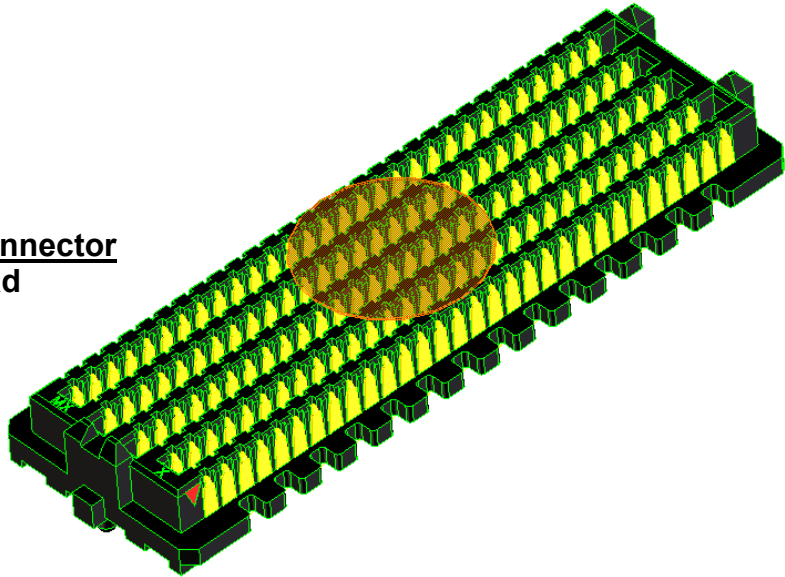




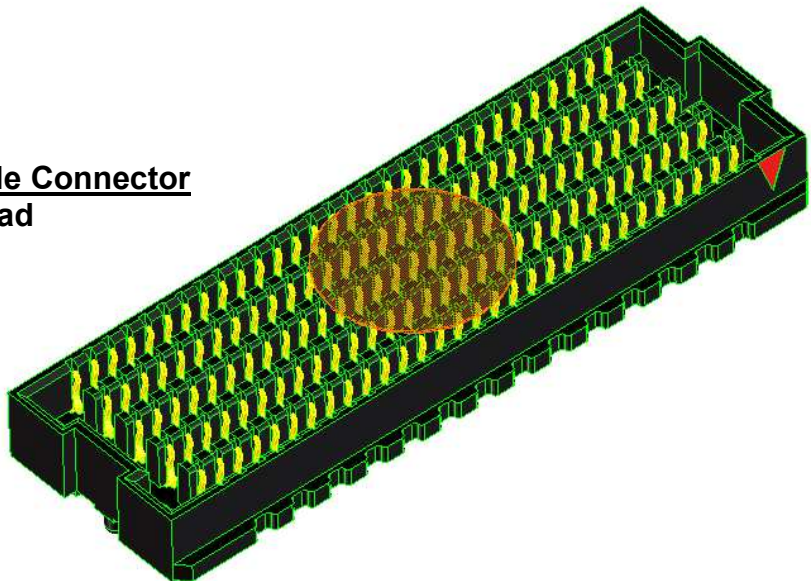
APPLICATION SPECIFICATION

SEARAY™ BOARD TO BOARD INTERCONNECT SYSTEM

45970 / 46556 SMT Plug Connector
(shown with kapton pad for pick and place)



45971 / 46557 SMT Receptacle Connector
(shown with kapton pad for pick and place)



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1.0 SCOPE

*This document is **NOT** intended to be the final process definition nor is it intended to constrain design. This document contains guidelines and settings will vary according to the process and equipment used.* The document addresses the manufacturing techniques and end-usage considerations for Molex's SEARAY™ parallel board to board interconnect system. This system consists of various height surface mount receptacles and plugs that are combined to get particular board to board stack height internconnects. Various circuit sizes are also available. This document is a guideline for process development and customers with varying equipment, materials, and processes will need to develop individual processes to meet their needs. The customer is encouraged to contact Molex with any questions regarding the application of this product.

2.0 PRODUCT DESCRIPTION

2.1 Product Names and Series Numbers

SMT Plug Connectors

Series: 45970 / 46556 (Slim)

SMT Receptacle Connectors

Series 45971 / 46557 (Slim)

2.2 Molex Part Number Configuration 45970 / 46556 Plug

(See applicable sales drawings for information)

2.3 Molex Part Number Configuration 45971 / 46557 Receptacle

(See applicable sales drawings for information)

2.4 Connector Assembly Mated Stack Height Options

(See applicable sales drawings for information)

2.5 Dimensions, Materials, Platings, and Markings

(See applicable sales drawings for information)

3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

Product Specification:	PS-45970-001
Sales Drawing:	SD-45970-001 (Plug); SD-46556-001 (Plug Slim)
Sales Drawing:	SD-45971-001 (Receptacle) ; SD-46557-001 (Receptacle Slim)
PCB Footprint :	SD-45970-001; SD-46556-001 - Sheet 2 (Plug)
PCB Footprint :	SD-45971-001; SD-46557-001 - Sheet 2 (Receptacle)
Packaging:	PK-45970-001; PK-45970-002 (Plug)
Packaging:	PK-45971-001; PK-45971-002 (Receptacle)

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4.0 MATING AND UN-MATING OF CONNECTORS

4.1 Recommendations for Mating:

Connector mating occurs after both halves have been surface mounted to their respective circuit boards and their pick and place pads removed. Each customer should evaluate how the boards are going to be handled and make the determination of which connector is mounted on which board.

