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Research

The Indian Semiconductor Ecosystem

Legal, Tax and Regulatory Pathways to Global Leadership

November 2025

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Contents

List of Abbreviations

4IR	Fourth Industrial Revolution
AFM	Atomic Force Microscopes
AI	Artificial Intelligence
ALD	Atomic Layer Deposition
ALP	Arm's Length Price
APA	Advanced Pricing Agreements
ATMP	Assembly, Testing, Marking and Packaging
CBDT	Central Board of Direct Taxes
CGST	Central Goods and Services Tax
CIT	Corporate Income Tax
CPU	Central Processing Unit
CVD	Chemical Vapor Deposition
DPIIT	Department for Promotion of Industry and Internal Trade
DUV	Deep Ultraviolet
ESDM	Electronics System Design and Manufacturing
EUV	Extreme Ultraviolet
FEMA	Foreign Exchange Management Act, 1999
FDI	Foreign Direct Investment
GPU	Graphic Processing Unit
GST	Goods and Services Tax
IC	Integrated Circuits
IDTA	India DeepTech Alliance
IEEE	Institute of Electrical and Electronics Engineers
IGST	Integrated Goods and Services Tax
IoT	Internet of Things
IP	Intellectual Property
ISM	India Semiconductor Mission
ISRO	Indian Space Research Organisation
ITA	Income-tax Act, 1961
ITC	Input Tax Credit
LUT	Letter of Undertaking
MEITY	Ministry of Electronics and Information Technology
NPE	National Policy on Electronics, 2019
OSAT	Outsourced Semiconductor Assembly and Testing
PE	Permanent Establishment
PLI	Production Linked Incentive
PVD	Physical Vapor Deposition
R&D	Research and Development

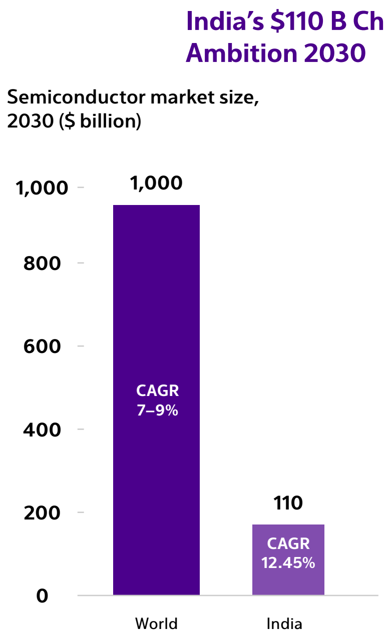
RBI	Reserve Bank of India
RDI	Research, Development & Innovation
SEM	Scanning Electron Microscopes
SEZ	Special Economic Zone
SGST	State Goods and Services Tax
SICLDA	Semiconductor Integrated Circuits Layout-Design Act, 2000
SICLDR	Semiconductor Integrated Circuits Layout-Design Registry
SPCBs	State Pollution Control Boards
SPECS	Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors
TP	Transfer Pricing
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TSMC	Taiwan Semiconductor Manufacturing Company
UPW	Ultra-Pure Water
UTGST	Union Territory Goods and Services Tax
WTO	World Trade Organisation

Introduction

India has been steadily emerging as a significant player in the global semiconductor industry. Fueled by the explosive growth of artificial intelligence (AI), the global semiconductor market is expected to reach USD 1 Trillion by 2030 with India's market projected to reach between USD 100-110 billion.[1]

Semiconductors are the fundamental blocks for almost all electronic devices we use today. They are needed to store, process, and transmit information within and across the devices. They enable us to advance technologies like artificial intelligence, Internet of Things, robotics, etc. Almost every industry from health-care to energy to defense to transportation to even entertainment is dependent to the continuous availability of semiconductors. They are so deeply ingrained in our life and economy that any disruption in their supply can have devastating impact on our lives and create a huge threat to national security.

These tiny devices are a class of crystalline materials whose electrical conductivity lies between that of conductors and insulators. Conductors, such as copper and aluminum, are materials that allow electricity to flow freely, whereas insulators, like rubber or glass, resist the flow of electric current. Semiconductors fall between these two extremes; they can behave either as conductors or insulators depending on external conditions such as voltage, temperature, light, or the presence of impurities. This unique ability to control the flow of electricity makes semiconductors the foundation of modern electronics. The controllability of semiconductors enables essential functions like amplification, switching, and energy conversion.



1 Times of India, "India bets on semiconductors: Aim for big share in $1 trillion global market by 2030," 4 Aug. 2025, available at https://timesofindia.indiatimes.com/business/india-business/india-bets-on-semiconductors-aim-for-big-share-in-1-trillion-global-market-by-2030-says-government-investments-infrastructure-drive-momentum/articleshow/123085304.cms (last accessed on November 05, 2025); and MARC Group, "India Semiconductor Market Size, Share, Trends and Forecast by Components, Material Used, End User, and Region, 2025 2033," available at https://www.imarcgroup.com/india-semiconductor-market (last accessed on November 05, 2025).

Semiconductors are typically made from silicon, the second most abundant element in the crust of the Earth, other elements like germanium, and compounds like gallium arsenide and gallium nitride.[2] The purified silicon is processed into wafers, lithographically patterned, and cut into tiny chips that include components like diodes, transistors, capacitors, inductors, and resistors as well as metal interconnects to form integrated circuits, memory chips, computer processors (CPUs), graphical processors (GPUs), AI chips, and IoT devices. Acting as microscopic electrical switches, these chips turn electric currents on and off rapidly, enabling high-speed data processing within compact, energy-efficient systems. Their applications span across industries, from personal computing, telecommunications, and automotive to healthcare, manufacturing, and consumer electronics, making them the backbone of today's digital economy.

Understanding the structure, manufacturing processes, and legal treatment of semiconductors is essential to appreciating India's policy initiatives and regulatory framework. This paper examines the Indian semiconductor ecosystem through global context, technical foundations, policy interventions, and legal and tax frameworks, and evaluates the pathways through which India seeks to establish itself as a global leader in this critical sector.

I. Moore's Law and Technological Innovation

A major driver of progress in semiconductor technology has been Moore's Law, proposed by Gordon E. Moore in 1965. He observed that the number of transistors on a microchip tends to double approximately every two years, enabling chips to become faster, more powerful, energyefficient, and cost-effective. Although physical and economic constraints mean Moore's Law no longer holds strictly true, the trend has guided technological innovation for nearly six decades.[3]

As transistors continue to shrink, semiconductors enable breakthroughs in everything from smartphones and autonomous vehicles to cloud computing, artificial intelligence, and the Internet of Things (**"IoT"**). This relentless innovation has fueled the Fourth Industrial Revolution (**"4IR"**), where smart, connected technologies rely heavily on semiconductor-driven performance.

However, this growing dependence on semiconductors also exposes vulnerabilities. The pandemic-era global chip shortage highlighted how disruptions in semiconductor supply chains can affect industries worldwide, underscoring their critical role in shaping the future of technology, business, and innovation.

Semiconductor manufacturing is expensive due to massive investments in highly complex, multistep processes that occur in ultra-clean environments, requiring billions of dollars in capital for specialized equipment, advanced machinery, and the construction of massive facilities. The need to constantly upgrade this machinery to produce smaller, more advanced chips, combined with lengthy and intricate production timelines, drives up costs significantly every year.

2 Semiconductor Material. IEEE IRDS. https://irds.ieee.org/topics/semiconductor-materials (last accessed on November 05, 2025).

3 Investopedia, "Moore's Law," available at https://www.investopedia.com/terms/m/mooreslaw.asp (last accessed on November 05, 2025).

II. Demand and Supply

I. Global Semiconductor Supply Chain Vulnerabilities

The COVID-19 pandemic exposed critical vulnerabilities in the global semiconductor supply chain, creating shortages that persisted for over three years and caused significant economic disruption. The automotive industry alone faced estimated losses of $110 billion by May 2021,[4] as chip manufacturers had shifted capacity to meet surging consumer electronics demand during pandemic-induced lockdowns.

The global semiconductor supply chain's concentration in specific geographic regions has created systemic risks. Taiwan produces more than 60% of the world's semiconductors, including nearly 90% of the most advanced chips through companies like Taiwan Semiconductor Manufacturing Company (TSMC). This heavy dependence on a single region has exposed global supply chains to significant risks from pandemics, natural disasters, and geopolitical tensions. Such disturbances can severely disrupt the availability of critical semiconductors even for uninvolved countries on the other side of the world.

Recognizing these vulnerabilities, India has embarked on an ambitious journey to establish domestic semiconductor manufacturing capabilities. India's response has been comprehensive, involving substantial government investment, policy reforms, and international partnerships.

4 Reuters, "Chip shortage to cost automakers $110 bln in revenues in 2021," 14 May 2021, available at https://www.reuters.com/business/retail-consumer/chip-shortage-cost-automakers-110-bln-revenues-2021-alixpartners-2021-05-14/ (last accessed on November 05, 2025).

Dissecting The Industry Value Chain

Against this backdrop of global supply chain fragility, it is useful to first understand the internal structure of a semiconductor itself, as the nature of its components and their legal treatment provide context for India's regulatory and policy response.

