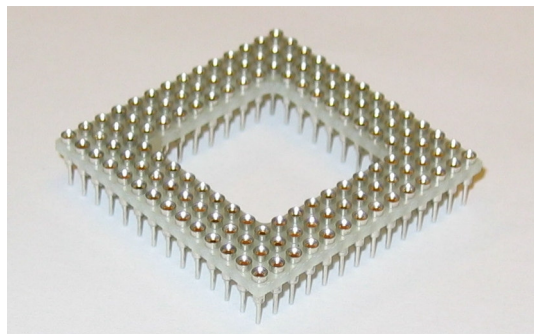




Test Report

**RoHS Qualification
FR-4 PGA Product Family**



Rev. 0, 8/16/05

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Approved: Glenn Goodman

1 Purpose:

To ensure process compatibility with the RoHS Directive* a design of experiments (DOE) was conducted to validate the solderability compliance of FR-4 material in the PGA product family.

(*Refers to Directive 2002/95/EC “The restriction of the use of certain hazardous substances in electrical and electronic equipment.”)

2 Testing Summary:

The parts, made up of terminal assemblies and FR-4 wafers, were run through the testing listed below. Inspection, test parameters, and results are listed in Section 3.

- 1) Part Inspection
- 2) Subassembly / Part Assembly
- 3) Board Attachment
- 4) Analysis (x-ray / cross section)

3 Components:

SK9399-G (Gold plated PCB)

SK9399-TL (Tin/Lead plated PCB)

1214GG (1001-5 Gold plated shell / 1002 Gold plated contact)

1214TG (1001-5 Tin/Lead plated shell / 1002 Gold plated contact)

1214MG (1001-5 Matte Tin plated shell / 1002 Gold plated contact)

1025-32 (FR-4 wafer)

4 Testing Requirements:

Plating Test Matrix

The terminals are configured with 3 types of plating for testing; Gold, Matte Tin, and Tin/Lead. These plating configurations were attached to the 2 types of boards, Gold and Tin/Lead using lead-free solder paste. (see matrix below)

Lead-free preform (SK9436) (Lead-free oven profile – see Section 7)

1214GG: 48 on GG PCB / 48 on TL PCB

1214TG: 48 on GG PCB / 48 on TL PCB

1214MG: 48 on GG PCB / 48 on TL PCB

RoHS Survivability Test

All non-lead material in the DOE has passed RoHS temperature requirements of 260°C peak for 40 seconds when measured on the top surface of the part, 2°C per second ramp and decline. Run 3 times; second and third run after ambient cool down

Attributes monitored during-after test

- 1) Assembly non-conformities
- 2) Wafer geometry/dimensional variation or distortion
- 3) Solder reflow
- 4) Correct interface attachment

5 Testing Results:

Section 1: Inspection

- 1.) Incoming quality inspection:
 - a) Parameters: All components must pass incoming inspection (print specification).
 - b) Resultant: All parts passed incoming quality inspection.

Section 2: Assembly

- 1.) Contact assembly
 - a) Parameters: Per normal manufacturing process; install contacts into terminal shells and press one block of each part number 1214GG / 1214TG / 1214MG.
 - b) Resultant: The parts were assembled by manufacturing.
- 2.) Inspect contact assemblies
 - a) Parameters: The parts were visually inspected for misalignment, skiving, non-populated, and contact height.
 - b) Resultant: The parts passed both print and visual inspection.
- 3.) Install terminals into the wafers: 4 wafers per assembly were fully loaded using standard manufacturing operations.
 - c) Parameters: Assemble 12 parts per normal manufacturing.
 - d) Resultant: The parts were assembled correctly per manufacturing procedures.
- 4.) Board assembly: Attach parts to PCBs (see Fig. 1 and Fig. 2 below)
 - a) Parameters: The parts were attached per the test matrix using sized through holes, lead-free solder paste, and the corresponding oven profile. (Section 7 for profile)
 - b) Resultant: The parts were attached by manufacturing.

Fig. 1 - Picture of board assembly (Matte Tin terminal – Gold PCB)

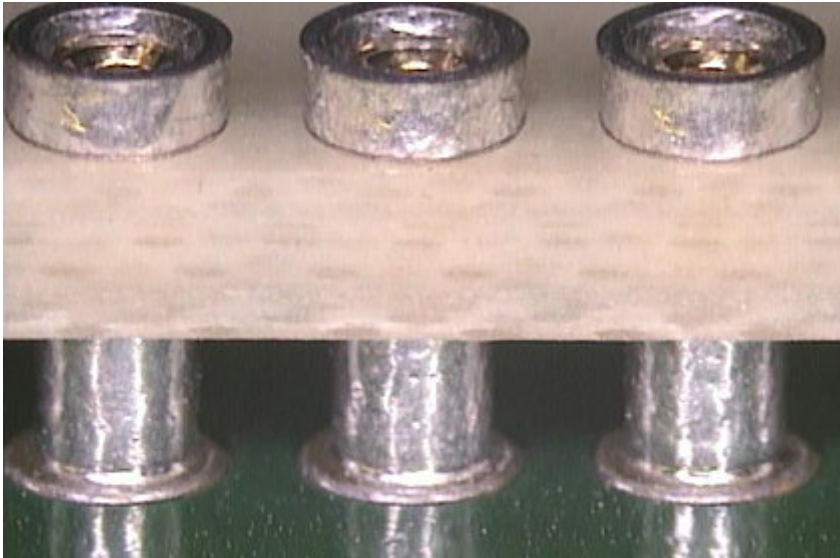
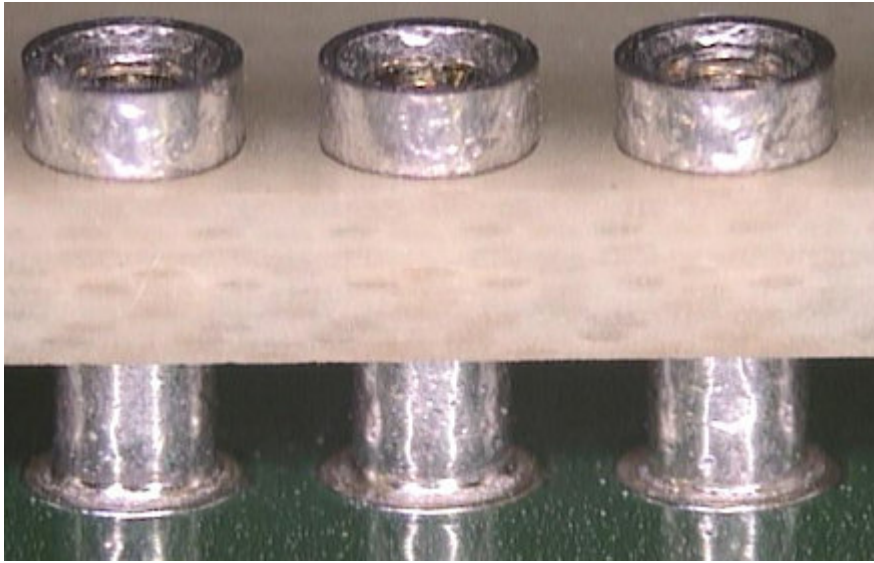


