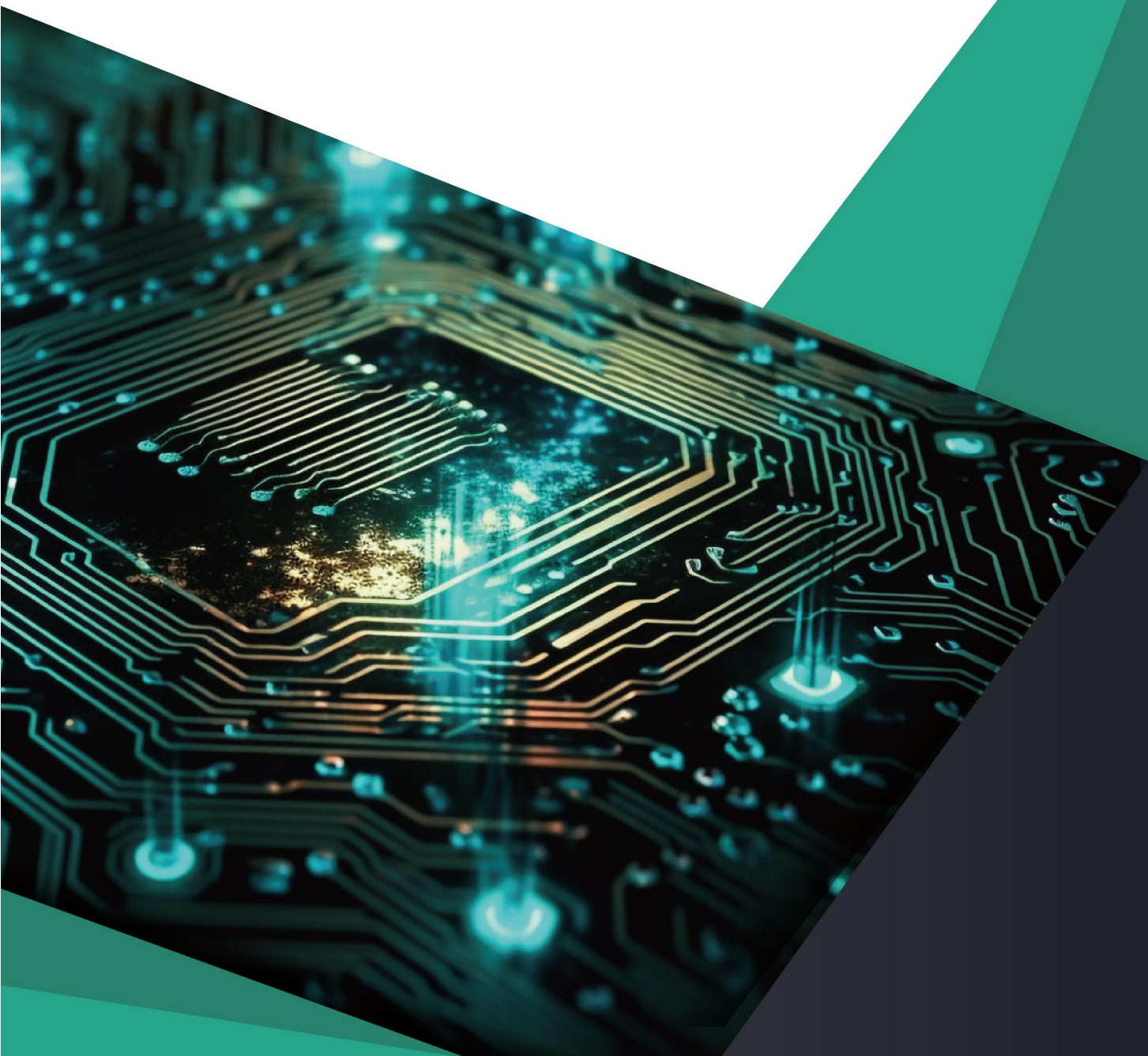
BRIOCEAN

# Monthly #MarketMatters Report

## September 2023



# CONTENT

## Executive Summary

This report provides an overview of the semiconductor industry in September, 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.

As manufacturing and semiconductor sectors continue to recover, competition between China and the United States has intensified. On the application side, the global automotive industry is facing a mixed environment. Despite the autoworker strike in the United States, China's sales are continuing to grow. As a result, the market landscape may slightly shift.

