

PROCESSING RECOMMENDATIONS

For Samtec's 0.80mm SEARAY™ Right Angle (SEAF8-RA) 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 SEAF8-RA components employ the unique solder charge design.

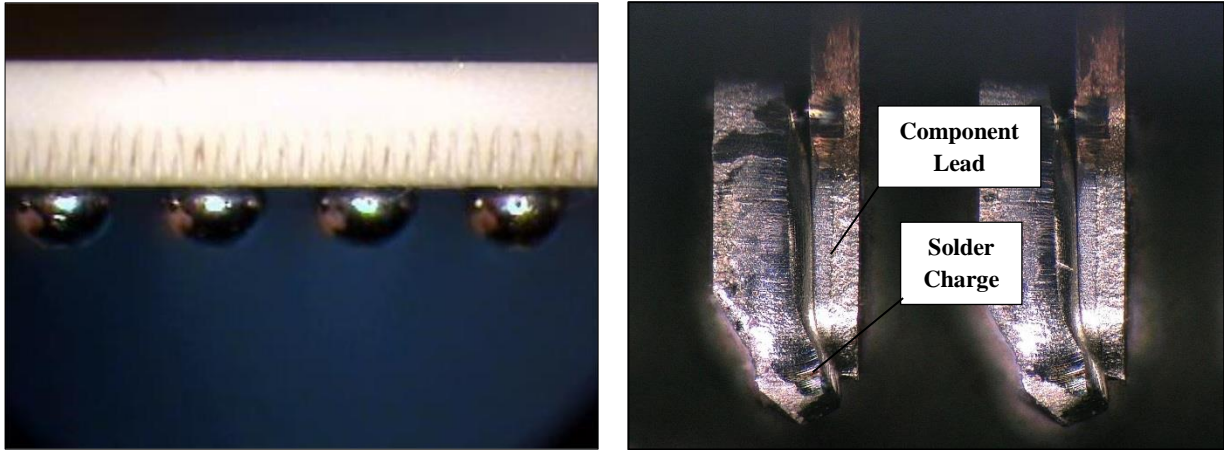


Fig. 1. Solder Balls on BGA's v. Solder Charges on SEARAY™ SEAF8-RA

Additionally, unlike the centralized grid arrangement of BGAs, the solder charges are offset. As shown in Fig. 2 below, the feet of the solder charges are nominally aligned with the pads.

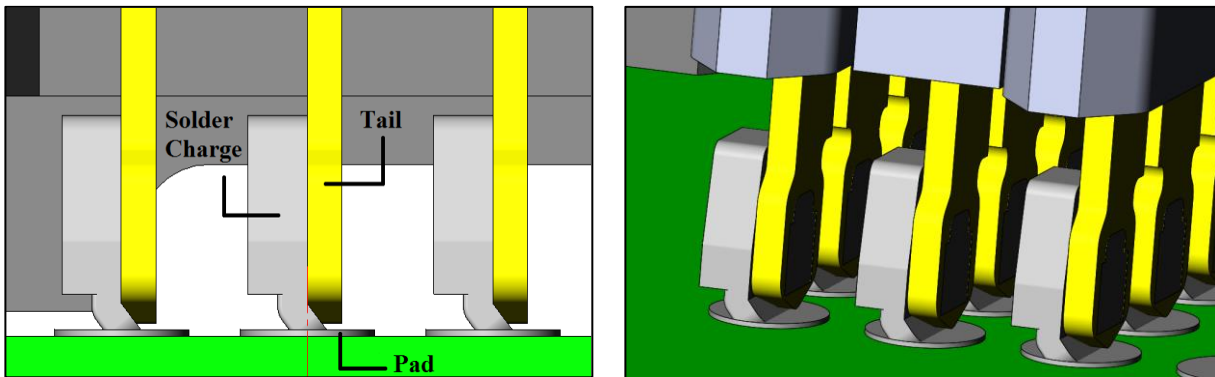


Fig. 2. SEAF8-RA Solder Charge Aligned with PCB Pad

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

1. Basic Recommendations

- Stencil thickness to be .005" (0.13mm),
- Follow our recommended footprint and stencil design, found here:
 - [SEAF8-RA – Surface Mount Footprint](#)

2. Solder Screen Printing Process

- Complete solder pad coverage is critical. The solder charges are intentionally formed at an angle to ensure that they contact 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 PCB should be rejected, cleaned and re-printed.
- Stencil cleaning may need to be monitored more frequently to ensure complete solder pad coverage is maintained.

