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Monthly #MarketMatters Report

February 2024

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Executive Summary

This report provides an overview of the semiconductor industry in February 2024 and attempts to identify essential market trends over the next month. Based on the relevant data available, the report analyses macro factors, supply chains, applications, and product market trends.

Global economic conditions continued to recover in February 2024, and semiconductor industry in China made an impressive growth benefited from high-end manufacturing industry performance.

Nvidia was on cusp of overtaking Apple as second-most-valuable company due to the wave of AI. What's more, HBM was so popular that memory chip giant has sold out their production capacity. However, Microchip decided to cut its employee's salaries because the demand for MCU had a dim outlook.

AI giants continued to upgrade their models, leading to evolution of hardware. Nevertheless, European automotive market may face a tough year due to subdued demand and fierce competition.

1. Macro Environment Overview

1.1 Global Economy Continued to Recover Moderately

In February 2024, according to data from J.P. Morgan, the global manufacturing PMI was 50.3, rising back above the boom-bust line.

In Asia, China's manufacturing PMI is still in the contraction range with its performance lower than the same period last year. However, the high-tech manufacturing PMI is 50.8, remaining in the expansion range for four consecutive months. Japan's manufacturing PMI continues to weaken, while South Korea's economy performs relatively strong. Benefiting from the transfer of Western countries' industrial chains and the support of local industrial policies, the prosperity of India's manufacturing industry continues to improve.

In the Americas, the U.S. (ISM) manufacturing PMI was only 47.8, significantly lower than market expectations and the previous value. It weakened again after rebounding for two consecutive months. Mexico's manufacturing PMI has been above the boom-bust line for several consecutive months, with continuing growth momentum.

In Europe, the Eurozone manufacturing PMI is still in the contraction range, and economic performance continues to be weak.

Manufacturing PMIs

Timeline	Global	China	Japan	South Korea	India	U.S.	Mexico	Eurozone
2023-02	**49.90**	52.60	47.70	48.50	55.30	47.70	51.00	48.50
2023-03	**49.60**	51.90	49.20	47.60	56.40	46.30	51.00	47.30
2023-04	**49.60**	49.20	49.50	48.10	57.20	47.10	51.00	45.80
2023-05	**49.60**	48.80	50.60	48.40	58.70	46.90	50.50	44.80
2023-06	**48.80**	49.00	49.80	47.80	57.80	46.00	50.90	43.40
2023-07	**48.70**	49.30	49.60	49.40	57.70	46.40	53.20	42.70
2023-08	**49.00**	49.70	49.60	48.90	58.60	47.60	51.20	43.50
2023-09	**49.10**	50.20	48.50	49.90	57.50	49.00	49.80	43.40
2023-10	**48.80**	49.50	48.70	49.80	55.50	46.70	52.10	43.10
2023-11	**49.30**	49.40	48.30	50.00	56.00	46.70	52.50	44.20
2023-12	**49.00**	49.00	47.90	49.90	54.90	47.40	52.00	44.40
2024-01	**50.00**	49.20	48.00	51.20	56.50	49.10	50.20	46.60
2024-02	**50.30**	49.10	47.20	50.70	56.90	47.80	52.30	46.50

