Interplex

Press Fit Tech Bulletin

Design Considerations for Molded Plastic Electronic Modules Using Press-Fit Technology

Press-Fit technology has already proven effective for implementing a wide range of applications that can benefit from its ability to provide robust solderless interconnects while streamlining assembly processes. Press-Fit interconnects can be adapted to support a variety of requirements such as PCB-to-PCB stacking interconnects, fuse holders, molded modules, smart junction boxes, controllers, lighting and other custom applications.

Performance testing has demonstrated that 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 14 lbs.

One of the particular areas where Press-Fit technology offers significant advantage is within molded plastic modules where the compliant press-fit interfaces can provide robust solderless connections for the finished electronic module assembly.

This Press-Fit Tech Bulletin provides an overview of key design considerations that engineers should be aware of when using press-fit interconnects in molded plastic electronic modules.

The specific areas covered include:

- Using shoulder design for shut-off of plastic around press-fit zone
- PCB locating posts to assist with staging and pressing PCB on to press-fit pins
- PCB Z axis positioning stops
- PCB hold down options
- Managing bend-radius for spring-based material
- Maintaining proper PCB edge distance and force management

Figure 1
- Press-Fit in Module

Shoulder Design

Incorporating precision shoulder designs into each interconnect can provide a built-in mechanism for shut off of plastic formation around the specific press-fit zone. This maintains the required clearance for proper access and functioning of the press-fit interface in the final assembly (See Figure 2).

It is also critical that the mold tool be set up to clear the press-fit zone in order to avoid any damage to the compliant pin during the molding process.

To aid in tool release and tool clearance, it is also recommended to incorporate angled shut off designs into the mold. Best practices typically call for 45 degree angles, as shown in Figure 3.

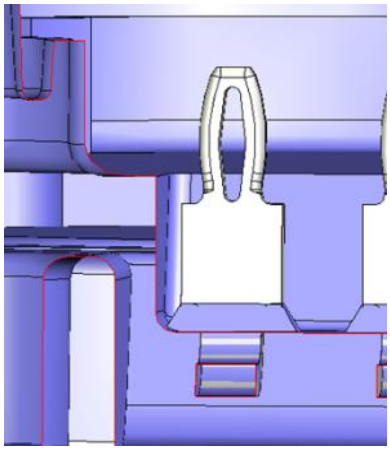
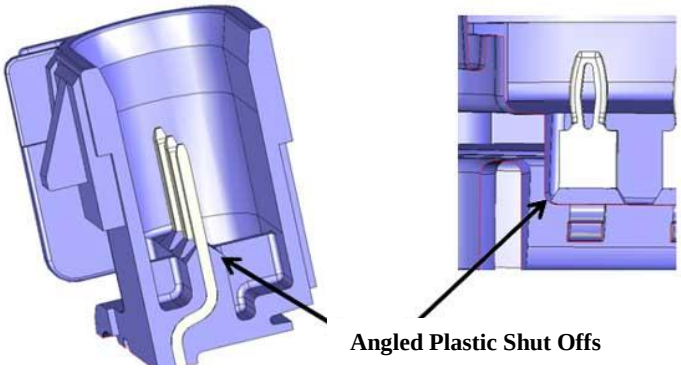


Figure 2 - Shoulder Design



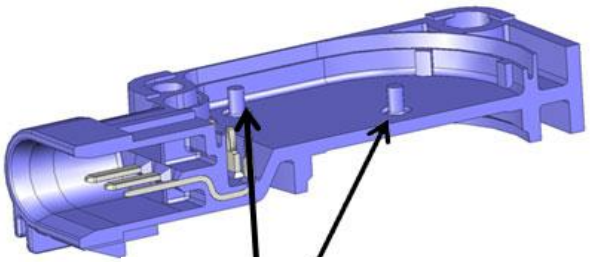
Angled Plastic Shut Offs

Figure 3

PCB Locating Posts

Incorporating PCB locating posts into the plastic mold design allows for consistent positioning of the PCB sub-assembly for pressing on to the pins. The PCB should always be properly located within two-axis space (X and Y) before being pressed on to the press-fit pins.

In some cases, the tip of the press-fit pins can be used as one of the datum posts but best practices indicate that secondary posts outside of the press-fit zone are a better design choice.



PCB Locating Posts

Figure 4

PCB Z-axis Positioning Stops

It is also important to control the distance that the PCB is pressed on to the press-fit pins. This can be accomplished by incorporating Z-axis positional stops into the plastic molded enclosure. Depending on the specific design, the floor of the plastic part's PCB section can also be used as the stop mechanism. Figure 5 illustrates for .64mm press-fit an example of the critical dimensions and considerations for pressing the PCB on to the press-fit pins in the molded assembly.