I. The Components

I. Core Semiconductor Components

At its core, a semiconductor chip is built through a multi-step process, beginning with raw materials and culminating in integrated circuits that drive modern computing. At the material level, ultra-pure silicon wafers are sliced from silicon ingots. Thin layers of various materials are deposited on the wafers. Then they are photolithographed, etched and doped to alter conductivity. This processed is repeated hundreds of times to create complex, multi-layered chips with billions of components, such as transistors and diodes. These nodes now measured in terms of nanometres (nm - a unit of length equal to one billionth of a meter), such as 65nm, 28nm, 22nm, 3nm, 2nm, 1nm. By 2037, the IEEE predicts the semiconductor node technology to reach the size of 0.5nm.[1] The process of etching gets exponentially complicated as the size of the node decreases. Recently, Indian Union Minister Ashwini Vaishnaw announced that India is already working on chips with 2nm size nodes.[2]

At the circuit level, these devices are interconnected into integrated circuits (ICs), designed for functions ranging from computation and memory storage to signal processing and power management. Section 2(i) of the Semiconductor Integrated Circuits Layout-Design Act, 2000 ("SICLDA") defines a semiconductor integrated circuit as "a product, whether in its final form or intermediate form, consisting of a body of semi-conducting material in which at least one active element and interconnections are formed to erform an electronic function."

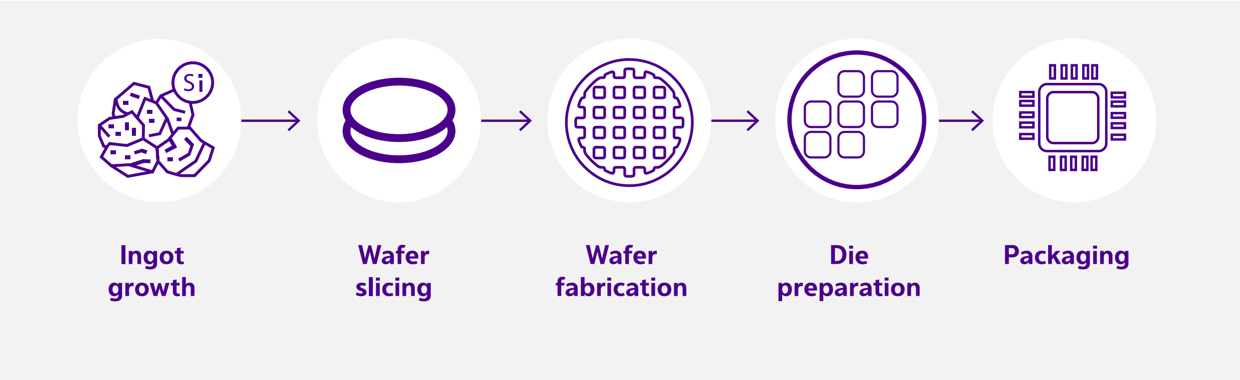
Finally, at the system level, ICs are packaged into functional chips and embedded across consumer electronics, telecommunications, automotive, and AI applications. Importantly, the SICLDA draws a legal boundary around this layered structure. Section 2(h) defines a "layoutdesign" as the arrangement of transistors, circuitry elements, and interconnections in an IC. The statute therefore protects not individual components—which are standardized across industry— but the unique three-dimensional arrangement of those components, recognizing that innovation lies in the way billions of elements are combined.

Grasping this layered structure highlights why India's legal framework safeguards not the individual physical components, but their distinctive configuration into commercially valuable circuits.

1 ScienceDaily, "Scientists discover way to 'grow' sub nanometer sized transistors," 3 July 2024, available at : https://www.sciencedaily.com/releases/2024/07/240703131811.htm (last accessed on November 05, 2025).

2 NDTV, "India working on 2 nm chip," 18 Oct. 2025, available at : https://www.ndtv.com/world-news/india-working-on-2-nm-chip-ashwini-vaishnaw-shows-wafer-at-ndtv-world-summit-9477738 (last accessed on November 05, 2025).

II. Production Process



The manufacture of semiconductors follows a highly complex, multi-stage process that transforms raw silicon into functional, packaged chips.

Silicon Ingot Preparation and Wafering: The process begins with refining sand (silica) into pure silicon, which is melted and crystallized into cylindrical ingots using the Czochralski method. These ingots are sliced into thin wafers, polished to a mirror finish, and cleaned to form the substrate for microchip fabrication.

Wafer Fabrication (Front-End Processing): Fabrication takes place in ultra-cleanrooms to avoid contamination. The wafer undergoes hundreds of sequential steps including: oxidation (growing a thin oxide layer to insulate devices), photolithography (coating wafers with photoresist and using light to transfer intricate circuit patterns), etching (removing unwanted material to create microscale structures), ion implantation/doping (introducing impurities to control conductivity), deposition (layering metals, insulators, or semiconductors) and chemical mechanical planarization (polishing the wafer surface flat between layers).

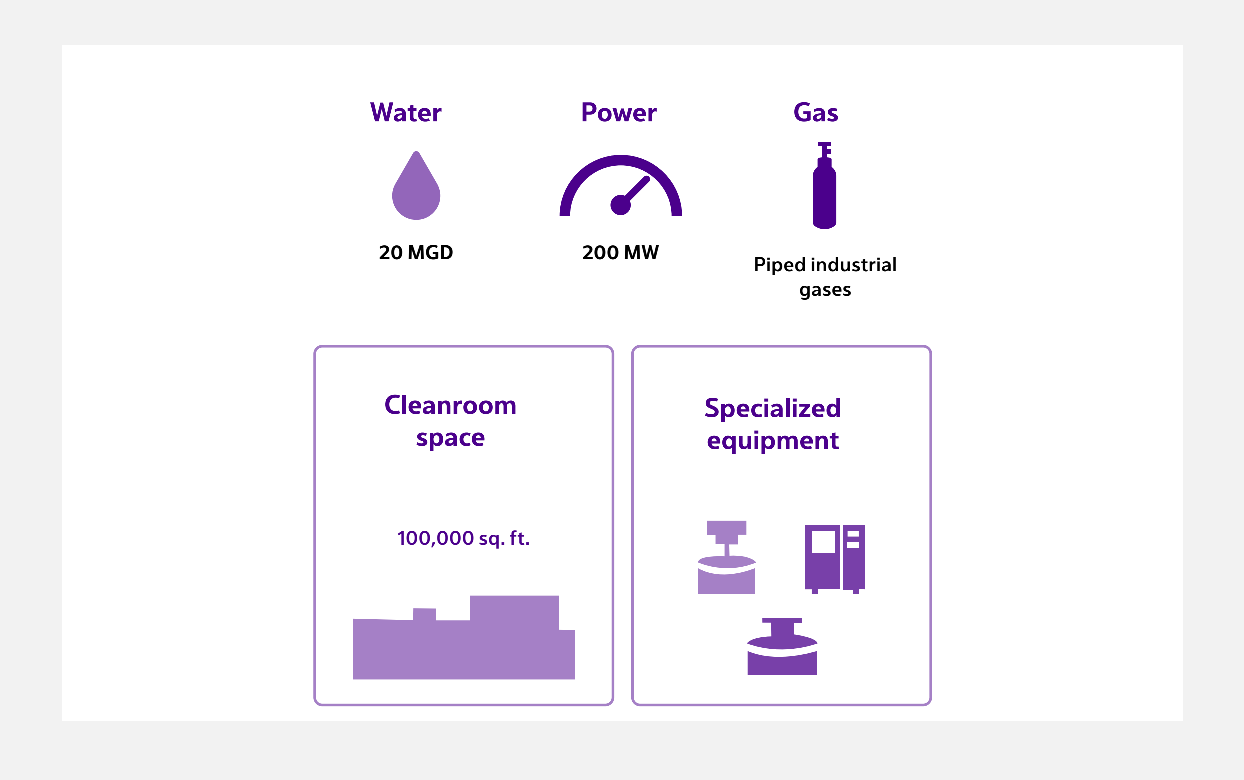
This cycle is repeated many times to build multiple layers of transistors, diodes, and interconnections.

Wafer Testing (Electrical Probe Testing): After fabrication, each chip on the wafer is tested electrically using probe cards to identify defective dies. Only the functional dies move to the next stage.

Assembly, Packaging, and Back-End Processing: Working dies are separated from the wafer, mounted onto substrates, and connected with bonding wires or solder bumps. The chip is then encapsulated in protective packaging that allows integration into larger systems while dissipating heat and shielding from environmental stress.

Final Testing and Burn-In: Packaged chips undergo functional testing, reliability testing, and “burn-in” (running under high stress conditions) to ensure long-term stability before shipment.

