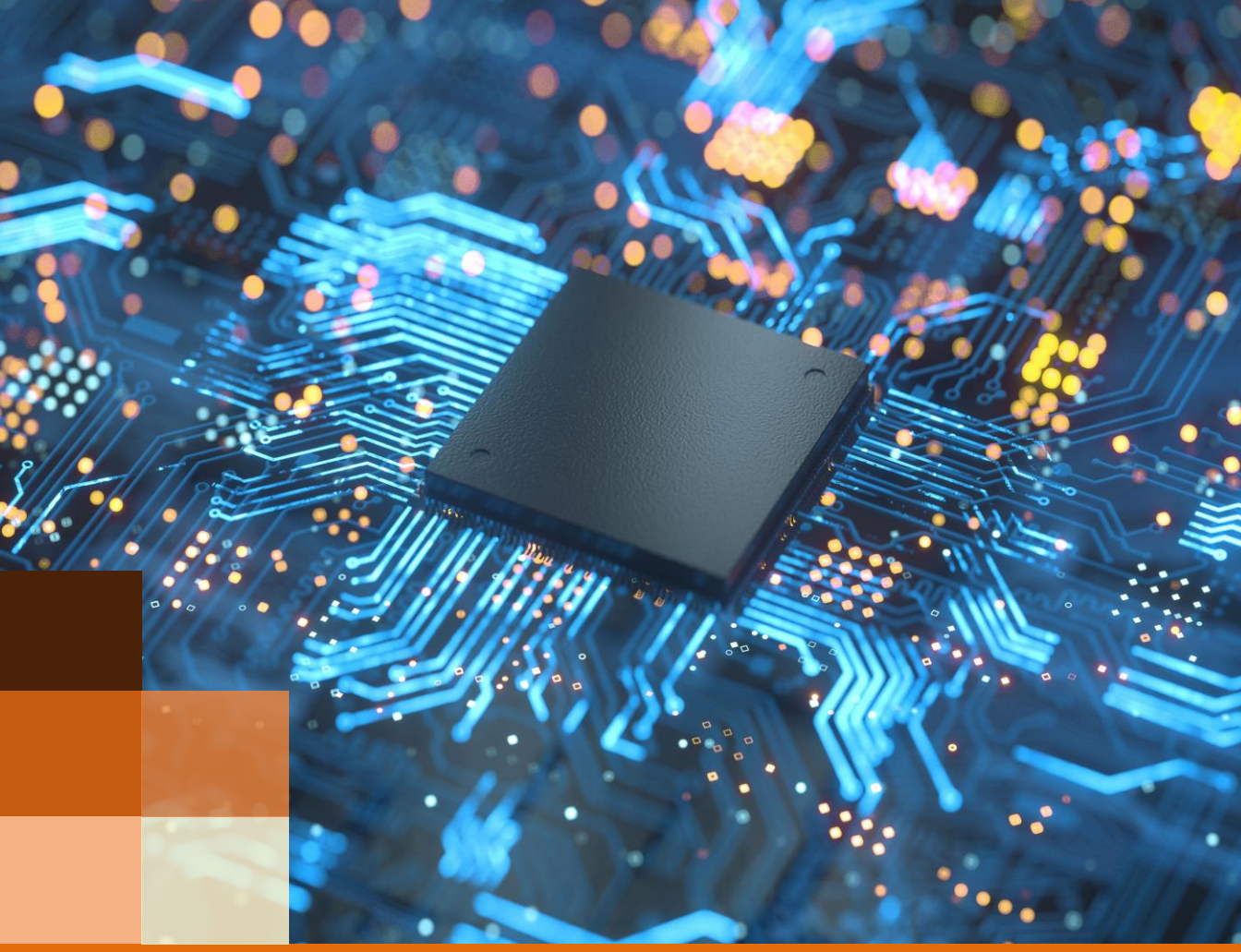

The Semiconductor Industry in India - IP and Policy Updates

LexOrbis | Intellectual Property Attorneys & Advocates

ABSTRACT

Semiconductors or chipsets are used in all modern electronic devices and technologies, with a range of applications that range from electronic products and IT hardware to defence technology, industrial electronics, medical electronics, automation (workplace, healthcare, manufacturing etc.), and the Internet of Things (IoT). Moreover, rapid developments in the capacity for intelligent computing and growth of AI in these applications and related industries has further expanded the dependency on semiconductor research and escalated the economic value of its manufacturing capacity.

The global Semiconductor market is expected to steadily grow over the ensuing years resulting from a mix of ongoing technical developments, rising environmental consciousness, ever increasing need of Semiconductor devices, tactical alliances, and several Government led initiatives.

Till now, India's contribution to the industry has focused on its technical competencies in R&D, design, etc. due to its talent pool in IT design and R&D engineers and requirement of huge investments, high operating costs, and the need of frequent technology replacement.

This research paper explores the semiconductor industry in India, focusing on the patent filing trends, top patent filers and providing key statistical insights. It also focusses on the Government regulations, supportive policies and several schemes to promote and support the Semiconductor industry in India.

Authors:

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INTRODUCTION

The semiconductor industry plays a huge role in producing end-user products like electronics, autos, computers, and mobile phones by manufacturing companies across various sectors. The industry is growing tremendously year after year. According to the Semiconductor industry association, the global semiconductor industry saw a 26% increase in revenue with sales totalling $555.9 billion in 2021, this is the highest-ever annual total.

In recent years, the semiconductor industry has suffered setbacks in producing enough semiconductors to meet the industry demand. This is due to the COVID-19 long shutdown, this anomaly had a significant impact on global businesses that led to the vast demand for more advanced chips from consumers in various sectors.

The demand for consumer electronics and computer components increased exponentially due to the enforcement of people working remotely by employers during the COVID-19 era. During this time, businesses were stuck with billions of dollars in unsold goods, causing inventory-to-sales ratios to surge briefly before businesses liquidated these inventories. But, as the economy recovered and demand increased, businesses have not yet been able to bring inventories fully back to pre-pandemic levels, causing inventory-to-sales ratios to fall.

Inadequacy in demand forecast by chip manufacturing companies has led to longer lead times due to a surge in demand for the chips. The average lead time between 2018 and late 2020 was 13 weeks but shortly after 2021, there was a spike in the average lead time. However, depending on the nature of the business, the lead time could be longer. Some of the major issues affecting production that we have identified include the insufficient capacity of semiconductor fabs, expense, and complexity of the semiconductor production process.

The top two biggest semiconductor companies by market shares TSMC (54%) and Samsung (17%) were hit by disasters in 2021 that halted the production of chips. TSMC uses 60,000 tons of water a day in manufacturing semiconductors and the droughts in Taiwan's TSMC production rate. In February 2021, Samsung was forced to shut down its microprocessors IC plant in Austin Texas due to a heavy storm that rendered 200,000 homes without power.[i]

The COVID-19 pandemic pushed economies into multiple lockdowns, chip production facilities had to remain shut, consequently running global stocks dry. The global semiconductor crisis adversely impacted over 170 manufacturing industries – from personal computers and smartphones to dishwashers and automobiles. The demand for chips, however, did not decline. Rather, the

worldwide shift to remote work led to a surge in demand for smartphones, personal computers, smart home devices, gaming consoles, and myriad home appliances. Even the demand for automobiles bounced back quickly as lockdowns gradually eased across countries.

COVID-19 changed the perception of the global supply chain in manufacturing, where more localized value chains and regionalization have come into the picture. These are primarily done in order to minimize similar risks posed by the pandemic in the near future. The rising growth in wearable technology and the growing adoption of the Internet of Things (IoT) are some of the major factors that augment the market's growth.

Semiconductor IP (SIP) market is witnessing rapid growth with the growing semiconductor sales. The market studied is entirely dependent on the semiconductor industry. The semiconductor business has been experiencing steady growth. However, growth is expected to be faced with several challenges.

The global semiconductor sector generated revenues of 50.9 billion USD in April 2022, up 21.1 percent from USD 42.0 billion in April 2021 and 0.7% from USD 50.6 billion in March 2022, according to the Semiconductor Industry Association. In 2020, the semiconductor industry was anticipated to increase steadily. For 13 straight months, global semiconductor sales climbed by over 20% year over year, demonstrating consistently strong and rising demand for semiconductors across a number of crucial industries.[ii]

The automotive industry consumes about 10% of the global semiconductor market. Semiconductors are critical to the manufacture of automobiles and are used for power management, safety features, sensing, displays, and vehicle control. Shortages in sourcing semiconductor chips continued into the spring of 2021, with major automakers such as General Motors, Ford, and Stellantis (formerly FIAT Chrysler Automobiles) having to close or reduce production of some models during Q1 2021. At that time, IHS Markit estimated that the semiconductor shortage would result in 672,000 fewer light duty vehicles being produced globally during Q1 2021 and that North America could see 100,000 fewer vehicles made. In November 2021, General Motors announced a restart in production at formerly closed plants.[iii]

A typical gasoline engine car uses from 50 to 150 semiconductors, but an electric vehicle can use up to 3,000 semiconductor chips. The growing emphasis on electric vehicle manufacturing is certain to consume vastly more semiconductor chips in the future. While increased electric vehicle use will mitigate greenhouse gases, the

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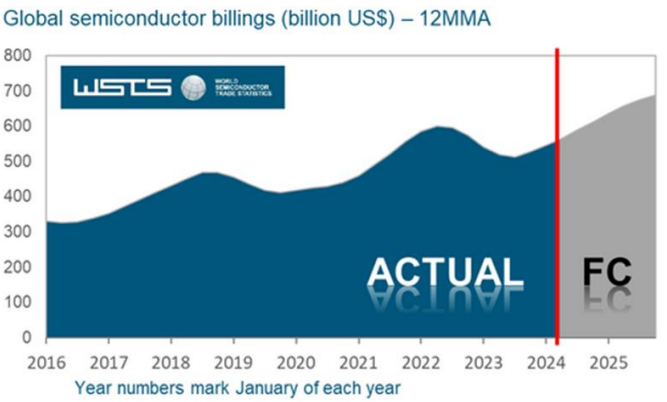
dependence of the automotive industry on semiconductor manufacturing will become even more critical.

During Q2 2021, smartphone OEMs (original equipment manufacturers) and component suppliers reported that they were receiving only 80% of their requested volume of key components. By Q3 2021, some only received 70% of key components. Even the two largest smartphone manufacturers, Samsung and Apple, have become affected by the chip shortage.[iv]

According to The World Semiconductor Trade Statistics (WSTS), the Global Semiconductor Market is going to take a dip of 10.3% in 2023, however it is anticipated to recover robustly, with an estimated growth of 11.8% in 2024.[v]



In the forecast summary table below, it is noteworthy that the Americas and Asia Pacific regions are estimated to grow in double digits in 2024.

