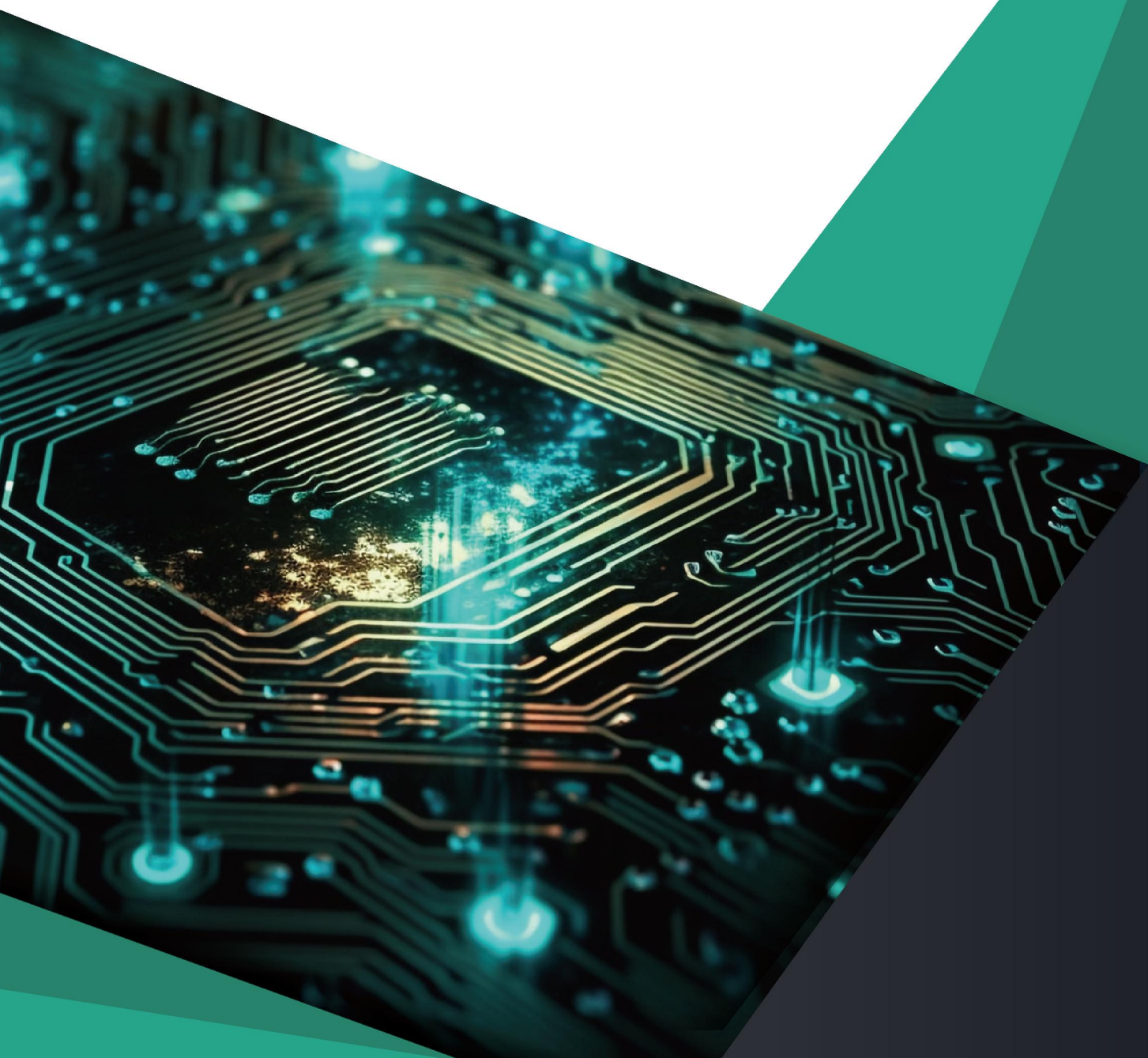
BRIOCEAN

Monthly #MarketMatters Report

August 2023



CONTENT

Executive Summary

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

The global manufacturing industry has made a modest recovery, and countries around the world have taken various measures to strengthen the supply chain of semiconductors. Furthermore, uncertainty continuously surrounds consumer electronics market while electric vehicle (EV), artificial intelligence (AI) and energy storage sectors are significantly expanding.