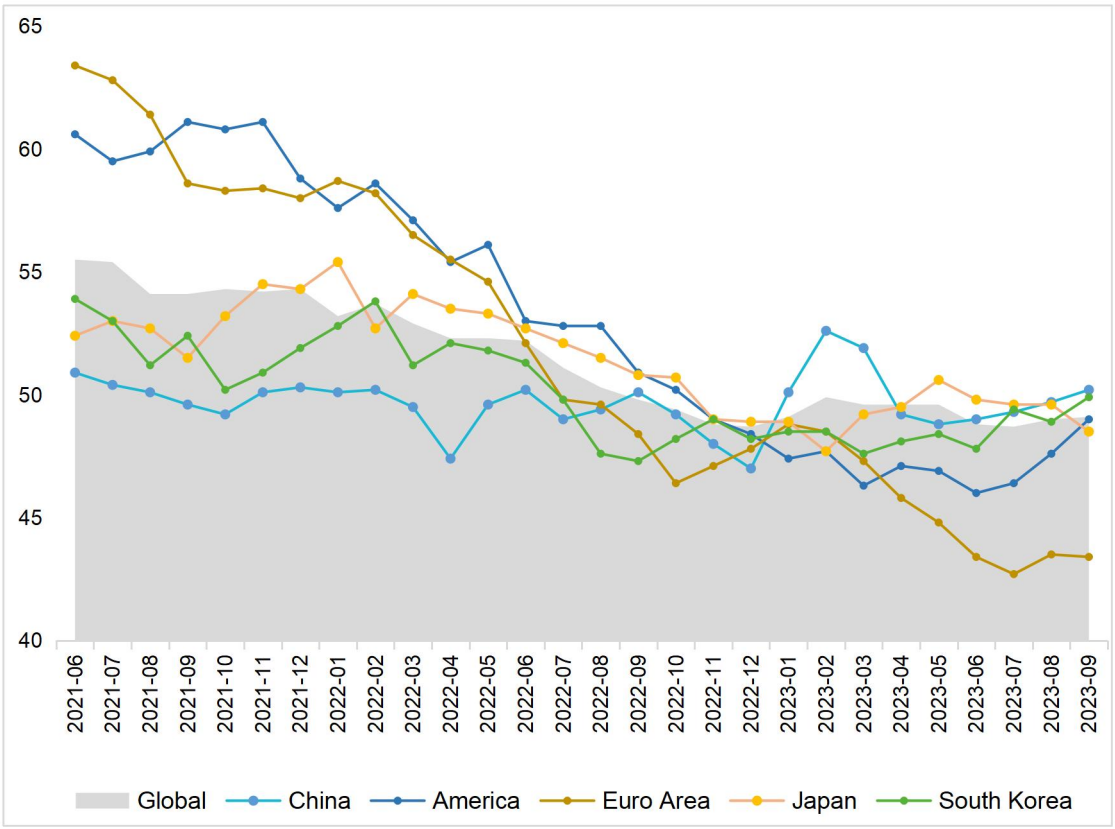
A clear recovery has been seen in memory chips in September, and this trend is set to continue in October. In addition, AI chips are still in high demand due to the positive outlook for the AI sector. The CIS market may have a bleak future, however, as the demand for smartphones is weak.

# 1. Macro Environment Overview

## 1.1 Global Manufacturing Industry has Recovered Steadily

In September, the global manufacturing purchasing managers' index (PMI) was 49.1. The manufacturing PMIs for the United States, China, and South Korea were all higher in September than in August, with China showing the most improvement, indicating that the economy is expanding. On the other hand, the manufacturing PMIs in Europe and Japan declined.