Each receptacle connector is designed with polarizing rib features, mating alignment slot features and a circuit #1 indicator (see figure 1). Each plug connector is designed with polarizing slot features, mating alignment keys and a circuit #1 indicator (see figure 1). Each plug slot accepts the corresponding receptacle rib during mating and each receptacle slot accepts the corresponding plug key. The combination of these features orient the connectors and discourages improper mating.

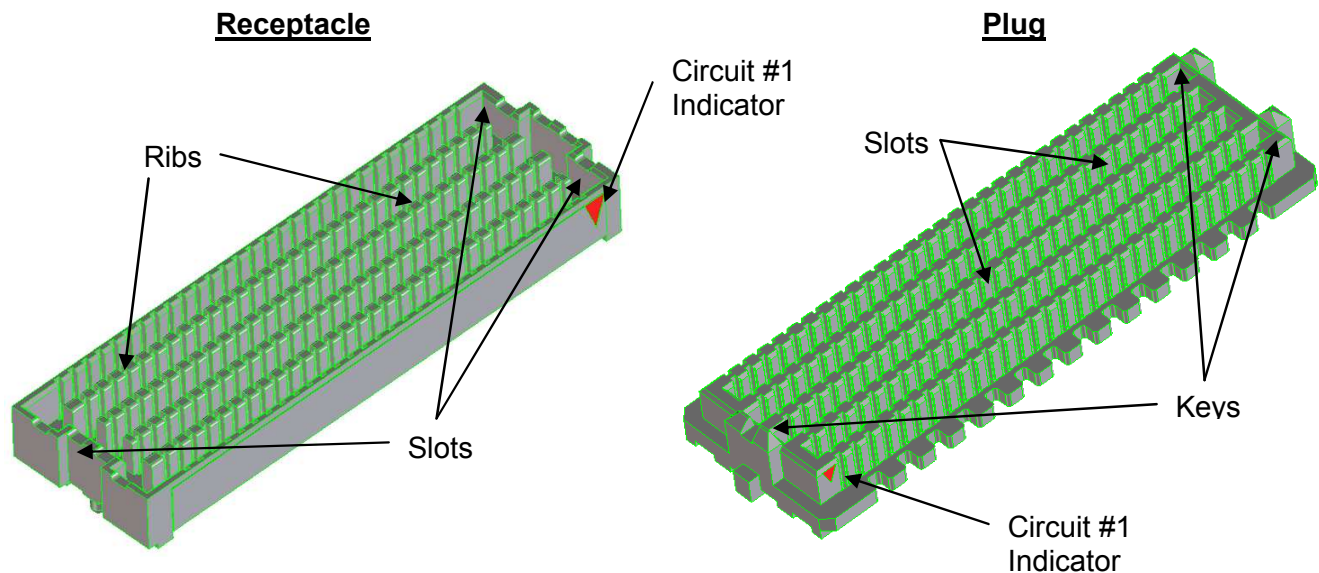


Figure 1: Housing Mating Polarization Features
(Note: Terminals not shown for clarity)

Place the main board on a solid surface with the connector up. Remove the pick and place kapton pad from both connectors by peeling it away from the connector housing. Take special care to not contact the terminal blades on the plug or receptacle. Quarantine suspect assemblies for damaged or bent terminal inspection. **Connectors with damaged or bent terminals should not be used.**

This system is not designed with guide pins. Rough alignment is required prior to connector mating as misalignment of $>.034''$ (0.86mm) could damage the connector housings. Alignment of the connectors is achieved through mating the alignment slots of the receptacle housing to the alignment keys of the plug housing (see figure 2).

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Generous lead-in edges on these features will allow the user to 'blind-mate' the connectors.