WSTS Forecast Summary

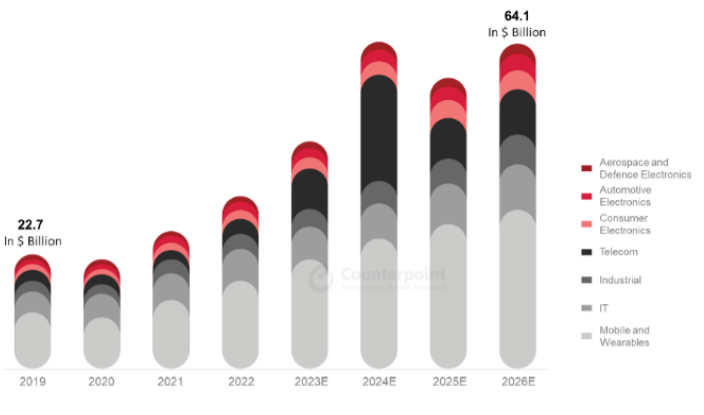
Spring 2024	Amounts in US$M			Year on Year Growth in %		
	2023	2024	2025	2023	2024	2025
Americas	134,377	168,062	192,941	-4.8	25.1	14.8
Europe	55,763	56,038	60,901	3.5	0.5	8.7
Japan	46,751	46,254	50,578	-2.9	-1.1	9.3
Asia Pacific	289,994	340,877	382,961	-12.4	17.5	12.3
Total World - $M	526,885	611,231	687,380	-8.2	16.0	12.5
Discrete Semiconductors	35,530	32,773	35,310	4.5	-7.8	7.7
Optoelectronics	43,184	42,736	44,232	-1.6	-1.0	3.5
Sensors	19,730	18,265	19,414	-9.4	-7.4	6.3
Integrated Circuits	428,442	517,457	588,425	-9.7	20.8	13.7
Analog	81,225	79,058	84,344	-8.7	-2.7	6.7
Micro	76,340	77,590	81,611	-3.5	1.6	5.2
Logic	178,589	197,656	218,189	1.1	10.7	10.4
Memory	92,288	163,153	204,281	-28.9	76.8	25.2
Total Products - $M	526,885	611,231	687,380	-8.2	16.0	12.5

Note: Numbers in the table are rounded to whole millions of dollars, which may cause totals by region and totals by product group to differ slightly.

Indian Semiconductor Industry in 2022 was USD 27 Billion, with over 90% being imported, and therefore a significant external dependence for Indian Chip consumers.[vi]

With this perspective, the Government of India has announced USD 10 Billion program for the development of semiconductors and display manufacturing ecosystem in India covering both manufacturing and design with an objective of attracting investment in semiconductor and display manufacturing and design to position India has the major hub.[vii]

According to a report by Counterpoint Research and the India Electronics & Semiconductor Association (IESA), the manufacturing of semiconductor chips in India will be driven by domestic and export markets with significant demand from the consumer electronics, telecom, IT hardware, and industrial sectors. India's semiconductor market will touch $64 billion by 2026, almost three times its 2019 size of $22.7 billion. The country's telecom stack and industrial applications will account for two-thirds of the total market share.[viii]

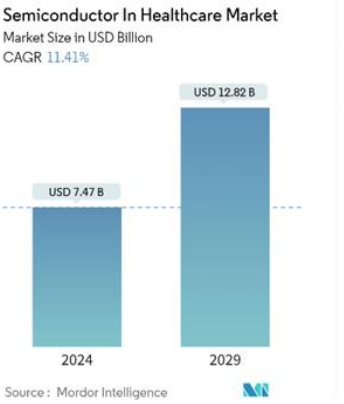


SEMICONDUCTOR MARKET ANALYSIS

HEALTHCARE MARKET:

The **Semiconductor healthcare market** is segmented by Applications such as Medical Imaging, Consumer Medical Electronics, Diagnostic Patient Monitoring and Therapy, Medical Instruments, by Components like Integrated Circuits (Analog, Logic, Memory, Micro Components), Optoelectronics, Sensors, and Discrete Components and by Geography. (North America, Europe, Asia-Pacific, Latin America, and Middle East and Africa).

The Semiconductor in Healthcare Market size is estimated at USD 7.47 billion in 2024, and is expected to reach USD 12.82 billion by 2029, growing at a CAGR of 11.41% during the forecast period (2024-2029).[ix]



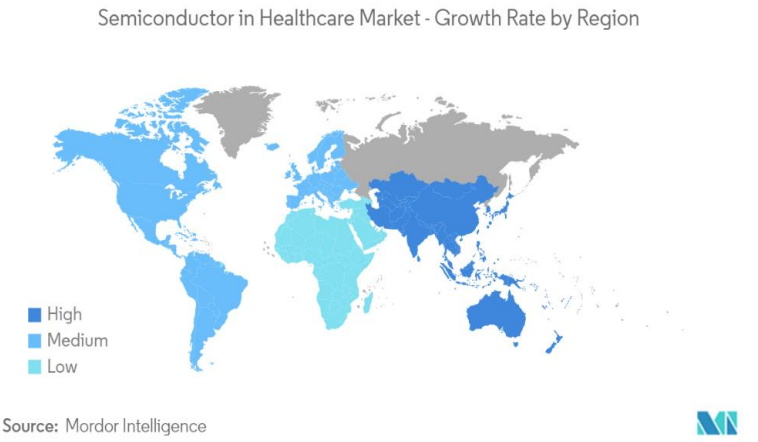
Study Period	2019 - 2029
Market Size (2024)	USD 7.47 Billion
Market Size (2029)	USD 12.82 Billion
CAGR (2024 - 2029)	11.41 %
Fastest Growing Market	Asia Pacific
Largest Market	North America

Major Players

Texas Instruments, onsemi, Analog Devices, maxim integrated, ST

*Disclaimer: Major Players sorted in no particular order

According to Mordor Intelligence, Asia Pacific region is expected to be the fastest growing region. Major factors supporting growth are increasing investments in research and innovation centres, government programs, and policies favoring the IT and healthcare equipment and devices markets. Moreover, the region is the biggest market for semiconductors across the globe. This is due to countries like China, Japan, India, Taiwan, South Korea, and Singapore. These countries contribute to the growth of the healthcare segment.



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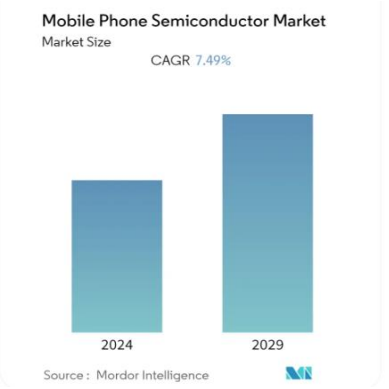
MOBILE PHONE MARKET:

Global **Mobile Semiconductor Market** is Segmented by Component Type (Mobile Processors, Memory, Logic Chips, Analog), and Geography (North America, Europe, Asia Pacific, Latin America, MEA). The market sizes and forecasts are provided in terms of value (USD million) for all the above segments.

The Mobile Phone Semiconductor Market size is expected to grow at a CAGR of 7.49% during the forecast period (2024-2029).[x]



Study Period	2019 - 2029
Base Year For Estimation	2023
CAGR	7.49 %
Fastest Growing Market	Asia Pacific
Largest Market	Asia Pacific
Market Concentration	Low

Major Players

MEDIATEK SKYWORKS SAMSUNG Qualcomm arm

*Disclaimer: Major Players sorted in no particular order

Asia-Pacific is one of the major markets for mobile phone and semiconductor technologies. The region is dominating semiconductor and smartphone manufacturing fields. Most of the major companies, in both the markets, are based in the Asia-Pacific region, while the remaining companies have a presence in the region.

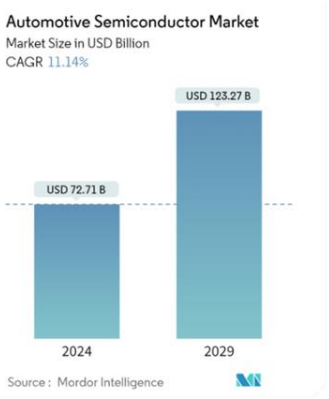
The region also dominates the global semiconductor market. The increasing smartphone and semiconductor production, especially in emerging countries, is also augmenting the mobile semiconductor demand in the region. Countries like India, Vietnam, Thailand, and Singapore, among others, are witnessing an increasing number of smartphone manufacturers setting up their manufacturing plants in the region.

For instance, in November 2022, Apple announced its plan to open one of its largest manufacturing units in India under the ‘Make in India’ initiative by the Indian Government. The new manufacturing unit is expected to be Apple's largest manufacturing unit in the region. Such initiatives by the company in the region are expected to promote the mobile phone semiconductor market in the region.

AUTOMOTIVE MARKET:

The **Automotive Semiconductor Market** Report Covers Top Automotive Semiconductor Companies and is Segmented by Vehicle Type (Passenger Vehicle, Light Commercial Vehicle, and Heavy Commercial Vehicle), Component (Processors, Sensors, Memory Devices, Integrated Circuits, Discrete Power Devices, and RF Devices), Application (Chassis, Power Electronics, Safety, Body Electronics, Comfort/Entertainment Unit, and Other Applications), and Geography (North America, Europe, Asia-Pacific, Latina America, and Middle East & Africa). The Report Offers the Market Size in Value Terms in USD for all the above-mentioned Segments.

The Automotive Semiconductor Market size is expected to grow from USD 72.71 billion in 2024 to USD 123.27 billion by 2029, at a CAGR of 14.43% during the forecast period (2024-2029).[xi]



Study Period	2019 - 2029
Market Size (2024)	USD 72.71 Billion
Market Size (2029)	USD 123.27 Billion
CAGR (2024 - 2029)	11.14 %
Fastest Growing Market	Asia Pacific
Largest Market	Asia Pacific

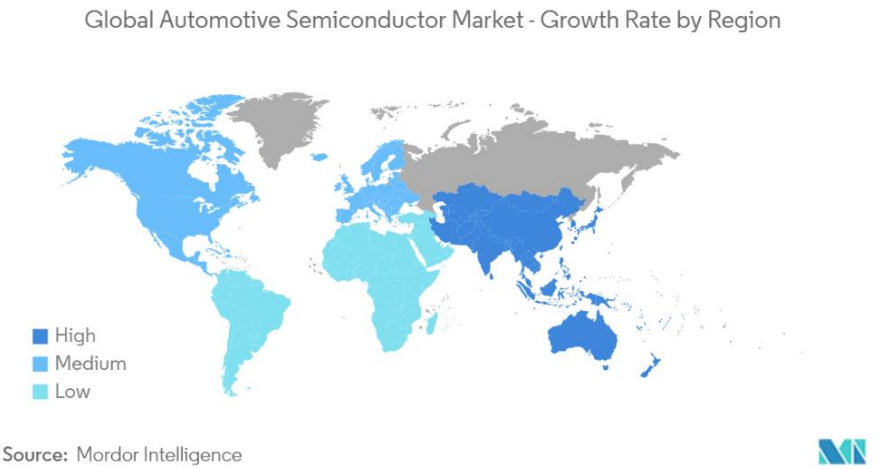
Major Players

RENESAS infineon TOSHIBA NXP

*Disclaimer: Major Players sorted in no particular order

Mordor Intelligence predicts Asia Pacific region to be the fast-growing region due to increased automotive manufacturing and continued partnerships between automotive OEMs and semiconductor manufacturers.

According to the automobile industry, two-wheelers, three-wheelers, and tractors are in great demand across the country. In addition, India has a strong semiconductor R&D infrastructure, which may open up new potentials for the automotive semiconductor market in India in the future. Further, the government is taking various initiatives to boost the supply of semiconductor chips in the country. For instance, in September 2022, the Indian government announced to provide uniform fiscal support of 50% of the project cost for setting up semiconductor fabrication plants to boost semiconductor manufacturing in the country.



According to Gartner, the top 10 global original equipment manufacturers (OEMs) decreased their chip spending by 7.6% and accounted for 37.2% of the total market in 2022, according to preliminary results by Gartner, Inc. Global inflation and recession pressures sharply weakened demand for PCs and smartphones in 2022, impacting global OEMs production.[xii]

Most of the top 10 semiconductor customers are major PC and smartphone OEMs. All top ten companies in 2021 remained in 2022, with Apple and Samsung Electronics retaining the top two spots. Only Samsung Electronics and Sony increased their chip spending in 2022.

