Semiconductor crisis, an opportunity for India

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Manifest Pedagogy:

Currently, the world is experiencing a shortage of chips and semiconductors that have become essential not only for new-age technological products like smartphones and computers, but also for traditional sectors like automobiles.In every adversity, there's an opportunity. As the world grapples with an acute semiconductor shortage, there is an opportunity for India to move the needle in the right direction.

In News: Recently, there has been an abrupt and cascading shortage of semiconductors worldwide
Placing it in Syllabus: Economy

Static Dimensions

- Background of the Issue
- Present Supply Chain of Semiconductors

Current Dimensions

- Crisis in Taiwan Straits and its implications for Semiconductor Industry.
- India's Readiness
- Challenges for India in developing a robust Semiconductor Industry.
- Opportunity for India
- Government Initiatives

Content

Background of the Issue

- **Semiconductors**

        - It is a material product usually composed of silicon, which conducts electricity more than an insulator, such as glass, but less than a pure conductor, such as copper or aluminium.
        - Semiconductors are critical technological components for emerging technologies viz. artificial intelligence (AI) and internet of things applications, 5G communications, cloud computing, automation, electric vehicles, with a wide coverage of applications from basic consumable electronic gadgets and automobiles to areas of strategic operations.
- Semiconductor chips are a vital component in practically every industry. However, the world is facing a chip shortage because of its limited supply.
- In addition to long-standing issues within the industry, such as insufficient capacity at semiconductor fabs, the Covid-19 pandemic introduced unprecedented challenges.
- The current chip shortage is unlikely to be resolved soon, partly because of the complexities of the semiconductor production process.
- Typical lead times can exceed four months for products that are already well established in a manufacturing line.
    - The end-to-end life cycle spans one to three years. Setting up a manufacturing unit with all infrastructure takes around 12-18 months, followed by a research-intensive product development cycle of another 12-36 months and a repeatable production process of more than four months.
    - A semiconductor chip, in other words, is a function of an efficient manufacturing process, engineering talent and a conducive government policy.

Present Supply Chain of Semiconductors

- The semiconductor manufacturing capacities are concentrated in a few geographies.
- Nearly all leading edge (sub 10nm) semiconductor manufacturing capacity is limited to **Taiwan and South Korea, with nearly 92 percent** located in the former.
- Further, **75 percent of the semiconductor manufacturing capacity is concentrated in East Asia and China**.

Crisis in Taiwan Straits and its implications for Semiconductor Industry.

- The recent visit of US House of Representatives Speaker Nancy Pelosi to Taiwan has created an unprecedented crisis in the region.
- The **situation will be** grave, and it will take us not years but several decades to recover from it as an outcome if the country producing 63 percent of total semiconductors stops producing them.
- According to a Goldman Sachs report, the world chip shortage has already affected 169 industries .
- Reports suggest that mobile phones are going to get costlier. Prices have been rising across the supply chain,
    - Computers, laptops, mobiles, and automobiles are getting costlier and harder to get by.
- A shortage in chips due to Covid-19 resulted in the Jaguar–Land rover producing around 1.70 lakh fewer cars than expected.
- US-based car automobile company General Motors reported **16% of vehicles** being unsold due to a global chip shortage.

India's Readiness

- India is ready in just one of the three parameters of chip self-reliance. According to government data, **India imports 94 percent of its electronics and 100 percent of its semiconductors.**

        - India currently imports all chips and the market is estimated to touch **$100 billion by 2025 from $24 billion now**.
    - Digital India initiatives seek to fulfil all three parameters with a sense of urgency.
    - The good news is that India is trying to lay a strong foundation of chip design that can be expanded to research and development focus for product development and IP (intellectual property) creation.
    - There is an opportunity to create a solid manufacturing base, but it can happen only with strong government support for this sector.
    - **Taiwan provides a 90 percent subsidy** to chip manufacturing, and we will have to travel a long way to achieve a comparable scale.

Challenges for India in developing a robust Semiconductor Industry.