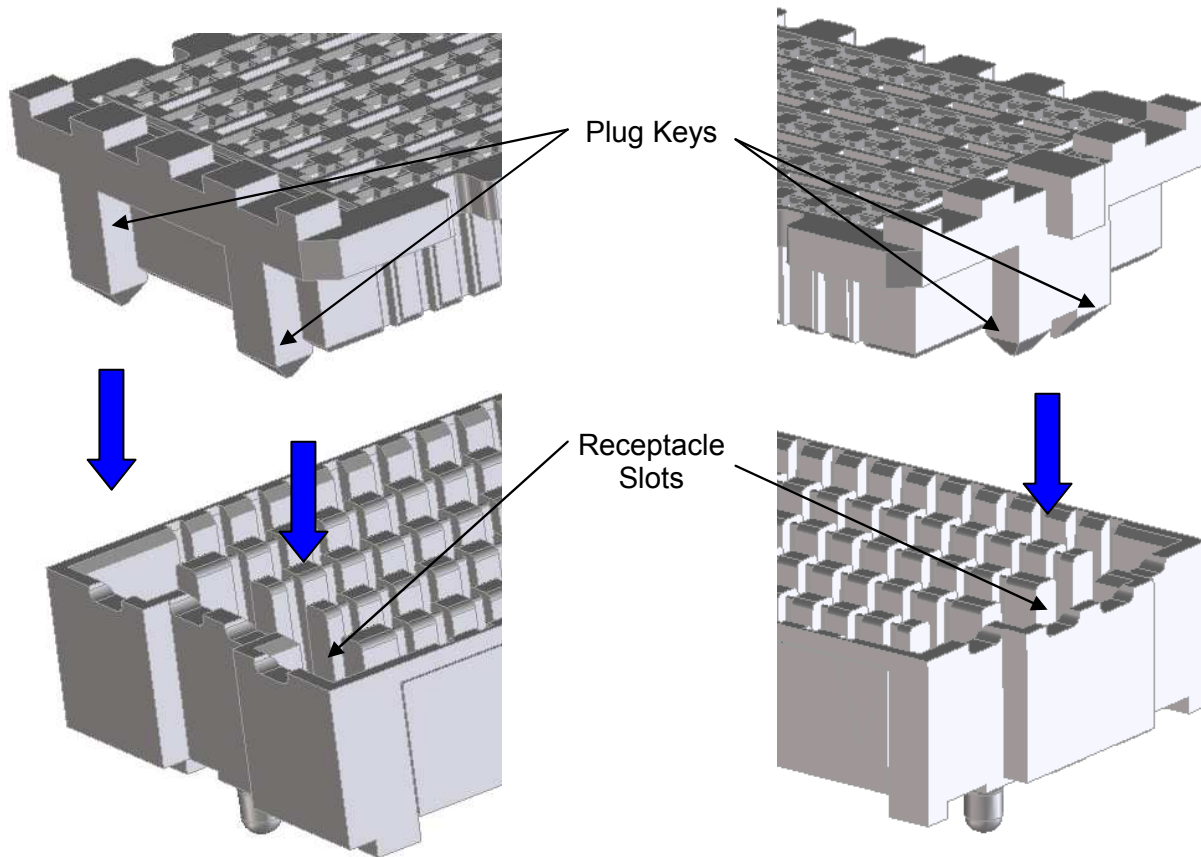


Figure 2: Housing Rough Alignment Features

(Note: Terminals not shown for clarity)

Place the secondary board over the main board oriented such that the circuit #1 indicators of both connectors line up with each other. Apply a force normal to the secondary board directly behind the location of the connector until the connector housing is fully seated and the circuit boards are parallel to one another. It is recommended that the SEARAY™ connectors be mated straight, as shown in figure 3, however when mating the larger circuit counts (400 circuits to 500 circuits) less force is required if the two connectors are zippered together, as shown in figure 4. Zipper mating can be started from either end.

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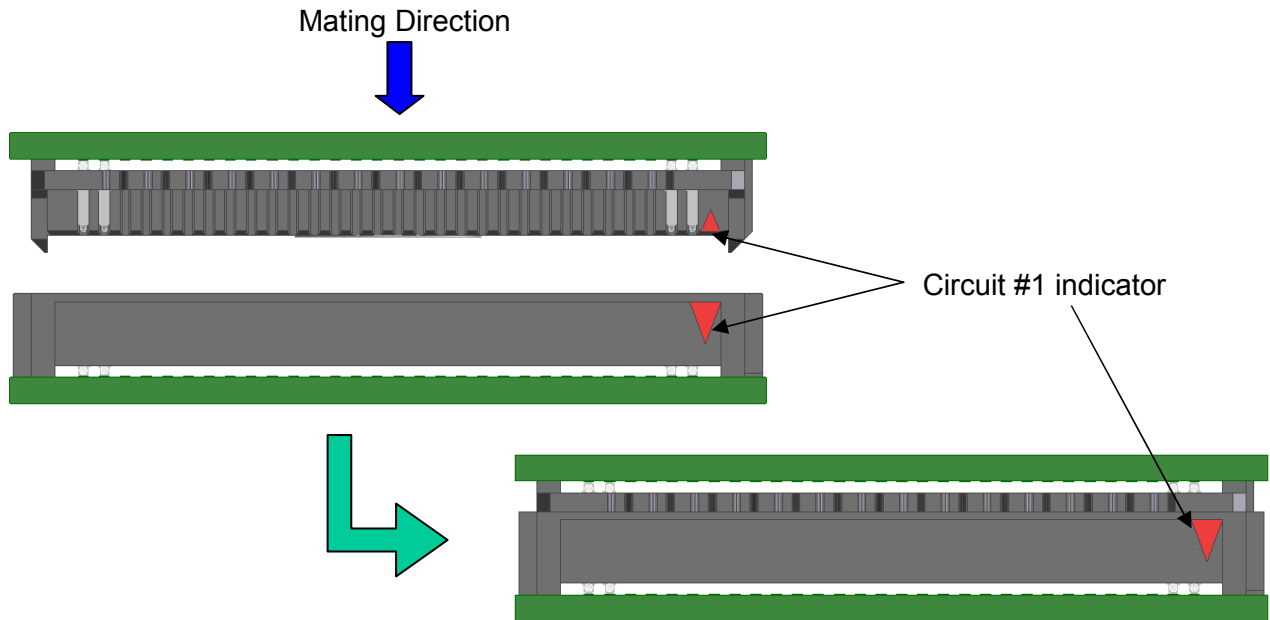