Data Source: Choice

1.2 China Gained an Impressive growth in the Semiconductor Market, While Japanese Market Have a Subdued Outlook

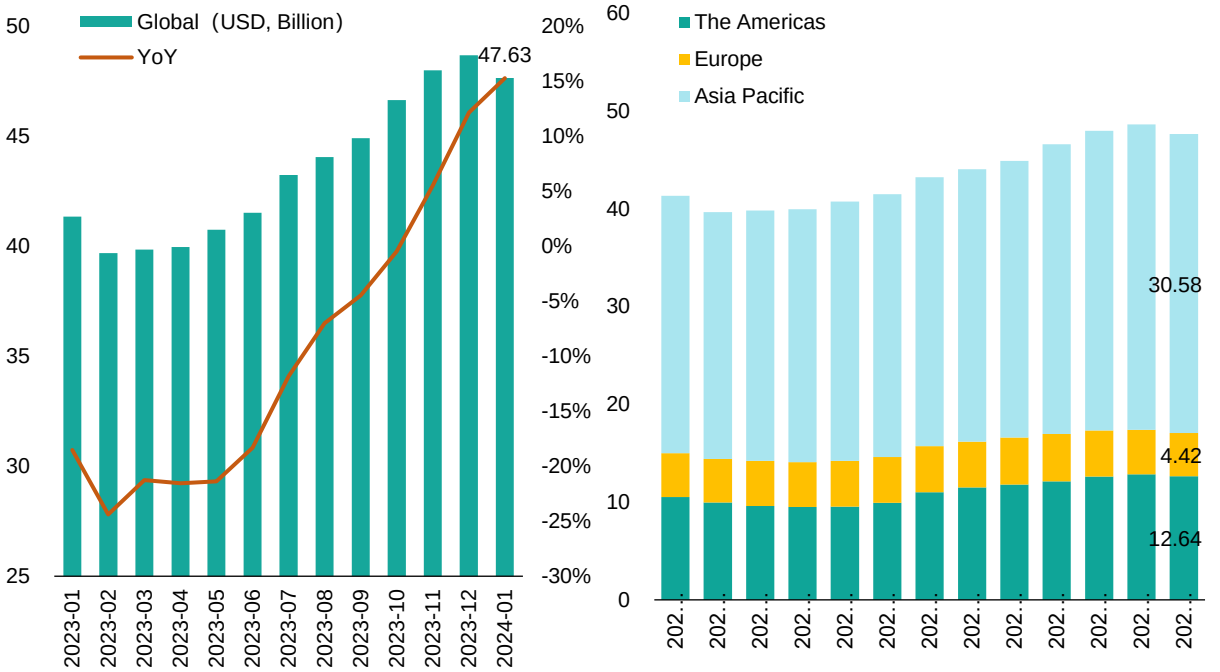
In January 2024, global semiconductor sales declined month-on-month while increased by 15.2% year-on-year, affected by the off-season cycle of the industry. Market demand performance was better than the same period last year.

In the Asia-Pacific region, the overall market demand performed well, with a year-on-year growth rate of 16.1% and a market share of 64.2%. Among them, China's yearly growth rate is impressive (+26.6%). Affected by earthquake and economic downturn, demand growth in Japan has hit a trough with yearly decline of 6.4%, accounting for 7.71% of the global market.

In the Americas, market demand continues to recover and grows rapidly with a yearly growth rate of 20.3%. This may be due to the U.S. Chips and Science Act's support for industry development. The Mexican market continues to attract foreign industrial investment, resulting in increased chip demand.

In Europe, sales fell slightly year-on-year, mainly due to the decline in overall economic prosperity, including the recent weak demand growth in the automotive industry.

Semiconductor Sales by Regions (USD, Billion)

