Interplex

Solder Attach Tech Bulletin

Solder-Bearing RF Shields Streamline PCB Assembly, Reduce Costs, Improve Quality and Eliminate Signal Leakage

This Tech Bulletin addresses the specific challenges involved with soldering RF shields to PCBs and explains how using solder-bearing technologies to pre-apply solder to the shields can significantly improve assembly processes and productivity, while enhancing quality of the final product.

This issue has become especially important with the widespread requirements for RF shielding that is used in small form-factor products such as Smartphones, tablets and other handheld devices that require consistent quality within very high-volume production environments.

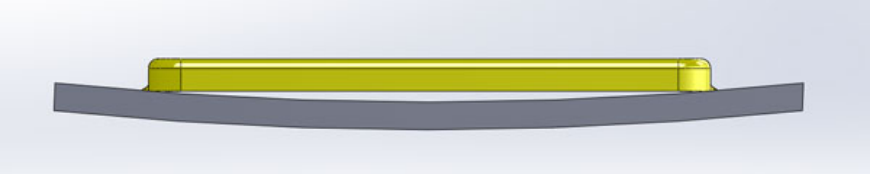
The following sections provide information on these key issues:

- Challenges with shield assembly in high-volume, compact-sized products
- Costs of secondary solder application
- Costs of undetected problems and shield pop-up
- One-step approach with solder-bearing shields
- Design, fabrication and testing considerations

Key Challenges of Shield Assembly and Soldering

Integration of RF shielding is a critical element in a widening variety of product designs, ranging from communications infrastructure systems to the plethora of mobile handheld devices that have become a ubiquitous part of our daily lives. As these products are getting smaller, more complex, and are offering higher performance features, the integration of RF shielding has become more challenging.

For example, longer shields (over 30mm) can exhibit a gap between the shield and the PCB, such as shown below. This can be due to a combination of coplanarity issues with the PCB and/or the RF shield itself. It can also result from warping of the PCB during production line assembly and soldering, in which case, the problem does not become apparent until after initial assembly. The extra thin PCB materials, denser circuitry and higher frequency signals in new-generation devices are all combining to make these shield assembly problems a critical issue.



If gaps between shielding and PCB substrates are not addressed, it can lead to signal leakage that reduces the effectiveness of the shielding and degrades product performance, as well as mechanical stability problems that can cause hard field failures of the devices.

Costs of Secondary Solder Application

The above described problems can result from variations in the application of solder and/or flux to the bare shields, which cause in lack of consistency in the solder joint integrity after initial assembly.

One way that the industry has been dealing with this issue is to inspect each product after initial assembly and to selectively add solder balls in order to fill the gaps. However, this approach presents a number of problems, including:

- Cost and time of post-assembly inspecting and selecting items for rework
- Solder ball application and soldering cost (can add $0.10 to $0.20 per assembly)
- Potential damage to sensitive parts during secondary re-heating of assemblies
- Potential risk of shorting or solder-bridging during secondary soldering steps
- Potential risks of higher scrap due to inconsistent secondary soldering processes

The bottom line from a production standpoint is lower throughput, higher cost and increased waste.

Costs of Undetected Problems and Shield Pop-up

Another issue that can be even more problematic is the risk of undetected solder problems with the RF shielding, which can lead to “shield pop-up” or detachment during the product life cycle and therefore results in higher field failure rates.

In today’s highly competitive markets for phones, tablets and other consumer devices, every product maker’s reputation is under constant pressure and scrutiny. Each new product launch is a high profile event and is quickly followed by widespread user feedback, market reviews, and competitive comparisons, all amplified by the megaphone of social media. In this environment, any trend toward perceived or real field-failure problems can quickly gain a life of its own and critically harm a company’s reputation, market share and profitability.

Whenever such problems can be traced back to suppliers, such as RF shield pop-up issues, the supplier reputations and profitability are also at great risk. The best solution is to proactively take corrective measures within the assembly process and to avoid the root cause of RF shield assembly gaps and/or inadequate solder-joint formation – during the initial assembly/soldering steps.

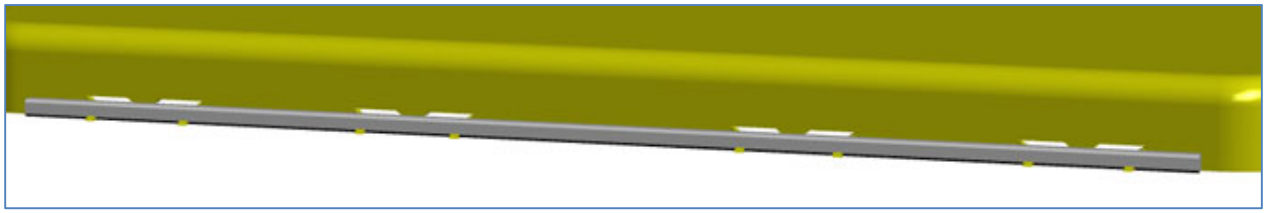
One-Step Approach with Solder-Bearing Shields

This alternative addresses the problem of shield gaps and the risks of shield pop-up before they can occur by incorporating a precise amount of solder onto the RF shields during their fabrication.

