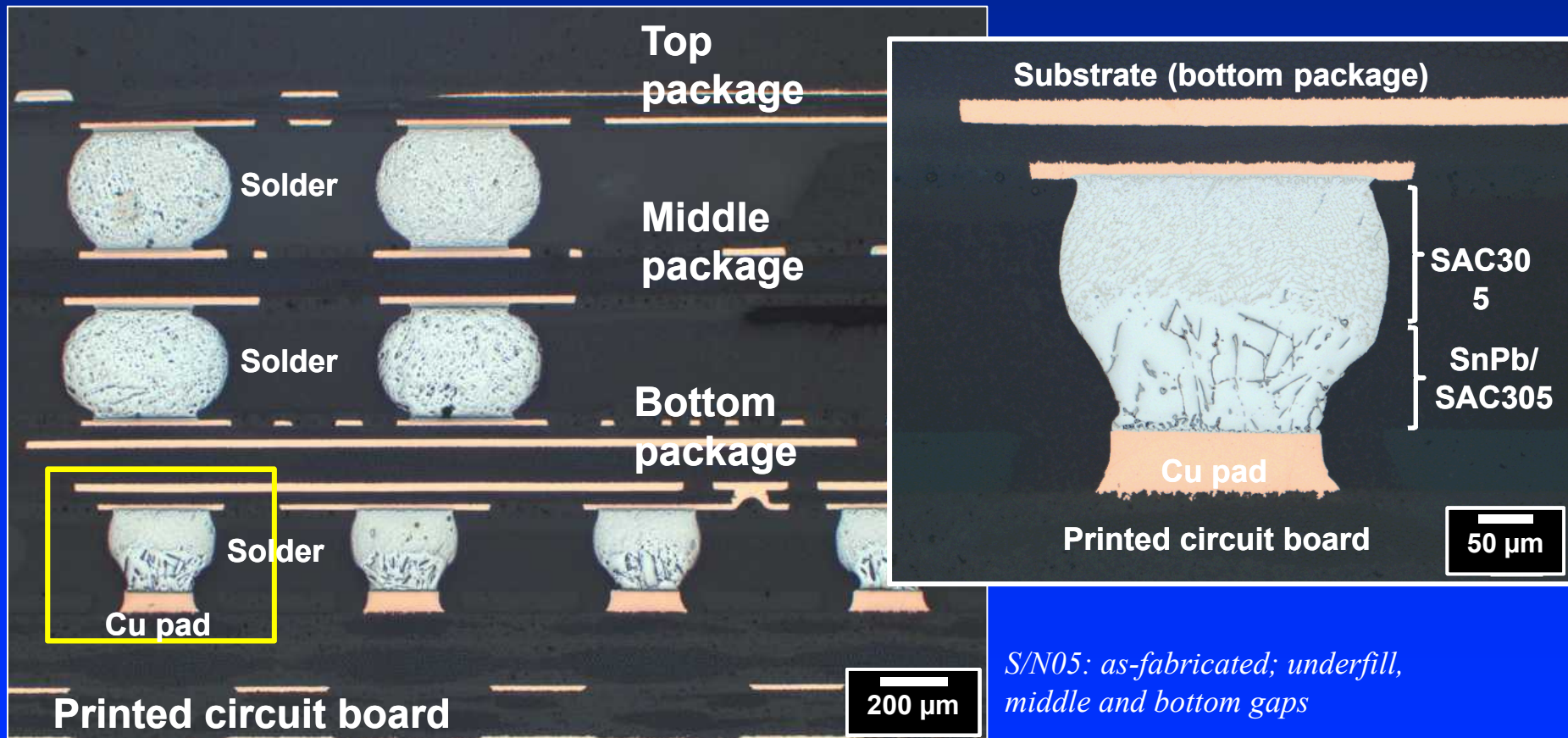
Backwards Compatibility

- ◆ **Stacked package technology** has shown that mixed Sn-Pb/SAC305 solder joint have adequate reliability.



Backwards Compatibility

- ◆ An objective of the backwards compatible test vehicles was to assess the TMF behavior of the inhomogeneous microstructure.
 - Unfortunately, this microstructure was realized on only one test vehicle, S/N05, and that PWA was NOT monitored for failure events.

