

Supplier Best-Practices for Getting Results with Press-Fit Technology

Part 1- Design, Testing & Documentation

With a rapidly expanding range of industries now relying on solder-free Press-Fit technology as a key lynchpin in their electronics assembly strategies, it has become increasingly important for suppliers of compliant Press-Fit interconnects to provide stringently controlled manufacturing processes.

As discussed in previous Tech Bulletins, Press-Fit technology offers an excellent alternative for creating reliable electro-mechanical interconnects without using solder. Press-Fit interconnects are used in demanding applications such as PCB-to-PCB stacking interconnects, fuse holders, molded modules, smart junction boxes, controllers, lighting and a variety of other custom applications.

Performance testing has demonstrated that Interplex's Press-Fit pins satisfy stringent operational requirements as defined by IEC, EIA and SAE specifications and they have been qualified to 150° C temperatures. Depending on the pin configuration, Press-Fit interconnects can provide retention force of up to 120 Newtons and current carrying capacity of 35 amps or more through a single press-fit eye.

The key factors for achieving success are rooted in the design, materials, manufacturing quality and consistency of the Press-Fit components. To assure that specified electrical and mechanical properties are consistently achieved on every assembly, the Press-Fit interconnects must uniformly conform to very exacting parameters. This is especially critical for high-volume global production situations, where all of the products made throughout the world need to yield consistent results.

Key elements that must be addressed by Press-Fit interconnect suppliers include the following:

- Design and testing standards
- Documentation and applications support
- Raw materials selection and plating process controls
- Global tooling standards, inspection criteria and production control plans
- Worldwide functional testing and application support capabilities

This is the first in a new two-part series of Press-Fit Tech Bulletins on Supplier Best-Practices for Getting Results with Press-Fit Technology.

This Tech Bulletin focuses on the first of these areas:

Design, Testing, Documentation and Applications Support

Part 2 in this new Tech Bulletin series will then cover the remaining three key best-practice areas.

Design & Testing Standards

Not all press-fit interconnects are created equal, but more importantly, not all press-fit technology has been proven and tested to assure proper results. It is important to keep in mind the fact that Press-Fit technology is not a commodity product.

Press-Fit can be a very beneficial solution when using a qualified proven design and collaborating with an experienced, application-knowledgeable supplier. Using Press-Fit parts from suppliers that have not conducted extensive testing and lack extensive experience in real-world applications can introduce significant risk into your application processes and end product quality.

Because the electrical properties and reliability of the press-fit zone are a direct result of consistent mechanical and material characteristics of the Press-Fit interconnect, the path to ultimate success must start with a proven design, backed by extensive testing and supported by well-documented manufacturing, quality processes and applications expertise.

Over the course of many applications, much of the industry has adopted the use of eye-of-the-needle press-fit implementations in 0.64mm and 0.80mm thicknesses, which can also be integrated into a wide range of custom pin lengths, stampings and custom configurations.

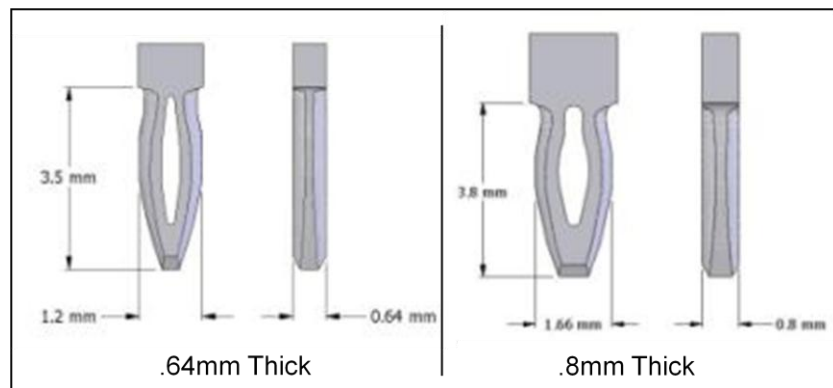


Figure 1 – Press-Fit Eye-of-the-Needle Designs

Before considering the use of any press-fit zone design, it is critical to know that it has been through and has passed a comprehensive environmental test program based on the core requirements of IEC-60352-5.

Press-Fit designs from Interplex have been subjected to a full spectrum of testing and qualification processes, including:

- Plated Through Hole integrity (cross-section analysis)
- Mechanical Forces (insertion & retention forces)
- Contact Resistance (electrical measurement)
- Environmental stress and long term durability

