

# MP-IDSA

## *Issue Brief*

# India's Strategic Push for Semiconductor Manufacturing

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## **S***ummary*

As the semiconductor industry, vital for modern electronics, faces global supply chain disruptions, India is aiming to enhance its role in semiconductor manufacturing, driven by government initiatives like the National Policy on Electronics and substantial investments in semiconductor facilities. Despite challenges such as high costs and the need for skilled labour, India is making significant progress towards becoming a major player in the global semiconductor market.

## Introduction

On 11 September 2024, Prime Minister Narendra Modi addressed the SEMICON India 2024, wherein he highlighted India’s ambition to become a global hub for semiconductors, showcasing the nation's growing role in the industry.<sup>1</sup> He highlighted India’s favourable ecosystem, ease of doing business, and a skilled workforce of 85,000 semiconductor experts, which has attracted Rs 1.5 trillion in investments.<sup>2</sup> He stressed the significance of resilient supply chains and the combination of technology with democratic values, reaffirming India’s commitment to building a robust semiconductor industry and contributing to global efforts.

Semiconductors, which are central to the production of electronic devices, are projected to become a trillion-dollar industry by 2030.<sup>3</sup> Semiconductors are essential for developing electronic components like transistors, diodes and integrated circuits (ICs). These components, together constitute a chip, and are the building blocks of modern electronics such as computers and smart devices, and form the crux of the automobile industry and also modern military weapons.

The semiconductor industry began to thrive in the 1960s, with China, Japan, South Korea, the United States and Taiwan, emerging as key players. Specialised companies with advanced manufacturing facilities, known as foundries, produce semiconductor chips for design firms, which are referred to as fabless companies. This allows the optimisation of chip manufacturing for multiple clients, and is integral to the global semiconductor ecosystem, allowing rapid scaling up and innovation. The Taiwan Semiconductor Manufacturing Company (TSMC) and the multinational companies such as Global Foundries are examples of dedicated foundries creating ICs.

The semiconductor industry’s supply chain has faced significant disruptions due to various events such as the 2011 tsunami in Japan, the COVID-19 pandemic in 2020, the ongoing Russia-Ukraine conflict, and the Red Sea shipping crisis. The widespread lockdowns, worker shortages and disruptions to shipping and logistics led to chip shortages and increased prices, affecting the car manufacturing industry, digital devices for remote work, and other major electronics.<sup>4</sup> Furthermore, with Taiwan being the leading hub for semiconductor production, the growing threat from China, along with trade disputes between the United States and China, underscores

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<sup>1</sup> [“Prime Minister Shri Narendra Modi Inaugurates SEMICON India 2024 in Greater Noida, Uttar Pradesh”](#), Press Information Bureau, Prime Minister’s Office, Government of India, 11 September 2024.

<sup>2</sup> Ibid.

<sup>3</sup> Ondrej Burkacky, Julia Dragon and Nikolaus Lehmann, [“The Semiconductor Decade: A Trillion-Dollar Industry”](#), McKinsey & Company, 1 April 2022.

<sup>4</sup> Naandika Tripathi, [“Can India Truly Become a Global Semiconductor Hub?”](#), *Forbes India*, 7 August 2023.

the need to diversify manufacturers and suppliers and to de-risk supply chains to reduce dependence on a limited number of suppliers.

Critical and strategic technologies increasingly drive innovation and modernisation within India’s manufacturing and technological sectors, with an aim to transform India into a global manufacturing hub by improving product and service quality to meet international standards. There is a strong emphasis on ‘Design in India, Design for the World’, encouraging the creation of products that serve both domestic and global markets.<sup>5</sup>

India started its pursuit of semiconductor technology in 1976 when the Semiconductor Laboratory was founded in Mohali, Punjab.<sup>6</sup> However, the commercialisation of fabrication plants was not successful. ISRO and DRDO have their own semiconductor foundry system which is being utilised for their in-house productions. In order to establish a robust semiconductor ecosystem and give a boost to the electronics export market, India has set a goal of reaching US\$ 500 billion in electronics production by 2030.<sup>7</sup> This is in order to facilitate the integration of India into the Global Value Chains (GVCs) in the electronics and manufacturing domain.<sup>8</sup>

Amid the global economic shifts, India stands out as a strong investment and production hub for high-tech industries like clean energy, medical devices, electronics and ICT hardware. India has long been a leader in semiconductor design, housing 20 per cent of the world’s chip design talent.<sup>9</sup> Recently, the focus has shifted to semiconductor manufacturing, which was initiated with the partnership with the US-based Micron Technology in June 2023 to establish a major Assembly, Testing and Packaging (ATP) facility in Gujarat.<sup>10</sup>

On 2 September 2024, the central government approved a proposal by Kaynes Semicon to establish a semiconductor Assembly, Testing, Marking and Packaging (ATMP) facility in Sanand, Gujarat, with an investment of Rs 3,307 crore.<sup>11</sup> This is the fifth semiconductor unit approved under the India Semiconductor Mission (ISM).

