



## Semiconductor Industry in India

**For Prelims:** [India Semiconductor Mission](#), [Development of Semiconductors and Display Manufacturing Ecosystems in India](#), Semiconductor Fab.

**For Mains:** India's Semiconductor Industry, India Semiconductor Mission (ISM), Importance of Semiconductor Fabrication, Challenges and Way Forward

[Source: PIB](#)

### Why in News?

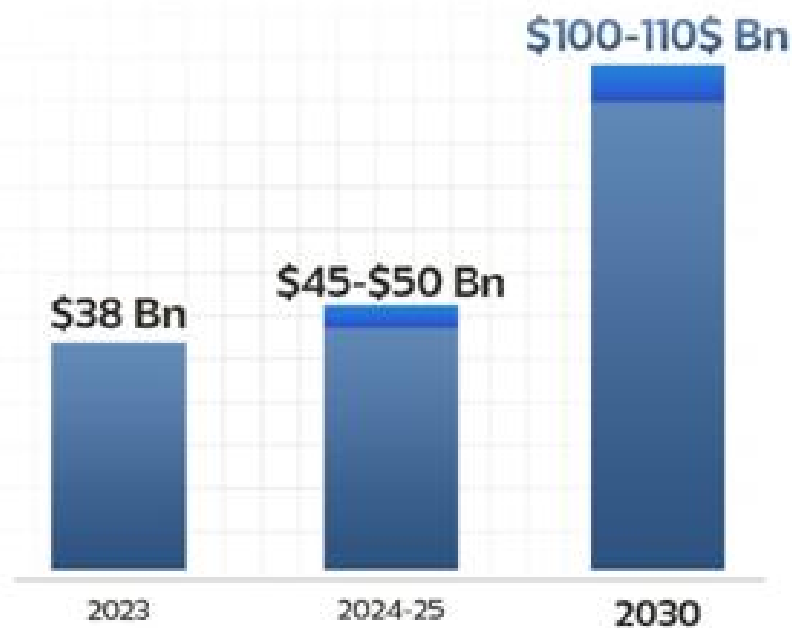
The **Union Cabinet** approved 4 new semiconductor projects in **Odisha, Punjab, and Andhra Pradesh** under the [India Semiconductor Mission \(ISM\)](#), bringing the total to **10 projects** across **6 states**.

### What are the Key Trends and Opportunities Shaping the Growth of India's Semiconductor Market?

- **Market Size:** India's semiconductor consumption market, valued at **USD 52 billion** in 2024-25, is expected to reach **USD 103.4 billion by 2030** with [Compounded Annual Growth Rate \(CAGR\)](#) of **13%**.
  - **Mobile handsets, IT, and industrial applications** account for **approx 70% of revenue**, while **automotive and industrial electronics** offer significant scope.
  - Taiwan, South Korea, Japan, China, and the US dominate the semiconductor industry.
  - India's imports of **Integrated circuits (ICs)**, memory chips, and amplifiers surged by 2,000%, 4,500%, and 4,800% from FY16-24, with China supplying nearly **one-third of these imports**.

## Size of the Indian Semiconductor Market

(In USD Billion)



Source: Ministry of Electronics and Information Technology

### ▪ Key Opportunities for India:

- **Large Market Potential:** India has emerged as the **world's second-largest market** for 5G smartphones, trailing only behind China, holding a **13% share**, behind China's **32%**.
- **Surging Domestic Demand:** Growing consumption of **mobile devices, computers, and digital technologies**, coupled with the **5G rollout** and **AI adoption**, is driving **strong demand for advanced semiconductors**.
- **Global Partnerships & Support:** Collaborations with **global semiconductor leaders** and countries like **US and Japan** facilitate **technology transfer** and enhance India's capabilities.
  - **Semicon India Programme** and expansion of **manufacturing and digitalisation** strengthen India's semiconductor ecosystem.



- **Cheaper Electronics:** Phones, TVs, Laptops made in India.
- **Manufacturing in India** leading to **Stronger Economy** (less import, more Exports).
- **More Jobs** and new Opportunities.



- **Opens the door** to strengthen global electronics value chains.
- **National Security:** Chips are used in Defence, Space and Communication.
- **Innovation Hub:** Indian Startups and students can now design world-class technology at home.