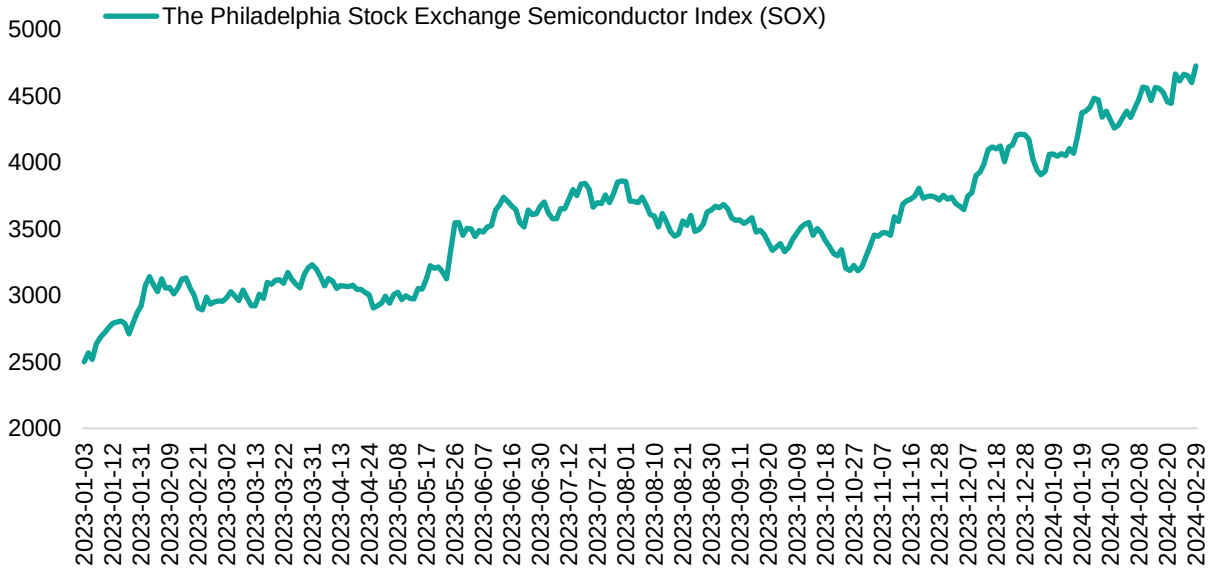


Data Source: Choice

1.3 Semiconductor Stock Market Rose to a Record High

The Philadelphia Semiconductor Index (SOX) maintained its high rise, mainly due to the surge in stock prices brought about by Nvidia's impressive performance.

The Philadelphia Stock Exchange Semiconductor Index



Data Source: Choice

1.4 The U.S. Has Stepped up More Pressure on SMIC

In an effort to rein in China's top sanctioned chipmaker, the Biden administration has cut off more American imports after its most advanced factory produced a chip for Huawei's Mate 60 Pro phone, three people with knowledge of the matter said.

1.5 India Approves the Construction of Three Semiconductor Factories to Serve the Fields of Defense, Automotive, and Telecommunications

Recently, India has officially approved Tata Group, CG Power, and other companies to build three semiconductor factory projects with a total investment of IDR 1.26 trillion (approximately USD 15.2 billion) to position India as the global hub for chip manufacturing. Among them, one factory that Tata Group cooperates with Power Semiconductor Manufacturing Co., Ltd. is a wafer factory, and the other two are packaging and testing factories, which produce and package chips for industries such as national defense, automotive, and telecommunications.

1.6 Japan will Provide Financial Subsidies for TSMC’s Second Factory to Consolidate the Semiconductor Supply Chain Alliance Tied by Capital

Japan will provide an additional JPY 732 billion in subsidies to fund TSMC's second factory in Kumamoto. TSMC’s Japanese subsidiary has introduced Sony Group, Toyota Motor, and Denso Corporation to be shareholders. It can be seen that Japan is forming a supply chain alliance for semiconductor production and application with capital as the linkage.

2. Semiconductor Industry Updates

2.1 Short-term Implications

Overview

- Demand for cloud computing power and memory chip continues to grow, with significant growth of AI.

2.1.1 Nvidia's Revenue from Data Center Business Surges with Growing Demand for Cloud Computing Power

Nvidia achieved revenue of USD 22.10 billion in FY24 Q4, of which data centre business revenue was USD 18.40 billion (+409% year-on-year, +27% month-on-month). InfiniBand end-to-end solutions and Nvidia's Hopper GPU computing platform contributed to data centre growth in the fourth quarter.

With the wave of AI business, Nvidia’s valuation has outreached USD 2 trillion. There are three main moats, including high speed of chips, high-performance chip network, and CUDA, the industry-standard software platform. Nvidia’s performance and valuation are expected to grow as AI commercialisation accelerates in the future.

2.1.2 Microchip Cuts Salaries by up to 20% with Weak Demand for MCU

American MCU manufacturer, Microchip Technology, is implementing salary reduction measures. It plans to reduce the salary of employees unrelated to factory closures by 10%, and reduce the salary of its management team by 20%.

2.1.3 Major Memory Chipmakers have Sold Out HBM Production Capacity, Indicating the Supply Shortage of HBM

As the demand for AI chips continues to surge, HBM, as a key component of current AI chips, continues to be in short supply. Following Micron's previous announcement that HBM production capacity has been sold out, SK hynix has also sold out HBM production capacity this year.

2.1.4 Kioxia Ends Production Cuts, Optimistic about the Memory Chip Market

In view of the gradual improvement of the semiconductor market, Kioxia announced that it will review the flash memory production reduction plan from 2022 and expand production. By

March of this year, capacity utilisation is expected to return to around 90% based on demand.

2.1.5 TI Plans to Lay Off its Low-end Power Chip R&D Team in Beijing, Seeking to Optimise its Business Model

According to reports, TI has laid off its chip design team in Beijing, which is mainly responsible for the research and development of low-end power chips. TI's abolished Chinese product lines will be transferred to India to seek optimisation of business layout. This adjustment is mainly due to the impact of weak consumer market demand and the accelerated process of domestic substitution.

