CONSUMER DURABLES

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Semicon India 2025: Towards a fab nation

- **Global leaders' participation signals India's integration into the semiconductor ecosystem**
- **Policy support is pivotal; ISM's USD 8.6bn outlay mirrors global efforts like US CHIPS Act and Japan's chip initiative (building 2nm chip)**
- **Tata Electronics, with its fab and OSAT plant, anchors the majority of chip commitments (~73%)**

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India conference reflected govt's thrust on semiconductor ecosystem: Semicon India, inaugurated by the Prime Minister with the launch of India's first indigenously developed chip, saw a broad global participation. Exhibitors spanned the full value chain — led by materials suppliers, followed by fab equipment makers and a growing base of OSAT and PCB/EMS players. At the apex, fewer but strategic EDA platforms, design houses, and fab operators, reflected the natural hierarchy of the global semiconductor ecosystem.

Chip consumption to rise from ~USD 45-50bn today to ~USD 100bn by FY30: India's semiconductor consumption is pegged at USD 45–50bn in 2025, driven by consumer electronics, telecom, automotive, and industrial/IoT. Consumer electronics and wireless account for ~25–30%, while automotive is fast emerging as a growth engine. Demand is skewed to mature/legacy nodes (60–70%) vs ~15% at advanced nodes (<10nm), aligning with Tata Electronics' focus on mature-node fabs.

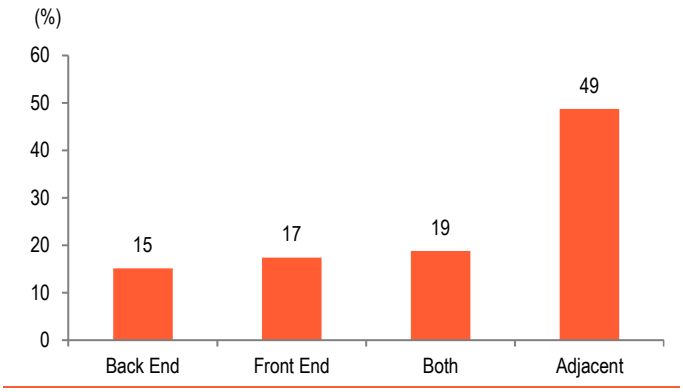
Comprehensive policy framework makes it a play beyond import substitution: India's Rs760bn ISM initiative is gaining momentum with strong central and state backing — from Gujarat to Assam. Focused on design, talent, and infrastructure hubs like Dholera and Sanand, the policy goes beyond import substitution to position semiconductors as a strategic priority. Mirroring global efforts like the US CHIPS Act and Japan's programs, India is aligning with leading nations to build a robust ecosystem.

Tata leads with India's first fab; Micron, Kaynes and CG Semi add ATMP capacity: Tata Electronics is setting up India's first semiconductor fab at Dholera with a Rs 900bn investment, producing chips on 28–110nm nodes. While mature, this marks an aspirational start for a country without a semiconductor ecosystem. Alongside, Kaynes and CG Semi are establishing ATMP/OSAT facilities, initially in legacy packaging but with scope to advance. Though a late entrant, India is actively building capabilities to move up the learning curve.

Inside semiconductor ecosystem

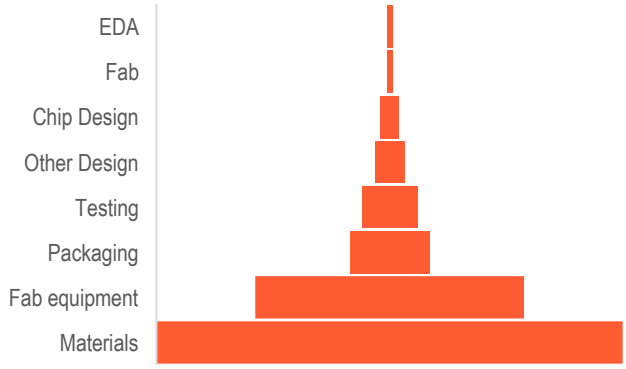
The Semicon India 2025 exhibitor mix mirrored the global semiconductor value chain – spanning both front end (equipment, materials, design) and back end (testing, packing, PCB/PCBA). While front-end participation remained concentrated among a few global leaders, the back end attracted a broader base of firms, reflecting the inherently more distributed structure of the industry.