Figure 3: **RECOMMENDED** Straight Mating Condition

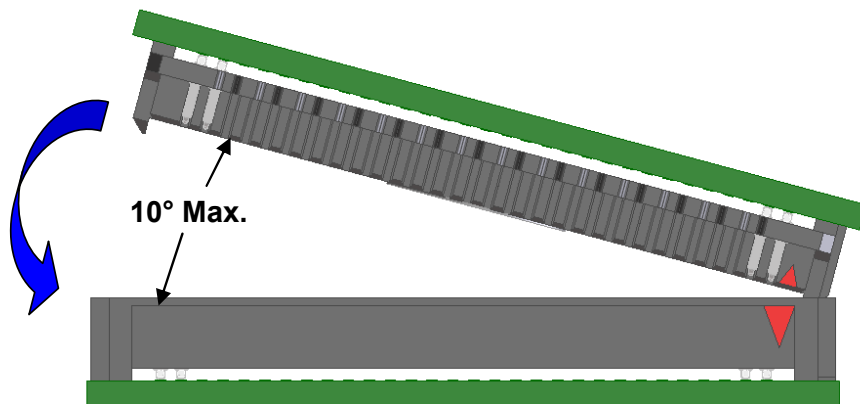


Figure 4: Longitudinal Zipper Mating Condition

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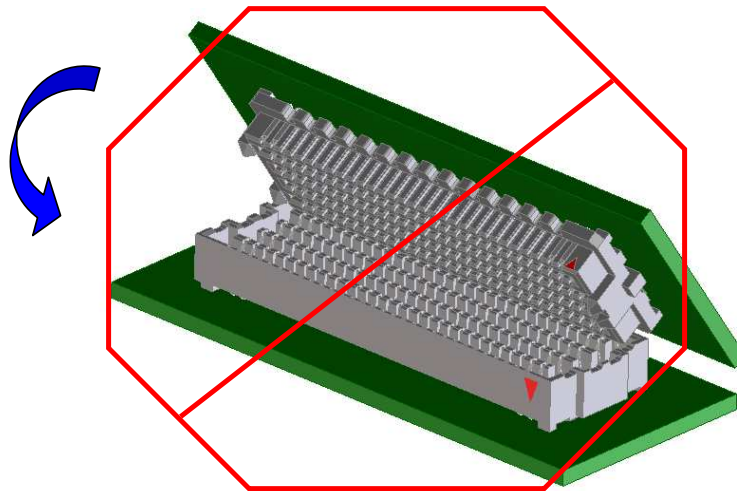


Figure 5: **NOT RECOMMENDED** Lateral Zipper Mating Condition

There is no active latching mechanism in the connector system so assembled connectors must be handled with care. If shipped in the mated condition packaging tests should be conducted to verify there is no damage to the assembly.

4.2 Recommendations for Un-Mating:

It is recommended that the SEARAY™ connectors be un-mated straight, as shown in figure 6, however when un-mating the larger circuit counts (400 circuits to 500 circuits) less force is required if the two connectors are zippered apart, as shown in figure 7. Un-Zipper un-mating can be started from either end.

