

INDUSTRY OVERVIEW

Certain information and statistics set out in this section and elsewhere in this document are derived from various official government and other publicly available sources, and from the market research report prepared by Frost & Sullivan, an independent industry consultant which was commissioned by us (the “Frost & Sullivan Report”). No independent verification has been carried out on the information from official government sources by us, the Sole Sponsor, the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED] or any other parties (other than Frost & Sullivan) involved in the [REDACTED] or their respective directors, officers, employees, advisers, or agents, and no representation is given as to the accuracy. Unless and except for otherwise specified, the market and industry information and data presented in this “Industry Overview” section is derived from the Frost & Sullivan Report. The information and statistics contained in this section may not be consistent with other information and statistics compiled within or outside of China. As a result, you are advised not to place undue reliance on such information.

SOURCES OF INFORMATION

We have commissioned Frost & Sullivan, an independent market research and consulting company, to conduct an analysis of, and to prepare a report on China’s IC industry. The report prepared by Frost & Sullivan for us is referred to in the document as the Frost & Sullivan Report. We have agreed to pay a total fee of RMB580,000 to Frost & Sullivan for the preparation of the Frost & Sullivan Report, which we believe reflects market rates for reports of this type. Frost & Sullivan is a global consulting company founded in 1961 in New York and has over 40 global offices with more than 3,000 industry consultants, market research analysts, technology analysts and economists.

During the preparation of the market research report, Frost & Sullivan performed both (i) primary research, which involved in-depth interviews with leading industry participants and industry experts; and (ii) secondary research, which involved review of company reports, independent research reports and data based on Frost & Sullivan’s own research database. Projected data was obtained from historical data analysis plotted against macroeconomic data with reference to specific industry-related factors. Unless otherwise noted, all of the data and forecasts contained in this section are derived from the Frost & Sullivan Report, various official government publications and other publications.

In compiling and preparing the Frost & Sullivan Report, Frost & Sullivan has adopted the following assumptions (i) the social, economic, and political environment in China is expected to remain stable in the forecast period; (ii) industry key drivers are likely to drive China’s IC industry in the forecast period; and (iii) there is no extreme force majeure or unforeseen industry regulations in which the industry may be affected in either a dramatic or fundamental way.

Our Directors have confirmed that there has been no adverse change in the market situation since the date of the Frost & Sullivan Report which may qualify, contradict, or have impact on the information of this section.

