Community Reflections: The Impact of the EU CHIPS Act, the U.S CHIPS and Science Act, and Beyond– February 1, 2023

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A global trend towards nationalization that began before the COVID-19 pandemic, came to an inflection point because of it. Since then, governments around the globe are realizing the important role semiconductors play in everything from economic leadership to national security. This has sparked a trend in countries and regions investing in the localized semiconductor manufacturing ecosystem.

Two of the most notable government acts in 2022 were the signings of the EU Chips Act, and the US CHIPS and Science Act. As many of our members conduct business from and within these regions, we invited them to contribute reflections on how these events have impacted their companies so far. Here are their answers.

A Small Business Perspective

Paul Balentine, Mosaic Microsystems

As a small U.S. semiconductor packaging company, Mosaic Microsystems is very supportive of the CHIPS Act and looks forward to contributing to the efforts being taken to strengthen the U.S. semiconductor industry.

Our business focuses on the use of glass for substrates and interposers, which are critical technologies required by the industry to maintain a rapid pace of integration and innovation and essential aspects of building a strong U.S. semiconductor supply chain.

Figure 1: Mosaic's CTO, Shelby Nelson, presents the company's technology during the IMAPS DPC 2022 poster session.

With the slowing of Moore's Law, more efforts are being placed on package-level integration. Substrates play a critical role in advanced packaging. AI is pushing the limits of existing high-density interconnect substrates both in terms of feature size and thermal management. 5G is ushering in the era of mm-wave communications, which will require substantial innovations in design, with low-loss substrates playing a key role.

Glass has many properties that make it an attractive material for substrates and interposers. Mosaic's thin glass provides dimensional stability, small vias, and line widths/spacing, smooth surfaces, high resistivity, and low dielectric loss. Having a strong position in glass-based packaging will help the U.S. leapfrog foreign competition.

The CHIPS Act recognizes the critical importance of advanced packaging to the semiconductor industry as well as to the U.S. economy and national defense. While the U.S. accounts for 12% of IC fabrication, it only has 3% of the packaging market and essentially no IC substrate capability. These are Achilles heels for the U.S. There will be substantial investments in packaging from all three major components of the Act – the $39 billion incentives program, the $11 billion R&D program, and the $2 billion DoD ME Commons program.

Mosaic has been active in helping shape these programs by submitting responses to multiple requests for information issued by the Department of Defense and Department of Commerce, attending and participating in industry and government-led symposia, and participating in groups such as the American Semiconductor Innovation Coalition (ASIC). In addition to advocating for investments in packaging in general — and substrates and interposers in particular — we have been advocating for support for small businesses and regional cluster development. Small businesses are an important source of innovation and job growth for the U.S. semiconductor industry.

We have made multiple recommendations to NIST and the DoD on how to support small businesses and startups. As the CHIPS Act funding becomes available, Mosaic plans on having an important role in helping the U.S. build and grow its IC packaging substrate and interposer capabilities. In the Incentives program, we anticipate there will be funding for small businesses that plan to scale.

Mosaic is committed to growing its U.S. glass substrate and interposer manufacturing operations in Rochester, N.Y., and scaling it to high volume. In the R&D program, Mosaic is working with ASIC and other groups to

identify technologies and research projects to be funded under the National Advanced Packaging Manufacturing Program. And Mosaic is looking for opportunities to participate in both the Hubs and Cores portions of the ME Commons program. Mosaic looks forward to continuing to help shape and participate in the CHIPS programs.

Ready for US Growth to Address Supply Chain Challenges

Ramakanth Alapati, YES

At YES, we are positioning ourselves for growth that is expected to flow from the on-shoring of semiconductor manufacturing. As a global company, we understand the need for local manufacturing to address supply chain challenges. The governmental incentives persuading large multinational companies to base their manufacturing in the US and Europe are, we believe, simply speeding up a trend that is, in and of itself, a reasonable response to an environment of growing uncertainty.

Figure 2: The YES team exhibited at ECTC 2022 in San Diego.

The return of advanced node logic, memory, and advanced packaging to the United States and Europe, the electrification megatrend-driven growth in compound semiconductors, and the automation of life science products' manufacturing lines continue to underlie the aggressive growth trajectory of YES's business. We see some momentum coming from the CHIPS Act and similar governmental funding programs, but a significant acceleration in disbursing these funds are needed to drive sufficient onshoring of critical semiconductor products to meet the demands of these burgeoning markets.

The past three years have dramatically highlighted the vulnerability of our worldwide supply chains. And although the strictest COVID-related shutdowns are receding into the past, it is safe to say that we have not seen the end of disruptions caused by a changing climate, new pandemics, and a wide range of geopolitical factors still unknown. The increasing pace of economic and technological change will amplify these disruptions. We cannot keep those changes from happening. But as a company, we can be smart about how we prepare for them, and what adaptive decisions we choose to make.

YES has a long and valued history of close relationships with our customers. Indeed, we have defined our company's primary mission as anticipating, enabling, and supporting those customers' technology roadmaps. Establishing physical proximity to those customers is the next logical step in the evolution of that mission, enabling YES to build and nurture stronger connections through changing times.

Consequently, in addition to strengthening our engineering footprint in India and expanding our customer-facing teams in North America, Europe, and Asia, we will be opening the new YES Technology Center in Chandler, Arizona in the first half of 2023. Our Chandler Technology Center is a 123,000-square-foot state-of-the-art facility dedicated to R&D, clean-room operations, advanced manufacturing, and customer support.

As a member of the vibrant "Silicon Desert" semiconductor ecosystem — which includes Intel, TSMC, Infineon, Analog Devices, TEL, and NXP among many others — we look forward to improved communication and greater opportunity for strategic interactions with our key customer base. This geographic hub in Chandler, fueled by the CHIPS Act and excellent support from state and local institutions including the Arizona Commerce Authority and the City of Chandler, is already starting to bring wide-ranging benefits to the semiconductor industry and, by providing a locus for technology innovation, to the world at large.

