INDIA'S FIRST 3NM CHIP DESIGN CENTRES - ECONOMY

NEWS: India's first 3nm chip design centres Renesas Electronics India Private Limited have been inaugurated in Noida and Bengaluru.

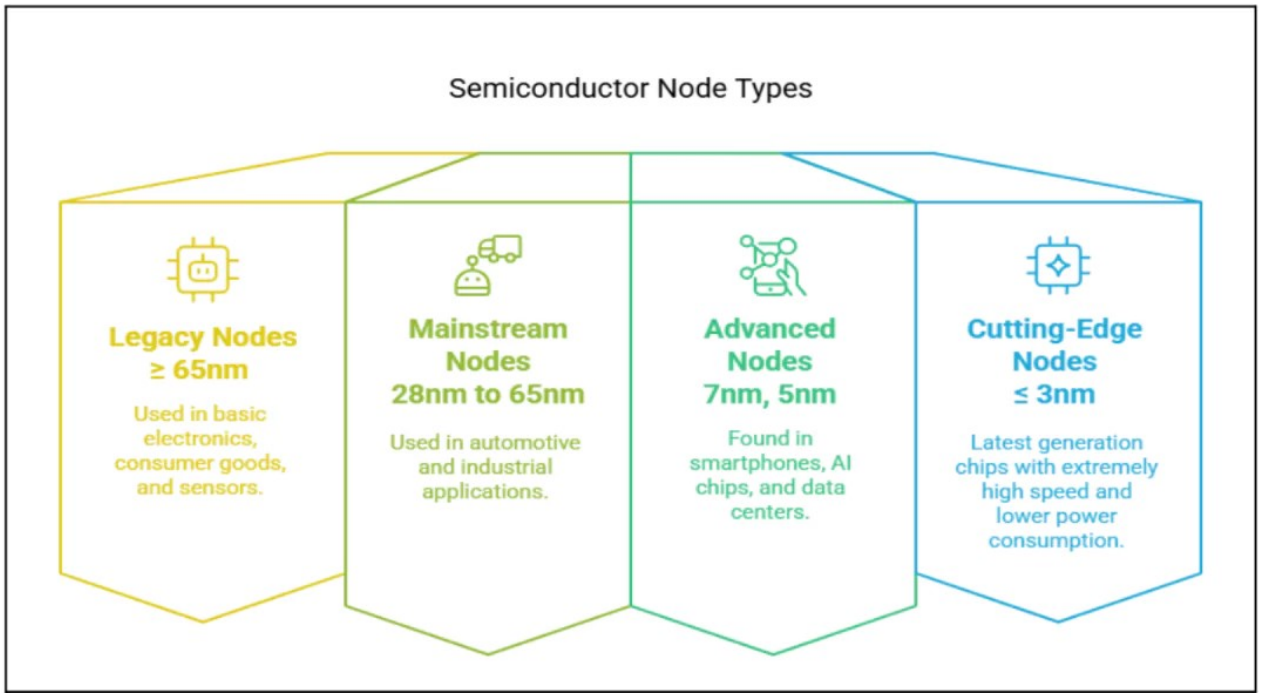
WHAT'S IN THE NEWS?

Understanding Chip Technology

- Chip technology refers to the design and fabrication of integrated circuits (ICs) on semiconductor wafers, usually made of silicon.
- These chips are fundamental to all modern electronic devices, enabling core functions such as data processing, memory storage, communication, and control.
- They are extensively used across various industries including computing, telecommunications, healthcare, automotive, and artificial intelligence (AI).

Working Principle of Chips

- Chips operate by integrating a vast number of transistors—ranging from millions to billions—on a compact silicon substrate.
- These transistors act as tiny electrical switches, processing binary information (0s and 1s) to carry out logical and arithmetic operations.
- The miniaturization of these switches allows for high-speed processing and



complex task execution in real-time.

Chip Classification Based on Node Size

- The node size, measured in nanometers (nm), indicates the smallest feature that can be fabricated on a chip.
- Smaller nodes mean more transistors can fit into the same chip area, improving performance, reducing power consumption, and enabling further miniaturization.
- For instance, 3nm represents a more advanced node compared to older 7nm or 5nm technologies.

3nm Chip Technology – A Leap Forward

- The 3nm technology is the latest milestone in semiconductor design, offering higher efficiency and speed compared to previous generations.
- These chips enable tighter transistor integration, resulting in better performance with significantly lower energy usage.
- Their compact nature supports the development of smaller yet more powerful electronic devices.

India’s Emergence in 3nm Chip Design

- India's entry into the 3nm chip design space elevates its status in the global semiconductor ecosystem.
- This development highlights India’s growing technical capabilities and positions it among the few nations with advanced semiconductor design proficiency.
- It also marks a crucial step in achieving technological self-reliance in critical digital infrastructure.

Renesas Design Centres in India

- Renesas, a major Japanese semiconductor company, has opened advanced design centres in Noida and Bengaluru, with plans to expand to Hyderabad.
- These centres specialize in developing embedded solutions for sectors like automotive, industrial infrastructure, and energy.
- The initiative capitalizes on India’s engineering talent pool and strengthens semiconductor R&D within the country.

Indo-Japan Semiconductor Cooperation

- The partnership between India and Japan is strategically aligned, focusing on co-developing advanced semiconductor technologies.
- This cooperation enhances innovation while also contributing to the resilience of the global supply chain.
- It represents a blend of geopolitical strategy and technological collaboration.

Applications of 3nm Chips

- These chips are essential in a wide array of devices including smartphones, tablets, laptops, high-performance servers, and medical electronics.
- They are vital for AI workloads, machine learning models, and high-performance computing (HPC) systems that demand immense processing capabilities.
- In the automotive sector, they power advanced driver assistance systems (ADAS) and vehicle connectivity features.
- In industrial automation and IoT ecosystems, they enable real-time data analysis, connectivity, and intelligent decision-making.

India Semiconductor Mission (ISM)

- ISM is a specialized government initiative launched in 2021 under the Semicon India Programme, aimed at boosting domestic semiconductor manufacturing and design.
- It is a central pillar of the Aatmanirbhar Bharat vision, focusing on self-reliance in high-tech sectors.

ISM's Focus Areas and Support

- The mission supports all parts of the semiconductor value chain including design, manufacturing, ATMP (Assembly, Testing, Marking, Packaging), materials, and logistics.
- By fostering a complete semiconductor ecosystem, ISM aims to reduce dependency on foreign suppliers and strengthen national security.

- The mission is also facilitating advanced infrastructure and research capabilities.

International Collaborations and Strategic Positioning

- India has signed MoUs and Framework Agreements with countries such as the USA, Japan, Singapore, and the European Union to promote semiconductor cooperation.
- These agreements help integrate India into global technology supply chains as a trusted and reliable partner.

Skilling and Innovation Support

- Over 270 academic institutions in India have been equipped with advanced chip design tools and development kits to nurture skilled professionals.
- Schemes like Chips to Startup (C2S) and Design Linked Incentive (DLI) are encouraging innovation through academia-industry linkages and startup promotion.

Global Investment and Industrial Growth

- Leading global companies such as Renesas, Lam Research, and Applied Materials have made significant investments in India's semiconductor ecosystem.
- These investments validate the credibility of India's semiconductor roadmap and are expected to spur industrial growth and employment generation.

Conclusion

- The advancement in 3nm chip design signifies a landmark in India's technological development and innovation capacity.
- It boosts India's strategic positioning in the global semiconductor landscape while supporting the vision of digital sovereignty.
- Continued focus on partnerships, talent development, and ecosystem building will be crucial in sustaining this momentum.

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