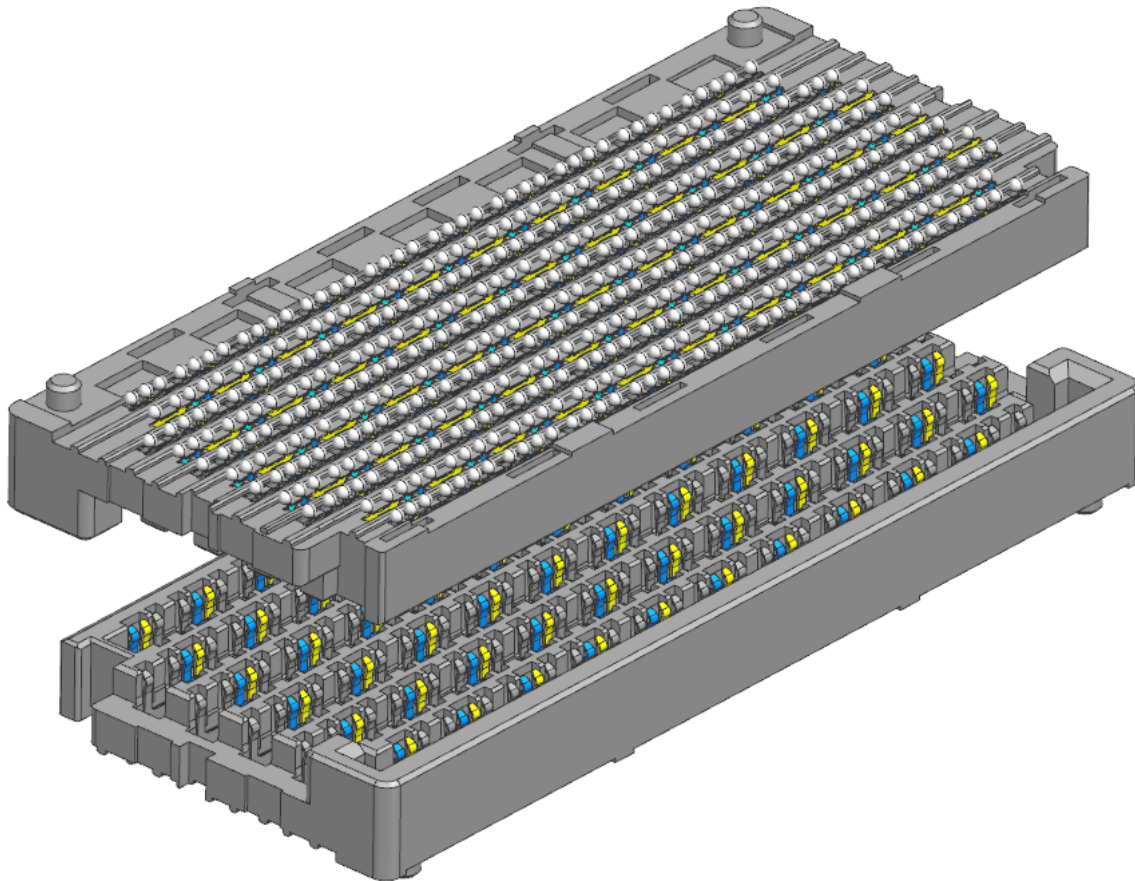


APPLICATION GUIDE FOR MIRROR MEZZ™



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1. INTRODUCTION

1.1 Mirror Mezz™ Overview

Mirror Mezz™ is a series of board-to-board connectors that connect two Printed Circuit Boards (PCB) together to which they are parallel. This type of connector is also known as a “Mezzanine” connector. Mirror Mezz™ is primarily for high-speed differential signals (i.e., Double-Ended Signals), but is also appropriate for single-ended signals, sundry low-speed signals and power connections.

Mirror Mezz™ can be produced in various heights to accommodate multiple separation distances between two parallel boards in a variety of grids.

1.2 Applicable Documents

- a. Product Specification
- b. Routing Guide
- c. Sales Drawing

1.3 Disclaimer

Details included in the 2D sales drawings take precedence over information included in the Design Guide document.

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2. DESIGN RECOMMENDATION

2.1 PCB Pad Type

Solder-mask defined pad are susceptible to crack propagation at the solder-joints.

Non-solder Mask defined pads (recommended) yields a stronger solder-joint and a more accurate solder-pad True-position tolerance.

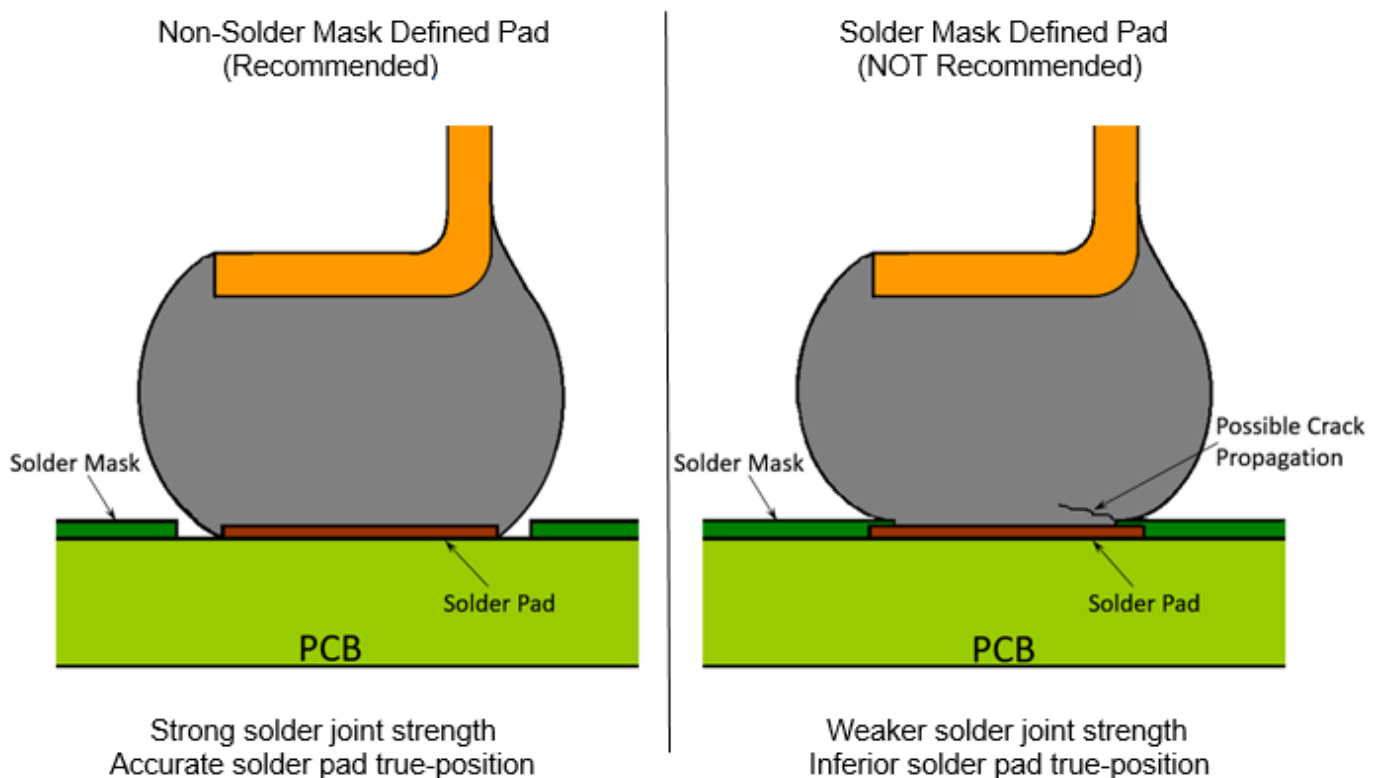


Figure 1 Non-Solder Mask Defined Pad and Solder Mask Defined Pad

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2.2 Connector Orientation

Multiple connectors on the same PCB are recommended to be orientated in the same direction. Proper connector orientation will aid compliance with the recommended connector mating and unmating procedures that are described in section 2.13.