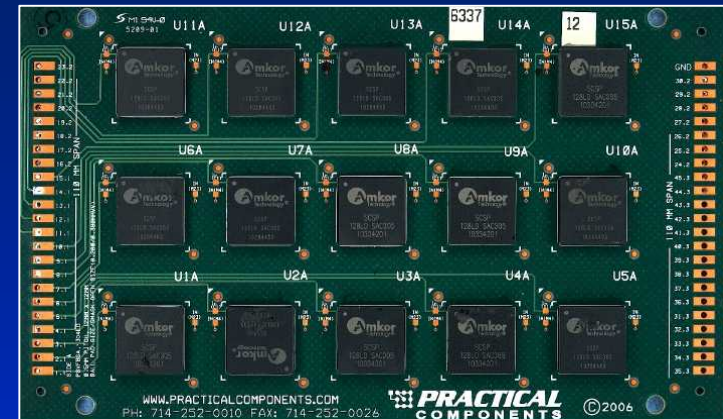


S/N05: as-fabricated; underfill, middle and bottom gaps

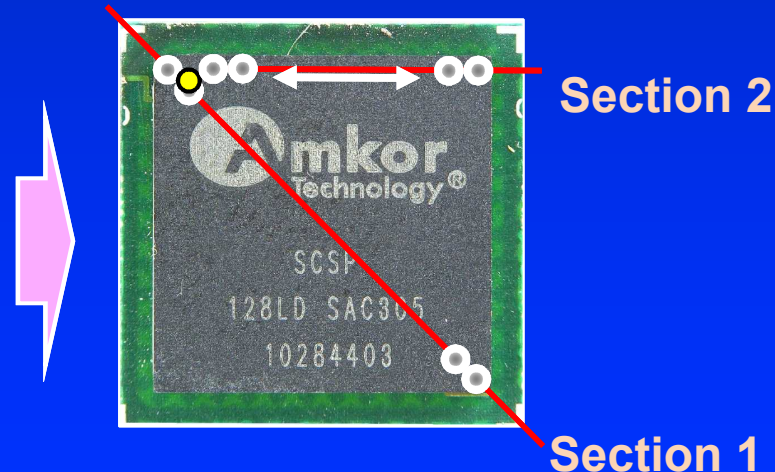
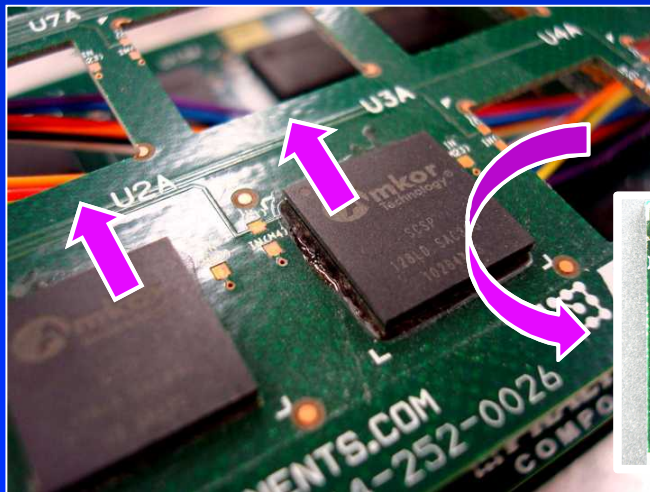
Backwards Compatibility

- ◆ Although not monitored for “events”, S/N05 was also placed in the temperature cycling chamber.

- Individual package were routed out of the PWA after 600, 1000, 1500, 2500, 5000, and 7000 cycles.



