

PROCESSING RECOMMENDATIONS

For Samtec's SEARAY™ (SEAM-RA/SEAF-RA Series) Right Angle Connectors

The method used to solder these 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 SEARAY™ Right Angle components employ the unique solder charge design.

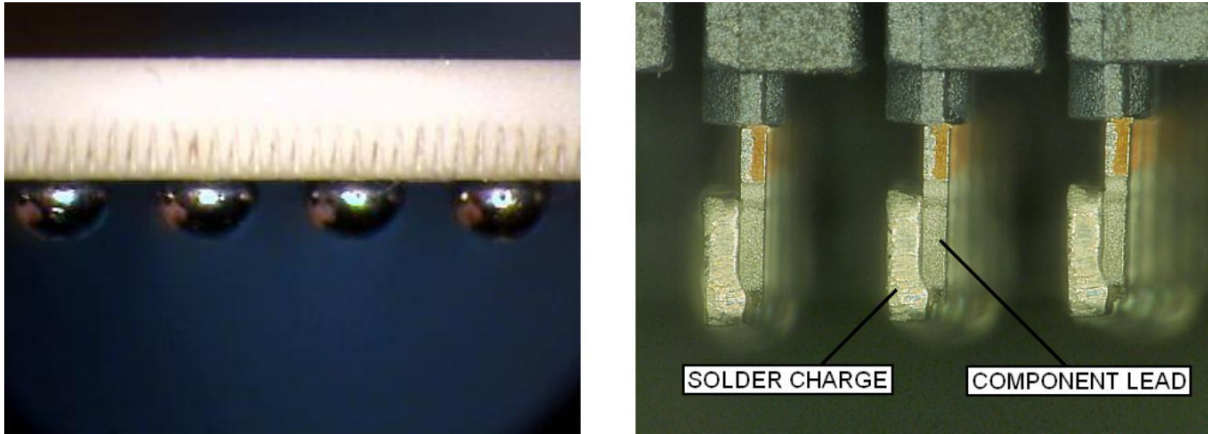


Fig. 1. Solder Balls on BGA's v. Solder Charges on SEARAY™ Right Angle

Additionally, unlike the centralized grid arrangement of BGAs, the solder charges are offset, possibly giving the illusion that the leads are misaligned with the PCB pads. Note that as shown in image #2 below, the tails are nominally aligned with the pads while the solder charges are not.

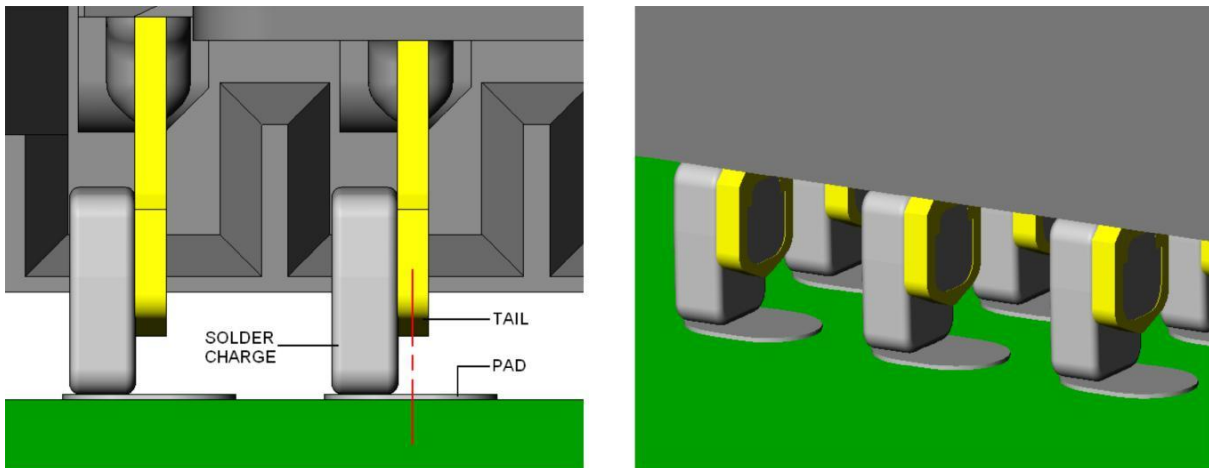


Fig. 2. SEARAY Tail Aligned with SMT Pad

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

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1. Basic Recommendations

- Stencil thickness to be .006" (0.15mm),
- Follow our recommended footprints and stencil designs, found here:
 - [SEAM-RA – Surface Mount Footprint](#)
 - [SEAF-RA – 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 charge comes into contact with the solder paste (see Fig. 3). 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.