## What is the India Semiconductor Mission (ISM)?

- **About:** ISM, approved in **2021**, aims to boost India's **global electronics value chain presence** and establish it as a **global manufacturing hub**.
  - It **operates** under the **Ministry of Electronics and Information Technology (MeitY)**.
- **Objective:** To **support chip design startups**, promoting **indigenous IP** and **technology transfer**, fostering **research, innovation, and industry-academia collaboration**.
  - It aims to reduce **import dependence** to strengthen India's **global semiconductor presence**.
- **Mission Focus:**
  - Set up **chip manufacturing fabs**
  - Create **packaging and testing units (ATMP/OSAT)**
  - Support **chip design startups**
  - Train **engineers and technical talent**
  - Attract **global semiconductor investments**
- **Key Schemes under ISM:**
  - **Semiconductor Fabs Scheme:** Providing up to **50% fiscal support** for wafer

fabrication(fabs) units.

- **Display Fabs Scheme:** Up to **50% financial assistance** for AMOLED/LCD display fabs to promote domestic innovation.
- **Compound Semiconductors & ATMP/OSAT Scheme:** Up to **50% support** for compound semiconductors, MEMS/sensors, silicon photonics, and downstream packaging/testing facilities.
- **Design Linked Incentive (DLI) Scheme:** Promotes **semiconductor design startups** and **Micro Small Medium Enterprises (MSMEs)** by financial support up to **Rs 15 crore per company** across product development stages.

## Initiatives to Promote India's Semiconductor Industry in India

- **Production Linked Incentive (PLI) scheme:** **PLI** for **large-scale electronics manufacturing** and **IT hardware** to boost domestic production and exports.
- **Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECES):** Strengthened component and semiconductor manufacturing ecosystem.
- **Electronics Manufacturing Clusters (EMC & EMC 2.0):** Developed infrastructure and ecosystem for electronics manufacturing.
- **Public Procurement (Preference to Make in India) Order, 2017:** Prioritizes **domestically manufactured products** in government procurement.
- **Tax Reforms:** Rationalization of tariffs, exemption of **basic customs duty on capital goods**, and other incentives.
- **FDI Policy:** Allows **100% FDI** in electronics manufacturing, subject to applicable laws/regulations.

## What are the Key Challenges to India's Semiconductor Industry?

- **Infrastructure & Innovation Challenges:** Semiconductor fabrication involves **500-1,500 complex steps in cleanrooms**, requiring advanced **infrastructure, technology, and skilled talent**.
  - High costs of **fab setup, R&D, and equipment**, coupled with India's **weak semiconductor research and dependence on imported components and IP**, limit innovation and technological self-reliance.
- **Skilled Workforce Gap:** India currently employs about 220,000 semiconductor professionals, but the **industry faces a projected shortfall of 250,000 to 350,000** skilled workers by 2027 across the semiconductor value chain
- **Technology & Global Competition:** **Taiwan and South Korea dominate** global semiconductor production (80% of chip foundries), while **ASML (Netherlands) controls EUV lithography**, and **Nvidia and ARM** lead chip design, limiting India's access to advanced technologies.
- **Environmental & Regulatory Challenges:** Semiconductor manufacturing uses **hazardous chemicals, toxic metals, and high energy**, creating environmental risks and added compliance costs.
  - **Complex regulations, IP issues, export controls, and policy uncertainty** increase operational challenges for manufacturers.

## What Steps Should India Take to Strengthen Its Semiconductor Industry?

- **Skill Development:** Establish **specialized training programs** in **chip design, fabrication, and testing** to build a skilled workforce.
- **Boost R&D & Indigenous IP:** Increase investment in **research and development**, support **indigenous product design**, and develop **intellectual property**, enabling **startups and smaller companies** to compete globally.
- **Incentives & Policy Support:** Strengthen government initiatives like **India Semiconductor**

**Mission (ISM)** and state-level policies (e.g., **UP Semiconductor Policy 2024**) to **attract investments** and promote semiconductor manufacturing.

- **Chip Diplomacy & Niche Focus:** Promote **international collaboration** (“chip diplomacy”) and focus on **niche technologies** like **MEMS and sensors** to position India in specialized segments of the global market.
- **Private Sector Participation & Strategic Opportunities:** Encourage **private investment** and collaborations, such as **Tata-PSMC fab in Gujarat**.
  - Leverage **geopolitical shifts** (US-China tensions) to **expand India’s semiconductor footprint**.

