

The Semiconductor Shortage Explained: The Auto Industry's Big Challenge

 [automoblog.net/research/news/semiconductor-shortage-explained](https://www.automoblog.net/research/news/semiconductor-shortage-explained)

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The worldwide semiconductor shortage that began in 2021 has continued to be one of the biggest stories in the automotive industry. Automakers have faced slashed production schedules and staggering revenue losses since the shortage of computer chips began. Emerging data has helped experts understand the impact of the chip shortage as well as its causes. Now, as the shortage drags on, many are left wondering when it will end.

The Semiconductor Shortage's Wide-Reaching Impact

Despite calls for calm from auto industry voices, the chip shortage has been a tremendous obstacle for businesses in many sectors. While the makers of consumer electronics such as smartphones account for the largest share of microchips at about 50%, automakers are the second largest, accounting for around 15% of the supply.

Automakers around the world have certainly felt the impact, with an estimated \$210 billion in revenue lost globally in 2021. According to a report from Techwire Asia, the shortage of semiconductors has caused manufacturing lead times to increase from an average of three to four months to an average of 10-12 months.

Effects of the Semiconductor Shortage on the Automotive Industry, Worldwide



\$210 billion (projected)
revenue lost by
automakers
in 2021



Average lead time
extended
from 3-4 months
to 10-12 months



18.3 million (estimated)
vehicles cut from
production schedules
in 2021-2022

Data: Statista, Techwire Asia

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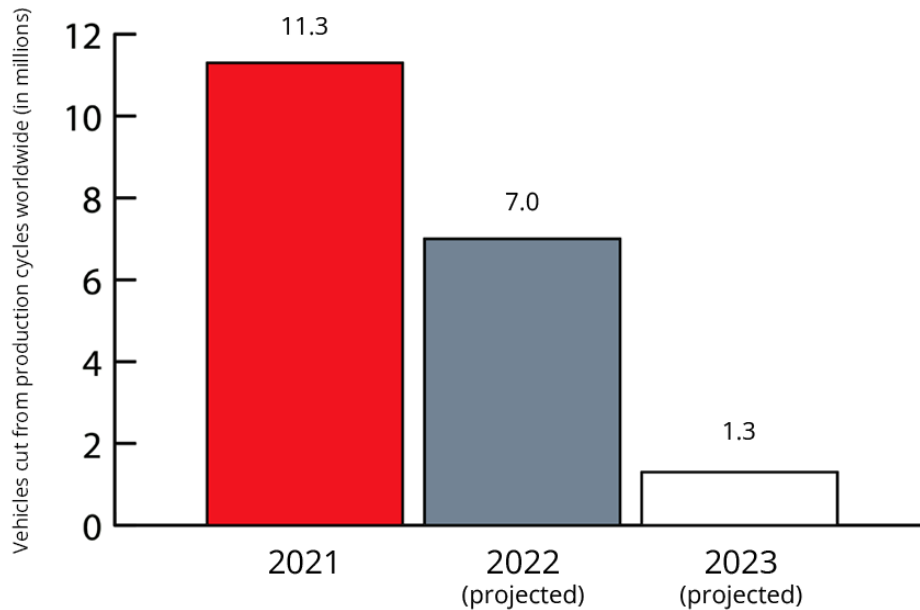
Some of the industry's largest players took major hits. According to [a report from Motor Trend](#), General Motors' (GM) net income fell 40%, to \$2.4 billion in Q3 of 2021. The company's North American profits were sliced in half that quarter, down to \$2.1 billion.

The Semiconductor Shortage Has Forced Automakers To Cut Production

Earlier in 2021, GM's Chief Financial Officer Paul Jacobson [announced](#) that the company would cut roughly 200,000 units out of its production schedule in the second half of the year. Motor Trend reported that GM plants ran at only 60% capacity in Q3 as a result of scheduled downtime. The company's factories ran at 112% capacity during the same period in the previous year.

GM's production problems are far from unique. The lack of sufficient semiconductors caused widespread production cuts around the globe. Worldwide, carmakers are estimated to [cut a total of 19.6 million vehicles](#) out of their production schedules between 2021 and 2023.

Global Automaker Production Cuts Due to the Semiconductor Shortage



Data source: Statista.com

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Why Is There a Semiconductor Shortage?

Global supply chain issues are a well-documented problem in a wide range of industries, including both the automotive and semiconductor manufacturing industries. These issues have played a significant role in the semiconductor shortage, with many of them exacerbating each other.

Manufacturing Delays

The manufacturing world is still struggling to recover from the ongoing COVID-19 pandemic, especially in China and Taiwan – the world’s leading semiconductor manufacturers. Worker shortages and other labor challenges have resulted in delays to chip production. Government lockdowns also shut down production lines on multiple occasions.

Shipping Delays

Delays have been prevalent in the shipping industry. This impacts not only the raw materials and base components coming into semiconductor companies but also the finished products leaving them.