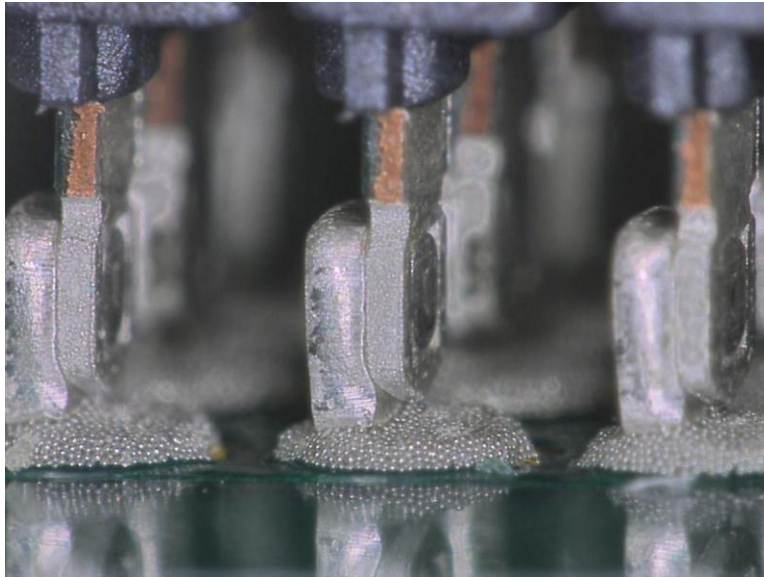


Fig. 3. Solder charge location relative to solder print. Notice good contact between solder charge and paste.

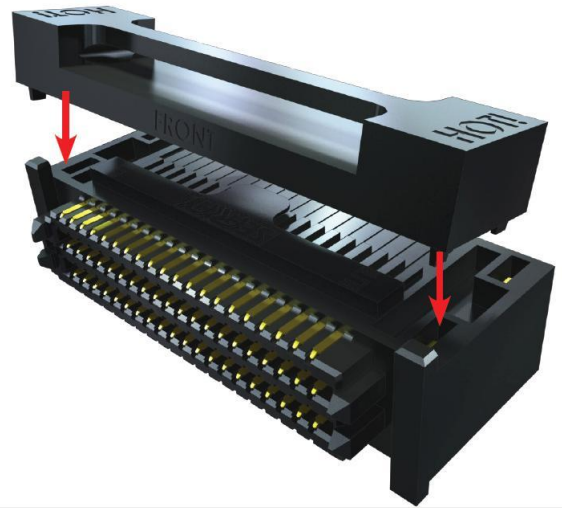
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3. Component Placement

- Samtec recommends the use of a Fixture Tool for the 8 and 10 row versions of the SEARAY™ Right Angle connector to maintain co-planarity through the reflow process. The Fixture Tool is reusable and should be manually installed on the connector just prior to entering the reflow oven. For more information on this tool, please follow the link below or contact Samtec's Interconnect Processing Group at 1-800-SAMTEC-9 (USA & Canada) or 812-944-6733 or email ipg@samtec.com.

- [SEARAY™ Right Angle Fixture Tool](#)



- The connector must be fully seated. As previously stated and shown in Fig. 3, it is critical that all solder charges come into contact with the solder paste to ensure proper wetting. Fig. 4 illustrates a fully seated connector prior to and after reflow. When using automated pick and place equipment, ensure the Z-axis dimension fully seats the connector onto the board surface. Due to nominal variances in solder charge positioning, i.e., coplanarity, not all charges will contact the board at the same time. As the solder charges reflow, however, the weight of the connector causes it to settle so that the body rests on or slightly above the board after processing (see Fig. 4 below).