2.2 Mid-term Implications

Overview

- There are still some stock adjustments in the supply chain with a declined capacity utilisation rate in some foundries.

2.2.1 Samsung Suspends Construction of P5 Factory and Prioritises Completion of P4 Clean Room to Meet Market Demand

Samsung has adjusted the construction progress of the P4 factory in Pyeongtaek, South Korea, so as to prioritise the construction of the PH2 production line (for foundry business) and suspend the construction of new production lines at the P5 wafer fab. In addition, Samsung's P4 wafer fab will also build a PH3 production line of DRAM and other memory chips.

2.2.2 Semiconductor Industry has not yet Fully Recovered with Continuing inventory Adjustments

TSMC believes that semiconductor inventory will return to a healthier level in 2024 and expects its full-year revenue to grow by 21%-25%. SMIC believes that the recovery of demand is not enough to support a strong rebound in semiconductor sector, and the total growth of smartphones and PCs in 2024 will be limited. UMC expects wafer shipments in 2024 Q1 to increase by 2%-3%, with a capacity utilisation rate of approximately 61%-63%. PSMC expects capacity utilisation rate in 2024 Q1 to rebound to 70%-75%. VIS believes that

inventory adjustment will continue in automotive and industrial supply chains, and the capacity utilisation rate in 2024 Q1 will drop to about 50%.

2.3 Long-term Implications

Overview

- The United States may accomplish the localisation of Nvidia’s supply chain, indicating that its semiconductor supply chain has further been enhanced.

2.3.1 SK hynix will Build an Advance Packaging Factory in the United States, Strengthening Nvidia’s Local Supply Chain

SK hynix will build an advanced packaging factory in Indiana, USA, mainly using the 3D stacking process to build HBM, which is integrated into Nvidia's AI GPU. Coupled with TSMC's chip manufacturing plant in Arizona, Nvidia's GPU chips can be produced locally in the United States in the future.

2.3.2 Major Chipmakers such as Murata and Yageo Plan to Expand Production, Optimistic about the Long-term Demand for MLCC

Long-term demand for MLCC will continue to grow. As application market such as smartphones, automotive, IoT, and AI servers increases, the demand for various types of MLCC capacitors will be boosted. Although MLCC is still in the process of destocking, major passive component manufacturers such as Murata and Yageo have recently announced MLCC production expansion plans. Murata plans to build a new factory in Shimane Prefecture, Japan, with a target of completion in 2030; Yageo will build its sixth factory in Taiwan and will introduce wafer resistor and MLCC production lines in the future.

2.3.3 Infineon and Honda Work Together to Develop Automotive Semiconductor Solutions

Infineon will provide Honda with technical support to help build competitive vehicles. These technical supports will mainly focus on areas such as power chips, advanced driver assistance systems (ADAS), and electronic and electrical architecture. Based on this, both will work together to develop new concepts.

3. Application Updates

3.1 Artificial Intelligence

Overview

- AI model continues to change, leading to hardware’s evolution, which may be conducive to the demand growth of AI chip.

3.1.1 OpenAI Releases Text Generation Video Model, Sora, Indicating the Possibility of AGI Application

Recently, OpenAI released the text generation video model, Sora, which currently supports generating videos up to 60 seconds through text or pictures, and also supports extending videos forward or backward in time, as well as video editing. OpenAI said it is training AI to understand and simulate the physical world in motion, with the goal of training models to help people solve problems that require real-world interaction.

Sora's AI training idea is similar to Tesla's FSD V12 technology – it is not training the AI to generate videos but training the AI to understand and generate a real scene or world. In other words, the technology of Sora is similar to the simulator of physical world. This can not only improve the efficiency of cloud data simulation and testing, but also solve the interpretability problem of AI intelligent driving, paving the way to achieve L4 autonomous driving.

3.1.2 Meizu Stops Developing New Projects for Traditional Smartphones and Invests in New Generation AI Equipment

Meizu announced a strategic adjustment. While all in AI, it will stop the development of new traditional smartphone projects and fully invest in new generation AI devices. Meizu's first AI Device hardware product will be officially released this year, and a total of six hardware products will be launched in the next three years.