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<sup>5</sup> [“Prime Minister Shri Narendra Modi Sets Ambitious Vision for India’s Future in 78th Independence Day Address”](#), Press Information Bureau, Prime Minister’s Office, Government of India, 15 August 2024.

<sup>6</sup> Gyanendra Keshri, [“Decoding India’s Quest for Semiconductor Manufacturing”](#), *Deccan Herald*, 30 June 2023.

<sup>7</sup> [“Electronics: Powering India’s Participation in Global Value Chains”](#), NITI Aayog, Government of India, 18 July 2024.

<sup>8</sup> Ibid.

<sup>9</sup> [“Semiconductor Chip Designing and Manufacturing”](#), Press Information Bureau, Ministry of Electronics & IT, Government of India, 6 April 2022.

<sup>10</sup> [“Micron’s Semiconductor Project at Sanand in Gujarat on Fst Track”](#), Press Information Bureau, Ministry of Electronics & IT, Government of India, 6 December 2023.

<sup>11</sup> [“Cabinet Approves One More Semiconductor Unit Under India Semiconductor Mission \(ISM\)”](#), Press Information Bureau, Cabinet, Government of India, 2 September 2024.

India is offering generous incentives to attract semiconductor investments, recognising the strategic importance of this industry amid other competing priorities.

## Efforts to Establish a Global Semiconductor Hub

In 2019, the Government of India introduced the National Policy on Electronics (NPE) with the goal of making India a global centre for Electronics System Design and Manufacturing (ESDM) and fostering a robust semiconductor chip design ecosystem.<sup>12</sup> The policy focuses on boosting domestic production and exports across the ESDM value chain, providing incentives for manufacturing core components, and supporting high-tech mega projects such as semiconductor facilities. It also encouraged R&D, innovation in emerging technologies and expansion of existing units, while promoting skill development and a special emphasis on areas such as fabless chip design, medical electronics and automotive electronics.

About Rs 76,000 crore was allocated for the development of India’s semiconductor and display manufacturing ecosystem under Semicon India programme held on 15 December 2021.<sup>13</sup> To support this goal, the government launched the Programme for Development of Semiconductors and Display Manufacturing Ecosystem in India on 21 December 2021.<sup>14</sup> This programme provides incentives to companies involved in semiconductor and display manufacturing, covering areas such as Silicon Semiconductor Fabs, Display Fabs, Compound Semiconductors, Silicon Photonics, sensors and packaging. Additionally, the government has approved the modernisation of the Semi-Conductor Laboratory in Mohali as a brownfield Fab.<sup>15</sup>

The India Semiconductor Mission, the appointed nodal agency, oversees the programme, which provides a fiscal incentive covering 50 per cent of the project cost for companies, consortia or joint ventures to establish Semiconductor Fabs, including mature nodes, and Display Fabs with specified technologies in India. On 29 February 2024, Prime Minister Narendra Modi announced the establishment of three semiconductor units: a fabrication facility in Dholera Special Investment Region (DSIR), Gujarat, and Outsourced Semiconductor Assembly and Test (OSAT)

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<sup>12</sup> [“Cabinet Approves the Proposal of National Policy on Electronics 2019”](#), Press Information Bureau, Ministry of Electronics & IT, Government of India, 19 February 2019.

<sup>13</sup> [“Cabinet Approves Programme for Development of Semiconductors and Display Manufacturing Ecosystem in India”](#), Press Information Bureau, Cabinet, Government of India, 15 December 2021.

<sup>14</sup> [“India Semiconductor Mission”](#), Press Information Bureau, Cabinet, Government of India, 21 December 2021.