Fig 1 – Majority exhibitors from core value chain



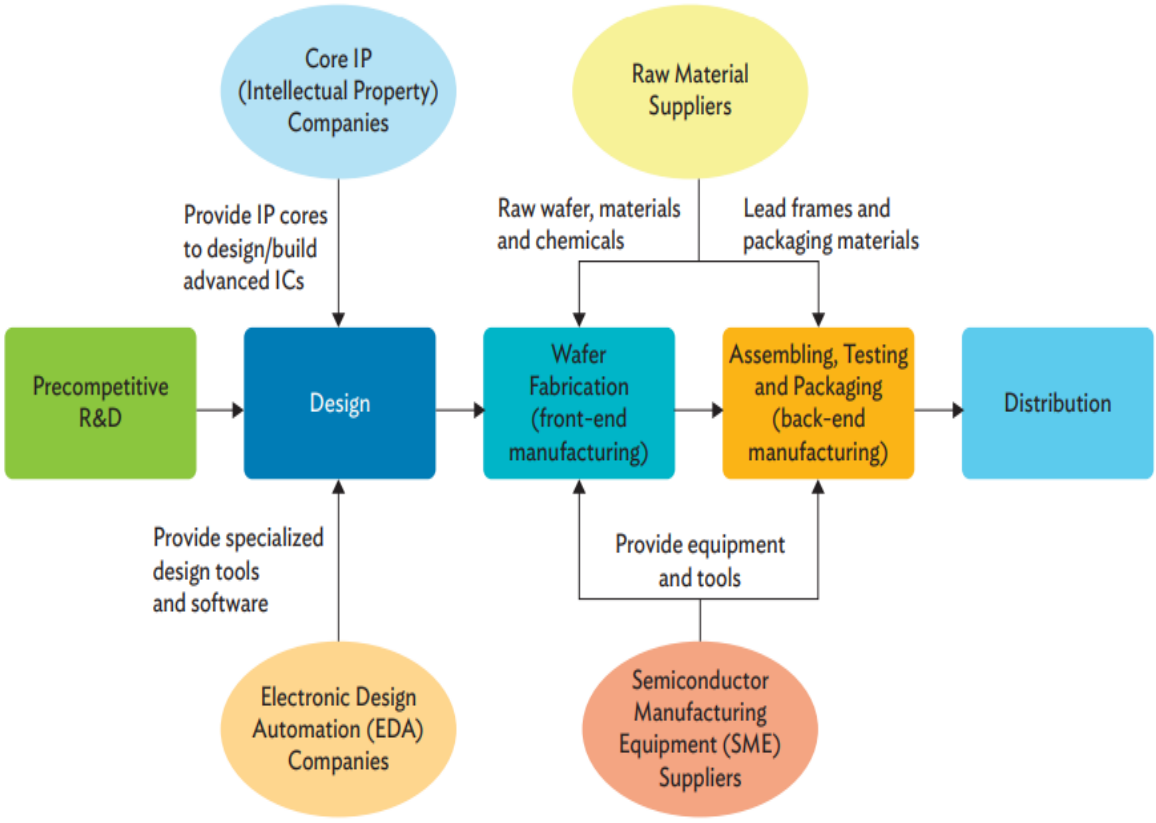
Source: Semicon India, BOBCAPS Research

Fig 2 – Strong presence of materials & equipment sellers



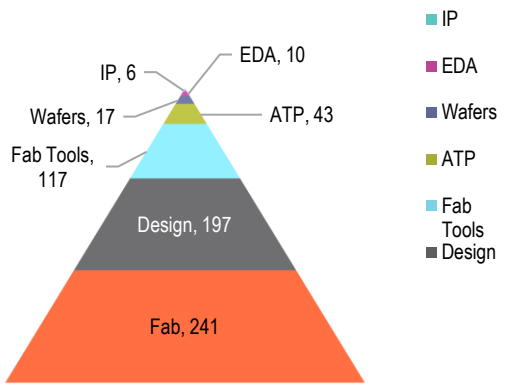
Source: Semicon India, BOBCAPS Research

Fig 3 – Semiconductor Value Chain



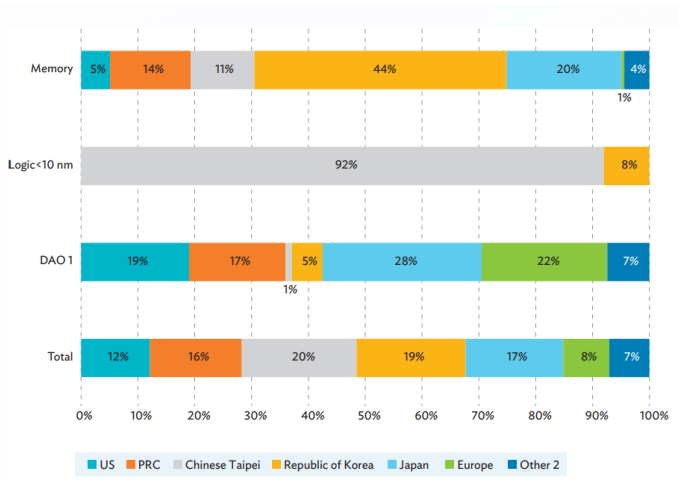
Source: SIA, BOBCAPS Research

Fig 4 – Value added by segments of semiconductor production process (US$ bn)



Source: Itif, BOBCAPS Research

Fig 5 – Taiwan a leader in advanced logic ICs (<10nm)



Source: GVCD, BOBCAPS Research

Fig 6 – Key players in India's semiconductor ecosystem

Source: Itif, BOBCAPS Research

An interdependent ecosystem: Semiconductor value chain is marked by high interdependencies, with a handful of players dominating critical segments such as EDA, EUV lithography, fabs, and fab design — each leveraging distinct technological advantages. The chain begins with design software, where a single enterprise EDA license can cost upwards of Rs 100 mn annually, and extends all the way to advanced packaging for downstream applications.

- **EDA & design:** EDA is a software used by design firms that creates chip architectures (for example – Cadence design system, Siemens EDA, etc.). Then, there are design firms such as Nvidia, Qualcomm, ARM, IBM, etc. Some firms are fabless while others like Intel are IDM (with fabs). Design companies have high dependency on EDA tools as they help run simulations. Both EDA and design are talent-intensive businesses, and Indian design engineers form a significant part in the EDA and design.
- **Fab:** Front-end wafer manufacturing – high capital intensive, producing chips on silicon wafers. Tata Electronics is entering into front-end wafer manufacturing of node size – 28nm, 40nm, 55nm, 90nm and 110nm, all mature nodes. TSMC is the world's largest fab with capability of manufacturing the world's smallest node of 3nm and manufactures ~92% of the world's chip with size 7nm and below.
- **Fab equipment & materials:** Toolmakers and material suppliers are essential to chip fabrication, spanning lithography, etching, deposition, metrology, and specialty gases. These markets are highly concentrated — ASML holds a monopoly in EUV lithography, while the overall lithography is dominated by ASML, Nikon, and Canon. Metrology, too, is concentrated with leaders like KLA, highlighting the strategic importance of a few global players. Major fab equipment companies already have their global ER&D capability centres in India.
- **Testing:** Back-end validation and automated testing of chips (e.g., Advantest, Teradyne).
- **Packaging / OSAT (ATMP):** The segment involves assembly, testing, marking, and packaging of chips (e.g., Amkor, ASE, Kaynes, CG Semi). Indian players are beginning to tap opportunities here, primarily in legacy packaging, with support from global technology partners.
- Total manufacturing cycle of chips from wafer fabrication stage to packaging is of ~ 3-4 months. The wafer goes through hundreds of steps – deposition, lithography, etching, doping, polishing, etc. Each layer must be patterned and tested. This stage usually takes 8-12 weeks (2-3 months). ATMP takes another 4-6 weeks, and hence, total 3-4 months. However, for the initial manufacturing phase (in case of Tata Electronics), the lead time should be assumed higher on account of teething challenges.
- However, total end-to-end manufacturing from design to volume supply takes 12-18 months as before fabrication starts, design cycles can take 6-12 months.

Fig 7 – Key global leaders in semiconductor ecosystem

Segment	Key global players
EDA & Design	EDA: Cadence, Synopsys, Siemens EDA, Ansys; Design: Nvidia, IBM, AMD, Qualcomm
Fab	TSMC (Taiwan), PSMC (China), Intel (US and Malaysia), Samsung (South Korea), SK Hynix (South Korea), Micron
Fab Equipment	ASML, Applied Materials, Lam Research, Tokyo Electron, KLA
Materials	Air Liquide, Entegris, BASF, AGC, Dow, 3M
Testing	Advantest, Teradyne, Keysight
Packaging / OSAT	Amkor, ASE, ASMPT, Besi

Source: Industry, BOBCAPS Research

Fig 8 – India has a talent pool of engineers in EDA, chip-design and ER&D; key global giants have GCCs in India since last decade

Segment	Company	India location
EDA	Cadence	Noida and Bengaluru
	Synopsys	Noida, Bengaluru, Hyderabad, Bhubaneswar
	Siemens EDA	Bengaluru
Design	Nvidia	Development centre is located in Bengaluru
	IBM	Bengaluru, Pune, Chennai, Delhi, Hyderabad, etc.
	AMD	One of the largest R&D centres in Bengaluru
	Qualcomm	Bengaluru
	Intel	Bengaluru and Hyderabad
Fab Equipment	Applied Materials	ER&D centre in Bengaluru
	Lam Research	ER&D centre in Bengaluru
	Tokyo Electron	Setting up its office in Dholera, will be providing equipment to Tata Electronics
Testing	Keysight	Bengaluru
	KLA	Bengaluru

Source: Industry, BOBCAPS Research

- In the above value chain, India is developing its capability in fabrication (Tata Electronics, Micron, HCL-Foxconn), ATMP (Micron, Kaynes, CG Semi, 3D Glass Inc) and strengthening its capability in design, given that a big number of companies have their global capability centres set up in India.

Thrust on compound semiconductors, particularly Gallium Nitride (GaN) and Silicon Carbide (SiC). Compound semiconductors, built on materials such as gallium nitride (GaN) and silicon carbide (SiC), offer superior power efficiency, thermal conductivity, and frequency performance vs traditional silicon, making them critical for applications in 5G, EVs, renewable energy, aerospace, and defense. India too is beginning to focus on this segment, which is reflected in the new projects approved - SicSem (a subsidiary of Archean Chemicals).