Global semiconductor revenue is projected to grow 16.8% in 2024 to total $624 billion, according to the latest forecast from Gartner, Inc. In 2023, the market

declined 10.9% and reach $534 billion, however they have forecasted that 2024 is going to be a bounce-back year where revenue for all chip types will grow, driven by double-digit growth in the memory market.[xiii]

Table 1. Top 10 Semiconductor Vendors by Revenue, Worldwide, 2023 (Billions of U.S. Dollars)

2023 Rank	2022 Rank	Vendor	2023 Revenue	2023 Market Share (%)	2022 Revenue	2023-2022 Growth (%)
1	2	Intel	48.664	9.1	58.436	-16.7
2	1	Samsung Electronics	39.905	7.5	63.823	-37.5
3	3	Qualcomm	29.015	5.4	34.780	-16.6
4	6	Broadcom	25.585	4.8	23.868	7.2
5	12	NVIDIA	23.983	4.5	15.331	56.4
6	4	SK Hynix	22.756	4.3	33.505	-32.1
7	7	AMD	22.305	4.2	23.620	-5.6
8	11	STMicroelectronics	17.057	3.2	15.842	7.7
9	9	Apple	17.050	3.2	18.099	-5.8
10	8	Texas Instruments	16.537	3.1	18.844	-12.2
		Others (outside top 10)	268.853	50.7	294.729	-8.8
		Total Market	**533.025**	**100.0**	**599.562**	**-11.1**

Source: Gartner (January 2024)

SEMICONDUCTOR INDUSTRY IN INDIA

The Indian electronics industry saw growth in the early years of the 21st century, encouraged both by government policies and incentives and by international investment. Its key and most resource-intensive segment, the semiconductor industry, was benefitted from domestic demand growing briskly. Semiconductors were required by many industries, including telecommunications, information technology, industrial machinery and automation, medical electronics, automobile, engineering, power and solar photovoltaic, defence and aerospace, consumer electronics, and appliances.

India, according to the CEO of the Indian think tank NITI Aayog, is now the second-largest producer of mobile phones in the world. Currently, the country has more than 200 manufacturers producing mobile phones. Production increased, going from 60 million mobile phones in 2014-2015 to about 300 million in 2020-21. As a result, semiconductor fabrication is not far from India.[xiv]

Here is a chronological development of the semiconductor industry in India, with a focus on legal and policy updates:

- **1960s:** India's first semiconductor research laboratory, the Central Electronics Engineering Research Institute (CEERI), is established in Pilani, Rajasthan.
- **1970s:** The government of India sets up the Semiconductor Complex India Limited (SCL) in Chandigarh to manufacture integrated circuits (ICs).
- **1980s:** The government of India introduces the Electronics Policy of 1982, which aims to promote the growth of the electronics industry in India.
- **1990s:** The government of India introduces the New Telecom Policy of 1994, which opens up the telecom sector to private investment. This leads to a surge in demand for semiconductors in India.
- **2000s:** The government of India introduces the National Policy on Electronics (NPE) 2006, which aims to make India a global hub for electronics manufacturing.
- **2010s:** The government of India introduces the Electronics Manufacturing Clusters (EMC) scheme in 2012, which provides financial incentives to companies that set up semiconductor manufacturing facilities in India.
- **2020s:** The government of India announces a $10 billion incentive plan to attract semiconductor manufacturing companies to India. This plan, called the Production Linked Incentive (PLI) scheme, is expected to create over 50,000 jobs in the semiconductor industry in India.

The semiconductor ecosystem also consists of EDA (Electronic Design Automation) companies that assist in the design, planning, implementation, verification and manufacture of chips. Major players in this segment include Cadence Design and Synopsys, both based in the United States, and German multinational, Siemens. There are also third-party providers of semiconductor assembly and testing (OSATs). Well-known players include ASE, Amcor, and JCET. As per Moore's Law, semiconductors would double the circuit density every two years. The leading companies in the space are in a race to create more dense and powerful ICs (Integrated Circuits). South Korea's Samsung and Taiwan's TSMC are at present the only two companies that manufacture chips at the most advanced process nodes (under 7 nm) at scale. The leading producers are currently looking to transition into the 5nm and 3nm processing nodes.

India's electronics market, one of the largest in the world in terms of consumption, has grown to USD 400 billion by 2020 from USD 69.6 billion in 2012. It was largely led by an up-surge in demand, growing at a projected compound annual growth rate of close to 25% over the period.[xv]

The Indian semiconductor market was worth US$21.75 billion in 2021. By 2027, the market size is projected to increase 20% annually over a five-year period. The expansion of **semiconductor manufacturing companies in India** may aid in the reduction of the country's trade imbalance by boosting exports and decreasing imports. In the upcoming years, it is anticipated that the semiconductor industry would expand more quickly due to the rising demand from end-user sectors, including those for computing applications in industrial equipment, automobiles, communication devices, office automation, and other products.[xvi]

Few notable Semiconductor companies in India:

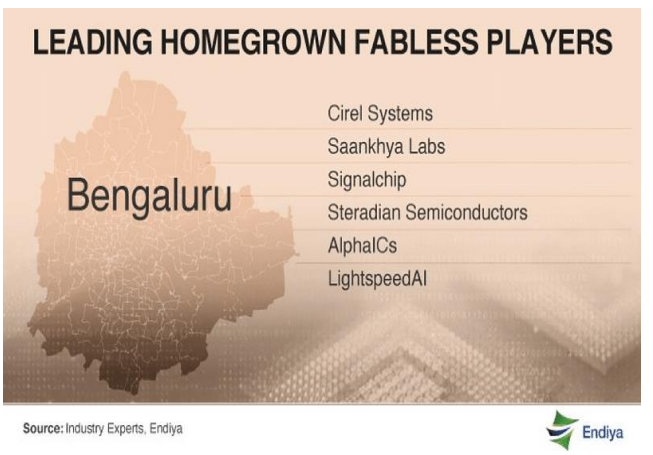
<table>
<tr>
<td>Integrated Circuit (IC) Manufacturing:

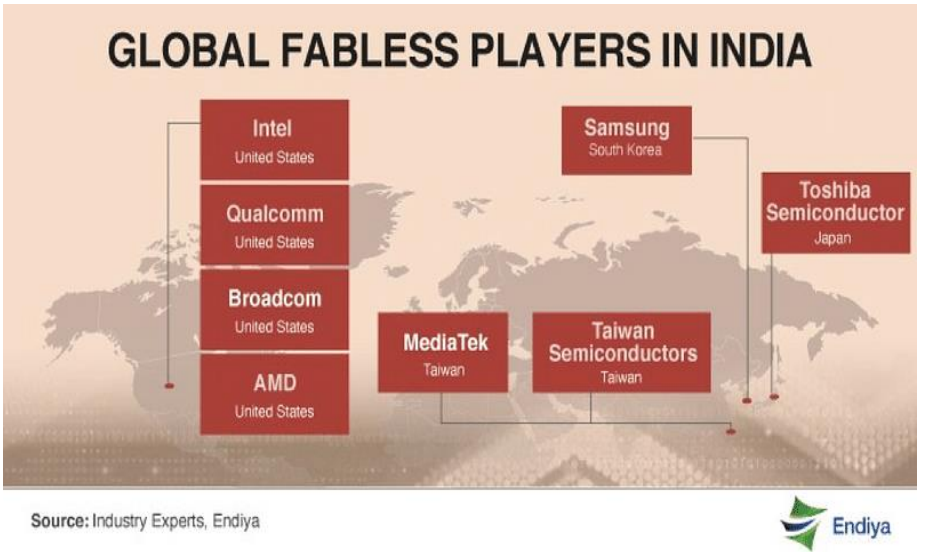
• Intel India
• Texas Instruments India
• STMicroelectronics India</td>
<td>Outsourced Semiconductor Assembly and Test (OSAT):
• Siliconware Precision Industries (SPIL) India
• Powertech Technology (PTI) India
• Amkor Technology India</td>
</tr>
<tr>
<td>Semiconductor Design and Services:
• Wipro Semiconductor
• Mindtree Semiconductor (Owned by L&T)
• Sankalp Semiconductor (Owned by HCL)</td>
<td>Semiconductor Equipment Manufacturing:
• Applied Materials India
• Lam Research India
• ASML India</td>
</tr>
<tr>
<td colspan="2">Fabless Semiconductor Companies:

("fabless" means that the company designs and sells the hardware and semiconductor chips but does not manufacture the silicon wafers, or chip)

• Ineda Systems
• Saankhya Labs
• Signalchip
• Cirel Systems
• Steradian Semiconductors
• AlphaICs</td>
</tr>
</table>

India's fabless future India, over the past two decades, has made considerable progress in the fabless segment. In terms of size, it is still relatively nascent, with cumulative annual revenues estimated at a little over $50 million. In recent years, companies such as Steradian Semiconductors, AlphaICs, Cirel Systems, Saankhya Labs, LightspeedAI and Aura Semiconductors have been successful at designing and building competitive circuit enhancements.[xvii]





Semiconductor manufacturing involves several key areas, including:

- **Wafer Fabrication:** This is where silicon wafers are transformed through processes like photolithography, etching, and doping to create the intricate patterns and layers that form integrated circuits.
- **Photolithography:** A process that uses light to transfer circuit patterns onto the wafer's surface, crucial for defining the features of the semiconductor components.
- **Etching:** Chemical or plasma-based processes used to selectively remove material from the wafer's surface to create circuit patterns.
- **Deposition:** Techniques like chemical vapor deposition and physical vapor deposition are used to add thin layers of material onto the wafer, forming various components like transistors.
- **Ion Implantation:** Doping the silicon with specific ions to modify its electrical properties, essential for creating the conductive paths within transistors.
- **Chemical Mechanical Polishing (CMP):** Smoothes and levels the wafer's surface, removing imperfections and excess material after various processing steps.
- **Packaging and Assembly:** The finished wafers are diced into individual chips and placed in protective packages, connecting them to external circuitry.
- **Testing:** Each chip undergoes rigorous testing to ensure functionality and performance meet quality standards.

- **Metrology and Inspection:** Techniques like scanning electron microscopy and X-ray imaging are used to inspect and measure tiny features to ensure they meet specifications.
- **Quality Control:** Ensuring consistent production, yield optimization, and minimizing defects are critical for semiconductor manufacturing.

Wafer fabrication in India has both potential and challenges:

Potential:

- **Skilled Workforce:** India has a large pool of skilled engineers and technical professionals, making it a favourable destination for semiconductor manufacturing.
- **Market Demand:** India's growing electronics and mobile device markets create a substantial demand for semiconductor products, increasing the potential for local fabrication.
- **Government Initiatives:** Government programs like the "Make in India" initiative have been launched to promote domestic manufacturing, including semiconductor fabrication.
- **Rising Investments:** Several Indian companies and global semiconductor players have shown interest in setting up fabrication units in India, which can lead to a boost in the industry.

