

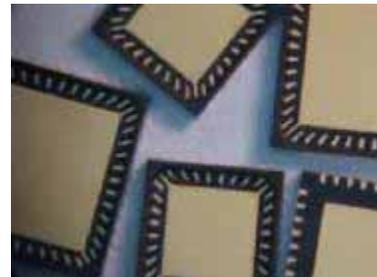
## Technical Article

# The Need for the Open Molded Plastic Package

By Casey Krawiec, Global Sales and Marketing Manager, Quik-Pak

When you need to meet a project or customer deadline, can you count on your outsourced semiconductor assembly and test (OSAT) provider to get you the parts when you need them? If the answer is “no” or “it depends”, then you will clearly understand the value of having open molded plastic packages readily available for quick-turn assembly.

OSATs are very good at rapidly producing large quantities of particular packaged device. But what about small quantities of many different packaged devices? The reality is that OSATs aren't structured to support product development and device verification processes. That's where smaller, more nimble companies that stock open molded plastic packages can provide cost-effective solutions for customers who need low to mid-volume packaging.

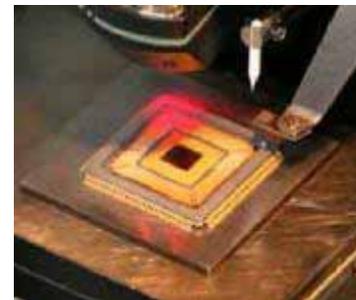


### Choosing the Package

If you are a device design engineer in the U.S., where do you get your initial run of new devices packaged so that you can test them and how do you choose the package? It is comforting and practical if the device is packaged in the same form factor that it will be when it goes into high volume manufacturing (HVM). The comfort comes from not having to guess how the performance of the tested package device will compare to that of the mass-produced package device. It's an even better solution if the packages used for prototypes match outlines for which test sockets have already been developed. There are numerous acronyms for standard package outlines. Some of the most popular in use today include quad flat pack no leads (QFN), thin quad flat pack, (TQFP), and small outlined integrated circuit (SOIC).

### Where to Package

Even when you have selected your package type, you still have to decide where to have the new devices packaged. What if the wafer with the new design is produced in the U.S.? Does it make sense to ship it overseas to be assembled and then have it returned to you so you can evaluate the performance? Even the large OSAT provides quick turnaround; it can be a time-consuming process, especially if it takes several iterations before you are satisfied with the



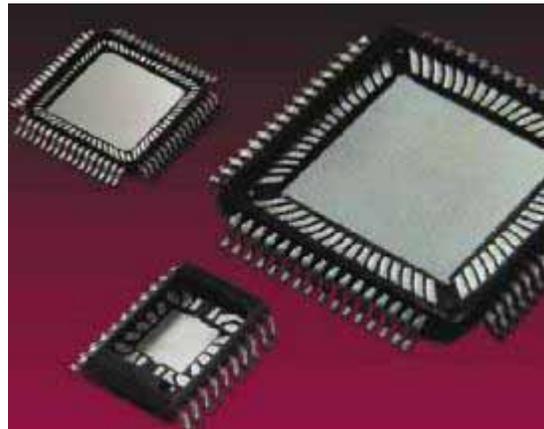
performance of the packaged device. If time-to-market is important, you don't want to be handcuffed with this kind of supply chain scenario. It might work a little better if the wafer is fabricated offshore near your assembler, but a lengthy iterative validation process may make your sales department go nuts.

There are numerous companies in the U.S. that provide outside assembly services. Nearly all of them focus on something other than high-volume injection molded packaging because it's difficult to be cost competitive with offshore OSAT companies. Labor costs and overhead are too high in the U.S. to make a living, they focus on assembly services that require special processes or on product that hasn't reached a high enough volume to be of interest to OSATs.

Therefore, a U.S.-based assembly company can provide a solution. What else do they need to have besides being located in the same continent? It's a given that they need to be able to assemble the devices. What else is needed? In a perfect world, they (the U.S.-based assembler with the solution) will have injection or transfer molding equipment with tooling for every conceivable package outline that you may need to test your device. And the equipment has to be perpetually available. If there is a queue of days or weeks, the OSAT might be the better way to go.

### **The Open Mold Advantage**

Since having all the transfer molds readily available at the drop of a hat isn't feasible for a multitude of reasons, the next best solution is to have open molded plastic packages in stock in all the various outlines. These will be plastic packages with open cavities. The assembler can place the device in the cavity, wire bond the pads to the leads, and then encapsulate everything with a plastic material. The plastic encapsulation will put the device in an environment that is virtually identical to when it's assembled by the OSAT in high volume with injection-molded plastic. Ceramic or glass-to-metal seal packages with open cavities can also be used, but there will be a difference in electrical performance since the electric path is composed of materials that are different from the high-volume packaging configuration.



An added advantage of using the open molded plastic package instead of injection molded packaging is that the open cavity allows for the device and wire bonds to be left exposed. During product

validation, especially for applications that have high frequency signal transmissions and the device design engineer may want to view the wire bonds. Viewing the wire bonds and having access to them can allow the design engineer to optimize the performance. Wire bond length and the shape of the wire bond loop may contribute to the device's electrical performance, so, being able to provide some packaged devices without encapsulation is a real benefit because it can help reduce the number of iterations to determine optimal performance. Another obvious benefit of using open molded plastic packages is that they accommodate devices that require air gaps above them. Imaging devices, MEMS, and

MMICs are a few examples of devices that may require air gaps. So, are there any U.S. companies that have a virtually unlimited number of open molded plastic packages in stock in all sorts of package configurations? There are. They exist.

The key to providing a successful alternative to the overseas OSATs is the amount of time it takes for the U.S. company to turn assembly jobs. They have to have short turn times on prototype builds. Excess capacity isn't necessarily nearly as critical as having manufacturing flexibility to meet surges in demand. A talented, cross-trained workforce is one of the key components to being flexible. Another is the equipment set. Investments in the latest equipment have been made to stay in step with the leading-edge semiconductor technologies. Newer equipment will tend to be faster and have greater flexibility. Lastly, if the assembly and packaging company can offer some level of wafer processing, it makes the U.S.-based solution even more appealing.

### **Conclusion**

The existence of open molded plastic packages enables rapid turnarounds for prototype packaged devices. Die designers are often pushed to validate the performance of their new designs as quickly as possible. The time-to-market is often paramount. OSAT infrastructure and geographical location makes it a challenge for them to support quick turn prototyping for U.S.-based semiconductor design firms. With the availability of open molded plastic packages, companies with flexible assembly operations can provide the support that is required.

*Casey Krawiec, Global Sales and Marketing Manager, Quik-Pak*  
[www.icproto.com](http://www.icproto.com)