3.1.3 Apple Halts Electric Car Project to Focus on Generative AI Business

Apple has stopped its car-making project that has been in operation for nearly 10 years and instead investing in generative AI business. Employees engaged in car research and development will be transferred to the artificial intelligence department.

3.2 New Energy

Overview

- Chinese leading energy storage manufacturers are optimistic about the growing demand abroad, building factories overseas together with foreign partners.

3.2.1 China Southern Grid Energy Storage and NIO Enter into Strategic Cooperation in Energy Storage

China Southern Power Grid Energy Storage Co., Ltd. signed an agreement with NIO Energy to carry out comprehensive cooperation in the fields of virtual power plants, battery swap station business, battery escalation, and recycling to promote the integration of aggregate resources such as charging and swap stations, energy storage stations, and adjustable loads into virtual power plant platform.

3.2.2 Honeycomb Energy Strategically Cooperates with Thailand's Banpu NEXT to Deepen Localisation Layout

Honeycomb Energy signed a strategic cooperation agreement with Banpu NEXT, a subsidiary of international energy giant Banpu Group, to further deepen the local cooperation and layout of both parties in the fields of energy storage, battery cells, and recycling, and to maintain Honeycomb Energy's leading position in the Thailand lithium battery industry.

3.2.3 Duke Energy May Stop Using CATL Energy Storage Batteries

U.S. utility company, Duke Energy, said that under pressure from the U.S. Congress, it plans to stop using energy storage batteries produced by Chinese battery manufacturer CATL at Camp Lejeune, the largest Marine Corps base in the United States, and will gradually discontinue the use of CATL battery products in civilian energy storage projects.

3.3 Automotive

Overview

- European automotive market continues to have a dimming prospect, as some large auto parts suppliers have decided to lay off their employee.

3.3.1 Auto Parts Suppliers have Implemented Layoffs One After Another, Indicating that European Auto Market Continues to be Weak

German auto supplier, Continental, will cut 1,750 jobs in its R&D department, and Forvia, the world's eighth-largest auto supplier, plans to lay off 10,000 people in Europe. The European automotive market is expected to continue to decline in the short to medium term.

3.3.2 Volkswagen and Xpeng Signed a Technical Cooperation Agreement and Plan to Optimise the Cost Structure Through Joint Procurement

Volkswagen and Xpeng Motors have signed a technical cooperation agreement for joint development of platforms and software. According to the agreement, the two parties will purchase parts applied to shared vehicle and platform through a joint procurement plan, optimise the cost structure, and jointly develop two intelligent connected models for China's mid-size car market, the first of which is an SUV. Through joint procurement and the application of innovative technologies in the vehicle design and engineering stages, the product development cycle will be significantly shortened by more than 30%.

3.3.3 Hyperview Provides Intelligent Driving Products for JAC Ruifeng RF8

Hyperview announced that it will provide intelligent cameras and ADAS high-end assisted driving software systems for JAC Ruifeng RF8. The basic intelligent driving version is equipped with a front-view camera and two millimetre-wave radars, which can achieve L2 intelligent driving assistance. Among them, the smart front-view camera has a built-in Horizon Journey 3 visual perception chip, paired with the domestic MCU Xinchi E3420. In addition, the subsequent high-end intelligent driving version RF8 model will use Hyperview’s self-developed intelligent driving domain controller products and high-end intelligent driving algorithms to achieve navigation-assisted driving capabilities in high-speed scenarios.