Shipping companies face many of the same labor issues as other industries, which contributes to the delays. Port closures in major shipping hubs like Ningbo, China due to COVID-19 outbreaks also set schedules back.

Raw Material Shortages

Even during times when manufacturing capacity has reached a relatively normal level, getting the raw materials to produce semiconductors has posed a challenge for chipmakers.

China dominates production of silicon, germanium, and gallium arsenide – the three most important materials used to make semiconductors. The mining, processing, and production industries associated with these materials have suffered the same labor and supply challenges as Chinese manufacturers.

Another major issue is a worsening shortage of neon, which is essential to the semiconductor manufacturing process. The primary source of this gas is Ukraine, where two companies produce roughly half of the world's purified neon gas. Ongoing Russian attacks on the country have halted production in many areas and severely impacted supply chains since February.

Just-in-Time Manufacturing

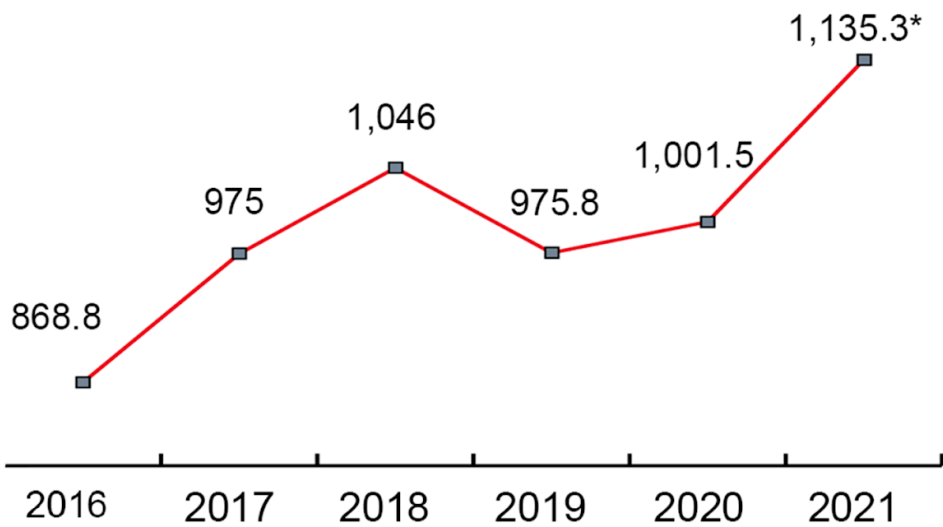
In recent history, just-in-time manufacturing has become the norm for the auto and semiconductor industries. Also known as lean manufacturing, this method produces supply to meet demand, rather than manufacturing a surplus.

This means that when the semiconductor shortage began, chip manufacturers and automakers didn't have surplus to weather it. As a result, the impact of that shortage was felt almost immediately.

Global Automotive Semiconductor Shipments Are Actually Up

The supply chain issue is the popular story, but demand is also part of the equation. Shipments of semiconductor units for automobiles actually increased from 2020 to 2021.

Total Semiconductor Units Shipped Worldwide (In Billions) 2016-2021



*2021 shipping volume is estimated

Data source: Statista.com

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As the chart above shows, worldwide shipments of semiconductor units reached a record high last year. Despite a higher rate of chip production than ever before, there was still effectively a shortage for the auto industry. This means that factors beyond chip production numbers are at play in the shortage.

Why Semiconductors Are Critical to the Auto Industry

Rising demand is a major factor in the global chip shortage. As passenger vehicles have become more technologically advanced, they've used an increasing number of microchips. According to estimates, the average modern car has between 1,400 and 1,500 semiconductor chips. Some have as many as 3,000. These chips are used to control everything from emissions systems to driver assist systems, making them an essential part of vehicle production.

Electronic Vehicle Systems

Semiconductors have allowed automakers to replace manual systems with electronically controlled ones. Electrical systems have helped engineers develop vehicles that are more efficient, depend less on oil, and have reduced carbon emissions.