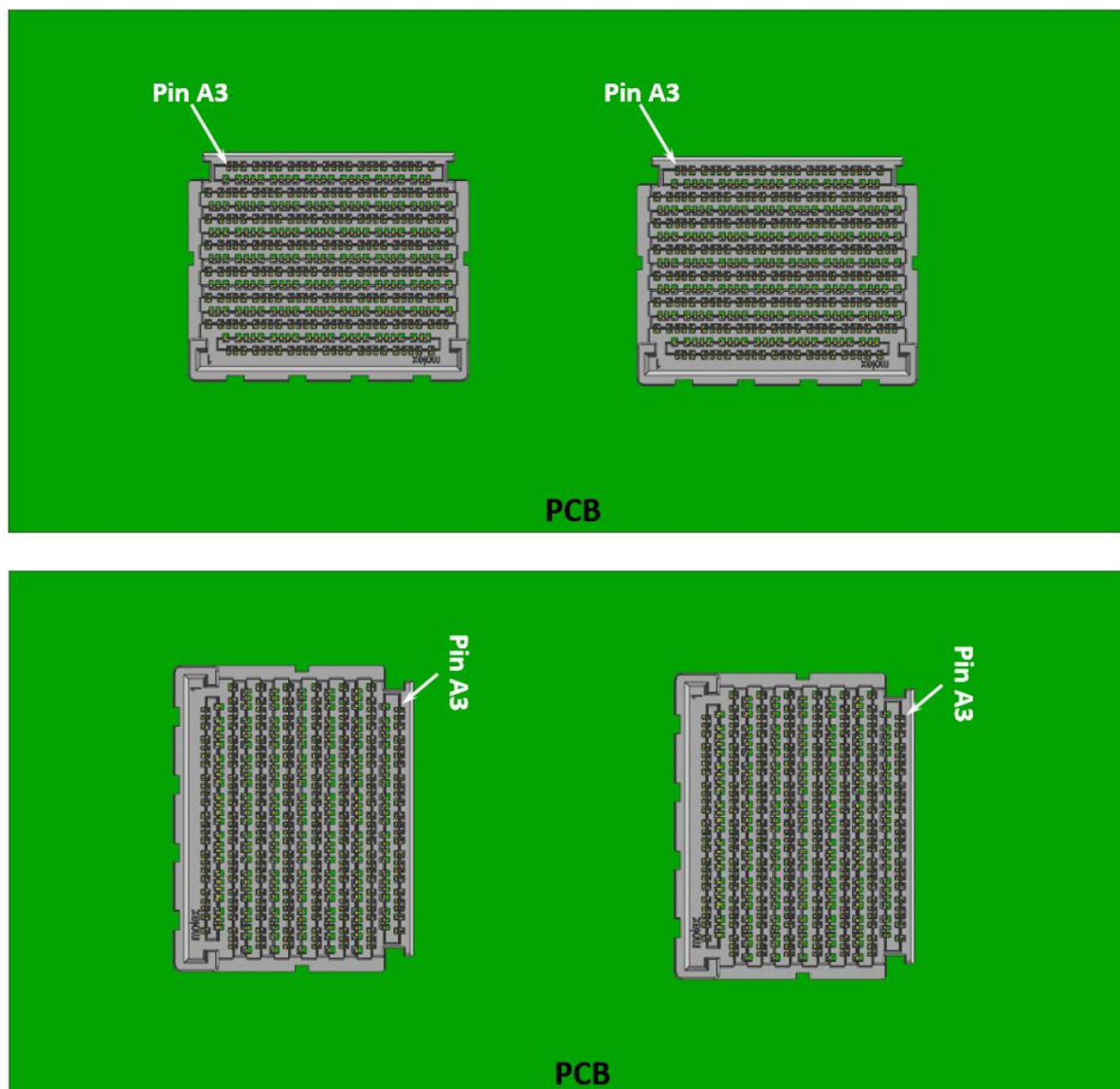


Figure 2 Recommended Orientation for Multiple Connectors

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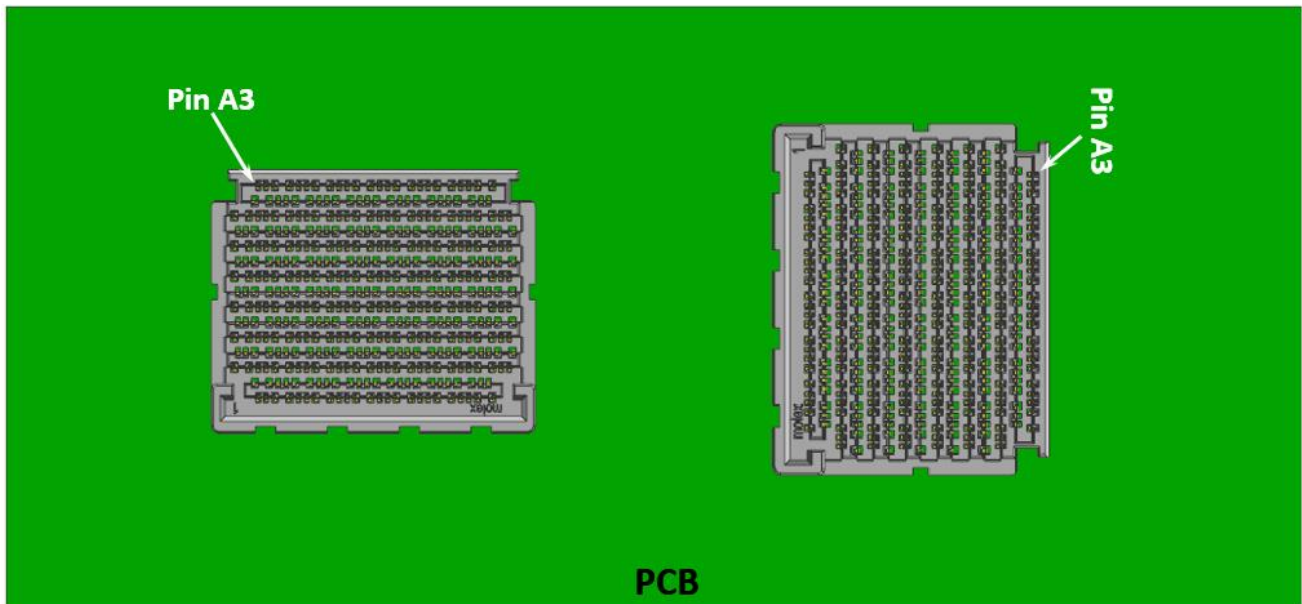


Figure 3 NOT Recommended Orientation for Multiple Connectors

2.3 Solder-pad True Position

Connector solder pad registration shall be held to a True-Position control of $\varnothing 0.05\text{mm}$.

2.4 Silkscreen Marking

Silkscreen Printing of the connector outline is recommended for visual inspection on the placement alignment.

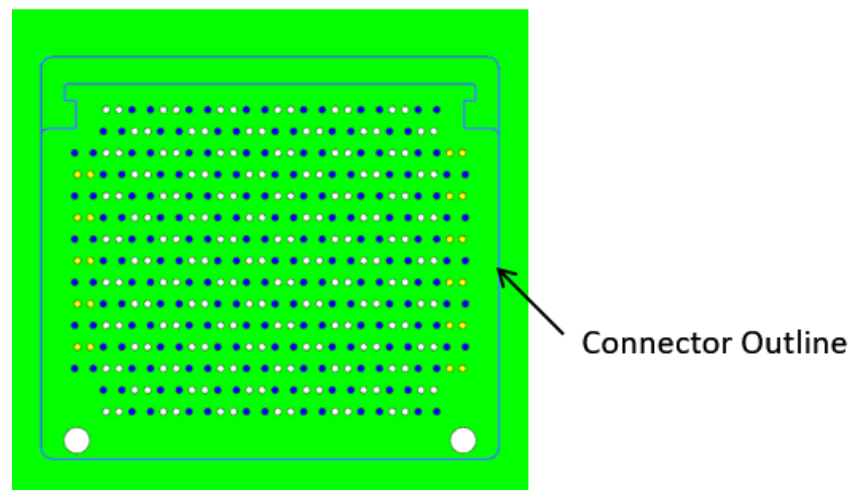


Figure 4 Connector Silkscreen Outline

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2.5 Keep-out Zone

There shall be sufficient space around the connector to accommodate rework nozzles. Although clearances as small as 3mm are frequently catered to accommodate rework nozzles, a clearance around the connector of 5mm is preferred. This recommendation is based upon the practical needs of most rework board assemblers.

In the event this clearance cannot be acceded, then the rework feasibility shall be carefully assessed among the responsible assembly people.

It is also recommended that components adjacent to the Mirror Mezz™ connector, which are temperature-sensitive, to be shielded from the rework heat.

2.6 Stand-offs & Bolting Structure

Standoffs between boards (refer to Figure 6) are required for all applications.

To ensure a reliable board-to-board system, it is recommended to position standoffs or bolting structure within 30mm from every corner of the connector.

Standoffs or bolting structure can be shared in-between connectors.

The number of standoffs can be reduced when the board-to-board system is deemed stable enough.