III. Infrastructure and Tools Required



Semiconductor production requires some of the most advanced and capital-intensive infrastructure in modern industry. It requires:

i. **Cleanrooms:** Fabrication occurs in ISO-classified cleanrooms with controlled temperature, humidity, and particle count; even a single dust particle can destroy a chip.

ii. **Photolithography Equipment:** Extremely costly machines such as deep ultraviolet (DUV) and extreme ultraviolet (EUV) lithography systems (e.g., supplied by ASML) that etch nanoscale features.

iii. **Deposition and Etching Tools:** Equipment for chemical vapor deposition (CVD), physical vapor deposition (PVD), atomic layer deposition (ALD), plasma etching, and wet etching.

iv. **Ion Implanters:** Machines that accelerate ions into wafers to alter electrical properties.

v. **CMP Tools:** Used to planarize wafer surfaces with nanometer precision.

vi. **Testing and Metrology Tools:** Scanning electron microscopes (SEM), atomic force microscopes (AFM), and probe stations for defect analysis and measurement.

vii. **Packaging and Assembly Equipment:** Wire bonders, flip-chip bonders, encapsulation and molding systems, and thermal management tools.

viii. **Utilities:** Constant supply of ultra-pure water (UPW), uninterrupted high-voltage electricity with redundancy, specialty gases (e.g., silane, nitrogen trifluoride), secure chemical pipelines, and high-speed telecommunications for global integration.

IV. Value Chain

There is no single entity that can undertake all of the above activities. Rather, specialized global leaders have emerged for each activity leading to the development of an interdepending global supply chain. This makes it very difficult for an individual country to be fully self-reliant, especially for semiconductors involving very small nanometre sizes.

The below figure provides an overview of the semiconductor value chain with some key players.

The Semiconductor Value Chain

All trademarks are of the respective owner. Used here only for informational purposes.

India and The Chip Boom

The Indian Government has released multiple policies and schemes with the objective of developing the electronic hardware manufacturing sector in India. Semiconductor manufacturing, a subset of the electronic hardware manufacturing sector, has attracted specific attention post the pandemic. This section discusses some key policies and industry incentives relevant from a stakeholders' perspective.

The National Policy on Electronics (NPE 2019), launched by the Ministry of Electronics and Information Technology (MeitY), was India's flagship policy to position the country as a global hub for Electronics System Design and Manufacturing (ESDM). Electronics was identified as one of the 12 champion sectors under the Government of India's broader industrial strategy, leading to targeted policies, incentives, and ecosystem development for electronics.[1]

The vision of the NPE 2019 is to position India as the global hub for Electronics System Design and Manufacturing (**"ESDM"**), which includes developing core components such as chipsets.[2] With respect to ESDM, the NPE 2019 focuses, amongst other concerns, on (i) promoting domestic manufacturing in the entire value-chain, and (ii) improving ease of doing business.[3]

The National Investment Promotion and Facilitation Agency was established under the NPE 2019 to improve ease of doing business in India. The National Investment Promotion and Facilitation Agency functions as a 'one-stop shop' for global investors to facilitate investment in the ESDM sector. The functions include (i) co-ordination with state governments, (ii) to obtain speedy approvals on behalf of investors and (iii) assistance to the investors till their units become functional.[4]

As per the NPE 2019, the electronics hardware manufacturing sector is termed to be of *"high priority"* for the government and is an important pillar for both the *'Make in India'* and *'Digital India'* programmes. NPE 2019 focuses on the development of (i) semiconductor fabrication units, (ii) manufacture of semiconductor facilities and display fabrication units, and (ii) fabless chip design industry in the country.

Schemes have been notified with respect by points (i) and (ii) by the central government which have been discussed in detail below. With respect to point (iii), please note that the NPE 2019 specifically focuses on the promotion of the fabless chip design industry in the country.[5] The fabless chip design industry focuses on research and development and the design of the semiconductor but does not manufacture it themselves. Such industries outsource the manufacturing of the designed semiconductors to third-parties. With respect to the fabless semiconductor industry, the NPE 2019 states that (i) the industry may be funded through venture capital funds, including the establishment of a *"India Fabless Semiconductor Venture Fund"* [6]and (ii) export related incentives may be provided to such companies.[7]

1 Ministry of Electronics & Information Technology, Government of India, Annual Report 2024-25 (2025).

2 Clause 2, NPE 2019.

3 Clause 4, NPE 2019.

4 Clause 5.6, NPE 2019; For a detailed analysis on ease of doing business in India, you may refer to our research article titled "Doing Business in India" at : https://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Doing-Business-in-India-P2.pdf.

5 Clause 5.22., NPE 2019.

6 Clause 5.22.1.4., NPE 2019.

7 Clause 5.22.1.7., NPE 2019.

The Semicon India Programme, Government of India's initiative to build a sustainable semiconductor and display manufacturing ecosystem, was approved in December 2021 (and refined through 2022–24).It directly builds on the vision of NPE 2019 but translates it into a comprehensive INR 76,000 crores (~ $8.6 billion USD) incentive package, aiming to attract global leaders while also nurturing domestic players.

The incentives the program introduced four schemes[8]:

a. **Semiconductor Fab Scheme:** Designed to promote large-scale chip manufacturing in India, this scheme provides financial assistance covering up to 50% of the total project cost for eligible entities establishing silicon-based wafer fabrication facilities.

b. **Display Fab Scheme:** Aimed at reducing India's dependence on imports of advanced display technologies, this scheme offers similar fiscal support for setting up fabrication units for TFT LCD and AMOLED displays.

c. **Modified Scheme for setting up of Compound Semiconductors / Silicon Photonics / Sensors Fab / Discrete Semiconductors Fab and Semiconductor Assembly, Testing, Marking and Packaging (ATMP) / OSAT facilities in India:** This scheme supports investment in specialized facilities for compound semiconductors, silicon photonics, MEMSbased sensors, discrete semiconductors, and downstream processes such as Assembly, Testing, Marking and Packaging (ATMP) and Outsourced Semiconductor Assembly and Testing (OSAT). The GoI will provide fiscal support of up to 50% of the capital expenditure incurred by qualifying applicants.

d. **Design Linked Incentive (DLI) Scheme:** This initiative focuses on strengthening India's chip design capabilities. It offers financial incentives and infrastructure support for the design of integrated circuits, chipsets, systems-on-chip, IP cores, and other semiconductor-related products.

To drive implementation, the government created the **India Semiconductor Mission (ISM)**[9] as an independent, empowered agency under MeitY. ISM acts as a single-window facilitator, evaluating project proposals, forging global partnerships and enabling infrastructure, R&D, and skill development needed for the sector.

In addition, several State Governments, including Gujarat,[10] Uttar Pradesh,[11] Tamil Nadu,[12] and Andhra Pradesh,[13] have rolled out dedicated policies to attract semiconductor manufacturing. These policies provide both financial and non-financial benefits, such as extra capital subsidies, discounted land, reduced power costs, support for water supply, and exemptions on stamp duty and certain taxes, to encourage companies to set up fabs locally.

8 Ministry of Electronics & Information Technology, Government of India, "Government of India Taking Steps to Encourage Domestic Manufacturing of Semiconductors & Promote Country's Digital Transformation and Self-Reliance" (July 31, 2024), Press Information Bureau, Govt. of India (Release ID 2039638), available : https://www.pib.gov.in/PressReleasePage.aspx?PRID=2039638 (last opened on 03 September 2025).

9 https://ism.gov.in/about-ism.

10 Gujarat Semiconductor Policy, 2022-27.

11 UP Semiconductor Policy 2024.

12 Tamil Nadu Semiconductor & Advanced Electronics policy framework (2024–25).

13 Andhra Pradesh Semiconductor & Display Fab Policy 2024–29.

Recent Manufacturing Developments in India

Since launching the above schemes under, India has attracted record-breaking investments of over INR 340 crores (~ USD 41 million) for startups in the semiconductor manufacturing industry.[14]

The India Semiconductor Mission has also approved ten major semi-conductor plants across six different states,[15] with cumulative investments reaching approximately INR 1.60 lakh crore ($18.23 billion). These projects encompass the entire semiconductor value chain, such as:

i. **Tata Electronics-PSMC Fab:** A $11 billion investment in Dholera, Gujarat, for a semiconductor fabrication facility with 50,000 wafer-per-month capacity

ii. **Micron ATMP Facility:** A $1.51 billion assembly and packaging facility in Sanand, Gujarat

iii. **Multiple OSAT Units:** Including facilities in Assam, Gujarat, and other states

iv. **Compound Semiconductor Fabs:** Including India's first commercial Silicon Carbide facility

Union Minister Ashwini Vaishnaw announced that India is set to launch its first domestically produced semiconductor chip by the end of 2025, using 28 to 90 nanometer technology, targeting applications in automotive, telecom, power, and railway sectors.[16]

14 Ministry of Electronics & Information Technology, Government of India, Semiconductor startups in India attracting record investment, Driven by Government of India's support (Press Release No. 2147821, July 24, 2025) , available at : https://d2p5j06zete1i7.cloudfront.net/Cms/admin/Press-Release/1753368775.pdf (last opened on Sept. 03, 2025).

15 Press Information Bureau, Government of India, Powering the Future: The Semiconductor and AI Revolution (Factsheet, Aug. 15, 2025), available at https://www.pib.gov.in/FactsheetDetails.aspx?Id=149242 (last opened on Sept. 3, 2025).

16 India's First Semiconductor Chip to Be Unveiled in 2025, Union Minister Ashwini Vaishnaw," The Hindu (July 19, 2025). yes.

