Space Transformer Application Guidelines

Space Transformers or Mother Daughter boards can provide a very cost effective means of maximizing the utility of test board systems. Each is custom designed to address the specific application. The following guidelines provide a general set of rules and recommendations for the optimum design of the interface between the boards and the PariPoser® contact.

Solder Mask – There should be no solder mask placed on the daughter board or on the mother board in any area where PariPoser® material is located. This includes the frame area projected onto the mother board.

Pad Height – The sum of the pad heights on the daughter board and mother board should be approximately 40-50% of the PariPoser sheet thickness. The pad height on the 2 boards does not need to be identical. The PariPoser sheet thickness varies with contact pitch per the following table. These numbers are approximate and are designed to restrict total contact penetration to be under 40% of the PariPoser Sheet thickness.

Contact Design Rules

Contact Pitch (mm)	Minimum Gap[1] (mm)	Minimum Pad Area[3] $(mm)^2$	Combined Pad Height[2] (inches)	Sheet Thickness (inches)	Sheet Thickness (mm)
1.27	0.51	0.46	0.0068	0.0150	0.38
1.00	0.40	0.28	0.0045	0.0100	0.25
0.80	0.32	0.18	0.0039	0.0087	0.22
0.65	0.26	0.12	0.0031	0.0068	0.17
0.50	0.20	0.071	0.0025	0.0056	0.14
0.40	0.16	0.045	0.0020	0.0044	0.11
0.30	0.12	0.025	0.0015	0.0034	0.09
0.20	0.08	0.011	0.0011	0.0025	0.06
0.10	0.04	0.0028	0.0009	0.0021	0.05

1- Gap applies to pads on both surfaces.
2 - Pad height includes combined height of opposing pads.
3 - Area is projected interconnection area between opposing pads.

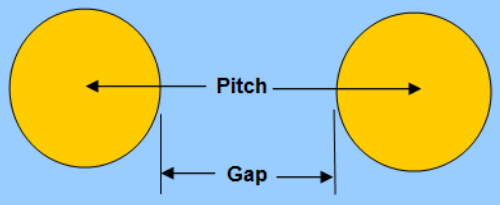

Figure 1.

Pad Area and Edge Gap – The table shown in figure 1 shows the recommended pad area for good conductivity and minimum gap between contact pad edges for high

insulation resistance. Paricon's standard formulations are designed using a gap of 40% of the pitch and a conductive zone whose nominal area is a circle with a diameter of 60% of the pitch.

Applied Load – A compressive load should be applied across the entire contact array using a true spring structure to maintain the load. This can not be accomplished using a simple bolt and nut structure but can be accomplished by adding a spring or Belleville washer. The uniformity of the load is not as important as assuring that the minimum pressure at each contact exceeds ~50 grams/ per contact. A common means of clamping uses 4 spring loaded screws at the daughter board corners.

- **Bow** can occur during the clamping due to a lack of daughter board stiffness coupled with a gap between the daughter and mother boards at the bolt site. This can be minimized by incorporating washers at each corner bolt location whose thickness is approximately equal to the thickness of the plating height plus 50% 0f the PariPoser sheet thickness. This should not be required for boards which use stiffeners and backing plates and the use of spacer washers is not the preferred method.
- **Backing Plates** are recommended for this application. They should be placed on the bottom side of the mother board and serve as the compressive base for the clamping system. The backing plate does not have to fully contact the mother board and open areas can be incorporated to allow for component placement.
- **Socket Stiffener** – The socket assembly mounted to the top of the daughter board can serve as a means to add stiffness to the daughter board. Additional stiffeners can be added as needed to assure that the daughter board does not bow.
- **Board Motion** – Printed circuit materials are not designed as structural members. With the constant load applied by handler systems at elevated temperature, as the device is pressed to the board, board deformation will occur. This can impact the long term performance of the space transformer. The only way to prevent this is to incorporate a reasonable backing plate structure. Two million test cycles have been demonstrated when a backing plate is incorporated.

Operating Temperature – The normal assembly of the PariPoser frame provides for operating temperatures up to ~125º C. This can be extended to 150º C at additional charge.

Mounting Frame – The PariPoser material is mounted, under tension, on a frame much like a painting canvas would be mounted on a frame. The cross sectional width and height of the frame is designed for a given application. At the present time, the minimum available frame width is ~1.5 mm. A matching groove is cut in the daughter board to house the frame and retain the contactor.

Dimensions – All PariPoser contactors are defined by an engineering print that is jointly developed by Paricon and the customer. In developing these prints certain rules must be adhered to.

- **Frame to outer pad edge** – The distance from the inside edge of the frame to the outside edge of the nearest pad on the daughter board is recommended to be held

at a minimum gap of ~0.25 mm. This assures that no bonding adhesive can leak into the contact area. If needed this dimension can be reduced at additional charge.

- **Groove to Plated barrel** – When machining the edge of a printed circuit board, certain rule are established which define the edge to plated through hole minimum allowed gap. A similar set of rules apply to the groove in the daughter board. This dimension is a function of board materials and manufacturing processes and must be established with the board vendor.
- **Frame Dimensions** – Frame dimensions are shown on the customer print so as to assure that the frame will fit in the groove on the daughter board. These are expressed as follows:
    - **Inner frame**- Minimum
    - **Outer frame** – Maximum
    - **Frame thickness** – Maximum

Multilayer Stack – Additional routing and component handling capability can be accomplished by stacking multiple daughter boards which are each interconnected with a PariPoser contactor. Input on these concepts can be obtained from Paricon's Application Engineering Department.

Failure Mechanisms – When properly used, the PariPoser interconnection has been shown to have a long functional life which exceeds 2.1 million test cycles at elevated temperature. This interface will greatly outlast the socket contacts. Key to achieving long life is to minimize unnecessary disassembly and assembly cycles. The daughter board to mother board interface should not be disassembled when replacing the test socket. If this is done, it is recommended that the PariPoser contact be replaced at the same time.

Design and Ordering Information – All Space transformer interfaces are custom products. Each is defined by a print and part number. Paricon Application Engineering will provide assistance as needed to define your application. Please contact Paricon at Sales@Paricon-Tech.com or (508) 676- 6888 for application support.