**Manufacturing PMIs**

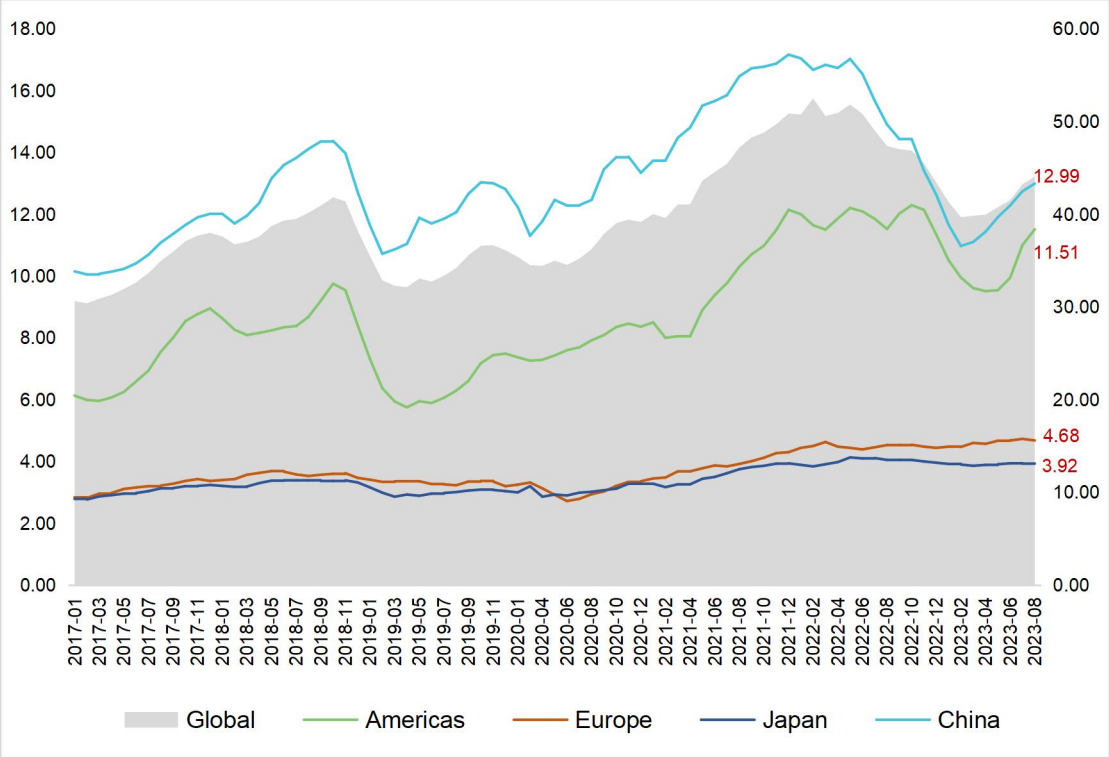



*Data Source: Choice*

## 1.2 Semiconductor Sector Shows a Continued Recovery

There has been a continued recovery in the global semiconductor market demand. SIA's latest data indicate that the global semiconductor sales totaled USD 44.04 billion in August 2023, a decline of 7.0% over a year ago but a rise of 1.9% from last month. In the same period, the decline continued to narrow, however the month-over-month recovery continued. Comparing to July 2023, the semiconductor sales in America and China increased by 4.64% and 1.96%, respectively, while those in Europe and Japan decreased slightly.

**Semiconductor Industry Market Size (USD, billion)**




*Data Source: SIA*

## 1.3 U.S. Finalises Rules to Prevent the Transfer of Chip Funds to China

It was announced on 22 September that the United States would prohibit chip companies competing for a new infusion of federal funding from expanding their businesses, forming partnerships, and conducting research in China described as an effort to enhance national security for the country. Under the final restrictions, firms that receive federal funding will not be able to use it for construction of chip factories outside the United States. They also restrict companies from significantly expanding semiconductor manufacturing in "foreign countries of concern" – defined as China, Iran, Russia, and North Korea – for 10 years after receiving an award. The rules also prohibit companies that receive funding from carrying out certain joint research projects in those countries, or licensing technology that would raise national security concerns to those countries.

## 1.4 U.S. and Vietnam Ink Historic Partnership Deepening Cooperation in Cloud Computing, Semiconductors and AI

Executives at top U.S. and Vietnamese firms in the semiconductor, technology, and aviation sectors met on 11th September seeking to forge business partnerships during U.S. President Joe Biden's visit to Hanoi. At the meeting, Biden reiterated that the two countries were deepening their cooperation in cloud computing, semiconductors, and artificial intelligence, and stressed that Vietnam was important source for essential minerals. The White House highlighted the number of chip-related investments made by the U.S. firms in Vietnam, including plans by Marvell and Synopsys to establish chip design centers there. As part of a pilot project, Honeywell will develop Vietnam's first battery energy storage technology in collaboration with a Vietnamese partner.

## 1.5 China will Launch a USD 40 Billion State Fund to Boost Chip Industry

China is set to launch a new state-backed investment fund that aims to raise about USD 40 billion for its semiconductor sector, as the country ramps up efforts to catch up with the U.S. and other rivals. It is likely to be the biggest of three funds launched by the China Integrated Circuit Industry Investment Fund, also known as the Big Fund. Its target of RMB 300 billion (USD 41 billion) outdoes similar funds in 2014 and 2019, which according to government reports, raised RMB 138.7 billion and RMB 200 billion respectively.

| No | Date of establishment | Funding Scale (RMB, billion) | Areas of Investment | Main Investment Targets |
|---|---|---|---|---|
| 1 | 2014.09.24 | 138.72 | Wafer processing, IC design and packaging and testing | SMIC, Huahong Semiconductor |
| 2 | 2019.10.22 | Over 200 | Equipment & Materials | NAURA, AMEC |
| 3 | / | 300 | Chip manufacturing equipment | / |

