EIPC SPEeDNEWS

The Weekly On-Line Newsletter

Issue 4– January 2022

NEWS FROM THE EIPC

Coverage of our 14th Technical Snapshot was undertaken by the unparagoned Pete Starkey, and his review is available on the link shown below.

http://pcb.iconnect007.com/index.php/article/130610/eipc-technical-snapshot-considering-supply-chain-and-defense/130613/?skin=pcb

The EIPC Team

The European Institute for the PCB Community

EIPC SPEeDNEWS

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NEWS FROM GERMANY

Schweizer Electronic AG: WUS shareholders' meeting approves direct investment in Schweizer Electronic China

The direct investment of the strategic investor WUS Printed Circuits (Kunshan) Co., Ltd. (China) in the wholly-owned Chinese subsidiary of Schweizer Electronic AG was subject to an extraordinary shareholders' meeting of the investor.

Today the extraordinary shareholders' meeting of WUS Printed Circuits (Kunshan) Co., Ltd. approved the investment. This means that the transaction can take place as planned by means of a 12.8 percent capital increase at Schweizer Electronic (Jiangsu) Co., Ltd. (China). The inflow of funds from the capital increase will amount to CNY 75 million (approximately EUR 10.5 million).

About SCHWEIZER
Schweizer Electronic AG offers the latest, cutting-edge technology and consultancy expertise in the PCB industry. Thanks to its state-of-the-art production facilities in Schramberg, Germany and Jintan, China as well as close partnerships with other technology leaders, SCHWEIZER provides individual PCB & Embedding solutions. SCHWEIZER's innovative PCB technologies are used in the most demanding applications, for example, in the Automotive, Aviation, Industry & Medical and Communications & Computing sectors, and are characterised by their extremely high quality and energy-saving and environmentally-friendly features.

The company was founded by Christoph Schweizer in 1849 and is listed at the Stuttgart and Frankfurt Stock Exchanges (ticker symbol „SCE“, „ISIN DE 000515623“).

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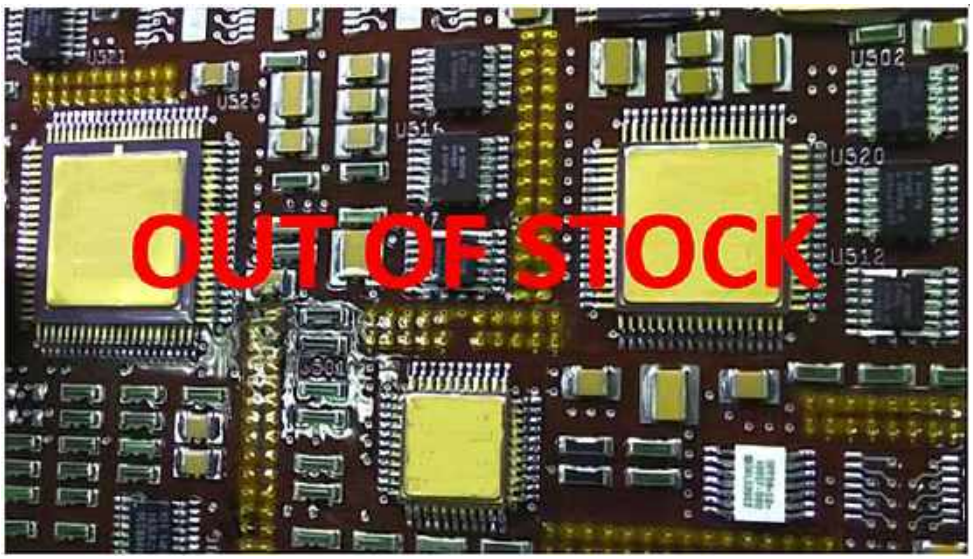
ELECTRONIC INDUSTRY NEWS

The impact of electronic component shortages on the global space industry

JANUARY 25, 2022
BY **RAJAN BEDI**

In 2021, the global satellite-manufacturing industry was valued at $25 billion, predicted to increase significantly over the next decade from 380 to 1,700 new satellites annually. Satellites and spacecraft need lots of electronic components and semiconductors in particular, have enabled many new applications for space technology.

Covid-enforced production stops of raw materials, the soaring demand for commercial work-from-home devices such as laptops, tablets and routers, and the continued growth of the space market, has resulted in supply-chain issues such as component shortages, extended lead-times, increased prices and in several cases, postponed launches.



In 2021, the global semiconductor market was valued at $450 billion, predicted to increase to almost $1 trillion by 2028. The world-wide space-microchip sector was valued at $2.1 billion, predicted to increase to $3.3 billion by 2028 (CAGR of 6.9%). 20% of all parts were used by launchers! Sales of space-grade integrated circuits represent less than 1% of the total semiconductor market. In the middle of an international pandemic, is it right for our industry to request more wafers when there are other, more immediate priorities?

As an OEM, my company, Spacechips, has experienced extended lead-times and increased component prices. Several prospects have required proof that we can get parts before signing a contract to guarantee on-time delivery of their space electronics. I recently spoke to many diverse stakeholders around the world to understand the impact of the supply-chain issues being experienced by the global space industry and want to share feedback from space-grade semiconductor manufacturers with foundries, fabless chip providers, suppliers of passive parts, component distributors, as well as satellite and sub-system OEMs.