<sup>15</sup> [“Government of India Taking Steps to Encourage Domestic Manufacturing of Semiconductors & Promote Country’s Digital Transformation and Self-Reliance”](#), Press Information Bureau, Ministry of Electronics & IT, Government of India, 31 July 2024.

facilities in Morigaon, Assam and Sanand, Gujarat.<sup>16</sup> The foundations of these facilities worth about Rs 1.25 lakh crores were laid via video conferencing on 13 March 2024.<sup>17</sup>

<b>Facility</b>	<b>Partners</b>	<b>Launch Date</b>	<b>Cost</b>	<b>Capacity</b>
Semiconductor Fab Unit in Dholera, Gujarat	Tata Electronics Private Limited (TEPL) with Powerchip Semiconductor Manufacturing Corp (PSMC), Taiwan	29 February 2024	Rs 91,000 crore	50,000 wafer starts per month (wfsm) capacity
ATMP unit in Morigaon, Assam	Tata Semiconductor Assembly and Test Pvt Ltd (TSAT)	29 February 2024	Rs 27,000 crore	48 million chips per day
Semiconductor ATMP unit in Sanand, Gujarat	CG Power, with Renesas Electronics Corporation, Japan and Stars Microelectronics, Thailand	29 February 2024	Rs 7,600 crore	15 million per day
ATMP fabrication plant in Sanand, Gujarat	Micron Technology	June 2023	Rs 22,516 crore	Not Available
Semiconductor unit Sanand, Gujarat	Kaynes Semicon Pvt Ltd	2 September 2024	Rs 3,300 crore	6.3 million per day
Semiconductor Fabrication Unit	Tower Semiconductor (Israel) and the Adani Group	5 September 2024	Rs 83,947 crore	40,000–80,000 wfsm
Semiconductor Outsourced Semiconductor Assembly and Test plants (OSAT) facility	RRP Electronics	September 2024	Rs 36,573 crore	Not Available

*Source: Media Reports*

India’s path to semiconductor self-reliance requires both national determination and coordinated efforts at the state level. Various states are taking the lead in this

<sup>16</sup> Ibid.

<sup>17</sup> [“PM Participates in ‘India’s Techade: Chips for Viksit Bharat’ Program”](#), Press Information Bureau, Prime Minister’s Office, Government of India, 13 March 2024.

endeavour, implementing diverse strategies and incentives to achieve technological advancement. Tamil Nadu, Gujarat, Odisha, Karnataka and Maharashtra are actively pursuing growth in the semiconductor industry with distinct strategies. Tamil Nadu has introduced a comprehensive semiconductor policy featuring financial incentives, infrastructure development and talent programmes, aiming to become a leader in semiconductor and advanced electronics manufacturing while addressing challenges like land acquisition and high operational costs.<sup>18</sup>

Gujarat, through its Vibrant Gujarat initiative and the Gujarat Semiconductor Policy 2022–27, is attracting major investments with significant capital assistance and the creation of ‘Semicon City’ to enhance its semiconductor ecosystem.<sup>19</sup> The semiconductor policy of Odisha offers incentives such as land cost reimbursement and subsidised power tariffs, capitalising on its deep-water ports and industrial corridors, though it needs to further develop its talent pool and infrastructure.<sup>20</sup> Each state presents unique advantages and challenges, and streamlined regulatory processes and transparent governance will be crucial in attracting investments to the semiconductor sector.

## Challenges to the Semiconductor Industry

Although various steps have been undertaken in way of creating a robust semiconductor manufacturing ecosystem, certain limitations remain. Chip manufacturing is highly complex and capital-intensive, requiring cutting-edge technology, sophisticated material and precision in the production process, which necessitates significant and sustained investment. The initial set-up for fabrication plants is cost-intensive. The Tata Electronics Private Limited (TEPL), the first commercial semiconductor fab at the Dholera Special Investment Region (DSIR), required an initial investment of over Rs 91,000 crores.<sup>21</sup> Additionally, TEPL also set up an Outsourced Semiconductor Assembly and Test (OSAT) facility in Morigaon, Assam, with an investment of around Rs 27,000 crores, while CG Power and Industrial Solutions Limited will build another OSAT facility in Sanand with an investment of about Rs 7,500 crores.<sup>22</sup>

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<sup>18</sup> [“Tamil Nadu Semiconductor and Advanced Electronics Policy 2024”](#), Industries, Investment Promotion & Commerce Department, Government of Tamil Nadu, January 2024.

<sup>19</sup> [“Gujarat Semiconductor Policy 2022-27”](#), Department of Science and Technology, Government of Gujarat, 27 July 2022.

<sup>20</sup> [“Odisha Semicon Fabless Policy 2023”](#), Invest Odisha, Government of Odisha, July 2023.

<sup>21</sup> [“Giant Leap for India Semiconductor Mission: Cabinet Approves Three More Semiconductor Units”](#), Press Information Bureau, Ministry of Electronics & IT, Government of India, 29 February 2024.

<sup>22</sup> Ibid.

