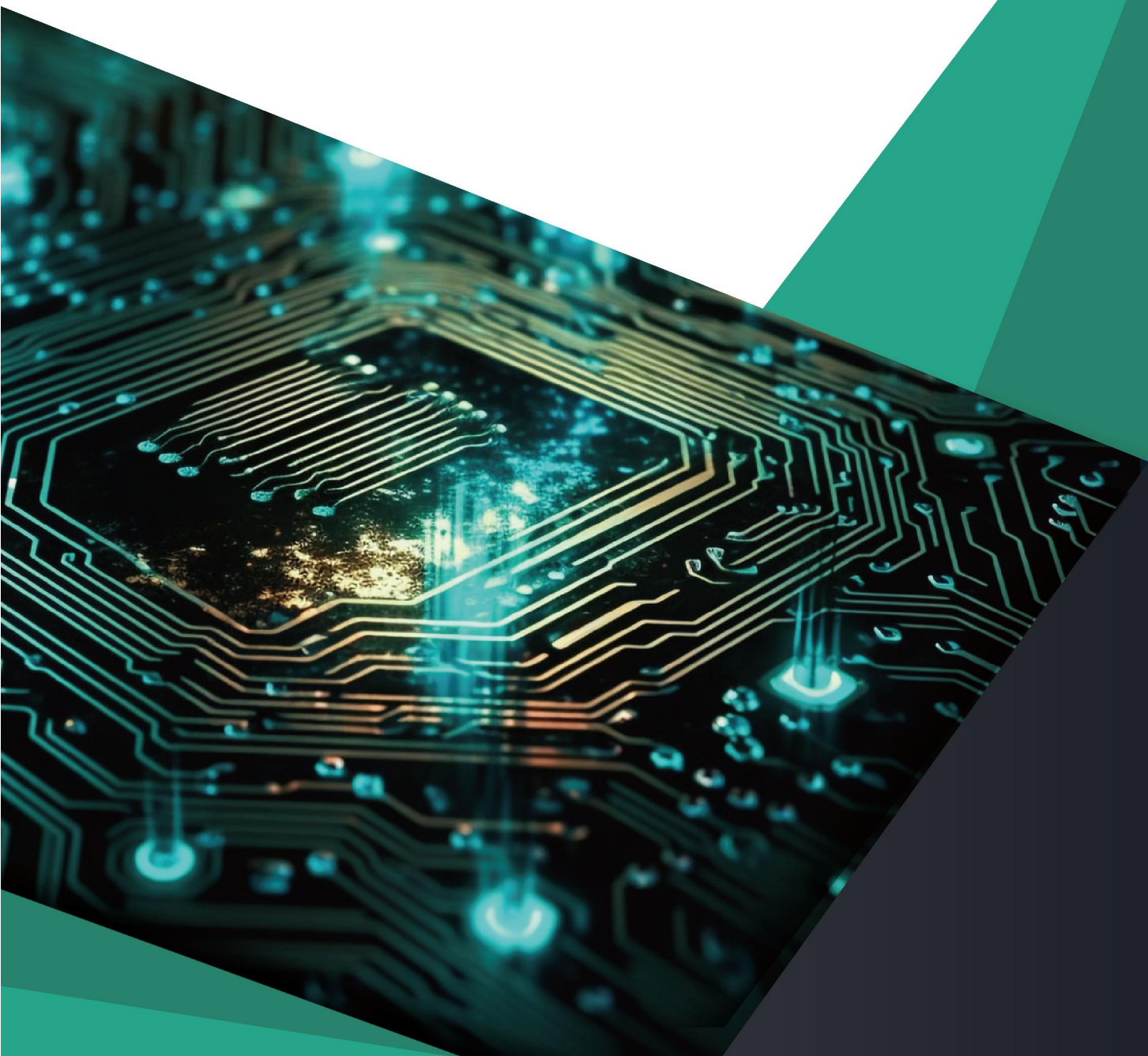
BRIOCEAN

Monthly #MarketMatters Report

October 2023



CONTENT

Executive Summary

This report provides an overview of the semiconductor industry in October, analysing the macro environment, industry supply chain and product market trends, based on the relevant data available. It seeks to pinpoint prospective market opportunities and risks over the coming month.

The uncertainty of global manufacturing industry has been exacerbated while semiconductor sector has showed a continued recovery trend. Competitive landscape around the world is expected to change as the export restriction released by the United States has been further strengthened.