Several space-grade semiconductor manufacturers with their own foundries have reported delays sourcing 'raw materials' such as ceramic packages and lead frames. Typically these are made in Asia and COVID-enforced lockdowns have impacted their availability, resulting in longer lead-times for some space-qualified integrated circuits. To make matters worse, some manufacturers are required to produce to AS9100 quality, which includes an audit for on-time delivery. The cost of materials has increased which is then passed-on to the final customer. Will we ever see prices reduce I wonder and could there be a future glut of parts once the supply-chain normalises? Some space-grade foundries in the US and Europe fabricate for specific applications using specialist processes containing features advantageous for radiation hardness, *e.g.,* SOI, low charge-collection accumulation and SiGe.
Several manufacturers have been able to buffer the shortage by keeping material and wafer stocks. To help you source parts quickly, some suppliers with their own foundries now allow you to buy parts directly from their on-line store. Websites provide an indication of inventory, date code, lot information and provided you are not procuring for a new, non-forecasted 500 satellite constellation, your parts will arrive in a few days.

Several fabless providers of space-grade integrated circuits are fighting and competing for wafers and foundry time. Is this really a surprise? The problem we have as an industry is that while we pay significantly more for fully-qualified parts, our industry represents less than 1% of the global semiconductor market while at the same time competing with the surge for work-from-home and home-learning devices. Subsequently, fabrication costs have risen to meet this enforced need which has resulted in higher component prices and extended lead-times for spacecraft manufacturers.

Only last week, TSMC reported a record quarterly profit with a major increase in investment planned for this year. One well-known provider of space-grade semiconductors told me, "*We are getting primes coming to us with multi-million dollar contracts jumping up and down screaming, do you know who we are and the importance of our programme? The problem is that we simply can't secure*

enough wafers." During a global pandemic, should priority be given to producing urgently-needed, life-saving medical electronics? This question poses many moral and human considerations!
Distributors of space-grade parts used to keep stock, but this trend is becoming less popular and they too are experiencing longer lead-times and higher prices. One key comment from distributors is that New Space companies baselining automotive or industrial-grade COTS parts will see delays. One approach that is helping some investor-rich space companies is their ability to procure and then hold components for when they are ready to build, to ensure on-time future delivery to their customers.

I spoke to OEMs and those that act quickly and are prepared to take risk have secured parts. Some bought large stocks in early 2020 and now have a healthy inventory that is allowing them to deliver to schedule. However, access to COTS, industrial and automotive-grade parts has been a challenge that existed before the pandemic with some spacecraft manufacturers competing with larger-volume buyers from other industries. Several British OEMs mentioned that BREXIT has complicated export control requirements within the EU and the rest of Europe, adding further delays.

What can we do as an industry to reduce the impact of supply-chain shortages, longer lead times and increased prices?

Understandably, many satellite/spacecraft manufacturers only order parts after winning a firm contract, however, given the current challenges, this may be a risky approach to guarantee on-time delivery. As an industry, we need to improve our ability to forecast future sales and plan procurement accordingly. To increase our influence in accessing materials and wafers, as well as our buying power, in my opinion, distributors could play a more leading role by combining the purchasing needs of multiple OEMs, while respecting individual sensitivities, and negotiate directly with manufacturers/foundries. There's an entrepreneurial opportunity here! I also believe agencies, governments and catapults could make a positive contribution to this discussion by providing loans or up-front contract payments to facilitate early procurement to mitigate longer lead-times.

Producers of high-volume smart phones, tablets and laptops are able to forecast future sales more accurately and then plan procurement accordingly, *e.g.,* they have data for how many customers will want to upgrade their phones next year. This certainty gives them an advantage allowing them to place large orders while the space industry adopts a more risk-averse approach. Saying that, even Apple has been affected, delaying the launch of the iPhone 12 with production impacted throughout 2021. Chip shortages also affected SpaceX's new user terminals.
There have been political and national reverberations with some countries investing in new, local foundries to reduce their reliance on foreign fabs. However, it takes time and billions to build new foundries and several providers of space-grade semiconductors have started this investment.

While I don't think the current challenges will get worst, I do expect them to last throughout 2022. Foundries have worked hard to squeeze as much capacity as they can and ramp-up production, but this takes time. The CEO of Microchip recently provided his views on the supply chain and future outlook.
Have your space projects been impacted by longer lead times, increased component costs, schedule slips or postponed launches? If so, how have you managed the situation? What do you think the space industry could do better to reduce the impact of the current shortages and how should we plan for the future? Please leave your comments below and the best answer will win a Courses for Rocket Scientists World Tour tee-shirt.
Congratulations to Dave from Canada, the first to answer the riddle from my previous post.
I'd like to thank all the component manufacturers, distributors and OEMs whom I spoke to while writing this post. Your inputs have been invaluable!

Dr. Rajan Bedi is the CEO and founder of Spacechips, which designs and builds a range of advanced, L to K-band, ultra high-throughput on-board processors, transponders and Edge-based OBCs for telecommunication, Earth-Observation, navigation, internet, 5G and M2M/IoT satellites. The company also offers Space-Electronics Design-Consultancy, Avionics Testing, Technical-Marketing, Business-Intelligence and Training Services. (www.spacechips.co.uk). Rajan can also be contacted on Twitter to discuss your space-electronics' needs: https://twitter.com/DrRajanBedi

How the global chip shortage is helping US manufacturing

A pandemic problem led to a $52 billion proposal to help US chipmakers like Intel, which plans a new $100 billion Ohio "megafab." But Taiwan and Korea are also spending massively.

Intel's Fab 42 in Chandler, Arizona, cost $7 billion. The chipmaker has begun making fabs 52 and 62, which are scheduled to go online in 2024 and employ 3,000 more people.

When you can't buy that Sony PS5 or Ford F-150 pickup, blame the chip shortage.

A worldwide problem triggered by the COVID-19 pandemic has metastasized into a years-long disruption of everything electronic.

The shortage is leading the tech industry and politicians to try to reverse the United States' waning importance in the microprocessor business. The US government isn't happy with how reliant the country's economy and military have become on Asian high-tech manufacturing. And chipmakers -- salivating at government subsidies to underwrite research and new factories and forecasting a widespread increase in chip demand -- are investing as never before.