Fig 9 – Companies in compound semiconductors (SiC and GaN)

Company	Location	Focus Area & Status
Agnit Semiconductors	Bangalore	India's first vertically integrated GaN (Gallium Nitride) startup—from wafers to modules—with pilot production via IISc support.
RIR Electronics	Odisha	Setting up a Silicon Carbide (SiC) fab targeting EV and renewable energy segments.
SiCSem (with UK partner)	Odisha	To establish India's first commercial compound semiconductor (SiC) fab under ISM.
Sahasra Electronics	Rajasthan	Developing GaN packaging solutions for LEDs and defense electronics (early-stage).
Tata Electronics (+ partners)	Gujarat	Exploring GaN/SiC R&D and advanced packaging within upcoming facilities.
CUMI (Carborundum Universal)	Tamil Nadu	High purity SiC (reaction bonded & sintered) supplier
Grindwell Norton Ltd.	Gujarat, Karnataka, MH, Himachal	SiC abrasives, ceramics, specialty materials supplier
Vesuvius India Ltd.	Gujarat, Telangana, WB	Refractors and SiC-based industrial products supplier

Source: Industry, BOBCAPS Research

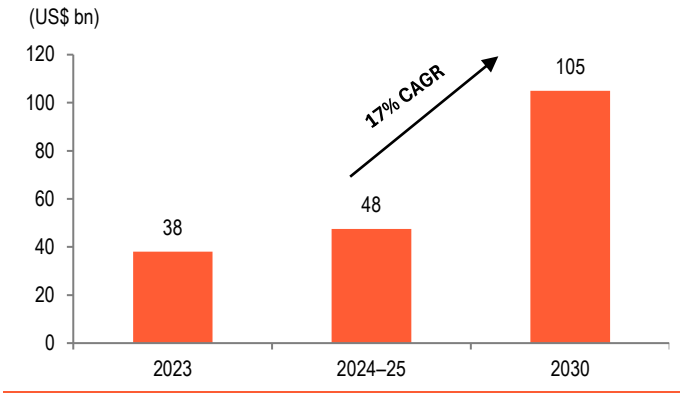
Semiconductors an opportunity for specialty chemical and advance materials players: Indian chemical companies have the potential to supply specialty gases, solvents, and process chemicals required across wafer fab and packaging. Similarly, advanced materials players can scale into high-value segments such as gallium nitride (GaN) and silicon carbide (SiC). This convergence offers India a pathway to leverage the existing domain expertise and industrial infrastructure to accelerate the buildout of a competitive semiconductor value chain.

Established talent pool in chemicals and pharma can support building the ecosystem: India's pharma talent, skilled in clean-room operations and precision processes, can play a key role in semiconductor fabs — bringing quality discipline and cross-functional expertise to the emerging ecosystem.

Chip consumption to 2x in 5 years

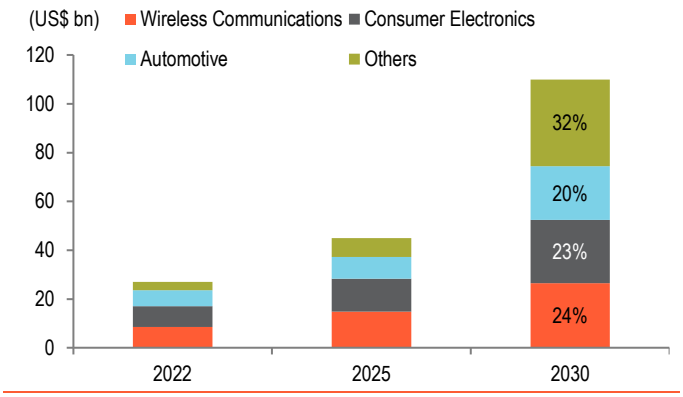
India's semiconductor consumption is estimated at USD 45–50 bn in 2025, led by 4 key sectors — consumer electronics (smartphones, TVs, laptops, appliances), telecom & networking (4G/5G infra, routers, cloud servers), automotive (EVs, ADAS, infotainment, powertrain), and industrial/IoT devices (smart meters, controls, defence, aerospace) and is expected to 2x over 5 years to reach USD 100-110bn (2030).

Fig 10 – Chip consumption to grow at 17% CAGR over next 5 years



Source: Industry, BOBCAPS Research

Fig 11 – Consumer electronics and telecom contribute ~ 47-48% of chip consumption



Source: Industry, BOBCAPS Research

Consumer electronics and telecommunication form the largest share at ~45% (combined), while automotive is emerging as a major growth driver. By node, only ~15% of demand is at advanced nodes (<10 nm, largely in smartphones), whereas mature and legacy nodes dominate at 60–70%, reflecting the heavy use of peripheral ICs, automotive, and industrial chips. India's first fab by Tata Electronics will produce mature and legacy nodes.

ISM can potentially lead to 15-20% import substitution with Tata Electronics at forefront: Given the 12–18-month cycle from design to mass production, we do not expect immediate substitution from Tata Electronics' fab, with commercial output still at least a year away. Over the longer term, domestic production will primarily address mature nodes (28nm and above), while ATMP facilities can handle more advanced nodes. Collectively, these units have the potential to substitute ~10-15% of India's semiconductor import demand with domestic production.

Fig 12 – Tata Electronics (Fab + OSAT) has potential to substitute 10-15% of import demand

Tata Facility	Area of Impact	Potential Import Substitution (by 2030)
Fab – Dholera	Wafer Fabrication (Mature Nodes)	Moderate — may substitute ~US$5 bn annually (~5% of total semiconductor import value), depending on demand for mature-node chips
OSAT – Assam	Assembly & Testing	Significant — could replace much of the current packaging imports (up to ~10–15% of total semiconductor imports value)

Source: Company, BOBCAPS Research

Policy support at key nodes of value chain

The India Semiconductor Mission (ISM) is targeting multiple nodes of the value chain through tailored incentive schemes — design (Design Linked Incentive scheme), silicon fabs, compound semiconductors, and ATMP/OSAT. This policy thrust extends downstream as well, with government support for EMS players via the Electronics Components Manufacturing Scheme (ECMS).

Fig 13 – Incentive schemes under ISM for various applications – Silicon fabs, display fabs, ATMP, SiC/GaN and DLI

Segment / Scheme	What it covers	GoI fiscal support	Key thresholds (tech / capacity / size)	Disbursement & other supports
Silicon Semiconductor Fabs (Modified Scheme, 2022)	Greenfield silicon CMOS fabs for logic/memory/analog/mixed signal/SoCs	50% of project cost	300 mm wafers; ≥40,000 WSPM; min capex Rs 200bn; min revenue Rs 75bn (group allowed)	Disbursed pari-passu into a No-Lien Account (NLA); detailed claim process; equity (if used) capped at 49%; EMC 2.0 infra; purchase preference; R&D/skills up to 2.5% of outlay
Display Fabs (Modified Scheme, 2022)	TFT-LCD or AMOLED panel fabs	50% of project cost	Gen-8+ TFT-LCD (≥60k panels/mo) or Gen-6+ AMOLED (≥30k panels/mo); min capex Rs 100bn; min revenue Rs 75bn	Pari-passu via NLA; EMC 2.0 infra; purchase preference; R&D/skills up to 2.5% of outlay
Compound Semiconductors / SiPh / Sensors / Discrete Fabs (Modified Scheme, 2022)	III-V / SiPh / MEMS / discrete device fabs	50% of capital expenditure	150/200 mm wafers; ≥500 WSPM (100 mm eq.); min capex Rs 1bn; experience or licensed process required	Purchase preference; R&D/skills up to 2.5%; eligible capex includes used/refurb equipment, ToT, R&D
ATMP/OSAT (Modified Scheme, 2022)	Assembly, test, marking & packaging (incl. outsourced)	50% of capital expenditure	Min capex Rs 500mn; operational packaging experience or licensed technologies	Purchase preference; R&D/skills up to 2.5%; eligible capex includes building/cleanrooms/equipment (used allowed), ToT, R&D
Design-Linked Incentive (DLI)	IC/IP/SoC design companies, startups & MSMEs; EDA access & MPW	Product Design Linked Incentive: up to 50% of eligible expenditure reimbursed (EDA/IP/prototype, etc.) Deployment Linked Incentive: on net sales	Operational via C-DAC with rolling appraisal & approvals	National EDA Grid: MPW shuttle runs; access to IP repositories; support for prototypes; rolling approvals