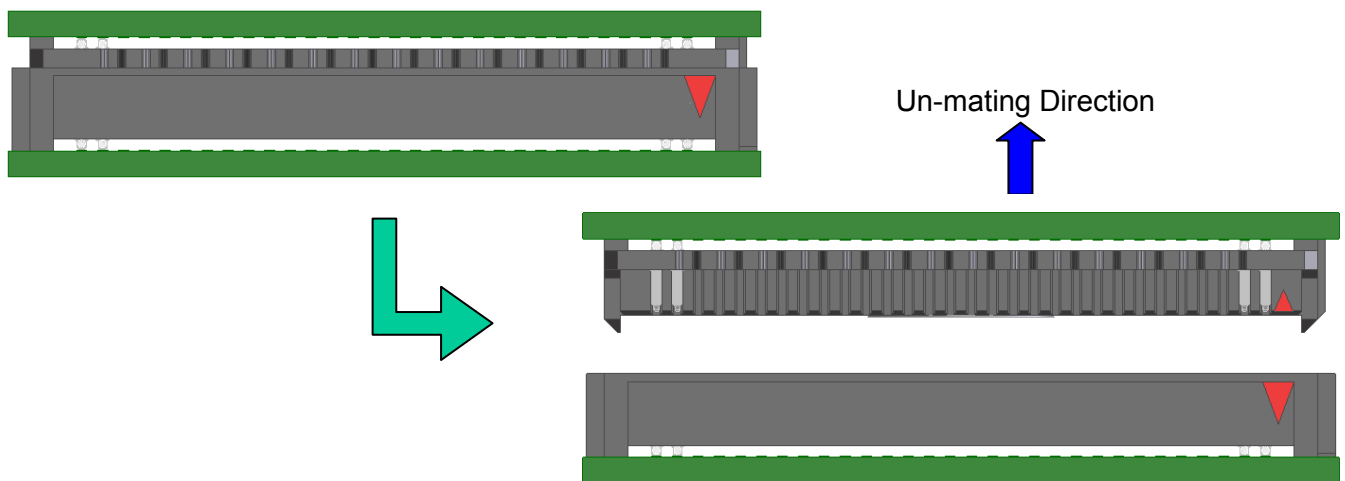


Figure 6: **RECOMMENDED** Straight Un-Mating Condition

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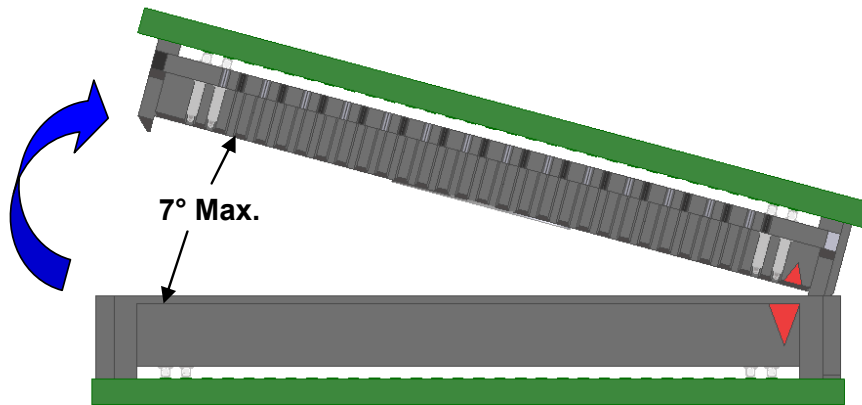


Figure 7: Longitudinal Zipper Un-Mating Condition

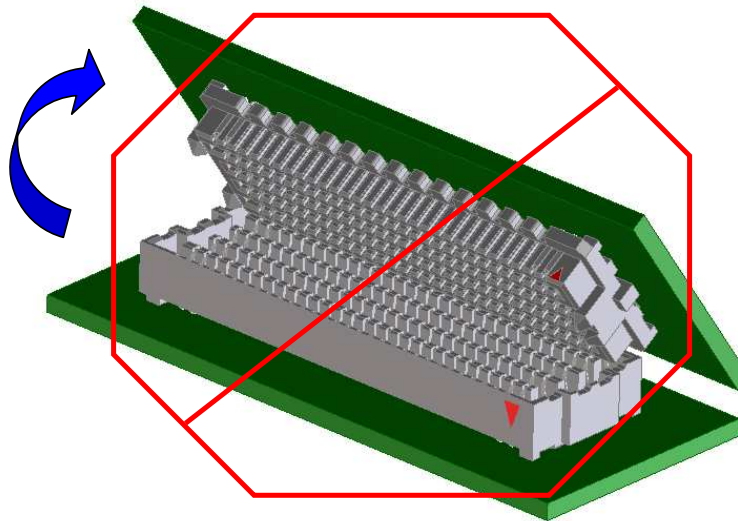


Figure 8: **NOT RECOMMENDED** Lateral Zipper Un-Mating Condition

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5.0 MULTI-CONNECTOR PROCESSING

(Note: CTE differences between PCB / fixturing during reflow must be considered regarding connector locations)

5.1 Process Limitations

A customer may elect to place two systems on the same board. Multiple connectors must have the longitudinal (pin to pin) direction of the connectors parallel (figured 9 and 11) and not perpendicular (figure 10) When using multiple connectors on a PCB, care must be taken to ensure proper alignment. All connectors on a board, in this application, must be the same gender, must come from a single supplier and process. Furthermore, they must come from either the same package or from successive packages with the same manufacturing date.

For applications requiring more than two connectors per board, please contact Molex.

Minimum spacing shall be dictated by circuit routing best practices.