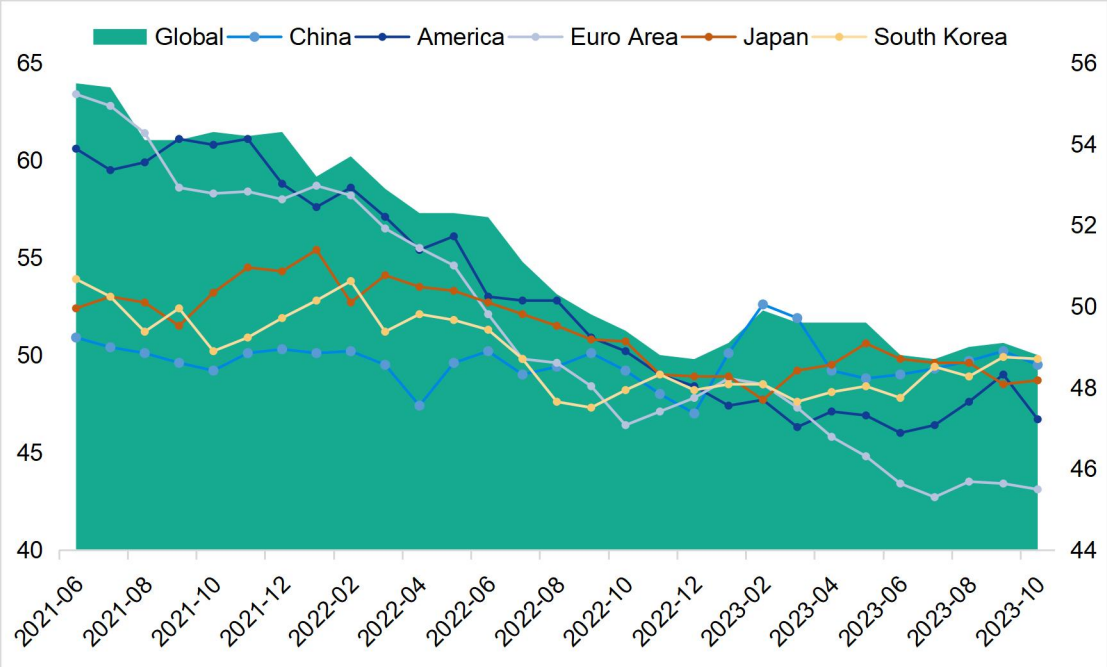
It is anticipated that some chips for mobile phones and PCs will be in growing demand due to the moderate recovery in the consumer electronics market. The artificial intelligence industry also appears promising, as the demand for AI chips will be increasing steadily over the coming years. There are, however, some risks in the industrial and automotive markets due to the sluggish demand in these sectors announced by leading chipmakers, such as Texas Instruments and STMicroelectronics, in the fourth quarter.

1. Macro Environment Overview

1.1 Global Manufacturing Industry Remains Uncertain

According to the latest global manufacturing PMI for October, it was recorded at 48.8, down 0.4pct from the previous month and is running over thirteen consecutive months below the boom-bust line. The manufacturing PMI for China was 49.5, which dropped to the contraction range, showing a seasonal decline. The U.S. (ISM) manufacturing PMI fell sharply to 46.7, lower than market expectations. Similarly, the manufacturing PMI in the Euro area continued to decline, and major European countries have been experiencing an economic downturn for several consecutive quarters. A moderate recovery was observed in the manufacturing industry of Japan, while a slight decline was observed in the manufacturing industry of South Korea.