Source: ISM, BOBCAPS Research

Fig 14 – List of 10 projects under ISM – 2 fabs, 6 ATMP, 1 compound semiconductor and 1 advance packaging

Date	Company	Location	Investment (Rs bn)	Output Capacity
Fab				
Feb-24	Tata Electronics (TEPL) + PSMC	Dholera, Gujarat	910	50,000 wafers/month
May-25	HCL-Foxconn JV	Jewar, Uttar Pradesh	37	20,000 wafers/month (36 M units/yr)
ATMP/OSAT				
Jun-23	Micron Technology	Sanand, Gujarat	225	ATMP Facility, with phased ramp-up.
Feb-24	CG Power & Industrial Pvt Ltd + Renesas + Stars	Sanand, Gujarat	76	15 million chips/day
Feb-24	Tata Semiconductor Assembly and Test Pvt Ltd (TSAT)	Morigaon, Assam	270	48 million chips/day
Sep-24	Kaynes Semicon Pvt Ltd	Sanand, Gujarat	33.1	6.33 million chips/day
Aug-25	CDIL (Continental Device)	Mohali, Punjab	1.1	158 million units/year
Aug-25	ASIP (Advanced System in Package Technologies)	Andhra Pradesh	4.8	96 million units/year
Compound Semiconductor				
Aug-25	SicSem Private Limited	Bhubaneshwar, Odisha	20.7	60k wafers/yr; ATMP capacity: 96M units/yr
Advance Packaging (Heterogenous integration)				
Aug-25	3D Glass Solutions Inc.	Bhubaneshwar, Odisha	19.4	Glass panels: 70k units/yr

Source: Company, BOBCAPS Research

Fig 15 – List of design companies who received approval under DLI scheme

Company Name	Project Name	State
DV2JS Innovation	Low-Light Image Sensor with Single-Photon Detection for Security, Surveillance, Automobile Cameras.	NCR
Vervesemi Microelectronics	A Mixed Signal Microcontroller for Motor Control and Smart Power Applications	
Incise Infotech	A Linear LED Driver IC.	
Fermionic Design	A 4-channel Mux-Demux Gain Phase Shifter for Hybrid Beamformer in 8-12GHz for satellite communication and 5G Antenna Array systems	Karnataka
Morphing Machines	SoC, IP and Accelerator card powered by REDEFINE architecture and Ecosystem	
Calligo Technologies	SoC with RISC V and POSIT Coprocessor based Accelerator Card with Software Ecosystem	
Sensesemi Technologies	SenseSoC-200 SoC for IOT and Medical Applications	
Saankhya Labs.	SoC for Baseband Processing for 5G Telecom infrastructure	
Aryabhata Circuits and Research Labs.	Next Generation IC for Advanced Tire Monitoring System (TMS)	
BigEndian Semiconductors.	SoC for Video Audio Surveillance Unit, Design and Development	
C2i Semiconductors	A Digital Multiphase Controller IC for Enterprise Server Power	
MBit Wireless	Dual-mode LTE Cat-1 bis and NB-IoT Baseband chipset for IoT applications.	
MMRFIC Technology	Indigenous Ka-Band Beamformer RADAR Chip	
Sophrosyne Technologies	High-precision, Ultra-low-power SoC for real-time monitoring of cardiac activity and other vital health parameters	
Aheesa Digital Innovations	VEGA Processor based GPON ONT and Network SoC for FTTX and Broadband applications	Tamil Nadu
Mindgrove Technologies.	Vision SoC using Shakti processor for Edge Computing	
InCore Semiconductors	RISC-V multi-core super scalar processor for smartphones and edge AI.	Kerala
Netrasemi	A High-End Edge-AI SoC with on-chip video analytics and vector processing computing.	
Netrasemi	Development of ML Acceleration chip with Programmable Hardware Infrastructure for Robots, Drones, Industrial automation and Video Analytics systems (64 TOPS AI performance) on 12nm, TSMC	
Green PMU Semi.	Energy-Harvesting power management Chip for IoT applications	Telangana
WiSig Networks	A 5G NB-IoT based SoC for Terrestrial and Satcom Applications	
MosChip Technologies.	Smart Energy Meter IC-VIDYUT	
Multi Nano Sense Technologies	MEMS Platform Gas Sensors and CMOS Data Acquisition AFE SoC	Maharashtra

Source: DLI, BOBCAPS Research

India's chip design scene is thriving — InCore Semiconductors is slashing development time from months to days, while Netrasemi is building full-stack Edge AI SoCs with strong investor support.

InCore Semiconductors, a Chennai-based RISC-V startup incubated at IIT-Madras, is working on chip design timelines. InCore has developed a SoC Generator platform that can shrink the design cycle from months to minutes, promising that what traditionally took weeks of effort can now be done in under a week by a small team. The company has already demonstrated silicon proof at 40 nm with heterogeneous RISC-V cores.

Netrasemi, a Kerala-based fabless startup, is positioning itself as India's Edge AI SoC innovator. The company is developing full-stack solutions, including custom SoCs for vision and sensor processing, and its own AI development platform, NETRA Edge Studio. Its chips (A2000 and R1000, built on 12 nm TSMC nodes, with an A4000 in the pipeline) target surveillance, IoT, and smart device markets. Netrasemi recently raised Rs 1.1bn (~USD 12.5 mn) from Zoho Corporation and Unicorn India Ventures.

Fig 16 – State policies to support semiconductor ecosystem

State	Policy & Year	Capital Subsidy (over Center)	Land Incentives	Power Incentives	SGST / Tax Incentives	Interest Subsidy	Talent / Payroll Support
Assam	Assam Electronics & Semiconductor Policy 2023	+40% of project Capex over GoI support (phased disbursal 20% annually, with flexibility 18–22%)	Land at nominal prices; freehold transfer possible	50% tariff reimbursement for 10 yrs from COD	SGST reimbursement up to 15 yrs	—	20% of net wages for local employees
Odisha	Odisha Semiconductor & Fabless Policy 2023–2030	30% of Project Capex (pari-passu with GoI)	Land at IPR rates; 25% discount for first 5 mega projects >Rs 50 bn; 10% discount for others	Rs 2/unit reimbursement for 10 yrs; 100% exemption from electricity duty & inspection fee for 10 yrs	100% SGST reimbursement, capped at 200% of plant & machinery cost	5% p.a. up to Rs 2.5 bn/yr for 7 yrs	—
Gujarat	Gujarat Semiconductor Policy 2022–27	40% of GoI's Capex support (disbursed over 5 yrs); initially limited to 1 Fab + 1 Display project	75% subsidy on first 200 acres, 50% subsidy on additional land in Dholera SIR; only via DSIRDA allotment	Rs 2/unit subsidy for 10 yrs; 100% electricity duty exemption; extra support for FDI / relocated projects	—	—	—
Uttar Pradesh	UP Semiconductor Policy 2024–29	50% of GoI subsidy (pari-passu)	75% rebate on first 200 acres, 30% on additional	100% electricity duty exemption for 10 yrs; dual grid (one reimbursed); 50% rebate on wheeling/transmission charges for 25 yrs	Overall incentives capped at 100% of eligible project cost	5% p.a. interest subsidy, up to Rs 0.1 bn/yr/unit for 7 yrs (max Rs 0.7 bn)	Skilling support (Rs 0.3 bn for workshops, internships, global hires)