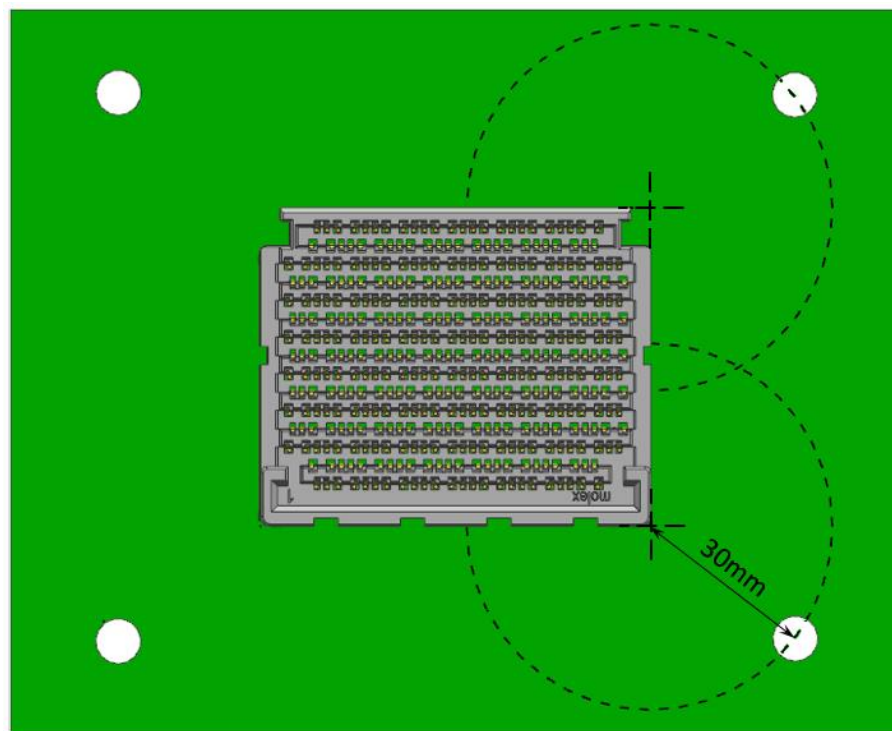


Figure 5 Recommended Stand-Offs location

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2.7 Standoff Length

Recommended Stand-off Length = Connector Mated Stacked Height +/- 0.15mm.

2.8 PCB Bottom Support

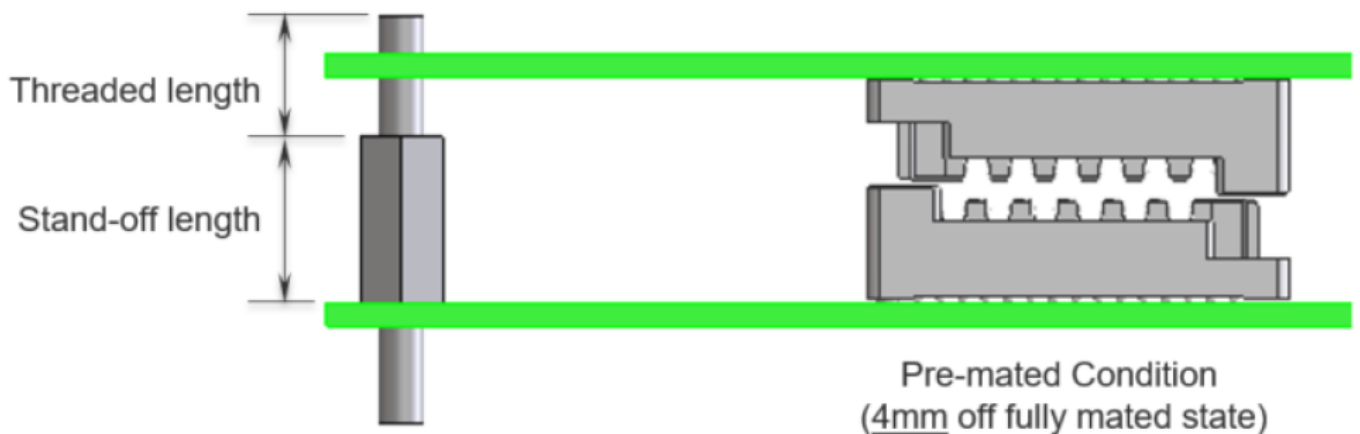
Supporting structure(s) at the bottom of the PCB must be considered as the PCB will have to experience & tolerate the mating force of the connector(s).

It is also recommended to position points of support on the bottom side of the PCB, within 30mm off every corner of the connector.

2.9 Stand-off functioning as Guides

Stand-offs, also known as hexagonal spacer, can serve as a guide for a board-to-board assembly.

Aligning the holes of the mating board to the threaded length of the standoffs will bring the 2 boards to a closer proximity within the gather-ability of Mirror Mezz™.



Recommended thread length = PCB Thickness + 4mm

Figure 6 Recommended Stand-offs length

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2.10 Pin Numbering

Below Figure 7 shows the Pin Numbering of a standard Mirror Mezz™ connector on a PCB (Connector Side).

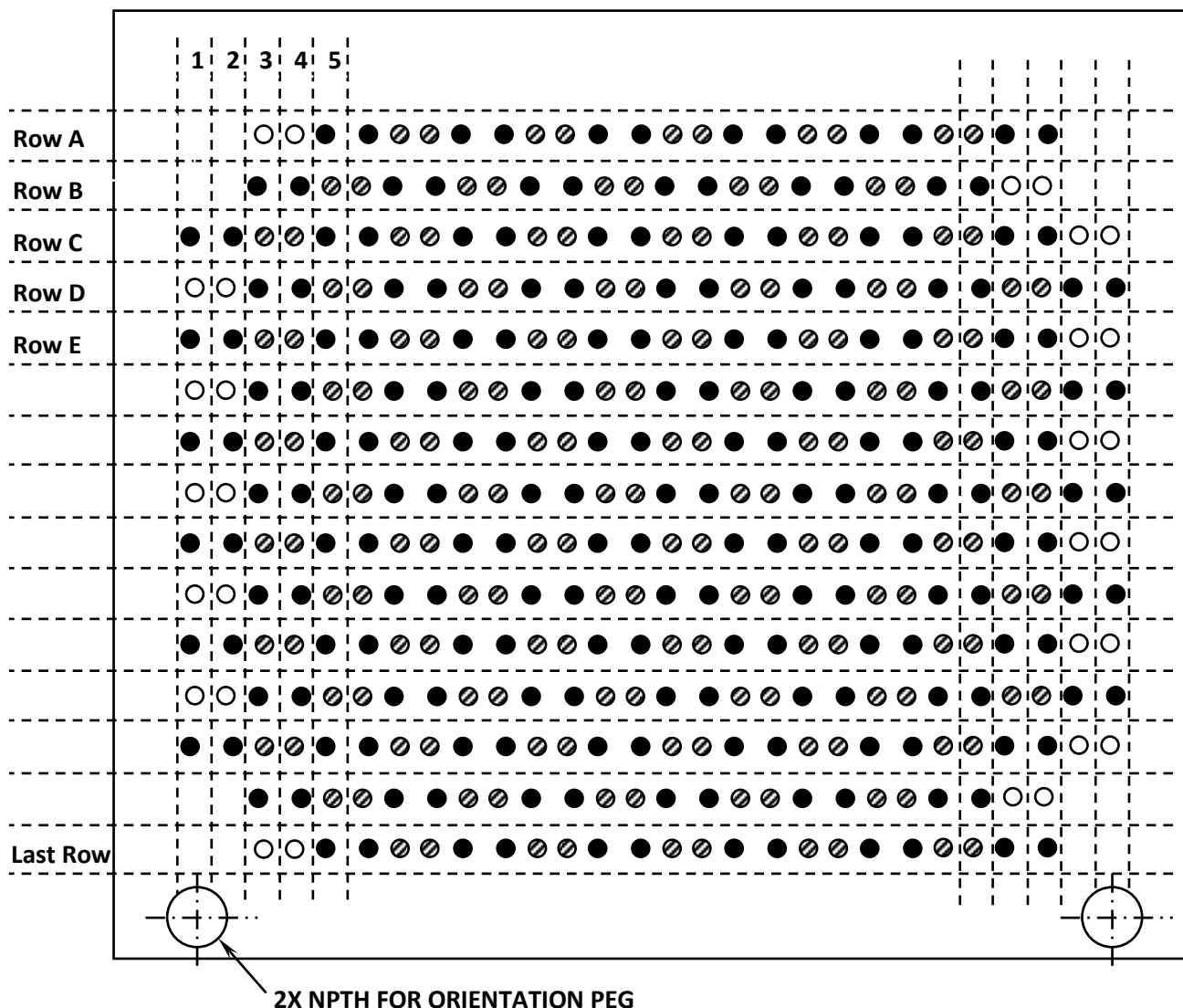


Figure 7 Pin Numbering of a Standard Mirror Mezz™ Connector

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2.11 Pin Layout

Below Figure 8 shows the pin layout.

