LPAM/LPAF Processing Recommendations

The method used to solder the LPAX high-density connectors is the same as that used for many BGA devices even though there are some distinct structural differences. BGA's have spherical solder balls attached to the leads while the LPAX components employ the unique solder crimp design.

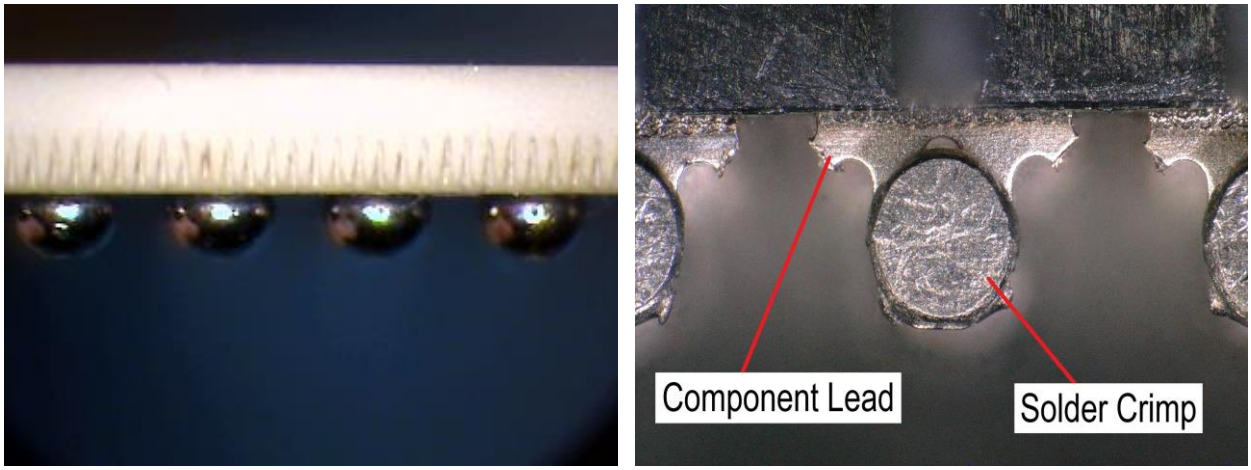


Fig. 1. Solder Balls on BGA vs. Solder Crimps on LPAX

These differences are minor, however, and customers will have success by following the simple guidelines detailed in this document.

1. Basic Recommendations

- ***Minimum*** stencil thickness to be .005" (0.13mm)
- Follow our recommended footprints and stencil designs, found here:
    - LPAM - Surface Mount Footprint
    - LPAF - Surface Mount Footprint

2. Solder Screen Printing Process

- Complete solder pad coverage is critical. The recommended aperture size is intentionally larger than the pad to ensure that the solder crimp comes into contact with the solder paste (see Fig. 2). If this does not occur, proper wetting will not be achieved. Automated inspection of each print is recommended. If solder paste does not completely cover the solder pad the assembly should be rejected, cleaned and re-printed.

- Stencil cleaning may need to be monitored more frequently to ensure complete solder pad coverage is maintained.