## Conclusion

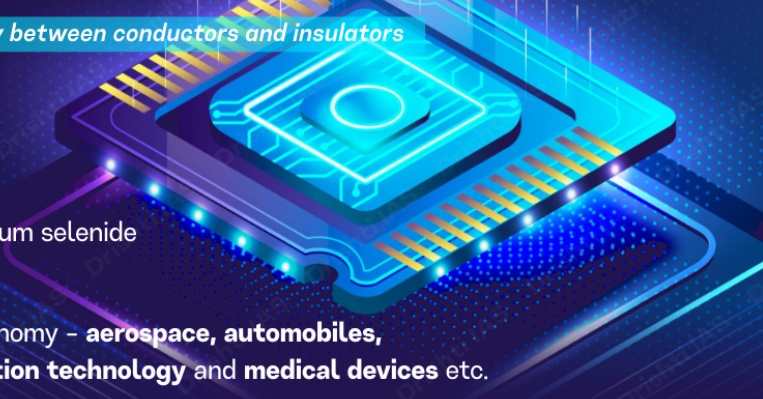
India’s **semiconductor sector** is growing rapidly, driven by **ISM, PLI, and SEMICON India**, rising **domestic demand**, and **global partnerships**. Strengthening **infrastructure, technology, and skills** will be key to making India a **global hub for semiconductor manufacturing and design**.





# SEMICONDUCTORS

Semiconductors are materials having conductivity between conductors and insulators



## EXAMPLES

- **Pure Elements:** Silicon and Germanium
- **Compounds:** Gallium Arsenide and Cadmium selenide

## SIGNIFICANCE

- Essential to almost all sectors of the economy – **aerospace, automobiles, communications, clean energy, information technology and medical devices** etc.

## SEMICONDUCTORS AND INDIA

- **India Imports from:** China, Taiwan, USA and Japan
- **Indian Semiconductor Market:** Expected to reach **USD 55 bn** by **2026**

### SCHEMES

- ↳ **Production-Linked Incentive (PLI) scheme**
- ↳ **Design Linked Incentive (DLI) Scheme**
- ↳ Scheme for Promotion of Manufacturing of Electronic Components and Semi-conductors (SPECs)

### OBJECTIVES

- ↳ Encourage semiconductor and display manufacturing in the country.
- ↳ Nurture >20 domestic companies in semiconductor design  
Achieve a turnover of > Rs.1500 crore in next 5 years
- ↳ Manufacture electronics components and semiconductors

## INDIA'S SEMICONDUCTOR MISSION (ISM)

### VISION

- Build a **vibrant semiconductor and display design and innovation ecosystem**

### LAUNCHED

- 2021

### NODAL MINISTRY

- Ministry of Electronics and Information Technology (MeitY)

### TOTAL FINANCIAL OUTLAY

- Rs 76,000 crore

### COMPONENTS

- Scheme for setting up of Semiconductor Fabs
- Scheme for setting up of Display Fabs
- Scheme for setting up of Compound Semiconductors/Silicon Photonics/Sensors (including MEMS) Fabs/ Discrete Semiconductors Fab and Semiconductor ATMP/OSAT
- DLI Scheme



### Drishti Mains Question:

Examine the growth potential of India's semiconductor sector and suggest measures to overcome key challenges for self-reliance.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Prelims:

**Q. Which one of the following laser types is used in a laser printer? (2008)**

- (a) Dye laser
- (b) Gas laser
- (c) Semiconductor laser
- (d) Excimer laser

**Ans: (c)**

**Q. With reference to solar power production in India, consider the following statements: (2018)**

1. India is the third largest in the world in the manufacture of silicon wafers used in photovoltaic units.
2. The solar power tariffs are determined by the Solar Energy Corporation of India.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (d)**

---

### **Mains**

**Q. Why is nanotechnology one of the key technologies of the 21st century? Describe the salient features of Indian Government's Mission on Nanoscience and Technology and the scope of its application in the development process of the country. (2016)**

PDF Reference URL: <https://www.drishtiias.com/printpdf/semiconductor-industry-in-india>

