Does the FPGA Industry Face Peril? *Pt. IV*

Martin Hart
TopLine Corporation

PART III OF THE SPRING 2020 MEPTEC REPORT titled "Call to Action" disclosed gaps in the diminishing supply base that collectively threatens America's leadership position as a producer of Field Programmable Gate Array (FPGA) devices.

Coming Soon: Multiple Subcontractors Column Attachment Services

FPGA devices used in defense and aerospace applications must be produced by suppliers on the Qualified Manufacturing List (QML). Multiple contractors are at various stages of tooling up, waiting for Defense Logistics Agency (DLA) certification to provide copper wrapped column attachment services on FPGA and ASIC packages. Six-Sigma, based in Milpitas, California, is already QML-38535 approved for attaching copper wrapped columns. VPT Components and Micross Components have also demonstrated the capability to perform these services, and other suppliers, including Golden Altos, plan to offer them. By the end of 2021, it is probable that five contractors will be qualified to attach columns to FPGA packages, pending DLA QML certification.

Covid-19 Heightens Risk of Delay

In September 2018, the Department of Defense published a document titled, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United Stantes" that clearly identified ten risk assessments that can potentially derail America's dominance in warfighter technology. One-year after its publication, a world pandemic, known as Covid-19, has introduced new risks not previously considered. An early casualty of Covid-19 was an advisory to halt travel to conduct QML-38535 audits by DLA employees. DLA audits that were scheduled in March 2020 were abruptly cancelled without rescheduling dates. This unexpected event blocks new suppliers from participating in the QML market. The postponement of DLA field audits means that there is now an indeterminate delay in qualifying additional qualified suppliers to make QML FPGA devices. This author wonders: would DLA consider conducting virtual QML audits using video platforms, such as Zoom or Microsoft TEAMS, to support the supply chain?

Financial Impact of Having a Monopoly Supplier

The copper-wrapped column attachment service business is currently dominated by a single-source monopoly. Historically, monopolies, left unchecked, tend to drive up costs, extend delivery times, and generally dampen customer satisfaction. It is anticipated that the introduction of fresh competition to perform column attachment services will establish competitive pricing and speed up deliveries. Multiple vendors offering copper wrapped column attachment services increases the likelihood that a strong and resilient manufacturing and defense industrial base and supply chain in the United States will result. Original Device Makers (ODM) have noted that FPGA and ASIC packages are suspended in financial limbo for more than a year while products remain in a state of work-in-process (WIP) before generating cash flow.

There are many manufacturing steps required to produce ceramic FPGA devices. In the first stage, it takes a minimum of six months to procure and produce Land Grid Array (LGA) packages consisting of ceramic housings along with necessary die bonding and lid sealing. Then, it takes another six months for the current monopoly supplier to attach solder columns to convert the LGA package into a Column Grid Array (CGA or CCGA). Finally, it takes months to perform final testing before the customer receives delivery. This lengthy procuration and production cycle can be significantly reduced by having multiple capable vendors, because they collectively have the bandwidth to perform column attachment services in weeks rather than many months.

New Markets Imminent

In Part V "Call to Action" we will take a peek at the emerging market for A.I. and 5G that utilize super-sized organic packages, components that are too large for reliable BGA packaging. Alternative interconnects, other than solder balls, are needed to ensure reliability. This is a burgeoning market sector wherein solder columns are required, because they reduce stress caused by mismatches in the Coefficient of Thermal Expansion (CTE) in the package and connection to Printed Circuit Boards. A new type of solder column utilizing copper braid, rather than copper wrapping, has the potential to dissipate more heat while offering compliancy to extremely large A.I. and 5G base station packages.

Braided Column. *U.S. Patent 10,477,698*

Conclusion

U.S. manufacturing of copper wrapped solder columns is available even today. By the end of 2021 it is anticipated that five or more subcontractors will be offering column attachment services to the industry once DLA is able to resume auditing and certifying new QML suppliers of column attachment services. Establishing strength in this critical area will result in enhanced readiness, greater security of supply, and fewer program delays caused by the potential inability to deliver FPGA components in a timely manner. ◆