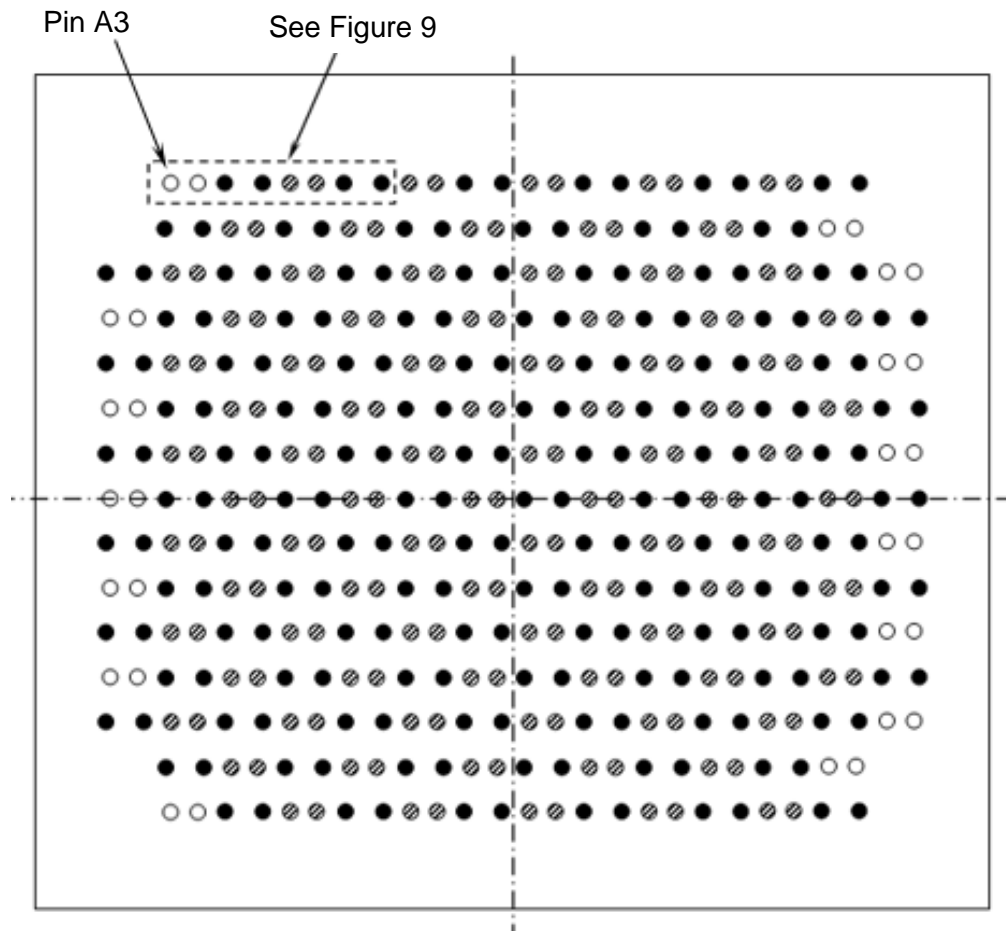


Figure 8 Pin Layout

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2.12 Pin Type

Below Figure 9 shows the different pin type:
High Speed Differential Pairs, Ground and Orphan Pins.

Orphan Pins are located at the start or at the end of every row. These pins can be assigned as a lower speed signal pair, or individually as a single-ended pin, or a low current carrying pin.

Differential Signal Pair, flanked by ground pins, is designed to achieve a higher data transfer rate.

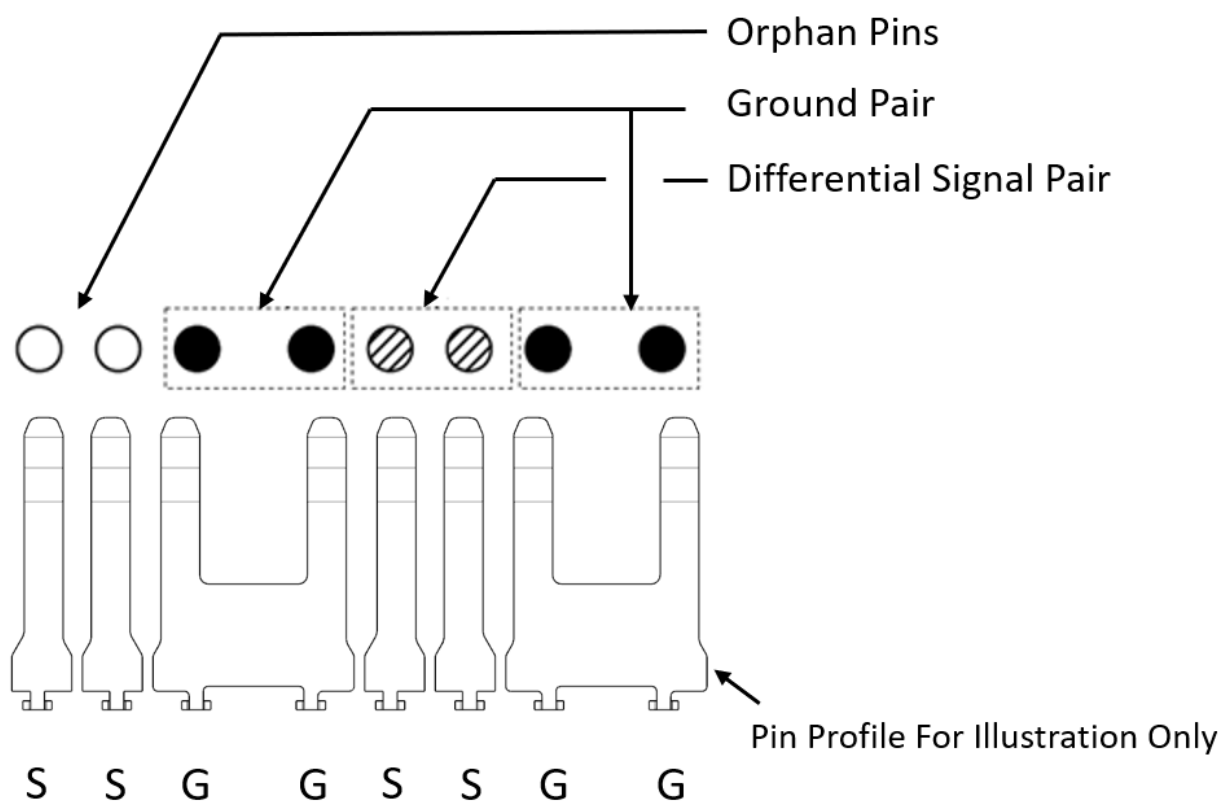


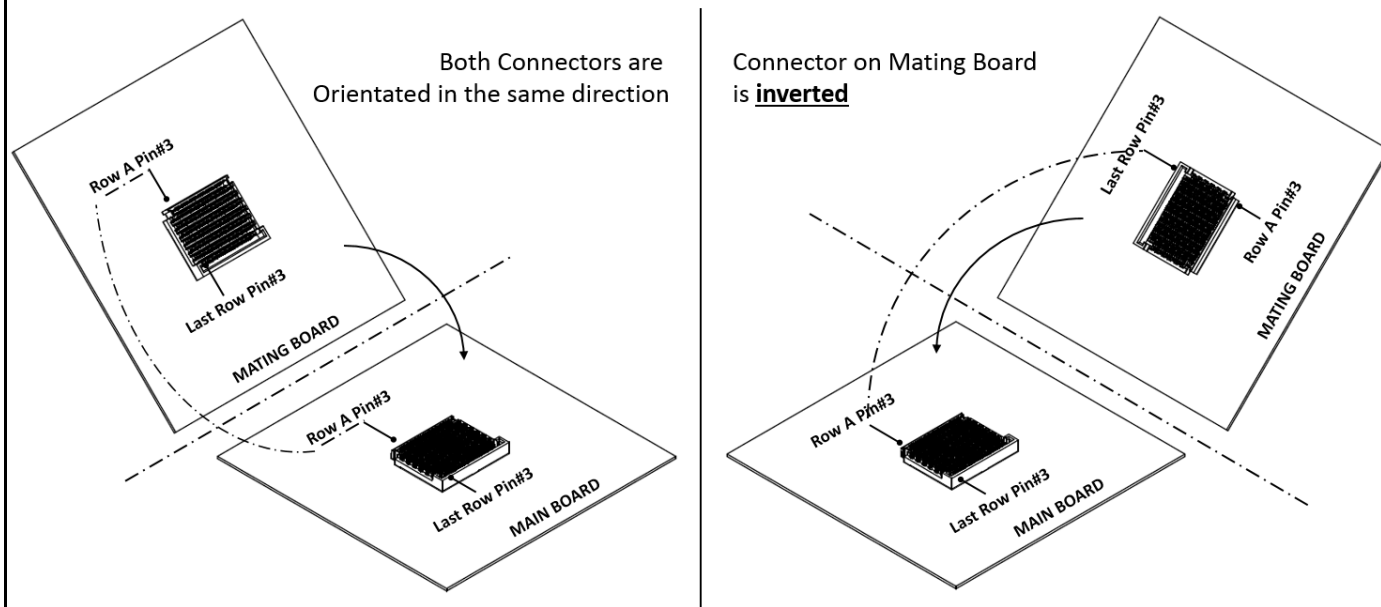
Figure 9 Different Pin Type

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2.13 Connector Orientation on Main and Mating Boards

Mating board flip over the top (calendar) style versus page turning (book) style.
For both styles, the mating board connector will be vertically inverted when mated.