Fig. 2 - Picture of board assembly (Matte Tin terminal – Tin/Lead PCB)



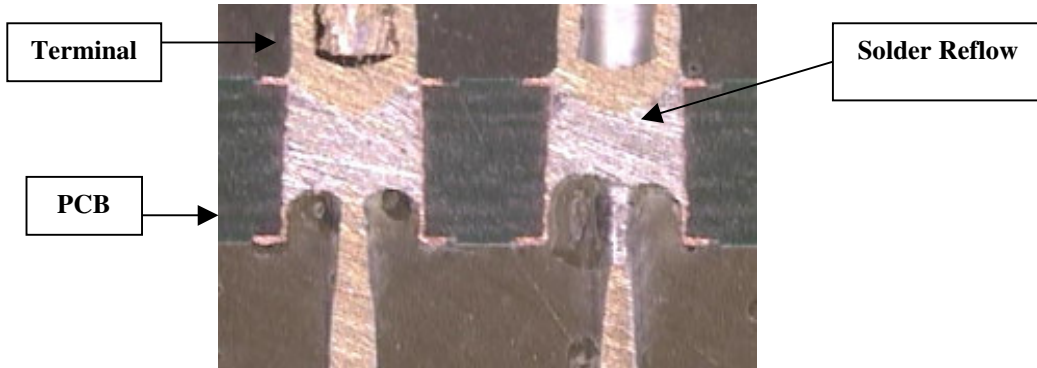
- 5.) Inspection of Board attachment
 - a) Parameters: The parts were visually inspected for correct attachment looking at placement and solder reflow.
 - b) Resultant: The parts passed visual inspection.

Section 3: Board Attach Inspection:

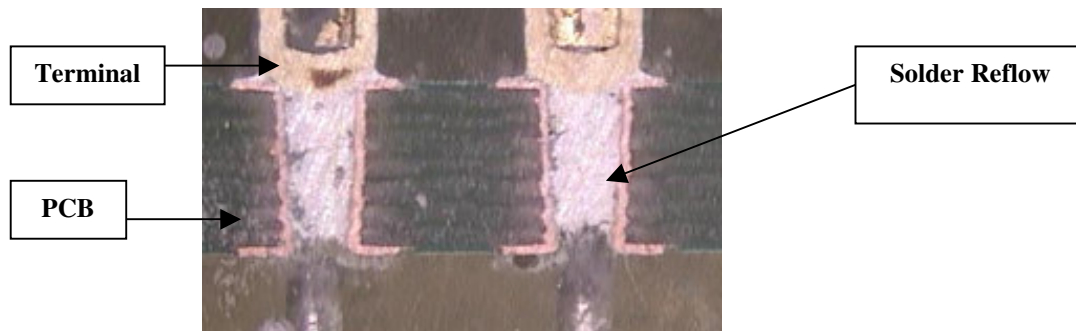
- 1) X-ray the attached parts.
 - a) Parameters: X-ray 2 parts from each group, visually inspecting for any solder non-conformities.
 - b) Resultant: The parts were x-rayed correctly and no defects were found.
- 2) Cross section parts: (see Figure 3 below)
 - a) Parameters: Cross section parts from each group. Section through the middle of the terminal.
 - b) Resultant: The parts were sectioned correctly.
- 3) Inspection of cross-sectioned parts
 - a) Parameters: Visual inspection of the cross sectioned parts, looking for correct solder reflow (attachment).
 - b) Resultant: The parts show a good attach between the terminal and board. All the plating variations showed good attachment. Example: Matte Tin terminal on a Gold board with lead-free solder paste vs. Matte Tin terminal on a Tin/Lead board with lead-free solder paste show the same characteristics.

Fig. 3 - Cross Section of board assembly

(1) Matte Tin / Gold terminal assembly on Gold board with lead-free paste.



(2) Matte Tin / Gold terminal assembly on Tin/Lead board with lead-free paste.



6 Conclusion:

The FR-4 PGA Product Family has been approved by engineering for use in lead-free applications meeting RoHS standards.

7 Oven Profile:

Lead-Free Profile