Manufacturing PMIs

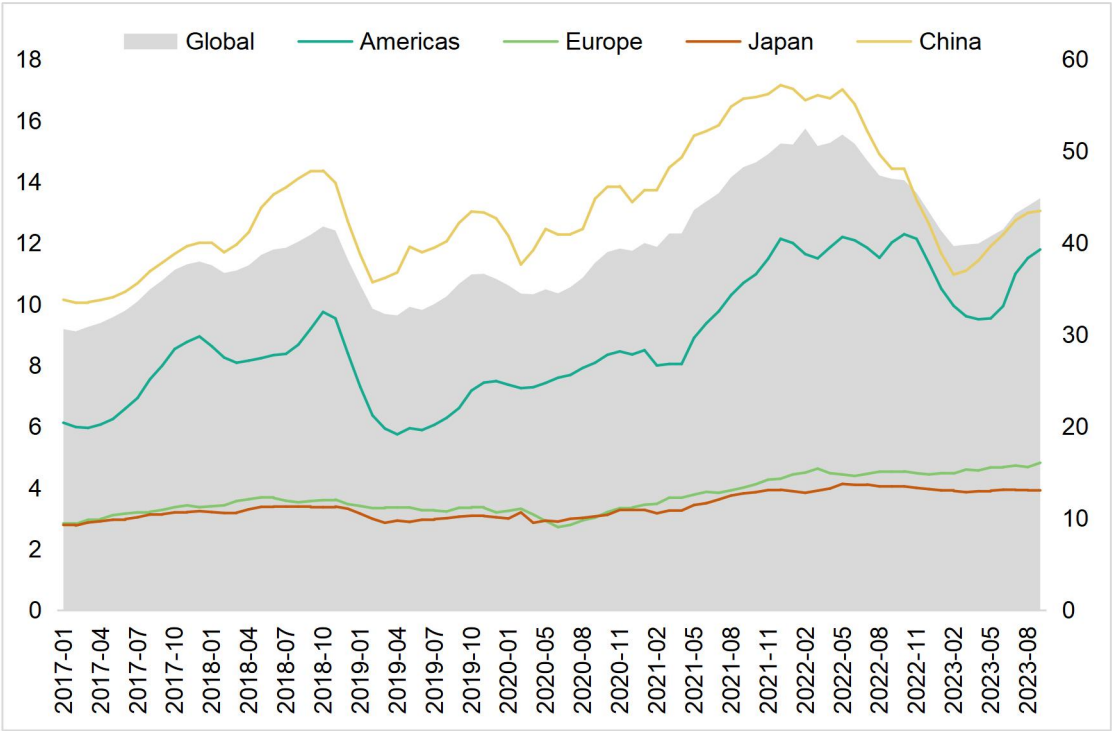


Data Source: Choice

1.2 Outlook for Semiconductor Sales Improves Further

Semiconductor Industry Association (SIA) reported that global semiconductor sales in September were USD 44.89 billion, representing a yearly decline of 4.5% and a monthly increase of 1.9%. In the meantime, semiconductor industry growth was 2.4% and 1.9% respectively in the Americas and Europe. Comparing with the same period last year, the European semiconductor market increased by 6.4%. There was also a slight increase in the semiconductor sales in China (+0.46% month-on-month), although the Japanese semiconductor sales continued to decline.

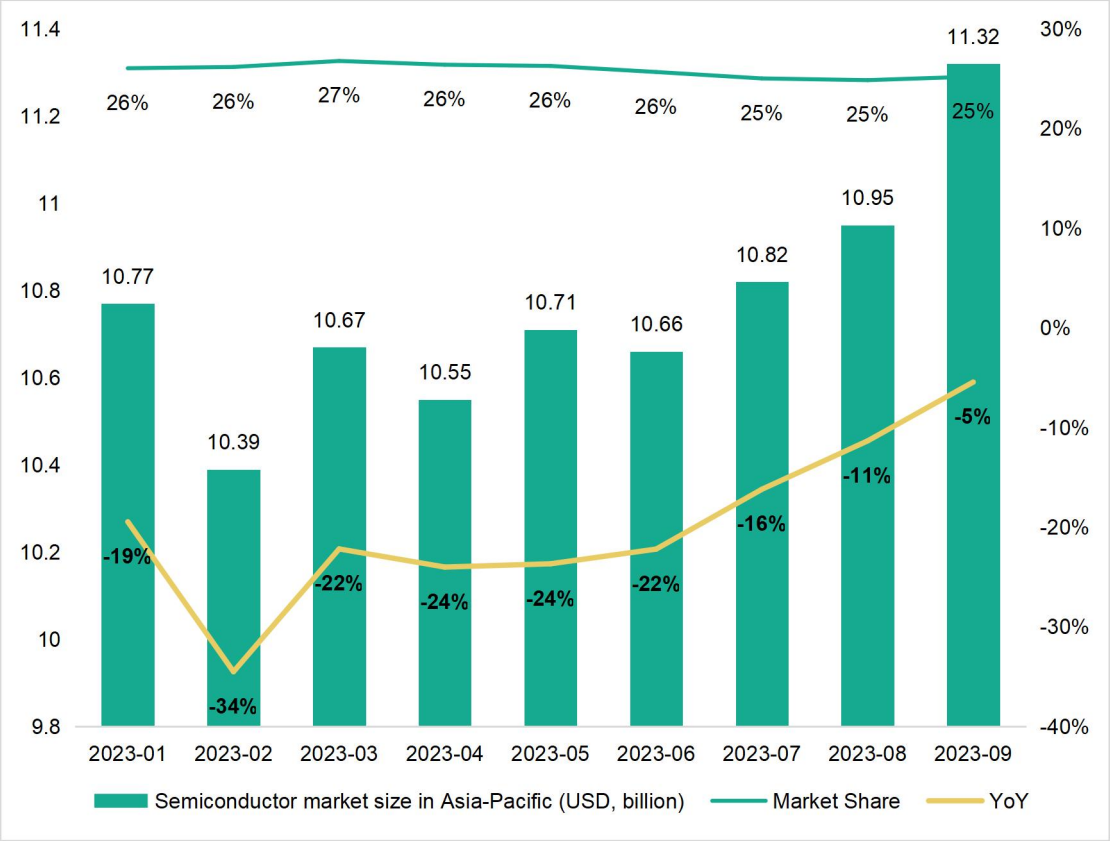
Semiconductor Market Size (USD, billion)



Data Source: SIA

Asia-Pacific's semiconductor industry has experienced continuous growth since June 2023 with a stable share of the global semiconductor market. As of September, the total was USD 11.32 billion, an increase of 3.4% from the previous month, but a decline of 5% from the previous year.

Semiconductor Market Size in Asia-Pacific (USD, billion)



Data Source: Choice

1.3 A New Ban Announced by the United States Expands the Scope of Controls on China's Export of Chips

In an effort to prevent Beijing from receiving cutting-edge U.S. technologies to enhance its military capability, the Biden administration plans to halt shipments of more advanced AI chips designed by Nvidia and others to China. As a result of the rules, a broader range of advanced chips, and the tools needed to design them, are restricted to more countries, including Iran and Russia, and Chinese chip designers Moore Threads and Biren have been blacklisted.

1.4 The United States Waives Export Ban on South Korea Wafer Manufacturers

Samsung Electronics and SK Hynix have received indefinite extensions of exemptions from the United States to export chip manufacturing equipment to their factories in mainland China. In addition, TSMC is also expected to receive another one-year exemption from the United States.