The chip shortage is also shining a new spotlight on the state of US manufacturing and how much of it has moved out of the country. Intel, which has slipped to third place behind Taiwan Semiconductor Manufacturing Co. (TSMC) and Samsung Foundry, hopes to take advantage of rising demand and government funding to reclaim its leadership position.

The biggest change: In January, Intel said it is spending $20 billion on two chip fabrication plants, or fabs, near Columbus, Ohio. The new "megafab" site eventually could house eight Intel fabs costing $100 billion.

"We don't want to create a situation where the United States, which created the semiconductor industry and Silicon Valley, would be completely dependent on other nations for that product," said Al Thompson, who leads Intel's US government relations.

The chip industry's new course is part of what some call the decoupling, which at least to some degree is pulling the Chinese and US economies apart. No one expects supply chains without links overseas, but the chip shortage response definitely has a nationalist flavour.

Asian manufacturers aren't standing idle as Intel invests in capacity increases. In January, while reporting record revenue for the fourth quarter of 2021, TSMC said it will invest between $40 billion and $44 billion in new chipmaking plants and equipment in 2022 -- an enormous amount.

"Foundry capacity will be precious for the foreseeable future as demand for semiconductors only grows," said Creative Strategies analyst Ben Bajarin.

Here's what's going on and what's at stake.

What started the chip shortage?

In short, the COVID-19 pandemic and a lot of shock waves that traversed the world's economy. Demand for work-from-home technology like PCs, tablets and webcams soared beyond the semiconductor manufacturing industry's ability to supply chips -- not just the big CPU brains of a laptop but also the host of supporting chips required to produce things like dishwashers, baby monitors and LED light fixtures. The chip shortage soon extended beyond remote work and school needs to home entertainment products like tablets, game consoles, TVs and graphics cards for gaming PCs, all of which people stuck at home were buying in record numbers. Compounding the problem: a fire at Japanese chipmaker Renesas Electronics, and crippling winter weather in Texas that knocked more than 70 power plants offline and cut juice to a Samsung chip plant.

COVID lockdowns led automakers to put chip orders on hold. Those companies rely disproportionately on cheaper processors that don't require cutting-edge chipmaking technology. By the time they realized demand was picking up, chip plants had allocated their capacity to other customers.

And that wasn't all. A glut of shipping and dearth of shipping containers has snarled delivery of not just finished goods but also their components and raw materials. Cars and computers require hundreds of electronic components, but just one missing component means a product can't be sold. For an advanced processor, there's likely only one company building it.

How long will the chip shortage last?

It probably won't get any worse, but it'll likely last for several more months. Chipmakers have worked to squeeze as much new capacity as they can out of their fabrication facilities, or "fabs," but it takes years to build new fabs and ramp up production.

Intel Chief Executive Pat Gelsinger told CNET that he thinks we're almost through the worst of the chip shortage, which will last through the second half of 2021. He predicts it'll gradually ease through 2022 and fade in 2023.

Mismatches in chip supply and demand have been common for decades, but not like this. "We've always gone through cycles. This time it's different," AMD CEO Lisa Su said in September at the Code conference. She, too, expects this chip shortage will ease in 2022. But IBM CEO Arvind Krishna thinks it's more likely the chip shortage will last through 2023 and even 2024.

What's being affected by the chip shortage?

It's easier to say what isn't being affected. Just about anything with a power cord these days uses chips, so the shortage has hit cameras, microwave ovens, TVs, pacemakers, washing machines and more.

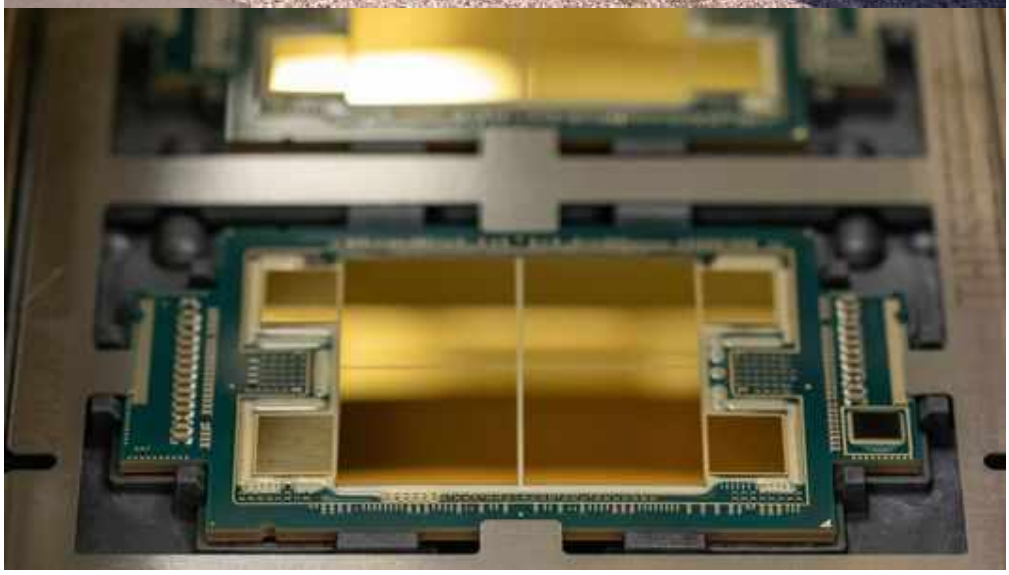
Worst hit is the auto industry. Cars are now studded with computer chips that control everything from infotainment systems to antilock brakes, and the car-making industry has relied heavily on "just-in-time" purchasing that cuts costs but means there's no big inventory of parts to buffer against shortages. The situation has gutted their revenue by an estimated $210 billion in 2021, according to a study by AlixPartners, and auto manufacturing could suffer through 2023.