# 2. Semiconductor Industry Overview

## 2.1 Silicon Wafer/Equipment

The lack of demand from clients may result in a decline in shipments from material and equipment manufacturers.

| Classification | Company | Updates |
|---|---|---|
| Silicon Wafer | Global Wafers | · Customers' expectations for revenue for Q3 have improved |
| Equipment | ASML | · Ships first pilot tool in 2023 for next product line |

## 2.2 IDM/Fabless

Following the continuation of production cuts, memory manufacturers began to announce increases in contract prices in Q4.

| Company | Updates |
|---|---|
| Samsung | · Developed the world's first unmanned semiconductor packaging line, and plans to automate all packaging plants by 2030<br>· U.S. factory is expected to start producing 4nm chips by the end of 2024<br>· Expanded its automotive MLCC production base to the Philippines and will increase investment in Busan and Tianjin plants<br>· A 10% to 20% increase in the price of mobile phone memory chips<br>· *NAND Flash* memory production has been reduced by 40%, and the target is to reach 50% by the end of the year<br>· *DDR4* production is expected to be reduced again during the second half of the year – resulting in a rise in prices<br>· Q3 performance is expected to improve month-on-month, but production cuts will cost Samsung Electronics more than expected |
| AMD | · Data center business is expected to grow rapidly in the second half of the year |
| SK Hynix | · The construction of its first factory in Yongin is expected to begin in 2025 and completed by 2027 |
| Nvidia | · About 3,600 tons of *H100 GPUs* are expected to be sold this year |
| Intel | · Tower Semiconductor will receive foundry services if the acquisition deal fails<br>· Cooperated with TSMC to develop multi-chip packaging chips |
| Qualcomm | · To supply BMW and Mercedes with chips for displays |
| Broadcom | · Revenue forecast for the next quarter was below expectations due to broader weakness in demand |

## 2.3 Foundry

DIGITIMES estimates that the wafer foundries in Taiwan will generate USD 77.9 billion in revenue this year, a decrease of 13% from last year. It is expected that the revenue of the wafer foundry industry will rebound next year.

| Company | Updates |
|---|---|
| TSMC | · Despite a short-term shortage of CoWoS production capacity, the overall inventory adjustment is expected to continue into the fourth quarter<br>· Developing new products with Broadcom and NVIDIA, such as silicon photonics technology and, packaged optical components, which are expected to gain large orders and will step into the mass production in 2025 at the earliest<br>· A slowdown in the construction of the Hsinchu Baoshan 2nm factory has led to the postponement of mass production until 2026 |
| UMC | · Capacity utilisation is expected to range from 64% to 66%, shipments will decrease by 3% to 4%, average selling prices will increase by approximately 2%, and revenue and expenditure capital will remain at USD 3 billion |
| PSMC | · Expected to launch low-priced popular AI chips next year, targeting the consumer market next year |
| Global Foundries | · Signed a ten-year USD 3.1 billion chip supply contract with the U.S. Department of Defense |

## 2.4 Packaging Test

The availability of CoWoS advanced production capacity continues to be limited.

| Company | Updates |
|---|---|
| ASE | · It is possible that the volume of orders for CoWoS advanced packaging interposers will double, and the price may rise |
| JCET | · Accelerated the expansion of manufacturing capacity for mid- to high-power devices<br>· Revenue for the third-generation semiconductor market solution is expected to grow significantly |

## 2.5 Applications

### 2.5.1 Automotive

Global automotive industry is in a tumultuous month. The UAW strike is expected to reduce auto production by nearly a third, Britain's decision to delay the ban on new fossil fuel cars has raised concerns among automakers about supply chains and investment uncertainty, and the European Commission is investigating whether punitive tariffs may be imposed to protect European automakers from Chinese electric vehicle imports.

| Company | Updates |
|---|---|
| TESLA | · Released refreshed Model 3 with longer driving range in China |
| BYD | · Expanded EV sales in Southeast Asia through partnerships |
| Nio | · Launched an EV-compatible smartphone |
| Continental | · Integrated Google Cloud into vehicle cockpit |
| Bosch | · Sales in the core mobility division are expected to grow by 10% in 2023 |

### 2.5.2 Industrial Automation

China's leading manufacturers have increased their overseas investments and expanded their global footprint in recent years.

