How to navigate the global chip shortage





The global semiconductor shortage that impacted industries worldwide is starting to have major consequences for manufacturers and consumers alike. The first signs of the crisis for the wider public have been difficulties in buying beloved consumer tech products – Sony's Playstation 5 was impacted by the shortage, and Apple recently announced that the same will happen to its flagship iPhone. But the consequences of the shortage could go far beyond the inability to procure the latest tech gadgets. The automotive industry is being hit the worst, and home devices such as TVs and washing machines are next in line.

> Unfortunately, there is no end in sight. Jean-Marc Chery, the chief executive of semiconductor manufacturer STMicroelectronics, recently told the media that things are expected to gradually improve in 2022, but that we will not return to a normal situation before the first half of 2023. But how did the shortage start? And what can be done to mitigate its consequences until inventory levels go back to normal?



The causes

The semiconductor shortage stems from a complex combination of socio-political factors.



Tensions between the US and China

In September 2020, the US declared that Semiconductor Manufacturing International Corporation (SMIC), the biggest chip producer in China, is a military end-user and forced US companies dealing with it to obtain an export licence. Other sanctions followed, including the ban for American companies to invest in SMIC. The restrictions forced companies to use chip manufacturers based in Taiwan, but these were already working at maximum capacity and could not deliver. Moreover, an escalation of tensions due to the trade war between the two countries led China to stockpile record amounts of semiconductors.

Shutdowns at major semiconductor manufacturers

In February 2021, the Samsung plant in Austin, Texas, was forced to shut down due to extreme weather that left more than 200,000 homes without power. The plant lost over \$270 million of won business as a result.

In March 2021, the Renesas plant in Japan paused activities after a devastating fire. Renesas is a key automotive supplier and the shutdown had a considerable impact on makers such as Honda, Nissan, Ford and Toyota.

Boom in tech sales as a result of COVID-19

The pandemic prompted consumers and businesses to invest in technology to work from home, connect to loved ones, and have access to essential services such as e-learning and online doctor appointments. Technology for entertainment also saw a boost in sales — in the UK, Curry's PC World registered a 45 per cent increase in sales for fitness trackers, while gaming technology sales increased by 121 per cent.



Climate change

Taiwan recently experienced its worst draught in over 50 years. The country is usually one of the rainiest places on Earth, but this year no typhoons or monsoons replenished its water reservoirs. This has impacted the semiconductor industry, which uses huge amounts of ultrapure water. Taiwan is the third global chip producer and manufactures more than 90 per cent of all advanced chips.



An unsustainable supply chain

These factors exacerbated issues that were already under way well before the COVID-19 pandemic, and that have to do with the unique nature of semiconductors' supply chain. Only a small minority of companies, such as Intel, design and manufacture their own semiconductors, because the cost and complexity of this process makes it unfeasible for the great majority of producers.

The result is that everybody else relies on a few chip manufacturers, also called foundries or fabs. These are predominantly located in South-East Asia, with about three quarters of all global chips coming from China, Japan, South Korea and Taiwan. For complex and advanced semiconductors, the entire global production is virtually confined to South Korea and Taiwan.

Geographical specialisation has helped these countries excel in the production of components that are now in huge demand – decades of expertise allowed South-Eastern producers to offer high-quality semiconductors at the best price. However, relying on a handful of companies located in just one area is a double-edged sword for buyers, who are left without an alternative when problems inevitably arise.



Why automotive is hit worst

The uncertainties related to COVID-19 and the resulting lockdowns prompted automotive manufacturers to cancel orders for semiconductors. However, at the same time, people started to work from home and invest in tech for remote working and entertainment, boosting sales for the consumer electronics sector.

By the time car makers were ready to place their orders again, they found that foundries were already producing at maximum capacity to satisfy the demand from other sectors — chip producers were struggling to fulfil their orders, and automotive manufacturers were at the back of the line. Moreover, the automotive sector relies on a just-in-time production model, meaning that most car makers don't have sufficient inventory to cover them up until semiconductors' production goes back to normal.

Another thing to consider is that chips for the automotive sector are made to meet safety regulations such as ISO 26262, which makes them different from those used in other sectors. The automotive industry normally relies on 40 nm chip technology, a relatively old technology that has existed on the market for more than 20 years.

The problem is, that there is no intention to build new production lines for 40 nm chips, since the return on investment wouldn't be high enough. According to market research firm IDC, the automotive industry makes up less than nine per cent of chip demand by revenue, and this small figure doesn't justify the investment required to set up new production lines.



Government-led initiatives

Governments across the globe are taking initiative to increase their semiconductor self-sufficiency and to diversify their supply chains.

In the US, the share of global semiconductor manufacturing capacity has dropped from 37 per cent in the 1990s to just 12 per cent today. So, manufacturing giants such as Amazon, Google, Apple and Microsoft founded the Semiconductors in American Coalition (SIAC), whose mission is to advance domestic semiconductor manufacturing and research. Moreover, on June 8, 2021, the US Senate passed the US Innovation and Competition Act, which includes \$52 billion in federal investments for domestic semiconductor research, design and manufacturing.

Meanwhile, in March 2021 the European Commission announced the Digital Compass Plan, which includes investments in new equipment and technology with the goal of producing 20 per cent of the global chip supply by 2030. At the moment, the EU produces less than ten per cent of global chips, so boosting production is critical. However, the EU is currently focusing on investing in advanced chips, such as 5 nm and 2 nm chips, which is not particularly helpful for the automotive sector.



What can we do?

When a crisis of these proportions impacts the global economy, manufacturers might think that there is little they can do to mitigate its consequences. In reality, there are several strategies that can help.

The first is to limit the purchase of industrial equipment that contains semiconductors. Take care of your existing equipment by implementing a strategic preventive maintenance programme and keep track of machines' lifecycles to manage component obsolescence effectively. EU Automation's online **Knowledge Hub** is full of useful tips to help you do that. You can also download our free e-book on **obsolescence management (BoOM)**. By partaking in a circular rather than linear economy, you can reduce your environmental footprint while helping mitigate the negative consequences of the global chip shortage.

If you do need to purchase equipment that contains semiconductors, consider adding regional and local companies to your suppliers list to minimise risks if your supplier of choice is impacted by shortages. At EU Automation, we are firm believers in the diversification of supply chains. With sites in four strategic locations – the UK, the US, Germany and Singapore – and a global network of reliable partner suppliers, we can dispatch a huge variety of automation components worldwide in record times.

Another good strategy is that of investing in technology that increases the visibility of all nodes of your extended supply chain, so that if one node is impacted, you will have time to come up with a plan B.

For more tips on industrial automation, and to know more about our huge range of new reconditioned and obsolete automation parts, visit **www.euautomation.com**.

