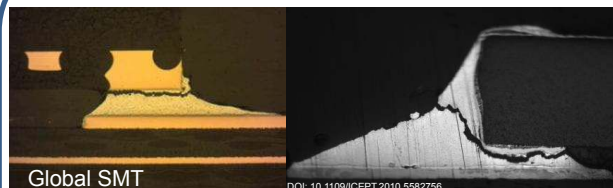


Novel Method for High Reliability Assembly of Microwave QFN Packages for Extreme Thermal Cycling Applications

R. Pino, N. Rodríguez, C. Gómez, A. Rodríguez, R. Baker, C. Chandler.

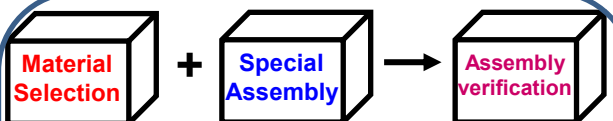
STATUS QUO

QFN package in extreme thermal cycling



- ✓ CTE mismatch between PCB and SMD parts induces fatigue cracks on solder joints
- ✓ Low Earth Orbit payloads are subjected to continuous thermal cycles. This condition has demonstrated a high failure rate of QFN devices
- ✓ Some amplifiers are only available in QFN with no option to use another package

NEW INSIGHTS



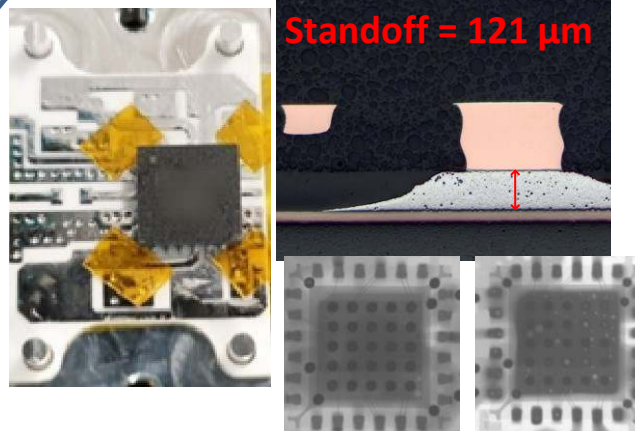
Tailored approach to enable using restricted packages such QFNs

- Ceramic board targeting QFN CTE
- Tailored CuMo alloy to match board & component CTE

Careful assembly process

- Increase standoff height to absorb remnant mismatch
- X-Ray inspection
- Solder annealing to relieve solder tensions

DESCRIPTION

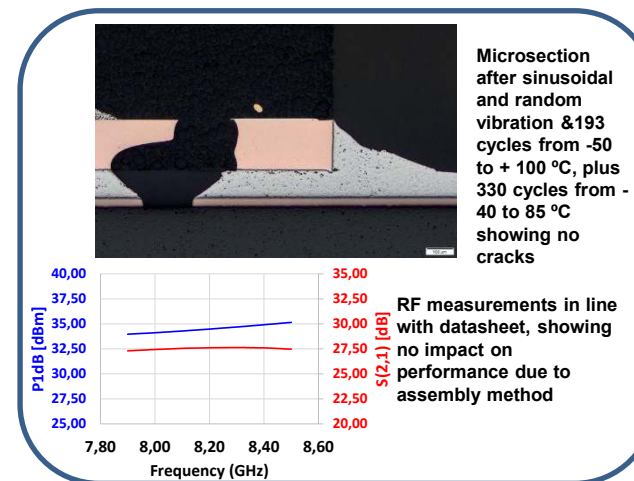


Assembly includes three major steps:

- De-golding: gold plating is removed to allow a good SnPb solder joint. Heat resistant RTV avoids solder wicking to unwanted regions
- The use of Kapton shims ensures sufficient standoff height by avoiding the component weight to push solder away from the joints
- X-Ray inspection allows void percentage count. Large void percentage can be identified when using shims, but remains inside compliant limits



QUANTITATIVE IMPACT



PROPOSED CONCEPT GOALS

QFN assembly method includes

- ✓ Match CTE of SMT part, PCB and carrier
- ✓ Use high temperature RTV to control tin wicking
- ✓ This method has demonstrated robustness in front of extreme vibrations and severe thermal cycling
- ✓ Customer Approval for satellite use in Low Earth Orbit