| Company | Updates |
|---|---|
| Emerson | · An acquisition of National Instruments for USD 8.2 billion has been approved by the European Commission's antitrust authority |
| Siemens | · Signed a deepening strategic cooperation 2.0 agreement with JinkoSolar |
| SUPCON | · Planned to establish four overseas wholly-owned subsidiaries through the overseas investment holding platform SUPCON International Holdings, with a total investment of RMB 1.744 billion |
| Rockwell | · Acquired autonomous robotics company, Clearpath |
| Schneider Electric | · Launched MSS security hosting service to help enterprises reduce potential network risks |
| ABB | · Invested USD 280 million in the European Robotics Centre in Sweden, providing customers with AI collaboration and industrial robots, as well as digital solutions to support flexible automation |

### 2.5.3 Telecom

The demand for telecommunication infrastructure, including computing power and optical modules, is expected to rise as artificial intelligence advances.

| Company | Updates |
|---|---|
| Huawei | · Reached a global patent cross-licensing agreement with Xiaomi to end patent disputes<br>· Tested 5.5G functionality successfully |
| ZTE | · Jointly promoted the Open-DTN cooperation plan with China Mobile |
| Ericsson | · Partnered with Deutsche Telekom to offer software tools for developers and business customers that will allow telecom companies to get more revenue |
| Reliance Jio | · Raised up to USD 2 billion in offshore loans, with BNP Paribas acting as lead arranger, to fund the purchase of 5G network gear from Ericsson |

### 2.5.4 Energy Storage

In response to the explosive growth in industrial and commercial energy storage demands, many manufacturers have accelerated the development of products in this area.

| Company | Updates |
|---|---|
| TESLA | · Launched *Powerwall 3* home energy storage system, solar grid-connected efficiency reaches 97.5% |
| Fluence | · Partnered with Statkraft for 50 MW energy storage project |
| CATL | · Signed storage system contracts worth more than AUD 1 billion with Western Australia Government |
| LG Energy Solution | · Planned to make additional investments in the United States, aiming to expand its shares in the global energy storage market |

### 2.5.5 Medical Equipment

Several leading medical equipment companies and chip manufacturers are collaborating on digital medical solutions.

| Company | Updates |
|---|---|
| Abbott | · Acquired Bigfoot to develop personalised connected solutions for diabetics |
| Asensus Surgical | · Collaborated with NVIDIA to develop digital surgical solutions using NVIDIA's artificial intelligence computing platform |
| Paige | · Partnered with Microsoft to build the world’s largest oncology digital pathology AI program |
| Medtronic | · Medtronic Canada ULC has formed a strategic partnership with AI start-up, FluidAI Medical, to jointly participate in the Continuous Connected Patient Care (CCPC) project |
| GE Healthcare | · Signed a strategic cooperation framework agreement with the Kazakhstan government, planning to invest more than USD 60 billion in four areas, including ultrasound equipment, CT scanners, angiography machines and mammography machines |

### 2.5.6 Consumer Electronics

According to DIGITIMES Research, global tablet shipments will increase sequentially in the third and fourth quarters.

| Company | Updates |
|---|---|
| Apple | · Self-developed 5G modem may be delayed until 2025 |
| Huawei | · Mate 60 Pro and Mate 60 Pro+ shipments have been raised to 20 million units |
| Xiaomi | · Xiaomi 14 series is scheduled to be released in early November, and the number of omni-channel stocking orders has increased significantly by 60% compared to the same period last year |

# 3. Market Trend of Products

## 3.1 Discrete

In September, Infineon's high-voltage cooling MOSFET products were relatively in short supply, and the price of Infineon's automotive components was also rising, such as TLE, IPD and AUIR series high-voltage MOSFET components.

ST announced that it will provide the latest third-generation 750V silicon carbide power MOSFET chips for BorgWarner's Viper power module. This power module will be used by BorgWarner to develop electric drive inverter platforms for Volvo and many future pure electric vehicles. ST's cooperation with BorgWarner will help improve Volvo's vehicle performance and cruising range, and will also expand SiC production capacity to fully support global automotive and industrial customers' transformation towards electrification and efficiency.

| Product | Brand | Pricing | Lead Time (Weeks) |
|---|---|---|---|
| MOSFETs | Vishay | → | 12-32/+ |
| | Infineon | → | 22-39/+ |
| Rectifiers | ONSEMI | → | 12-22/+ |

## 3.2 Analog

The consumer analog device market has not yet recovered from the destocking of consumer analog devices over a long period of time. The level of inventory held by clients remains high, primarily due to the expansion of orders placed by end-user.