Source: ISM, BOBCAPS Research

Fig 17 – 13 MoUs signed during Semicon India 2025

Parties Involved	Focus Area / Details
Tata Electronics & Merck	Merck will supply high purity material, specialty gases and chemicals along with access to AI power material intelligence.
Tata Electronics & C-DAC	Develop domestic semiconductor design and IP ecosystem
Kaynes Semicon, SPARSH-IQ, 3rdiTech, Focally, SenseSemi	Kickoff joint development of India's first fully localized automotive camera module
Kaynes Semicon & Infineon	Deliver India's first MEMS Microphone & Advanced Semiconductor Packages
L&T Semiconductor, IIT Gandhinagar, C-DAC	Joint development of "Make-in-India" Secure Chip with smart OS for digital identity (e-passports etc.)
L&T Semiconductor & IISc Bangalore	Build National Innovation Hub for semiconductor research & quantum leadership
C-DAC & Indiesemic	Unveiling India's 1st IoT Evolution Board integrating indigenous VEGA processor with Bluetooth & LoRa
NIELIT & Singapore Semiconductor Industry Association (SSIA)	Promote semiconductor skilling, academia-industry linkages, capacity building
ISM & NAMTECH	Establish framework for talent pipeline & applied research in line with ISM roadmap
Arizona State University & ISM	Scientific and educational collaboration
C-DAC, Synopsys & IIT Madras Pravartak	Provide flexible access to Synopsys IPs for DLI-approved companies
ISM / C-DAC (DLI Scheme)	Design infrastructure support to DLI-approved companies
Odisha Government & TopTrack Hi-Tech PCB Pvt. Ltd.	Rs 10.5 bn investment for advanced PCB manufacturing facility in Odisha
Odisha Government & Sancode Technologies Ltd. (with partners Silicon Connect, Inari Amertron Berhad, APIRC Penang)	Rs 16.5 bn semiconductor manufacturing project in Odisha

Source: ISM BOBCAPS Research

Fig 18 – Global semiconductor equipment manufacturers partnering with Indian institutes for building labs

Foreign entity	Indian institute partner	R&D centre / lab (as named)
Applied Materials	IIT Bombay	*Applied Materials Nanomanufacturing Lab* (India's first university-based 200 mm fab tools) and the Applied Materials CLEAN Lab
Applied Materials	IISc Bengaluru (CeNSE)	Industry Affiliate collaboration; joint work to take advanced materials from "Lab-to-Fab"
Applied Materials	IIT Patna	3-year R&D program on special coatings for corrosion avoidance in semi equipment (with DST support)
KLA	IIT Madras (IITM Research Park)	AI-Advanced Computing Lab (AI-ACL) for inspection/metrology research using AI/HPC
Synopsys	IIT Bombay (SemiX)	Synopsys Semiconductor Lab for Virtual Fab Solutions
Lam Research	IISc Bengaluru (CeNSE) with MeitY/ISM	Semiverse Solutions virtual-fab training/research infrastructure using SEMulator3D
Renesas Electronics	IIT Hyderabad	Multi-year research MoU in VLSI & embedded semiconductor systems (talent + joint R&D)
Samsung Semiconductor India Research (SSIR)	IISc Bengaluru	Quantum Technology Lab (set-up support & collaboration)
Tokyo Electron (TEL)	IIT Bombay	Strategic partnership to boost semiconductor research & training; TEL joined IITB Research Park (ASPIRE) as Associate Member

Source: Industry BOBCAPS Research

ANRF to aid creating a superior design ecosystem: The Anusandhan National Research Foundation (ANRF), established in 2023 with a planned corpus of Rs 860bn over five years (government + industry/philanthropy), is India's new apex body for funding scientific research and innovation. It is designed to broaden the scope of the earlier SERB by supporting both fundamental and applied research, fostering academia–industry collaboration, and accelerating commercialisation. In the semiconductor context, ANRF is expected to complement ISM by funding research in chip design, advanced materials, and deep-tech innovation. Its role is somewhat akin to the US National Science Foundation (NSF) under the Department of Science & Technology, which drives federally funded R&D and links academic research to national priorities—including semiconductors through the CHIPS and Science Act.

C2S another initiative under ISM to support and attract talent in designing chip: Chips to startup (C2S) programme is designed to strengthen India's semiconductor design ecosystem by training ~85,000 engineers and supporting SoC design, IP creation, and prototyping across 100+ institutions. Focus on academia–industry collaboration and access to advanced EDA/prototyping infrastructure mirrors global models like Belgium's IMEC, which has long served as a bridge between universities, research labs, and chipmakers.

Policy support imperative for semiconductor industry

The semiconductor industry is capital intensive, tech driven, and geopolitically strategic. Without government incentives, subsidies, and ecosystem support, the barriers to entry are often very high.

This is evident not only in India, but globally. Countries have put semiconductors as one of the priority sectors. For instance, the US has rolled out CHIPS and Science Act, committing over USD 50bn in incentives to catalyse domestic manufacturing, research, and workforce development. The intent is not just to reduce import dependency on East Asia, but also to anchor leading-edge innovation within the country. Similarly, Japan is betting heavily on next-generation technologies such as 2nm fabs, channeling subsidies and policy backing into partnerships with global leaders like TSMC, to ensure it stays relevant in advanced nodes.

Fig 19 – Key policy support across leading nations towards building/ strengthening semiconductor industry

Country	Strategic Intent	Key Focus Area	Policy / Support
China	Self-reliance	Domestic fabs, memory (NAND, DRAM, HBM), AI chips	Big Fund (~USD 47bn), Made in China 2025
US	Reshoring & tech security	Leading-edge fabs, R&D, workforce, secure supply	CHIPS & Science Act (USD 52bn), tax credits
Japan	Advanced-node leadership	2nm fabs (Rapidus), 12/16nm fabs (TSMC-JASM), R&D	Govt subsidies, LSTC, ~USD 6.5bn+ funding
S. Korea	Global memory dominance	DRAM, NAND, advanced foundry, mega-cluster	K-CHIPS Act, $23B package, $470B long-term plan
India	Ecosystem building	Mature-node fabs, compound semis, ATMP/OSAT, design	ISM + PLI (~$18B, ISM 2.0 ~$20B)
Malaysia	Supply chain hub	OSAT/assembly, friend-shoring, backend services	National Semi Strategy ($5.3B), tax incentives

Source: Industry, BOBCAPS Research

Like ISM (2021) in India, US is pursuing via Chips and Science Act '22
What India is doing through the India Semiconductor Mission (ISM), subsidising fabs, OSAT/ATMP, design, materials, and talent, is also what the US has pursued through the CHIPS Act, with both aiming to localise production, cut import reliance, and build end-to-end semiconductor ecosystems. The US CHIPS and Science Act provide USD 52.7bn in incentives and USD 24bn in tax credits to reduce reliance on East Asia and rebuild domestic semiconductor capacity. Of this, USD 39bn is for manufacturing, USD 11bn for R&D, and USD 2.7bn for defense/workforce. Support, which can offset up to 35% of project costs via grants, loans, and a 25% ITC, covers fabs across leading-edge, memory, and legacy nodes, as well as packaging and equipment suppliers, with guardrails restricting expansion in China. Flagship projects like TSMC's USD 40bn Arizona fab, Intel's USD 20bn+ Ohio fabs, and Samsung's USD 17bn Texas plant, are key beneficiaries.