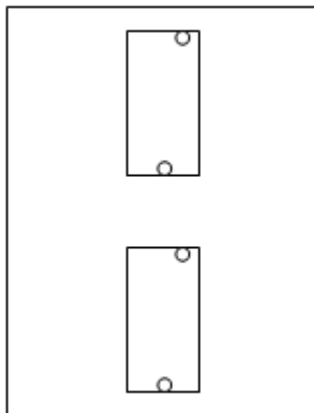


Figure 9

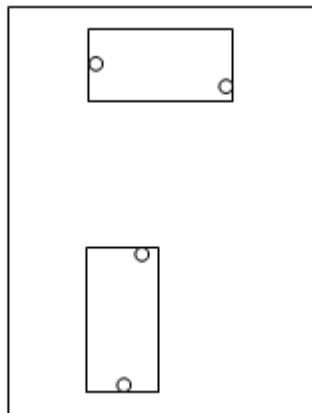


Figure 10

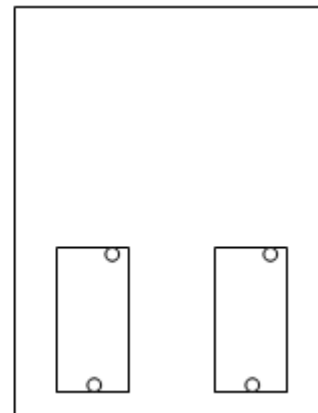


Figure 11

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6.0 SOLDERING PROCESS RECOMMENDATIONS

45970 / 46556 SMT PLUG CONNECTOR
45971 / 46557 SMT RECEPTACLE CONNECTOR

6.1 PCB Layout

See the applicable Sales Drawings for an illustration of the recommended PCB layout. Contact Molex if further assistance is required.

The connector should be placed on the field of copper defined pads of diameter .025" (0.635mm) (Ref. Sales Drawing) either coated with an organic protective coating (OSP) or HASL finish.

Solder mask must be registered correctly to within .003" (0.075mm) of the pad edge.

Recommended clearance or keep out area allowed for reworking of this component is .200" (5.0mm) all the way around the perimeter of the part. Contact Molex if further assistance is required. Instructions from the repair equipment manufacturer should be followed where necessary. Sensitive components can be either electrically sensitive or mechanically sensitive such as micro BGA components.

Vias should not be placed on pads.

A solder dam should be created using solder mask when a land goes to a via which is close to the pad, this will avoid wicking of the solder from the pad into the via.

Legends around the perimeter of the connector are recommended to aid in hand placement situations.

6.2 Solder Paste Stencil Layout

See the applicable Sales Drawing for an illustration of the recommended PCB layout. Contact Molex if further assistance is required.

For ease of use a no-clean paste is recommended.

The stencil thickness should be .005" (0.13mm) MIN and aperture size in the stencil should be .035" (0.89mm) diameter in order to facilitate sufficient solder paste volume and ensure a good solder joint.

6.3 Placement

Verify that your pick and place equipments Z axis can accommodate the height of the product and the depth travel require to clear the component packaging. Reference the applicable Sales and Packaging Drawings for dimensions. The connector can be supplied in antistatic thermoformed plastic trays or embossed tape and reel. Each tray

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will have a first circuit indicator corresponding to the location of the first circuit on the connector.

For ease of pick-up, the connector has a removeable kapton pad fitted for vacuum pick-up and automated SMT machine placement. Care should be taken when removing the kapton pad after placement to avoid any damage to exposed terminals.

Connectors should be placed with enough pressure to ensure that the leads touch down on the copper pads. This requirement would normally be 300 grams. Where placement pressure is not adjustable a negative placement height of .008" (0.2mm) can be used.

Placement should be within a tolerance band of .002" and placement equipment meeting this accuracy should be used.

6.4 Solder Reflow

The connectors process like a standard BGA type SMT devise. The PCB containing the connector should be processes in compliance with the manufacturers data sheet for the paste used.

It is recommended that the soak time be long enough to allow temperature equalization of the whole area under the connector and the time above liquidus be long enough for total reflow. Soak time and temperature is dependent on the type of solder used and should conform to the paste manufacturer's guidelines.

Correct reflow should be confirmed by placing 3 thermocouples underneath the connector, one (1) on the leading corner position, one (2) in the middle and one (3) on the trailing corner as shown in figure 11 (drilling through the PCB may have to be undertaken to accomplish this). This will need to be done on both the plug and receptacle since differences in their general construction may effect the amount of time required to reach reflow temperatures.

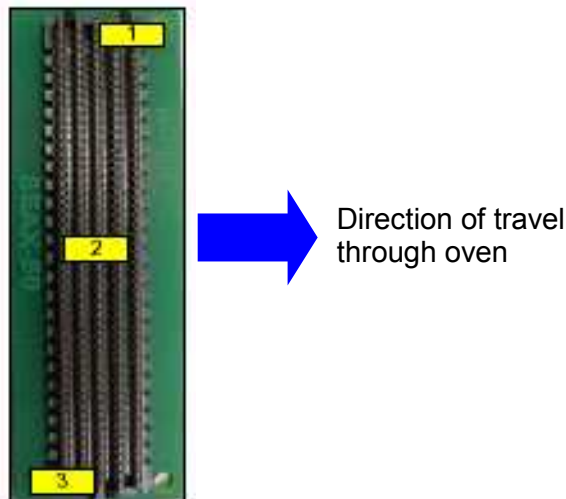


Figure 11: Thermocouple Placement

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The lead free version of this component is suitable for processing through the temperatures used in lead free processes but should not be subjected to temperatures in excess of 250° C.