Developing a semiconductor manufacturing ecosystem in India presents significant challenges, including the need for uninterrupted power, vast quantities of clean water, and the establishment of expensive water purification facilities, especially for chip fabrication.<sup>23</sup> Furthermore, establishing a successful semiconductor ecosystem depends heavily on attracting and nurturing a highly skilled workforce. In order to counter this limitation, there has been an attempt to connect the youth talent pool of the state to academia, educational institutions, and even R&D centres to the semiconductor mission by establishing Centres of Excellence (CoEs).<sup>24</sup> These have been established in IIT Kanpur, IIT Bombay, Andhra Pradesh MedTech Zone Limited (AMTZ), Visakhapatnam and IIT Madras.<sup>25</sup>

There have also been challenges and delays in joint venture efforts, like the Vedanta-Foxconn JV, which planned to set up a semiconductor fabrication facility in Dholera Special Investment Region (SIR). Foxconn withdrew from the agreement despite having signed an MoU with the Gujarat state government.<sup>26</sup>

The semiconductor industry demands intricate processes and substantial investments in R&D and fabrication facilities. As chip sizes shrink, there is a growing need for innovation and skilled labour.<sup>27</sup> To address these challenges, the Design Linked Incentive (DLI) Scheme has been introduced in January 2022 to provide financial incentives and design infrastructure support at various stages of semiconductor design and deployment, of between Rs 15–30 crore per applicant.<sup>28</sup> Financial support is provided to domestic companies, start-ups and MSMEs from the domestic sector. Under the DLI scheme, the government has approved 12 companies for financial assistance of around Rs 133 crores, while 21 applications are still under review. These companies include DV2JS Innovation, Vervesemi Microelectronics, Fermionic Design, Morphing Machines, Calligo Technologies, Sensesemi Technologies, Saankhya Labs, Aheesa Digital Innovations, Netrasemi, Green PMU Semi, WiSig Networks and MosChip Technologies. The government aimed to fund at least 100 start-ups through the DLI scheme.<sup>29</sup>

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<sup>23</sup> Ondrej Burkacky et al., [“Exploring New Regions: The Greenfield Opportunity in Semiconductors”](#), McKinsey & Company, 29 January 2024.

<sup>24</sup> [“PM Participates in ‘India’s Techade: Chips for Viksit Bharat’ Program”](#), no. 17.

<sup>25</sup> [“Centres of Excellence in Support of ESDM”](#), Ministry of Electronics & IT, Government of India, 28 March 2024.

<sup>26</sup> [“Foxconn Pulls Out of \\$19.5 Billion Semiconductor JV but Vedanta Says Other Partners Already Lined Up”](#), *Livemint*, 10 July 2023.

<sup>27</sup> [“Semiconductor Industry – Challenges, Latest Trends and Road Ahead”](#), WTW, 22 November 2023.

<sup>28</sup> [“Design Linked Incentive”](#), Ministry of Electronics & Information Technology, Government of India.

<sup>29</sup> Soumyarendra Barik, [“Govt Clears 12 Indian Start-ups for Incentives Under Chip Design Plan”](#), *The Indian Express*, 9 September 2024.

The Centre for Development of Advanced Computing (C-DAC), part of the Ministry of Electronics and Information Technology (MeitY), is responsible for implementing the DLI scheme, which includes Chip Design Infrastructure Support, Deployment Linked Incentive and Product Design Linked Incentive. Additionally, initiatives like the Scheme for the Promotion of Electronic Components and Semiconductor Manufacturing (SPECS) aimed to expand the country’s electronics manufacturing sector.<sup>30</sup> However, this Production-Linked Incentive (PLI) scheme expired in March 2024, and the government is currently considering revisions for a new PLI programme.<sup>31</sup>

## Conclusion

With its pivotal role in powering modern electronics, semiconductors are integral to technological advancements across various industries. India, recognising the strategic importance of this sector, has embarked on an ambitious journey to establish itself as a global semiconductor manufacturing hub. Despite challenges such as high capital costs, the need for skilled labour, and technology transfer restrictions, India is making strides through government initiatives, strategic partnerships and educational investments. The country’s focus on building a robust semiconductor ecosystem aligns with its broader goals of fostering innovation, building resilience in supply chains, attracting global investments and positioning itself as a leader in the global electronics and manufacturing landscape. By building on its current strengths in chip design and fostering growth in the domestic semiconductor sector, India aims to not only fulfil domestic demand but position itself as a significant player in the global semiconductor market.

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<sup>30</sup> [“Promotion of SPECS”](#), Press Information Bureau, Ministry of Electronics & Information Technology, Government of India, 7 December 2022.

<sup>31</sup> Melissa Cyrill, [“Discussions for a New Electronic Components PLI Scheme in India: What We Are Hearing”](#), *India Briefing*, 12 June 2024.



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