2nm technology reduces power consumption by 30-35%

Rapidus is Japan's moonshot to 2nm advanced nodes, an all-in effort of Japan govt: Rapidus represents Japan's boldest bet to regain relevance in advanced semiconductors and is widely being seen as a moonshot project. The company was formed in 2022 as a PPP and has got backing from industrial giants and strong government support to deliver 2nm chips by 2027.

TSMC's 1.4nm next generation chip tech set for production in 2028 and is targeting 2nm production in 2HCY25

Rapidus' advancements — Highlights:

- Conceived under Japan's 2021 semiconductor strategy, aimed at fostering a domestic champion for advanced nodes.
- Founded in 2022, backed by Toyota, Sony, NTT, SoftBank, NEC, Kioxia, Denso, MUFG (Yen 7.3bn/USD 51mn equity) and supported by a Yen 920bn (USD 6.5bn) government grant, part of a broader Yen 1.72trn (~USD 12bn) revival package.
- Entered a strategic alliance with IBM in 2022 to co-develop and transfer IBM's 2nm node technology.
- Broke ground in Sept 2023 on a cutting-edge fab in Chitose, Hokkaido; by April 2025, a pilot line for 2nm chips was operational, with initial test runs conducted.
- Facility equipped with 200+ advanced tools, including an EUV lithography machine from ASML costing USD 300–400mn.
- Vision: Pilot production by 2025, followed by mass production of 2nm chips by 2027.
- The company's structure reflects an "all-Japan" effort, with Toyota contributing its manufacturing excellence and Sony leveraging its image sensor leadership.
- CEO Atsuyoshi Koike has been an active advocate of international collaboration and even attended Semicon India 2025, underscoring Japan's openness to strategic partnerships.

China leads chip sovereignty push with its USD 100bn Big Fund: China's Integrated Circuit Industry Investment Fund, or "Big Fund," has raised ~USD 100bn across 3 phases (2014: US$22bn, 2019: US$29bn, 2023: US$47bn). Backed by the Finance Ministry, state banks, and provincial governments, it funds foundries, memory, and equipment players such as SMIC, Hua Hong, YMTC, CXMT, Naura, and AMEC. The aim is to expand fab capacity, build memory and equipment strength, cut imports (>US$300bn annually), and invest in areas hit by US export controls—lithography, EDA tools, and advanced packaging—to secure tech sovereignty.

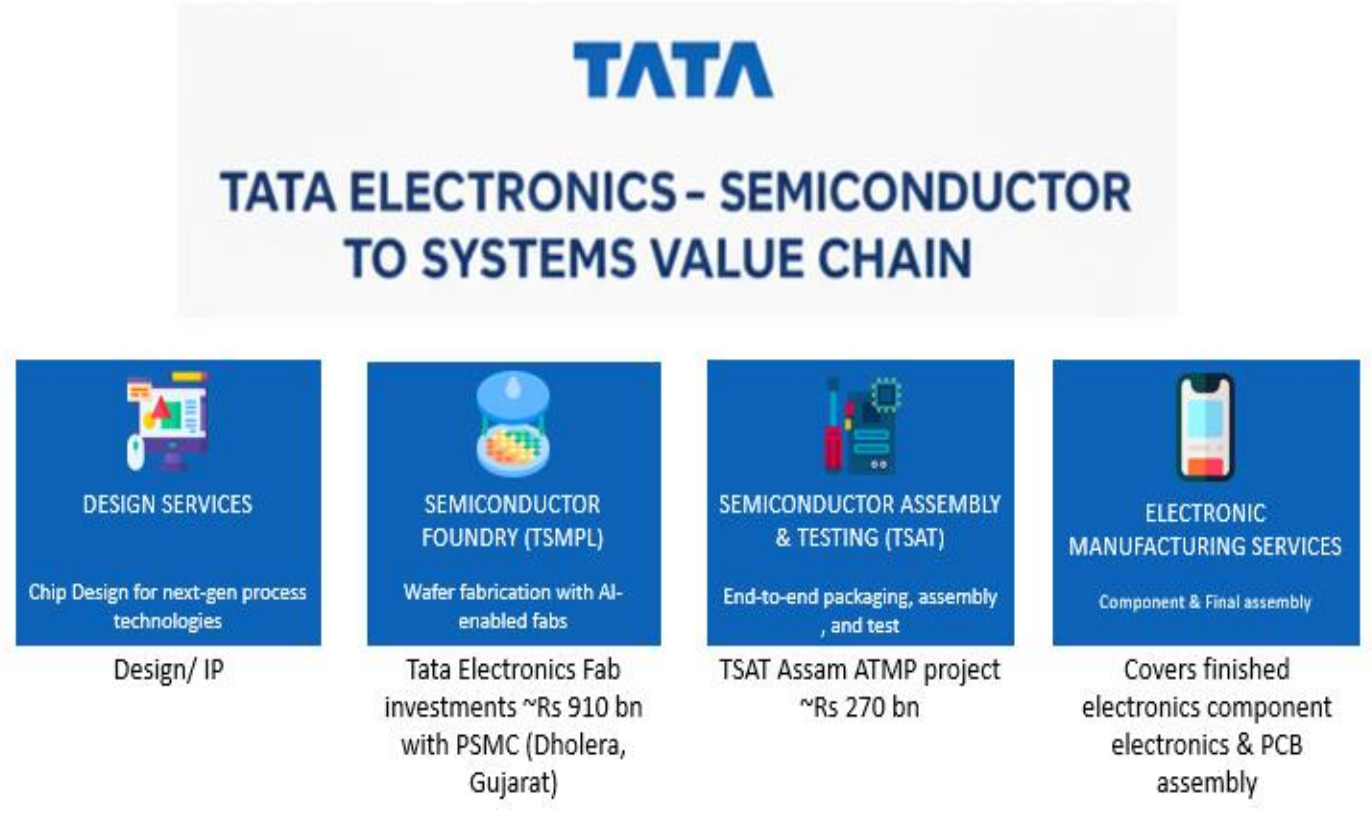
- SMIC (Semiconductor Manufacturing International Corporation) is China's largest contract chipmaker. It offers foundry services up to 7nm.
- Hua Hong Semiconductors is the second largest foundry, CXMT is DRAM maker
- Naura Tech and AMEC are fab equipment manufacturers.

Tata Electronics leads India's semicon push

Tata Electronics is India's semiconductor anchor with its Rs 1.1trn commitment under ISM: Tata Electronics has emerged as the single largest anchor for India's semiconductor industry, accounting for nearly 73% of the total investment commitments under the government's incentive schemes. With projects spanning a Rs 910 bn fab in Dholera, Gujarat, a Rs 270 bn OSAT facility in Jagiroad, Assam, and an expanding EMS footprint through Apple-linked plants in Tamil Nadu and Karnataka, Tata Electronics is building scale across the semiconductor and electronics value chain. Scale of its commitment — alongside strategic acquisitions such as Wistron's iPhone unit and a controlling stake in Pegatron India — reflects its intent to capture value in upstream as well as downstream value chain.