THE IC MARKET IN CHINA

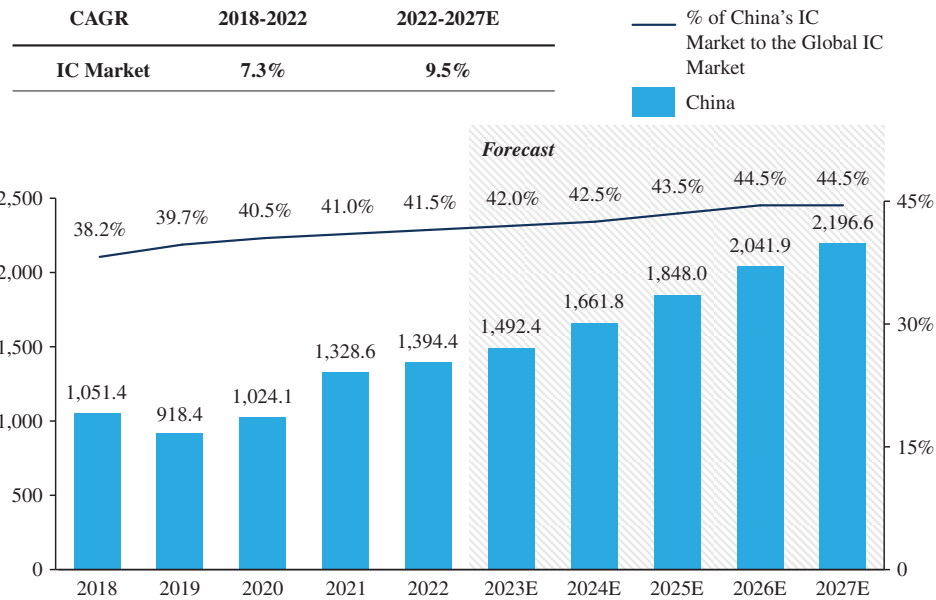
Overview

The integrated circuit, or IC, is a miniature electronic device or component that serves as the fundamental building block and central component of the global information technology industry. According to Frost & Sullivan, it is expected that in the next few years, along with the promotion of new technologies represented by 5G, Internet of Things and cloud computing, the market size of the IC market in China is projected to reach RMB2,196.6 billion by 2027, growing at a CAGR of 9.5% from 2022 to 2027. With the shift of the global IC market to China and the strong support of Chinese national policies and funding, the market share of China’s IC industry has accounted for a substantial portion of the global IC market, increasing from 38.2% in 2018 to 41.5% in 2022 and expected to reach 44.5% in 2027.

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The following chart demonstrates the IC market size in China in terms of revenue, and the percentage of China’s IC market share to the global IC market:

**Market Size of the IC Industry in China, by Revenue
RMB in Billions, 2018-2027E**



Source: Frost & Sullivan Report

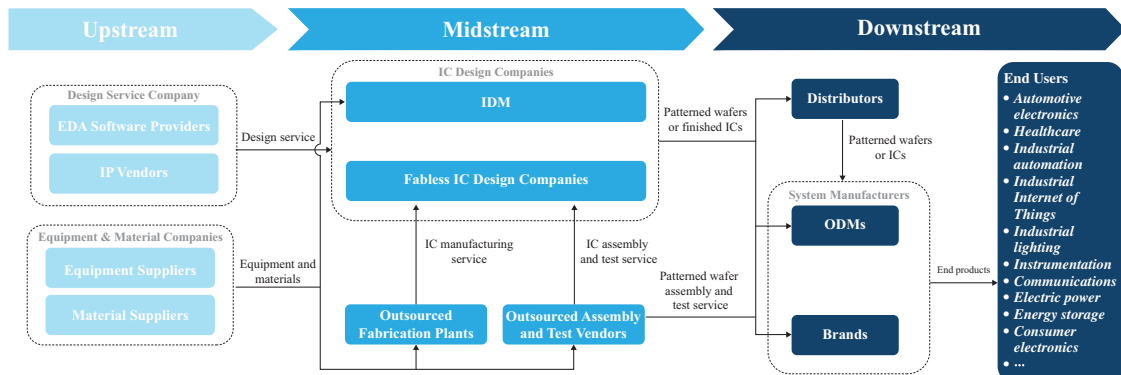
Note:

(1) The market size is measured by aggregating the total revenue generated from various IC products.

Value Chain of the IC Industry

According to Frost & Sullivan, the upstream market players on the value chain of the IC industry are service and solution providers of supporting technologies and tools, including EDA software (a specialized software developed for IC design), IP (independent, modular and reusable circuit design), IC equipment and IC materials. The midstream market players on the value chain include companies engaging in IC design, IC manufacturing and IC assembly and test, covering the core stages of the IC industry. IC design companies typically consist of companies operating on IDM model, where they are involved in the whole process of design, manufacturing, packaging, testing and subsequent sales of the finished products, and fabless model, where they only focus on the design process and outsource the IC manufacturing to foundries. The downstream market players on the value chain are distributors, system manufacturers and end users. Major end users include companies engaging in consumer electronics, industrial automation and instrumentation, energy management, automotive and others, as well as individual consumers.

The following chart illustrates the major market players on the entire value chain of the IC industry:



Source: Frost & Sullivan Report

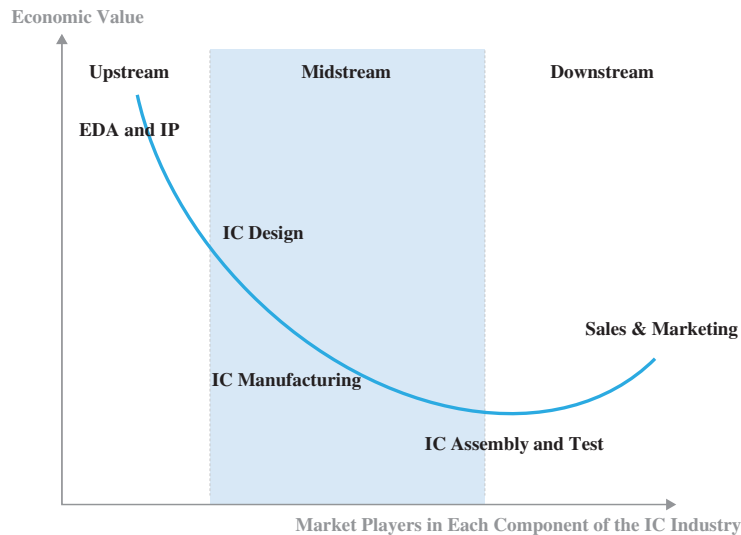
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IC Design: Component with High Economic Value in the IC Industry

IC design is at the core of the entire value chain with high economic value in that it directly affects the performance of IC products. Therefore, companies operating on the fabless model usually achieve higher profitability than most of the other market players on the value chain.

The following chart illustrates the economic value of market players in each component of the IC industry:

Economic value of market players in each component of the IC industry



Source: Frost & Sullivan Report

EDA and IP: Cornerstones to IC Design

Given the complexity of IC design, EDA software that enables electronic computer-aided design and simulation of layout, and IP modules that can be incorporated into layout to achieve specific functions, are cornerstones to IC design companies.

- *EDA underpins IC design by providing essential support.*

The significance of EDA tools lies in their ability to guarantee design accuracy, enhance performance of designed products, and shorten both IC design cycles and product testing and verification periods.

In recent years, due to the significant advancements in AI and related technologies, IC design process has transitioned towards a smarter, more automated direction. By employing intelligent and automated EDA software, IC design engineers can now accomplish their goals more efficiently with a higher degree of precision. As the pace of development of the analog EDA market lags behind that of digital EDA market, more opportunities are created. Meanwhile, in the absence of timely and individual support from third-party EDA vendors, self-developed EDA is crucial to rapidly adapting to changes in downstream customers' demand.

- *IP is an integral component of IC design.*

By incorporating multiple IP modules into complex ICs, design engineers can circumvent the need for repetitive work, effectively shorten design cycles and boost IC design success rates. In addition, as different IP modules with multiple functionalities are developed from and will be adapted to manufacturing processes, IC design companies can align their design with foundries' manufacturing processes, achieving products with optimal performance and high reliability and efficiency.

In the long run, low-cost, standardized IC designs depend on the long-term development of essential and foundational IP technologies. By possessing a diverse and comprehensive IP portfolio, IC design companies can expand their design capabilities. This, in turn, allows them to provide downstream customers with a wider range of choices and ultimately strengthens their competitive position in the market.

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With the continuous evolution and increasing importance of EDA and IP, IC design companies, especially analog IC design companies equipped with self-developed EDA tools and profound IP modules, will be highly valued.

Market Segmentation

In terms of downstream demand for IC products, the IC market in China can be further segmented by delivery forms (including patterned wafers and finished ICs) and types (including digital ICs and analog ICs).

Segmentation by Delivery Form: Patterned Wafers and Finished ICs

Compared to traditional IC design companies that typically provide finished ICs, patterned wafer suppliers cater to the flexible needs of downstream customers. Without the assembly and test process, patterned wafers can be shipped to downstream customers after the design and manufacturing processes. These downstream customers primarily consist of IC design companies or system manufacturers who subsequently send the patterned wafers to OSAT vendors for assembly and test, after which finished IC products are produced.