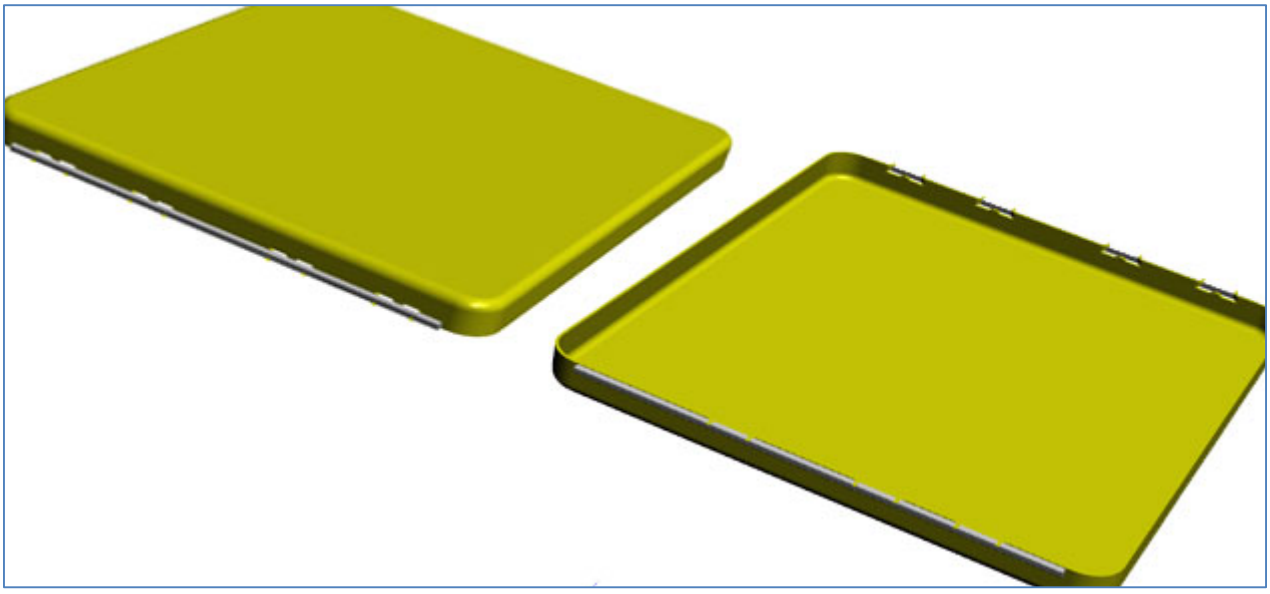
This approach leverages years of technology advances and innovation in the solder-bearing lead segment, which focuses on integrating solder and/or flux directly into all types of components during the design, stamping and fabrication processes. The goal is to create parts that are ready for placement and soldering, without the need for secondary dipping or other solder/flux application steps and which can deliver 100% solderability results while streamlining the production process.

For example, in a solder-bearing shield application such as the one shown below, the solder would be integrated directly into the shield during its fabrication.

By incorporating the precise amount of solder as part of the shield prior to its placement on the PCB, this approach not only eliminates the need for applying solder/flux to the shield; it avoids the process variations that can lead to gapping and/or inconsistent solder-joint formation.



Because it is an integrated part of the actual shielding fabrication, the solder-bearing shield technique can easily be adapted for virtually any shape, size or configuration of shield. Application specific ready-to-place solder-bearing shields can be custom tailored to conform to the exact product design requirements, including the ability to easily provide shielding on two or more sides of the device.



Summary: Solderability Improvements and Yield Advantages

Over the course of decades of development, refinement and applications-specific deployments, solder-bearing technology has been shown to deliver 100 percent solderability results, while reducing the cost and complexity of secondary operations. The bottom line outcome has been a significant increase in production yields and product reliability.

By using flexible shield manufacturing techniques, these yield, quality and productivity advantages are now being seamlessly adapted to streamline and improve production results for a widening range of shielding configurations and applications.

More information regarding Solder Bearing Lead Technologies and products can also be found on the web by visiting http://www.interplex.com/nas or by calling (201) 367-1300.