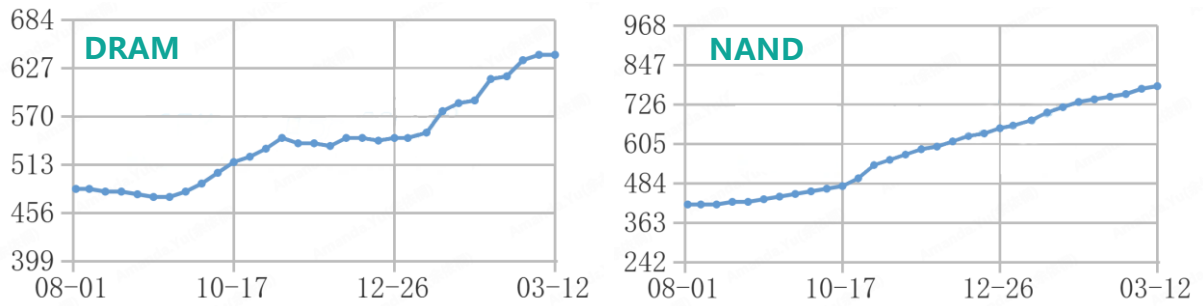
4. Product Updates

4.1 Memory: Customers' Demand is Under Pressure, While Trader's Demand Dominates

Since Spring Festival, the demand in the memory chip market has been flat, the prices of some embedded products from original manufacturers have loosened, and the demand in the server market has been relatively stable. Spot market has controlled supplies to increase the chips' price but traders' demand for NAND Flash wafer has dominated the market.

The current focus of original manufacturers is still on making profits from price increases and making up for losses. However, the pressure from the demand side is gradually emerging.

Price Index of DRAM & NAND

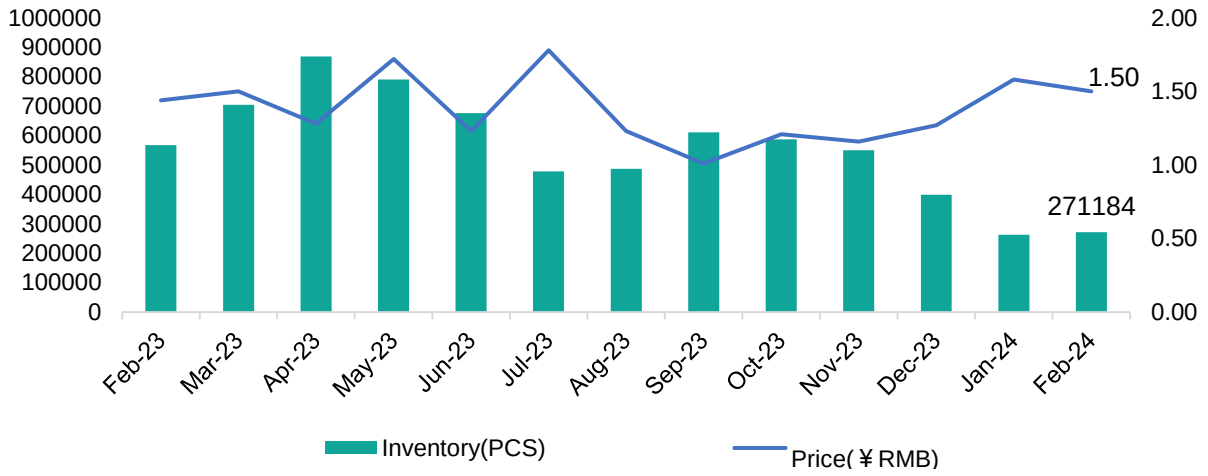


Data Source: CFM

4.2 Power: It is Still in the Oversupply Stage, with Insufficient Momentum for Price Upward

Power chips are still in the oversupply stage. Taking Infineon IRF640NPBF as an example, the average quotation dropped by nearly 5% in February, and the inventory increased by 3%, which also verified that the price upward of some Chinese small and medium-sized manufacturers last month was mainly due to cost pressure.

