1.0 OVERVIEW OF THE CONNECTOR

Mirror Mezz is a line of Board to Board Connectors that connect one printed circuit board to another printed circuit board to which it's 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 made in varying heights to accommodate varying separation distances between two parallel boards in a variety of grids. Please check with Molex for availability.

Figure 1: Mirror Mezz connector

2.0 CIRCUIT BOARD DESIGN RECOMMENDATIONS

Board Design Considerations for Mirror Mezz High Speed Signaling

1. A 0.25mm (0.010”) maximum stub length is recommended for vias used with Mirror Mezz.

2. A 0.25mm (0.010”) maximum drill diameter is recommended for signal vias.

3. Minimum length vias are key to electrical performance – Some options:
   i) Use a thin PCB, recommended thickness to be 1.60mm minimum.
   ii) A through via in a thicker board may be back-drilled.
   iii) Use blind vias.

4. Microstrip can be used on opposite side of the PCB where Mirror Mezz is mounted.

5. Via-in-pad delivers superior electrical performance because it eliminates the short trace between the pad and via. There may be a trade-off between the electrical performance benefits of Via-in-pad and the cost to fabricate PCBs that utilize Via-in-pad.

6. Connect all ground vias directly to internal ground planes and do not use thermal relief pads.

7. For top layer (connector attachment side), include copper pour at connector footprint area and use thermal relief ground pads with more spokes to connect top layer plane. This will help to balance ground connectivity and solderability.