The prices of TI's general-purpose PMICs continue to decline, however, other special-purpose chips and signal chips are experiencing very small price reductions. Furthermore, ADI lowered ex-factory prices, resulting in the current contract price being higher than the secondary market price.

| Product | Brand | Pricing | Lead Time (Weeks) |
|---|---|---|---|
| Operational Amplifiers | ADI | → | 7-20/+ |
| | TI | ↘ | 6-26/+ |
| ADCs | ADI | → | 13-26/+ |

## 3.3 Passives

Major manufacturers have actively controlled production capacity utilisation and have strictly managed output after more than a year of inventory adjustment. The current inventory level has fallen below healthy levels. Mobile phone brands in mainland China have seen a wave of price reductions and promotions in preparation for Apple's new iPhone 15 series. This has stimulated the shipment of mid-range to low-end mobile phones.

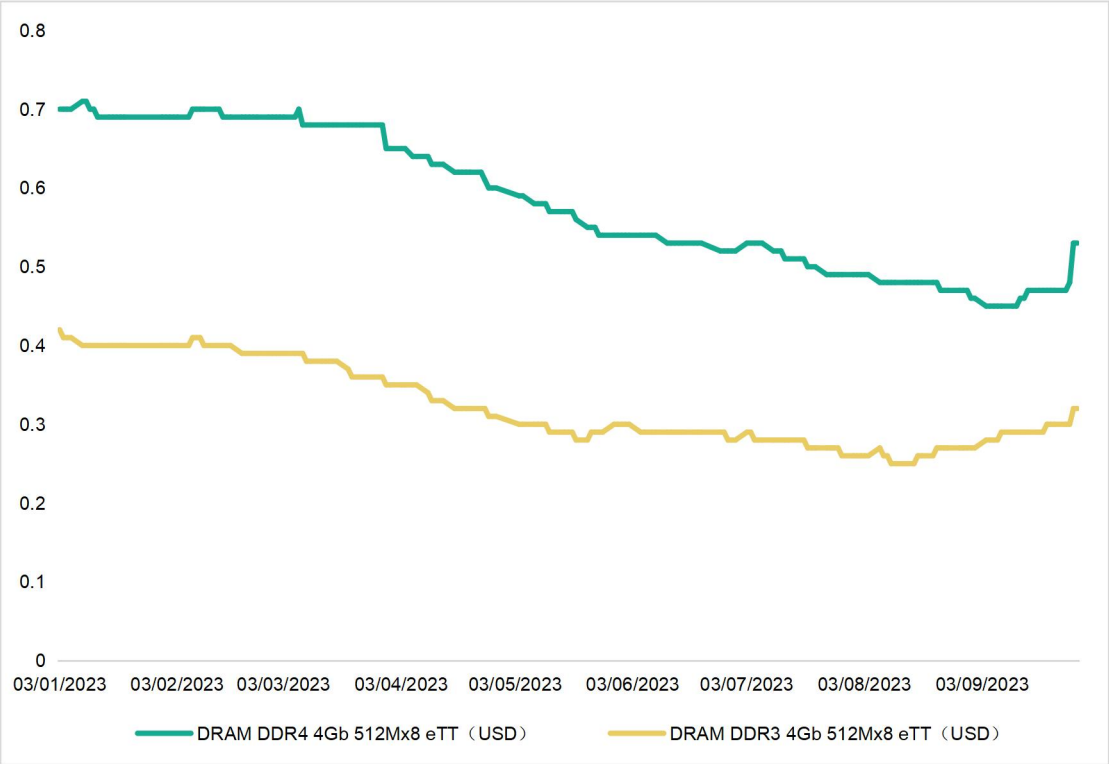
The price of passives component tends to be stable.

| Product | Brand | Pricing | Lead Time (Weeks) |
|---|---|---|---|
| Chip Resistor | Vishay | → | 18-32/+ |
| | ROHM | → | 12-24/+ |
| | Stackpole Electronics Inc. | → | 13-22/+ |
| Ceramic Capacitors | Kemet | → | 16-30/+ |
| | Murata | → | 18-23/+ |

## 3.4 Memory

NAND supply has slowed down recently, and the market continues to consume inventory, leading to rising prices. With increased demand for stocking and some brands raising memory prices, the DRAM market is accelerating to stabilise despite sufficient DRAM supplies.

**Price of DRAM**




*Data Source: Choice*

## 3.5 MCUs

In general, the MCU industry is still destocking, and MCU chip manufacturers' inventory levels are at high levels. In the third quarter, NXP maintained 1.6 months of channel inventory turnover, primarily because the recovery of its Android phone and consumer IoT businesses were not sufficient to drive an increase in its distribution inventory. However, some materials and parts have been replenished, resulting in a price upward trend.

MCU pricing remains stable, while delivery times for 32-bit MCU products have increased.