Legal and Regulatory Landscape

I. Intellectual Property Rights

India's intellectual property framework for semiconductors is anchored in the Semiconductor Integrated Circuits Layout-Design Act, 2000 (**"SICLDA"**) and the and the Semiconductor Integrated Circuits Layout-Design (SICLD) Rules 2001, a specialized legislative measure designed to protect integrated circuit layout-designs. This *sui generis* statute fills a gap left by traditional intellectual property regimes, as layout-designs do not fall neatly within the categories of patentable inventions or copyrightable works. The enactment of the SICLDA was influenced by India's obligations under the Agreement on Trade-Related Aspects of Intellectual Property Rights (**"TRIPS"**), which require World Trade Organization (**"WTO"**) member states to provide legal recognition and protection for integrated circuit layout-designs.[1]

The scope of protection under the Act emphasizes protection on the arrangement and interconnections, not on individual parts.[2] Accordingly, the SICLDA protects original layoutdesigns that are inherently distinctive and capable of being distinguished from other registered designs. By contrast, it excludes designs that lack originality, have been commercially exploited in India or in convention countries prior to filing, are not inherently distinctive, or which are not inherently capable of being distinguishable from any other registered layout-design.[3] The duration of protection extends for ten years, calculated from either the date of filing or the date of first commercial exploitation, whichever occurs earlier.[4] Registration confers upon the proprietor exclusive rights to reproduce, distribute, and import products incorporating the registered layout design.[5]

The registration process is administered through the Semiconductor Integrated Circuits Layout-Design Registry (**"SICLDR"**), headquartered in New Delhi under the Ministry of Electronics and Information Technology. The process begins with the creator or applicant filing an application in the prescribed form before the SICLDR, accompanied by the required representations and fee.[6] The Registrar examines the application to ensure that the layout-design is original, distinctive, and not commercially exploited for more than two years, and may accept it outright or subject to amendments.[7] Once accepted, the application must be advertised within fourteen days,[8] thereby inviting the public to oppose registration within three months (extendable by one month).[9] If an opposition is filed, the applicant must submit a counter-statement and both parties can lead evidence before the Registrar decides the matter.[10] If no opposition is filed, or if opposition is

1 Articles 35 – 38, Agreement on Trade-Related Aspects of Intellectual Property Rights. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299.

2 21 Section 2(h).

3 Section 7, Semiconductor Integrated Circuits Layout-Design Act, 2000.

4 Section 15, Semiconductor Integrated Circuits Layout-Design Act, 2000.

5 Section 14, Semiconductor Integrated Circuits Layout-Design Act, 2000.

6 Section 8, Semiconductor Integrated Circuits Layout-Design Act, 2000.

7 Section 8(3), Semiconductor Integrated Circuits Layout-Design Act, 2000.

8 Section 10, Semiconductor Integrated Circuits Layout-Design Act, 2000.

9 Section 11, Semiconductor Integrated Circuits Layout-Design Act, 2000.

10 Id.

resolved in the applicant's favour, the Registrar registers the layout-design, enters it in the Register of Layout-Designs, and issues a certificate of registration,[11] with protection lasting for ten years from the date of filing or first commercial exploitation, whichever is earlier.[12]

Despite the existence of this framework for more than two decades, to date, only two registrations have been recorded: the "8 port Micro-controller (BE.80501)" by Bharat Electronics Ltd. in 2015 and the "50–60 GHz Sub Harmonic IQ Mixer 2(I)" by the Indian Space Research Organisation (ISRO) in 2016.[13] This limited use may be attributed to industry preference for trade secret protection, the complexity of registration procedures, and low levels of awareness among stakeholders.

Although the SICLDA provides the primary vehicle for semiconductor layout design protection, it operates within the broader ecosystem of Indian intellectual property law.

Patent protection under the Patents Act, 1970, remains highly relevant for semiconductor-related innovations that go beyond layout design. For instance, inventions involving novel processes for fabricating semiconductors, innovative compositions of materials used in chip manufacturing, or new apparatus and devices for enhancing chip performance can be patented if they meet the criteria of novelty, inventive step, and industrial applicability. Semiconductor companies may rely on a combination of SICLDA protection and patents to safeguard different aspects of their technology: the layout design is shielded under the SICLDA, while underlying processes, materials, or functional innovations are protected through patents. This dual-layered approach ensures a more robust IP strategy, providing comprehensive coverage against infringement and strengthening the incentive for continued innovation in India's nascent but rapidly growing semiconductor ecosystem. Additionally, while software per se is excluded from patentability, innovations combining software and hardware that demonstrate technical advancement may qualify.[14]

Copyright law under the Copyright Act, 1957, may also be relevant to semiconductor-related innovations, particularly in the context of supporting materials and creative expressions associated with the design process. While the layout of a semiconductor chip itself is primarily governed by the SICLDA, the documentation that captures the design, including schematics, circuit diagrams, technical drawings, and design manuals, can be protected as original literary or artistic works under copyright law. Similarly, software developed to design, simulate, or test semiconductor circuits may qualify for copyright protection, provided it meets the criteria of originality and fixation. This layered protection allows semiconductor developers not only to safeguard the functional layout of chips under SICLDA but also to protect the broader ecosystem of creative and technical materials that enable the design and manufacturing process.

In parallel, trade secrets continue to play a significant role in safeguarding proprietary processes, design methodologies, and technical know-how. In India, trade secret protection is not codified but enforced through contractual arrangements and common law principles.

Trademark protection, governed by the Trademarks Act, 1999, further supplements semiconductor IP by safeguarding brand names, logos, and other identifiers that distinguish semiconductor products in the marketplace.

11 Section 13, Semiconductor Integrated Circuits Layout-Design Act, 2000.

12 Section 15, Semiconductor Integrated Circuits Layout-Design Act, 2000.

13 Semiconductor Integrated Circuits Layout Design Registry (SICLDR), "Certificates Issued," available at https://sicldr.gov.in/sicw/certificates (last accessed on November 05, 2025).

14 Blackberry Limited v Controller of Patents and Designs, 2024:DHC:6572.

II. Taxation Law Perspective

The Indian government has provided the following tax incentives to support the semiconductor industry:

Direct Taxes

Corporate income tax ("CIT") rates for domestic manufacturers

Under the Income-tax Act, 1961 (**"ITA"**), domestic and foreign companies are subject to different tax rates. For domestic companies, the corporate tax rate under the general tax regime is 25% if annual turnover is below INR 4 billion and 30% otherwise.[15] Alternatively, companies may opt for the concessional regime under Section 115BAA,[16] which provides for a 22% tax rate subject to conditions, including foregoing specified deductions, restrictions on set-off of certain losses, and prescribed depreciation rules. In contrast, foreign companies are taxed at the rate of 35% under the general regime.

The ITA further aligns India's corporate tax framework with its semiconductor ambitions by providing reduced tax rates for domestic companies, under Section 115BAA where an optional reduced CIT rate of 22% (effective rate 25.17%)[17] for existing domestic companies, provided they forego certain deductions and incentives.

Capital expenditure deduction

Taxpayers setting up certain specified businesses can claim a 100% deduction of capital expenditure[18] incurred (other than land, goodwill, and financial instruments). Under the ITA, specified business includes setting up and operating a semi-conductor wafer fabrication manufacturing unit notified by the Central Board of Direct Taxes (**"CBDT"**) in accordance with such guidelines as may be prescribed. Thus, semiconductor manufacturing facilities, given their high capital-intensive nature, can claim significant upfront tax relief by leveraging this provision, provided they do not opt for the concessional CIT rate under Section 115BAA of the ITA.

Additional depreciation

To further encourage capital investment, a taxpayer is entitled to an additional depreciation[19] of 20% on the actual cost of new machinery or plant acquired and installed after 31 March 2005 by a taxpayer engaged in manufacturing.

15 Surcharge at 7%, (if total income is in the range of INR 10 mn – 100 mn) or 12% (if total income exceeds INR 100 mn). Further, a health and education cess ("HEC") is levied at the rate of 4% on tax and surcharge, irrespective of amount of total income.

16 Surcharge at 10% and HEC at 4% on tax and surcharge, irrespective of amount of total income.

17 Including surcharge of 10% and HEC at 4% on tax and surcharge, irrespective of amount of total income.

18 Section 35AD of the ITA and Section 46 of the New Income Tax Code.

19 Section 32(1)(iia) of the ITA.

Presumptive taxation

To strengthen India's position as a global hub for electronics system design and manufacturing, the Finance Act, 2025 provides a presumptive taxation[20] regime for non-residents engaged in providing services or technology for setting up electronics manufacturing facilities or producing electronic goods in India ("**Non-Resident Assessee**") which is effective from the Assessment Year 2026-27.

Under this scheme, Non-Resident Assessees that assist Eligible Resident Entities (defined below) by deploying technology or providing services such as technical designs, manufacturing processes, testing frameworks, and SOPs can compute their profits on a presumptive basis, thereby simplifying tax compliance and ensuring certainty. It is clarified that benefit under this provision will be available whether or not the Non-Resident Assessee equips the Eligible Resident Entities to independently use the knowledge or technology or skill in the future.