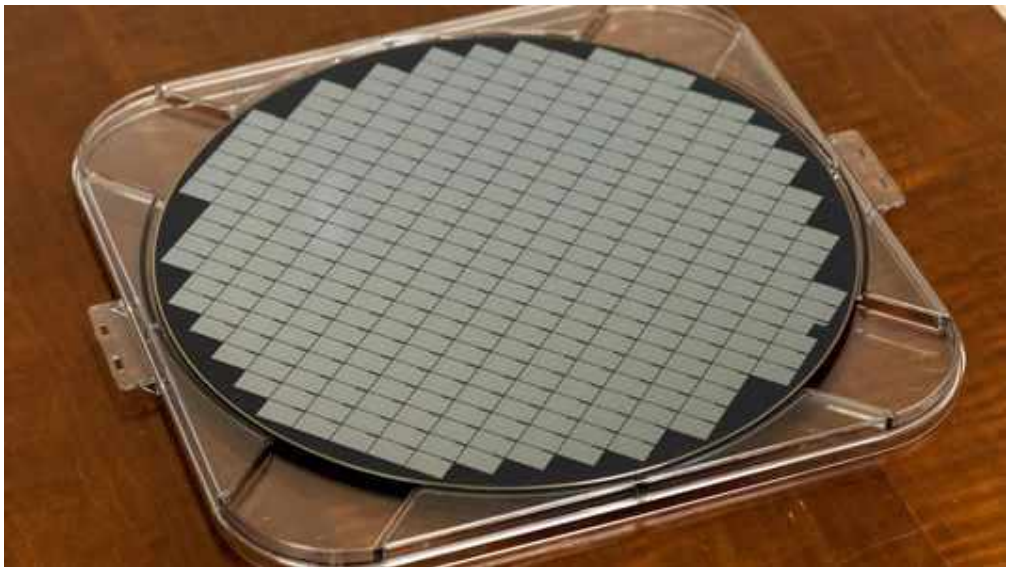
The shortage forced carmakers to halt production, including Ford Motor, General Motors, Toyota, Nissan, Subaru and Stellantis (formerly Fiat Chrysler). Some carmakers have shipped autos without accessories that need chips, leaving customers without touchscreens in their new cars. Tesla got credit for weathering the storm better than most, but it's still suffering from chip constraints.

Gaming consoles also have been hit hard. The chip shortage meant fitful availability and poachers jacking up prices for the Sony PS5 and Microsoft Xbox Series X. The Nintendo Switch and Valve's Steam Deck arrived late, too.

A look inside Intel's mammoth Arizona chipmaking fab

See all photos





Even Apple has suffered, despite being led by supply chain guru Tim Cook and having the clout to place massive orders years in advance. The iPhone 12 launch was weeks late, and chip shortages continued to hit Apple through 2021.

To cope with the problem, PC maker Framework has had to make "risk buys" by purchasing extra inventory of components well ahead of time, said CEO Nirav Patel, though it's weathered the storm so far. "It's definitely a long-term, extended challenge for everyone," he said.

To secure capacity for future products, "fabless" chip designers like Nvidia, AMD and Qualcomm pay billions of dollars to chip manufacturers. Intel expects such prepayments as well through its new foundry business. Smartphone chip designer Qualcomm expects sufficient capacity midway through 2022 thanks to such capacity planning. "Our supply has increased significantly," CEO Cristiano Amon told The Verge in a January interview. "The chip shortage is not over yet, but things are getting much better as we go to the first half of 2022."

What are chipmakers doing to ramp up manufacturing?

Semiconductor manufacturers are working harder to squeeze every last wafer through their fabs. But there's not much they can do about the immediate shortage.

It takes years to build a fab. Intel just started building two new facilities, Fab 52 and 62 in Arizona, at a cost of $20 billion. But they won't begin mass manufacturing until the second half of 2024, said Keyvan Esfarjani, leader of Intel's manufacturing and supply chain.

But today's shortage is accelerating tomorrow's investment. Chipmakers like Samsung, Global Foundries, Intel and TSMC see demand for semiconductors surging as digital technology spreads far beyond computers and smartphones.

"We see the digitization of everything," Gelsinger said.

CHANGES IN CHIPS

- **Intel's chip recovery plan could restore US manufacturing prowess**
- **What it's like inside a $7 billion Intel fab**
- **Apple's M1 Pro and M1 Max chips mean new trouble for Intel**
- **Intel will make others' chips in major turnaround effort under new CEO**

Gelsinger has urged automakers to shift their processors to newer manufacturing technology that, thanks to miniaturization, can squeeze more chips out of a single 300mm-wide silicon wafer. That's not an easy change, though, given that much of the auto industry selects and validates components that are used for years. It could help Intel's effort to become a foundry that builds others' chips, though, not just its own products.

OK, how expensive is this investment?

Chipmakers' coming capital investments are extraordinary. Intel trumpeted $23.5 billion in spending this year in the US, followed by plans for two "megafabs" in coming years totalling $200 billion. "These are big sites -- something like over 1,000 acres," each with room to fit eight fabs, Esfarjani said.

TSMC's investments include a new fab in Arizona and a new fab partnership in Japan with Sony. Samsung expects to spend $145 billion through 2030.

"Five years ago, people said we were boring," Su said. "The world has really realized this is now an essential part of what people do."

In November, Samsung announced that one of its investments is a $17 billion fab in Taylor, Texas.

The shortage also gave new power to lesser-known chipmakers still building chips with earlier-generation "legacy node" manufacturing technology. That includes ST Microelectronics, Onsemi, Microchip, NXP Semiconductors and Infineon. Global Foundries, the manufacturing division AMD spun off in 2018, held its initial public

offering despite a lack of profitability and bowing out of the race to keep up with the three leading-edge chipmakers: Intel, Samsung and TSMC.