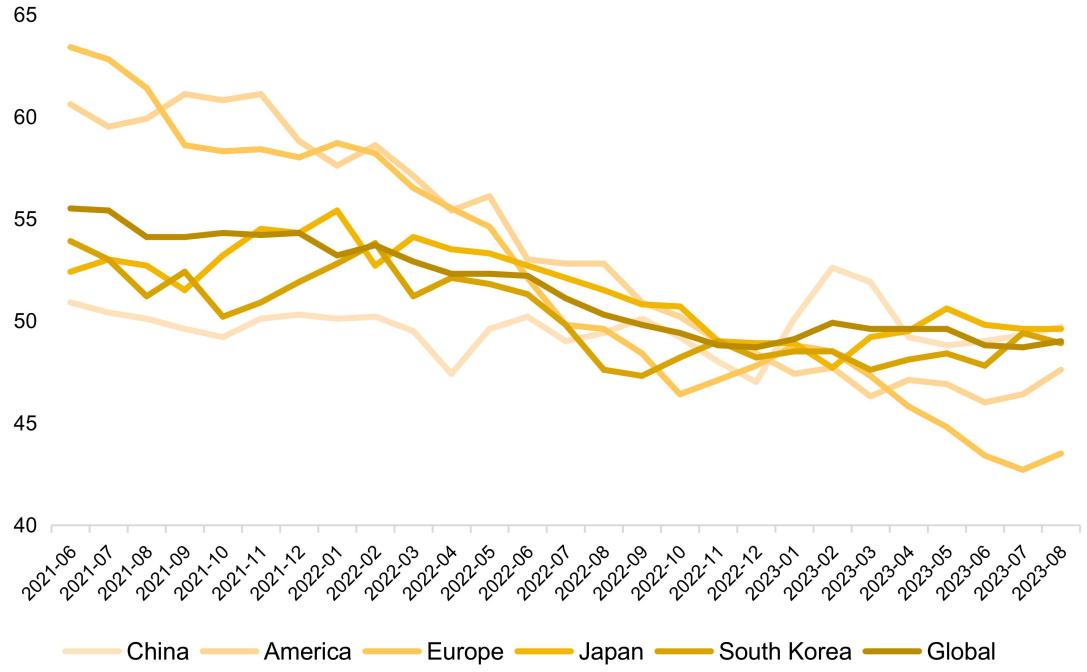
According to forecasts, the markets for Micro LED chips, BMIC and AI GPU are anticipated to exhibit steady growth. However, the recovery of the demand for passive and active optical devices is limited as telecom players plan to decrease CapEx and the price of driver ICs continues to be under pressure.

1. Macro Environment Overview

1.1 Global Manufacturing Industry has Made a Modest Recovery

The manufacturing purchasing managers' index (PMI) of the world in August is 49.0, an increase of 0.3pct month-on-month (MoM). The manufacturing PMIs of the United States, Europe, Japan and China in August have rebounded as compared to July 2023. However, South Korea showed a decline of 0.5pct MoM.