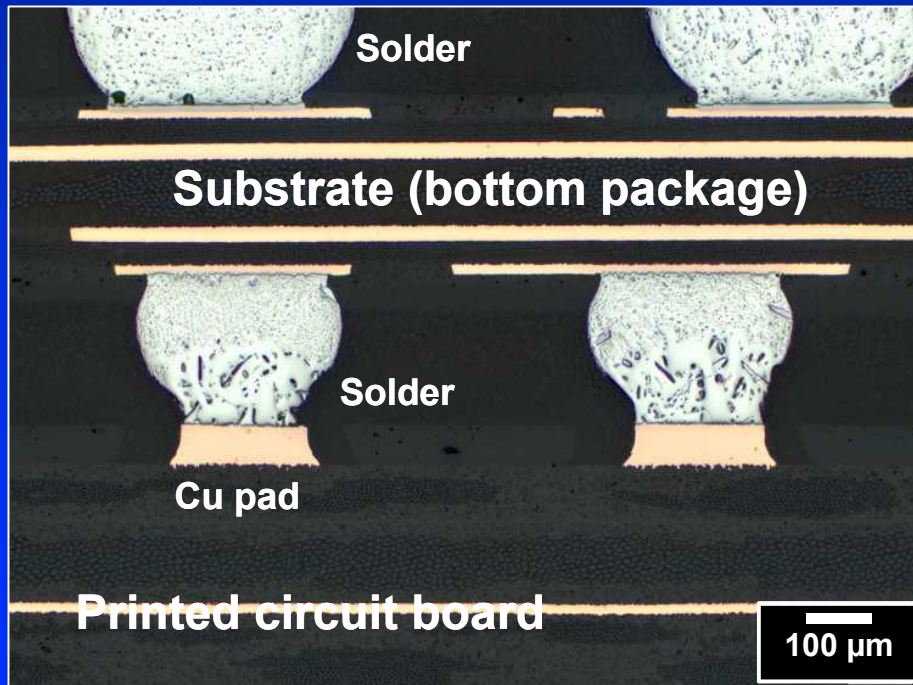
- ◆ Two cross sections were made to the package: Section 1, a full diagonal and Section 2, a perimeter row.



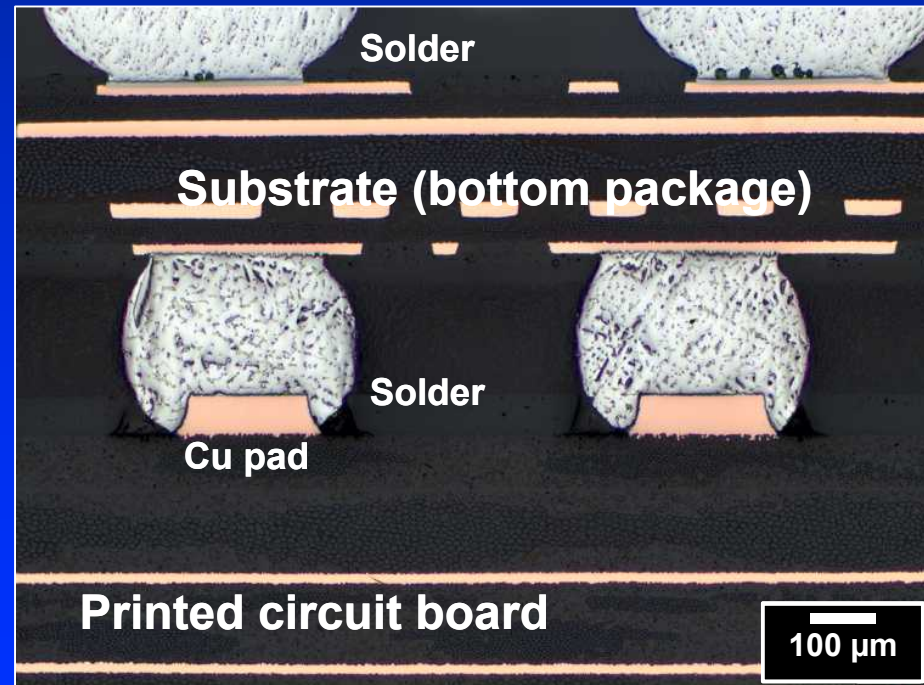
Backwards Compatibility

- ◆ A direct comparison was made of the extents of TMF in the backwards compatible microstructures:
 - non-homogeneous, S/N05 ... versus ... homogeneous, S/N07

