

# New Federal Incentives Jump Start Domestic Chipmaking Factories

*The Chips and Science Act has now been signed into law. Find out if this \$200 billion funding bill will help jumpstart the domestic chipmaking industry.*

AUSTIN, TEXAS, UNITED STATES, August 31, 2022 /EINPresswire.com/ -- The Russian invasion of Ukraine has caused worldwide economic disruption and led to rising energy prices for oil and natural gas.

But what would be the consequences of China invading Taiwan?

We got a strong reminder of the possibility that could happen last week when China conducted military exercises around the island during the visit of US House Speaker Nancy Pelosi.

Taiwan is vulnerable. And it's the home of TSMC, one of the world's most advanced chipmaking companies, as well as an entire ecosystem of suppliers providing key components and advanced technology for the microelectronics [manufacturing](#) industry.

Since the start of the pandemic, chip shortages have roiled the manufacturing industry, leading to a production rollback in the auto industry alone of millions of vehicles worldwide.

A Chinese invasion of Taiwan could paralyze industries around the world (including potentially those in China) that are increasingly dependent on advanced computer chips.

The Bi-Partisan United States Chips And Science Act (CHIPS-Plus) Becomes Law



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This week, President Biden signed into law the United States Chips and Science Act (also known as CHIPS-Plus), a rare bi-partisan bill that promises to invest \$200 billion in the next five years to help reshore chip manufacturing operations back to the USA.

The bill includes increased funding and incentives for research and development, industrial chipmaking production, STEM education, and space exploration:

- \$170 billion in research funding is split between the National Science Foundation and the Department of Energy to promote new technology development (including AI, quantum computing, advanced material science, and manufacturing)
  - \$13 billion to fund STEM education, especially in rural areas
  - \$39 billion in incentives for companies to build, update, or grow their US chipmaking facilities
  - A new 25% tax credit for investing in new semiconductor manufacturing equipment or new manufacturing facility construction
- “ Given the current geopolitical situation (as well as our increasing dependence on computer chips!) it’s easy to justify the need to make investments to help America to become more “chip” independent.”
- Formaspace*
- Funding for NASA’s moon and Mars exploration programs

#### Creating An Ecosystem For Leading Edge Chips Manufacturing Is A Tall Order

Given the current geopolitical situation (as well as an increasing dependence on computer chips!) it’s easy to justify the need to make investments to help America to become more “chip” independent.

Unfortunately (re-)creating prowess in chipmaking technology is not easy, nor can it be accomplished quickly – so the expectations need to be set accordingly.

Experts at Intel point out it can take at least 3 years at a cost of over \$10 billion to set up a new

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chip fabrication facility or fab.

Compounding the problem is that few manufacturers have been able to catch up with the acknowledged leader in the high-tech chip fab production field, Taiwan's TSMC, which builds chips on a contract basis for many of the world's leading brand name companies.

What makes the chip building industry so hard?

One explanation is that successful chip fabs need a solid support foundation – an ecosystem, in other words – that combines savvy tech leadership with multiple high-tech product and service inputs, including:

- Leadership And Finance

The chip industry is not for the faint of heart. As mentioned earlier, it takes billions of dollars to set up a chip fab and major financial investments to keep up with each successive new chip generation, driven by an expectation that (in accordance with Moore's Law) computer chip speed/capacity will double every two years.

Leadership and vision are also key success indications. Unfortunately for the US, the Taiwanese immigrant Morris Chang (who got his degree from Stanford) felt underappreciated during his career at semiconductor maker Texas Instruments; he returned to Taiwan and founded TSMC in 1987, an incalculable loss for American technology. But it stands as a good reminder of the importance of keeping the US-educated, foreign-born scientists and engineers to stay and contribute to the American economy.

- Infinitesimal Tolerances

Under Moore's law, chipmakers are trying to shrink the size of transistor components. Here is a chart of how the process nodes (roughly corresponding to the size of individual transistor gates) have shrunk every two-year cycle:

10  $\mu\text{m}$  – 1971

6  $\mu\text{m}$  – 1974



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3  $\mu\text{m}$  – 1977

1.5  $\mu\text{m}$  – 1981

1  $\mu\text{m}$  – 1984

800 nm – 1987

600 nm – 1990

350 nm – 1993

250 nm – 1996

180 nm – 1999

130 nm – 2001

90 nm – 2003

65 nm – 2005

45 nm – 2007

32 nm – 2009

22 nm – 2012

14 nm – 2014

10 nm – 2016

7 nm – 2018

5 nm – 2020

So, from 1971 to 2020, semiconductor nodes have shrunk from 10,000 nm to just 5 nm, just 0.000005% of their size in only 49 years.

Incredibly, TSMC plans to produce 3 nm chips later this year and introduce 2 nm chips in 2024, going into production in 2025-2026.

Given that the size of a typical atom ranges between 0.1 to 0.5 nanometers in diameter, it's pretty obvious that this is about infinitesimal tolerances.

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