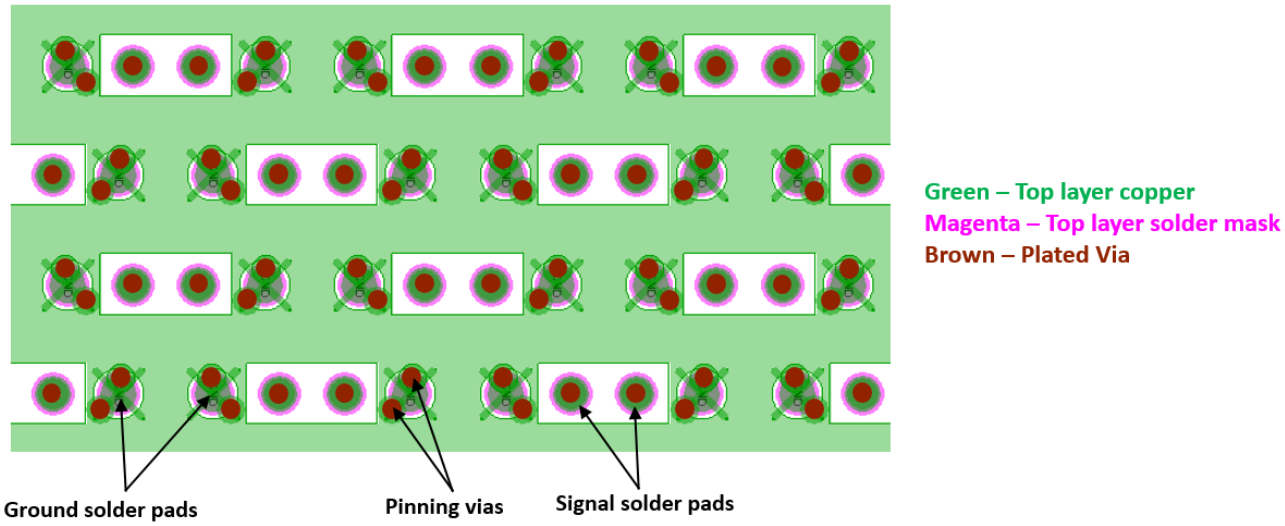


Figure 2: Example of via-in-pads showing top layer copper and its solder mask

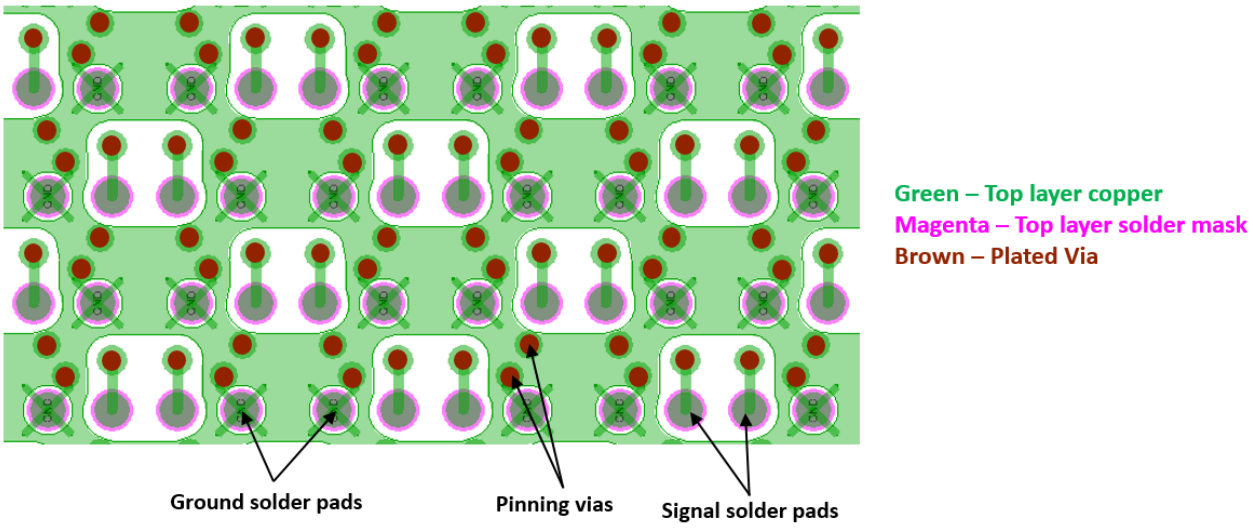
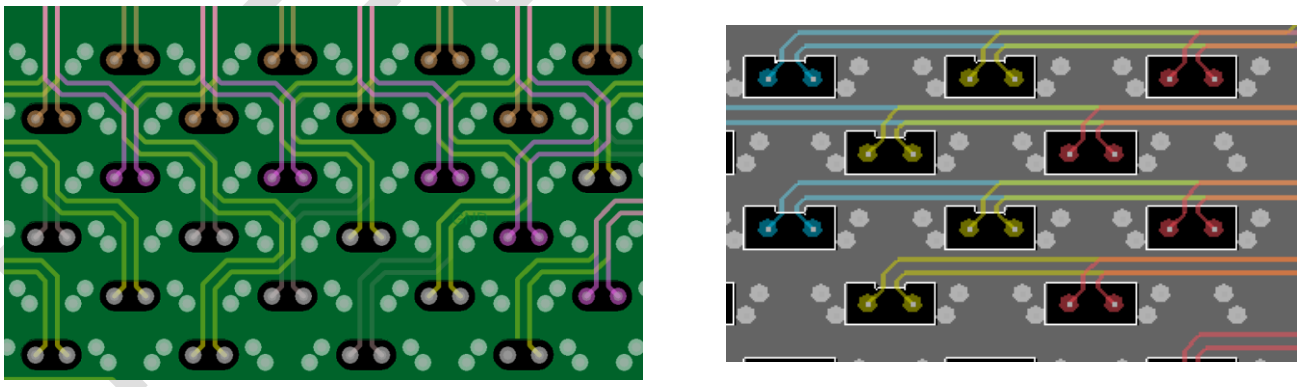


Figure 3: Example of dog bone pads showing top layer copper and its solder mask

2.1 DIFFERENTIAL TRACE TO SIGNAL PAD ATTACHMENT

The footprint of Mirror Mezz can accommodate PCB trace routing directions to be either East-West (through 1.5mm row spacing) or North-South (through 1.3mm via distance between grounds). It can also be a combination of both to help to reduce the number of routing layers required. Users can determine the optimized choice of PCB routing for their high-speed application. Figure 4 shows examples of using a North routing and East routing.



(a) North routing (b) East routing

Figure 4: Trace routing using 3 layers

2.2 ANTI-PAD SIZE

For most high-speed applications, one needs to maximize the anti-pad width (between rows) and length (between columns). The width of the anti-pad is affected by the following:

1. Trace width and spacing
2. Pair to pair spacing
3. Top and bottom ground strips to trace edge spacing
4. PCB material

The length of the anti-pad is limited by the distance and the construction of ground pin vias. The anti-pad example in Figures 5 is based on a 5 mil trace width, 6 mil spacing and a 5 mil registration buffer (reference ground strips edge to trace outer edge) inside the pin field. Figure 5 also shows the **pinning via** arrangement used within the connector footprint to improve the isolation and reduce via crosstalk.