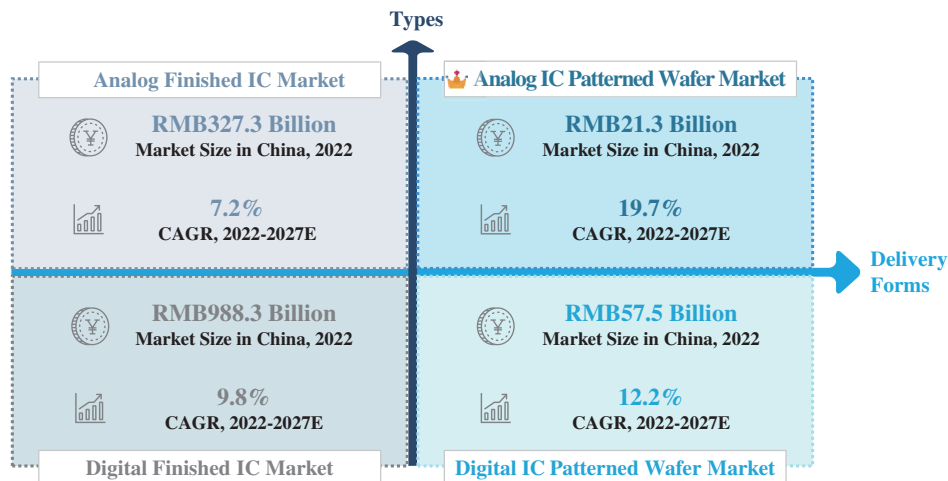
Segmentation by Type: Digital ICs and Analog ICs

Digital ICs are specifically designed to process digital signals and its operations are based on digital logic. Analog ICs are engineered to manage continuous analog signals, enabling them to work with varying signal levels. The design of digital ICs and analog ICs are substantially different. When designing digital ICs, engineers focus on constantly enhancing computational capabilities by increasing the number of logic gates and boosting integration levels. Conversely, analog IC design revolves around the actual circuit layout, which involves fine-tuning and making trade-offs based on specific product requirements. As such, well functioned supporting tools for analog IC design, such as EDA software and IPs, are more scarce than those for digital IC design, leading to a more heavily reliance on manual input and skilled engineers in analog IC design.

Our Market Position in the IC Industry in China

We have placed a strong emphasis on the analog IC patterned wafer market, which represents a key area of growth at the intersection of the patterned wafer and analog IC markets. According to Frost & Sullivan, the analog IC patterned wafer market in China will experience significant and consistent expansion from 2022 to 2027. The size of the analog IC patterned wafer market in China is expected to reach RMB52.2 billion by 2027 at a notable CAGR of 19.7% from 2022 to 2027, significantly exceeding the pace of development of the other three sub-markets in the IC industry in China.

The following chart illustrates the market size and expected growing pace of all the four sub-markets in the IC industry in China:



Note:

- (1) The chart above is for illustrative purposes only. Each of the depicted areas does not correspond to its actual market size.

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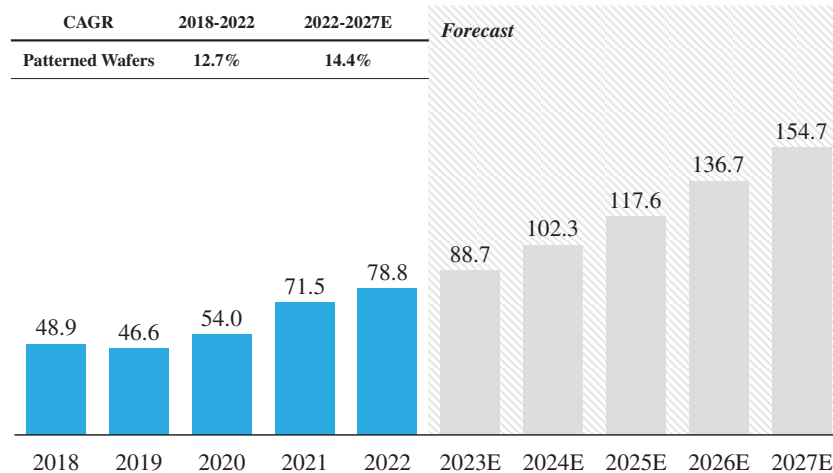
THE PATTERNED WAFER MARKET IN CHINA

Overview

According to Frost & Sullivan, the patterned wafer market in China has become an emerging trend, benefiting from substantial market demands and favorable industry policies. The size of the patterned wafer market in China has grown from RMB48.9 billion in 2018 to RMB78.8 billion in 2022 at a CAGR of 12.7% from 2018 to 2022, and is expected to reach RMB154.7 billion by 2027 at a CAGR of 14.4% from 2022 to 2027.