Full stack (front end + back end) electronics manufacturing company: Formed in 2020 as a Tata Sons subsidiary, Tata Electronics is building an end-to-end semiconductor and electronics ecosystem that spans the entire value chain. Its fab at Dholera, developed with technology transfer from Taiwan's PSMC, will produce mature-node chips (28–110 nm). The Jagiroad OSAT plant adds back-end assembly and testing capacity at scale, while acquisitions in EMS (Wistron and Pegatron India) ensure integration with global smartphone supply chains, especially Apple. Complementing this manufacturing footprint, Tata is also investing in design services, signing an MoU with C-DAC to support a design-to-silicon ecosystem, and partnering with global leaders such as Tokyo Electron, Lam Research, and Merck for equipment, simulation, and materials. Together, these initiatives position Tata Electronics as India's first full-stack semiconductor player, with capabilities across design, fab, OSAT, and EMS.

Fig 20 – Tata Electronics presence across Electronics Manufacturing value chain ~design to device



Source: Company, BOBCAPS Research

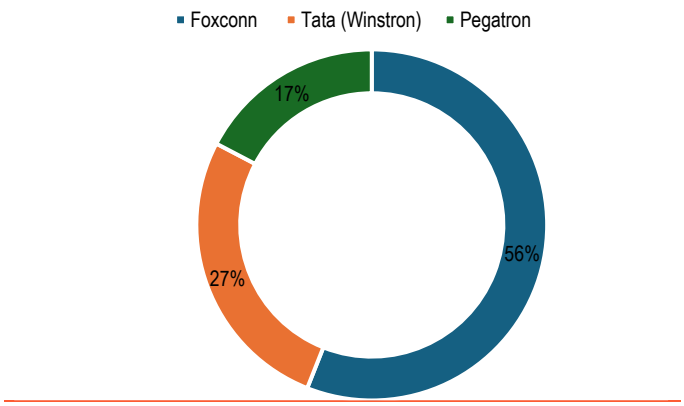
Fig 21 – Scaling business from EMS to ATMP, Fab and design

Year	Event	Remark
2020	Tata Sons incorporates Tata Electronics Pvt Ltd (TEPL)	Plans to enter the high tech mfg space, sets up plant Krishnagiri, TN
Oct-23	Entry into EMS through acquisition of Wistron India	TEPL acquires 100% of Wistron India iPhone assembly business for USD 125mn.
Jan-24	CCI approval	Receives CCI approval, cementing presence in EMS and smartphone mfg
Feb-24	Union cabinet approves two Tata Electronics projects - Fab and OSAT	Approves two projects - 1 for Fab at Dholera (investment amount Rs 900bn) and 1 OSAT at Jagiroad, Assam (investment amount Rs 270bn)
Aug-24	Groundbreaking at Jagiroad, Assam	Construction starts at Jagiroad plant
Sep-24	Tata signs a tech transfer agreement with Taiwan's PSMC	Technology transfer to support fab's capability across nodes from 28nm to 110nm
Sep-24	Tata and Tokyo Electron signed an MoU	Tokyo Electron will supply semiconductor production equipment for both Dholera fab and Jagiroad OSAT
Nov-24	Lam Research plans to set up office in Dholera	Lam Research plans to set up office in Dholera to supply fab equipment
Jan-25	Tata Electronics announces acquisition of majority stake in Pegatron	TEPL announced to acquire 60% stake in Pegatron technology
Jan-25	Groundbreaking at Dholera, Gujarat	Tata Electronics formally begins construction of the Dholera fab
Mar-25	Fiscal support agreement for Fab	Tata Electronics, TSMPL and ISM sign a fiscal support pact, govt commits 50% financial support for Rs 910bn
Mar-25	Infrastructure support from Gujarat govt	Gujarat govt initiates development of 1500 residential units near fab to accommodate staf
Sep-25	Tata - Merck sign MoU	Merck will supply specialty chemicals and materials for the Dholera fab

Source: Industry, BOBCAPS Research

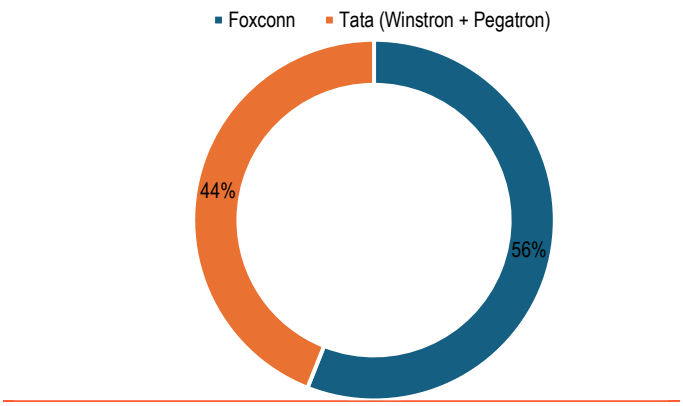
- Post acquisition of majority stake in Pegatron, Tata Electronics is the second largest player in India (few mn units away) for Apple. Also, post the acquisition Tata Electronics has 5 manufacturing units in Gujarat, Assam, Karnataka and Tamil Nadu.

Fig 22 – Tata share pre acquisition of Pegatron



Source: Media reports, BOBCAPS Research

Fig 23 – Share in iPhone supply from India stands ~44-45%



Source: Media reports, BOBCAPS Research

Fig 24 – Tata Electronics manufacturing sites located in Gujarat, Assam, Karnataka and TN

Segment	Location / Site	Facility Type & Focus	Key Details
Front-end & Back-end (Semiconductor Core)	Dholera, Gujarat	Semiconductor Fab (28–110 nm)	Rs 910bn (~USD 11 bn); 50k wafer starts/month; tech transfer with PSMC; operations targeted 2026
	Jagiroad, Assam	OSAT / ATMP	Rs 270bn (~USD 3bn); ~48 mn chips/day; mass production from 2025–26; largest private investment in NE India
Downstream & EMS (Apple Ecosystem)	Krishnagiri/Hosur, Tamil Nadu	Precision components / EMS	Tata Electronics first plant
	Narasapura (Kolar), Karnataka	iPhone Assembly (ex-Wistron)	100% acquisition in 2023; India's first Indian-owned iPhone plant; located in Narasapura Industrial Area
	Chennai area, Tamil Nadu	iPhone Assembly (Pegatron JV)	60% stake acquired Jan 2025; ~10,000 employees; ~5 million iPhones per year output

Source: Industry, BOBCAPS Research

- Over last 2-3 years, Tata Electronics has attracted talent from global semiconductors giants like Intel, Global foundries and Applied Materials