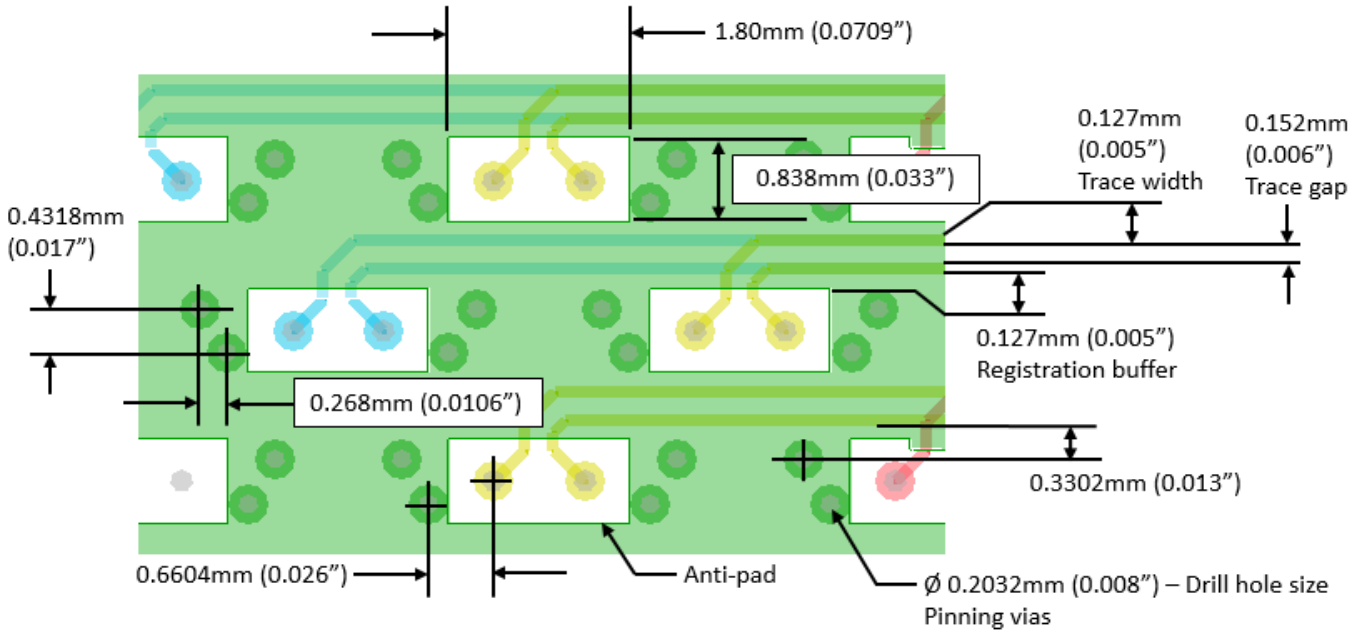


Figure 5: Recommended break-out and anti-pad for differential signaling

Caution: Vias placed close to soldering pads may need to be filled (epoxy) so that capillary action does not rob the soldering pads of solder.

2.3 DIFFERENTIAL TRACE TO SIGNAL PAD ATTACHMENT

Figure 6 shows one of the ways to connect the differential traces to their corresponding signal pads.

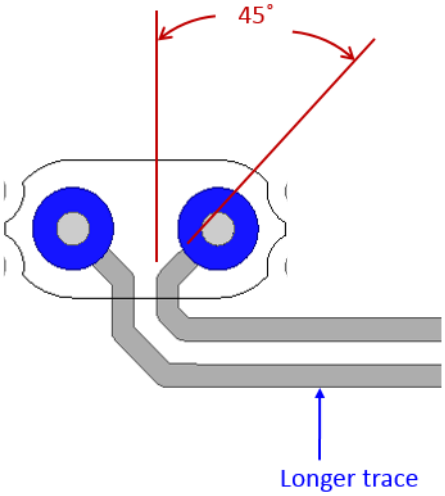


Figure 6: Standard trace escape detail

As seen in Figure 6, one of the traces has a longer length than the other one. This uneven length must be corrected to minimize the skew within the channel for high-speed signal application.