The following chart shows the market size of patterned wafers in China:

**Market Size of Patterned Wafers in China, by Revenue
RMB in Billions, 2018-2027E**



Source: Frost & Sullivan Report

Competitive Landscape of the Patterned Wafer Market in China

The patterned wafer market in China is highly fragmented, composed of a large number of small to medium scaled patterned wafer providers. According to Frost & Sullivan, in 2022, we ranked the fourth among all companies of the patterned wafer market in China in terms of revenue, accounting for a market share of approximately 0.4%. The following chart demonstrates the revenue and market share of the top five companies of the patterned wafer market in 2022:

Top 5 Companies of the Patterned Wafer Market in China, by Revenue

Ranking	Market Player	Revenue in 2022 (RMB in millions)	Market Share
1	Company A	618.8	0.8%
2	Company B	473.1	0.6%
3	Company C	412.3	0.5%
4	BaTeLab (貝克微)	352.5	0.4%
5	Company D	330.1	0.4%

Source: Frost & Sullivan Report

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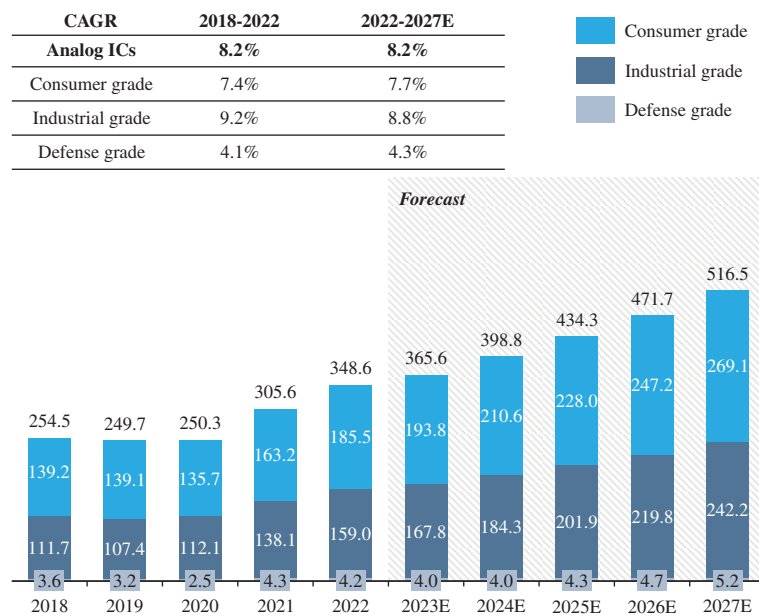
THE ANALOG IC MARKET IN CHINA

Overview

According to Frost & Sullivan, China has the largest market for analog ICs. Driven by the end market applications, the analog IC market in China is growing rapidly. The market size of the analog IC market in China increased from RMB254.5 billion in 2018 to RMB348.6 billion in 2022 at a CAGR of 8.2% from 2018 to 2022, and is expected to reach RMB516.5 billion in 2027 at a CAGR of 8.2% from 2022 to 2027. Analog ICs can be roughly divided into three categories, namely consumer grade, industrial grade and defense grade. Compared to the other categories, industrial grade analog IC market grows at the fastest pace from 2018 to 2022 and from 2022 to 2027, respectively, demonstrating great potentiality.

The following chart demonstrate the market size of analog ICs in China:

**Market Size of Analog ICs in China, by Revenue
RMB in Billions, 2018-2027E**



Source: Frost & Sullivan Report

Note:

- (1) Consumer grade ICs are ICs that are able to work at a range of temperature conditions from 0°C to 70°C.
- (2) Industrial grade ICs are ICs that are able to work at a range of temperature conditions from -40°C to 85°C.
- (3) Defense grade ICs are ICs that are able to work at a range of temperature conditions from -55°C to 125°C.