S/N05, 600 TC



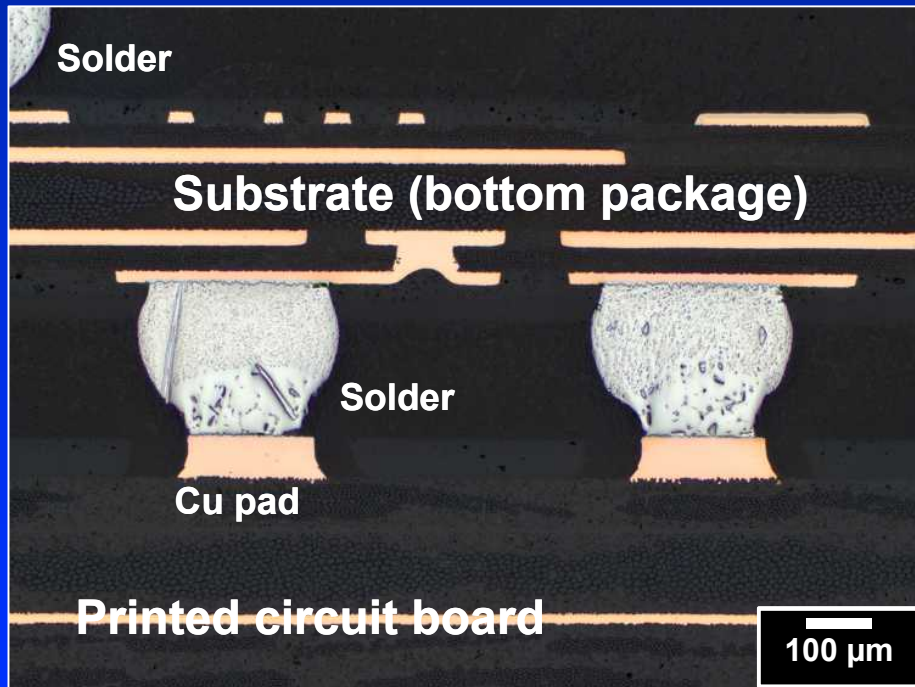
S/N07, 600 TC



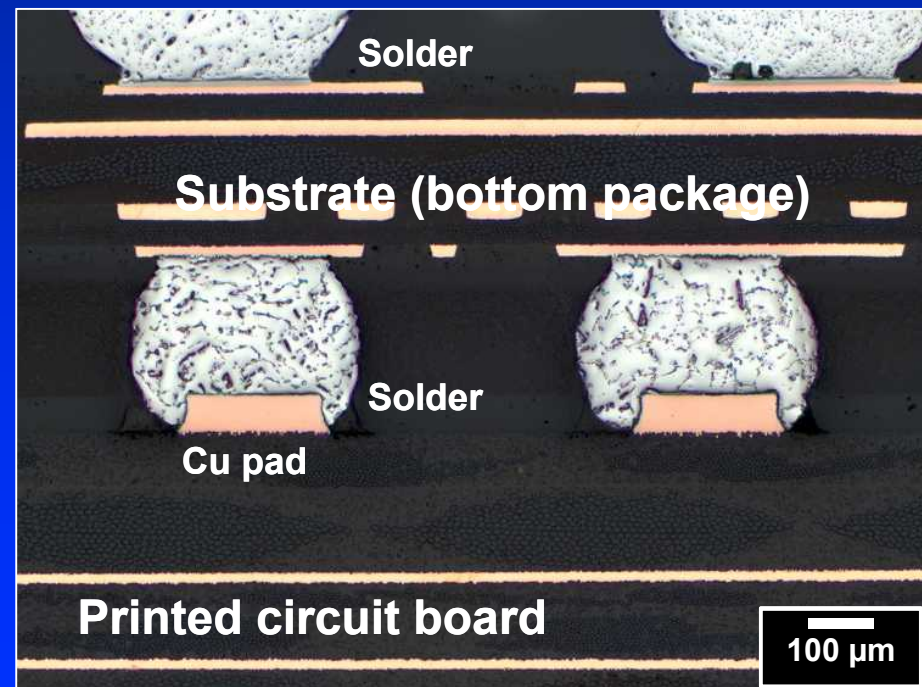
Backwards Compatibility

- ◆ There is very little change to either microstructures after 1000 TC.