Drawbacks and Challenges:

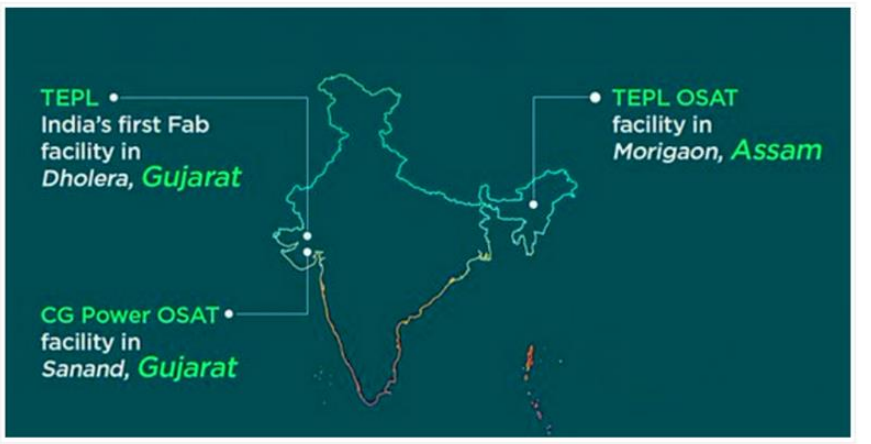
- **Infrastructure:** Establishing a state-of-the-art wafer fabrication facility requires significant infrastructure, including cleanrooms, advanced equipment, and utilities, which can be challenging.
- **High Capital Investment:** Building and maintaining a fabrication facility requires substantial capital investment, which might deter potential investors.
- **Lack of Ecosystem:** The semiconductor industry requires a robust ecosystem of suppliers, research institutions, and skilled talent. Developing this ecosystem from scratch can be a challenge.
- **Technological Gap:** Catching up with the cutting-edge semiconductor technologies and processes might take time, as the industry is highly competitive and fast-paced.
- **Regulatory Hurdles:** Navigating regulatory and policy frameworks for setting up semiconductor fabs can be complex and time-consuming

- **Land Acquisition:** Acquiring land for establishing a fabrication facility can be challenging due to land-use regulations, environmental concerns, and local community considerations.
- **Environmental Regulations:** Semiconductor fabrication involves the use of chemicals and processes that can have environmental impacts. Meeting stringent environmental regulations and obtaining necessary clearances can be complex.
- **Labor Laws:** India has a complex labor regulatory framework that involves various laws related to employment, wages, benefits, and more. Complying with these laws can be demanding.
- **Import and Export Regulations:** Importing and exporting equipment, materials, and finished products might be subject to customs duties, taxes, and regulations that can impact costs and logistics.
- **Intellectual Property Protection:** Ensuring proper protection of intellectual property rights and navigating patent laws are essential, especially in a technology-intensive industry like semiconductor manufacturing.
- **Government Approvals:** Multiple government approvals, licenses, and permits are often required at different stages of setting up and operating a fabrication facility.
- **Investment and Foreign Direct Investment (FDI) Policies:** If you're a foreign investor, understanding FDI policies and restrictions is crucial. India's FDI regulations can impact the level of ownership and investment in the semiconductor sector.
- **Infrastructure Development:** While not strictly a regulatory hurdle, building necessary infrastructure, such as power supply, water, and transportation networks, can be a challenge in certain regions.
- **Taxation and Incentives:** Understanding the tax structure, incentives, and benefits available for semiconductor manufacturing is important for making informed decisions about investment and operations.

Recent updates in India Semiconductor Industry:

The Assam Government has expedited the establishment of a semiconductor unit in Morigaon by signing a 60-year lease agreement with the Tata Group for over 170 acres of land. The facility will be located at the site of the defunct Hindustan Paper Corporation Limited and Tata Semiconductor Assembly and Test Pvt Ltd ("TSAT") will invest INR 270 billion to set it up.[xviii]

On March 13, 2024, Hon'ble Prime Minister of India, Mr. Narendra Modi, virtually inaugurated 3 New Semiconductor Units.[xix]



Source: Government of India

Murugappa Group's CG Power and Industrial Solutions Ltd. (CG Power) has formed a joint venture with Renesas Electronics America Inc. (Renesas) and Stars Microelectronics (Thailand) Public Co. Ltd. (Stars) to establish an outsourced semiconductor assembly and testing (OSAT) facility in Gujarat, India. CG has also inked agreements with Renesas Electronics Corporation, Japan, and Stars for technology, services, offtake, manufacturing, technology know-how sharing, and technical support. The JV formation awaits necessary approvals from the Ministry of Electronics and Information Technology (MeitY) and subsidies from central and state governments. The investment breakdown includes US$205 million from CG, US$15 million from Renesas, and US$2 million from Stars, with the total equity capital representing 92.34 percent, 6.76 percent, and 0.90 percent, respectively.

In November, CG had disclosed plans to invest approximately US$791 million over five years for the OSAT venture.[xx]

Foxconn has reportedly communicated to the Indian government that it hopes to establish four to five semiconductor fabrication lines in India. The Taiwanese electronics manufacturer is expected to submit their final application within the next two months. Foxconn also reportedly told MeitY that it has reached two MoUs with technology partners; once it fulfils the government's requirements, the announcement will be made.[xxi]

Foxconn is now reportedly engaged in discussions with Taiwan Semiconductor Manufacturing Co (TSMC) and Japan's TMH Group to form new partnerships to establish semiconductor fabrication units in India. Both Foxconn and TSMC are headquartered in Taiwan. The Economic Times, July 14, stated that Foxconn is expected to reach an agreement soon regarding the specifics of the partnership, with a focus on producing advanced as well as legacy node chips. TSMC, a prominent player in the semiconductor industry, stands as one of the largest chip foundries globally. Meanwhile, TMH Group specializes in providing semiconductor-related solutions and offers services in the operation and maintenance of manufacturing equipment.[xxii]

A UK-based company plans to set up a massive semiconductor fabrication unit in Odisha's Ganjam district with an initial investment of ₹ 30,000 crore in the first phase, officials said. The overall project is worth around ₹ 2 lakh crore. The SRAM & MRAM Technologies and Projects India Pvt Limited, the Indian unit of UK-based SRAM & MRAM Group, had signed memorandum of understanding (MoU) with the state government on March 26 to set up the semiconductor unit in the state.[xxiii]

In June, the Gujarat government had signed a Memorandum of Understanding (MoU) with Micron for setting up a semiconductor assembly and test facility at Sanand in Ahmedabad district with an investment of USD 2.75 billion or Rs 22,540 crore.[xxiv]

US-based Silicon Power Group will invest $121.73 million in Odisha to set up a facility to make 150-millimetre silicon carbide, a semiconductor component. The company has committed to start operations in the next 18 to 24 months, as per a statement by the Chief Minister's Office.[xxv]

In Semicon India 2023, Semiconductor giant AMD at the conference, unveiled its ambitious investment strategy in India, aiming to infuse around $400 million over the course of the next five years to bolster its research, development, and engineering operations in the country. As part of this plan, AMD intends to construct a state-of-the-art campus in Bangalore, which will serve as the world's largest R&D facility for the company.[xxvi]

Recently, Indian and Japanese officials held discussions in New Delhi, exploring potential collaboration in crucial areas such as semiconductors and establishing robust supply chains. The talks aimed at achieving a target of $35.9 billion Japanese investment in India by 2027.[xxvii]

Most recently, Israel's chipmaker Tower Semiconductor has submitted a proposal to the government to set up an $8 billion chipmaking plant in India.[xxviii]

The government of India has approved a major investment in semiconductor and electronics production that will include the country's first state-of-the-art semiconductor fab. It announced that three plants—one semiconductor fab and two packaging and test facilities—will break ground within 100 days. The government has approved 1.26 trillion Indian rupees (US $15.2 billion) for the projects.[xxix]

The country's first fab will be an $11 billion joint venture between PSMC and Tata Electronics in Dholera, Gujarat.

Through the partnership, it will be capable of 28-, 40-, 55-, and 110-nanometer chip production, with a capacity of 50,000 wafers per month.

CG Power, in partnership with Renesas Electronics Corporation, Japan, and Stars Microelectronics, Thailand, will establish a semiconductor unit in Sanand, Gujarat, with an investment of INR 760 million (US$91.63 million). Renesas, a semiconductor company specializing in chips, operates 12 semiconductor facilities and is a key player in microcontrollers, analog, power, and System on Chip (SoC) products. The CG power semiconductor unit will manufacture chips for consumer, industrial, automotive, and power applications, with a capacity of 15 million per day.[xxx]

PATENT LANDSCAPE

The following landscape analysis has been conducted for the patent applications published during the period of 2018-2023 (till date) in the technical domain of Semiconductor Devices (IPC Classification H01L). *

**Data procured from Questel Orbit.*

H01L:

SEMICONDUCTOR DEVICES: ELECTRIC SOLID-STATE DEVICES NOT OTHERWISE PROVIDED FOR

For further classification, the following graphs have been prepared for the following subclasses:

SUBCLASS INDEX:

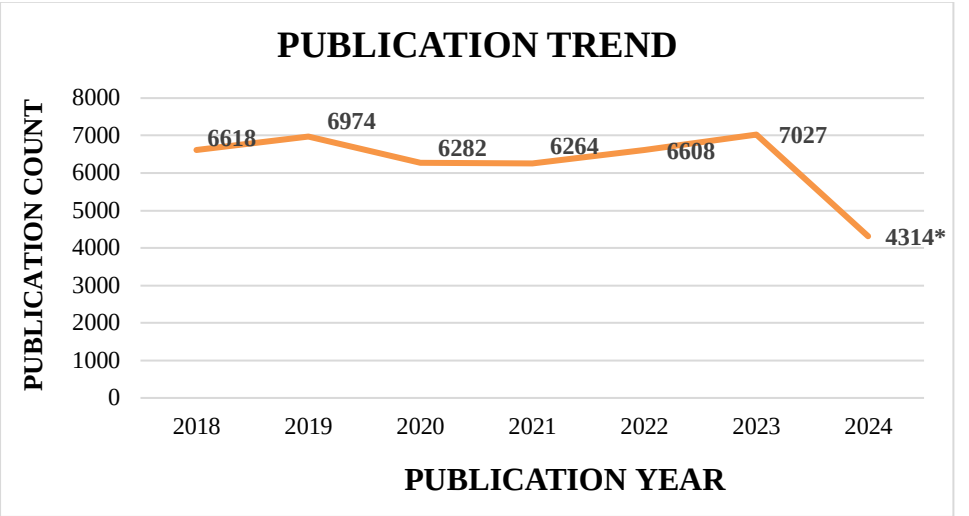
SEMICONDUCTOR DEVICES

Devices adapted for rectifying, amplifying, oscillating, or switching	29/00
Devices sensitive to, or emitting, radiation	31/00, 33/00
Solid state devices using organic materials other solid-state devices	51/00
Thermoelectric or thermomagnetic devices	35/00, 37/00
Superconductive or hyper conductive devices	39/00
Piezo-electric, electro-strictive or magneto-strictive elements in general	41/00
Galvano-magnetic devices	43/00
Devices without a potential-jump or a surface barrier; bulk negative resistance effect devices; devices not otherwise provided for	45/00, 47/00, 49/00

