



The [Defense Business Accelerator, or DBX, Microelectronics Challenge](#) aims to revolutionize how the Department of Defense (DoD) drives the development of dual-use technology, which can be used for both civilian and military applications. (Learn more about the challenge following the story.)

DBX Awardee Story: **Mosaic Microsystems Mission is Clear**

The team at Mosaic Microsystems is putting thin glass technologies to work, enabling a major leap in microelectronics.

For device builders, it's no longer just about the sheer power of the underlying semiconductor. Increasingly, how the chips connect to the rest of the electronics system is just as important, particularly when it comes to ground-breaking applications that threaten to overpower existing hardware and design strategies.

This need for more advanced methods to connect multiple chips on a single casting, using more capable materials, is the driving force behind Mosaic Microsystems. Instead of traditional organic laminate or silicon substrates, the company specializes in thin glass packaging. Mosaic works individually with clients to build interposers designed to support specific use cases.

It's part of a growing trend in electronics design, with demand shifting from a single semiconductor chip to many connected, smaller chips. The growth of so-called "chiplets," which can deliver even greater power and performance, promises to help bring powerful technologies like Artificial Intelligence (AI) and future innovations like sixth generation cellular networks (6G) to life.

"You can't have chip packaging as an afterthought. You really benefit from having the design right from the start of how to connect the chip all the way to the outside world, instead of just worrying about the chip," said Shelby Nelson, chief technical officer at Mosaic Microsystems.

Bringing packaging back to the U.S.

For sophisticated applications, it's not enough to just place a semiconductor chip in its own package on a panel and expect it to work with high speed and great performance. Instead, it needs to be connected to other chips, and the entire electronics system — using what is commonly referred to as semiconductor advanced packaging. And as design gets more

complicated with the growth of chiplets, there's a need for more advanced packaging techniques and materials.

While organic laminate or silicon-based packaging may be used in many devices, the performance delivered by both materials suffers under certain conditions. For example, the Department of Defense (DoD) may need military devices to work in very humid or very dry conditions, requiring hermetic packaging. A commercial customer may require very thin routing lines to build the many connections on the interposer. Or radios may need to work in very high frequencies, like with next generation 6G systems, which are of interest to both commercial and military entities. In each of these scenarios, existing packaging methods struggle. But glass excels.

"For some applications, glass is going to win. For others, you're going to stick with other substrates. But the density of the circuitry can be limited by the substrate roughness. With a typical organic substrate, you can't make the connecting lines very small. Glass is super smooth, which enables a super high density for routing lines" said Nelson. "Glass also is useful for demanding applications because it doesn't absorb moisture, so the insulating properties do not change with humidity, and not much with temperature either."

Some products, like cell phones, require billions of identical components stitched together in cookie-cutter patterns. But the public and private sectors alike are increasingly looking to create and iterate on custom designs, potentially built on thousands of components, to deliver more optimal outputs for specialized or experimental applications. Manufacturing the material that enables this customized packaging is what Mosaic Microsystems specializes in.

While outsourcing manufacturing of interposers — the connective glue carrying electric signals between the chips — to overseas producers was an option, Mosaic wanted to keep production in the U.S. This required building a domestic fabrication facility. But with such capital-intensive projects, later-stage investors can get nervous about the potentially long timeframe for a return.

Mosaic needed to convince investors of the opportunity in establishing these next-generation packaging capabilities in the U.S. — as well as the importance of onshoring a critical market currently dominated by international suppliers.

"People think outsourcing means just sending it somewhere to be produced. But it turns out an awful lot of invention happens when you produce things," said Nelson. "Building here, the intellectual property and trade secrets are captured here, to benefit the U.S."

Capitalizing on a new DoD program

Mosaic found out about the DBX Microelectronics Challenge Award a week before the application deadline. Created by the DoD and managed by the U.S. Partnership for Assured Electronics (USPAE), the DBX Awards support companies that are pursuing transformative technology that can be used by both commercial and government customers.

With quick work, Mosaic submitted its bid. And soon after, the team was in Washington D.C. as a finalist, pitching their company to the judges. After a round of five-minute presentations judged by a panel of investors and industry experts, Mosaic was selected as one of the winners and awarded \$1 million, funds that helped the company advance its technology.

“Cash is always king in any startup, and it was cash with flexible constraints,” said Nelson. “DBX allowed us to make some equipment investments, as well as invest in our production staff, so that we are going up in our manufacturing readiness level. And it’s helping give us credibility with potential future investors.”

With glass interposers rising in popularity, the DBX Award is helping Mosaic to go from prototype to production and bridge the so-called “Valley of Death” that often traps startups. “Glass as a material is suddenly really popular,” said Nelson. “DBX is helping us capture the opportunity.”

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What is the DBX Microelectronics Challenge?

The challenge was created by the DoD Manufacturing Capability Expansion and Investment Prioritization (MCEIP) office and is administered by the U.S. Partnership for Assured Electronics (USPAE). It provides monetary awards intended to help accelerate the commercialization of vital, next-generation capabilities that also have defense applications. With the additional funding from a DBX Award, companies can get the resources needed to overcome critical manufacturing or technology development hurdles to reach full-scale production more quickly.

With the DBX Award, DoD and USPAE are helping companies build a sustainable business to ensure the supply of essential hardware for both commercial and defense needs.

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