Global Foundries is investing $1 billion to increase its current fab capacity in New York and add another fab there. It's also building a fab in Singapore and expanding one in Germany.

Companies that build semiconductor manufacturing tools are raking in the money. Globally, spending on chip equipment will rise 10% in 2022 to a record high of $98 billion, the third year of growth in a row, the trade group Semi said in January. South Korea is the biggest spender, followed by Taiwan and China, collectively accounting for an expected 73% of spending this year. Korean spending should increase 14% in 2022, but spending in the US and China likely will decrease, the group said.

ASML, the Dutch company that's the premier maker of the lithography equipment critical to shrinking chip electronics, has seen orders surge. It's already received its first order for a next-gen machine -- likely from Intel, which said it’s first in line. The truck-sized equipment inscribes circuitry with extremely short wavelength extreme ultraviolet, or EUV, light and focuses it more precisely with high numeric aperture (high NA) optics. Those devices will cost chipmakers an average of $340 million each.

What are the political repercussions?

US politicians, attuned to economic ebbs and flows, don't like it when consumers can't consume. The Biden administration has been trying to respond federally to the supply chain problems. It prodded companies to be more transparent about their needs and supplies, called on Congress to create the Critical Supply Chain Resiliency Program and started working to foster more US independence from international suppliers.

And there's been more than a little freaking out that the US military is so reliant on overseas companies. As a 250-page White House report put it in June: "Semiconductors ... are fundamental to the operation of virtually every military system, including communications and navigations systems and complex weapons systems such as those found in the F-35 Joint Strike Fighter. They are key to the 'must-win' technologies of the future, including artificial intelligence and 5G, which will be essential to achieving the goal of a 'dynamic, inclusive and innovative national economy' identified as a critical American advantage in the March 2021 Interim National Security Strategic Guidance. In addition, the development of advanced autonomous systems, cybersecurity, space and hypersonics, and directed energy is also dependent on semiconductor technologies."

The push also dovetails with the Biden administration's Made in America effort to increase government spending on US-made products and boost US manufacturing more broadly.

The term that encapsulates the desired outcome? Supply chain resiliency. That means flagging problems sooner, making the government and private sector more adaptable, and building supply buffers of inventory that cushion supply chain shocks. Overall, that would reduce the likelihood and severity of supply chain surprises.

"The industry is begging for derisking," said Capgemini analyst Darshan Naik.

What does that mean for chipmakers specifically?

In short, money. Congress authorized $52 billion in subsidies for chipmakers in the CHIPS for America Act, but Congress has yet to actually appropriate the funds. The Senate in June passed the United States Innovation and Competition Act, or USICA, to allocate funds, but it wasn't until November that House Speaker Nancy Pelosi nudged the chip funding forward in the House of Representatives. On Nov. 29, US Commerce Secretary Gina Raimondo pushed for the funding, saying the US is "vulnerable" without more semiconductor manufacturing since "chips are the building blocks of our entire modern economy."

If USICA passes, Intel can't pocket the full $52 billion. But $10 billion of that is earmarked for fab projects, with a cap of $3 billion per project and Intel a likely beneficiary. That 30% discount is comparable to what chipmakers in South Korea and Taiwan get, Gelsinger said.

Some of the tech industry's biggest names agree. In a Dec. 1 letter, the CEOs of Apple, Google parent Alphabet, Verizon, Dell, HP, Toyota America, Ford, GM, Stellantis and IBM joined chip leaders from Intel, AMD, TSMC, Samsung, Global Foundries and others to urge Congress to pass funding for the CHIPS Act.

"Semiconductors are essential to virtually all sectors of the economy -- including aerospace, automobiles, communications, clean energy, information technology, and medical devices," the execs said. "Demand for these critical components has outstripped supply, creating a global chip shortage and resulting in lost growth and jobs in the economy. The shortage has exposed vulnerabilities in the semiconductor supply chain and highlighted the need for increased domestic manufacturing capacity."

Intel will build its Ohio megafab regardless of government funding, but the funding will make the project bigger and accelerate Intel's expansion, Esfarjani said. The company plans to settle on its European megafab site in coming months, he added.

Gelsinger has argued that only companies headquartered in the United States -- which is to say Intel and not Samsung or TSMC -- should benefit from US subsidies. "Foreign chipmakers vying for US subsidies will keep their valuable intellectual property on their own shores, ensuring that the most lucrative and cutting-edge manufacturing stays there," Gelsinger said in a June op-ed.

But even fabs owned by overseas companies can help anchor electronics manufacturing in the US, develop trained workers, and generate economic activity and taxes. "In addition to our partners in Texas, we are grateful to the Biden Administration for creating an environment that supports companies like Samsung as we work to expand leading-edge semiconductor manufacturing in the US," said Kinam Kim, the CEO of Samsung Electronics Device Solutions Division, in a statement.

Intel's plan is to boost the US share of chipmaking from 12% today to 30% in coming years and the European share from 9% to 20%.

Is this happening just in the US?

Nope. The European Union also wants a bigger piece of the processor production pie.

"This is not just a matter of our competitiveness. This is also a matter of tech sovereignty," said European Commission President Ursula von der Leyen, proposing a European Chips Act with its own subsidies.

Here, too, Intel is a fan. It plans to build another $100 billion megafab in Europe.