S/N05, 1000 TC



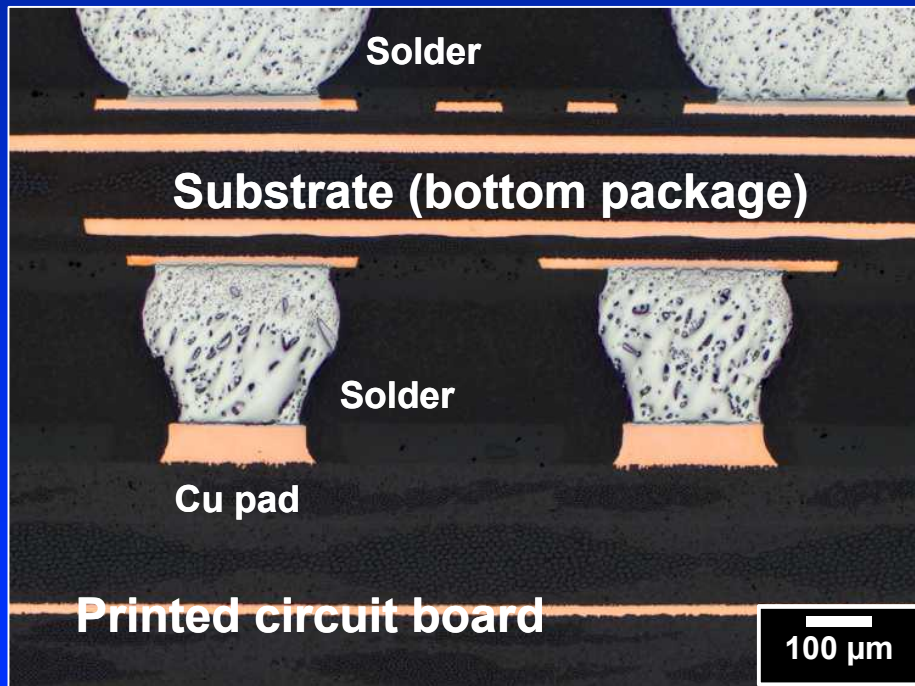
S/N07, 1000 TC



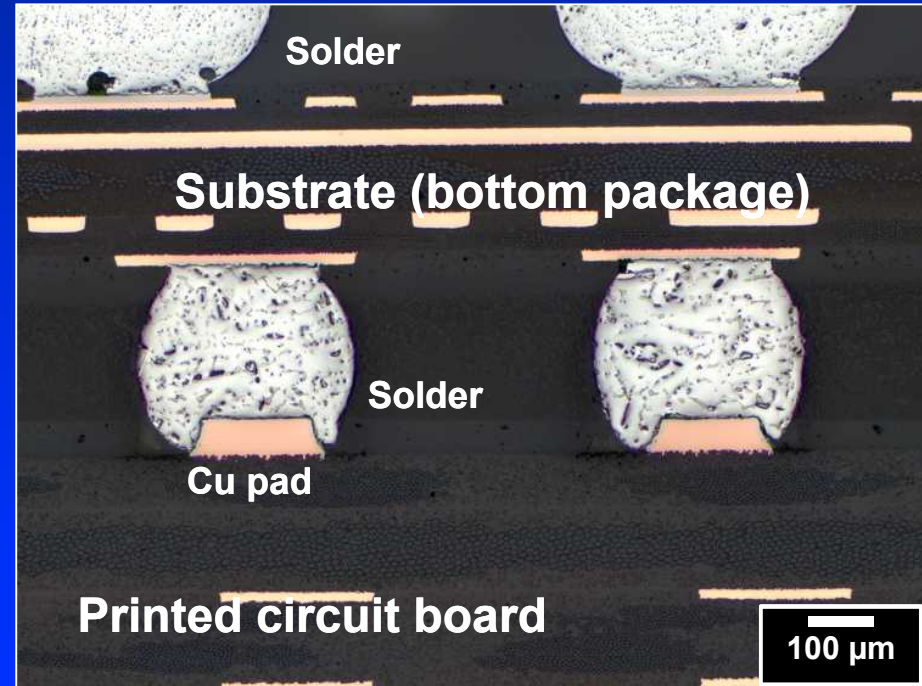
Backwards Compatibility

- ◆ *The non-homogenous microstructure begins to homogenize.*
 - The homogenization process is driven by the elevated temperatures, the mechanical strain, or a combination of both stimuli.