The Industrial Grade Analog IC Market in China

Overview

The industrial grade ICs are typically used for specific applications, including automotive electronics, healthcare, industrial automation, industrial Internet of Things, industrial lighting, instrumentation, communications, electric power, energy storage and high-end consumer electronics sectors, which require high performance, durability, and stability under harsh conditions. Benefiting from the trend of intelligent automation and digital transformation in industrial applications, the demand for industrial grade analog ICs is expected to boost, leading to a growing market size. According to Frost & Sullivan, the market size of the industrial grade analog IC market in China reached RMB159.0 billion in 2022, and is expected to reach RMB242.2 billion by 2027 at a CAGR of 8.8%.

Competitive Landscape of the Industrial Grade Analog IC Market in China

The industrial grade analog IC market in China is relatively fragmented, characterized by a large number of market players. According to Frost & Sullivan, we ranked the fifth among all fabless companies in China of the industrial grade analog IC market in terms of revenue in 2022, accounting for a market share of approximately 0.5%. As the market demand continues to grow, it is anticipated that future integration will give rise to the market share of core market players with significant capabilities.

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The following chart shows the revenue and market share of the top five fabless companies of the industrial grade analog IC market in terms of revenue in 2022:

Top 5 Fabless Companies of the Industrial Grade Analog IC Market in China, by Revenue

Ranking	Market Player (Fabless Model)	Revenue in 2022 (RMB in millions)	Market Share
1	Company E	1,148.3	1.7%
2	Company F	1,089.1	1.6%
3	Company G	916.8	1.4%
4	Company H	451.2	0.7%
5	BaTeLab (貝克微)	352.5	0.5%

Source: Frost & Sullivan Report

According to Frost & Sullivan, we enjoy obvious competitiveness in technical capabilities, especially in-depth capabilities in automated IC design, product category coverage and downstream application coverage, as compared to other market players in China. The following graph shows a comparison of core capabilities of leading industrial grade analog IC design companies operating on a fabless model in China:

Core Capabilities of Leading Industrial Grade Analog IC Design Companies (Fabless) in China

	Company E	Company F	Company G	Company H	BaTeLab (貝克微)
Automated IC Design Capabilities ⁽¹⁾					
Number of Patents					
Product Category Coverage of Industrial-grade Analog ICs					
Downstream Application Coverage of Industrial-grade Analog ICs					

Most competitive
 Least competitive

Note:

- (1) Automated IC design capabilities typically include capabilities that can realize efficient standardized design of analog IC products, such as EDA software and IP modules.

Source: Frost & Sullivan Report

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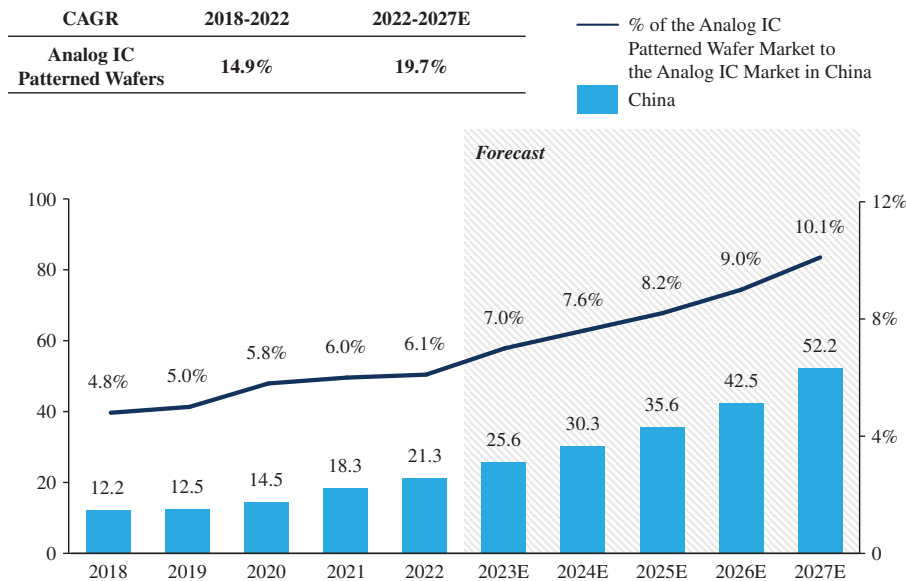
THE ANALOG IC PATTERNED WAFER MARKET IN CHINA

