Forward/Backward Compatibility

1 Definitions

Backward compatibility: A lead-free component is said to be backward compatible if it can be reliably attached to a PCB using tin/lead solder paste with a tin/lead solder profile (typical peak reflow temperatures ranging from 220°C to 235°C).

Forward Compatibility: A SnPb component is said to be forward compatible if it can be reliably attached to a PCB using lead-free solder paste with a lead-free profile (typical peak reflow temperatures ranging from 240°C to 260°C).

2 For Leadframe-Based Packages

Lead Finish	Reflow Process and Peak Temperature Range	
	Tin/Lead Process (220°C - 235°C)	Lead-Free Process (240°C - 260°C)
Tin/Lead (SnPb)	OK	OK if device ordered with suffix 260C (forward compatible)
Lead-free (matte Sn)	OK (backward compatible)	OK

3 For DSBGA and BGA packages

Solder Bump/Ball Composition	Reflow Process and Peak Temperature Range	
	Tin/Lead Process (220°C - 235°C)	Lead-Free Process (240°C - 260°C)
Tin/Lead (SnPb)	OK	NOT RECOMMENDED (not forward compatible)
Lead-free (SnAg [BGA] or SnAgCu [microSMD])	NOT RECOMMENDED (not backward compatible)	OK

4 Reflow Profile

- Generally, the reflow profile will depend on the melting point of the solder paste and the geometry and layout of the PCB.
- With sufficient engineering characterization, the throughput for the Pb-free profile can be made the same as that of the SnPb profile.
- For lead-free qualification, Texas Instruments used the Pb-free profile given in J-STD-020C. This profile is also acceptable for production, provided that adequate characterization is done by the board level assembler.

5 Tin Whiskers

- Tin whiskers are recognized as a reliability concern throughout the industry.
- To mitigate whisker growth Texas Instruments has done the following:
  - Established the minimum plating thickness of 8 microns, with a nominal thickness of 12 microns.
  - Established a post-plate annealing of 1 hour at 150°C within 24 hours of plating.

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