Companies	Factories in mainland China	Exemptions
TSMC	· An 8-inch wafer fab in Shanghai and a 12-inch wafer fab in Nanjing, Jiangsu · Less than 15% of its revenue comes from mainland China	One-year exemption
Samsung	· Xi'an has a NAND Flash wafer fab that produces 40% of its global output · A wafer packaging factory in Suzhou, Jiangsu	Indefinite exemption
SK Hynix	· Factory in Wuxi, Jiangsu, produces 50% of its global DRAM wafers	Indefinite exemption

2. Semiconductor Industry Overview

2.1 Silicon Wafer/Equipment

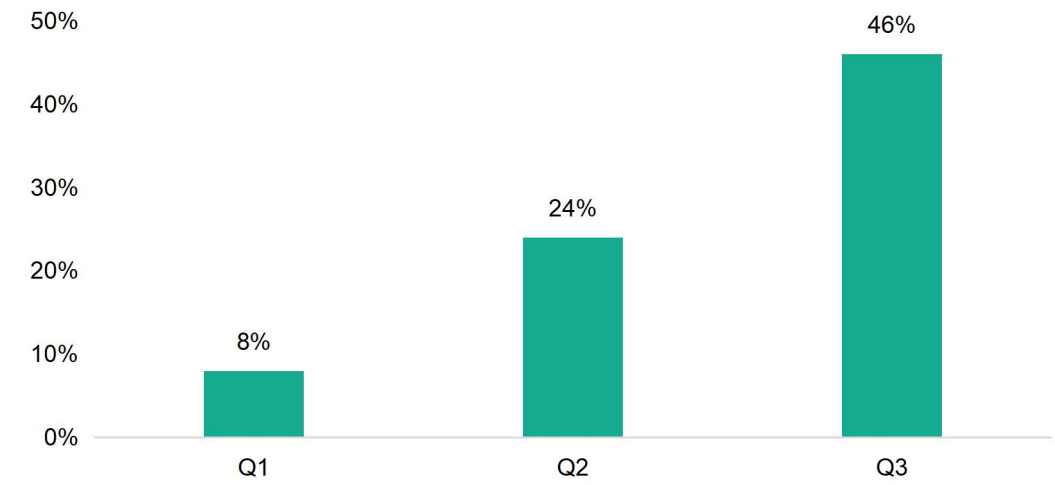
2.1.1 Canon Launches ASML Challenge with Machine to Make Advanced Chips

Recently, Canon has launched a new product, nano-imprinting technology, that uses flexible advanced circuit devices in the semiconductor manufacturing process. This technology can produce semiconductors required for smartphones and data centres with low cost and minimal energy consumption – showcasing a different exposure process from the previous method. Since the production process is relatively simple, there is no significant investment in equipment. At present, mass-production of semiconductors is used to applying EUV equipment monopolised by ASML. The launch of Canon's new equipment will have a certain impact on ASML, which may change the equipment industry landscape.

2.1.2 Order Amount for ASML Fell by 42% in Q3 Due to Sluggish Demand

On October 18, ASML released its 2023 Q3 financial report. According to ASML's financial report, it generated net sales of EUR 6.673 billion in the quarter, an increase of approximately 15.51% over the prior year, but decrease of 3.3% over the preceding quarter. As far as specific orders are concerned, ASML's new orders in Q3 this year were EUR 2.6 billion – a 42% decrease from Q2, of which EUR 500 million were EUV lithography machine orders. Currently China has become ASML's main market, with its shares of the market increasing throughout the last three quarters.

Market Share from China (%)



Data Source: ASML

2.2 IDM/Fabless

2.2.1 Samsung Reduces Production of Memory Chips

Samsung Electronics will continue to cut production to ease a chip supply glut, and will prepare for 2024 when industry-wide investment and production will be focused on high-end chips for generative artificial intelligence. In an effort to weather an unprecedented industry downturn, Samsung has cut chip production this year and has announced that further production adjustment will be made in the near future, especially for NAND flash memory chips.

2.2.2 Infineon Signs Semiconductor Supply Deal with Hyundai and Kia

German chip manufacturer, Infineon, has signed a multi-year agreement with Hyundai and Kia to supply power semiconductors to produce electric cars. It is intended that Infineon will build and reserve manufacturing capacity to supply silicon carbide, silicon power modules, and chips to Hyundai and Kia until 2030, while both car manufacturers will contribute financially to the project. With this partnership, Hyundai Motor and Kia are not only able to stabilise their semiconductor supply, but Infineon is positioned to further strengthen its position as a global semiconductor leader in electric vehicles.

2.2.3 Intel Plans to Spin Out Programmable Chip Unit

There are plans for Intel’s programmable chip unit to operate as a standalone business and to hold an initial public offering for stock in the business within two to three years. In the wake of Intel’s sales of its memory chip unit to SK Hynix earlier this year, part of Intel’s Mobileye self-driving car chip unit became public. Efforts were made to streamline Intel's business and raise capital for Gelsinger's initiative to turn the company around by revitalising its manufacturing division, which had fallen behind rivals such as Taiwan Semiconductor Manufacturing Co.