S/N05, 2500 TC



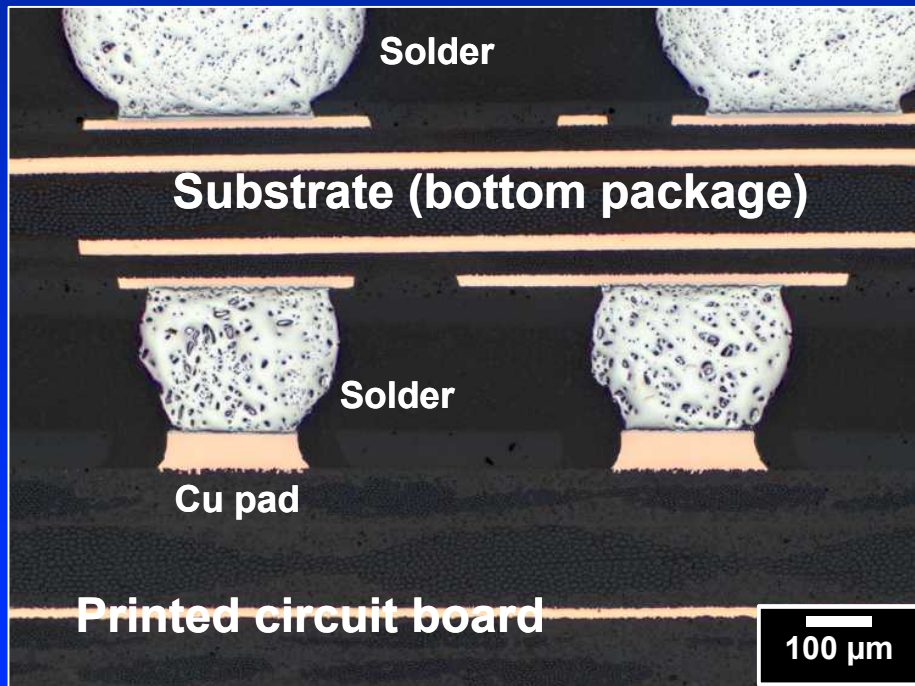
S/N07, 2500 TC



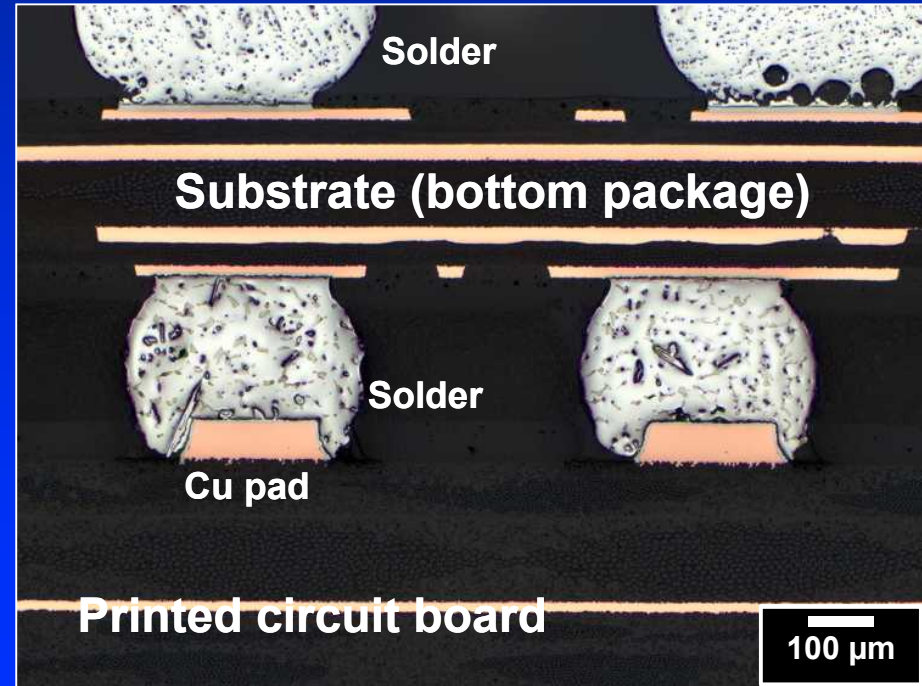
Backwards Compatibility

- ◆ The homogenization process is complete following 5000 TC.
 - The partial hour-glass profile was not susceptible to TMF crack development any more so than is the nominal ball geometry.