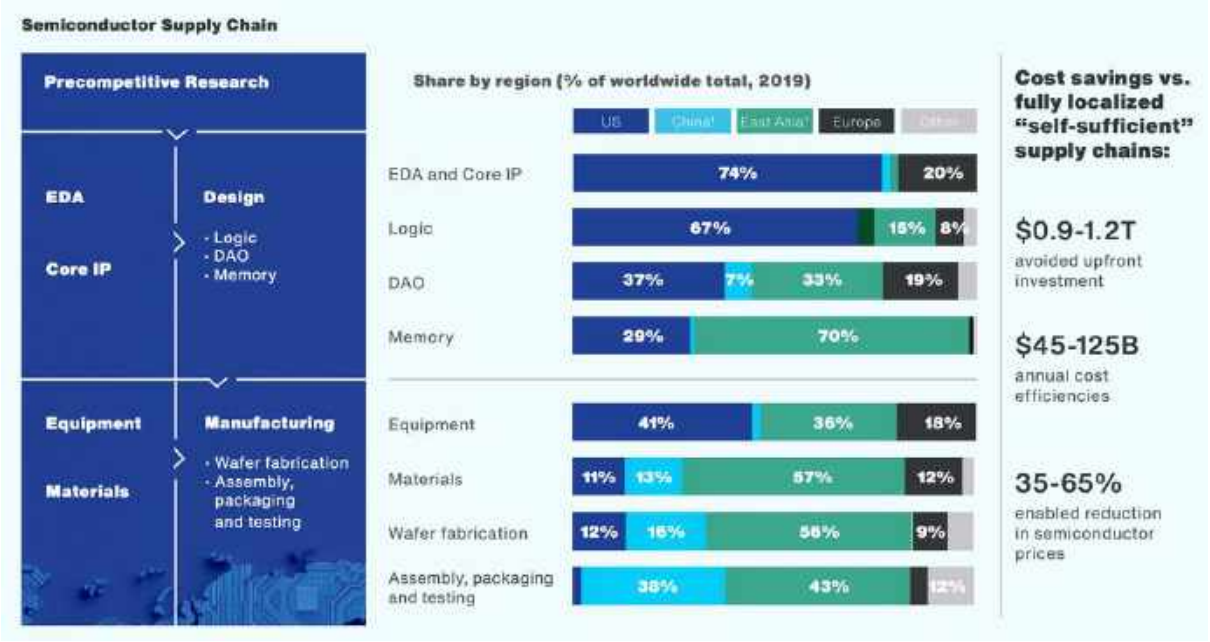
Can you really move the whole electronics industry to the US?

No way. The electronics industry is vastly larger than just making chips, including upstream supplies like wafers and manufacturing equipment and downstream activities like packaging, testing and assembly, most of it in Asia. "There's a lot of other aspects of the supply chain, and I believe those need to be more balanced as well," Gelsinger said.

Here's where $52 billion starts looking like a small expenditure. The Boston Consulting Group expects it would take $900 billion to $1.23 trillion in spending to create self-sufficient semiconductor supply chains worldwide. For just the US, it's $350 billion to $420 billion. And that cost runs contrary to the capitalistic impulse to reward the least expensive suppliers.

"It'll definitely create supply chain inefficiencies," BCG analyst Matt Langione said. "Costs will go up. But there should be more redundancy in the system."

Nearshoring, which would move manufacturing operations nearer to the US but not all the way, is another possibility, particularly for assembly, testing and other work not quite as high-tech as the chipmaking itself. "Mexico could be a strong option," CapGemini's Naik said.



Different regions develop specialties in semiconductor manufacturing around the world, and reproducing that expertise locally would cost $900 billion to $1.2 trillion, says a Boston Consulting Group study.
Boston Consulting Group

TSMC founder and former CEO Morris Chang is sceptical. "It's not going to be possible to turn back the clock," Chang said in October. "If you want to re-establish a complete semiconductor supply chain in the United States, you will not find it to be a possible task."

Chip players naturally clump into "highly concentrated clusters," consulting firm Deloitte said in a December report. Spreading that work geographically will help supply chain woes, but it's not easy. "Clusters create strong pools of talent and skills. Prior attempts to build more geographically distributed manufacturing capacity (such as Silicon Glen in the United Kingdom in the late 1970s) came to naught," Deloitte concluded.

The Massachusetts Institute of Technology believes investments need to happen at the research level, not just with chipmakers. "The hollowing out of semiconductor manufacturing in the US is compromising our ability to innovate in this space and puts at risk our command of the next technological revolution. To ensure long-term leadership, leading-edge semiconductor manufacturing in the US must be prioritized

and universities activities have to get closer to it," MIT said in a January report. It called for upgrades from 1990s-era technology that tiles chips onto silicon wafers 150mm in diameter to equipment with 200mm wafers that are newer if not cutting edge.

Who loses from splitting electronics supply chains?

Rebalancing global supply chains doesn't sound so great for companies that don't benefit, like Chinese phone and network equipment maker Huawei, a giant with $71 billion in revenue for the first three quarters of 2021. The Trump administration believed its network equipment posed a national security threat, and the Biden administration agrees, so sales of Huawei products continue to be blocked. Raising barriers against overseas companies and promoting US ones could lead China or others to take the same stance against US companies, said Andy Purdy, chief security officer of Huawei USA.

"There are some major unintended consequences [of trade barriers] that are really going to hurt the US in the long term," Purdy said. "If the American semiconductor industry is not allowed to sell to Huawei or Chinese companies, that's going to undo a lot of the good things the Biden administration is trying to do."

Indeed, Huawei has switched away from some US-made chips.

But even Andrew Feldman, CEO of AI chip and computer maker Cerebras, thinks there's a risk of relying too much on Samsung and TSMC -- his company's chip manufacturer.

"What a bad idea it is for so much of the American economy to rely on a fab you can swim to from China or that you can throw a stone to from the DMZ in Korea," Feldman said.

US government warns that chip supply crunch remains dire

According to the US Department of Commerce, the global computer chip shortage remains an ongoing economic weakness.

The global computer chip shortage won't end anytime soon, according to analysis from the US Department of Commerce. A new report issued Tuesday by the

department outlines the fragility of the worldwide semiconductor supply chain. Specifically, the main issue lies in the factories producing the chips. The DOC estimates that chip plants are churning along at 90% capacity or above.