2.3 Foundry

2.3.1 Global Wafer Foundry Industry to Decline by 13.8%

Based on the finding of DIGITIMES Research, global foundry revenue is expected to grow by 11.3% from 2023 to 2028, driven by the demand for 5G and electric vehicles. However, global foundry revenue is expected to decrease by 13.8% to USD 121.5 billion in 2023, due to the downturn in the semiconductor market. Looking forward to 2024, global wafer foundry revenue will rebound but economic uncertainty and increased geopolitical risks are likely to limit its growth.

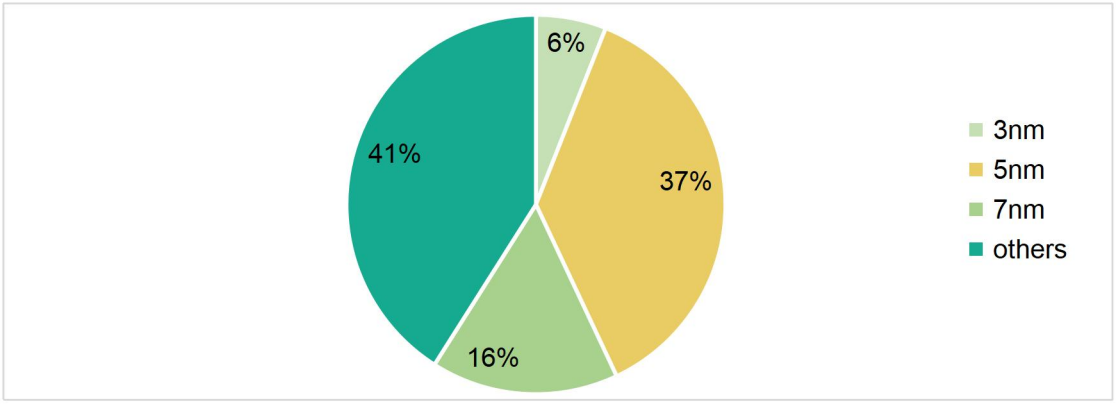
2.3.2 Leading Foundries Accelerate Deployment of 12-inch Production Capacity

VIS plans to build its first 12-inch wafer factory in Singapore. An investment of at least USD 2 billion will be made in the factory to meet the demand for automotive chips. VIS currently has five 8-inch wafer fabrication plants, four of which are located in Taiwan, and one in Singapore. This year, the production capacity reaches 3.35 million 8-inch wafers. As a result of VIS's establishment of a 12-inch wafer foundry in Singapore, all four major wafer foundries, namely TSMC, UMC, PSMC, and VIS, will have a 12-inch fab production capacity and establishment plan overseas. Among these companies, TSMC has operations in the United States, Japan and other places, while UMC and VIS are in Singapore, and PSMC plans to build factories in Japan with its partners. Leading manufacturers have been accelerating the deployment of production capacity for the 12-inch wafers as mainstream wafer size has evolved from 8 inches to 12 inches.

2.3.3 Advanced Process may Continue to Grow at TSMC

Due to the higher sales of new Apple models, Q3 sales of advanced manufacturing processes increased significantly by 6 percentage points over the second quarter, reaching 59%. In the current state of affairs, Apple is the only customer for the 3nm process. There will be an increase in proportion of advanced processes in the future as Qualcomm and MediaTek place orders. As a result, TSMC will be able to remove the influence of mature manufacturing processes from the manufacturing process.

Structure of TSMC's Revenue (%)



Data Source: TSMC

2.4 Packaging Test

2.4.1 Amkor to Invest in Advanced Packaging Factories with AI Chips on the Rise

It is expected that AI chip demand will drive revenue growth in 2024, even though major OSAT manufacturers have seen significant revenue decreases from January to September 2023.

The second largest OSAT manufacturer, Amkor, plans to build a new advanced packaging factory in Vietnam. In the first two phases of the plant, approximately USD 1.6 billion will be invested, primarily in the development of advanced system-level packaging and HBM memory integration.

2.5 Applications

2.5.1 Automotive

The demand for electric vehicles is expected to be slowed by inflation and high interest rate.

Company	Updates
Rivian	· A sustained demand for pickup trucks and sport-utility vehicles (SUVs) drove deliveries above market expectation in the third quarter
TESLA	· Slashed prices of its model 3 sedan and Model Y SUV in the United States, ratcheting up its price war following disappointing third-quarter sales
Stellantis	· To start production between 2024 to 2026 at its Melfi plant in southern Italy of five new medium-sized models for Europe and the Middle East
Lucid	· Launched the Air-Pure sedan with rear-wheel drive, starting at USD 77,400, to boost demand
Huawei	· Aito, a Huawei-backed EV brand, has received more than 50,000 orders in 25 days for its revamped M7 model
DRB Hicom	· Developing an automotive hub in Malaysia with Chinese car maker, Geely

2.5.2 Industrial Automation

A labour shortage has contributed to the growth of the industrial automation sector in the United States and Germany.

Company	Updates
Honeywell	· Reallocating capital and boosting sales by focusing on three broad business trends
Fortive	· Inked a USD 1.45 billion agreement to acquire German manufacturer, EA Elektro-Automatik Holdings GmbH
Siemens	· Chinese demand weakened in the third quarter, affecting its profit forecast

2.5.3 Telecommunications

In light of weaker demand for 5G equipment, telecommunications firms will continue to cut their spending.