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

## 3.6 FPGA/CPLDS

The price of FPGA has recently stabilised, and the delivery time is generally around 24 weeks or more.

| 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/+ |
| Cyclone IV, EP4Cxxx series | | → | 24-39/+ |
| Cyclone III, EP3Cxxx series | | → | 24/+ |

# 4. Market Opportunities and Risks

## 4.1 Opportunities

### 4.1.1 Price Increases for Memory Chips are Gradually Becoming Apparent

The memory market fundamentals have improved since original factories reduced production, with a strong demand for stocking also this month. The supply end is generally reluctant to sell low-priced inventory, pushing finished products prices to steadily rise in line with costs.

In response to sluggish demand, Samsung announced it would cut production by 50%, while focusing on processes below 128 layers. According to TrendForce's September forecast, other suppliers are expected to reduce production in the fourth quarter. It is estimated that the average price of NAND Flash in the fourth quarter will remain stable or rise slightly, with an increase estimated between 0% to 5%.

| | 23Q1 | 23Q2 | 23Q3E | 23Q4F |
|---|---|---|---|---|
| Total | Down | Down | Down | Up |
| NAND Flash | 10% - 15% | 10% - 15% | 5% - 10% | 0% - 5% |

### 4.1.2 AI Chips Remain in High Demand

According to server ODM manufacturers, there is a strong demand for AI servers and AI chips continue to be in short supply. Additionally, Amazon AWS plans to invest in the development of its own chips in response to the strong demand for AI.

In the area of back-end packaging and testing, TSMC has purchased additional CoWoS machines due to the expansion of AI chip order from Nvidia and urgent orders from major manufacturers such as AMD and Amazon. As of the present, TSMC's monthly production capacity for CoWoS advanced packaging is approximately 12,000 pieces. The expansion of production capacity and the purchase of additional equipment will allow TSMC to produce more than 25,000 pieces per month, significantly enhancing its capacity to fulfill AI-related orders.

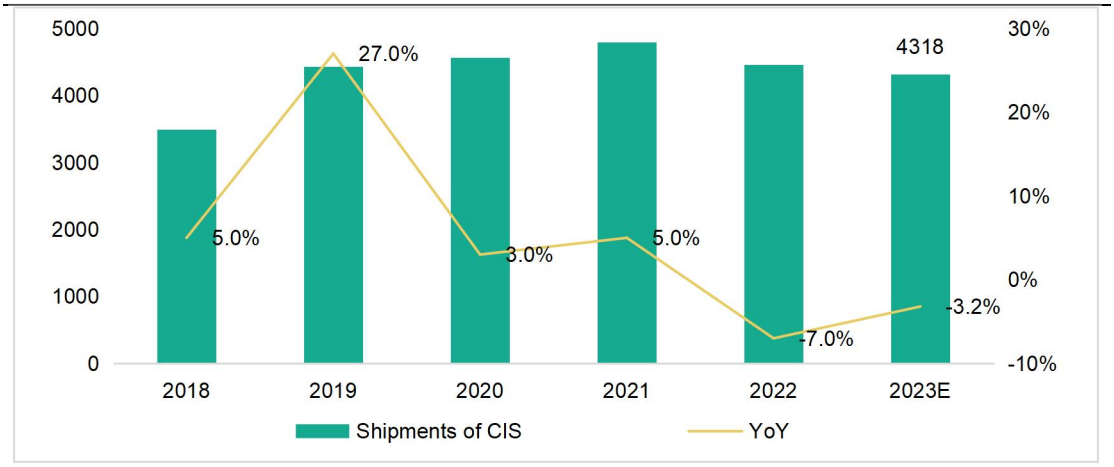
Nvidia is expected to sell 3,600 tons of H100 GPUs this year, according to Omdia.

## 4.2 Risks

### 4.2.1 Smartphone CIS Market Growth is Weak

The global smartphone market continues to face inflation pressure and pessimistic economic prospects. In addition, as smartphone product development matures, consumers continue to extend their replacement cycles. The growth momentum of the market is weak, and CIS shipments are expected to decline simultaneously. As estimated by TrendForce, global smartphone CIS shipments will amount to approximately 4.3 billion units in 2023, a year-on-year decrease of 3.2%.

**Shipments of CIS**




*Data Source: TrendForce*

# Conclusion

As of September, the global manufacturing PMI has stabilised at a low level and the semiconductor sector continues to recover. A ban has been imposed by the United States on keeping funds out of China, and the country has partnered with Vietnam to enhance cooperation in the semiconductor industry, while China intends to establish a state fund to support the development of chip manufacturing equipment. Chipmakers continue to reduce production in September. In addition, the EU commission launched an anti-subsidy investigation into China's new battery electric vehicles, which may prevent China's automakers from expanding market shares in Europe.