Inventory and Price Trends of IRF640NPBF



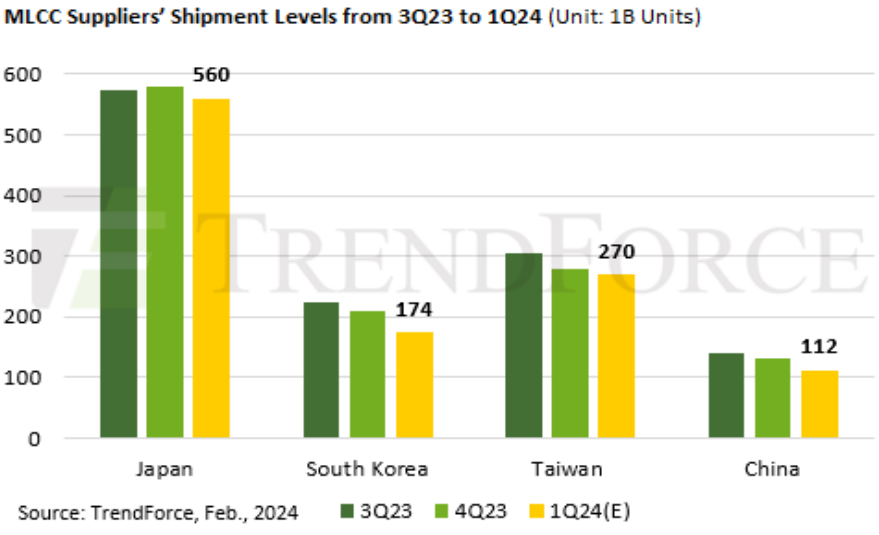
Data Source: www.hqew.com

4.3 Passive: MLCC Shipments are Expected to Quarterly Decline by 7% in the First Quarter

TrendForce data shows that the total MLCC shipments in Q1 2024 are expected to only reach 1,110.3 billion units, a decrease of 7% from the previous quarter. The market is still in a state of oversupply.

TrendForce predicts that the average BB Ratio (order/shipment ratio) of MLCC suppliers may fall to 0.89 in the first quarter, a decrease of 3.3% from the previous quarter. Facing the slowdown in order growth, MLCC suppliers have also become more conservative in their quotation strategies and continue to control production capacity.

Shipments of MLCC Suppliers (Billion Units)



Data Source: TrendForce

4.4 MCU: The Overall Market Continues to be Weak, and the Delivery Time of Some General-purpose Devices has been Shortened.

In February, the overall MCU market remained weak. Inventory of NXP's MCUs is relatively high with the further shortened lead time. However, the delivery time of some automotive-grade MCUs from Microchip is still long.

Brand	Product	Lead Time（Weeks）	Trend
NXP	16-bit MCU (S912x)	13-25	↘
	32-bit MCU (MK64x、MK70x)	18-54	→
	General MCU (LPC17x)	13-50	↘
	Automotive MCU (MP5x、FS32x、MCFx)	36-54	→
MICROCHIP	8-bit MCU (PIC16x、AT89x、ATMEGA25x)	6-12	→
	16-bit MCU (PIC24x、DSPIC3x)	6-30	↘
	32-bit MCU (ATSAMA5x、PIC32x)	4-14	↘

5. Key Market Trends

5.1 HBM Market Sentiment Continues to Rise, and the Complexity of AI Models is Driving the Development of HBM

Two major memory chipmakers, SK hynix, and Micron Technology, said that their HBM production capacity in 2024 has been sold out. In the future, as AI models become more complex, the HBM used in NVIDIA products will be upgraded to HBM3E, and the new generation of B100 products will further increase demand for HBM; AMD products will still use HBM3, and it is expected that the next generation MI350 will be upgraded to HBM3E; Intel products will still use HBM2E.

5.2 Short-term Order Demand for MLCC Slows Down, but Long-term Growth is Still Promising

Currently, the MLCC market is still in a state of oversupply. TrendForce predicts that MLCC shipments in Q1 2024 will decrease by 7% quarterly. However, major passive component manufacturers such as Murata and Yageo have recently announced MLCC production expansion plans and are optimistic about future demand growth.

5.3 Demand for MCU Continues to be Weak, with Shortened Lead Time of Some Devices

In view of the lack of momentum for rising demand in the MCU market, MCU manufacturer, Microchip, has cut wages and suspended operations. Its MCU delivery time has been shortened, but the delivery time of automotive MCUs is still relatively long.

Conclusion

As of February 2024, the global economy's outlook is improving, but the United States manufacturing PMI has declined.The overall semiconductor industry has performed better than the same period last year, and Chinese market has showed an impressive growth.

Recently, NVIDIA announced its latest performance, with a yearly revenue increase of 409% from data centre business and the valuation outreaching USD 2 trillion, indicating that AI sector continues to be on the fast-growing track.

AI hardware will continue to evolve, facilitating AI chip market size to excess RMB 1 trillion. Benefiting from AI sector, demand for HBM will surge, leading to high prosperity in memory chip market.

However, European automotive market has a subdued outlook with a moribund manufacturing PMI. Notably, demand for MCUs has flatlined which may show that there is still some uncertainty in the recovery of semiconductor industry.

In conclusion, we remain positive about the AI sector and HBM market, while negative on demand for MCU.