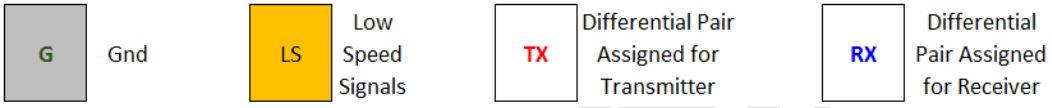
2.4 CROSSTALK MITIGATION

Crosstalk mitigation is a critical element of high speed system design. There are simple considerations to reduce crosstalk in many systems. These include the following:

1. Separate transmit and receive transmission lines. If transmit and receive transmission lines need to be placed in the same layer, separate them with extra space. It is recommended to place them on separate routing layers.

2. Separate transmit and receive vias. Group the TX and RX differential vias in blocks in rows or columns and, if possible, separate them with low speed signal lines.

In addition, orphan pins (extreme 2 columns on both ends) are more suited for low speed application. Hence, it is recommended to assign low speed signals or power to these pins.



	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	G	G	TX		G	G	LS	LS	G	G	RX		G	G
B	TX		G	G	TX		G	G	RX		G	G	RX	
C	G	G	TX		G	G	LS	LS	G	G	RX		G	G
D	TX		G	G	TX		G	G	RX		G	G	RX	
E	G	G	TX		G	G	LS	LS	G	G	RX		G	G
F	TX		G	G	TX		G	G	RX		G	G	RX	
G	G	G	TX		G	G	LS	LS	G	G	RX		G	G
H	TX		G	G	TX		G	G	RX		G	G	RX	
J	G	G	TX		G	G	LS	LS	G	G	RX		G	G
K	TX		G	G	TX		G	G	RX		G	G	RX	
L	G	G	TX		G	G	LS	LS	G	G	RX		G	G

Figure 7: Example of TX/RX grouping separated by low speed (LS) signal columns

	3	4	5	6	7	8	9	10	11	12	13	14
A	G	G	TX		G	G	RX		G	G	RX	
B	TX		G	G	TX		G	G	RX		G	G
C	G	G	TX		G	G	RX		G	G	RX	
D	TX		G	G	TX		G	G	RX		G	G
E	G	G	TX		G	G	RX		G	G	RX	
F	TX		G	G	TX		G	G	RX		G	G
G	G	G	TX		G	G	RX		G	G	RX	
H	TX		G	G	TX		G	G	RX		G	G
J	G	G	TX		G	G	RX		G	G	RX	
K	TX		G	G	TX		G	G	RX		G	G
L	G	G	TX		G	G	RX		G	G	RX	

Figure 8: Example of TX/RX grouping separated by columns

	3	4	5	6	7	8	9	10	11	12	13	14
A	G	G	TX		G	G	TX		G	G	TX	
B	TX		G	G	TX		G	G	TX		G	G
C	G	G	TX		G	G	TX		G	G	TX	
D	TX		G	G	TX		G	G	TX		G	G
E	G	G	TX		G	G	TX		G	G	TX	
F	TX		G	G	RX		G	G	RX		G	G
G	G	G	RX		G	G	RX		G	G	RX	
H	RX		G	G	RX		G	G	RX		G	G
J	G	G	RX		G	G	RX		G	G	RX	
K	RX		G	G	RX		G	G	RX		G	G
L	G	G	RX		G	G	RX		G	G		

Figure 9: Example of TX/RX grouping separated by rows

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS
B	G	G	TX		G	G	TX		G	G	RX		G	G	RX		G	G
C	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS
D	G	G	TX		G	G	TX		G	G	RX		G	G	RX		G	G
E	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS
F	G	G	TX		G	G	TX		G	G	RX		G	G	RX		G	G
G	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS
H	G	G	TX		G	G	TX		G	G	RX		G	G	RX		G	G
J	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS
K	G	G	TX		G	G	TX		G	G	RX		G	G	RX		G	G
L	LS	LS	G	G	TX		G	G	LS	LS	G	G	RX		G	G	LS	LS

Figure 10: Example of TX/RX grouping with low speed (LS) signal columns assigned at 2 ends