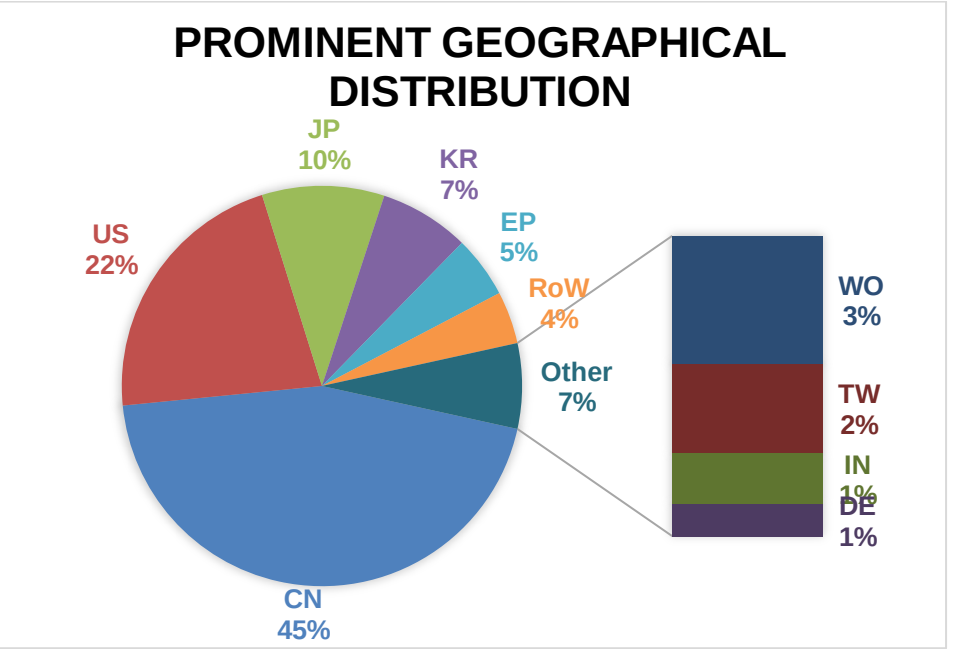
ASSEMBLIES OF SEMICONDUCTOR OR OTHER SOLID-STATE DEVICES

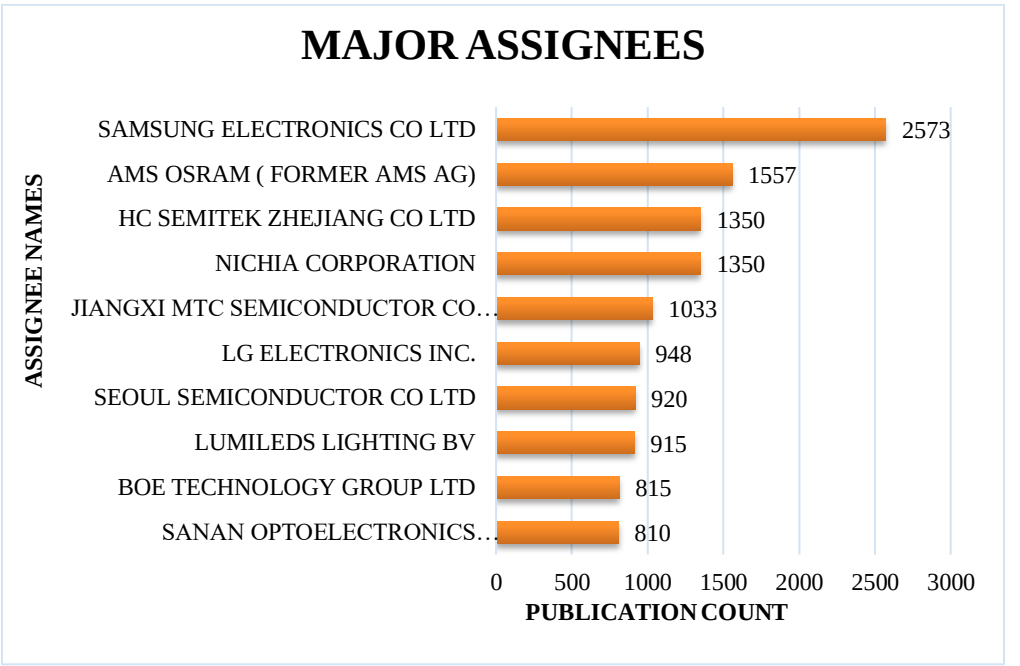
Assemblies of individual devices	25/00
Integrated circuits	27/00
Details	23/00
Manufacture	21/00

SUBCLASSES 29 - 33



* The count for the year 2024 may increase, as the year 2024 may see further publications.




MAJOR ASSIGNEES
ASSIGNEE NAMES
SAMSUNG ELECTRONICS CO LTD
AMS OSRAM (FORMER AMS AG)
HC SEMITEK ZHEJIANG CO LTD
NICHIA CORPORATION
JIANGXI MTC SEMICONDUCTOR CO…
LG ELECTRONICS INC.
SEOUL SEMICONDUCTOR CO LTD
LUMILEDS LIGHTING BV
BOE TECHNOLOGY GROUP LTD
SANAN OPTOELECTRONICS…
2573
1557
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1033
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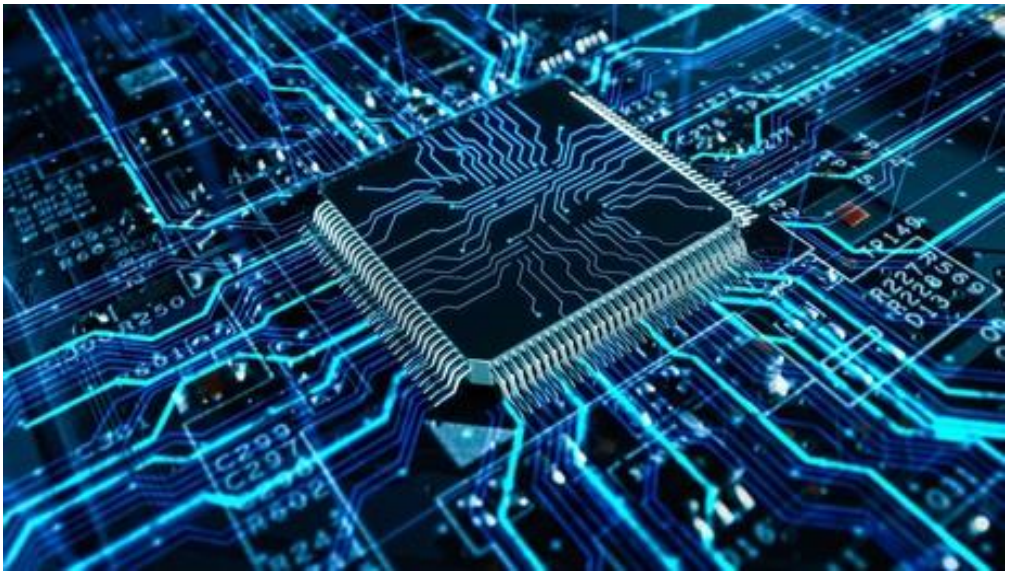
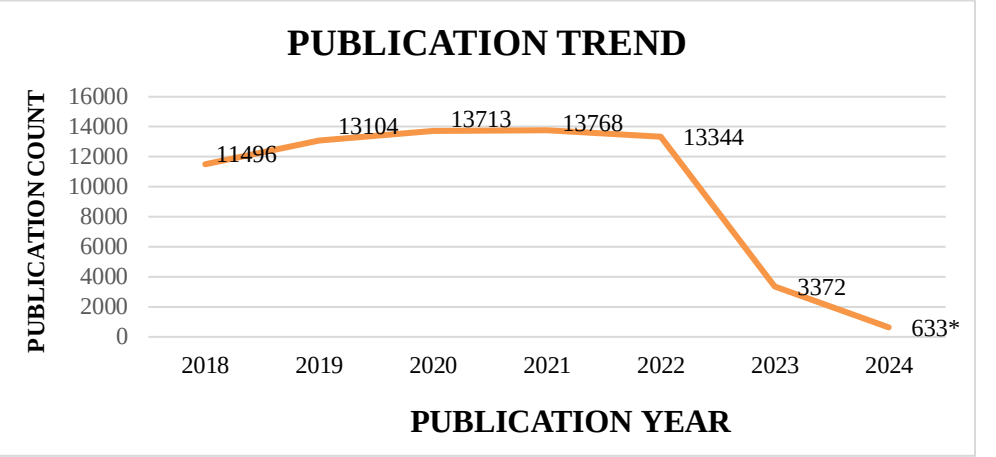
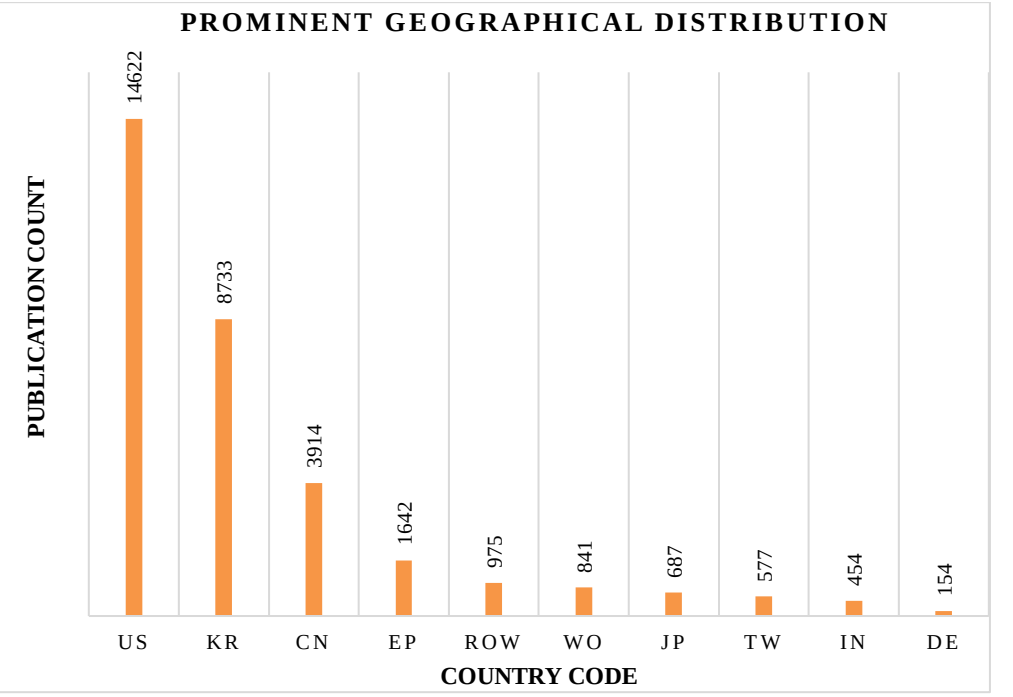
2500
3000
PUBLICATION COUNT

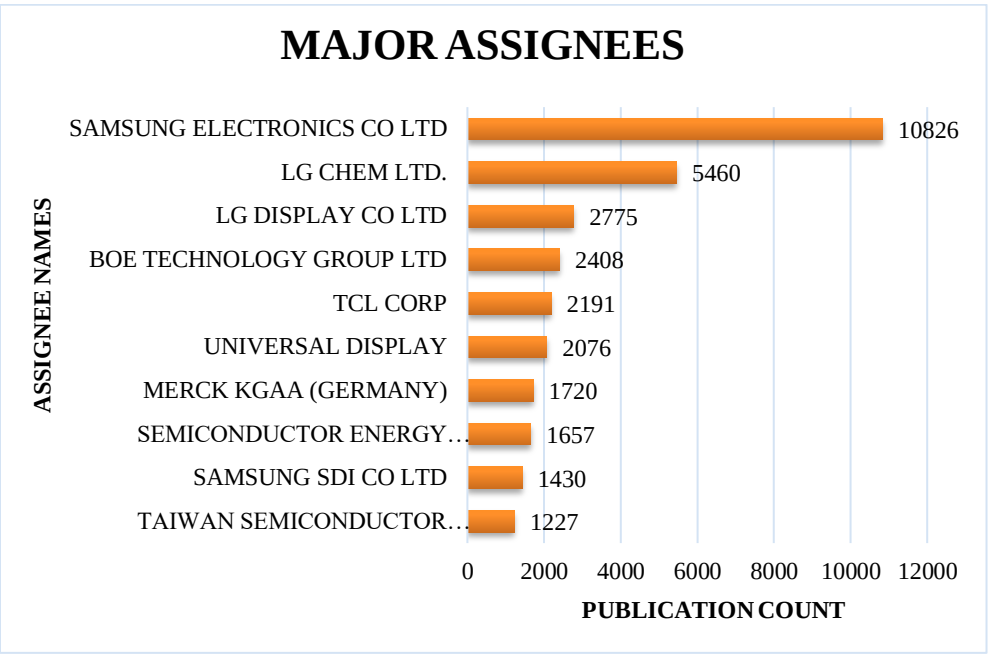


SUBCLASSES 35-51



* The count for the year 2024 may increase, as the year 2024 may see further publications.