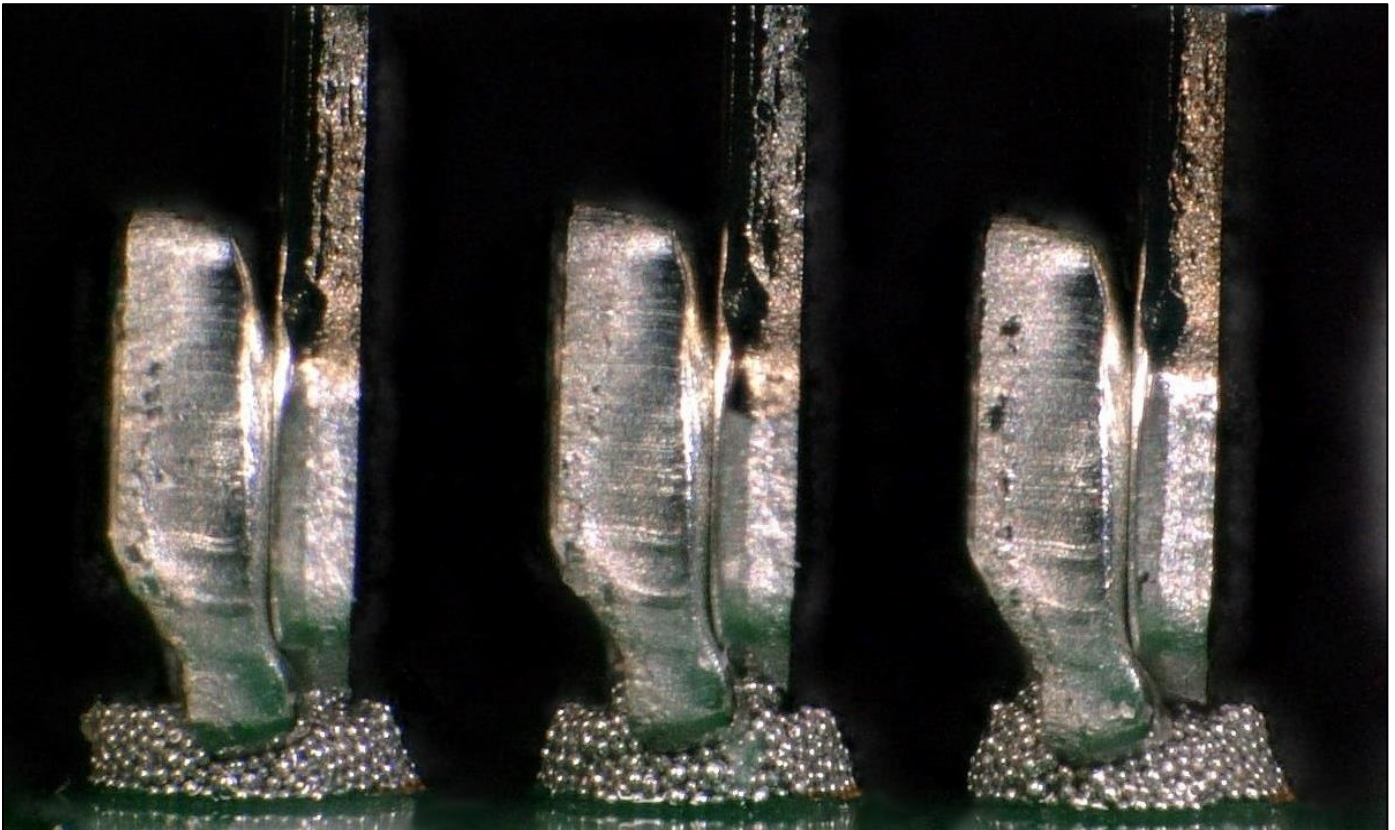


Fig. 3. Solder charge location relative to solder paste. Notice good contact between solder charge and paste.