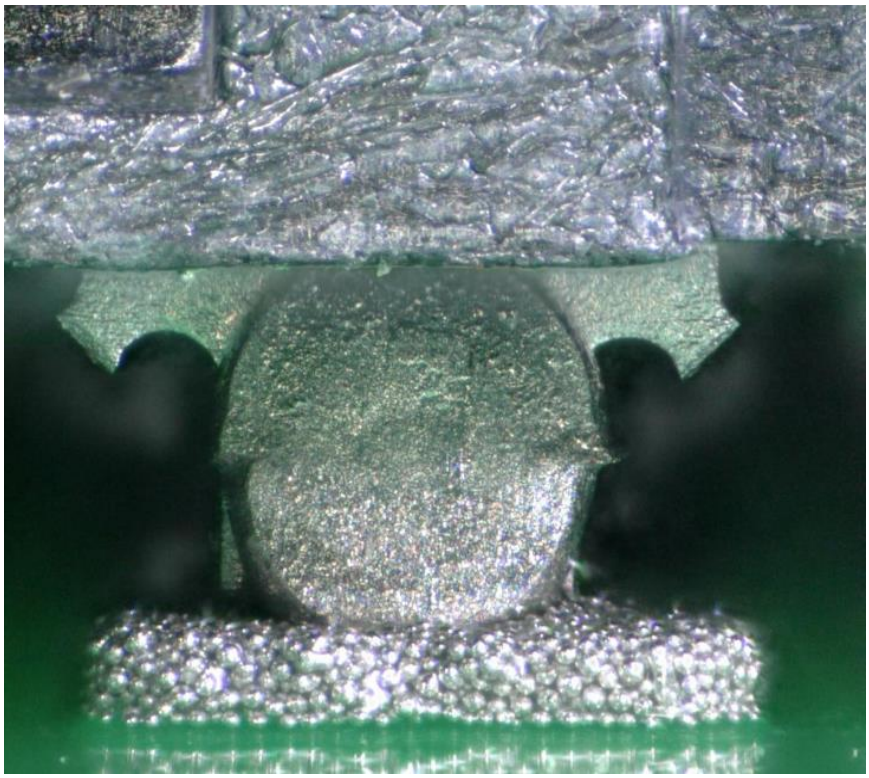


Fig. 2. Solder crimp location relative to solder print. Notice good contact between solder crimp and paste.

3. Component Placement

- The connector must be fully seated. As previously stated and shown in Fig. 2, it is critical that the solder crimp comes into contact with the solder paste to ensure proper wetting. When using automated pick-and-place equipment, ensure the Z-axis dimension fully seats the solder crimps onto the board surface. Due to nominal variances in solder crimp positioning, i.e. coplanarity, not all crimps will contact the board at the same time. Fig. 3 illustrates a fully seated connector prior to reflow.

- As the solder crimps reflow, the weight of the connector causes it to settle so that the body's standoffs rest on or just slightly above the PCB surface after processing. This phenomenon is why the upper coplanarity specification of .006" (.15mm) is acceptable for the LPAX connector family, even with thinner stencils (see Fig. 4 below).

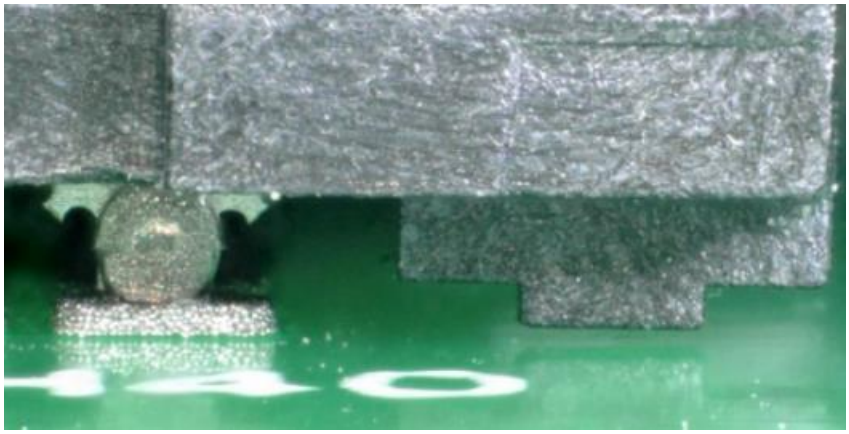


Fig. 3. The insulator housing of a fully seated LPAX connector prior to reflow.

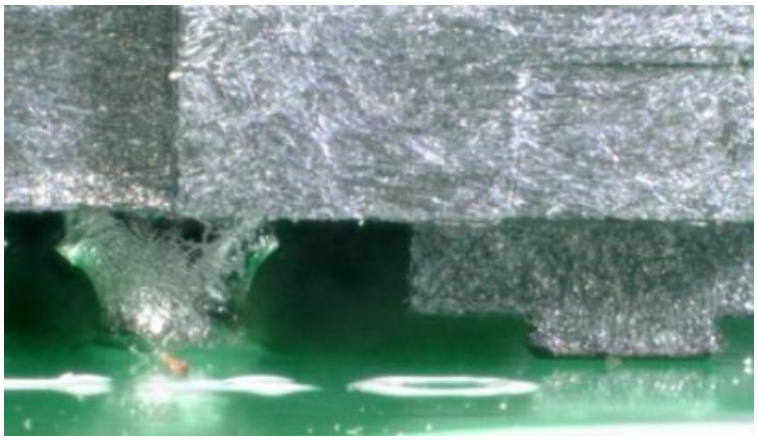


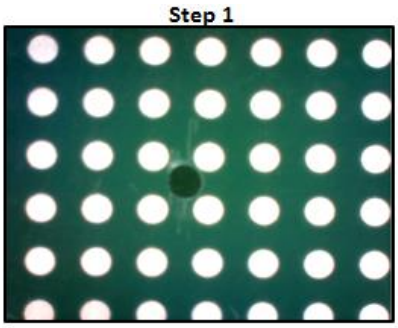
Fig. 4. The insulator housing of a reflowed LPAX connector will rest on the PCB surface or slightly above.