MAJOR ASSIGNEES
ASSIGNEE NAMES
SAMSUNG ELECTRONICS CO LTD
LG CHEM LTD.
LG DISPLAY CO LTD
BOE TECHNOLOGY GROUP LTD
TCL CORP
UNIVERSAL DISPLAY
MERCK KGAA (GERMANY)
SEMICONDUCTOR ENERGY…
SAMSUNG SDI CO LTD
TAIWAN SEMICONDUCTOR…
10826
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2775
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2191
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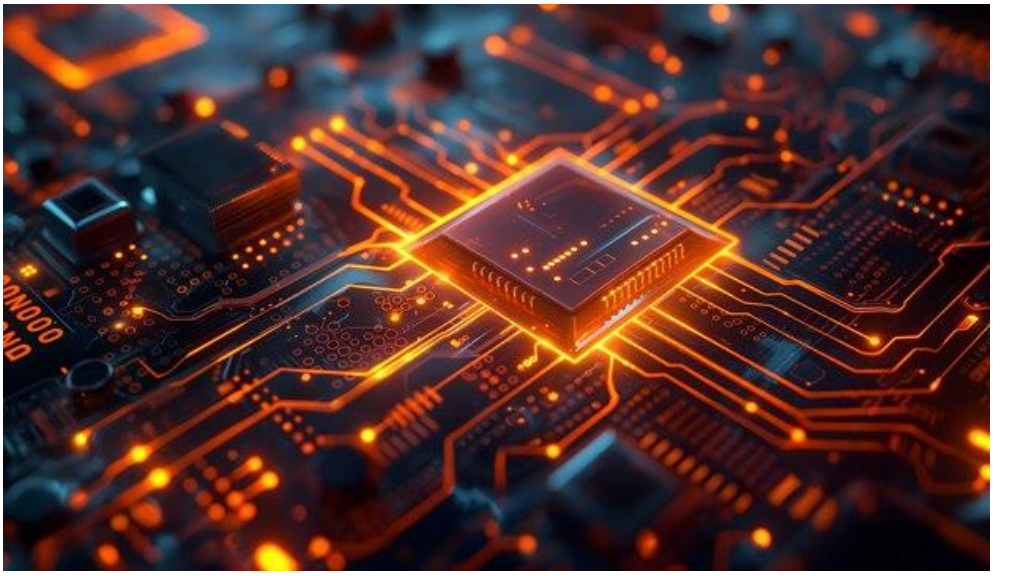
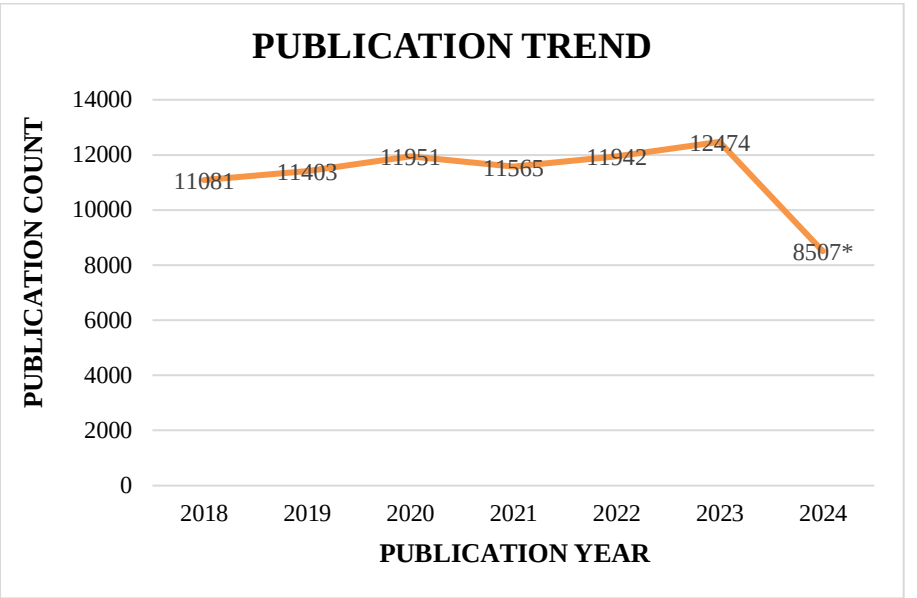
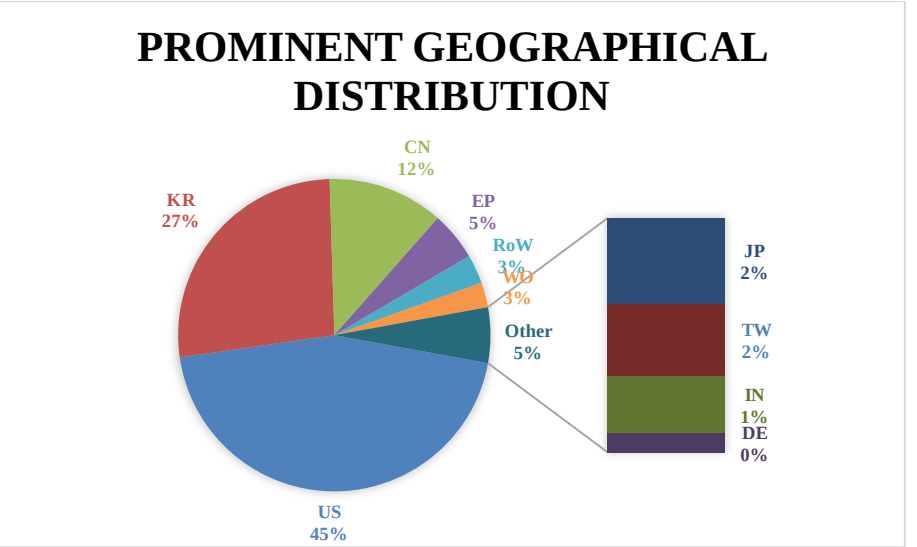
PUBLICATION COUNT

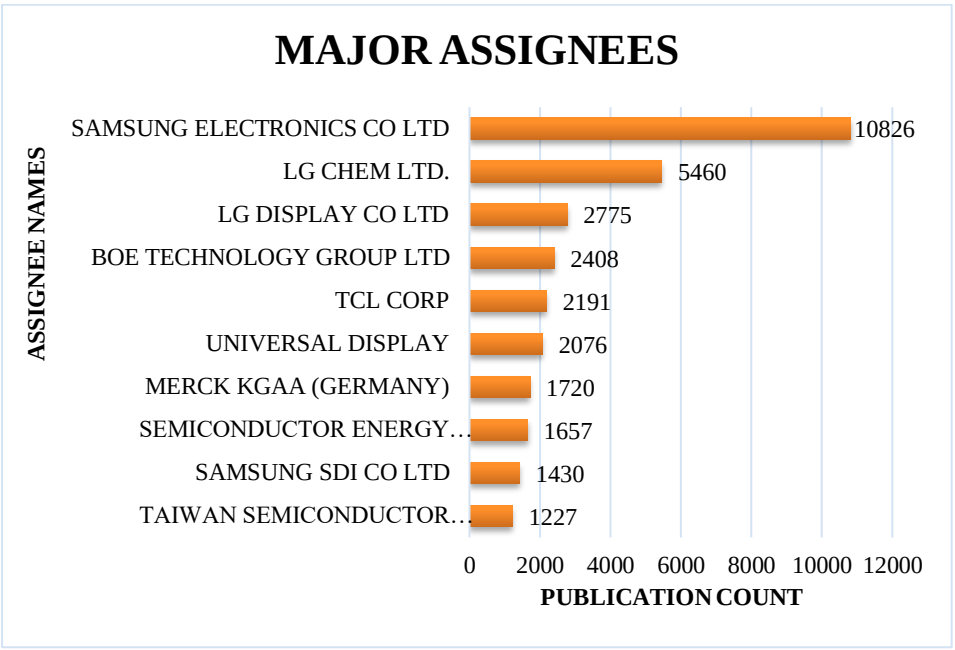


SUBCLASSES 21-27



* The count for the year 2024 may increase, as the year 2024 may see further publications




MAJOR ASSIGNEES
ASSIGNEE NAMES
SAMSUNG ELECTRONICS CO LTD
LG CHEM LTD.
LG DISPLAY CO LTD
BOE TECHNOLOGY GROUP LTD
TCL CORP
UNIVERSAL DISPLAY
MERCK KGAA (GERMANY)
SEMICONDUCTOR ENERGY…
SAMSUNG SDI CO LTD
TAIWAN SEMICONDUCTOR…
10826
5460
2775
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1720
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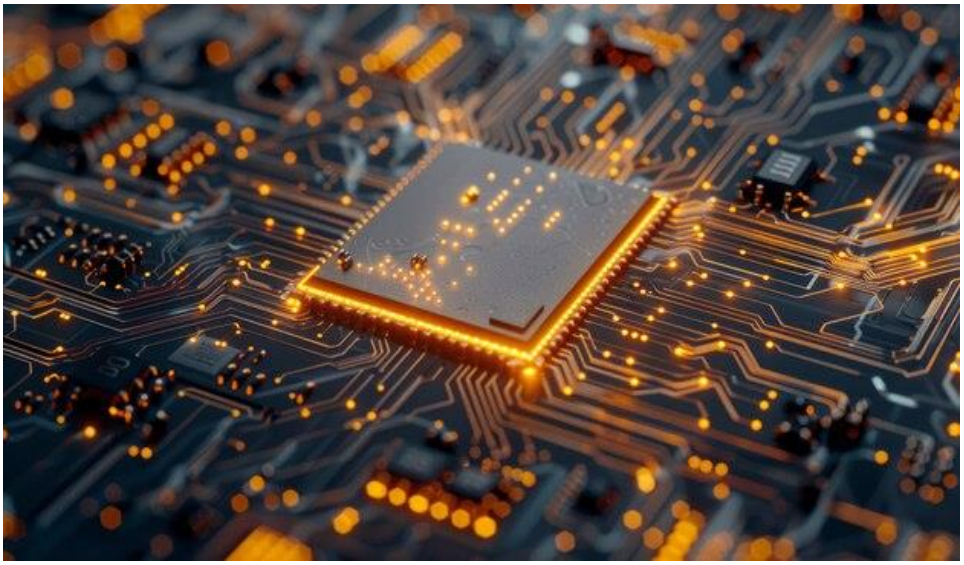
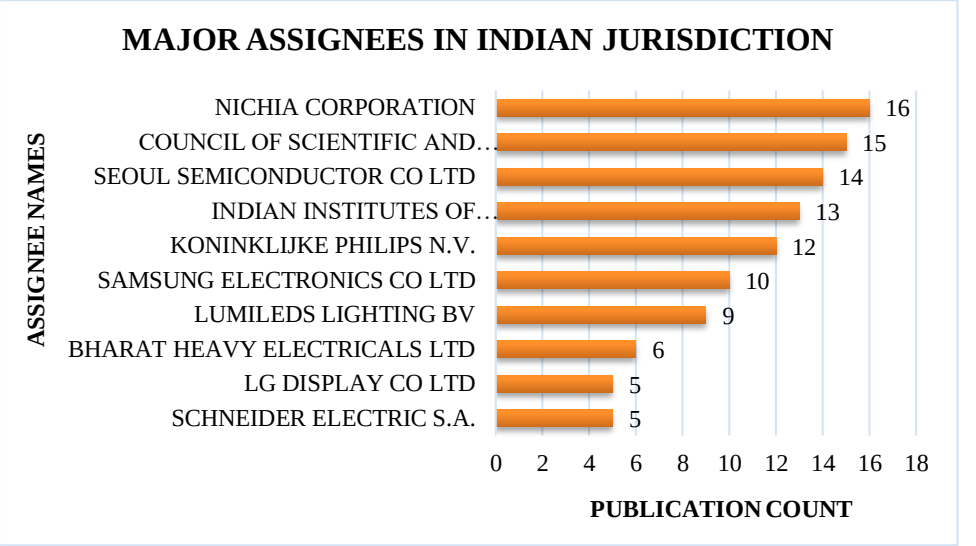
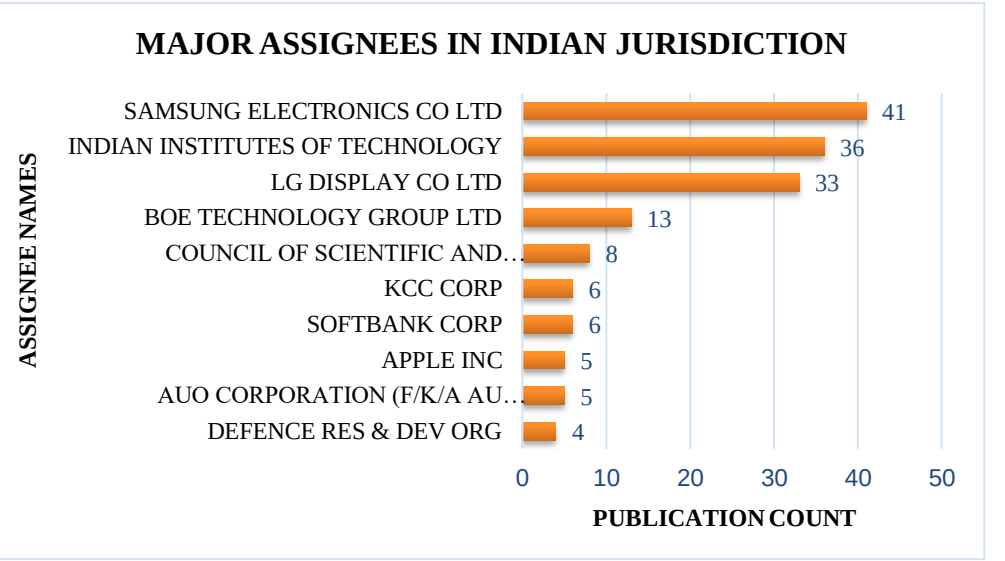
PUBLICATION COUNT



