



A Chip Shortage Recovery Guide

There is light at the end of the tunnel, but for some it's a very long tunnel. Take steps now to emerge stronger.

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At a Glance

- ▶ Chip shortages in some sectors will begin to ease later this year, including among automotive and industrial companies.
- ▶ Other industries, including gaming consoles and computer servers, won't recover until 2024.
- ▶ Leading companies are making investments to address short-term supply disruptions and set themselves up for long-term resilience.

The computing chip shortage has wreaked havoc on global supply chains for more than two years. Now, its end is finally in sight. But the recovery will be uneven: We project some industries will start to see improvement by the end of this year, while others might not turn the page until 2024 or later.

The automotive and industrial sectors, among the hardest hit by the chip shortage, will be the fastest to recover, according to Bain & Company analysis. We anticipate that supply bottlenecks in these sectors will begin to improve in late 2022 and early 2023 (see *Figure 1*). Their products rely most heavily on semiconductors in two categories—"leading-edge" 12-inch wafers and "lagging-edge" 6-inch and 8-inch wafers—that will see manufacturing capacity meaningfully increase over the next 9 to 12 months, thanks to new fabs coming online. These types of chips make up more than 90% of the semiconductors used by automotive and industrial companies.

Consumer electronics, including smartphones and tablets, will also rebound from the chip shortage over the next year or so. These products depend on the 6-inch, 8-inch, and 12-inch wafers whose supply is increasing, and they also use other types of semiconductors that have been more widely available.

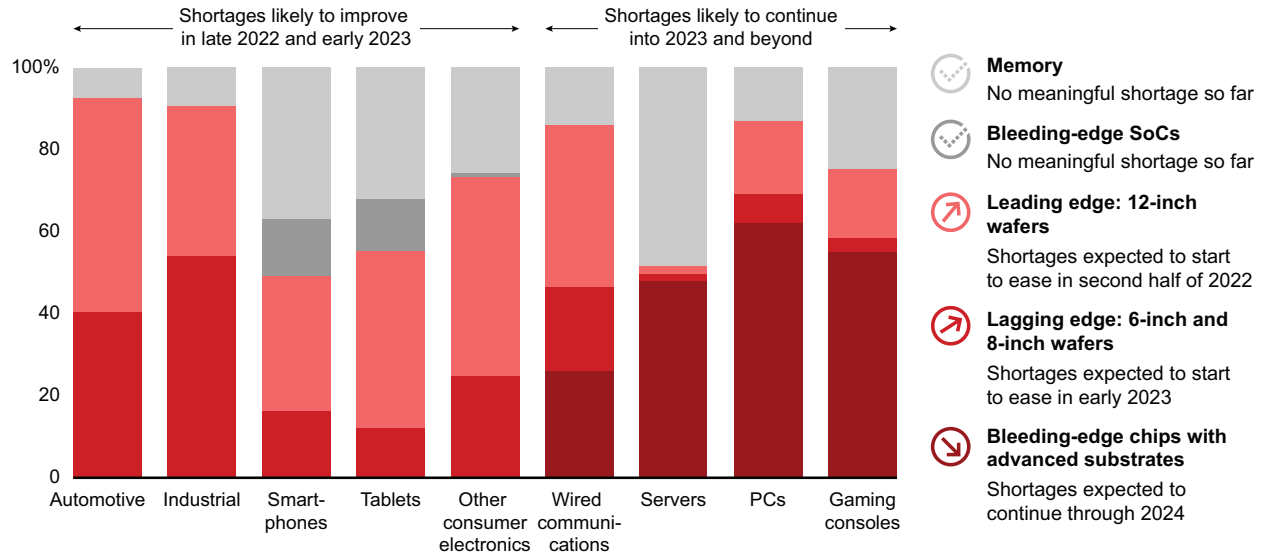
On the other end of the spectrum, we expect shortages to hamper several sectors through 2024, including gaming consoles and computer servers. Why? As demand for these products has jumped during the Covid-19 pandemic, the supply of "bleeding-edge" wafers has kept up, but production of the accompanying advanced substrate components has not. These suppliers lack the financial resources to build their substrate factories fast enough to meet rising demand. The bleeding-edge chips reliant on these substrates make up nearly 50% of the semiconductors used in servers and more than half those used in gaming consoles.

Given that the chip shortage will linger for the foreseeable future—and the devastating war in Ukraine and Covid-19 surges could cause further uncertainty and supply disruptions—many companies are moving beyond table-stakes response tactics and building a flexible, forward-looking semiconductor supply strategy. The leading companies are taking a two-pronged approach that makes bold investments to address short-term supply disruptions and set themselves up for long-term resilience. Here are some of the emerging best practices.