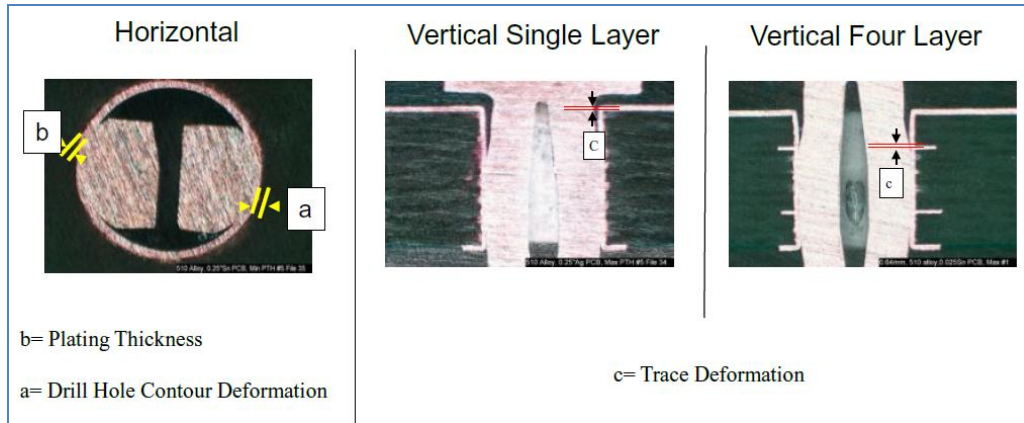


Figure 2 – Eye-of-the-Needle Cross Section Analysis

Maintaining sufficient retention force is absolutely critical for the long-term operational integrity of any press-fit interconnection. Therefore press-fit zone designs must be tested to meet the application's minimum retention force requirements and operating environments using IEC-60352-5 requirements as a baseline guide. Testing both before and after multi-axis environmental stress includes but is not limited to: thermal shock, high/low temperature exposure, vibration, climatic cycling, temperature and humidity cycling. Extensive testing of 0.64mm and 0.80mm press-fit interconnects in tin, silver and gold plated PCBs have confirmed that they exceed all minimum post-environmental stress retention force specifications as outlined in IEC-60352-5.

Pre and post-environmental testing of contact resistance has also been conducted for all press-fit configurations using the industry-standard millivolt level method as specified in IEC 60512-2-1 and using IEC-60352-5 as an overall guideline. Qualified press-fit interconnects have been shown to have values well below the automotive application design requirement of 0.5 mΩ maximum.

All of these fundamental design and testing processes are critical to assure that you are receiving press-fit interconnects that can perform in demanding real world applications.

Documentation and Applications Support

The next key to a successful press-fit implementation is making sure that the selected interconnects are properly designed into your specific application. Because a press-fit zone is created by the interface between the compliant pin (male) and the PCB plated-through-hole (female) elements, it is critical to achieve the proper relationship between them.

Application-knowledgeable press-fit suppliers must offer both deep engineering expertise and a broad range of documentation for implementing specific applications. Key resources should include detailed product specifications and drawings, documentation of test results, tech bulletins, and applications guides to help with optimizing the product design for press-fit.

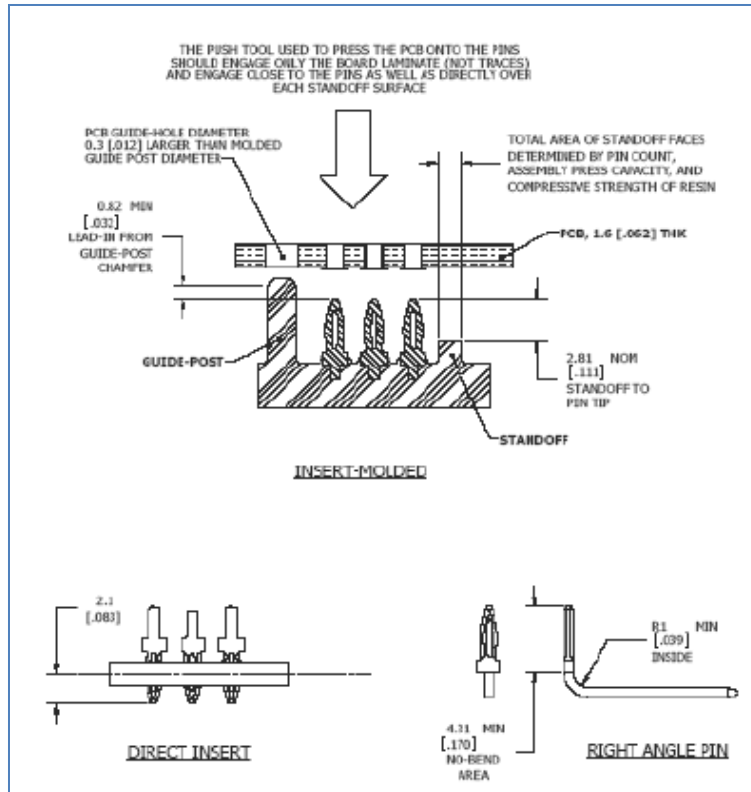


Figure 3 – Applications Guide: Tooling & Insertion Processes

		mm	in
REQUIRED PCB HOLE CONSTRUCTION	DRILL	$\phi 1.151 \pm 0.025$	$\phi .0453 \pm .0010$
	COPPER THICKNESS	0.025 MIN	.0010 MIN
	FINAL IMMERSION PLATED HOLE DIAMETER	$\phi 1.020 \pm 0.076$	$\phi .0400 \pm .0030$
1.57 (.062) THICK FR-4			
PIN INSERTION FORCE: 100 N (22.5 lbf) MAXIMUM PIN RETENTION FORCE: 20 N (4.5 lbf) MINIMUM SEE 0.64 PRESS-FIT TEST REPORT SUMMARY FOR TYPICAL VALUES			

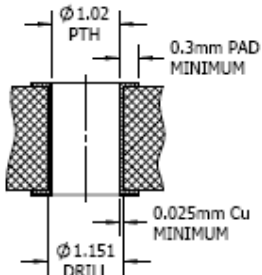


Figure 4 – Application Guide: Designing for Proper PCB Hole Construction

Summary

The bottom line is that press-fit technology has matured into a powerful solution for eliminating solder, avoiding complex secondary production processes, improving reliability and reducing costs. However press-fit components are not a commodity product that can simply be bought off the shelf. To achieve optimal results, customers need the help of knowledgeable press-fit suppliers with rigorous design, testing, documentation and manufacturing processes

The next Tech Bulletin will address the importance of raw materials & plating processes as well as the need for worldwide logistics and application support organizations that can seamlessly match up with globally-dispersed multi-tiered production strategies.

More information regarding Press-Fit technologies and products can be found on the web by visiting www.interplex.com/pressfit or by calling (718) 961-6212.