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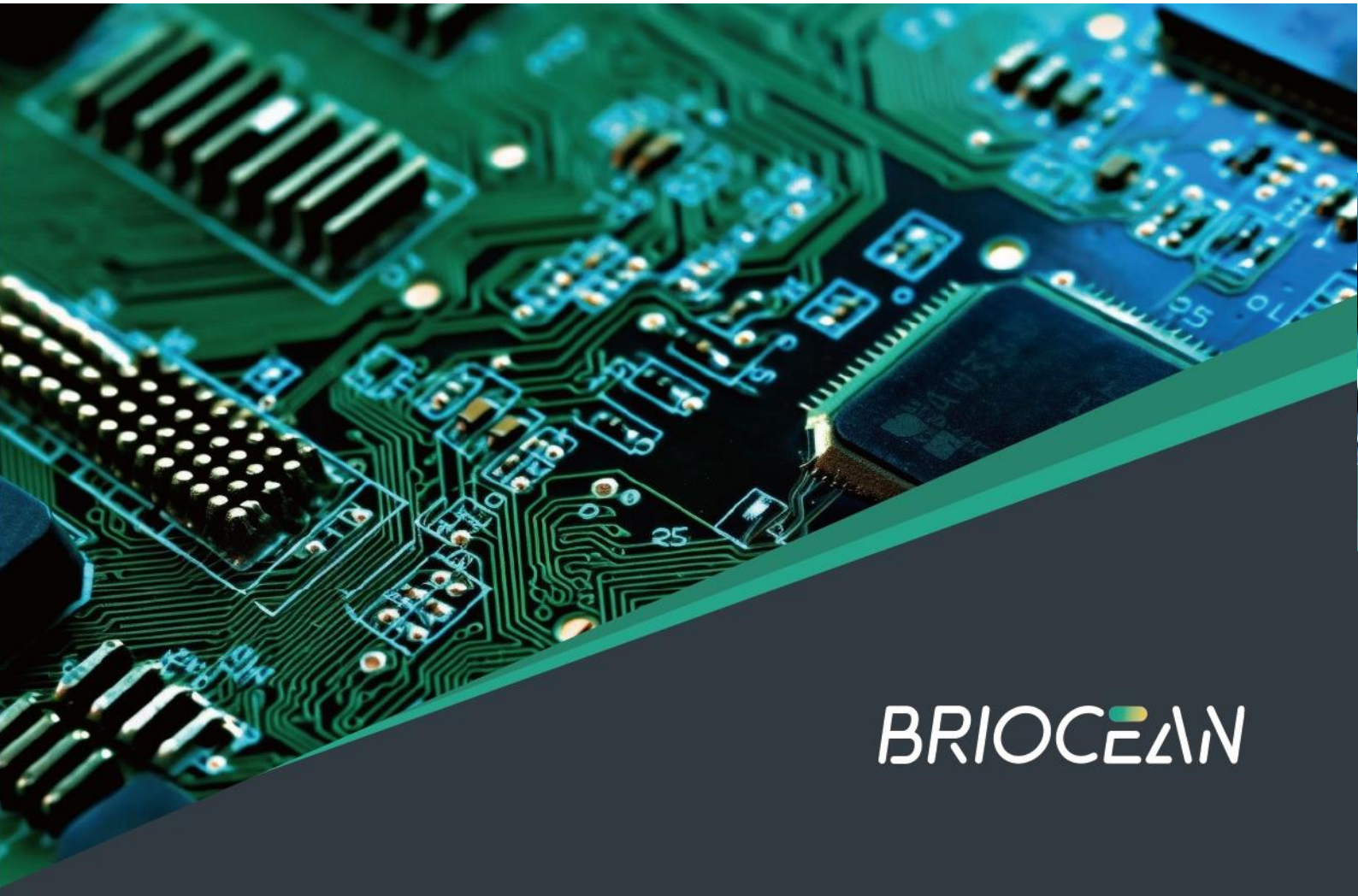
Briocean Technology Co., Ltd.

March 2024



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Working with over 10,000 global electronic component suppliers, Briocean strives to meet the various clients' demands on component shortages and cost savings. With the aim of providing clients with reliable and trackable procurment supply chain services, Briocean established one of the industry's most stringent Supplier Managmenet Systems and two world-class quality control centres based in Shenzhen and Hong Kong. Briocean's commitment to quality and reliability, ensures that every component we source, meets the highest standards.

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