

General:

Compliant type press fit pin(Compliant pin hereafter)is very basic technology for high pin count connector field. This memo describes design of the compliant pin comparing with press in pin design.

Press fit technology overview: [Little bit of history]

Press in pins has been used in printed circuit board for well over 25 years. First type of press in pin was just pushing in oversized solid pin into through hole to fix it to the PC Board. Use of press in pin however was limited in two sided PCB's, as it requires tight control over the size of through hole in order to avoid damaging it during press fit process. Press in pin was used to hold pin in place before flow soldering also. First compliant pin appeared in industrial market was a Tuning fork style connector by Teradyne that pins are press fitted into aluminum plate which is used as GND plane. This design has adapted to press fit pins into PCB through holes. Today, there are great many variation of compliant pin design offered and produced on great variety of products by many connector manufacturers and it became a basic technology of connector design. Hardmetric connector, which is used in compact PCI and telecommunication market, is one of them.

Theoretical concept of compliant pin:

Compliant pin design is elaborately taking advantage of material property of resilient metals (such as phosphor bronze) plastic property and elastic behavior.

Most of metals go into permanent deformation when bending pressure of more than it's elastic limit is applied. Resilient metal however has high elastic coefficient and it tries to recover its original position when the pressure is removed. Compliant pin design utilizes combination of elastic deformation, which provides wider through hole size tolerance and resilient restoration action, which provides elastic rebound force to the through hole for reliable electrical/mechanical interconnection.

One of the most common compliant pin designs is "eye of the needle" style, which was originated by Teradyne Connection Systems. In this design, there is an eye shaped opening in the center of press fit zone. The eye shaped opening provides rooms for two columns to move closer together which will result smaller diameter of the pin in the press fit zone. The columns that surround the eye is used as arm springs which provides normal force to hold pin firmly in the through hole.

Compliant pin's major difference from press in pin design

Solid press in pin

Pin does not deform in the insertion process.
Pin has no elastic rebound force.

Compliant pin

Pin's press fit zone compresses in the insertion process
Pin supplies elastic rebound force.

Benefits of compliant pin design over solid pin:

1. Because the press fit zone of pin compresses, the plating of the drilled through hole is saved from possible damage of the through connection to the circuit paths.
2. The compliant pin allows a larger tolerance of through plated holes.
3. Reduction of insertion force.
4. Repair without de-soldering: multiple pressing of pins into the same hole is possible.

Benefits of compliant pin design over soldering:

1. Eliminates thermal stress which is unavoidable using soldering method.
2. No contamination by the solder flux and free from solder lugs which cause short circuit
3. No deviation of stray capacitance due to the amount of solder applied to the joint.
4. Environmentally friendly: Reduction of lead usage, No need for cleaning solvent.
5. Fast, cost effective assembly of connectors onto the PCB.