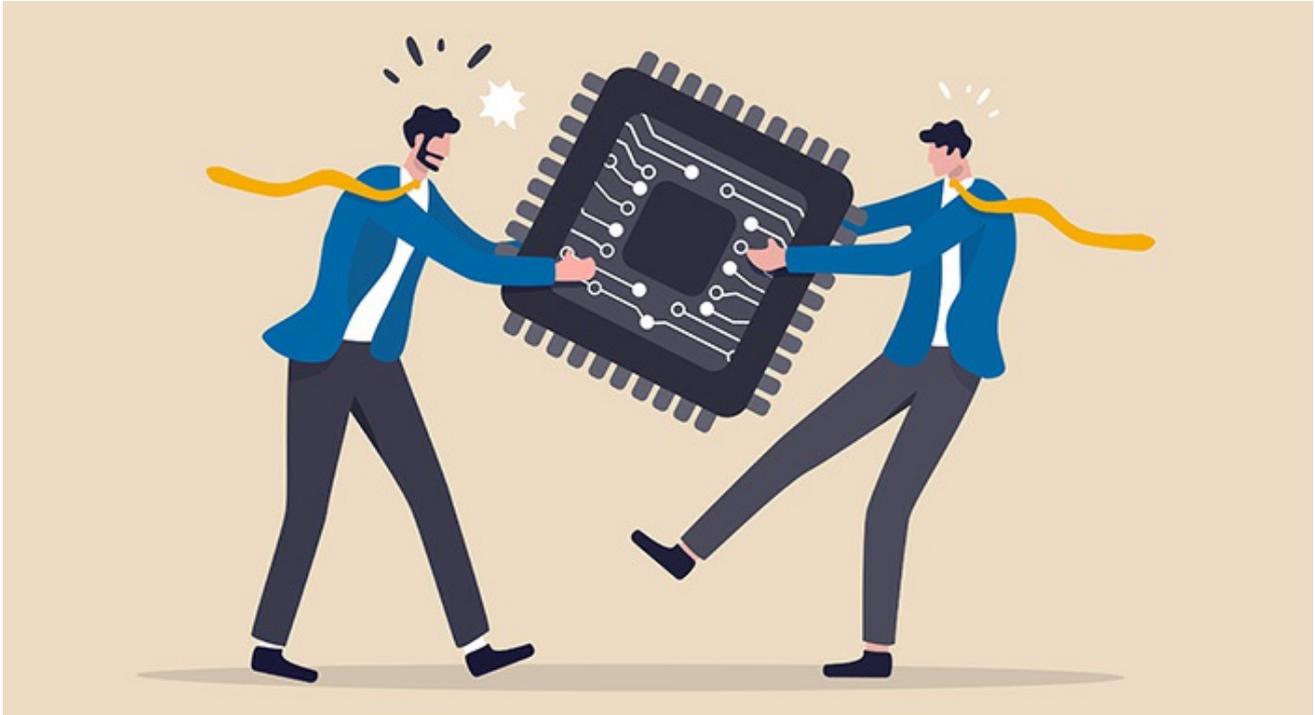


# CAN Newsletter Online

CHIP SHORTAGE

## CAN-connectable devices are affected

CiA (CAN in Automation) members suffer on the limited availability of MCUs (micro-controller unit) with on-chip CAN controllers, especially on those, which are qualified for automotive applications.



*The chip shortage affects not just carmakers and will remain in 2022 and eventually beyond (Source: Adobe/Stock)*

Boston Consulting Group (BCG) estimates that in 2021 about 11 million road-vehicles cannot be produced due to the chip shortage. This results in a 180 billion € turnover reduction. Carmakers around the world slowed down or even stopped production, because ECUs (electronic control unit) are not available. General Motors is going to restart in November the remaining three North American plants that have been closed. Opel, a brand of Stellantis (a merger of PSA and FCA), stops production until January 2022 in its factory in Eisenach (Germany). This are just a few examples. Elon Musk, Tesla's CEO, tweeted that Renesas and Bosch are by far the most problematic electronic suppliers: "We are operating under extreme supply chain limitations regarding certain 'standard' automotive chips."

