

# Does the FPGA Industry Face Peril? Pt. II

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PREVIOUSLY, PART I OF THE FALL 2019 MEPTec REPORT “Call to Action” addressed a concern that the main producers of Field Programmable Gate Arrays (FPGA) rely on a single source subcontractor to attach copper wrapped solder columns as their final production step. The Defense Logistics Agency (DLA) publishes a list of supply chain subcontractors authorized to assemble FPGA devices in the Qualified Manufacturer List (QML-38535).

Stakeholders have reason to be alarmed. A production stoppage of critical FPGA devices could result in the failure of the defense industry to fulfill commitments for delivery of warfighters. Radiation Hardened FPGA packages are constructed to withstand intense radiation and high temperatures in order to satisfy mission requirements.

## Supply Chain Resiliency

Several risk archetypes for achieving a robust and resilient production of FPGA devices include a diminishing domestic manufacturing base and a fragile market as described in the Department of Defense (Presidential Executive Order 13806) Industrial Policy report titled, “Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States”. FPGA packages with solder columns are produced in a low-volume manufacturing environment; as such, around 75,000 individual FPGA devices spread over 100 different outline packages are produced annually. Total annual volumes of 70 million copper wrapped solder columns are minuscule when compared to volumes of Commercial Off-The-Shelf (COTS) FPGA devices consuming billions of solder balls.

Attaching solder columns to FPGA packages is substantially different from attaching solder balls that dominate the COTS market. Solder columns are cylindrically shaped pins that must be held vertically in place by precision machined fixtures without slant-

	CAGE Code	Parent Company
1	1RU44	BAE Systems PLC
2	65342	Cobham plc
3	65786	Cypress Semiconductor, Inc Acquired by Infineon Technologies AG
4	34168	Honeywell International, Inc
5	0J4Z0	Microchip (Microsemi)
6	F7400	Microchip (Atmel)
7	OC7V7	Teledyne Technologies Incorporated
8	01295	Texas Instruments Incorporated
9	68994	Xilinx Incorporated

Producers of FPGA devices with solder columns (in Alphabetical order).

ing or falling over at any time during the entire attachment and reflow process. A final assembly step requires that the entire matrix array of up to 1752 columns be planarized without damaging a single column. No manufacturing defects are allowed. Talented operator skills must be employed during every step in the process of attaching columns to FPGA packages. Attaching copper wrapped solder columns to FPGA packages is fundamentally a non-automated, artisan process.

Fortunately, royalty-free, U.S. manufactured copper wrapped solder columns are readily available today in the supply chain without delay. However, starting from scratch, it could take 24 months for alternative subcontractors to undergo the arduous process of attaining QML status for column attachment services.

## Monetary Considerations

Companies that produce FPGA devices are not required to voluntarily qualify multiple subcontractors to attach copper-wrapped solder columns to their products. A lack of funding by FPGA manufacturing is most often cited as the primary reason for not qualifying a second source. Multiple microelectronic subcontractors in the supply chain are ready, willing and able to provide

column attachment services as long as funding is available to pay for the cost of QML qualification. A sizable investment would be required to support an accelerated initiative by FPGA makers to mitigate risk and qualify multiple subcontractors to attach copper wrapped solder columns. FPGA makers need to take the lead in initiating the qualification of alternative subcontractors. As a practical matter subcontractors cannot independently apply for QML status without the support of the FPGA maker.

## Conclusion

It’s time for advocacy stakeholders to initiate a shared vision to ensure a robust, resilient and sustainable supply chain for FPGA devices. Domestic manufacturing of copper wrapped solder columns is already available. The next step is to qualify multiple microelectronic subcontractors who are ready and willing to provide the critical process of copper wrapped column attachment services for FPGA packages. A prudent investment today can mitigate the risk of waiting for an unexpected disaster to strike, potentially costing the defense industry hundreds of millions of dollars. A production stoppage of critical FPGA components could ultimately diminish market readiness, possibly tipping the balance of peace in the World. ♦