The connector may be cleaned using a suitable cleaning agent to remove any residue or contaminants. When cleaning is required it is recommended that the pick up cap be removed and the connector be rotated 180° after cleaning process to allow excess cleaning solution to drain. Extra care should be taken to ensure that it is completely dry before electrical testing.

Standard Solder Paste Reflow Profile for Kester Paste Containing Alloys: Sn63Pb37 or Sn62Pb36Ag02

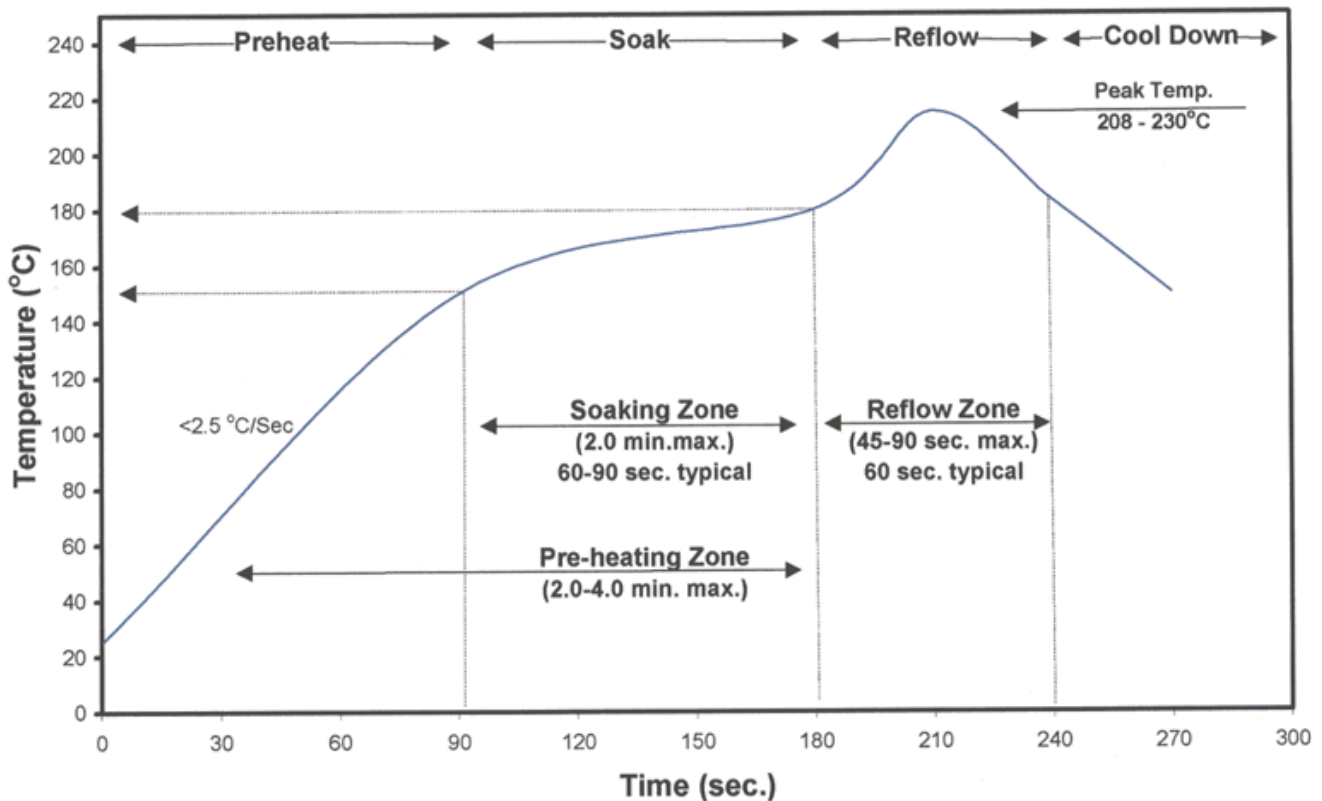


Figure 12: Sn/Pb Sample Reflow Profile
(sample profile only – be sure to follow solder profile guidelines of solder paste being used)

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Kester Lead Free Reflow Profile Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5