To substitute MCUs, is not that easy. Pin-compatible replacements are very rare. New printed-circuit board (PCB) designs need to be developed and to be tested, which is time-consuming. Software-compatibility is an issue, as well. Tesla went this way: But it was not just a matter of swapping out a chip; you also have to rewrite the software, explained Musk. The replacement was designed within a couple of weeks including a new software. The self-developed ECU for controlling airbags and seatbelts avoided production delays for a longer time.

The chip shortage is caused by different reasons. One of them is the lockdown in Malaysia earlier this year, because many of the automotive micro-controllers are assembled and packed in Southeast Asia. Malaysia packages and tests make 13 percent of the worldwide semiconductors. In early September, Malaysia started to restore chip factories to about 80 percent. Infineon and STMicroelectronics as well as other market-leading chipmakers depend on Southeast Asian chip-assembling companies. However, increasing production capacity needs some time.

The chipmakers fight chip shortage with new plants, too. Renesas unveiled plans to increase the capacity by 50 % for automotive MCUs by 2023. This is equivalent to 40 000 200-mm wafers. Earlier this year, the Japanese company lost a chip plant close to Tokyo because of a fire. Renesas' production gap has increased by 30 percent since June. Unfortunately, the Infineon chip factory in Dresden (Germany) went down after a power outage mid of September. Reinhard Ploss, Infineon CEO, said already one month earlier that the worldwide chip shortage is likely to remain until 2023. Recently, the German company opened a 300-mm fab in Villach (Austria). It produces power-ICs, which are needed for e-vehicles. But this does not improve the MCU shortage. Anyway, it takes six to seven months to manufacture a micro-controller. This covers the time from inserting the wafer until a packaged and tested chip drops out the worldwide production chain.

The semiconductor shortage hurts not just the carmakers, but also the Tier-1 suppliers. They are fostering the in-house production of integrated circuits, to reduce dependencies on chipmaking companies. In June, Bosch opened a one-billion € factory in Germany. Continental, another big automotive Tier-1 produces also its own semiconductors, for example CAN transceivers and CAN system base chips.

The most reason of the automotive chip crisis is self-made: The automakers reduced immediately orders, when car sales dropped in the beginning of the Covid-19 pandemic. When sales rebounded mid to end of 2020, suppliers and carmakers could not adjust their MCU orders, because chipmakers were already producing chips for other customers, especially for laptops, smartphones, printers, and other electronic equipment suitable for home-offices, for example.

In the meantime, many industries suffer. There is some rumor that Apple reduces the iPhone 13 production by 10 million units in the last three month of 2021, because of reported chip delivery bottlenecks by Broadcom and Texas Instruments. Originally, 90 million smartphones were forecast. None of the involved companies confirmed these reports. Chip shortage could persist for another two to three years, estimate Hisense, one of China's largest TV and domestic appliance vendors.

There is no detailed information on MCU with CAN on chip shortage available. The same is for CAN transceivers. But CiA members from all markets reported supply-chain problems – not just for integrated circuits.

The lesson-to-learn for the automotive industry: Manufacturing of MCUs takes more time than bending sheets of metal. The bottom line is that just-in-time logistics is only of limited value for products that have such a slow supply-chain as micro-controllers. As a strategy to avoid such bottlenecks in the future, Lars Reger, CEO of NXP, proposes building up safety stock positions, at several points in the supply-chain. Alternatively, second sourcing would be a possibility - but only if chip interface would be standardized. In case of CAN controllers, a standardized user interface would be helpful. The CiA 601-2 document is not detailed enough and contains mainly recommendations and not hard requirements. Regarding CAN transceivers the situation is better: most of the offered components are pin-compatible with the CAN transceivers by NXP.

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