- **Raw materials**-Dependence on imports for raw materials.
- **Production**-Presently India lacks the high grade production facilities required for large scale chip manufacturing.
- **Water supply**-Semiconductor manufacturing consumes large quantities of water for a variety of purposes ranging from equipment cooling to wafer surface cleaning.
    - India lacks such a facility presently.
- **Irregular power supply** and frequent power cuts.
- **Technological Challenges** -The making of a semiconductor chip involves some technological skill .
- **Inadequate logistics** and absence of proper waste disposal have further exacerbated the poor state of its production.

Opportunity for India

- India has a strong base for semiconductor chip design, a software-intensive area.

- The Indian government, in December 2021, rolled out an incentive scheme worth Rs 76,000 crore (roughly $10 billion) to attract international semiconductor and display manufacturers in a bid to establish the country as a global chip manufacturing hub.
    - This will go a long way in establishing the country as a global hub for electronics goods, besides creating jobs and attracting investments from top companies around the world.
- Apart from high costs, certain infrastructure requirements are vital.
    - It requires an uninterrupted power supply and access to millions of litres of pure water.
- India is lacking in these departments. India still experiences frequent power cuts and our water supply treatment isn't up to the mark.
    - Before the global chip shortage, these factors were enough to discourage foreign players from setting up shop in India.
    - Things have started shifting positively and big corporations such as Tata group and Vedanta Have shown interest in moving forward with joint ventures.
- Establishing a few successful units is a long-haul game of at least 3 to 5 years.
    - It will work as an accelerator for other sectors and contribute immensely to India's desired $5 trillion economy target by 2025.
    - It can work on the PPP (public-private-partnership) model.
- Both state and central governments should come forward to provide infrastructure and long-term incentives, and companies can go for joint ventures with industry experts.
- Indian industries' consortium should come forward and incubate a new ecosystem of chip manufacturing.
    - Their commitment to manufacturing and supply chain

can help India minimise import dependency and reduce her vulnerability emanating from the potential crisis in the Taiwan straits.

- In recent years, the semiconductor industry's profitability has improved exponentially relative to other companies, and this trend is expected to continue further.
    - From 15th place in 2000-2004, it shot up to 4th place between 2016-2020 in terms of economic profit,as reported by **Mckinsey and Company.**
    - Here is an opportunity for India to go beyond the software and establish herself as a chip-manufacturing powerhouse.

Government Initiatives

- The Union Cabinet has allocated an amount of **₹76,000 crore** for supporting the development of a 'semiconductors and display manufacturing ecosystem'.
- India has also launched the **Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS)** for manufacturing of electronics components and semiconductors.
- In December 2021, India invited an "expression of interest" from chipmakers for setting up fabrication units in the country or for the acquisition of such manufacturing units.
- The MeitY also launched the **Design Linked Incentive (DLI)** Scheme to nurture at least 20 domestic companies involved in semiconductor design and facilitate them to achieve turnover of more than Rs.1500 Crore in the next 5 years.
- The recently announced **Semicon India** programme which provides **$10 bn fiscal support** and other non-fiscal measures is a step in the right direction.
    - The Semicon India Program aims to provide attractive incentive support to companies /

consortia that are engaged in Silicon Semiconductor Fabs, Display Fabs, Compound Semiconductors / Silicon Photonics / Sensors (including MEMS) Fabs, Semiconductor Packaging (ATMP / OSAT) and Semiconductor Design.

WayForward

- India must seize this opportunity of shortage across the globe and become an attractive alternative destination for semiconductor manufacturing.
- Placing semicon diplomacy at the heart of India's foreign policy is essential both strategically and economically.
- The establishment of the value chain for semiconductors would ensure a multiplier effect on the entire economy.
- Domestic production would be saving forex and reducing the balance of payments, especially vis a vis China.
- The semiconductor value chain is interrelated and linked with several industries, governments must develop policies that address all the crucial characteristics in the long run.
- Focus on assuring and securing access to foreign technology suppliers through trade and foreign policy to ensure a global level of collaboration.

Mould your thoughts

Q.In every adversity, there's an opportunity. As the world grapples with an acute semiconductor shortage, there is an opportunity for India to move the needle in the right direction. Critically analyse. Also enumerate the steps taken by the government in this regard. (250 words)

Approach to the answer

- Background of the issue.
- Why shortage across the world.
- India's readiness and what should India do.

- Challenges from India’s stand point.
- Government Measures
- Way Forward and Conclusion.