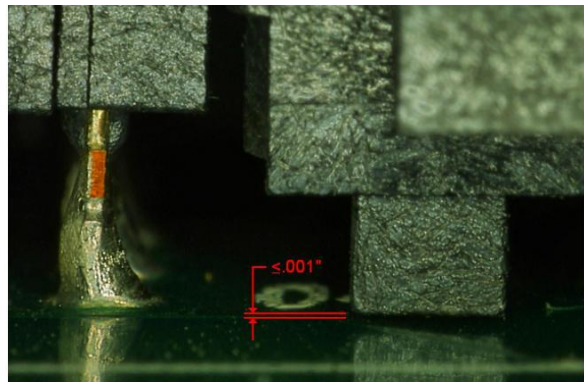
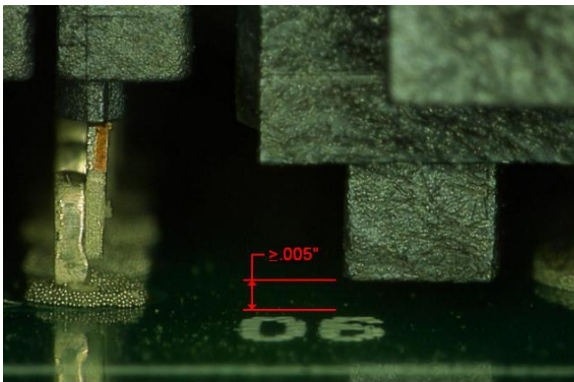


Fig. 4. The insulator housing of a fully seated SEAX-RA connector prior to reflow (Left) vs. after reflow (right)

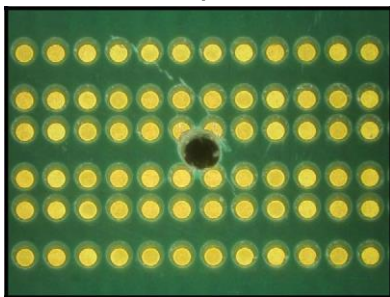
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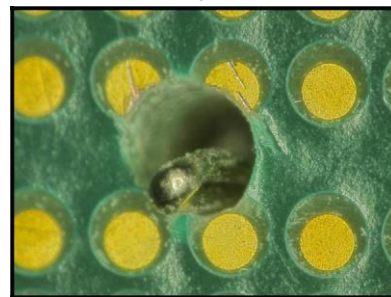
4. Proper Profiling

- 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. SEARAY™ Right Angle 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 charge 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 should be placed as close to the solder charge as possible (underneath the part) in the center and on the outside edge.
- The steps below detail a widely accepted method to attach thermocouples to array components.
 - Step 1 - Drill holes (0.040" max dia.) in PCB at thermocouple locations (center and corner)
 - Step 2 - Place thermocouples through 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 thermocouples on PCB

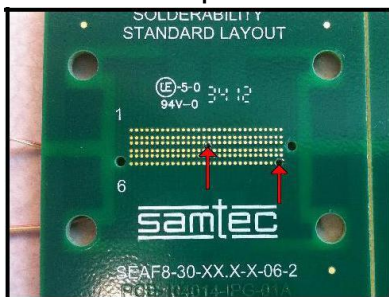
Step 1



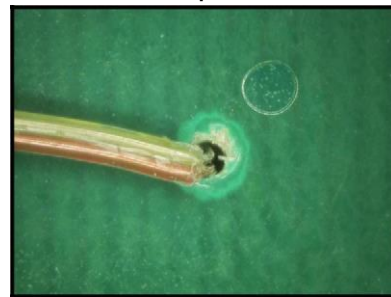
Step 2



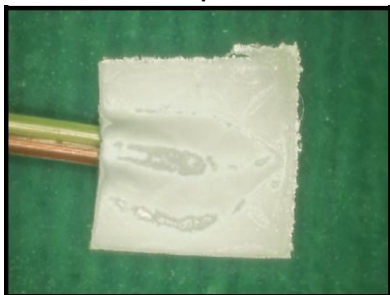
Step 2



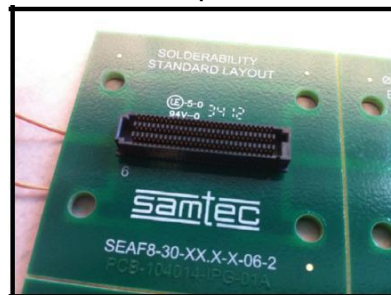
Step 2



Step 3



Step 4



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CAUTION: A 20~30°C TEMPERATURE DIFFERENCE MAY EXIST BETWEEN THIS HIGH-DENSITY COMPONENT AND THE BOARD SURFACE DURING REFLOW. SAMTEC RECOMMENDS A THERMAL STUDY BE PERFORMED TO UNDERSTAND THE TEMPERATURE GRADIENTS YOU MAY EXPERIENCE.

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 SEARAY™ Right Angle components are lead free reflow compatible and compliant with the reflow profile parameters detailed in IPC/JEDEC J-STD-020D. 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 are a compilation of lead-free profiles (overlaid) that have been tested during SEARAY™ Right Angle product qualification. Please note that these profiles may be used as recommendations but Samtec strongly suggests that each customer perform their own reflow profile study prior to processing or production.