"Eligible Resident Entities" include resident companies set up or operating as an electronics manufacturing facility under a scheme notified by the Central Government through the MEITY.

Currently, the notified schemes include:

i. Production Linked Incentive (**"PLI"**) Scheme for IT Hardware.

ii. Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (**"SPECS"**).

iii. Modified Electronics Manufacturing Clusters (**"EMC 2.0"**) Scheme.

iv. India Semiconductor Mission (**"ISM"**).

The presumptive tax is at the rate of 25% on the aggregate of :

i. the amount paid or payable to the non-resident assessee or to any person on his behalf on account of providing services or technology; and

ii. the amount received or deemed to be received by the non-resident assessee or on behalf of non-resident assessee on account of providing services or technology.

Unabsorbed depreciation or brought forward business losses are not permitted to be set off to arrive at the deemed pr under the presumptive scheme.

By integrating tax benefits with MEITY initiatives, the government intends to attract foreign technology providers and promote large-scale semiconductor manufacturing in India through a simplified and predictable tax regime.

Withholding Taxes

Semiconductor companies often operate through cross-border structures, where the holding company is incorporated outside India and the intellectual property may also held offshore. Separately the semiconductor companies may earn business income from its operations in India.

20 Section 44BBD of the ITA and Section 61 of the New Income Tax Code.

In such cases, payments such as dividends, royalties and fees for technical services may be received by offshore entities from India where the ITA prescribes a tax rate of 20%.[21] Companies are taxed on their net profits (business income) from operations carried on in India at their CIT rates. In such cases, the entity making the payment (i.e., the payer) is required to withhold tax at the time of making the payment to the offshore entity, ensuring that the non-resident receives the amount net of tax in accordance with Section 195 of the ITA.

However, the rate may be reduced or may be exempt where benefit a is available under an applicable Double Tax Avoidance Agreement (**"Tax Treaty"**) between India and the country of residence of the non-resident. The benefit is available only if the non-resident qualifies as a "resident" of that country and is eligible to claim relief under the Tax Treaty.

Given that India has entered into Tax Treaties with several semiconductor-heavy jurisdictions, such as the U.S., Taiwan, Japan, and South Korea, taxpayers can potentially benefit from reduced withholding tax rates on royalties, fees for technical services, and other cross-border payments. Where a Tax Treaty applies, a taxpayer is entitled to choose between the provisions of the ITA and the applicable Tax Treaty, opting for whichever is more beneficial.

Where the Tax Treaty benefits are available for royalties and dividends, generally a reduced rate is provided. In case of business income, only the income attributable to a permanent establishment (**"PE"**) of the non-resident would be taxed in India. In the absence of a PE, the business income would not be taxed in India.

Transfer Pricing ("TP")

Semiconductor companies often engage in intra-group cross-border transactions involving IP, R&D, technology licensing, and manufacturing services. Companies should ensure that the prices for intercompany international transactions between the related associated enterprises are consistent with the arm's length principle, meaning they should reflect the prices that would be charged between unrelated parties in comparable circumstances.

Advanced Pricing Agreements ("APA")

Given the complexity of IP-driven semiconductor business models, APAs offer certainty on pricing methodologies, particularly for royalties, design services, and contract manufacturing arrangements. APAs also prove useful to avoid potential litigation. An APA is an agreement between the CBDT and a taxpayer, aimed at determining the Arm's Length Price (**"ALP"**) or the methodology for computing the ALP for specific international transactions, in advance

The ALP ensures that transactions between related entities, such as subsidiaries and parent companies, are priced fairly, comparable to transactions between unrelated parties under similar conditions. Once an APA is executed, the ALP for the covered transactions during the specified period is determined strictly in accordance with the terms of the agreement, providing clarity and certainty to both taxpayers and tax authorities. APAs may be unilateral, bilateral or multilateral APAs provide certainty for a period up to 5 years.

21 Section 115A of the ITA read with section 195 of the ITA.

Indirect Taxes

Indirect taxes, such as Goods and Services Tax (**"GST"**), will apply to semi-conductor manufacturing companies in India with respect to all the taxable supplies made by them. Additionally, all import and export activities in India, as well as any goods or services involved in their cross-border operations, will be governed by Customs laws and regulations. However, for operations within a Special Economic Zone (**"SEZ"**) in India, a range of indirect tax benefits and incentives are designed to promote business activities within such zone under both the GST and Customs laws.

Goods and Service Tax ("GST")

Sales within India

GST is a destination based tax which is governed by: (i) the Central Goods and Services Tax Act, 2017 (**"CGST Act"**), which gives the Central government the power to tax goods and services; (ii) The individual state and union territory GST Acts (**"SGST Act"** and **"UTGST Act"** respectively), which give each state and union territory the power to tax goods and services; and (iii) The Integrated Goods and Services Tax Act, 2017 (**"IGST Act"**), which gives the central government the right to tax inter-state supplies. While IGST is applicable to taxable inter-state supplies, CGST and SGST / UTGST is applicable to taxable intra-state supply.

A supply is considered inter-state or intra-state depending on the "place of supply" provisions set out under the IGST Act. GST is generally charged at rate of 18% but may extend to 28%[22] depending on the nature of supply. The suppliers are also eligible to claim input tax credit (**"ITC"**) on inward supplies received by them subject to satisfaction of certain conditions.

With respect to cross-border supplies, a general rule is that goods and services imported into India are considered taxable inter-state supplies subject to IGST, whilst goods and services exported from India are considered zero-rated supplies exempt from GST, subject to satisfaction of certain conditions.

Accordingly, sales within India being taxable supplies in the taxable territory should be subject to GST in India.

Export Sales

For export sales which are zero-rated supplies,[23] a letter of undertaking ("**LUT**") would apply where exporters are allowed to export services/goods without paying the IGST upfront if exporter assures the government that it will fulfil all GST compliance requirements.

The LUT allows smooth cash flow as without a LUT, the exporter would be required to pay the IGST, claim a refund which can be subject to delays and may hinder operations.

22 Press Information Bureau, "GST Reforms 2025: Relief for Common Man, Boost for Businesses," 04 Sept. 2025, available at https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/sep/doc202594628401.pdf (last accessed on November 05, 2025) ;Effective from September 22nd 2025

23 Section 16 of Integrated Goods and Service Tax Act, 2017 ("IGST").

The key features of a LUT are as follows:[24]

i. Any exporter of goods or services, including companies engaged in exporting service is eligible to file an LUT.[25] The LUT is valid for a period of one year and needs to be renewed.

ii. Exporters must ensure that (a) the goods are exported within 3 months (or the time prescribed) from the date of issue of the invoice for export (b) the export proceeds (in convertible foreign exchange or otherwise as per RBI guidelines) are received within one year or the prescribed time frame as per FEMA (9 months),[26] whichever is later from the date of issue of the invoice for export. In case of failure to export the goods within the required time, or in case of non-realization of sales proceeds within the time prescribed, the supplier will be liable to deposit the tax amount due along with the applicable interest.[27]

iii. A foreign subsidiary may apply for LUT subject to the following conditions:

    a. It is registered under GST in India.

    b. It is exporting goods/services or making supplies to a SEZ.

    c. It has not been prosecuted for any offense involving tax evasion exceeding INR 25 million under GST or any previous law.

    d. It complies with all relevant conditions of export laid under the GST regulations and the applicable RBI guidelines.

Special Economic Zone ("SEZ") Benefits

Under GST, SEZ units and developers enjoy significant benefits such as zero-rated tax on supplies received (both goods and services), meaning they can procure without paying GST if done under a LUT or bond, or alternatively pay IGST and claim a refund. Supplies made to SEZs are treated like exports, attracting no GST, while supplies made from SEZs to the Domestic Tariff Area (**"DTA"**) are treated as imports and taxed accordingly. SEZ units are also eligible to claim ITC and benefit from duty-free procurement, improving cash flow. However, these benefits require strict compliance with GST and SEZ documentation and filing procedures.

Customs Duty

Customs duty is a tax imposed on products imported into and exported from India. The Customs Act of 1962 (**"Customs Act"**) establishes the imposition and collection of duties on imports and exports, outlines import/export processes, stipulates bans on the importing and exportation of products, and defines penalties and offences. The rates of customs duty are delineated in the Customs Tariff Act of 1975 (**"Tariff Act"**). To incentivize the semiconductor industry, the Customs Act and Tariff Act also provide exemptions on customs duty on import of certain materials utilized in manufacturing of semiconductors in India on certain specified conditions.

24 https://cbic-gst.gov.in/pdf/Final_Master_circular_LUT_Bond_04102017.pdf.

25 Except those who have been prosecuted for any offence under the CGST Act or the Integrated Goods and Services Tax Act, 2017 or any of the existing laws and the amount of tax evaded in such cases exceeds INR two hundred and fifty lakh.