Fig 25 – Management highlights

Name	Position/Role	Segment/Responsibility	Background
Dr. Randhir Thakur	CEO & MD	Leads operations, strategy, and execution of the Semiconductor Mission	Industry veteran with 40+ years in semiconductor manufacturing-from Applied Materials, SanDisk, Micron to serving as President of Intel Foundry Services; holds 300+ patents; IEEE Fellow since 2013
KC Ang	President & Head, Tata Semiconductor Manufacturing	Oversees semiconductor foundry operations and the Dholera fab initiative	Over 30 years of global foundry leadership experience (fab start-up, operations, technology transfers), including 15+ years as President – Asia and Chairman – China at GlobalFoundries
Dr. Charan Gurumurthy	Chief Executive, Tata Semiconductor Assembly and Test Pvt. Ltd. / Senior Vice President, Tata Electronics	Heads semiconductor assembly & testing (TSAT) vertical, especially the Assam-based facility and related skill-development efforts	Former Intel systems/components engineer (HDI substrates, RealSense imaging); previously at IBM Microelectronics and IBM TJ Watson Research; 55+ patents, 15+ publications.
R. Vivekanandah	Director	Operations lead, key to manufacturing facility development	Started as a maintenance engineer at Titan in 1989, rose to CEO of Titan Engineering & Automation, and instrumental in building the Hosur manufacturing facility for Tata Electronics
Srinivas Satya	Chief Supply Chain Officer & President, Components Business	Manages supply chain and components business segment	Spent 28+ years at Applied Materials in leadership roles before joining Tata Electronics to lead its Supply Chain & Components Business
Dr. Bobby Mitra	Chief Information Officer (CIO) & President of AI & Digital Transformation at Tata Electronics	Leading enterprise-wide initiatives across AI and digital transformation for all major verticals — including EMS, OSAT, Semiconductor Foundry, and Design Services	Has held global leadership roles at Texas Instruments across smart manufacturing, industrial systems, and personal electronics, served as President & MD of TI India, and most recently, as MD at Deloitte Consulting, led manufacturing and supply chain advancements

Source: Industry, BOBCAPS Research

Tata Electronics can leverage group companies' expertise: Tata Electronics can draw on the wider Tata Group to accelerate its semiconductor journey. TCS brings deep expertise in chip design, embedded software, and EDA toolchain support, with experience in working alongside global semiconductor majors. Tata Elxsi adds capabilities in VLSI design, automotive electronics, and system-level integration, aligning closely with emerging areas such as EVs, ADAS, and connected mobility. On the demand side, Tata Motors and Jaguar Land Rover (JLR) provide a ready downstream base for automotive semiconductors, particularly in EV power electronics, infotainment, and autonomous systems. Together, this integrated ecosystem positions Tata Electronics not just as a manufacturing anchor, but as part of a full-stack, group-wide semiconductor capability spanning design, development, and end-use applications.

ATMP/OSAT ecosystem getting ready in India: Beyond Tata Electronics, other Indian players are also stepping up in assembly, testing, marking, and packaging (ATMP). Kaynes Semicon is setting up an ATMP/OSAT facility at Sanand, Gujarat, with pilot production expected in 2025 and volume ramp by 2026. Similarly, CG Power & Industrial Solutions (CG Semi), in partnership with Renesas (Japan) and Stars Microelectronics (Thailand), is investing in a semiconductor ATMP plant in Sanand, focused on power devices and automotive applications. These developments mark the emergence of a broader domestic ATMP base, positioning India to capture value in packaging and testing — segments that are critical for building a full-stack semiconductor ecosystem.

Fig 26 – OSAT ecosystem poised for ISM 2.0

Company	Location	Focus	Comments
Tata Electronics (TSAT)	Jagiroad, Assam	Large-scale OSAT (multi-node; auto/AI/telecom)	48mn chips/ day, production to start by FY26
Micron Technology	Sanand, Gujarat	Memory ATMP (DRAM/NAND)	Production to start early 2026
Kaynes Semicon	Sanand, Gujarat	OSAT / SiP	Pilot underway, mass production Jan 2026; 6.4mn chip/day
CG Power (CG Semi) + Renesas + Stars	Sanand, Gujarat	ATMP (incl. QFN/QFP; FC-BGA/CSP)	11-12mn chips/day; Renesas anchor customer
CDIL (Continental Device India)	Mohali, Punjab	Discrete & power semis (assembly/test)	158mn chips/ year/
Sahasra Semiconductors	Bhiwadi, Rajasthan	Memory ATMP	Investing Rs 3.5bn
SPEL Semiconductor	Chennai, TN	Legacy OSAT	One of the oldest player
Tessolve (Hero Electronix)	Bengaluru (labs)	ATMP / test services	Getting into advanced test labs
Suchi Semicon	Surat, Gujarat	Proposed OSAT	Announced Rs 8.5bn OSAT plan

Source: Industry, BOBCAPS Research

Key takeaways from Semicon India 2025

Policy & government messaging (Ashwini Vaishnav, MeitY & PM Modi)

- India offers stable government and consistent policy support - investors urged to take advantage.
- In just 3.5 years, 5 semiconductor projects are underway; with one pilot already running.
- First “Made in India” 32-bit chip: designed by ISRO, fabricated at Mohali.
- Strong domestic demand: electronics output up 6x, exports up 8x in recent years.
- Talent pipeline: 85,000 engineers annually; EDA tools distributed to 270 colleges; thriving design-startup ecosystem.
- PM Modi: 10 projects worth US$18bn approved since 2021, with pilots at Micron, Tata, and Kaynes.
- India moving from backend hub → full-stack nation with vision of *“Design in India, Made in India, Trusted by the World.”*
- Plug-and-play model: land, power, logistics, approvals via National Single Window System.
- Efforts underway to secure rare minerals under the National Critical Minerals Mission.

Strong endorsements of partnering in India’s semicon growth by global equipment & material majors

ASML (CEO):

- Semiconductors are critical across consumer electronics, healthcare, autos, AI.
- Praised India’s semiconductor vision; sees India as a partner for collaboration & knowledge transfer.
- Explained Moore’s Law & EUV: smaller wavelength → smaller transistors → denser chips.
- Committed to mobilise expertise in India by 2028.

Lam Research (CEO):

- 25 years in India; integrated into global supply chain.
- Partnering with 60 universities + IISc via “Semiverse” platform.
- Long-term partner for India’s fab ecosystem.

Merck (CEO):

- Fabs need 500+ chemicals and 50 gases at 99.999% purity.
- 57 years in India; materials are the “vital enabler” for fabs.

Applied Materials (Prabhu Raja & Satish Kumar):

- AI is the biggest inflection point; data centre/edge opportunities worth USD 8T+.
- Warned of energy needs rising from 400 to 900 TWh by 2030.
- 1,000+ engineers in India; India’s window of opportunity is now.

Tokyo Electron (President/CEO & Mr. Takusen):

- India has the right talent, infra, and growth potential to be a hub.
- Highlighted India-Japan collaboration in advanced packaging and wafer processing.

Global chipmakers & design companies

AMD (CTO):

- Committed USD 400mn in 2023; Indian engineers at AMD contribute across product lines - from data centres to embedded devices.
- Strong focus on AI chip design in India.

Infineon (COO):

- 30 years in India, with 2,500 employees. India is a strategic market for IoT & smart solutions.

Micron, Tata Electronics, Kaynes:

- Pilot lines and fab projects are underway.
- Tata flagged supply chain & logistics challenges but sees opportunity for local players in specialty gases and cross-pollination from pharma.

Academia, R&D & ecosystem building

- IMEC (Belgium): India has strong design talent but needs advanced R&D and fab capacity.
- Suggested fab-oriented vocational training and curriculum alignment (like Taiwan with TSMC).
- Cross-pollination potential from pharma and clean-room industries.

Deep tech fund alliance

- Celesta Capital launched the India Deep Tech Industry Alliance (IDTA) with US$1bn committed capital, combining funding with mentorship and cross-border support.

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