Overview

Benefiting from substantial market demands and favorable industry policies, the analog IC patterned wafer market in China demonstrates a positive development trend and steadily growing market scale due to the long lifecycle and dispersed application scenarios of analog IC patterned wafers. According to Frost & Sullivan, the market size of the analog IC patterned wafer market in China has grown from RMB12.2 billion in 2018 to RMB21.3 billion in 2022 at a CAGR of 14.9% from 2018 to 2022, and is expected to reach RMB52.2 billion by 2027 at a CAGR of 19.7% from 2022 to 2027. Furthermore, the proportion and significance of the analog IC patterned wafer market among the entire analog IC market in China has continued to increase, accounting for 4.8% in 2018 and is expected to reach 10.1% in 2027.

The following chart illustrates the market size of analog IC patterned wafers in China:

**Market Size of Analog IC Patterned Wafers in China, by Revenue
RMB in Billions, 2018-2027E**



Source: Frost & Sullivan Report

Competitive Landscape of the Analog IC Patterned Wafer Market in China

According to Frost & Sullivan, we enjoy a leading position in the analog IC patterned wafer market in China, ranking the first in terms of revenue generated from analog IC patterned wafers in 2022 with a market share of 1.7%. The analog IC patterned wafer market in China is a relatively fragmented market, with the aggregate market share of the top five companies accounting for only 5.0% in 2022. Small scaled patterned wafer providers may fail to meet the increasing demands of downstream customers arising from the more and more diverse use scenarios of patterned wafers, enabling the top players in the market to achieve significant first mover advantages. As a result, the market share of leading companies is expected to further expand.

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The following chart shows the revenue and market share of the top five analog IC patterned wafer companies in China:

Top 5 Analog IC Patterned Wafer Companies in China, by Revenue

Ranking	Market Player	Revenue in 2022 (RMB in millions)	Market Share
1	BaTeLab (貝克微)	352.5	1.7%
2	Company C	263.1	1.2%
3	Company I	149.6	0.7%
4	Company E	147.6	0.7%
5	Company J	139.5	0.7%

Source: Frost & Sullivan Report

Market Drivers of the Analog IC Patterned Wafer Market in China

Surge in IC Design Companies in China Driving Growth in the Analog IC Patterned Wafer Market

IC design companies play a vital role in the downstream market of analog IC patterned wafers. According to Frost & Sullivan, in 2022, the self-sufficiency rate of analog IC in China was only 13%. This presents significant potential for domestic analog IC design companies to step in and substitute imports to meet downstream customers’ increasing demands. Driven by such demand along with supportive industry funding and favorable government policies, the number of IC design companies in China has grown rapidly over the past few years. As domestic IC design companies who cannot afford high R&D costs tend to cooperate with patterned wafer suppliers in the course of product development instead of performing in-house IC design to maintain a more efficient operation, the demand for analog IC patterned wafers correspondingly rises, making domestic analog patterned wafer providers more popular among downstream customers.

Patterned Wafers Effectively Meeting Flexible Packaging Demand

As packaging technology continues to evolve, advanced packaging techniques such as SiP and CoB have become more widely used. Compared to traditional packaging methods that use pin connections, SiP and CoB are mainly processed on wafers. Downstream customers who adopt these packaging techniques can avoid repetitive packaging of components and reduce production costs by purchasing patterned wafers. Furthermore, these techniques enable greater control over IC manufacturing process, leading to improved quality and consistency of the finished IC products, and in turn leading to an increasing demand for patterned wafers.

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Intelligent and Electric Trends Boosting Analog IC Patterned Wafer Market

In the future, with the explosion of demand in emerging application fields such as the Internet of Things, artificial intelligence, electric vehicles, cloud computing and 5G communication, the analog IC patterned wafer industry is expected to maintain a high momentum in the medium and long run. In specific, the rising application of automotive electrification and the increasing demand for industrial energy conservation are expected to lead the upgrading of analog IC patterned wafers. The ongoing transition towards electrification and intelligence in the automotive industry is expanding the application limits of analog ICs in this field, subsequently increasing their value per vehicle. As new energy vehicles continue to gain popularity and industries undergo digital transformation, the analog patterned wafer market is likely to experience an upward trend.