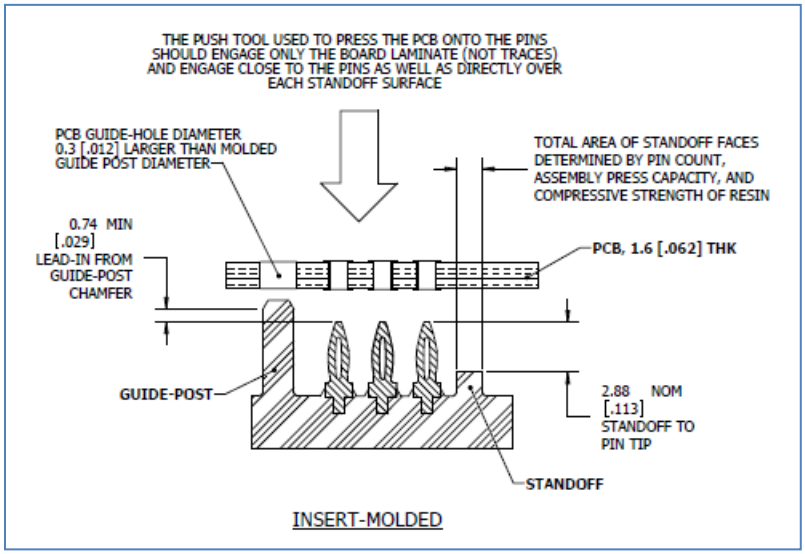


Figure 5 - PCB Pressing Guidelines

PCB Hold Down Options

There are a number of approaches that can be used to provide proper hold-down for the PCB after assembly and to assure robust operational capabilities throughout the product life cycle. For example, in very demanding environments, such as automotive applications, the incorporation of secondary anchors made from the press-fit pins can be a quite effective mechanical solution to help withstand high vibration and/or shock conditions (See Figure 6).

Using Secondary Anchors on Press-Fit Pins

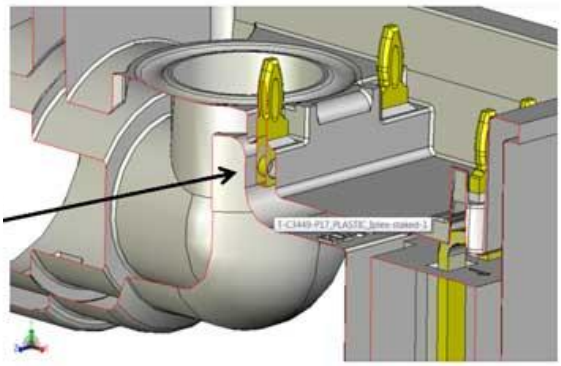


Figure 6 – Press-Fit Pins with Secondary Anchors

Other effective PCB hold-down methods include using locator posts that double as weld tabs to lock in the PCB or back-filling the cavity with an appropriate soft resin material. In some cases, it is possible to use the lid as a hold-down mechanism but this can be difficult in precision applications because of variances in the stack-up tolerances and PCB thickness tolerances.

Managing Bend Radius

In some applications, it is advantageous to create bends in the interconnect path in order to keep moisture out of the package. Press-fit interconnects can accommodate a variety of bend path configurations, however it is important for designers to understand the characteristics for spring based materials used in press-fit pins. For press-fit material, the minimum bend radius is typically two times the material thickness and some specialized materials can go down as far as 1.5 times.

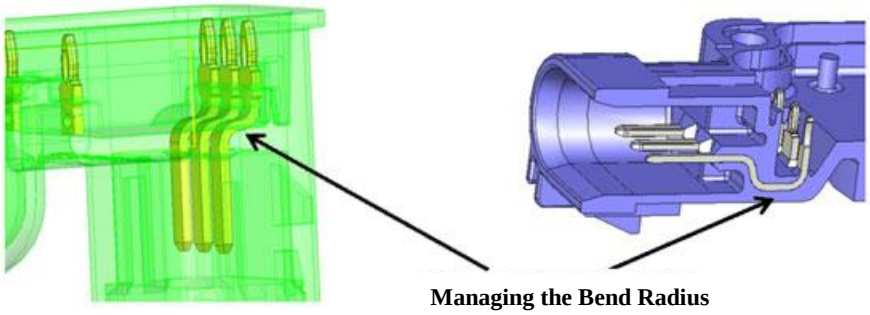


Figure 7 – Bend Radius

PCB Edge Distance and Force Management

Another key to success is management of the distance between the PCB edge and the press-fit pin. Press-fit pins do apply force on to the PCB and when a press-fit pin is close ot the edge of a PCB, it is important that there is enough material between the press-fit hole edge and the edge of the PCB to help avoid PCB breakout. Best practices recommend that the distance from the press-fit hole to the PCB edge be at a minimum equal to the press-fit hole diameter. It is also recommended that the tooling for pressing the PCB include tool steel around each row or column of pins as well as between the last press-fit hole and the edge of the PCB (see Red Box in Figure 8).

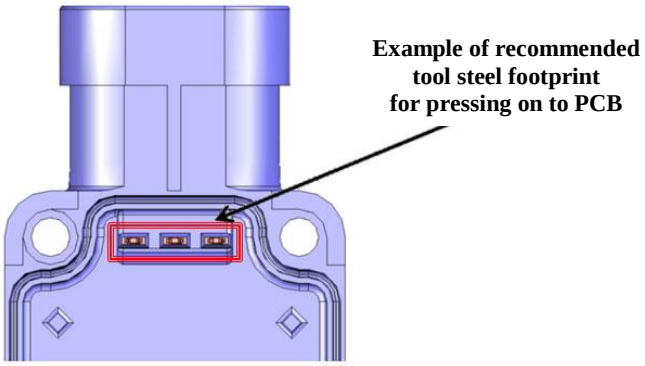


Figure 8 – Tool Steel Footprint

In addition, it is important to include force monitoring and appropriate process controls to assure successful press-fit engagement during the PCB assembly process.

Summary

Compliant Press-Fit interconnects have become an important enabling technology to support the proliferation of standard and custom molded electronic modules used in a widening range of applications. The inherent advantages of solderless assembly, simplified manufacturing processes, robust thermal characteristics and adaptability into a variety of high-volume stamping configurations make press-fit pins the preferred option for many module design projects.

By understanding the key issues outlined in this Tech Bulletin, module designers can plan ahead to specify the best press-fit configuration to meet their specific requirements and to optimize both the design and manufacturability of the final module assembly.

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.