Technical Article

Gaining Time and Creativity without Compromise

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In this world of shortening product cycles and highly competitive pressures, faster time-to-market is essential. At Quik-Pak, a division of Delphon Industries, they know all too well what it means to "sell time and creativity" in the Semiconductor Industry without compromise to quality or workmanship. At the end of an intense silicon design project and several weeks of wafer fabrication, the last steps to complete prototype integrated circuits are packaging and test. By the time these first wafers are ready for packaging, there is intense pressure to quickly validate and confirm whether the design works to specification. With the competitive market driving the need for innovative products, more design engineers, product managers and packaging professionals are seeking domestic US-based support with prototype development and fast-turn assembly.

Even with expedited shipping, the bi-directional transit process including handling, customs etc. can add multiple valuable days to offshore assembly of prototypes. For US-based fabless design companies, there is a significant time advantage to leveraging the skills and services of local on-shore assembly providers such as Quik-Pak. Certainly, one level of validation is available at wafer test, but it then almost always requires some packaged prototypes to be able to fully test at-speed performance under packaged conditions. Only when these test results are available, will designers know whether a re-spin of the chip design will be necessary or if they can proceed to production release.

The approach to obtaining fast turn-around prototype packaging will vary depending on the package style to be used. For wire-bond solutions, the primary consideration is in sourcing the correct leadframe or, even better, open cavity "blanks" ready for the die to be quickly attached, wire bonded and sealed. Wire bonding gives considerable flexibility to fitting the die into the selected package by simply programming the location of the ends of the wires to be bonded. A range of pre-molded open cavity packages (OmPP) are available to accommodate different die sizes and pincounts. When a specific package is required to optimize the chip's performance and fit into the test socket or application, then another fast way to source prototypes is by utilizing Quik-Pak's proprietary Open Cavity Plastic Packages (OCPP). This process utilizes mechanical samples, test rejects, or excess inventory to create "like new" open cavity packages with the exact package to be used in production. This results in the die being loaded with the correct parasitic package parameters that could affect performance and ensures that these quick-turn packages are tested under ideal conditions. For chips where the ultimate in performance is required, even short wire bonds can be too much of a load on the die and in those cases, designers

often select flip chip assembly.

Flip Chip
Performing flip chip assembly of a bumped die actually comprises fewer steps than that of wire-bonded products. However, the big challenge lies in the substrate. Each design has a unique footprint for its power and signal contacts, so the substrate has to be designed to exactly match this footprint. These substrates must therefore be custom designed and manufactured in time to meet up with the wafers as they exit the Fab.

For chip designers who have spent months on the complexities of silicon layout, they may not have the time or experience to complete the substrate design. At Quik-Pak, there are resources to handle the substrate design and work with the substrate manufacturer to ensure that substrates are in fact available in time for prototype assembly. This way, when wafers arrive at Quik-Pak, they can go through bumping, thinning, sawing and dicing before being flip chip assembled on to the matching substrate. All that then remains is the application of underfill adhesive, marking and the finished prototypes can be quickly returned to the designer.

Customization
Some products may require custom package considerations either before or after prototypes have been tested. For example, it may be necessary to incorporate optical devices, MEMS, or other chips into the same package. These may even require special tooling or fine-alignment to achieve the desired results. It is also common to find that initial test results indicate some level of fine-tuning of the package is required. Hence it is essential to use a packaging supplier with the creativity and experience to deliver the right solution quickly.

Prototypes and early volume requirements can certainly be met expeditiously by suppliers like Quik-Pak. However, ultimately most chip designers need to go offshore to achieve volume and cost objectives. To ensure a smooth transition, the prototype development must consider the requirements for scalability to full production at the targeted offshore vendors. This is where there is no replacement for experience in achieving the fastest ramp from first silicon to volume production.

Whether it's an unexpected delay with a design tape out and wafer fabrication or a special application, IC Designers and Product Engineers continue to take advantage of the full turnkey solutions available at Quik-Pak. From wafer back grinding, saw and dicing, all the way to chip assembly and packaging, their services enable customers to turn an idea into reality within a matter of hours.

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