26 Regulation 9(1), Foreign Exchange Management (Export of Goods & Services) Regulations, 2015.

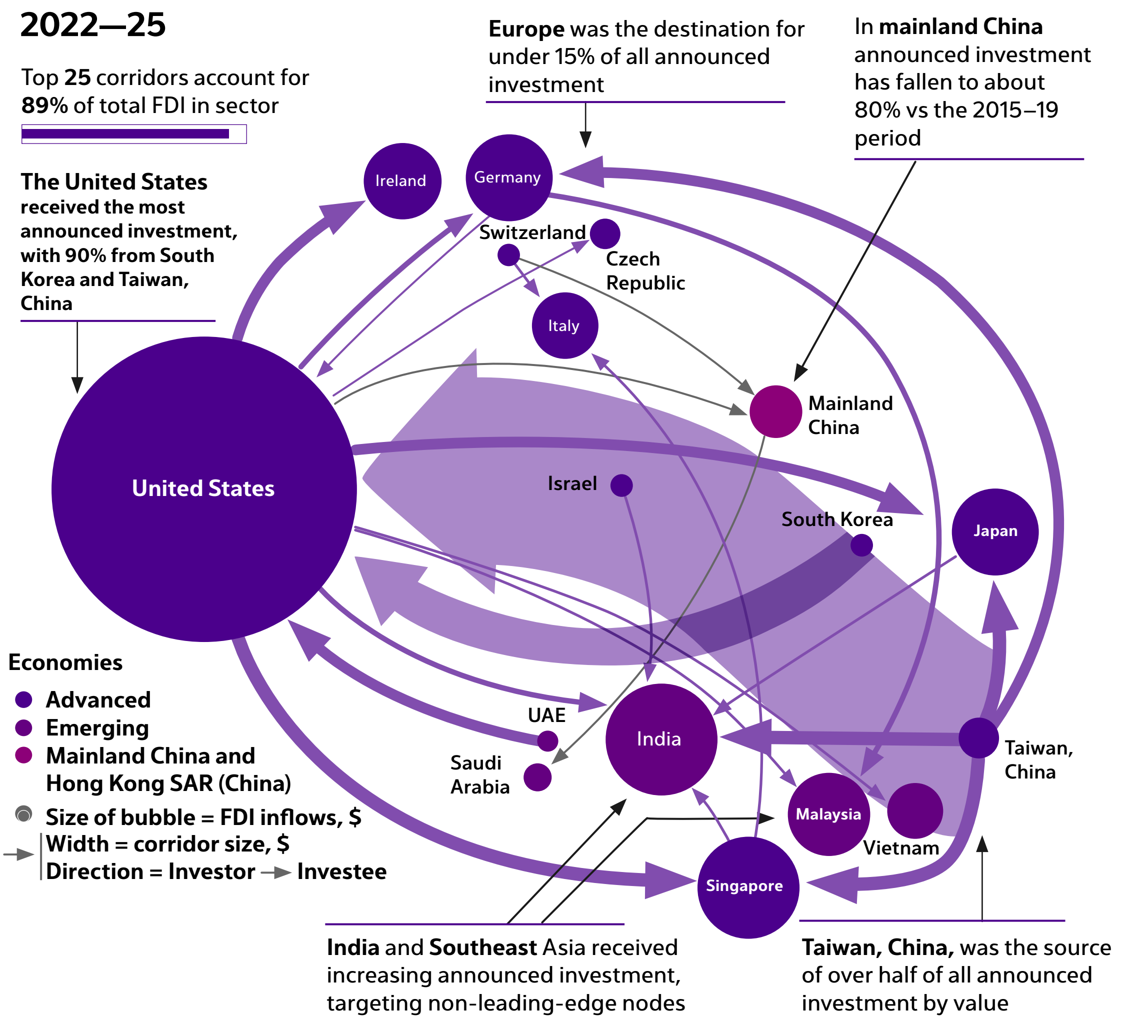
27 Rule 96A of CGST Rules.

Foreign Direct Investment ("FDI")

A recent study by McKinsey & Company[28] identified that due to the current rise in the geopolitical tensions, countries and companies are diversifying semiconductor production beyond the traditional locations—Taiwan and South Korea. India seems to be emerging as a topmost destination for FDI after the United States as a producer of semiconductors. See the figure below.

Foreign direct investment in semiconductors reconfigured sharply toward the United States.

Semiconductors: Top 25 corridors by announced greenfield foreign direct investment (FDI), $ billion



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McKinsey & Company

28 FDI fuels chip shift. McKinsey & Co. 13 Nov 2025. https://www.mckinsey.com/featured-insights/week-in-charts/fdi-fuels-chip-shift.

Foreign investment in India is primarily governed by the FDI Policy issued by the Department for Promotion of Industry and Internal Trade **("DPIIT")** under the Ministry of Commerce and Industry. In the case of semi-conductor manufacturing, the sector falls under the broader manufacturing category, where 100% FDI is permitted under the automatic route, subject to compliance with applicable laws, regulations, security clearances, and other prescribed conditions.

However, Press Note 3 mandates that any investment by an entity from a country sharing a land border with India, or where the beneficial owner of the investment is situated in, or is a citizen of, such a country, will require prior government approval. The countries sharing land borders with India include Afghanistan, Bangladesh, Bhutan, China (including Hong Kong), Myanmar, Nepal, and Pakistan. The requirement for obtaining such approval must be evaluated on a case-by-case basis, depending on the specific investment structure and ownership.

III. Funding the Semiconductors Industry

The Government of India has significantly intensified its efforts to position the country as a global hub for semiconductor innovation and manufacturing, backed by large-scale policy initiatives, strategic funding schemes, and industry partnerships. In July 2025, India unveiled its Research, Development & Innovation (**"RDI"**) Scheme with a INR 10,000 crores (USD 1.2 billion) corpus aimed at accelerating private-sector R&D in deep-tech sectors. At Semicon India 2025, the country's flagship annual conference on semiconductors and electronics manufacturing, the India DeepTech Alliance (**"IDTA"**) was announced. The IDTA is an industry-led coalition backed by an initial USD 1 billion commitment from eight major investors,[29] with a focus on strategic sunrise sectors including semiconductors, advanced manufacturing, artificial intelligence, quantum computing, robotics, digital biology, space, and defence technologies, with the goal of building foundational intellectual property and strengthening India's innovation ecosystem.

The Indian government aims to build a USD 110 billion semiconductor market by 2030.[30] During Semicon 2025, Prime Minister Modi emphasized this ambition, stating that *"the days are not far when the smallest chip made in India will drive the biggest change in the world."* Complementing the RDI Scheme and IDTA, existing initiatives like the PLI Scheme, SPECS and the ISM, with an outlay of INR 760 billion, seek to promote domestic manufacturing, attract foreign investment, and develop a competitive design-to-fabrication ecosystem. The Semicon India Programme has also been refined to account for aggressive incentives offered by competing nations and aims to provide financial support for semiconductor fabrication, display manufacturing, and design infrastructure. Collectively, these initiatives are designed to integrate India into global electronics value chains, reduce import dependence, and establish India as a critical player in chip innovation and production.

However, India's semiconductor ambitions must be understood within the broader global funding race, where nations are competing and committing hundreds of billions of dollars to secure leadership in chip manufacturing and advanced technologies. China has been a frontrunner, launching its China Integrated Circuit Industry Investment Fund, known as the (**"Big Fund"**).[31] In May 2024, China rolled out Phase 3,

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29 The founding members of IDTA include Celesta Capital, Accel, Blume Ventures, Gaja Capital, Ideaspring Capital, Premji Invest, Tenacity Ventures, and Venture Catalysts.

30 The Week, "Amid geopolitical skirmishes, an India–US alliance is betting big on deep tech startups," 02 Sept. 2025, available at https://www.theweek.in/news/biz-tech/2025/09/02/amid-geopolitical-skirmishes-an-india-us-alliance-is-betting-big-on-deep-tech-startups.html (last accessed on November 05, 2025).

31 The Phase 1 in 2014 and Phase 2 in 2019.

allocating approximately USD 48 billion focusing on chip manufacturing. Similarly, South Korea, home to Samsung and SK Hynix, unveiled the Yongin Semiconductor Cluster and has consistently backed it with subsidies, tax benefits, and regulatory support, culminating in a USD 19 billion funding package announced in May 2024 to consolidate its dominance in memory-chip technologies.

Europe has adopted a coordinated investment strategy beginning with the New European Industrial Strategy for Electronics (2013) and the ESCEL Joint Undertaking [32] (2014), scaling up significantly with the €100 billion Horizon R&D Initiative (2019). In 2023, the EU Chips Act and Chips JU allocated an additional €3.3 billion to drive advanced semiconductor research, strengthen fabrication capacities, and secure supply chains across the region. Meanwhile, the United States has staked its claim with the USD 53 billion CHIPS and Science Act, 2022, providing subsidies, R&D incentives, and tax credits to boost domestic manufacturing and reduce reliance on imports.

In parallel, private capital flows into semiconductors have surged globally, supplementing government initiatives. The VanEck Semiconductor ETF (SMH), launched in 2000, tracks the MVIS US Semiconductor 25 Index and invests in the 25 largest U.S.-listed semiconductor companies.[33] The Invesco PHLX Semiconductor ETF (SOXQ), introduced in 2021, based on the PHLX Semiconductor Index of 30 major U.S.-listed chipmakers.[34] Additionally, the Columbia Seligman Semiconductor & Technology ETF (SEMI), launched in 2022, is an actively managed global fund targeting both domestic and foreign semiconductor and tech-related companies.[35] Together, these public and private funding efforts represent a global investment ecosystem channeling unprecedented capital into semiconductors.