Manufacturing PMIs

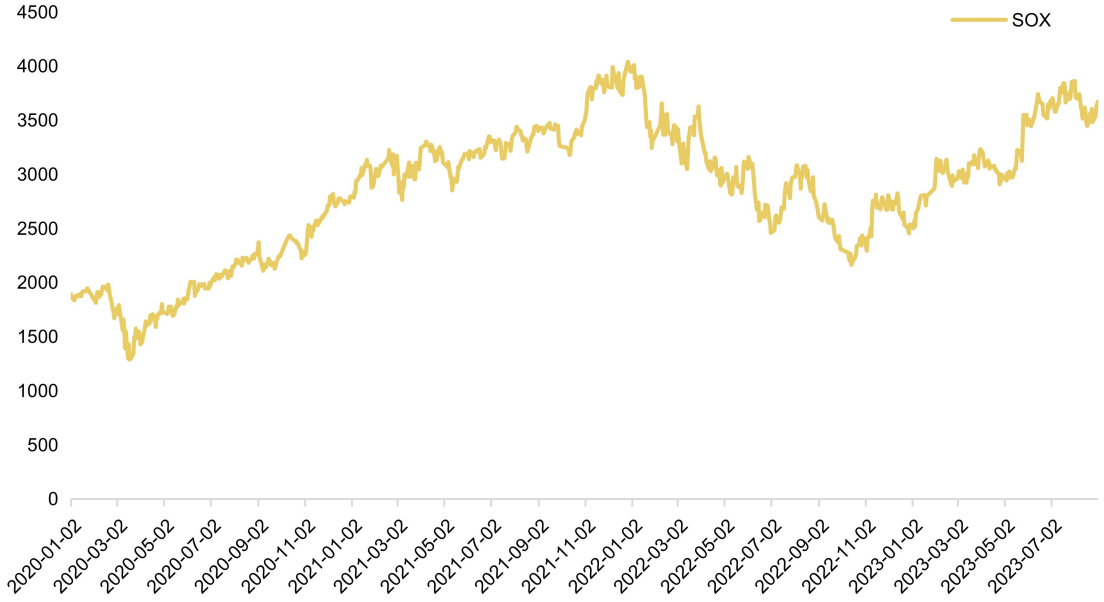


Data Source: Choice

1.2 Semiconductor Sector Shows a Small Downturn in August

From the view of capital market, the PHLX Semiconductor Sector (SOX) indicating the outlook for semiconductor industry, showed a downward trend in early August, and then rebounded in mid-August. This presented uncertain expectations for the semiconductor market in August.

Philadelphia Semiconductor Index



Data Source: Choice

1.3 United States, Japan and South Korea Agree to Expand Security and Economic Ties

On 18 August, the United States, Japan, and South Korea have agreed on a mechanism at the Camp David summit where the three countries will exchange information on the supply of semiconductors, critical minerals, batteries, and other industrially critical products. The three countries has also established a dedicated early warning mechanism to deal with possible supply disruptions, and if there is a shortage of these commodities, the three countries will be able to exchange information early, formulate measures, and reduce adverse impacts on the supply chain.

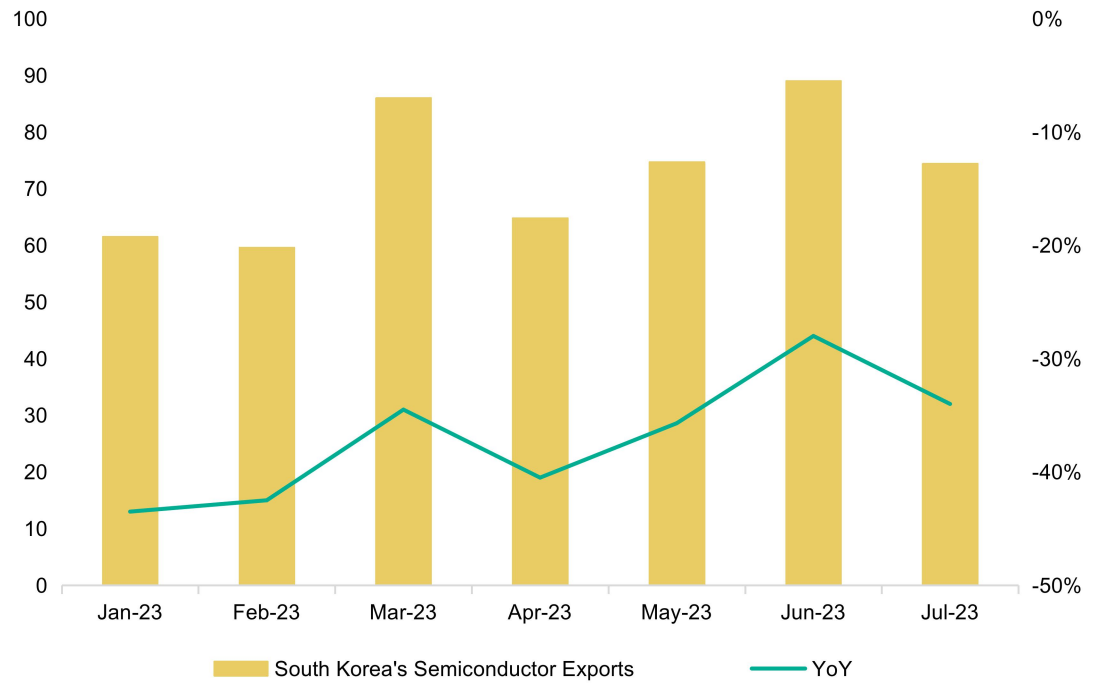
1.4 Tax Break for Domestic EV Battery and Chip Production in Japan

From April 2024, Japan plans to reduce corporate taxes based on the output of batteries and chips, encouraging companies to bring production home from China and facilitating the country's energy transition. To secure supply chains for strategic goods, Japan has also unveiled billion-dollar subsidies for chipmakers such as TSMC and Micron to build plants in Japan, and enacted on the Economic Security Promotion Act last year.