Entry Barriers of the Analog IC Patterned Wafer Market in China

Design Efficiency Leading to Strong Competitive Edges

In the highly fragmented market of analog IC patterned wafers, design efficiency is a key element for the market players to maintain their competitive advantages. Gaining self-sufficiency and control over core technologies, such as EDA and IP, is vital for IC design companies in order to boost design efficiency and establish a strong competitive edge. By deepening their technical expertise and mastery, these companies can make low-cost and standardized IC design more feasible, ultimately catering to a diverse range of user requirements more effectively.

First Mover Advantages in Forming Economies of Scale

Downstream customers in the analog IC patterned wafer market tend to choose reliable, industry-leading suppliers due to the long lifecycle nature of analog products. This leads to strong reluctance to switch patterned wafer suppliers. As a result, established leading companies with first mover advantages are better positioned to form economies of scale, which in turn enhances their overall competitiveness.

Maintaining an Extensive and Versatile Product Portfolio

The market of analog IC patterned wafers is quite diverse, encompassing a multitude of products with unique performance specifications designed for different application needs. It is essential for analog IC patterned wafer design companies, especially industrial grade analog IC patterned wafer design companies, to maintain an extensive and versatile product portfolio to address the wide-ranging requirements from their downstream customers. This diverse product offering not only helps meet downstream customers’ demands but also serves as a critical factor in maintaining a competitive edge in the market.

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Customer and Brand Recognition

To ensure the successful market launch of products, support from existing customers is necessary, along with continuous expansion of new customers and sales channels to build brand recognition. Analog IC patterned wafer suppliers, especially industrial grade analog IC patterned wafer suppliers that can enter the downstream supply chain, have gone through a long process of selection and brand recognition building. It is very challenging for new entrants to be listed among the supplier candidates of downstream customers.

Collaboration with Other Players in the Value Chain

For analog IC patterned wafer design companies, the accumulation of resources from collaborating with other players in the value chain, including channel partners and foundries, is the foundation for survival and development. Wafer production lines with advanced processing technologies are relatively scarce. To ensure product quality, control costs, and maintain stable production capacity supply, analog IC patterned wafer design companies need to establish close relationships with major players in the value chain.

Future Trends of the Analog IC Patterned Wafer Market in China

Growing Importance of EDA and IP for Analog IC Patterned Wafer Design Companies

As market demand continues to change and technologies continue to upgrade, the ability for analog IC patterned wafers design companies to perform independent R&D activities is becoming increasingly important for their competitiveness. Analog IC patterned wafers design companies equipped with in-house EDA software and IP libraries can quickly improve design efficiency, thus reducing product development cycles and costs. As a results, it is expected that more and more IC design companies will choose to develop in-house EDA software and accumulate IP libraries.

Increasing Proportion of Industrial Grade Analog IC Patterned Wafers

Recently, the application scenarios of analog IC patterned wafers are shifting from consumer electronics to high-performance sectors such as industrial and automotive. The competition in the consumer grade patterned wafer market is constantly intensifying, squeezing profit margins. Meanwhile, gross profit margins of industrial grade analog IC patterned wafer markets are expected to increase due to the high technology requirements in these sectors. The application scenarios of analog IC patterned wafers is anticipated to shift from the low-end consumer electronics market to the high-end industrial and automotive markets, leading to an increasing proportion of industrial grade products in the analog IC patterned wafer market.

Prominent Demand for Differentiated Patterned Wafer Design

As new and diverse scenarios continue to emerge, scenario demands are becoming increasingly differentiated and personalized. Standardized patterned wafers are struggling to keep up with the specific requirements of these scenarios, such as high processing power or low power consumption, leading to limitations in their applications. As a result, more and more manufacturers are seeking differentiation through the procurement of customized patterned wafers.