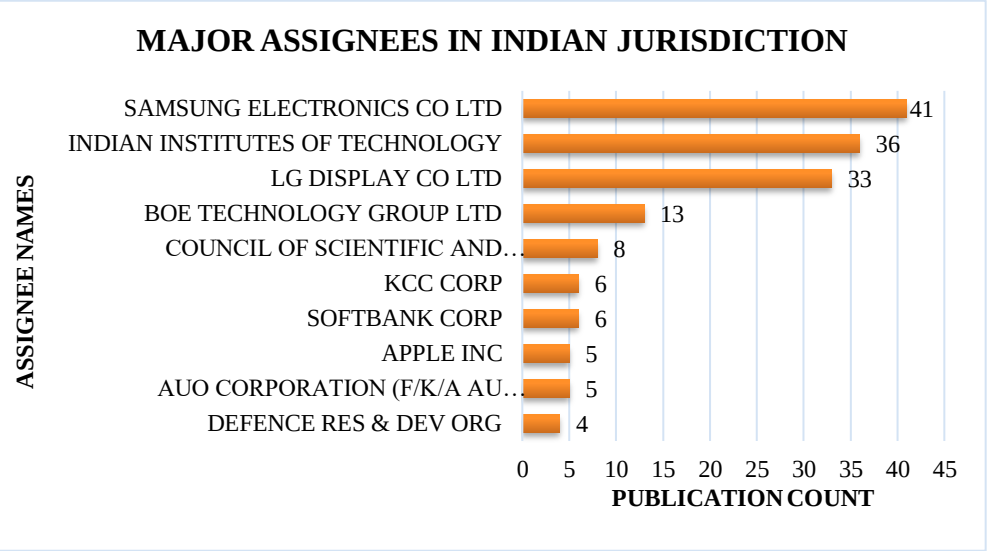
TOP PATENT FILERS IN THE INDIAN SEMICONDUCTOR INDUSTRY



Subclasses 29-33



Subclasses 35 – 51



Subclasses 21-27

OTHER IP PROTECTION IN INDIA FOR SEMICONDUCTOR

Apart from the patent protection, the stakeholders also enjoy the design protection on the layout of the Semiconductor Integrated Circuits which is governed by the

Semiconductor Integrated Circuits Layout Design (SICLD) Act 2000 ("Act" and the Semiconductor Integrated Circuits Layout-Design (SICLD) Rules 2001 ("Rules).

Requirements for registration:

Section 7 of the Act prohibits the following from being registered as layout of the Semiconductor Integrated Circuits in India:

(a) Which is not original; or
(b) Which has been commercially exploited* anywhere in India or in a convention country; or
(c) Which is not inherently distinctive; or
(d) Which is not inherently capable of being distinguishable from any other registered layout design.

Originality in Layout: A layout-design consisting of such combination of elements and inter-connections that are commonly known among creators of layout-designs and manufacturers of semiconductor integrated circuits shall be

considered as original if such combination taken as a whole is the result of its creator's own intellectual efforts.

According to Section 2(e) of the Act, "commercial exploitation" in relation to Semiconductor Integrated Circuits Layout-Design, means to sell, lease, offer or exhibit for sale or otherwise distribute such semiconductor integrated circuit for any commercial purpose.

* *Savings In Case of Commercial Exploitation*

Provided that a layout-design which has been commercially exploited for not more than two years from the date of an application for its registration has been filed either in India or in a convention country shall be treated as not having been commercially exploited for the purposes of this sub-section.

The registered layout of the Semiconductor Integrated Circuits gives the Registrant exclusive rights for a period of 10 years from the date of filing an application for registration or from the date of first commercial exploitation anywhere in India or in any country whichever is earlier.

SEMICONDUCTOR INTELLECTUAL PROPERTY (SIP)

An Intellectual Property (IP) core in semiconductors is a reusable unit of logic or functionality or a cell or a layout design that is normally developed with the idea of licensing to multiple vendors for use as building blocks in different chip designs. In today's era of IC designs, more and more system functionality is getting integrated into single chips (System on Chip/SOC designs).[xxxi]

IP cores/blocks become increasingly important in these SOC designs. This is due to the fact that most SOC designs have standard microprocessors and most of the system functionality is standardized. This means that if a design is designed once, it can be reused across multiple designs.

An IP core is a piece of hardware that can be licensed (or owned and used) by one party or another. The term "licensed" refers to the licensing of a patent (or source code copyright) that exists in a design. System on Chip (SoC) designers, Application-Specific Integrated Circuits (ASICs) and Systems of Field-Programmable Gate Array (FPGA) logic designers can use an IP core as a building block.

An IP core can be used in chip design in the same way that a library can be used in computer programming. An IP core can also be used in discrete integrated

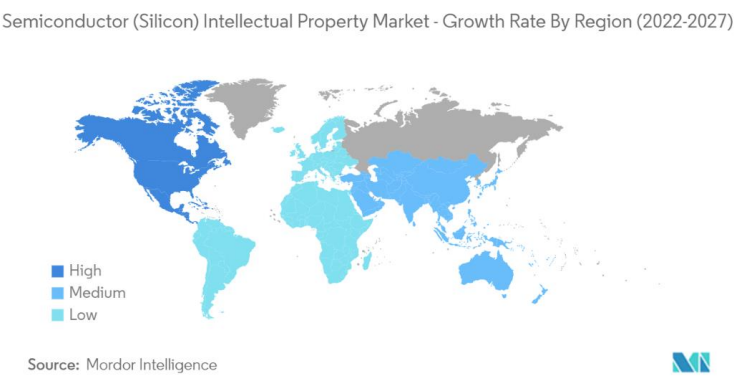
circuit design for PCB design. Each of these components is a reusable part of design logic that has its interface and behavior verified by the creator.

Today, the semiconductor (silicon) intellectual property market is dominated by large-volume vendors that are able to integrate backward and forward, and there are many players operating in both domestic and international markets.

In order to remain competitive in the market, the major players are adopting strategies such as product innovation, mergers, and acquisitions. The main players in the semiconductor market are: ARM Ltd Synopsys Inc. Cadence Design systems Inc. Imagination Technologies Ltd CEVA Inc.

The global semiconductor intellectual property market grew from $5.93 billion in 2022 to $6.89 billion in 2023 at a compound annual growth rate (CAGR) of 16.2% and is expected to grow to $11.07 billion in 2027 at a CAGR of 12.6%.

The semiconductor IP market includes revenues earned by entities by providing services such as hard IP, soft IP, and verification IP. The market value includes the value of related goods sold by the service provider or included within the service offering.[xxxii]



CHALLENGES AND OPPORTUNITIES:

Challenges faced by the semiconductor companies:

- **High Investments Required:** Semiconductors and display manufacturing is a very complex and technology-intensive sector involving huge capital investments, high risk, long gestation and payback periods, and rapid changes in technology, which require significant and sustained investments.

- **Minimal Fiscal Support from Government:** The level of fiscal support currently envisioned is minuscule when one considers the scale of investments typically required to set up manufacturing capacities in the various sub-sectors of the semiconductor industry.
- **Lack of Fabrication Capacities:** India has a decent chip design talent but it never built-up chip fab capacity. The ISRO and the DRDO have their respective fab foundries but they are primarily for their own requirements and are also not as sophisticated as the latest in the world.
- **Extremely Expensive Fab Setup:** A semiconductor fabrication facility (or fab) can cost multiples of a billion dollars to set up even on a relatively small scale and lagging by a generation or two behind the latest in technology.
- **Resource Inefficient Sector:** Chip fabs are also very thirsty units requiring millions of litres of clean water, an extremely stable power supply, a lot of land and a highly skilled workforce.

GOVERNMENT INITIATIVES AND POLICIES PROMOTING SEMICONDUCTOR RESEARCH AND DEVELOPMENT:

Comparing the creation of the semiconductor industry to the construction of a building, the IT Minister, said that India's semiconductor strategy was being developed brick by brick using the best talent available and creating a conducive ecosystem.

The government of India has earmarked 20,000 MW (20 GW) of energy for semiconductor manufacturing.

IT Minister said that all stakeholders had responded well to the government semiconductor policy announced on January 1, 2022. In the 17 months since then 106 Indian universities had started offering courses on semiconductors and the country had also inked an MoU with the US's Purdue University, with many more educational institutions expressing their interest in participating in the programme.[xxxiii]

To this effect, the Government of India ("GOI") has launched the India Semiconductor Mission (ISM)[xxxiv]. India Semiconductor Mission ("ISM") has been setup as an Independent Business Division within Digital India Corporation having administrative and financial autonomy to formulate and drive India's long-term strategies for developing semiconductors and display manufacturing facilities and semiconductor design ecosystem. Envisioned to be led by global experts in the Semiconductor and Display industry, ISM will serve as the nodal agency for efficient, coherent and smooth implementation of the schemes.

