

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

Part 2- Global Production Standards, Materials, Tooling and Process Controls

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.

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 production standards, inspection criteria and process control plans
- Worldwide tooling standards, functional testing and application support

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

The first Tech Bulletin in the new series addressed Design, Testing and Documentation issues.

This second Tech Bulletin in the series focuses on the rest of the key areas:

Raw Materials and Plating Process Controls

Global Production Standards & Inspection Criteria & Process Control

Worldwide Tooling Standards, Functional Testing and Application Support

Raw Materials Selection and Plating Process Controls

Because materials selection and plating processes are critical for press-fit success, suppliers must pay special attention to specifying and controlling these key factors throughout all of their production facilities. They also must have a solid understanding of how various alloys can impact performance, conductivity, formability, temperature capabilities and cost.

As summarized below, there can be significant variation between alloys and product engineers should be able to rely on their press-fit suppliers to help assure the right fit to meet the specific application requirements as well as the budget.

Alloy	Spring Performance	Cost & Availability	Conductivity	Formability/ Bend	Temperature-Max
CuSn (C5XX)	Best-Good	Best	13% to 20%	Fair	125°C
CuZnSn (C425)	Best	Fair	30%	Good	125°C
CuNi3Si (C7025)	Best	Fair	40%	Good	175°C *
CuNiSi (C19010)	Best-Good	Good	50%	Best(*)	175°C *
CuCrAg (C18080)	Fair	Fair	80%	Good	200°C *
Others-19210/ CuFeP /CuCrSi/BeCu/etc	Fair	Fair-Limited	Various	Good to Best	125°C to 175°C

Figure 1 – Comparison of Alloy Characteristics

The use of advanced alloys can enable press-fit interconnects to be tailored to meet a wide range of application requirements. For example, 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 up to 150°C temperatures. Depending on the alloy chosen and the pin configuration, Press-Fit interconnects can provide retention force of up to 14 lbs and current carrying capacities of 30 amps or more through a single press-fit eye.

To ensure the best results, consistent raw materials and plating process controls must be carefully managed by the interconnect supplier, no matter where the parts are manufactured.

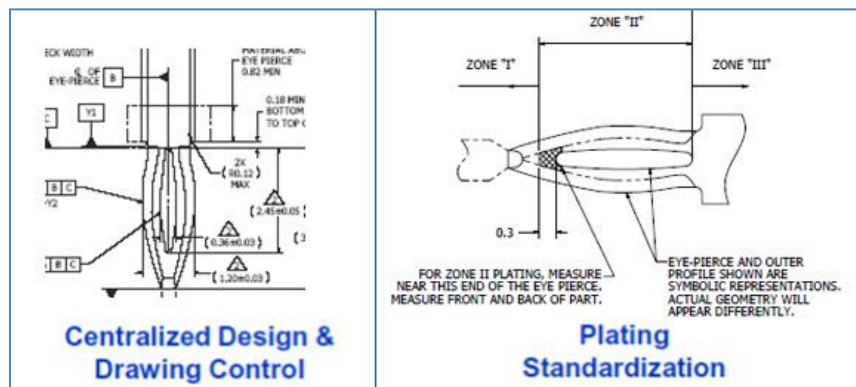


Figure 2 – Centralized Design Control and Plating Standardization

Global Production Standards, Inspection Criteria & Process Control

Because solder-free press-fit interconnects have become a key enabling technology for many globally dispersed industries, such as automotive, communications, power modules, mobile devices, etc., customers must be sure that their press-fit suppliers are delivering the exact same components wherever in the world they are needed.

To achieve the required results, it is critical that the suppliers must be able to stringently control and standardize their own manufacturing processes in order to deliver consistent press-fit components across all of the customer's global requirements. For press-fit interconnects the standardization of production tooling, documentation, inspection methods and quality control criteria are all critical for achieving global consistency.

For example, automotive manufacturers throughout the world expect press-fit to be able to meet a series of stringent performance criteria as summarized in Figure 3.

- Mechanicals: Insertion and Withdrawal force.
 - 0.64mm (.025") Thick- Insertion Force max. 97N (22.0 lbs.)/Minimum Hole Condition & Retention Force Min. 20N (4.5 lbs.)/Maximum Hole Condition
 - 0.80mm (.031") Thick- Insertion Force max. 177N (40.0 lbs.)/Minimum Hole Condition & Retention Force Min. 62N (14 lbs.)/Maximum Hole Condition
- Contact resistance : 1 mΩ max (Typical 0.5 mΩ max)
- Vibration in Temperature : Sine on Random :
 - Effective overall acceleration of sine on random excitation: 130.5...207.9 m/s²
- Thermal Shock (-40°C to +150°C ,30 mins cycles (500 or 1,000 cycles)
- Climatic Sequence : Cold & Dry Heat 1024 Hours (-40°C to +150°C) ; Damp 24 hours @ 95% RH)
- Mix Flowing Gas- 4 Gas Test. 21 days @ 75% RH
- Whisker testing: Before and after Environmental
- Plated Through Hole Integrity IEC 60352-5 - Before and after Environmental
 - 3 pins minimum tested in min & max holes
 - 5 cross sections in vertical axis & 5 cross sections in horizontal axis

Figure 3 - Typical Automotive Performance and Test Requirements for 150 °C Applications

Achieving the required level of consistency requires suppliers to invest in disciplined and documented Global Process Control Plans and Inspection Standardization.