Against this backdrop of intensifying global competition, India's RDI Scheme, DeepTech Fund, IDTA, and semiconductor-focused initiatives represent a strategic pivot, not just to boost domestic capabilities, but also to position the country as a major player in the global semiconductor value chain. With coordinated government policies, industry participation, and targeted investments, India seeks to bridge its technological gaps while capitalizing on the growing demand for chips that power AI, quantum computing, automotive electronics, telecommunications, and defence applications worldwide.

IV. Real Estate

The establishment of semiconductor fabrication facilities (**"fabs"**) in India requires substantial land and infrastructure, leading to multifaceted real estate and regulatory considerations. Semiconductor fabrication plants, or "fabs," demand large contiguous land parcels owing to the scale, sensitivity, and precision of their operations. The Indian regulatory framework has sought to accommodate this requirement by amending the Special Economic Zones Rules, 2006, to prescribe a minimum area of ten hectares for SEZs set up for semiconductor and electronic component manufacturing, a significant reduction from the earlier threshold of fifty hectares,[36] making land procurement easier.

32 The Public-Private Partnership for Electronic Components and Systems – funds Research, Development and Innovation projects for world-class expertise in these key enabling technologies, essential for Europe's competitive leadership in the era of the digital economy.

33 https://www.marketbeat.com/stocks/NASDAQ/SMH/#google_vignette.

34 https://www.marketbeat.com/stocks/NASDAQ/SOXQ/.

35 https://www.marketbeat.com/stocks/NYSEARCA/SEMI/.

36 Rule 5, Special Economic Zone Rules, 2006.

Land for semiconductor projects may be procured through direct purchase from private landowners, allocation by state governments under industrial development schemes, allotments within Special Economic Zones (SEZs), or through industrial parks and cluster-based initiatives established under state and central industrial policies. Private acquisition requires meticulous due diligence under the Registration Act, 1908 and the Transfer of Property Act, 1882. This includes verification of title, encumbrances, and survey records under state land revenue codes. Alternatively, state governments allocate industrial land through development corporations, SEZ allotments, or industrial cluster schemes, often with incentives attached. A recent amendment to the SEZ framework further allows SEZ developers to obtain land even where the title is encumbered by lease or mortgage in favour of the central or state government.[37] Regardless of the pathway, developers must establish compliance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, which regulate disposal of chemical effluents and solid waste generated during fabrication. The establishment of supporting infrastructure such as access roads, sewage, and drainage systems requires compliance with municipal zoning and building regulations, while operational approvals fall under the Factories Act, 1948, and state factories rules.[38]

The regulatory ecosystem governing semiconductor fabs extends beyond industrial approvals to touch upon real estate and township development. Where residential or worker housing townships are integrated into the project, the Real Estate (Regulation and Development) Act, 2016 ("RERA") may apply, necessitating registration of the housing component and adherence to disclosure and consumer protection norms. Stamp duty and registration fees under respective state laws apply to all transfers of land, although exemptions may be available for SEZs or under specific state incentive policies.

V. Environmental Law

The establishment and operation of semiconductor fabrication facilities in India entail significant environmental law implications, as such projects involve high levels of water and energy consumption, use of hazardous chemicals, and generation of waste streams. The regulatory framework is anchored in the Environment (Protection) Act, 1986, under which the Environmental Impact Assessment (EIA) Notification, 2006 (as amended in 2020)[39] prescribes mandatory environmental clearance for new projects and expansions likely to have a significant environmental footprint.

Key Environmental Compliance Areas

Water Usage and Wastewater Management: Fab operations are exceptionally resource-intensive, placing extraordinary pressure on local utilities. For instance, a single fabrication unit may consume upwards of two million gallons of ultra-pure water (UPW) per day, while global estimates suggest water requirements can reach ten million gallons daily - equivalent to the consumption of more than thirty thousand households.[40] In the Indian context, experts project that fabs could require more than five million gallons of UPW each day, translating into a need for approximately eight million gallons of raw municipal water given the

37 Rule 7, SEZ Rules 2006. Also see,: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2135116&utm_.

38 Graver Technologies, "Ultrapure Water", available at https://www.gravertech.com/broad-applications/ultrapure-water?utm_ (last accessed on November 05, 2025).

39 Environment Clearance Portal, "EIA Notifications," available at https://environmentclearance.nic.in/writereaddata/EIA%20Notifications.pdf (last accessed on November 05, 2025).

40 World Economic Forum, "The water challenge for semiconductor manufacturing: What needs to be done?," 19 July 2024, available at https://www.weforum.org/stories/2024/07/the-water-challenge-for-semiconductor-manufacturing-and-big-tech-what-needs-to-be-done/?utm_source=chatgpt.com (last accessed on November 05, 2025).

inefficiencies of purification systems.[41] To mitigate the environmental impact, facilities are mandated to implement water recycling and reuse measures, wastewater treatment infrastructure and in many cases, demonstrate zero liquid discharge compliance. These requirements are governed under the Water (Prevention and Control of Pollution) Act, 1974, which necessitates obtaining consent from State Pollution Control Boards (SPCBs) for establishing and operating such facilities.

Air Emissions Control: The Air (Prevention and Control of Pollution) Act, 1981, mandates the installation of air pollution control equipment, monitoring of stack emissions and ambient air quality, and specific control systems for volatile organic compounds (VOCs) to minimize air pollution from semiconductor manufacturing processes.

Hazardous Waste Management: The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, require authorization from SPCBs for handling, storage, transportation, and disposal of hazardous waste generated during semiconductor manufacturing. This includes conducting periodic safety audits and implementing emergency preparedness measures.

E-Waste Management: The E-Waste (Management) Rules, 2022, effective from April 1, 2023, impose Extended Producer Responsibility (EPR) obligations on semiconductor device manufacturers. These obligations include registration with the Central Pollution Control Board (CPCB), fulfillment of collection and recycling targets, filing of quarterly and annual returns, and procurement of EPR certificates. Non-compliance attracts environmental compensation. The rules cover 106 categories of electrical and electronic equipment, expressly including semiconductors and solar photovoltaic modules.

41 Bharti Institute, "India's Semiconductor Revolution: Navigating the Water Challenge on the Road to Manufacturing Excellence," 21 June 2023, available at https://blogs.isb.edu/bhartiinstitute/2023/06/21/indias-semiconductor-revolution-navigating-the-water-challenge-on-the-road-to-manufacturing-excellence/ (last accessed on November 05, 2025).

Finally, semiconductor fabs are increasingly incentivized to adopt sustainable practices, with government policies encouraging integration of renewable energy sources, installation of solar infrastructure, procurement of clean energy, and participation in green building certification programs. These measures align India's semiconductor strategy with its broader commitments to carbon footprint reduction and climate resilience.

VI. Regulatory Requirements

The development of semiconductor fabrication facilities in India requires careful navigation of regulatory requirements spanning land acquisition, infrastructure development, environmental compliance, and real estate approvals. These compliance requirements have been discussed in Sections D.4 and D.5.

Semiconductor fabs have highly specialized infrastructure requirements. They demand large contiguous land parcels, uninterrupted access to ultra-pure water, stable and redundant power supply, secure pipelines for specialty gases, advanced telecommunications networks, and comprehensive waste management systems. Utilities and services are generally developed through a combination of state industrial infrastructure corporations, public utilities, and private developers, often within SEZs or industrial clusters.

Environmental compliance is a critical aspect of regulatory approval. Fab operations must adhere to Environmental Impact Assessment (EIA) requirements, obtain consents from State Pollution Control Boards for water and air emissions, and implement measures for hazardous and electronic waste management, including water recycling, air pollution control, and waste treatment systems. Facilities are also encouraged to adopt sustainable practices, such as renewable energy integration and green building standards.

Real estate and construction compliance is equally important. Developers must ensure proper title verification, zoning approvals, building plan certification, and adherence to fire and industrial safety regulations, including the Factories Act, 1948, and applicable municipal and state laws. Stamp duty and registration requirements for land transfers must also be observed, with potential exemptions for SEZs or other incentive schemes.

Taken together, these regulatory, infrastructure, environmental, and real estate requirements define the framework that developers must satisfy to establish and operate semiconductor fabrication facilities efficiently and compliantly in India.

To facilitate investment and aid manufacturers overcome some of the regulatory demands, the Government of India and select state authorities have designated regions, such as Dholera in Gujarat and Sri City in Andhra Pradesh as semiconductor manufacturing hubs. These hubs provide plug-and-play infrastructure, including pre-approved land allotments, integrated utilities, and enhanced connectivity, which streamline project execution.[42]

VII. State Level Incentives and Policies

Indian states have pursued differentiated, aggressive policy mixes to attract semiconductor and advanced-electronics investment, pairing fiscal incentives with infrastructure commitments and streamlined regulatory support to build regional semiconductor ecosystems. Gujarat, an early mover, announced the *Gujarat*

42 Andhra Pradesh Electronics Components Manufacturing Policy (4.0) 2025-30, https://apchambers.in/wp-content/uploads/2025/08/AP-Electronics-Component-Manufacturing-Policy.pdf (last accessed on 04 Sept 2025)

Semiconductor Policy, 2022–27, offering a package of capital and operational incentives, expedited land allotment in dedicated semiconductor industrial estates, supply of semiconductor-grade utilities (including arrangements for ultra-pure water and dedicated power), and single-window facilitation through the Gujarat Industrial Development Corporation to accelerate project execution.