Company	Updates
Singapore Telecommunications	· Acquired Trustwave stake from MC2 Titanium, LLC for USD 205 million
Ericsson	· A demand drop in North America led to lower profits in the third quarter
Nokia	· Reduce costs by cutting 14,000 jobs
Reliance Jio	· A lack of tariff hikes and higher expenses caused the company's slowest profit growth in seven quarters

2.5.4 Energy Storage

There is likely to be an increase in bid-winning capacity in China's large storage market during the second half of the year, but there may be a decline in the growth rate of the European and American energy storage markets.

Company	Updates
NextEra	· Expected to meet or exceed earnings per share expectations over the next three years
CATL	· A RMB 10 billion in storage system strategic cooperation signed with Zhongchengdayou
Sunwoda EVB	· Cooperated with Power-x, a Japanese energy storage company

2.5.5 Medical Equipment

There has been a significant increase in the number of technology leaders entering the medical equipment industry to promote the intelligent development of medical equipment, and this will result in an increase in the demand for chips as well.

Company	Updates
CMR Surgical	· New surgical robot manufacturing facility opens in the United Kingdom
Boston Scientific	· A Chinese manufacturing base will be set up in Shanghai
Johnson & Johnson	· Reorganised DePuy Synthes orthopaedics business
Novo Nordisk	· Officially acquired 100% shares of Biocorp
Elekta	· Acquisition of Xoft business from iCAD for USD 5.5 million

2.5.6 Consumer Electronics

Data from IDC indicates that global PC shipments decreased quarterly by 7.6% in Q3, and the decline narrowed due to weak macroeconomic recovery, weak consumer and commercial markets, and IT budgets shifting from equipment procurement to other areas. According to Canalys, the global smartphone market fell by only 1% in Q3, and the downward trend appears to have slowed down. It is evident that consumer electronics procurement is expected to rise in the near future.

Company	Updates
Huawei	· 1.6 million Mate 60 Pro phones sold in 6 weeks
Samsung	· Target to ship 20 million folding machines next year
ACER	· PC inventories are back to 6 – 8 week normal levels

3. Market Trends of Products

3.1 Discrete

The demand for STMicroelectronics' automotive products is growing steadily, and order visibility is high. As for its MOSFET power devices, delivery times can reach 39-52 weeks or even longer. As a result of sluggish consumer demand, low-voltage MOSFETs are at risk of being oversupplied. IGBTs, however, still take a considerable amount of time to be delivered.

Product	Brand	Pricing	Lead Time (Weeks)
MOSFETs	Vishay	→	16-50/+
	ONSEMI	→	26-50/+
	Infineon	→	20-46/+
	ST	→	39-52/+
IGBT	Infineon	↗	36-40

3.2 Passives

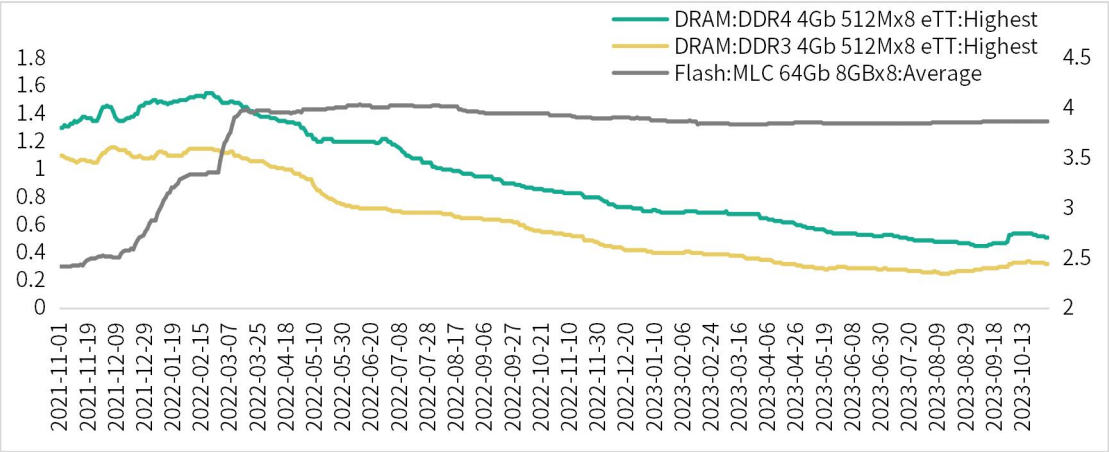
A cyclical decline has been observed recently in Japan’s MLCC export output, along with a reduction in the delivery time of mid- to low-end passive components. As predicted by Yageo, a major passive component manufacturer, the bottom of the passive component industry’s business cycle will be in Q4 of 2023 through Q1 of 2024.

Product	Brand	Pricing	Lead Time (Weeks)
Chip Resistor	Panasonic	→	20-36/+
	Yageo	→	18-20/+
Ceramic Capacitors	Murata	→	10-16/+

3.3 Memory

In response to a reduction in chipmakers' output, memory market prices continued to rise. The spot prices of memory chips, such as DRAM and NAND Flash, rose slightly in the fourth quarter.