3. Component Placement

- The connector must be fully seated. As previously stated and shown in Fig. 3, it is critical that the solder charges contact the solder paste to ensure proper wetting. When using automated pick and place equipment, ensure the Z-axis dimension fully seats the solder charges 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. Fig. 4 illustrates a fully seated connector prior to reflow.
- As the solder charges reflow, the weight of the connector causes it to settle so that the body rests on or just slightly above the board after processing. This phenomenon is why the upper coplanarity specification of .006" (.15mm) is acceptable for the SEAF8-RA connector family (see Fig. 5 below).

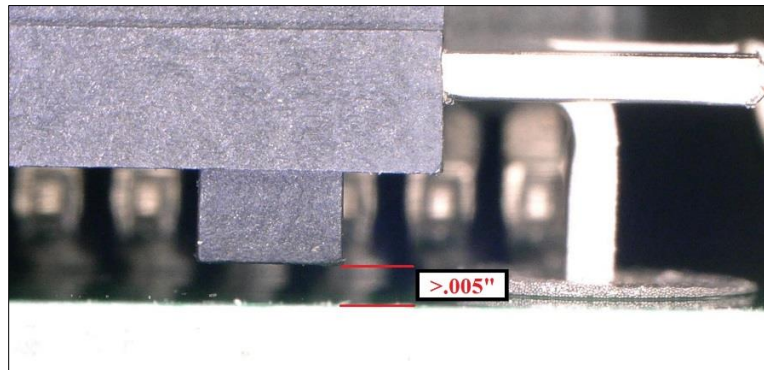


Fig. 4. The insulator housing of a fully seated SEAF8-RA connector prior to reflow will rest approximately .005" (0.13mm) above the board surface.

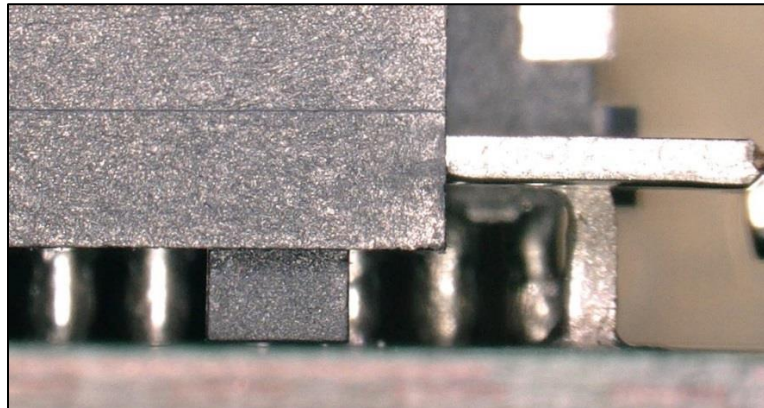


Fig. 5. The insulator housing of a reflowed SEAF8-RA connector will rest on the board surface or slightly above.

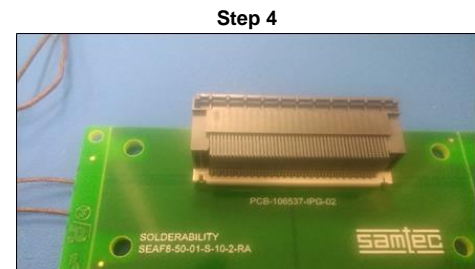
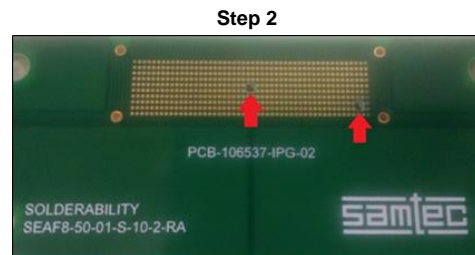
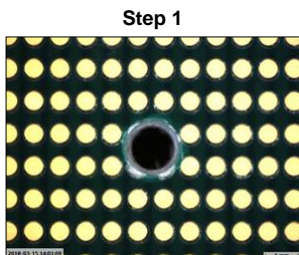
4. Proper Profiling

- Samtec requires 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. **The SEAF8-RA connectors are released for nitrogen environment processing only. The SEAF8-RA connectors are not recommended for air only processing.** SEAF8-RA 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 (TC's) 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 for attaching thermocouples 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 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



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 INVOLVED.