For both Layouts above, Main Board Row A Pin #3 connects to Mating Board Connector Last Row Pin #3
Take note of the Mating Board connector orientation

Figure 10 Mating board connector orientation

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2.14 Mating and Un-mating of connectors

For mating of the connectors:

1. Connectors should be parallel with respect to each other during mating.
2. Use a smooth motion during mating (no mechanical shock, knocking or hammering).
3. Recommended to have push/pressure points marked on mating board for operators.
4. Main and mating boards are to be bolted to enhance reliability.

If a fixture is used for mating the connectors, it shall hold the mating connectors parallel to within ± 3 degrees. The fixture shall also allow the connectors to become parallel to each other as the mating process progresses.

For un-mating of the connectors:

1. PCB design, preferably, to have sufficient finger accessibility/space required to hold the board for un-mating of the connectors.
2. Pivot the mating board a few times, no more than ± 3 degrees, to gradually disengage the connectors.

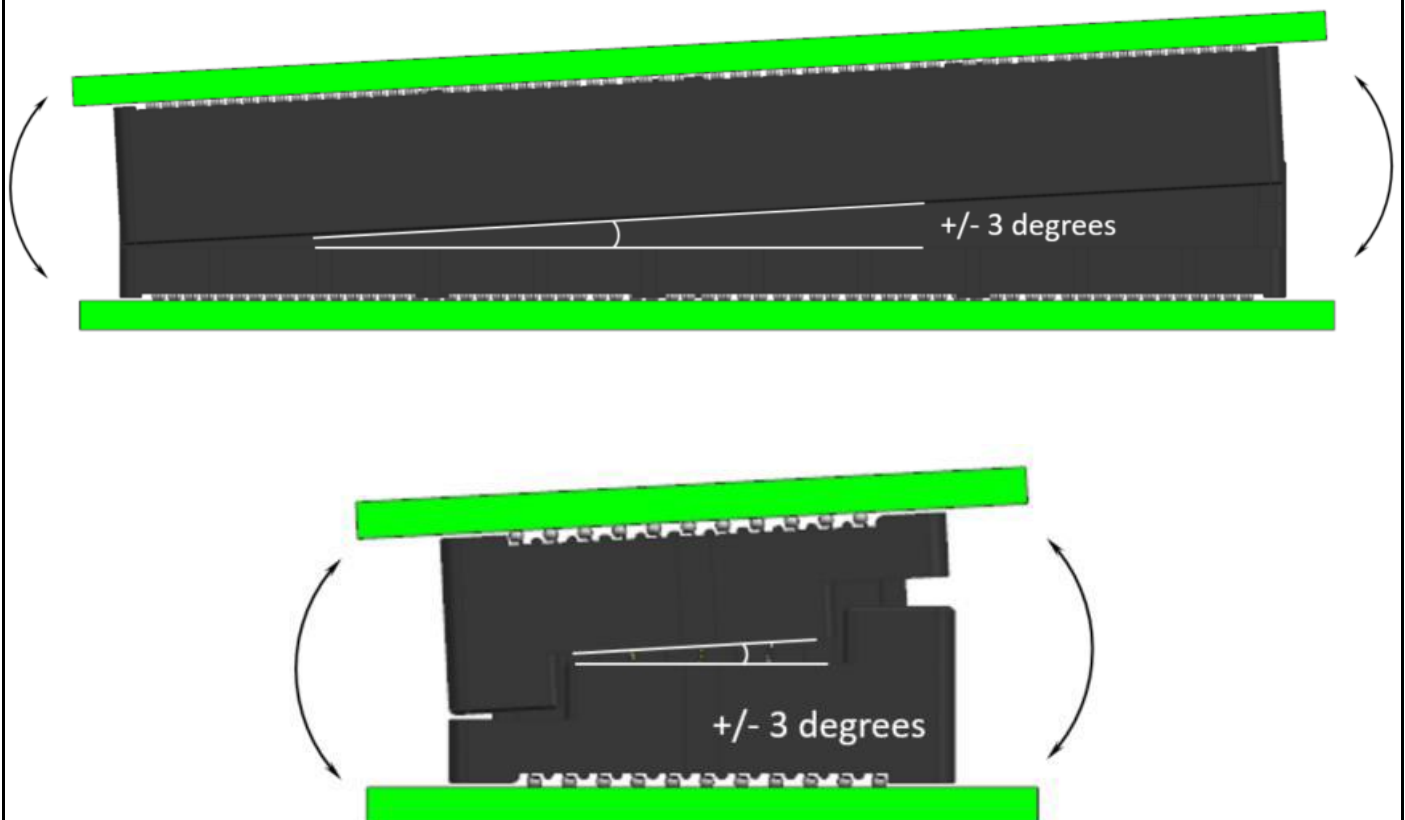


Figure 11 Mating & Un-mating angle

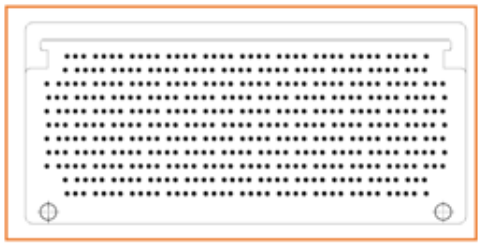
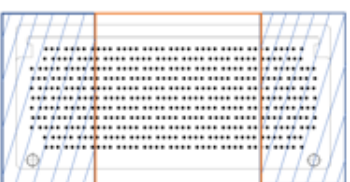
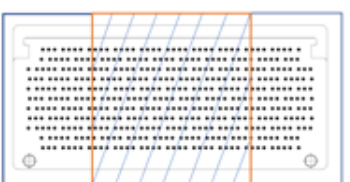
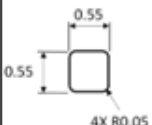
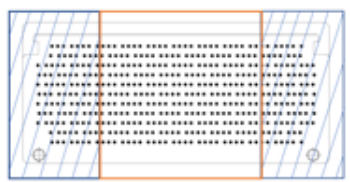
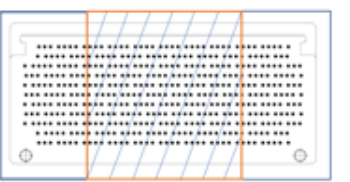
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3. SOLDERING

3.1 Soldering Stencil Design

Depending on the different CTE (Coefficient of Thermal Expansion) matching between the customer PCBA and the connectors, resulting in either open-soldering or solder-bridging, the stencil aperture shall vary between Ø15.7mils (0.40mm) to □ 21.7mils (□0.55mm).

Stencil Opening	Stencil Thickness	Defect Mode	Location of Stencil Opening	Recommended Stencil Opening
Ø19.7mils / 0.50mm	5mils (0.13mm)	None	Across All Pads	 <p>Ø0.50mm (Nominal Size)</p>
Ø15.7mils / 0.40mm		Solder Bridging	At Ends Or Middle Of Pins Array	 <p>Left 10 Column Ø0.40mm Ø0.50mm Right 10 Column Ø0.40mm</p> <p>Solder Bridging at Both Ends</p>  <p>Left 10 Column Ø0.50mm Ø0.40mm Right 10 Column Ø0.50mm</p> <p>Solder Bridging at Center</p>
 <p>□21.7mils / □0.55mm</p>		Solder Opening	At Ends Or Middle Of Pins Array	 <p>Left 10 Column □0.55mm □0.55mm Right 10 Column □0.55mm</p> <p>Solder Opening at Both Ends</p>  <p>Left 10 Column □0.55mm □0.50mm Right 10 Column □0.50mm</p> <p>Solder Opening at Center</p>