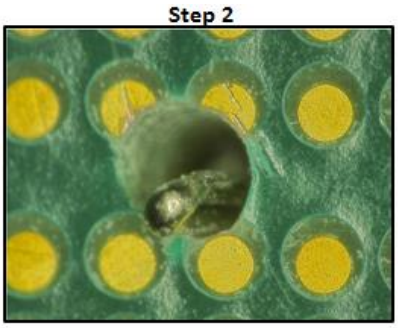
4. Proper Profiling

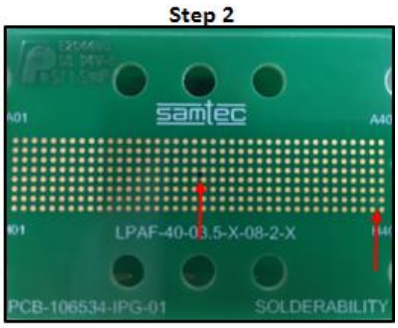
- **Samtec strongly recommends the use of a low level oxygen environment (typically achieved through nitrogen gas infusion) in the reflow process to increase the wettability of the soldering surfaces.** LPAX testing has consistently shown a dramatic increase in solder yields in a low level oxygen environment as opposed to an air environment. Many variables affect the level of residual oxygen required to optimize a given reflow process, but generally the levels should be less than 1000 ppm.

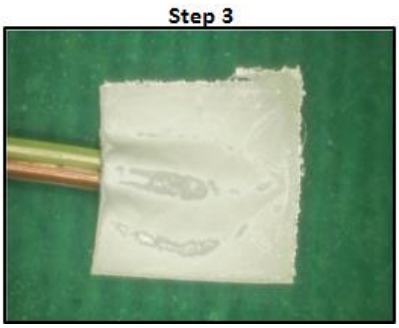
- **The importance of properly profiling the fully-populated printed circuit assembly cannot be overstated.** The reflow process that forms the solder joint is sometimes overshadowed by other processes but is critical to ensuring the solder crimp reaches proper reflow conditions. Certain components can be sensitive to time and temperature, so both variables must be controlled and thermal profiling must be performed prior to processing or production. Thermocouples (TC's) should be placed as close to the solder crimp as possible (underneath the part) in the center and on the outside edge.

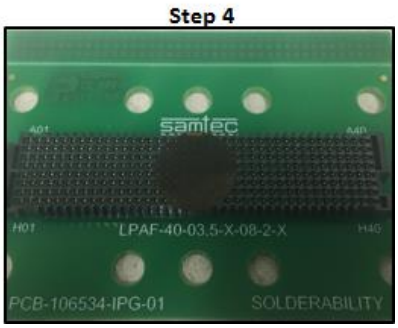
- The steps below detail a widely accepted method to attach TC's to array components:
    - Step 1 - Drill holes (0.040" max dia.) in PCB at TC locations (center and corner)
    - Step 2 - Place TC's through the holes (to just above board level) from bottom of PCB
    - Step 3 - Place thermally-conductive aluminum tape over drilled holes on bottom of PCB
    - Step 4 - Place array component over TC's on PCB