Price of Memory Chips



Data Source: Choice

3.4 MCUs

The Microchip market is primarily concentrated in the automotive industry, and it can take up to 52 weeks for MCUs to be delivered.

Product	Brand	Pricing	Lead Time (Weeks)
MCU, 8-bit	NXP	→	26-32/+
	Microchip	→	16-52/+
MCU, 16-bit	NXP	→	12-32/+
	Microchip	→	18-52/+
MCU, 32-bit	NXP	→	12-32/+
	Microchip	→	35-52/+
	TI	↗	26-35/+

3.5 FPGA/CPLDS

There has been a stabilisation of the prices of FPGA in recent months, and the delivery times are usually 24 weeks or longer.

Product	Brand	Pricing	Lead Time (Weeks)
Spartan 6, XC6Sxxx series	Xilinx/AMD	→	16-26/+
Artix 7, XC7Axxx series		→	18-24/+
Virtex-6, XC6Vxx series		→	18-24/+
Kintex UltraScale, XCKUxx series		→	18-24/+
Cyclone 10 LP, 10CLxxx series	Intel/Altera	→	24-39/+
MAX 10, 10Mxxx series		→	24/+

Product	Brand	Pricing	Lead Time (Weeks)
Cyclone V, 5Cxxx series		→	24/+
Cyclone IV, EP4Cxxx series		→	24-39/+

4. Market Opportunities and Risks

4.1 Opportunities

4.1.1 Demand for Mobile Phones and PC Chips May Recover Slightly

Mobile Phone Market: The demand for mobile phones in the third quarter appears to be recovering. According to IDC data, global smartphone shipments in the third quarter surpassed 303 million units, an increase of 14.13% from the second quarter, and a decrease of -0.1% from the previous year. A good performance was achieved by mobile phone chip manufacturers. In Q3, MediaTek's mobile phone business revenue increased by 19% quarterly, while Qualcomm's mobile phone business performance exceeded previous expectations. It has been anticipated that mobile phone business revenue growth will continue to accelerate in Q4.

PC Market: Intel’s Q3 performance exceeded market expectations, and its client business performed well. The company reported that customer inventory adjustments have been completed in the first half of the year, and it is expected that the client business in Q4 will continue to grow solidly, reflecting the recovery in the PC market.

4.1.2 Tech Giants Flock to AI Chips with Hefty Growth

Besides the launch of chips by NVIDIA and AMD, large international cloud service providers (CSPs) have invested in the research and development of their own application-specific chips (ASICs) to meet their specific requirements. AI chips will continue to grow in demand as a number of technology giants enter the market.

4.2 Risks

4.2.1 Negative Outlook for Industrial Manufacturers

In its report, Texas Instruments noted that the outlook for the industrial sector is expected to deteriorate in the third quarter, the demand for electronic components, such as industrial equipment, is expected to remain weak.

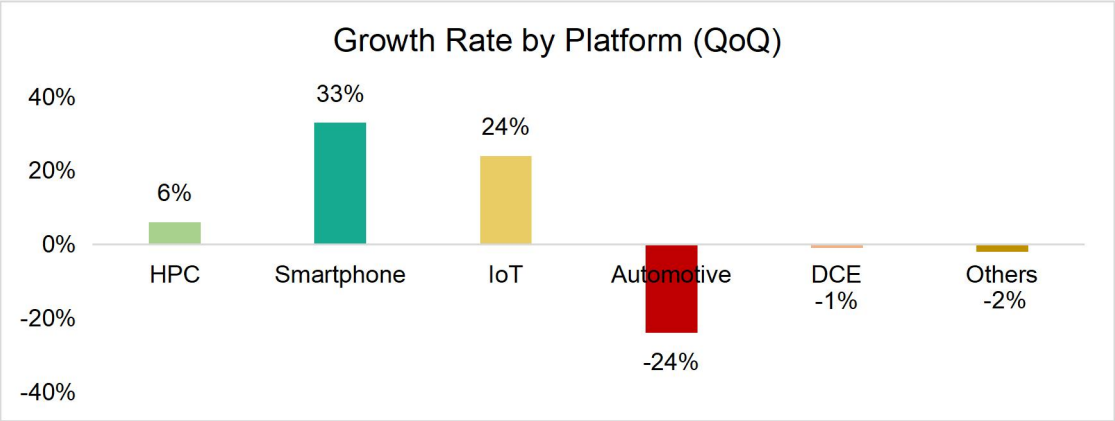
Looking ahead to the fourth quarter, STMicroelectronics expects that the demand for MCU in the industrial market in China to be lower than expected. The delivery times for MCU capacity utilisation have returned to normal, and order visibility is low in the industrial market.

4.2.2 Automotive Chips Growth Slows Down

The automotive landscape has undergone a significant change. From a demand perspective, the growth of consumer demand for electric vehicles may be slowed down by the impact of the global high interest rate environment. On the supply side, chip manufacturers have increased their production of automotive chips in the recent years in order to meet the growing demand. As a result of changes in demand fundamentals, automotive chips may face overcapacity issues in the future.

As evidenced by TSMC's Q3 performance, the revenue structure has changed, and the automotive field has declined during the quarter.