S/N05, 5000 TC



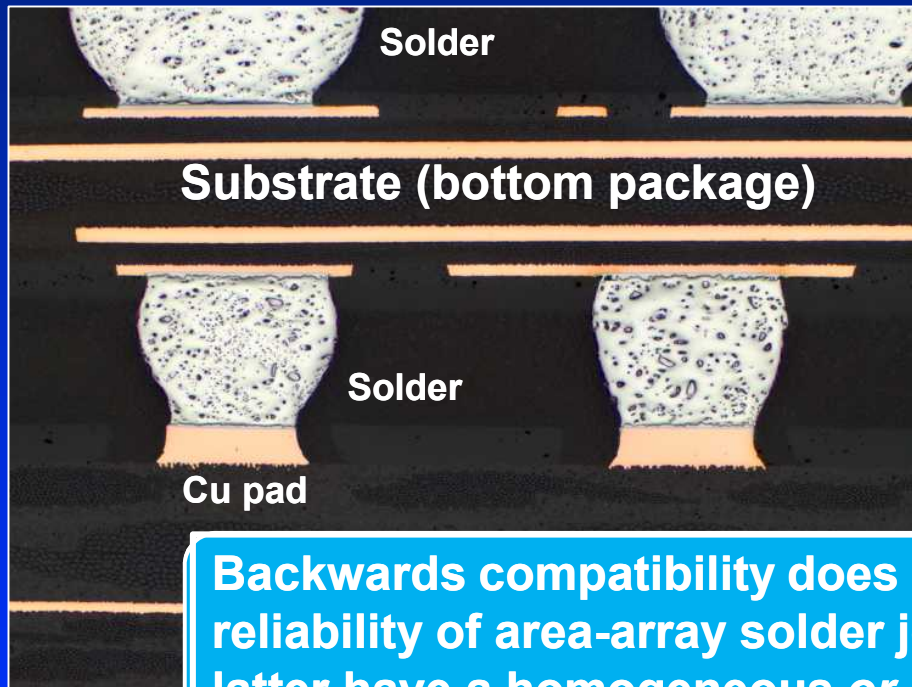
S/N07, 5000 TC



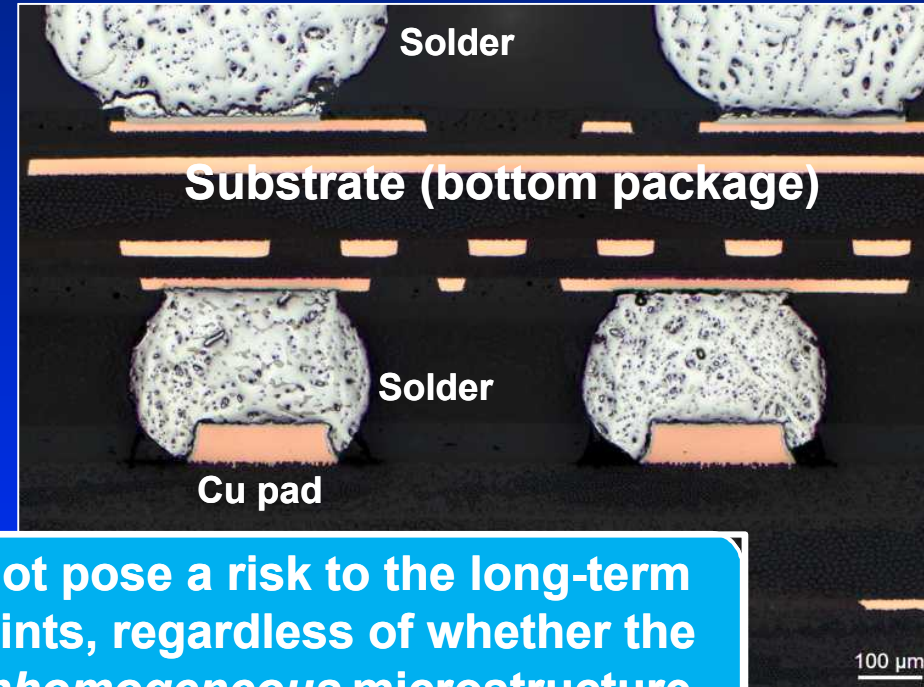
Backwards Compatibility

- ◆ The homogeneous microstructure remains in place after 7000 TC.

S/N05, 7000 TC



S/N07, 7000 TC



Backwards compatibility does not pose a risk to the long-term reliability of area-array solder joints, regardless of whether the latter have a homogeneous or *inhomogeneous* microstructure.

- ***This stipulation eliminates the warranty loss as well as cost and schedule penalties associated with reballing COTS area-array packages received from the supplier with Sn-Ag-Cu solder balls.***