1.5 South Korea to Grant KRW 23 Trillion in Financing Support for Exporters

South Korea will expand financing support for exporting companies by around 50% more this year. The Financial Services Commission will provide a total of KRW 23 trillion (USD 17.2 billion) worth of financial support for exporters through public and private banks from September 2023, along with other measures to ease difficulty in trade financing. Specific measures include expanded credit and lower borrowing costs for companies entering new markets, bidding for overseas project orders, and making investment in major industries such as semiconductor, rechargeable battery, biopharmaceuticals, and nuclear energy. As an export-dependent country, exports from South Korea declined in July for the tenth consecutive month and at their fastest rate in more than three years, increasing concerns that the slump may last longer than anticipated due to weak demand.

South Korea's Semiconductor Exports



Data Source: KCs

2. Semiconductor Industry Overview

2.1 Silicon Wafer/Equipment

ASML is accelerating the export of lithography machines to China before the curb comes into force, making up for the losses of the three major customers to reduce the purchase of lithography machines.

Classification	Company	Updates
Silicon Wafer	SUMCO	· Sumco sees sluggish silicon wafer demand continuing into 2024
Equipment	ASML	· Exports of lithography machines to China continue to double
	AMEC	· Profit boosted by strong local demand

2.2 IDM/Fabless

The artificial intelligence (AI) boom continues with major chipmakers actively increasing AI chip shipments.

Company	Updates
SAMSUNG	· Set to fabricate *ISELED* driver chips for Inova in Q4 2024 · Established new *Future Technology Office* to compete in differentiated markets · To mass produce over-300-layer 3D NAND chips in 2024 with double-stack process
SK Hynix	· Showcased 321-layer NAND sample
ST	· Airbus collaborated with ST on power electronics for aircraft electrification
INTEL	· Won a deal with US government, seizing the potential orders · Called off Tower Semiconductor deal
Infineon	· Increased investment in Malaysia as Q3 revenue exceeds expectations
ON SEMI	· Anticipated strong Q3 revenue growth driven by the robust performance of silicon carbide.
Qualcomm	· Anticipated sales below expectations as the smartphone downturn continues · Reduced the price of low-end 5G mobile phone chips by 1% to 2%
MICRON	· Launched memory expansion module portfolio to accelerate adoption of *CXL 2.0*
AMD	· Production of flagship *MI300* AI chips will be ramped up in the fourth quarter
NVIDIA	· Baidu, ByteDance, Tencent and Alibaba ordered USD 5 billion in chips from Nvidia · About 550,000 *H100* chips will be shipped worldwide this year, mainly to US technology companies

2.3 Foundry

Affected by sluggish terminal demand and market competition, wafer foundries have generally reduced prices. However, the price discount has not been effective, and the recent capacity utilisation rate of wafer foundries such as Samsung, Key Foundry and SK Hynix System IC is only between 40% and 50%.

Company	Updates
TSMC	· Lowered its foundry quotes for the next few quarters due to a lack of order visibility and order momentum from customers · Agreed to invest in VIS's 12-inch fab to be set up in Singapore · The Board of Directors has approved investment in the establishment of a 12-inch fab in Germany
VIS	· Due to inventory adjustments and the global economic recovery, its 8-inch fab utilisation will increase in the future
SMIC	· Third-quarter revenue is expected to rise by 3% to 5% sequentially, with a gross margin of 18% to 20%

2.4 Packaging Test

Major semiconductor manufacturers have cut into the packaging link and laid out CoWoS advanced packaging capacity.

Company	Updates
ASE	· Provided advanced packaging services for NVIDIA
JCET	· The Automotive Chip Manufacturing Packaging and Testing Project's initial phase began

2.5 Applications

2.5.1 Automotive

The lack of automotive chips has hindered the production capabilites of German automakers.