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3.2 Solder Paste Selection

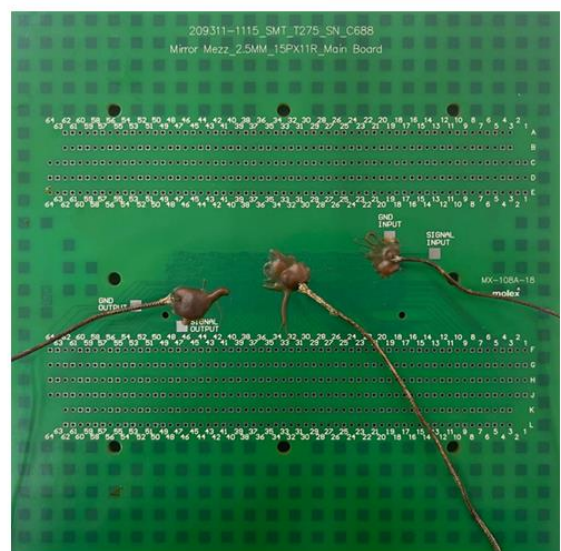
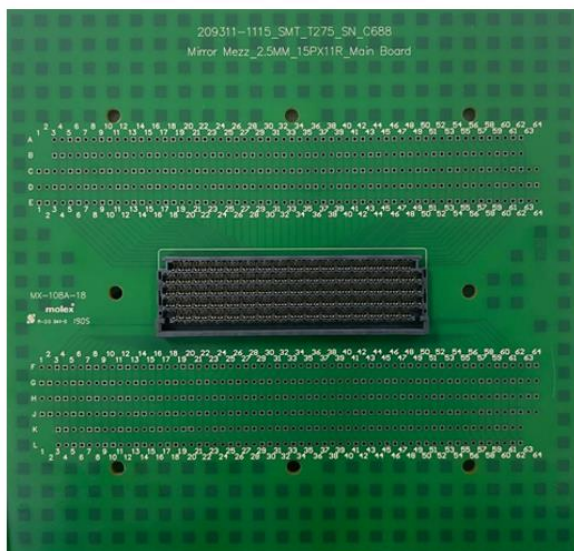
A no-clean lead-free solder paste is recommended to process Mirror Mezz connector. Water-soluble lead-free solder paste is NOT recommended for Mirror Mezz connector. In the event processing using water-soluble lead-free solder paste is necessary, care must be taken not to damage the connector terminal contacts and also to ensure proper drying to prevent moisture trapped within the connector.

3.3 Placement

Recommend Pick & Place Machine vision recognition algorithm to detect connectors housing corners as placement alignment. Recommended Pick-and-Place machine vision recognition algorithm to detect connectors housing corners as placement alignment with the nozzle's inner diameter to cover minimum 70% of connector cover tape. As the connector is placed onto the solder paste on the PCB, the placement force shall be applied at the center of the Pick-and-Place cover tape. This recommended force of 200gf minimum shall be applied smoothly and evenly.

3.4 Thermocouples Location

Thermocouples preferably be place at the middle and the two ends of the connector pin field. A minimum of 240°C is preferred in the middle of the connector. Temperature differences on connector left end, center and right end shall be within 5°C.



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3.5 Reflow Direction

Recommended solder-reflow direction: connector lengthwise to be perpendicular to the conveyor rail.

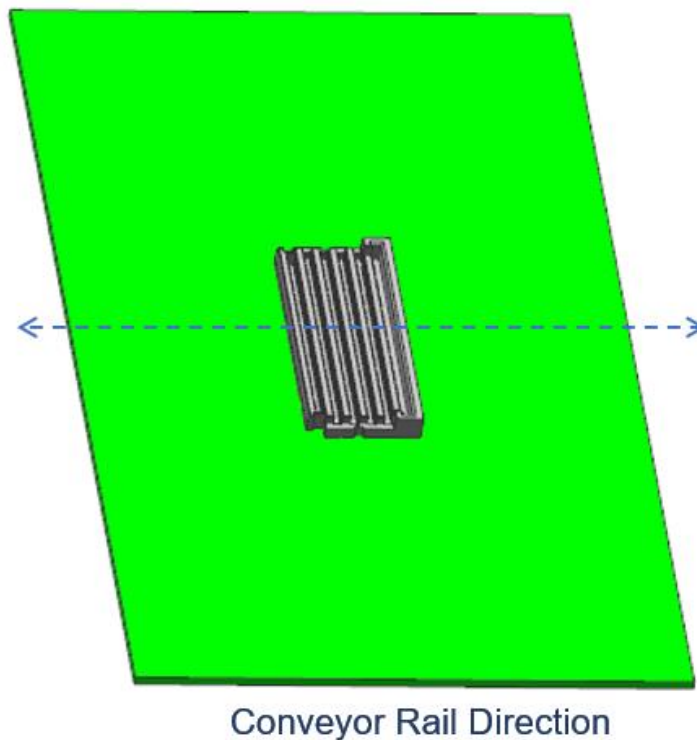


Figure 12 Solder- Reflow Direction

Temperature differences on connector left end, center and right end shall be within 5°C.

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3.6 Reflow Profile

Recommended convection reflows oven temperature profile:

Temperature Condition	Recommendation
Room Temperature to 100°C	60 to 100 sec
150°C to 200°C	60 to 100 sec
Liquidous Temperature (217°C)	60 to 100 sec
Peak Temperature	240°C to 250°C
Time Within 5°C of Peak	10 to 30 sec Max.
Total Time (Room Temperature to Peak)	6 mins Max.

The above profile is recommended to the user as starting points and should be optimized by the user to meet their individual process needs.

Nitrogen Reflow Environment is highly recommended for a good solder-joint reliability.

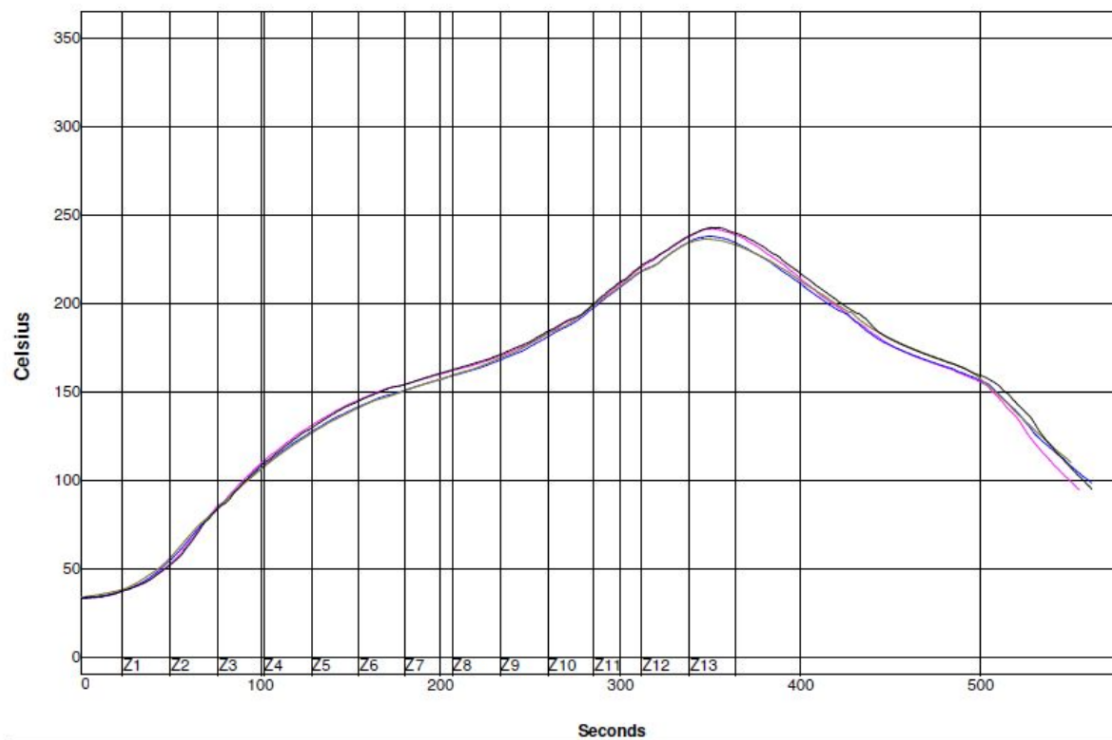


Figure 13 Recommended Reflow profile

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3.7 Inverted Reflow

Formulation for connector Inverted reflow computation (X):

Connector Weight (g) / [Total PCB Solder-Pad Surface Area (mm²) / 645.16]

$X \leq 30$ (Viable for Inverted reflow)

$X > 30$ (Not viable for Inverted reflow. In the event inverted reflow is necessary, use of epoxy application or mechanical hold-down fixture can be adopted)

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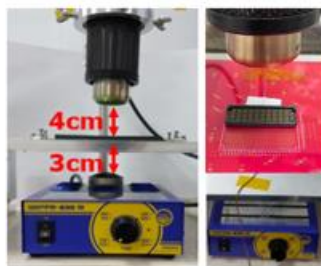
3.8 Rework Procedure

Molex highly recommend utilizing industrial standard SRT rework facility to rework the Mirror Mezz connector.

Any connector that is being removed from the PCBA shall not be reused.