Other problems the report highlights are bottlenecks in raw materials and skyrocketing demand; the DOC calculates that demand was as much as 17% higher in 2021 than in 2019.

Others have warned before about this shortfall. Qualcomm CEO Cristiano Amon told CNET last March that he expected the problem to last through 2021, which turned out to be a lowball.

The government does offer a solution to this mess, which has impacted everything from pickup trucks to game consoles. The DOC calls out the need for expanding domestic semiconductor production with President Joe Biden's proposed $52 billion spending package.

"The semiconductor supply chain remains fragile, and it is essential that Congress pass chips funding as soon as possible," said Secretary of Commerce Gina Raimondo in a statement. "With sky-rocketing demand and full utilization of existing manufacturing facilities, it's clear the only solution to solve this crisis in the long-term is to rebuild our domestic manufacturing capabilities."

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NEWS FROM THE UK

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Find out why we were the only analyst to correctly forecast 2021's shortages and double-digit growth. See how we view the market playing out in 2022

- Watch the webinar highlights here: https://youtu.be/xOJqHeDIUCI
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Our industry forecasts, methodology and analyses have consistently proved accurate, insightful, and reliable. This year's industry update will prove no exception. We do not just tell you what our prognoses are, we also tell you why, with supporting data and analysis. Priced at only UK£150 for individual use only. Site licence for corporate library or multi- use within your organisation, is also available at UK£695. Pre-payment by Bank transfer, PO number or via PayPal (please specify preference).

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World Electronic Circuits Council

Issue 4 – January 2022

NEWS FROM THE IPC

IPC Announces New Board Members at IPC APEX EXPO 2022

At the 65th IPC Annual Meeting on January 25, held in conjunction with IPC APEX EXPO 2022, the IPC Board of Directors announced new officers and members. Board officers serve a two-year term; board members serve a four-year term, and student board member serves a one-year term.

The newly elected Board officers are:

- IPC Board Chair: Bob Neves, chairman and CTO, Microtek Laboratories
- IPC Board Vice Chair: Tom Edman**,** president and CEO, TTM Technologies
- IPC Board Secretary/Treasurer: Jeff Timms**,** CEO and General Manager, ASM Assembly Solutions of America

The newly elected Board members are:

- First-term Board Member: Lisa Weeks**,** Senior Vice President, Chief Strategy Officer, and Head of Investor Relations, Benchmark Electronics
- First-term Board Member: Joe DeMan**,** Senior Board Executive, Amphenol – CTI
- Second-term Board Member: Jay Hill, Chief Technology Officer, Molecular Imaging and Computed Tomography, GE Healthcare
- Student Board Member: Hannah Nelson, Valparaiso University

"IPC is privileged to add these outstanding professionals to our current slate of Board members, said John W. Mitchell, IPC president and CEO. “We look forward to working with them as we advance the global electronics manufacturing industry and build electronics better.”

For additional information on IPC's Board of Directors including bios on newly elected Board members, contact Sandy Gentry, IPC communications director, at SandyGentry@ipc.org. For information on IPC APEX EXPO

High Material and Labour Costs Continue to Challenge the Electronics Manufacturing Industry

Growth rates expected to slow, but good growth expected in year ahead

New data from IPC shows that supply chain challenges remain acute, but may have peaked, while lead times remain high. IPC's February economic update and global electronics manufacturing supply chain sentiment reports found that high material and labour costs are expected to continue for at least six months while recruiting and finding skilled talent continues to be difficult.

Among other conclusions, the global electronics manufacturing survey results show:

- Nearly nine in ten electronics manufacturers report material costs are rising, with an additional four-fifths reporting rising labour costs
- Only 13 percent of the electronics manufacturing supply chain reports inventory is growing and one in ten say inventories from their suppliers are growing
- Ease of recruitment and profit margins are currently declining, along with inventories, especially those available from suppliers
- The electronics supply chain reports orders, shipments, and capacity utilization are expanding, but weak inventory availability and higher costs for materials and labour hurts profit margins

The data on future economic outlook suggests growth is decelerating, but good growth is expected in the year ahead. After growing 6.1 percent in 2021, global growth is expected to slow to 4 percent in 2022 and close to that in 2023. In North America, growth will fall from 5.4 percent in 2021 to 3.7 percent in 2022. In 2023, growth is expected to slow further, anticipated at 2.6 percent. In Europe, growth is expected to slip this year from 5 percent to 4 percent and decline to 2.4 percent next

year. In Asia, growth is expected to fall from 6.7 percent to 4.8 percent this year. Five percent growth in Asia is predicted for 2023.

"While growth slows this year, this should not necessarily be interpreted as weak growth," said Shawn DuBravac, IPC chief economist. "Growth rates in 2022 will generally be higher than they were headed into the pandemic."

IPC surveyed hundreds of companies from around the world, including a wide range of company sizes representing the full electronics manufacturing value chain.

View full reports:

- The Current Sentiment of the Global Electronics Manufacturing Supply Chain
- February 2022 Economic Outlook

North American PCB Industry Sales Up 16.9 Percent in December

BANNOCKBURN, Ill., USA, January 28, 2022 — IPC announced today the December 2021 findings from its North American Printed Circuit Board (PCB) Statistical Program. The book-to-bill ratio stands at 1.17.

Total North American PCB shipments in December 2021 were up 16.9 percent compared to the same month last year. Compared to the preceding month, December shipments grew 21.5 percent.

PCB year-to-date bookings in December were up 33.6 percent compared to last year. Bookings in December grew 47.1 percent from the previous month.

"PCB bookings rose sharply in December 2021, the strongest month of bookings since December 2005," said Shawn DuBravac, IPC's chief economist. "For the calendar year, bookings rose 19.3 percent and shipments rose 6.7 percent."