Quarterly Growth Rate of TSMC by Platform



Data Source: TSMC

Conclusion

There is still uncertainty prevailing in the global manufacturing industry in October, and the semiconductor sector in Asia-Pacific is still recovering, but Japan’s trend remains downward.

The United States has expanded chip export controls to China in order to further restrict the development of China’s semiconductor industry.

Although the industry continues to recover, its prosperity remains a low level. As a result, ASML's quarterly new orders decreased by 42% compared to the second quarter. The revenue generated by wafer foundries is expected to decline by 13.8%. As memory chip manufacturers have reduced their production, the average price of memory chips increases.

The consumer electronics market is expected to exhibit a slight upward trajectory in November, which will increase the demand for mobile phone and PC chips, while industrial and automotive markets will remain relatively weak.

Overall, although the outlook for global manufacturing industry is uncertain, the semiconductor industry continues to demonstrate a recovery trend. In light of the ever-changing policies and restrictions from countries throughout the globe, the semiconductor market landscape is going to continue to evolve.

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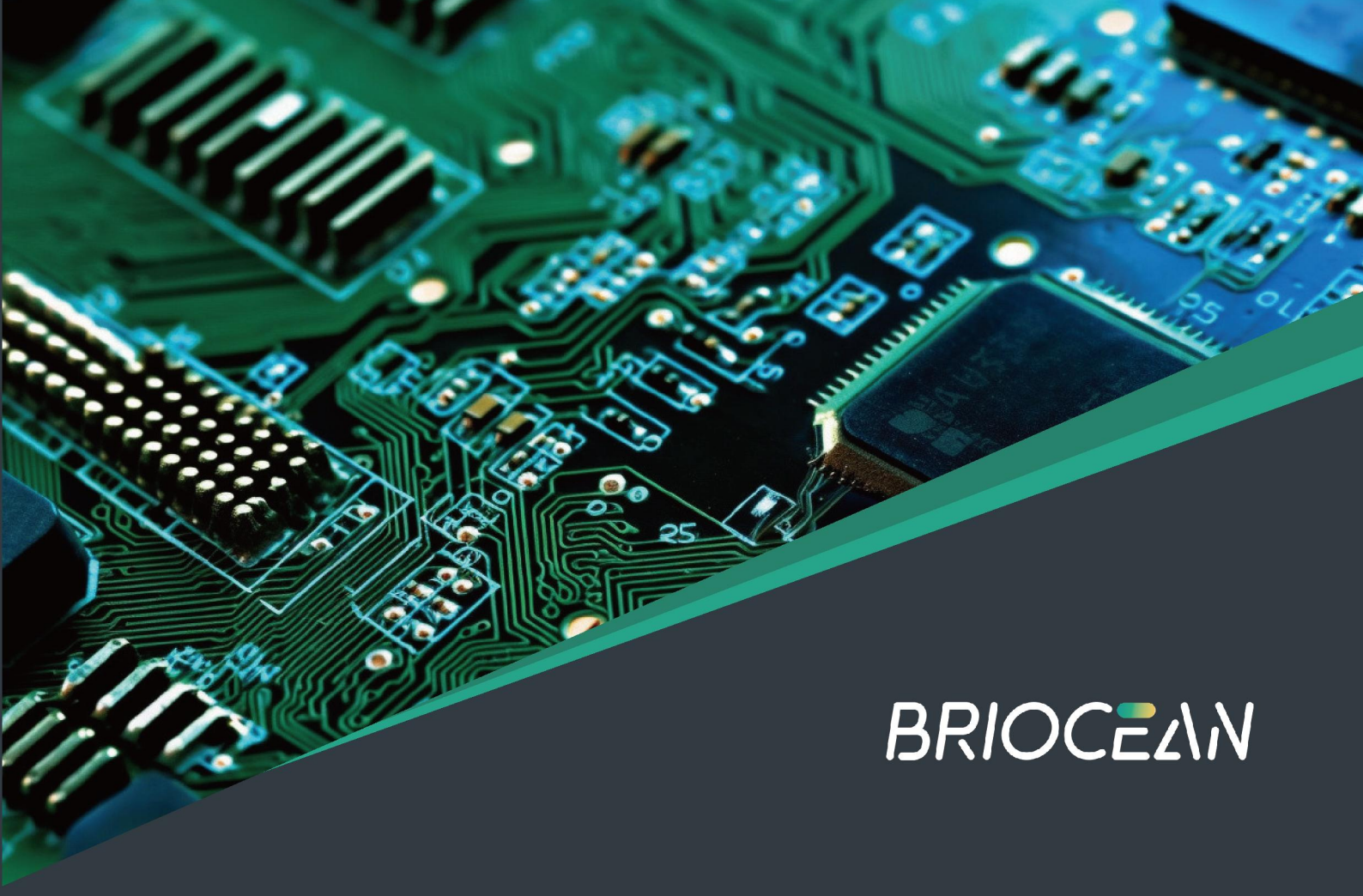

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Working with over 10,000 global electronic component suppliers, Briocean strives to meet the various clients' demands on component shortages and cost savings. With the aim of providing clients with reliable and trackable procurment supply chain services, 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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