Smart Safety Features

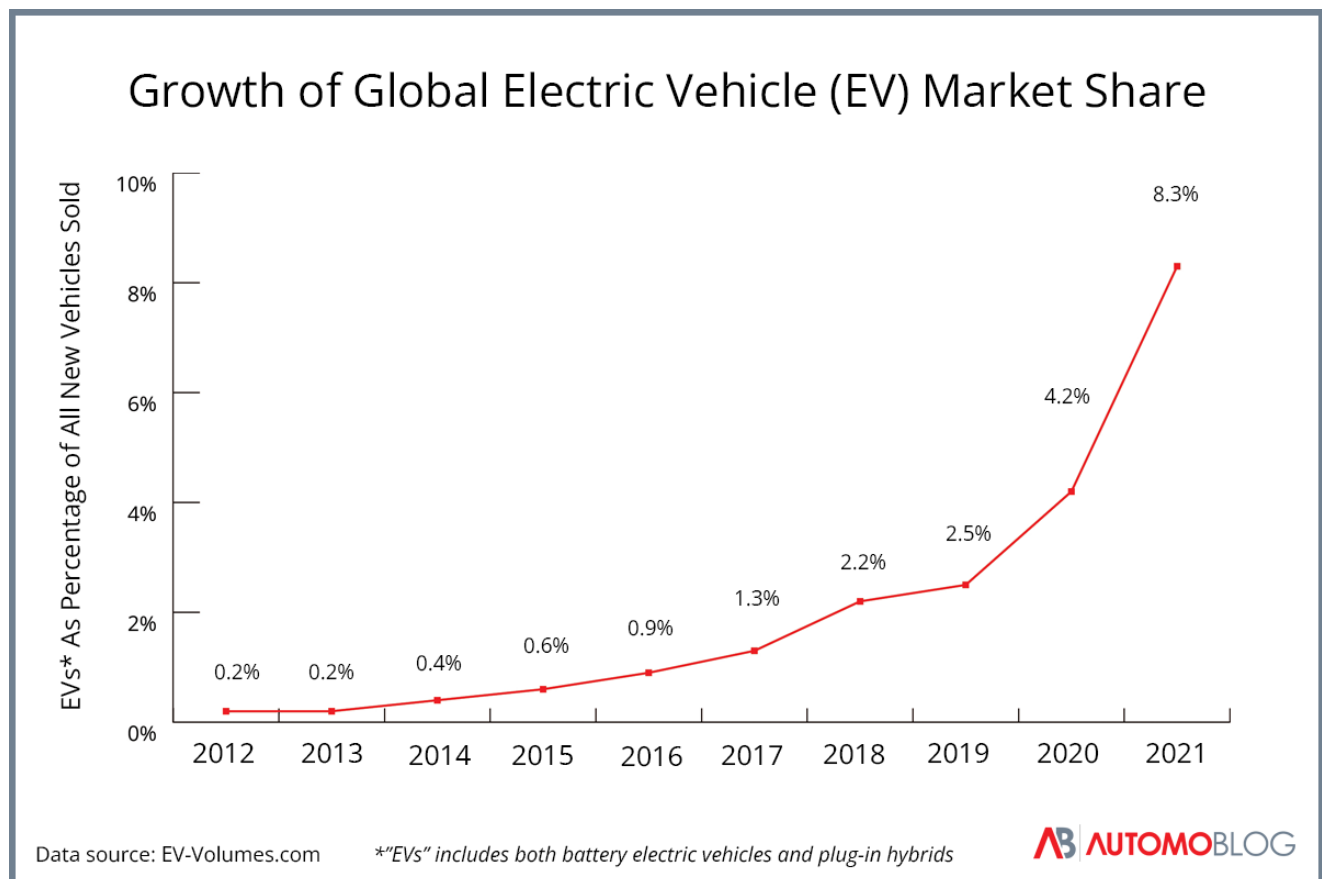
Chip systems have made important innovations in driver safety technology possible. Electronically controlled emergency braking, airbag deployment, blind spot detection, collision avoidance, and other systems all employ semiconductors.

Driver Assistance Technology

All of the recent innovations in driver assistance technology use semiconductors. Rear backup cameras, for example, require chips to communicate with onboard displays. Adaptive cruise control, navigation systems, and infotainment systems also require semiconductors.

Semiconductor Demand Will Increase With the Shift to Electric Vehicles

All signs suggest that the auto industry's shift toward electric vehicles (EVs) is rapidly picking up pace. Though EVs – defined as fully electric and plug-in hybrid vehicles – only accounted for 8.3% of all vehicles sold in 2021, that market share nearly doubled compared to 4.2% in 2020. Electric vehicles accounted for less than 1% of all vehicles sold as recently as 2016.



As critical as semiconductors are to automobile production at large, they are an even more essential component of EVs, which are becoming an increasingly large sector of the market. Chips control both the powertrain and the battery in EVs, along with everything else they

control in gasoline-powered vehicles. According to some experts, EVs use more semiconductors in general than their gas-powered counterparts.

Even a small uptick in the average number of semiconductors used in each vehicle, combined with continued growth of both the EV market and the auto market at large, could result in a significant increase in pressure on the semiconductor supply chain.

When Will the Semiconductor Shortage End?

While the causes and effects of the global semiconductor shortage are readily apparent, there is little consensus on when it will end. In general, automakers have been more optimistic about the end of the chip shortage than the semiconductor manufacturers themselves.

Hopes for a 2022 end to the semiconductor shortage are all but squashed, and the shortage's conclusion could still be far off. While 2023 remains a popular prediction for the chip supply to return to normal, some industry insiders like Intel's Pat Gelsinger have suggested that the semiconductor shortage could stretch into 2024.