In October, memory chip manufacturers are anticipated to maintain strict control over DRAM and NAND Flash supplies, resulting in an upward trend in the price of memory chips. As far as AI chips are concerned, the stable demand for AI chips will provide a promising market outlook. However, smartphone CIS market will experience a slow growth as the demand for smartphones continues to be subdued.

In conclusion, the competition in the semiconductor industry between countries is becoming increasingly fierce. It is worth noting that there is a strong demand for artificial intelligence chips. This might provide chipmakers and distributors with an opportunity to grow their businesses in the future.

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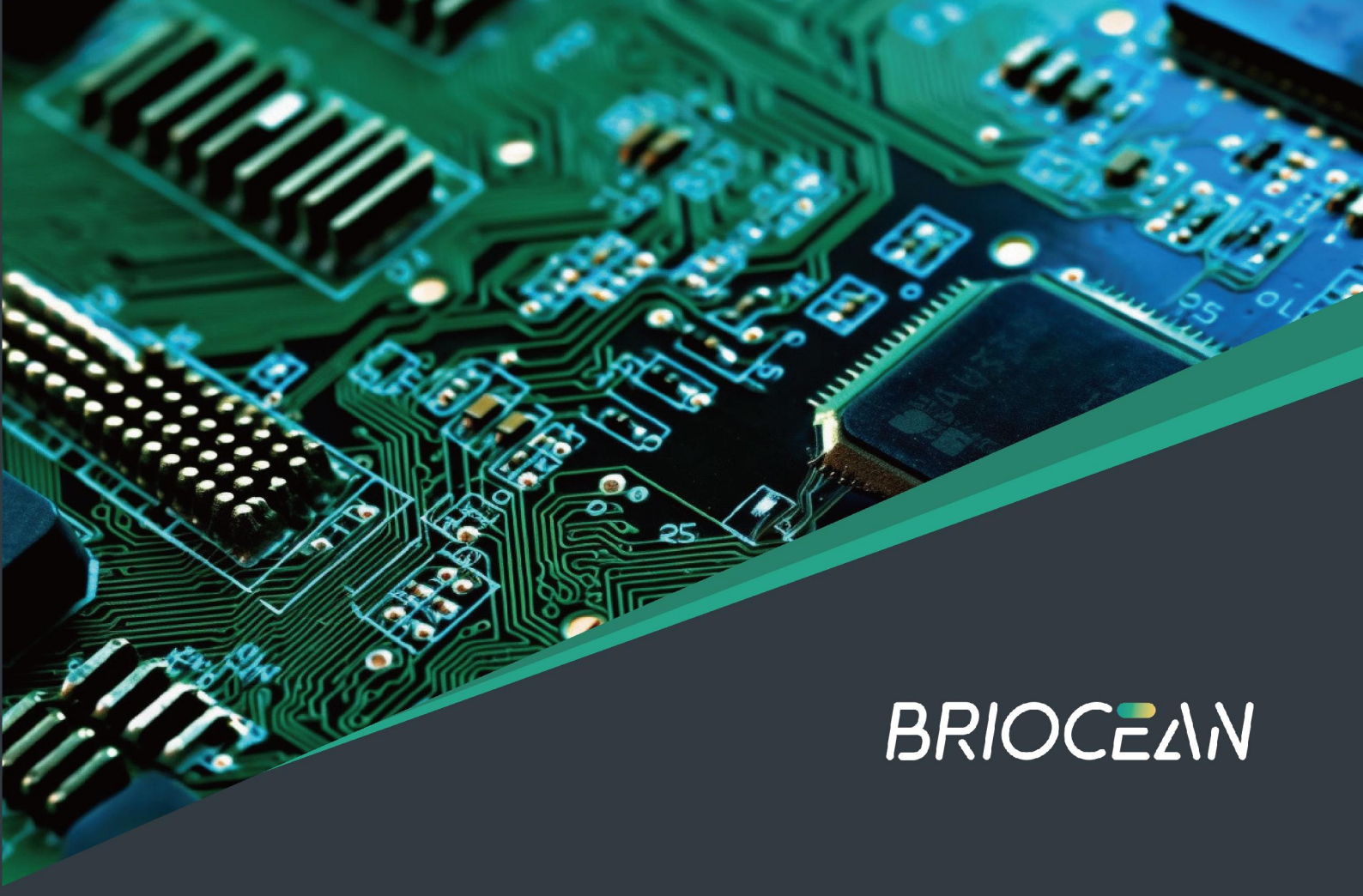

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