Tamil Nadu framed its *Semiconductor and Advanced Electronics Policy, 2024*[43] to complement national incentives and to leverage the state's existing electronics manufacturing base; the policy explicitly offers additional state-level top-up incentives to projects selected under central schemes, commitments to develop semiconductor-ready infrastructure, and measures to fasttrack environmental and land clearances so as to attract higher value-added segments such as design, ATMP (assembly, test, marking, and packaging), and compound semiconductors.

Karnataka's approach builds on a broader Electronics System Design and Manufacturing (ESDM) strategy and targeted schemes for specialized nodes (including ATMP/OSAT and compound/sensor fabs). The State has combined existing ESDM incentives, cluster development programs, and public-private initiatives to attract tool vendors, design houses and foundryadjacent investments; recent MoUs and large capital commitments (including international equipment suppliers committing to local investment and collaboration) demonstrate Karnataka's focus on both upstream (tools, materials) and downstream (ATMP, OSAT) segments of the value chain.

Uttar Pradesh has moved quickly to convert scale and connectivity into semiconductor opportunity, publishing a state semiconductor policy and amending its electronics incentives to attract large fabrication-adjacent projects, offering land allotment at concessional rates, capital and infrastructure subsidies, and significant state support for SEZ/industrial-park development (notably the Jewar region), with large anchor investments and OSAT announcements underscoring the state's strategy to aggregate manufacturing capacity and downstream packaging/test capabilities.

Across these states, common themes emerge: (1) fiscal support (CAPEX/top-up subsidies, interest and power subsidies, stamp-duty relief); (2) infrastructure provisioning (semiconductorgrade water, reliable/priority power, specialty gas and logistics in dedicated parks); and (3) regulatory facilitation (single-window clearances, fast-tracked environmental and land processes, and targeted skill and R&D support). While Gujarat's policy is notable as an early, focused semiconductor policy, Tamil Nadu's and Uttar Pradesh's recent state incentives emphasize complementarities with national schemes (often offering additional top-ups), and Karnataka continues to leverage its established ESDM ecosystem and industry partnerships to capture value across the semiconductor supply chain.

43 ICEA, "Tamil Nadu Semiconductor and Advanced Electronics Policy 2024," available at https://icea.org.in/wp-content/uploads/2024/11/Tamil-Nadu-Semiconductor-and-Advanced-Electronics-Policy-2024.pdf (last accessed on November 05, 2025).

Conclusion

India is positioning itself as a critical player in the global semiconductor value chain, backed by strong central and state-level incentives, a well-defined regulatory framework, and growing international partnerships. The Indian government clearly understands the monumental challenges involved in developing an end-to-end semiconductor industry domestically. Recently, Indian Union Minister of Electronics and Information Technology Mr. Ashwini Vaishnaw stated: “This is a very complex industry because the magnitude and dimensions at which we have to work and the complexity are really, really difficult. So, a chip can be extremely small, you can’t even see it with a microscope. It’s 10,000 times smaller than human hair” but “we have a very significant talent base that has given us a unique strength. Already 20 per cent of our design engineers, global design engineering talent is in India.”[1]

While challenges remain in infrastructure, environmental compliance, and skilled workforce development, the government’s coordinated push - through the India Semiconductor Mission, Research, Development & Innovation (RDI) scheme, large-scale fiscal support, and state-level facilitation - signals long-term commitment to this sector. For overseas investors, India offers both scale and policy stability, with opportunities spanning fabs, ATMP/OSAT, compound semiconductors, and design ecosystems. The next few years will determine whether India evolves from a strategic alternative to established hubs into a global leader, but the trajectory and policy clarity make it one of the most attractive emerging destinations for semiconductor investment.

1 NDTV, “India working on 2 nm chip,” 18 Oct. 2025, available at https://www.ndtv.com/world-news/india-working-on-2-nm-chip-ashwini-vaishnaw-shows-wafer-at-ndtv-world-summit-9477738 (last accessed on November 05, 2025).

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At Nishith Desai Associates, we have earned the reputation of being Asia's most Innovative Law Firm — and the go-to specialists for companies around the world, looking to conduct businesses in India and for Indian companies considering business expansion abroad. In fact, we have conceptualized and created a state-of-the-art Blue Sky Thinking and Research Campus, Imaginarium Aligunjan, an international institution dedicated to designing a premeditated future with an embedded strategic foresight capability.

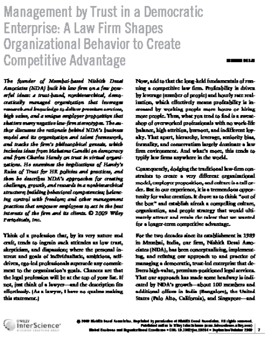
We are a research and strategy driven international law firm with Indian offices in Mumbai, New Delhi, Bangalore and GIFT City and foreign offices in New York, Palo Alto (Silicon Valley) and Singapore. Our team comprises of specialists who provide strategic advice on legal, regulatory, and tax related matters in an integrated manner basis key insights carefully culled from the allied industries.

As an active participant in shaping India's regulatory environment, we at NDA, have the expertise and more importantly — the VISION — to navigate its complexities. Our ongoing endeavors in conducting and facilitating original research in emerging areas of law has helped us develop unparalleled proficiency to anticipate legal obstacles, mitigate potential risks and identify new opportunities for our clients on a global scale. Simply put, for conglomerates looking to conduct business in the subcontinent, NDA takes the uncertainty out of new frontiers.

As a firm of doyens, we pride ourselves in working with select clients within select verticals on complex matters. Our forte lies in providing innovative and strategic advice in futuristic areas of law such as those relating to Blockchain and virtual currencies, Internet of Things (IOT), Aviation, Artificial Intelligence, Privatization of Outer Space, Drones, Robotics, Virtual Reality, Ed-Tech, Med-Tech and Medical Devices and Nanotechnology with our key clientele comprising of marquee Fortune 500 corporations.

The firm has been consistently ranked as one of the Most Innovative Law Firms, across the globe. In fact, NDA has been the proud recipient of the Financial Times–RSG award 4 times in a row, (2014-2017) as the Most Innovative Indian Law Firm.

We are a trust based, non-hierarchical, democratic organization that leverages research and knowledge to deliver extraordinary value to our clients. Datum, our unique employer proposition has been developed into a global case study, aptly titled '**Management by Trust in a Democratic Enterprise**,' published by John Wiley & Sons, USA.


Management by Trust in a Democratic Enterprise: A Law Firm Shapes Organizational Behavior to Create Competitive Advantage

Research@NDA

Research is the DNA of NDA. In early 1980s, our firm emerged from an extensive, and then pioneering, research by Nishith M. Desai on the taxation of cross-border transactions. The research book written by him provided the foundation for our international tax practice. Since then, we have relied upon research to be the cornerstone of our practice development. Today, research is fully ingrained in the firm's culture.

Over the years, we have produced some outstanding research papers, reports and articles. Almost on a daily basis, we analyze and offer our perspective on latest legal developments through our "Hotlines". These Hotlines provide immediate awareness and quick reference, and have been eagerly received. We also provide expanded commentary on issues through detailed articles for publication in newspapers and periodicals for dissemination to wider audience. Our NDA Labs dissect and analyze a published, distinctive legal transaction using multiple lenses and offer various perspectives, including some even overlooked by the executors of the transaction. We regularly write extensive research papers and disseminate them through our website. Our ThinkTank discourses on Taxation of eCommerce, Arbitration, and Direct Tax Code have been widely acknowledged.

As we continue to grow through our research-based approach, we now have established an exclusive four-acre, state-of-the-art research center, just a 45-minute ferry ride from Mumbai but in the middle of verdant hills of reclusive Alibaug-Raigadh district. Imaginarium AliGunjan is a platform for creative thinking; an apolitical ecosystem that connects multi-disciplinary threads of ideas, innovation and imagination. Designed to inspire 'blue sky' thinking, research, exploration and synthesis, reflections and communication, it aims to bring in wholeness — that leads to answers to the biggest challenges of our time and beyond. It seeks to be a bridge that connects the futuristic advancements of diverse disciplines. It offers a space, both virtually and literally, for integration and synthesis of knowhow and innovation from various streams and serves as a dais to internationally renowned professionals to share their expertise and experience with our associates and select clients.

We would love to hear from you about any suggestions you may have on our research publications.
Please feel free to contact us at **research@nishithdesai.com**.

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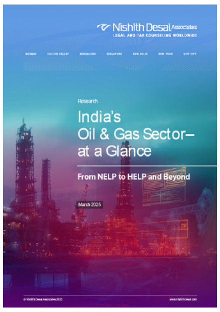

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