CONTROL PLAN						
<input type="checkbox"/> Prototype		<input type="checkbox"/> Pre-Launch		<input checked="" type="checkbox"/> Production		
Control Plan Number			Key Contact/Phone			
Interplex press fit 001			Dennis Segalmetz / 954.286.3572			
Part Name/Last Change Level			Core Team			
N/A			Jim Marlette, Rich Schneider, Jase Lynch			
Part Name/Description			Supplier Plant Approval/Date			
Interplex press fit			N/A			
Supplier Plant		Supplier Code		Other Approval/Date (if Rec'd)		
N/A		N/A		N/A		
PART/PROCESS NUMBER	PROCESS NAME/OPERATION DESCRIPTION	MACHINE/DEVICE NO. TOOLS FOR MFG.	CHARACTERISTICS			SPECIAL CHAR. CLASS
			NO.	PRODUCT	PROCESS	
starting	Final article validation	NA		Appearance		

Global Control Plan/FEMA



	DIM	TOL	MIN	MAX
01	1.68	+/-0.03	1.63	1.69
02	0.68	+/-0.03	0.65	0.71
03	2.62	+/-0.05	2.57	2.67
04	3.72	+/-0.07	3.79	3.65
05	0.64	+/-0.03	0.61	0.67

Inspection Standardization

Figure 4 – Global Production Control Processes

Worldwide Tooling Standards, Functional Testing and Application Support

Press-fit suppliers need to be able to support customers' manufacturing requirements from geographically optimal locations throughout the world, offering logistics and production supply that is both application-knowledgeable and adaptable to customer requirements.

To achieve their production volume and yield goals, global customers using press-fit technologies need responsive technical resources to help with functional testing and application support for their internal assembly processes as well as for any sub-contractors involved in the press-fit applications.

For example, in a global automotive electronics application, press-fit components could be specified into power PCBs that are initially assembled in Asia and then are integrated into modules in Europe or North America and ultimately deployed into vehicles throughout the world. In these instances, a press-fit supplier that can quickly and competently help solve problems anywhere in the product chain can make all the difference for achieving successful results.

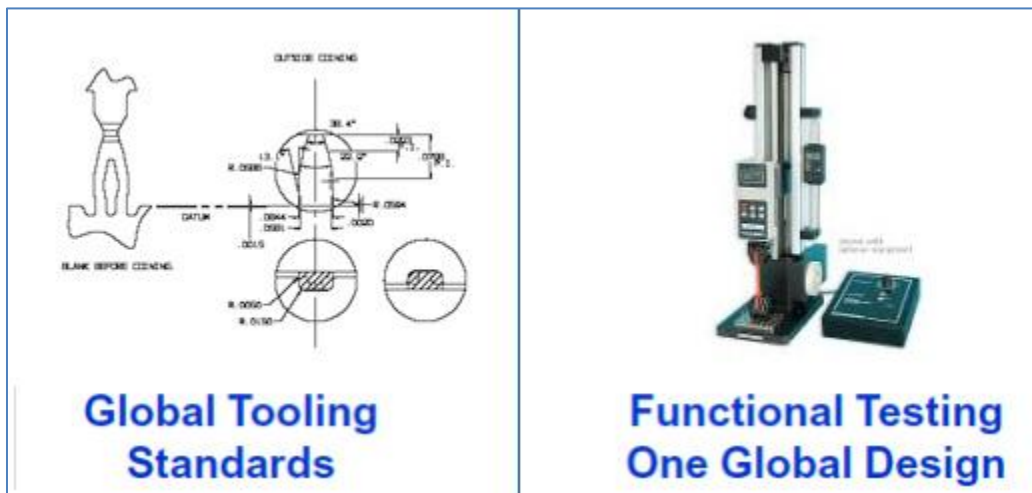


Figure 5 – Global Tooling Standards and Functional Testing

Summary

The bottom line is that press-fit technology has now matured into a powerful set of solutions to eliminate solder, avoid complex secondary production processes, improve reliability and reduce 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, as well as the global reach of 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.