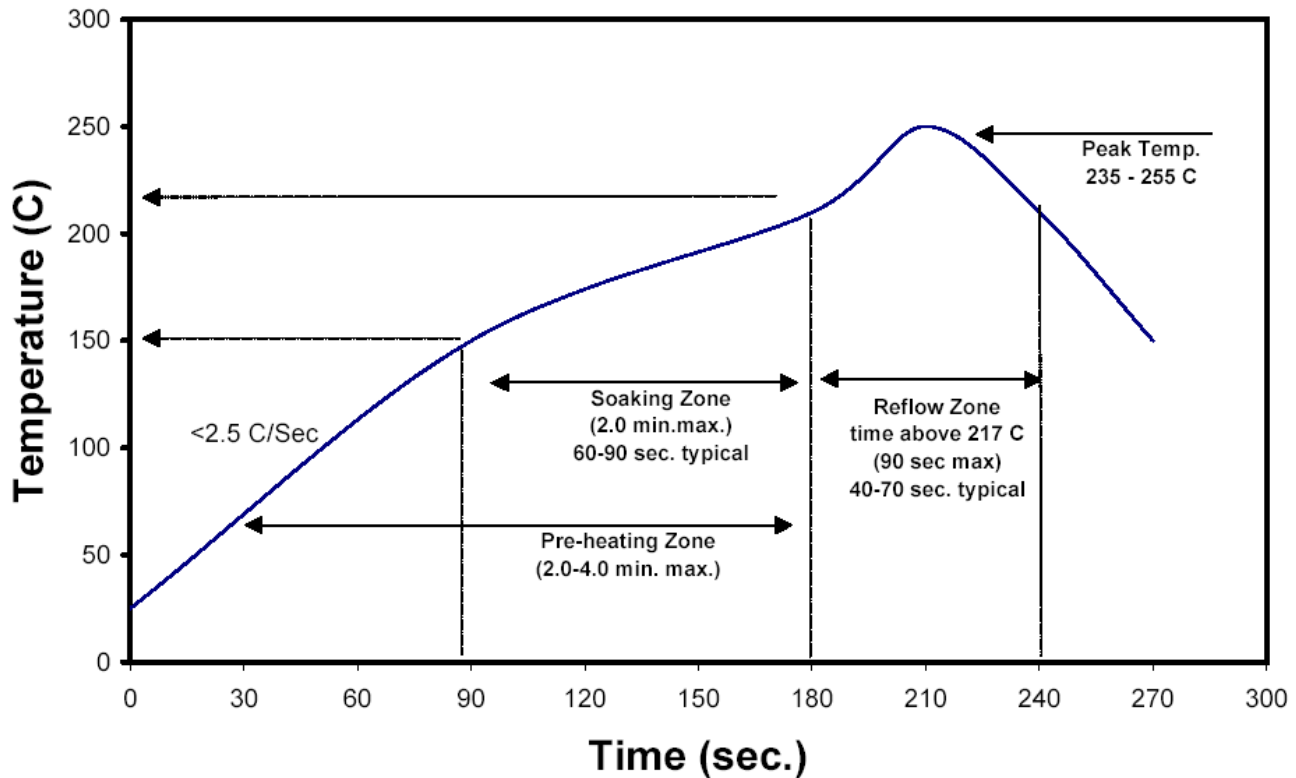


Figure 13: Pb Free Sample Reflow Profile

(sample profile only – be sure to follow solder profile guidelines of solder paste being used)

6.5 Inspection (Post Process)

The connector may be examined visually for damage and cleanliness.

The solder joints can be inspected using x-ray equipment or other established conventional methods.

Electrical testing can be performed with a customer designed system for both in circuit and application testing. However, care should be taken that the design of this equipment does not cause damage to the housing or the terminals.

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6.6 Rework and Repair

It is recommended that a commercially available hot air rework station be used for the repair of this product, many of these repair stations are readily available and the selected manufacturer is a matter of individual customer choice. It is very important that the correct nozzle be used for this operation. Some of the connectors are taller, larger, and therefore have more mass in comparison to other SMT devices and these attributes need to be considered in nozzle selection.

Before commencing with the repair, a rework kapton pad, similar to the original removable kapton pad should be fitted onto the connector to allow vacuum pick-up.

Removal can then be accomplished either by using a temperature ramp of 3 degrees C per second from 25 to 150 degrees C and then through liquidus or by baking the whole PCB in an oven at 100 degrees C for at least 30 minutes and then taking through liquidus. The time in soak and above liquidus should be sufficient to allow the solder to reflow underneath the connector and avoid damaging pads.

Soak time and temperature is dependent on the type of solder used and should conform to the paste manufacturer's guidelines.

Once the full reflow has been achieved the connector should be removed using a vacuum pick-up taking care to not have motion parallel to the board if done by hand.

This removed connector should now be discarded as it cannot be reused.

Before replacing the connector the residual solder on the pads should be removed using either a vacuum scavenging system or by hand using a skilled operator. It is recommended that the pads be pasted again using a .005" (0.13mm) MIN thick stencil and aperture size of .035" (0.89mm). Where this is not possible a highly skilled operator can deposit sufficient solder on the pads manually. Using this method the pads must be fluxed before reflow. This method requires highly skilled experienced operators and is not recommended.

The fresh connector can then be replaced either using the silkscreen outline on the PCB for placement or by using the repair tool where the repair tool has a split image prism vision system allowing the operator to see the leads superimposed on the pads.

Once the connector has been placed on the PCB it should be reflowed using the reflow profile developed for the rework process. When determining this profile initially, correct reflow should be confirmed by placing 3 thermocouples underneath the connector, one in the leading corner position, one in the middle and one on the trailing corner (drilling through the PCB may have to be undertaken to accomplish this). This will need to be done on both the plug and receptacle since differences in their general construction may effect the amount of time required to reach reflow temperatures.

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The kapton pad should now be removed and the assembly retested as applicable.

7.0 ELECTRICAL RECOMMENDATIONS

See product specification PS-45970-001 for electrical recommendations. Contact Molex if further assistance is required.

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