Below is an example of a low-cost rework setup as an initial starting point. However, this procedure also applicable to the industrial standard SRT rework facility.

3.8.1 Connector removal process



Step 1: Setup rework station as shown



Step 2: Turn on pre-heater



Step 3: Press Start / Stop on pre-heater



Step 6: Switch on hot-air gun to "HOT" position



Step 5: Allow temperature on thermocouple to reach approx. 130°C



Step 4: Adjust temperature knob to 300°C



Step 7: Allow temperature on thermocouple to reach approx. 240°C

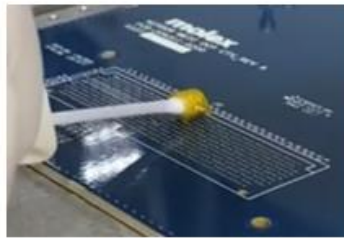


Step 8: Remove connector using tweezers

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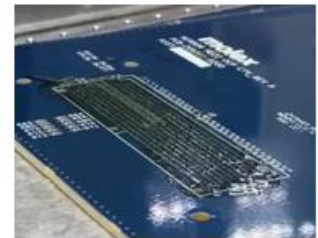
3.8.2 Solder Residue Removal / Connector Replacement Process



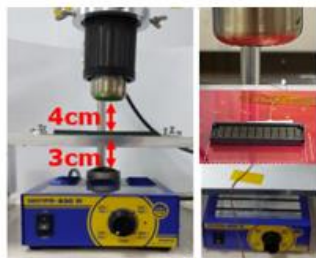
Step 1: Apply flux on solder residue



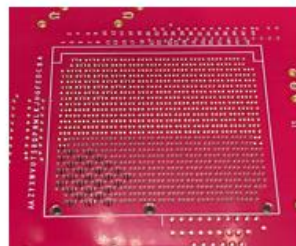
Step 2: Remove solder residue using solder-iron and wick



Step 3: Inspect and repeat step 2, where necessary



Step 6: Setup rework station as shown



Step 5: Inspect and repeat step 4, where necessary



Step 4: Apply solder paste using mini-stencil



Step 7: Repeat step 2 to step 7 as in "connector removal process"



Step 8: Replace new connector

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4. DIMENSIONS

4.1 Standard Configuration

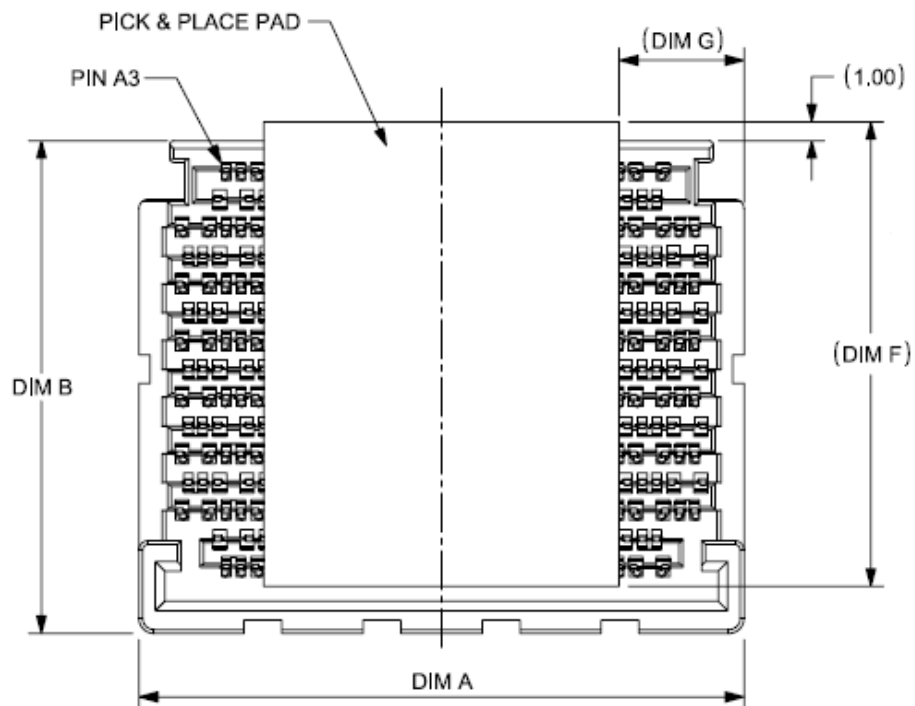


Figure 14 Connector outline dimension

Please refer to Molex sales drawing for dimensions of Mirror Mezz™ connectors.