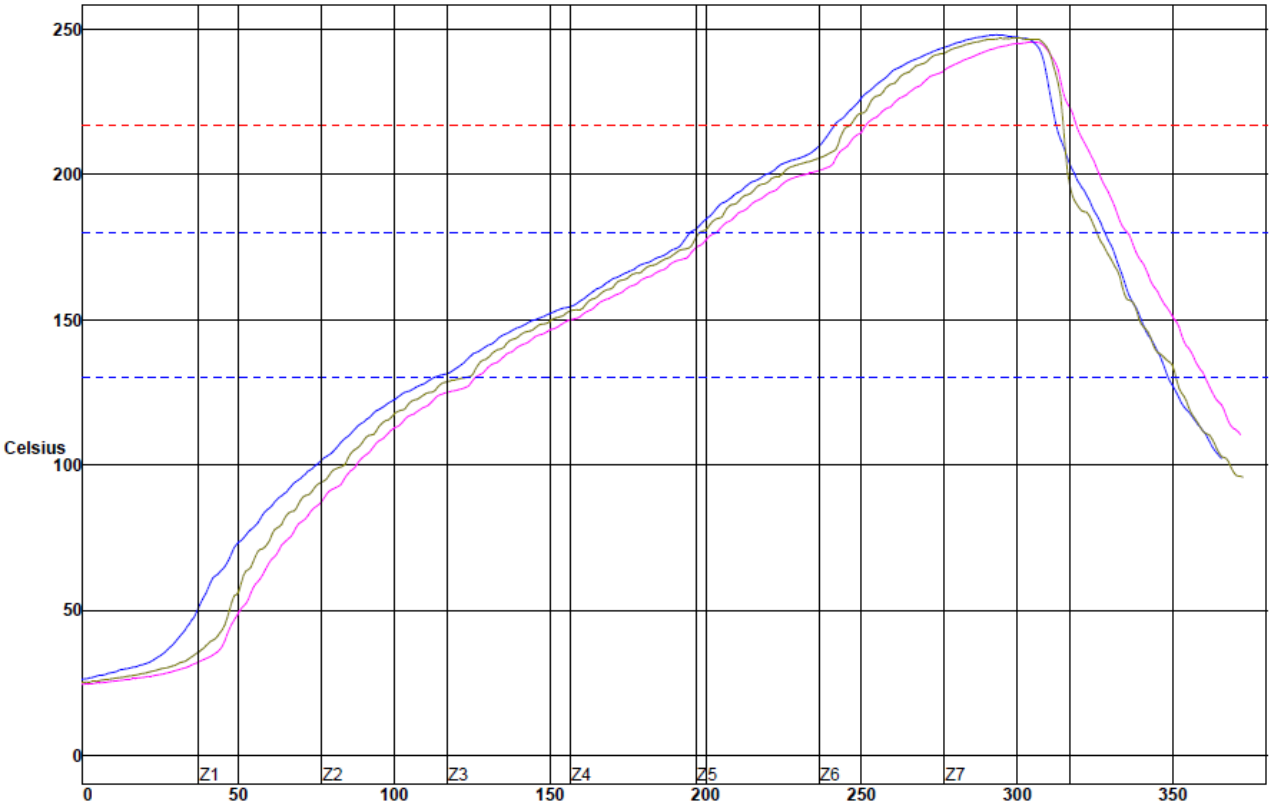




Due to the variances in solder pastes and applications (board design, oven type, component density, etc.), Samtec does not specify a recommended profile for our connectors. Our suggestion is to use a profile within the parameters of the solder paste manufacturer's guidelines. These parameters can usually be found on the solder paste manufacturer's website.

The LPAX components are lead free reflow compatible and compliant with the reflow profile parameters detailed in IPC/JEDEC J-STD-020. This standard requires that components be capable of withstanding a peak temperature of 260°C as well as 30 seconds above 255°C. The parts can also withstand three reflow passes.

Shown below is a lead-free profile that has been tested during LPAX product qualification. Please note that this profile may be used as a recommendation but Samtec strongly suggests that each customer perform their own reflow profile study prior to processing or production.



PWI= 48%	Max Rising Slope		Soak Time 130-180C		Reflow Time /217C		Peak Temp	
Conn Center	1.81	8%	77.58	-41%	67.42	18%	245.45	-16%
PCB	1.70	-6%	82.46	-25%	71.11	31%	247.99	4%
Conn Corner	1.91	22%	75.57	-48%	68.32	21%	247.00	-4%
Delta	0.21		6.89		3.69		2.54	

Fig. 5. Tested Lead-Free Profile

5. Rework Considerations

- Should rework be required, the method used will depend on the severity of the defect. Total connector replacement is typically accomplished using a hot-air rework system and traditional BGA rework methods. For more information on rework, please see the rework link below:
    - LP Array™ LPAM/LPAF Rework Guidelines

6. Handling

- The LPAX connectors are packaged in tape-and-reel which protects the solder crimps from damage. They should be handled like any other BGA device.
    - Avoid resting the connector on the solder crimps except during final placement onto the board.
    - When using tape-and-reel packaging, ensure the bottom of the pocket is protected as it travels through the feeder.
    - Avoid touching the solder crimps.

For further information or questions about anything in this document or processing questions about any Samtec connectors, please contact the Interconnect Processing Group at:

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