In summary, while 2023 will likely be challenging from a macroeconomic standpoint, YES is well-positioned to continue our growth trajectory – driven by the on-shoring of semiconductor manufacturing, increasing electrification (particularly in the automotive market), and the ongoing move toward automation of life science manufacturing lines. In support of these efforts, we will continue to invest our resources in increased manufacturing capacity, technology enablement, and customer proximity.

A Once in a Lifetime Opportunity

Paul Lindner, EV Group

Semiconductors truly are the engines that power the world. Yet despite the increasingly prominent role that they play in enabling our everyday lives, until recently semiconductors have flown under the radar for the public. This changed with the arrival of the COVID pandemic, which forced a paradigm shift in how we work, socialize, get our groceries and prescriptions, and even see a doctor.

Maintaining connection with the outside world during COVID lockdowns required consumers to invest in new computers, smartphones, and other various mobile and consumer electronic devices, all of which are powered by

semiconductors. Yet, the dramatic increase in demand for chips during the pandemic caused an unprecedented strain on supply chains that is still being felt to this day. And it's not just PCs with the latest graphics cards that have long delivery times. It's also automobiles, e-bikes, household appliances, and even electric inverters.

Today, governments around the world are beginning to recognize the strategic importance of semiconductors in enabling and supporting our quality of life. This has prompted governments to call for increased investments in domestic semiconductor research and manufacturing to maintain a stable supply chain for consumers, as well as strengthen their national security and global competitiveness. The European Union is acutely aware of this. While one trillion microchips were produced worldwide in 2020, only 10 percent of them were produced in the EU.

Figure 3: The EVG team exhibited at the SEMI 3D System Summit in Dresden, Germany.

The European Chips Act is set to change that. To strengthen the role of the EU in the semiconductor sector, Brussels is investing approximately €43B of public and private money in activities to promote the semiconductor sector. The goal is to double the EU's market share of global semiconductor production to 20 percent by 2030. The next step is for the EU member states and the EU Parliament to discuss and pass the European Chips Act.

Already, we are seeing positive momentum from major chipmakers in expanding manufacturing in Europe. Bosch led the way last year in announcing plans to build a new "smart fab" for microelectronics. Early In 2022, Intel announced plans for an initial investment of more than €33B to build a leading-edge semiconductor fab mega-site and a new R&D design hub, as well as expand existing R&D, manufacturing, foundry services, and back-end production across Europe. More recently, Infineon announced plans to invest €5B to expand 300-mm manufacturing capacity for analog, mixed-signal, and power semiconductors. These and other planned investments in Europe demonstrate that the world's leading technology innovators recognize the importance of Europe as a key center for cutting-edge technology research and manufacturing.

As a leading provider of highly specialized process solutions for the semiconductor industry, EV Group is actively engaged at many levels with the government and industry to share our knowledge and insights on both the challenges and opportunities for Europe's renewal in semiconductor manufacturing. We recognize that an undertaking as significant as the European Chips Act can have a positive impact on our business. However, the European Chips Act means much more to us than that. It is a once-in-a-lifetime opportunity to strengthen innovation throughout the European semiconductor supply chain as well as enhance Europe's technical leadership. We are excited about Europe's "renaissance" in semiconductor manufacturing, and we will continue to work closely with our partners and customers to help guide and support these strategic investments in Europe's future.

A European Perspective Beyond the EU Chips Act

Peter Dijkstra, Trymax Semiconductor

2022 was marked with multiple changes for Trymax Semiconductor Equipment B.V., we moved to a new manufacturing facility, managed supply chain issues, and travel constraints, and implemented a new quality system. Despite all these changes and challenges, we managed to book more orders and ship more systems.

The impact of COVID-19 is still present. In some countries, it disappeared completely while other regions cope with lockdowns on a daily base. From a human point of view, colleagues suffer from long covid and the "normal" five days at the office has changed to 2 -3 days in the office and other days working from home. Public transport is reduced as more people prefer to drive in their own car. This increase in cars created a push for stronger European norms for a clean environment and therefore a strong governmental push for electrical cars.

As a result, we see that the automotive market is growing strongly. Other markets also grow, however at a slower pace. Besides automotive, we also noticed that the storage and availability of data have increased dramatically over the past period and the forecast is very ambitious. People are now used to having high-speed access to data everywhere.

Trymax did benefit from this changing and increasing demand and we've seen a strong increase in IC-Logic (controllers), discrete (power electronics), and

optoelectronic (mini and Micro-led) devices. Besides the change in markets, we have also gained more recognition in the market and supplied multiple tools to major OSATs, foundry services, and IDMs. To be able to cope with the increase in demand for systems, it was the right decision to move to a new facility with 27 manufacturing bays instead of seven. The inauguration of the building and the participation of customers and suppliers is still very memorable.

Supply chain concerns have highly impacted the way of working. We increased the interaction with suppliers, and implemented plan B, plan C, and the level of creativity and out-of-the-box actions was, and still is impressive. Hats off to the Trymax team that can satisfy all our customers!

COVID-19 and the enormous pressure on supplying tools are finished, but now another challenge is on the table, the downturn. Different market studies predict a decrease of 15- 22% and yes, the first signs of customers delaying their shipments are already noticeable. I am convinced that 2023 will be another year in which we have to demonstrate our ability to adapt to situations and demonstrate our quality and deliver targets on time.

Finally, I would like to thank, on behalf of the whole Trymax team, customers, and suppliers for the trust and confidence we have received.

Figure 4: The Trymax team exhibited at SEMICON Europa 2022 in Munich, Germany.