The vision of AtmaNirbharta in electronics & semiconductors was given further momentum by the Union Cabinet, chaired by the Hon'ble Prime Minister, approving the Semicon India programme with a total outlay of INR 76,000 crore for the development of semiconductor and display manufacturing ecosystem in our country. The programme aims to provide financial support to companies investing in semiconductors, display manufacturing and design ecosystem. This will serve to pave the way for India's growing presence in the global electronics value chains.[xxxv]

Under ISM, the Government of India has launched the following 4 schemes:

a) Scheme for setting up of Semiconductor Fabs in India provides fiscal support to eligible applicants for setting up of Semiconductor Fabs which is aimed at attracting large investments for setting up semiconductor wafer fabrication facilities in the country. Following fiscal support has been approved under the scheme:

- 28nm or Lower - Up to 50% of the Project Cost
- Above 28 nm to 45nm - Up to 40% of the Project Cost
- Above 45 nm to 65nm - Up to 30% of the Project Cost

b) Scheme for setting up of Display Fabs in India provides fiscal support to eligible applicants for setting up of Display Fabs which is aimed at attracting large investments for setting up TFT LCD / AMOLED based display fabrication facilities in the country. The Scheme provides fiscal support of up to 50% of Project Cost subject to a ceiling of INR 12,000 crore per Fab.

c) Scheme for setting up of Compound Semiconductors / Silicon Photonics / Sensors Fab and Semiconductor Assembly, Testing, Marking and Packaging (ATMP) / OSAT facilities in India: The Scheme provides a fiscal support of 30% of the Capital Expenditure to the eligible applicants for setting up of Compound Semiconductors / Silicon Photonics (SiPh) / Sensors (including MEMS) Fab and Semiconductor ATMP / OSAT facilities in India.

d) Design Linked Incentive (DLI) Scheme offers financial incentives, design infrastructure support across various stages of development and deployment of semiconductor design for Integrated Circuits (ICs), Chipsets, System on Chips (SoCs), Systems & IP Cores and semiconductor linked design. The scheme provides "Product Design Linked Incentive" of up to 50% of the eligible expenditure subject to a ceiling of ₹15 Crore per application and "Deployment

Linked Incentive" of 6% to 4% of net sales turnover over 5 years subject to a ceiling of ₹30 Crore per application.

Recently, in the interim 2024 Union Budget, India increased the allocation for the scheme to support semiconductor and display manufacturing by 130 percent to INR 690.3 million (US$83.28 million). As per the finance documents produced by the central government, the revised estimate of expenditure for the 'Modified Programme for Development of Semiconductors and Display Manufacturing Ecosystem in India' in FY24 is INR 150.3 million (US$18.14 million).[xxxvi]

In addition to the above schemes, Government has also approved modernisation of Semi-Conductor Laboratory, Mohali as a brownfield Fab.

The government of Gujarat state, in line with the vision of GOI, has come up with the Gujrat Semiconductor Policy 2022-27[xxxvii] ("Policy"). With the presence of 48 ports, 17 operational airports and airstrips with 2 international airports and premier educational institutes, Gujrat government has taken up the initiative to become the pioneer state in realizing the GOI's mission to make India as a global hub for Electronics System Design and Manufacturing ecosystem.

Fiscal support pledged by the Gujrat Government under Policy:

Additional capital assistance of 40% of the capex assistance given by GOI,

- 75% subsidy on first 200 Acres of Land for FAB project (only on land allocated by DSIRDA, the Government or their agency),
- All eligible projects entitled for ONE time reimbursement of 100% of Stamp Duty and Registration fee paid for lease/ Sale/ Transfer of the land for the purpose of the project,
- Water supply at INR 12/cubic meter for 5 years,
- Capital subsidy of 50% is an eligible semiconductor fab or display fab builds a desalination plant, and
- Power subsidy of INR 2/unit for 10 years.

Non – Fiscal Incentives:

- Gujrat State Electronics Mission (GSEM) will act as the POC of all eligible projects,
- Easy access to Common Effluent Treatment Plants (CETPs) and Treatment, Storage and Disposal Facilities (TSDFs),
- Uninterrupted Power and Water Supply, and
- Facilitation in Land Procurement.

1. Tamil Nadu Government Schemes for Semiconductors in India

Tamil Nadu, a leading Indian state in electronics manufacturing, recognizes the critical role of semiconductors in driving technological advancement. To attract semiconductor investments and establish itself as a major hub, the state government offers several key schemes:

The Tamil Nadu Semiconductor and Advanced Electronics Policy 2024

The Tamil Nadu Semiconductor and Advanced Electronics Policy 2024 aims to propel the state to the forefront of India's semiconductor and advanced electronics industry.

Launched in January 2024, it offers several attractive incentives to attract investments and build a comprehensive ecosystem.

Key Objectives:

- Attract anchor investments in semiconductor and advanced electronics manufacturing.
- Enable a robust semiconductor design ecosystem through collaboration and incentives.
- Contribute 40% of India's electronics exports by 2030.
- Create a skilled talent pool of over 2 lakh individuals by 2030.

Key Features:

- Structured Package of Incentives: Applicable to new and expansion projects in advanced electronics with investments from January 1, 2024.
- Minimum Investment Threshold: Rs. 200 crores with minimum 150 jobs for initial investment, and Rs. 50 crores for every 35 additional jobs created.
- Financial Incentives: Land cost subsidy, capital subsidy, special training incentive, product testing and prototyping incentive, stamp duty exemption, and more.
- Non-Financial Incentives: Single window clearance, access to land bank, and support for infrastructure development.
- Focus on Design Ecosystem: Collaboration with academia and industry, funding support for design houses, and incubation facilities.

- Skilling Initiatives: Partnerships with industry and academia to develop a skilled workforce.

Potential Impact:

- Attract large-scale investments in semiconductor and advanced electronics manufacturing.
- Boost design capabilities and create a comprehensive ecosystem.
- Generate employment opportunities and contribute to economic growth.
- Strengthen India's position in the global semiconductor value chain.

Challenges:

- Competition from other states and countries offering similar incentives
- Availability of skilled workforce and infrastructure development.
- Ensuring long-term sustainability and attracting anchor investments.

Overall, the Tamil Nadu Semiconductor and Advanced Electronics Policy 2024 represents a significant step towards establishing the state as a leading player in India's electronics industry. Its success will depend on effective implementation, attracting major investments, and fostering a collaborative ecosystem.

2. Tamil Nadu Electronics Hardware Manufacturing Policy 2020 (TN EHMP 2020):

This comprehensive policy provides financial and non-financial incentives to semiconductor companies across different categories based on investment size and employment generation.

Incentives include land lease cost subsidy, stamp duty exemption, training subsidy, interest subsidy, exemption from electricity tax, and support for environment protection infrastructure.

The policy targets attracting both large-scale integrated circuit (IC) fabrication units (fabs) and smaller semiconductor component manufacturers.

3. Modified Semicon India Programme (MSIP):

This pan-India scheme by the Ministry of Electronics and Information Technology (MeitY) offers financial assistance for setting up semiconductor fabs and semiconductor design fabs.

Tamil Nadu actively encourages companies to apply under MSIP, providing additional state-level support to further incentivize investment.

4. Tamil Nadu Startup Policy (TNSP 2018):

This policy offers various benefits to startups, including seed funding, tax breaks, incubation space, and mentorship programs.

It can support aspiring semiconductor startups by providing early-stage funding and facilitating infrastructure access.

5. Tamil Nadu Electronics Manufacturing Cluster (EMC) Scheme:

This scheme aims to develop dedicated infrastructure for electronics manufacturing clusters across the state.

Companies setting up units in EMCs can avail various benefits, including plug-and-play infrastructure, shared facilities, and single window clearance.

While not specifically for semiconductors, EMCs can attract related supporting industries and create a conducive ecosystem.

6. SKILL DEVELOPMENT INITIATIVES:

The Tamil Nadu government actively invests in skill development programs for the electronics and IT sectors.

These programs aim to bridge the skill gap and provide a trained workforce for semiconductor companies.

Impact and Future Outlook:

These schemes have attracted several major players to Tamil Nadu, including Infosys and HCL, to set up semiconductor design centers. However, attracting large-scale fabs remains a challenge.

The state government is continuously reviewing and updating its policies to address industry needs and remain competitive.

Collaboration with central government initiatives like MSIP and partnerships with international players will be crucial for solidifying Tamil Nadu's position as a leading semiconductor hub in India.

Semiconductor Fabless Accelerator Lab (SFAL) is a K-Tech CoE for Fabless community.[xxxviii]

An initiative funded by the Department of Electronics, IT, Bt and S and T of Government of Karnataka through its Karnataka Innovation Technology Society (KITS), in collaboration with India Electronics and Semiconductor Association (IESA) towards developing and enhancing the fabless ecosystem in India.

Focus of SFAL is around enabling fabless startups, across India and encourage creation and development of Products/IPs from India.

OTHER NOTABLE POLICIES[xxxix]:

7. **National Policy on Electronics (NPE):** The NPE aims to position India as a global hub for electronics manufacturing. It focuses on creating an enabling environment for investment, promoting innovation, and enhancing domestic value addition in the electronics sector.

- The policy envisions placing India as a global hub for Electronics System Design and Manufacturing (ESDM).
- It is aimed at achieving a turnover of 400 billion dollars for the electronics sector by the year 2025 while generating employment opportunities for one crore people.
- Its objective is also to produce 1 billion mobile handsets in India by the year 2025.
- It envisages creation of an enabling environment for the electronics industries to compete globally.
- It requires creation of a Sovereign Patent Fund (SPF) for the promotion, development and acquisition of Intellectual Property (IPs) in ESDM sector.

8. **Electronic Manufacturing Clusters (EMCs):** EMCs are designed to provide infrastructure and facilities for electronics manufacturing units. These clusters offer common facilities like testing labs, training centers, and logistical support, encouraging companies to set up manufacturing units in India.

9. **Modified Special Incentive Package Scheme (M-SIPS):** M-SIPS provides financial incentives to encourage electronics manufacturing and offset high costs of setting up units in India. It offers benefits such as capital subsidies and reimbursement of central taxes for eligible projects*.

   **Not accepting new applications since December 31, 2018.*

10. **Electronics Development Fund (EDF):** The EDF supports innovation, research, and development in the electronics sector by providing funding to startups and companies working on emerging technologies and products.

11. **Make in India and Atmanirbhar Bharat:** The Make in India initiative and the Atmanirbhar Bharat (self-reliant India) campaign aim to boost domestic manufacturing and reduce dependence on imports. These initiatives promote the growth of the semiconductor industry through policies that facilitate local production.

12. **Phased Manufacturing Programme (PMP):** The PMP was introduced to encourage the domestic production of components, including semiconductors, by increasing value addition in India. It aimed to reduce import dependency by promoting the domestic manufacturing of components used in electronic products.

In addition to these policy initiatives, the government of India has also taken steps to strengthen the intellectual property rights (IPR) regime for semiconductors in India. In 2020, the government amended the Copyright Act to provide for stronger protection of semiconductor IP. The government has also set up a National Intellectual Property Rights (IPR) Policy, which aims to create a more conducive environment for innovation in the semiconductor industry in India.

These policy initiatives are expected to help India to emerge as a major player in the global semiconductor industry. The PLI scheme is already attracting major semiconductor companies to India, and the strengthening of the IPR regime is expected to further boost innovation in the sector. With its large pool of skilled manpower and low labor costs, India has the potential to become a major hub for semiconductor manufacturing in the coming years.

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