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4.2 Stacked Height

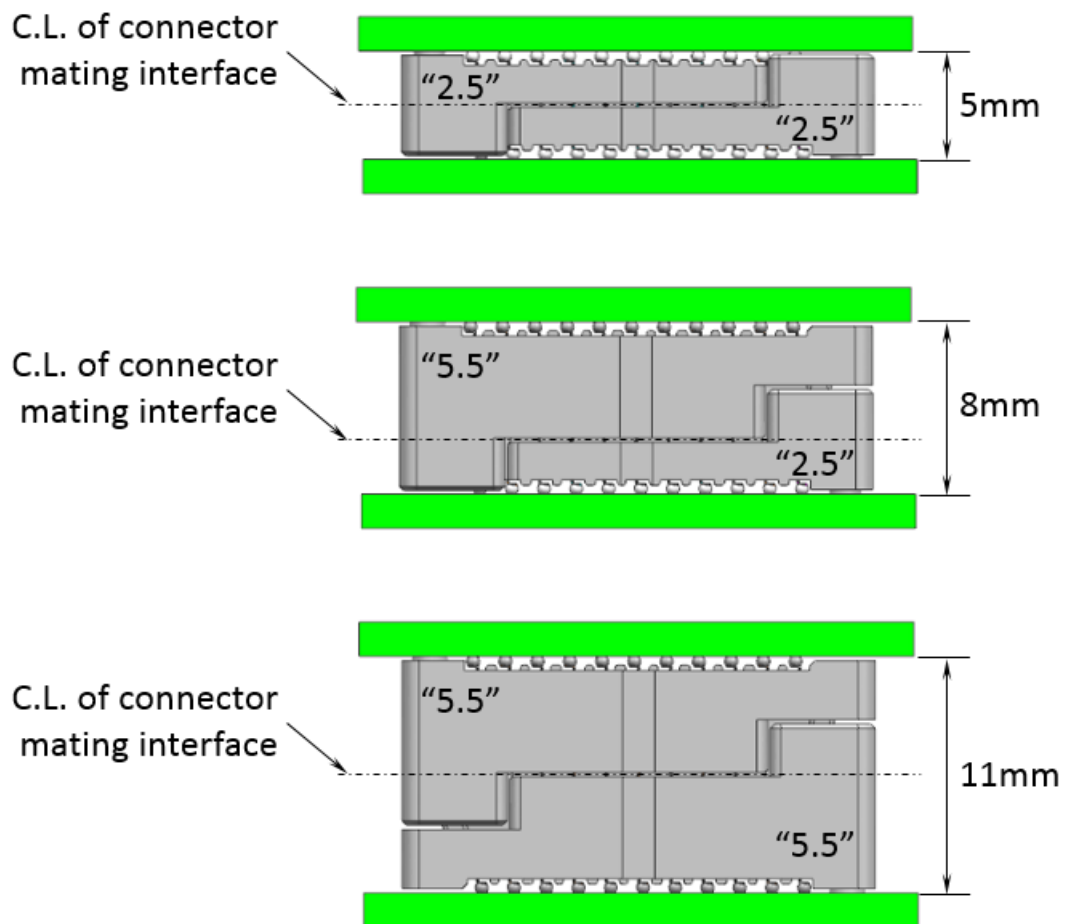


Figure 15 Mated connectors stacked height

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4.3 Gather-ability

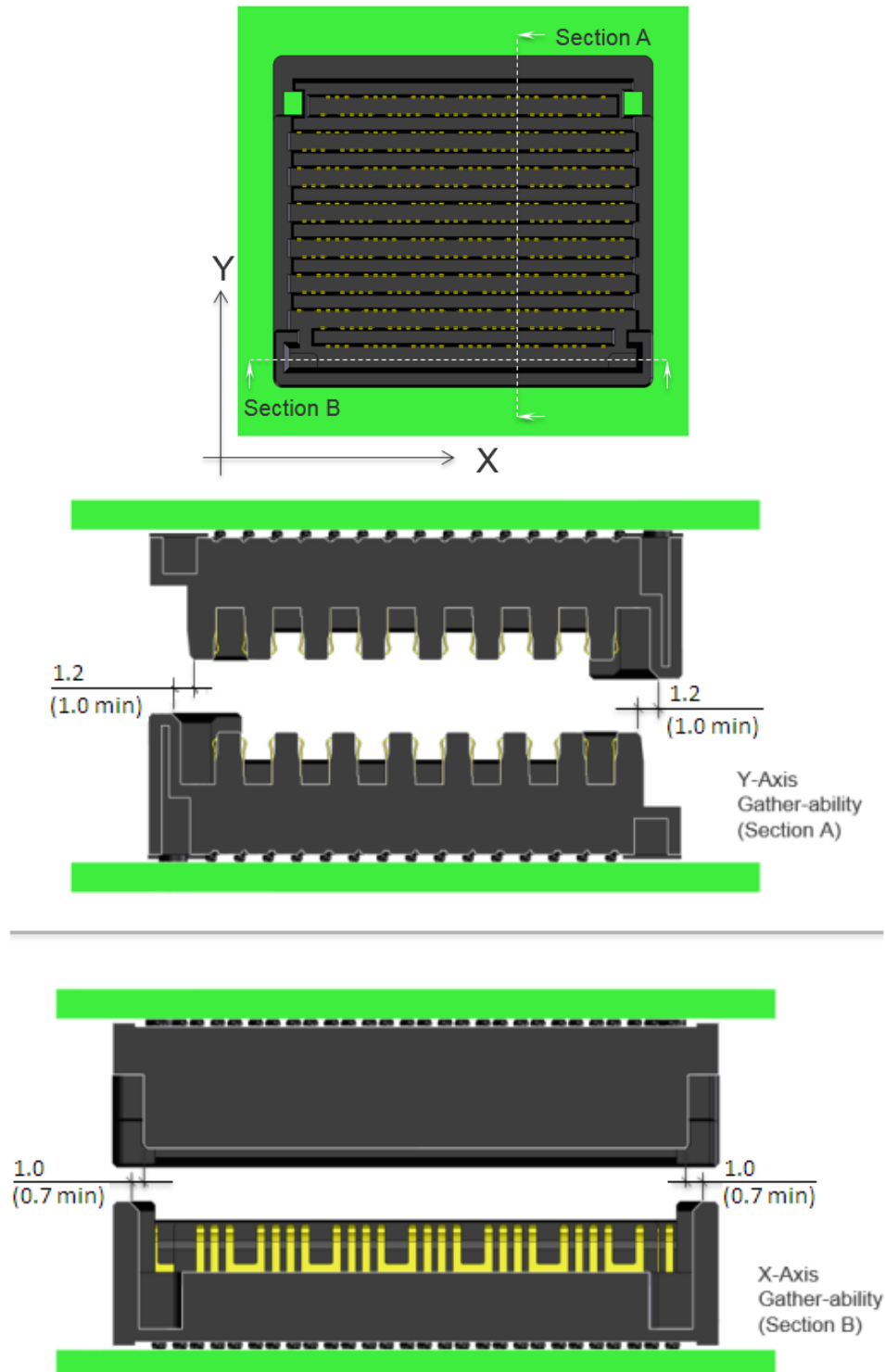


Figure 16 Gather-ability

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4.4 Rigid Offset

Mirror Mezz allowable rigid offset mating = $\pm 0.15\text{mm}$ max.

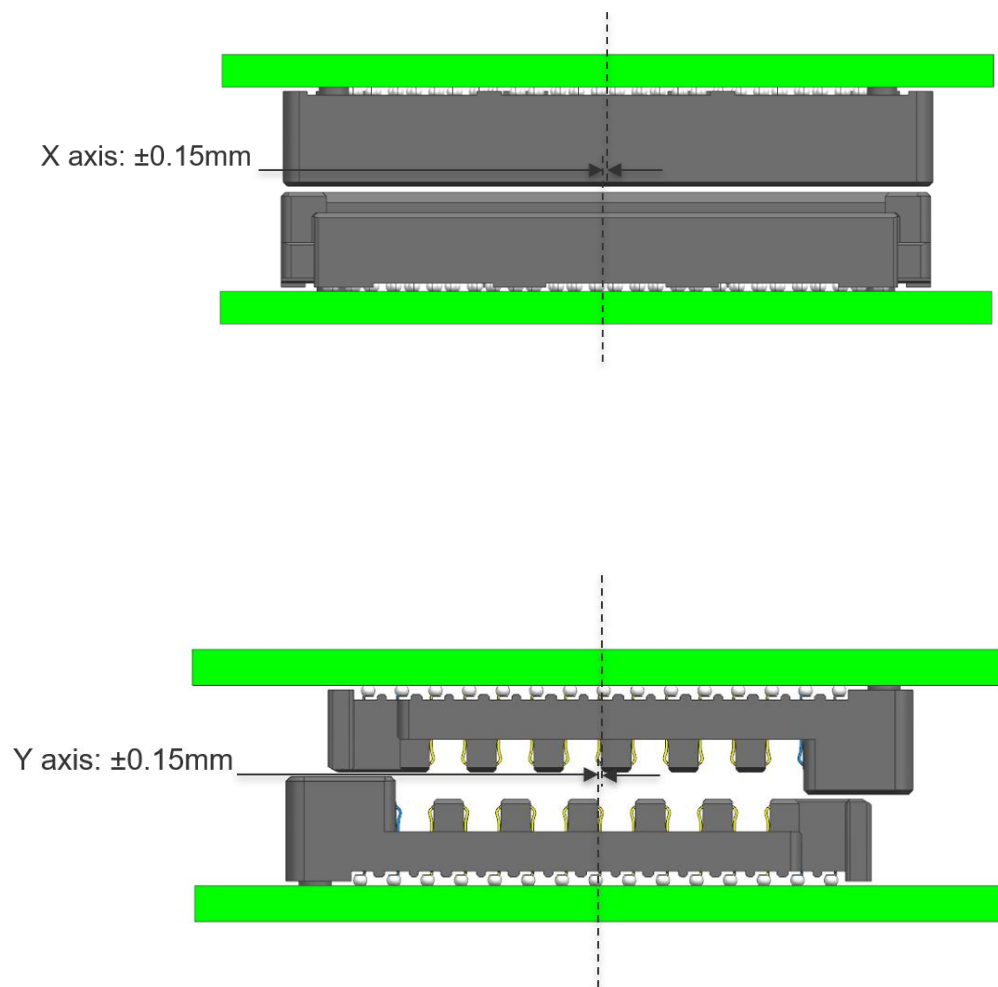


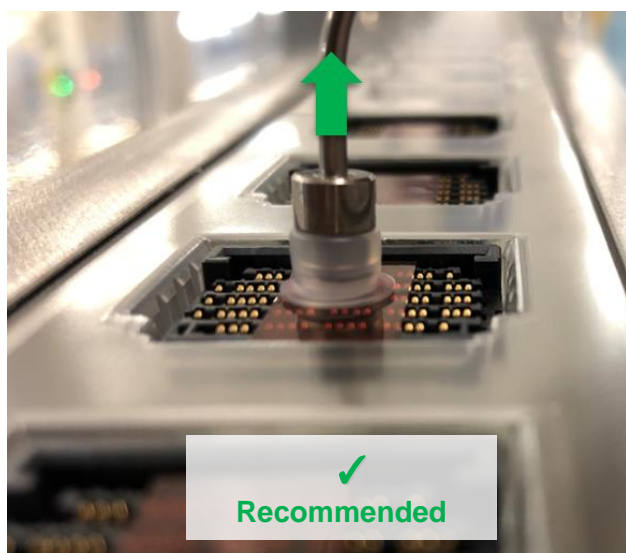
Figure 17 Rigid Offset

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molex APPLICATION SPECIFICATION

5. HANDLING

- The Mirror Mezz connectors are packaged in Tape & Reel to prevent damage to the contact and solder balls. The connectors should be handled with care like any other BGA or IC device.
- It is not recommended to pick up the Mirror Mezz connector from the Tape & Reel pocket using fingers.
- It is recommended to use vacuum pick-up tool (see below pictures) to pick up the connector from the Tape & Reel pocket if inspection is required.



- Care must be taken to pick up the connector vertically from the Tape & Reel pocket.
- Improper handling of the connectors manually could damage the terminal and solder ball of the connectors.
- All connectors removed from the original packaging for inspection purpose shall not be deemed functional and for production.
- Avoid touching the solder balls.
- Vacuum package can slow down the oxidation of connector solder balls. Do not open the vacuum package if not in use.

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6. STORAGE RECOMMENDATION

6.1 Shelf Life

- The shelf life of Mirror Mezz in vacuum packaging as shipped condition should not be longer than 1 year.
- If the vacuum packaging bag opened, the shelf life of Mirror Mezz without vacuum packaging bag should not be longer than 3 months.



Before unpacking (with vacuum packaging)

Shelf Life: Not more than 1 year



After unpacking (without vacuum packaging)

Shelf Life: Not more than 3 months

6.2 Storage Condition:

- Humidity: < 60% RH, Temperature: 22~50°C and control under 30°C preferred.

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