GETTING STARTED: IS IT NECESSARY?

One of the many concerns of an engineer is whether or not a printed circuit board mount transformer can be securely held by its printed circuit pins alone, or if some additional mounting method is needed. While the printed circuit pins may appear to securely hold the part, this should not be assumed as many conditions need to be considered. Weight & size (mass) of the component, PC board thickness & area, how the end product will be used (is it portable?), where it will be used (in a high shock/vibration environment?), and board orientation (is it vertical or horizontal with the component inverted?) are all factors which will justify the necessary approach.

SEVERAL METHODS TO CONSIDER

While not all-inclusive, we have seen many different methods used to secure transformers to printed circuit boards. These methods all have varying degrees of success and depend heavily on the specific application. What works for one manufacturer may not necessarily work for another. A listing of different methods with their advantages and disadvantages follow:

1) **Gluing**
   Many polyurethanes and epoxies lend themselves to securing parts to a printed circuit board. While convenient due to their typically permanent solidification, the degree of cohesion and flexibility of the cured material as well as whether or not it may crack and break off if subjected to stress can be of concern; the flame retardancy must also be carefully selected for those applications requiring a specific rating.

2) **Nylon Tie-Wraps**
   By drilling two holes on either side of the transformer, some success has been achieved by using a nylon tie-wrap. While the part may be somewhat secured in this fashion, concern is directed toward a nylon tie's tendency of "bowing" the PC board if fastened too tightly. This problem is further aggravated if a tightening tool is used.

3) **Mounting Screws**
   When there are mounting holes incorporated within the lamination of the transformer, many engineers prefer to use mounting screws. This generally leads to having to choose between a nylon or metallic material for the screw. While there are several choices available, the most popular are nylon and steel.

   - **Nylon Screws:** While nylon as a material appears to be the best choice due to it being non-conductive, its tendency to stretch when subjected to shock, vibration, and temperature may make its long-term usability questionable. Its ideal usage would primarily be limited to lower weight parts in non-severe environments. Where concern for the nylon hex-nut becoming loosened is high, we have seen applications where the end of the screw is "mushroomed" or melted to the surface of the hex-nut itself with the blade of a soldering iron. Screws secured in this manner can still be removed later with a pair of wire cutters.

   - **Steel Screws:** While providing the best method of securing as far as retention goes, steel screws are many times skeptically looked at. This may be from concerns such as the metallic body of the screw passing too close to the PC terminals, the inadvertent shorting of the lamination of the core causing the transformer to overheat, and the screw head itself shorting out printed circuit traces on the foil side of the PC board. In the first two examples, we have seen where some thin electrical tape or sleeving has been placed around the screw body where it comes in close proximity to the areas of concern. While most transformers will not "burn up" if uninsulated steel screws are used, insulating the screw can still be done if the concerns and costs warrant it. The concern for the traces on the foil side of the PC board can be addressed by raising the screw head off the surface of the board with a fiber or nylon washer; bushings can also be used.

   - **Non-Magnetic Screws (Stainless Steel/Brass/Aluminum):** While providing a better approach than steel screws due to the fact that they eliminate eddy current shorting of the individual laminations of the core, screws made from these materials still have the same potential problem of causing electrical shorts.

4) **Brackets**
   In situations where screws, gluing, or tie-wraps aren't desired, a mounting bracket placed over the core itself can be used to secure the part to the PC board. If the part is a "vertical" style (where the core length is perpendicular to the plane of the PC board), then a simple channel frame around the core may suffice. If the transformer is a "horizontal" style (where the core length and the plane of the PC board are parallel to each other, but on different planes), a "cage-type" bracket may be able to be tooled to fit over the entire board area dimensions. For those horizontal transformers with a sufficient amount of "window" room, a pair of simple post-style brackets may be feasible.

A CRITICAL NOTE: SECURE THE PART TO THE PC BOARD PRIOR TO SOLDERING.

The transformer **must** be secured to the PC board **prior to soldering**. If this is not done, the pins of the component will most likely be pushed out of the bobbin header causing a break in the magnet wire as the part is fastened tightly to the PC board. Many companies have tried to solder the transformer first and secure it afterward only to find that the parts are no longer operational.