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Figure 1: The automotive and industrial sectors will start to see chip shortage relief this year, but gaming consoles and servers face a challenging period ahead

Semiconductor use by industry



Note: SoCs are systems on chip
Sources: Gartner; Bain analysis

Short-term solutions

Design for availability. When losing sales due to a supply chain shock, leading companies rapidly redesign existing products to minimize or eliminate their exposure to the component shortage. With the chip shortage, this might entail removing nonessential features underpinned by unavailable chips, minimizing product customization, qualifying parts from multiple suppliers, or creating new products that rely on available chips and serve untapped market niches.

The most successful companies start by deploying an agile, cross-functional team with the right skills to quickly and effectively achieve the redesign, and give it a set of clear goals and incentives to deliver on the project. They continue using the agile team in other strategic ways even after the supply shock has passed. That way, these teams continue adding value while remaining ready to spring into action when the next disruption hits.

Shape demand to accommodate supply. Sales and marketing can play a critical role in responding to supply crunches. One of the most effective tactics is actively steering customers toward the company’s more widely available products, either by raising the price of products hit by the shortage

or more heavily promoting the widely available ones. One technology company is working to develop a machine learning algorithm for its online store that recognizes when a shopper demonstrates interest in a low-supply product and instead recommends a related product with more inventory.

Component shortages can also push companies to retire legacy products that rely on components in short supply, thereby accelerating the shift toward a company's newer, more advanced products.

Long-term solutions

Design for flexible resilience. Leading companies constantly refine their products to increase resilience, ideally beginning early in product development and before a supply disruption hits. In our work with clients and analysis of the global landscape, we've found that several specific attributes tend to improve a resilience strategy's odds of success. These include reducing a product's number of parts, reusing components, using standard design approaches and flexible product architecture wherever possible, and decoupling software from hardware. In a chip shortage, for example, the fewer "hooks" the product has into silicon, the better.

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Build capabilities to see deeper into the supply chain. Traceability has risen near the top of many companies' supply chain agendas. It not only supports their sustainability goals but also can play a critical role in increasing efficiency and resilience. Enabled by digital tools, traceability allows companies to follow products as they move along the value chain and quickly glean exact information about the provenance of inputs and supplier sourcing practices. That data enables companies to make better predictions, run scenarios, and dynamically optimize operations. Companies are also getting in front of potential shortages by establishing supply chain visibility systems to consistently gather real-time market intelligence on key pinch points across their components.

Invest in value chain innovations. In this era of increasingly frequent and intense supply disruptions, leading companies recognize that traditional supply chain approaches won't cut it. One type of partnership growing in popularity involves the company paying its supplier to subsidize its production capacity and guarantee an agreed-upon volume of product for the buyer. Others are getting more hands on; some automakers, for example, have formed joint ventures with silicon manufacturers to codesign the chips they need. Meanwhile, other companies are taking on more semiconductor design in-house, which requires developing new capabilities.

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To pull all of this off, leading companies are revamping their operating model to improve collaboration between engineering, sales and marketing, and procurement, the teams that are most critical to managing through supply disruptions and preparing for the next one. For example, these companies embed procurement staff within the engineering department during product design, to catch potential supply chain issues earlier in the product development process. They also create rapid feedback mechanisms to help the three departments better communicate and more efficiently prioritize the most important customer requests and highest-value product redesign opportunities. Lastly, leading companies emphasize cross-functional collaboration in their training programs to strengthen these operational muscles.

One global industrial company's supply chain vulnerabilities came to a head over the past two years, as it got hit by pandemic disruptions and the chip shortage. These headwinds made clear the growing importance of risk management and a well-defined supply chain resilience strategy, and the company's leadership team quickly responded with significant investments to bolster those capabilities.

First, the company created a new tool that uses a scoring system to triage risks. As part of this, the company developed and codified hundreds of risk assessments, while identifying thousands of metrics that would enable it to better predict risk and quickly react. Lastly, it designed a comprehensive operating model to support the new supply chain resilience strategy and cement it throughout the company. Although it's difficult to project the impact of these investments since every supply chain disruption is different, they could easily save the company hundreds of millions of dollars when the next major supply shock hits.

The eventual end of the chip shortage will undoubtedly bring a sigh of relief, but executives recognize that the supply chain shocks won't stop coming. Companies that move quickly to bolster their resilience will put themselves in the best position to respond to whatever comes next.

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