Detailed Data Available

Companies that participate in IPC's North American PCB Statistical Program have access to detailed findings on rigid PCB and flexible circuit sales and orders, including separate rigid and flex book-to-bill

ratios, growth trends by product types and company size tiers, demand for prototypes, sales growth to military and medical markets, and other timely data.

Interpreting the Data

The book-to-bill ratios are calculated by dividing the value of orders booked over the past three months by the value of sales billed during the same period from companies in IPC's survey sample. A ratio of more than 1.00 suggests that current demand is ahead of supply, which is a positive indicator for sales growth over the next three to twelve months. A ratio of less than 1.00 indicates the reverse.

Year-on-year and year-to-date growth rates provide the most meaningful view of industry growth. Month-to-month comparisons should be made with caution as they reflect seasonal effects and short-term volatility. Because bookings tend to be more volatile than shipments, changes in the book-to-bill ratios from month to month might not be significant unless a trend of more than three consecutive months is apparent. It is also important to consider changes in both bookings and shipments to understand what is driving changes in the book-to-bill ratio.

IPC's monthly PCB industry statistics are based on data provided by a representative sample of both rigid PCB and flexible circuit manufacturers selling in the USA and Canada. IPC publishes the PCB book-to-bill ratio by the end of each month.

North American EMS Industry up 0.9 Percent in December

IPC Releases EMS Industry Results for December2021

BANNOCKBURN, Ill., USA, January28, 2022—IPC announced today the December2021 findings from its North American Electronics Manufacturing Services (EMS) Statistical Program. The book-to-bill ratio stands at 1.55.

Total North American EMS shipments in December2021 were up 0.9percent compared to the same month last year. Compared to the preceding month, December shipments raised 8.0percent.

EMS bookings in December rose 47.1percentyear-over-year and rose13.8percent from the previous month.

"IPC recorded the strongest monthly North American EMS bookings on record in December 2021," said Shawn DuBravac, IPC's chief economist. "Strong bookings pushed the book-to-bill to near record levels, tying levels in May 2021 and only slightly below the all-time record high set in April 2021."

Detailed Data Available

Companies that participate in IPC's North American EMS Statistical Program have access to detailed findings on EMS sales growth by type of production and company size tier, order growth and backlogs by company size tier, vertical market growth, the EMS book-to-bill ratio, 3-month and 12-month sales outlooks, and other timely data.

Interpreting the Data

The book-to-bill ratios are calculated by dividing the value of orders booked over the past three months by the value of sales billed during the same period from companies in IPC's survey sample. A ratio of more than 1.00 suggests that current demand is ahead of supply, which is a positive indicator for sales growth over the next three to twelve months. A ratio of less than 1.00 indicates the reverse.

Year-on-year and year-to-date growth rates provide the most meaningful view of industry growth. Month-to-month comparisons should be made with caution as they reflect seasonal effects and short-term volatility. Because bookings tend to be more volatile than shipments, changes in the book-to-bill ratios from month to month might not be significant unless a trend of more than three consecutive months is apparent. It is also important to consider changes in both bookings and shipments to understand what is driving changes in the book-to-bill ratio.

IPC's monthly EMS industry statistics are based on data provided by a representative sample of assembly equipment manufacturers selling in the USA and Canada. IPC publishes the EMS book-to-bill ratio by the end of each month.

IPC Advocates for Transatlantic Cooperation on Resilient Supply Chains

By Alison James, IPC Senior Director, Government Relations, Europe

IPC recently made the case for a resilient electronics manufacturing ecosystem and further investments in advanced packaging at the inaugural meeting of the European Commission's consultation on secure supply chains.

The consultation took place in the context of the EU-U.S. Trade and Technology Council (TTC), which was launched last September to foster transatlantic collaboration on critical issues like technological innovation, trade, supply chain resiliency, and economic issues. A second high-level meeting of the TTC is planned for Spring 2022. The TTC has also identified strengthening the semiconductor supply chain as a priority area amid the ongoing chip shortage, and government investments are being planned via "Chips Acts" on both sides of the Atlantic.

IPC supports investments to stem the chip shortage, but if the EU and U.S. governments want to achieve greater innovation, resiliency, and security, they must also build up the entire electronics manufacturing ecosystem. This cannot be done alone; addressing capability and capacity gaps must be a transatlantic priority. IPC calls on the TTC to recognize the strategic importance of robust electronics manufacturing supply chains and to take a "Silicon-to-System" approach to strengthening the industry.

To achieve this, IPC recommends:

- A mechanism for regular analysis of the global electronics supply chain with special focus on strengthening transatlantic supply chain resiliency;
- Development of transatlantic trusted supplier programs that promote sourcing of electronics for sensitive technologies from European and U.S. manufacturers that demonstrate a commitment to high security and quality standards;
- Greater opportunities for joint research and development with a focus on segments of the electronics manufacturing industry that have highly constrained resources for research; and

- Promoting EU-U.S. partnerships through government funding to strengthen semiconductor advanced packaging capabilities.

IPC further calls for the European Union and the United States Government to accelerate transitions to Factories of the Future and to highlight the role of international, industry-led standards in enabling closer transatlantic industry collaboration.

> IPC will continue to engage with policymakers on both sides of the Atlantic and will continue to advocate for needed investments across the electronics manufacturing ecosystem.

EIPC SPEeDNEWS

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International Diary

2022

15th EIPC Technical Snapshot Webinar
Extended version Morning & Afternoon session
Registrations via www.eipc.org
23 February

EIPC @ SMT Connect
10-12 May
Nuremberg, Germany

EIPC @ CPCA
18-20 May
Shanghai, China

EIPC Summer Conference
Visit Ericsson 5G centre
14 & 15 June
Örebro, Sweden

EIPC @ Electronica
15-18 November
Munich, Germany