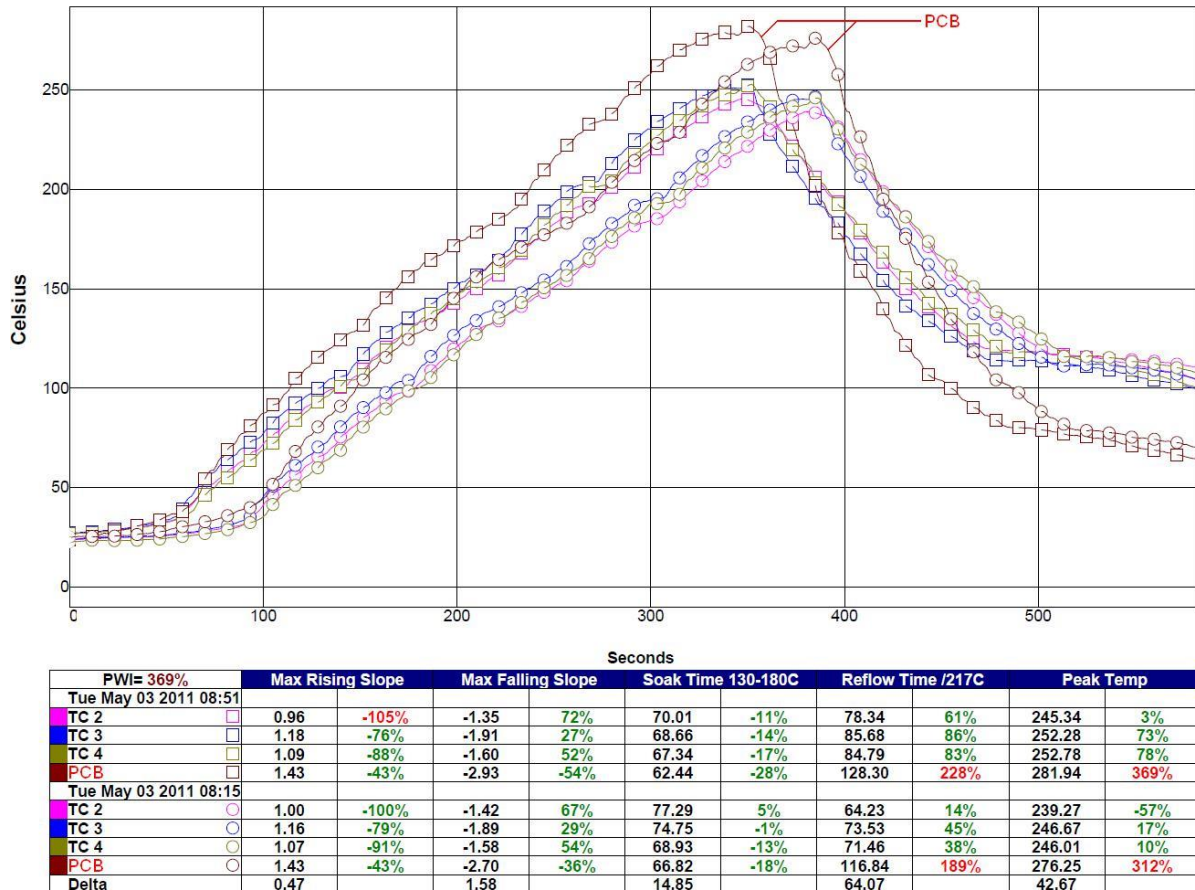


Fig. 6. Tested Lead-Free Profiles

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5. Rework Considerations

- Should rework be required, the method used will depend on the severity of the defect. Total connector replacement is accomplished using a Hot-Air rework system and methodology similar to traditional BGA rework methods. For more information on rework, please see the application note found here:
- [SEARAY™ SEAM-RA/SEAF-RA Rework Guidelines](#)

6. Handling

- These connectors are typically packaged in trays or tape and reel which protect the solder charges from damage. SEARAY™ Right Angle connectors should be handled like any other BGA or IC device.
 - Avoid resting the connector on the solder charges 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 charges,
 - When a partially used tray needs to be stored, use the flat cover from the original shipment or an empty tray to cover connectors. Band trays using flex wrap or rubber bands.

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

Phone: 1 (800) SAMTEC9 or 1 (800) 726-8329
E-mail: ipg@samtec.com