6. Semiconductor Mission 2.0- Science & Technology

Finance Minister Nirmala Sitharaman announced the launch of India Semiconductor Mission (ISM) 2.0 while presenting the Union Budget 2026-27 in Parliament.

India Semiconductor Mission (ISM)- Background and Strategic Rationale

Semiconductors are foundational to modern digital economies, underpinning sectors such as AI, telecom, defence, space, EVs, renewable energy, and consumer electronics. India's dependence on imports (over 90% of chips) creates strategic, economic, and national security vulnerabilities.
Global chip shortages during COVID-19 and rising techno-geopolitical tensions highlighted the need for domestic semiconductor capabilities. ISM is India's flagship intervention to integrate into global semiconductor value chains and achieve technological self-reliance.

India Semiconductor Mission 1.0 (ISM 1.0)

Launch and Institutional Framework

Launch Year- 2021

Total Outlay- ₹76,000 crore

Nodal Ministry- Ministry of Electronics and Information Technology

Core Objective- Position India as a trusted global hub for semiconductor manufacturing, display fabrication, and chip design.

Key Schemes under ISM 1.0

Semiconductor Fabs Scheme- Provides up to 50% fiscal support for setting up silicon-based wafer fabrication plants. Targets logic chips, memory chips, and specialized nodes. Aims to reduce India's total reliance on overseas fabs.

Display Fabs Scheme- Offers up to 50% project cost support for TFT LCD and AMOLED display manufacturing. Addresses India's heavy dependence on imported displays for smartphones, TVs, and electronics.

Design Linked Incentive (DLI) Scheme- Financial incentives across design, development, prototyping, and deployment stages. Encourages startups, MSMEs, and domestic firms to build indigenous semiconductor IP. Focuses on fabless design capabilities where India already has comparative strength.

Semicon India Programme- Implemented through Semicon India, a flagship ecosystem-building platform. Brings together industry leaders, policymakers, academia, startups, and investors. Facilitates global partnerships, policy dialogue, and investment mobilisation.

Key Achievements of ISM 1.0

10 semiconductor projects approved across six Indian states.

Cumulative investment- Exceeds ₹1.6 lakh crore.

Project mix includes-

1. Silicon fabrication plants
2. OSAT/ATMP (Assembly, Testing, Marking and Packaging) units
3. Compound semiconductor facilities (e.g., Silicon Carbide)
4. Advanced and heterogeneous packaging units

Signifies India's transition from policy intent to physical semiconductor infrastructure.

India Semiconductor Mission 2.0 (ISM 2.0)

Rationale for ISM 2.0- Builds on the initial momentum of ISM 1.0 but shifts focus from only fabs to ecosystem depth and resilience. Recognises that semiconductor self-reliance requires capabilities across materials, equipment, IP, talent, and supply chains.

Budgetary Support

1. Allocation- ₹1,000 crore
2. Financial Year- 2026–27
3. Designed as a strategic catalytic fund, complementing large capital subsidies under ISM 1.0.

Key Focus Areas of ISM 2.0

Semiconductor Equipment and Materials Manufacturing

Promotes domestic production of-

1. Lithography and fabrication equipment
2. Specialty gases, chemicals, wafers, and substrates

Reduces exposure to export controls and geopolitical supply shocks.

Full-Stack Indian Semiconductor IP

Encourages indigenous development of-

1. Processor architectures
2. Memory controllers
3. Analog, mixed-signal, and power electronics IP

Moves India up the value chain from services to ownership of core technologies.

Strengthening Semiconductor Supply Chains

Focus on backward and forward linkages-

1. Raw materials
2. Logistics
3. Packaging and testing

Enhances ecosystem resilience and cost competitiveness.

Industry-Led R&D and Training Centres- Establishes specialised centres led by industry collaboration.

Targets-

1. Fab process engineering
2. Advanced packaging
3. Equipment maintenance

Addresses chronic skill shortages in manufacturing-grade semiconductor talent.

About Semiconductors- Conceptual Clarity

Definition and Core Property- Semiconductors have electrical conductivity between conductors and insulators.

Conductivity can be precisely controlled through-

1. Doping (adding impurities)
2. Temperature changes
3. Exposure to light
4. Electric fields or applied voltage

Common Semiconductor Materials

Silicon (Si)- Most widely used due to abundance and stability.

Others- Germanium (Ge), Gallium Arsenide (GaAs), Silicon Carbide (SiC), Gallium Nitride (GaN).

Compound semiconductors are critical for EVs, power electronics, and defence applications.

Devices Made from Semiconductors

1. Transistors (switching and amplification)
2. Diodes (rectification)
3. Integrated Circuits (ICs) with billions of transistors
4. CPUs, memory chips, sensors, LEDs, solar cells, power modules

Opportunities for India in the Semiconductor Sector

Global Supply Chain Realignment- China+1 strategy creates space for India as a trusted democratic manufacturing partner. Rising export controls on China increase demand for alternative production bases.

Strong Policy and Fiscal Support- Around 50% fiscal support for fabs, ATMP units, and design firms. Long-term policy certainty improves investor confidence.

Design and Talent Advantage- India hosts nearly 20% of global semiconductor design engineers. Strong presence in EDA tools, verification, and chip architecture.

Low-Barrier Entry via ATMP/OSAT

Packaging and testing require-

1. Lower capital
2. Faster setup
3. Quicker export revenues

Acts as a stepping stone towards advanced fabrication.

Rising Domestic Demand

Growth drivers include- EVs and battery management systems

1. 5G and telecom equipment
2. Defence electronics and space tech
3. Consumer electronics manufacturing

Indian semiconductor market projected to reach **$100–110 billion by 2030**.

Challenges in Semiconductor Manufacturing

High Capital Intensity and Technology Gap- Advanced fabs cost several billion dollars per plant. Cutting-edge nodes require continuous technology upgrades.

Skilled Workforce Shortage

Gap in-

1. Fab process engineers
2. Equipment specialists
3. Yield optimisation experts

Limits speed of industrial scale-up.

Import Dependence in Supply Chain

Heavy reliance on imported-

1. Equipment
2. Specialty chemicals
3. High-purity materials

Exposes ecosystem to global disruptions and sanctions.

Infrastructure Constraints

Semiconductor fabs require-

1. Uninterrupted power supply
2. Ultra-pure water
3. Robust logistics
4. Clean room ecosystems

Infrastructure readiness varies across states.

Intense Global Competition

Taiwan, South Korea, and China benefit from-

1. Economies of scale
2. Mature supplier ecosystems
3. Decades of policy continuity

Way Forward- Strategic Imperatives

Fast-Track Fab Implementation- Ensure time-bound completion of approved 10 fab and packaging projects. Shift from incentive announcements to commercial production.

Build a Domestic Semiconductor Supply Chain

Promote local manufacturing of-

1. Equipment
2. Materials
3. Chemicals

Reduce strategic import vulnerabilities.

Scale Design and IP Capabilities- Support indigenous chip design firms and startups. Encourage academia–industry collaboration for IP creation.

Develop a Skilled Workforce- Expand specialised semiconductor courses. Strengthen hands-on training in fabrication and advanced packaging.

Enhance Global Partnerships and Exports

Attract global players for-

1. Technology transfer
2. Co-investment
3. Export-oriented manufacturing

Integrate India firmly into global semiconductor value chains.

Source- https-//www.thehindu.com/business/budget/budget-2026-india-semiconductor-mission-20/article70577173.ece