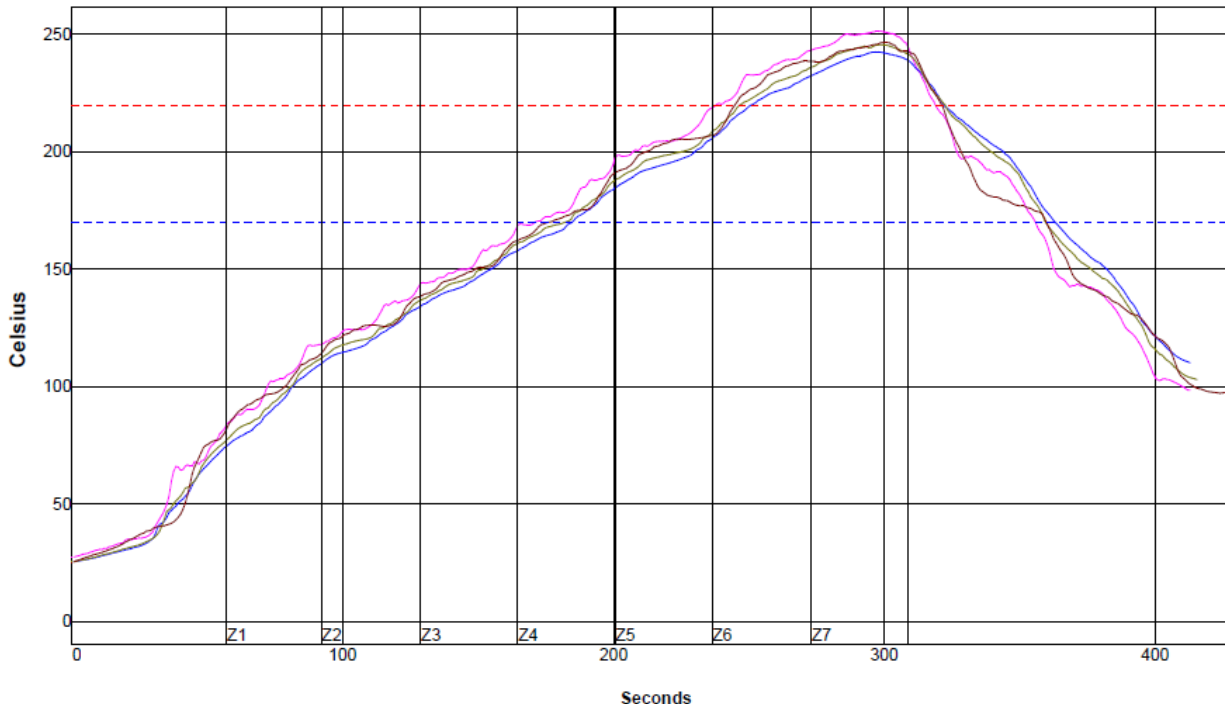
Due to the variances in solder pastes and applications (board design, oven type, component density, etc.), Samtec does not specify a recommended profile for our connectors. Our suggestion is to use a profile within the parameters of the solder paste manufacturer’s guidelines. These parameters can usually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

The SEAF8-RA 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 an example of a lead-free profile used during SEAF8-RA 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.

Setpoints (Celsius)							
Zone	1	2	3	4	5	6	7
Top	130	150	170	195	235	270	275
Bottom	130	150	170	195	235	270	275

Conveyor Speed (inch/min): 20.0



PWI= 67%	Max Rising Slope	Max Falling Slope	Soak Time 170-220C	Reflow Time /220C	Peak Temp					
Air	1.66	-12%	-2.99	-60%	66.95	46%	80.99	67%	251.45	65%
Center Joint	1.55	-27%	-1.93	25%	66.36	42%	70.87	30%	242.67	-23%
End Joint	1.71	-6%	-2.12	10%	64.72	31%	75.68	48%	245.73	7%
Body	2.10	47%	-2.86	-49%	69.18	61%	76.44	51%	246.73	17%
Delta	0.55		1.06		4.46		10.12		8.78	

Fig. 6. Example 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 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™ 0.80mm SEAF8-RA Rework Guidelines](#)

6. Handling

- These connectors are typically packaged in trays or tape and reel which protect the solder charges from damage. They 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:

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