Company	Updates
TESLA	· Has lowered its weekly production target for its Berlin plant to 4,350 units, and may consider to further reduce production thereafter
BYD	· Partnered with Stingray to introduce in-vehicle karaoke entertainment systems to the international market
Nio	· To produce own autonomous driving chips within the next one to two years
Volkswagen	· Closed direct supply deals for chips to avoid global shortage
Bosch	· Boosted manufacturing in India over the next two to four years
BMW	· Increased investment in electrification ahead of schedule but has not yet determined a specific date to cease production of combustion engine cars
Lucid	· Cut prices of its air luxury sedans by USD 12,400 as part of an offer

2.5.2 Medical Equipment

To accelerate innovation, more and more medical equipment companies have introduced advanced technology into their products to provide better services to the patients.

Company	Updates
Medtronic	· Announced the signing of a strategic cooperation agreement with Asia-Pacific Medical Group, a leading medical service provider in China, to promote the implementation of advanced orthopedic and extraneological diagnosis and treatment services
Omron Healthcare	· The new R&D and production base in Dalian, wholly-owned by Omron Healthcare, was officially completed
Johnson & Johnson Medical	· Announced the launch of two innovative suture products
Henry Schein	· Announced the acquisition of a majority stake in Shield Healthcare to expand into the home medical products segment
BD Medical	· Stripped the surgical instrument platform

2.5.3 Energy Storage

The energy storage market is growing rapidly, and the energy storage battery business of major leading manufacturers has entered the fast lane of growth.

Company	Updates
TESLA	· The first phase of the virtual power plant was launched and will participate in the first virtual power plant service offered by the Texas Power Grid
Fluence	· Entered into a procurement alliance with AESC
CATL	· Signed a strategic cooperation framework agreement with POWERCHINA · Energy storage battery system revenue increased by 119.73% YoY with a gross profit margin reaching 21.32%
NextEra Energy	· Inks 85MW solar PPA with chemical manufacturer Ingevity
Wartsila	· To supply the main power generation and power conversion system for a new 103.16 meter Antarctic support vessel being built for the Brazilian Navy

2.5.4 Industrial Automation

In August, some leading companies in the industrial automation industry have taken significant steps in business expansion by aquisition, resulting in a more concentrated and sophisticated market landscape.

Company	Updates
Emerson	· Acquired Afag to accelerate the upgrade of factory automation capabilities · Increase Emerson's factory automation services market by USD 9 billion and expand its reach in discrete and hybrid marker
Siemens	· Sees weakening demand trends as Q3 misses forecasts · Launched *Calibre DesignEnhancer,* which provides *Calibre design as the correct* IC layout optimisation solution · Cooperated with BayWa to promote the application of low-carbon production in the industrial field
Schneider Electric	· Deepened cooperation with SUEZ Group to help upgrade the global water industry with digital technology
INVT	· Signed a strategic agreement with Jiazhan Intelligence
TE Connectivity	· Reached cooperation with Yunhanxincheng (a well-known production service platform in electronic manufacturing)

2.5.5 Telecom

In the first half of the year, China's domestic telecommunication market demand did not show significant improvement. The demand of overseas telecommunication market was affected by the delay in the progress of 5G construction projects in some regions, and the order scale decreased slightly during the period YoY.

Company	Updates
TPG Telecom	· Received a USD 4.2 billion offer for non-mobile fibre assets from Vocus
Emirates	· Made an upfront payment of EUR 2.2 billion to acquire a controlling stake in its telecom assets in Bulgaria, Hungary, Serbia, and Slovakia
SK Telecom	· Invested USD 100 million in U.S. artificial intelligence firm, Anthropic, to strengthen its telecommunications-driven AI business
Verizon	· Signed a technology deal with India's HCLTech to help manage networks for business customers in a bid to stem a decline in its wireline business
Ericsson	· Predicted intellectual property rights licensing income of SEK 11 billion (USD 1 billion) crowns this year after it renewed a patent cross-licensing agreement with China's Huawei
BT Group	· Opened a 5G lab in the UK with Qualcomm

2.5.6 Consumer Electronics

The PC market may recover modestly. AMD mentioned that the Q2 growth in PC chip segment revenue was due to a surge in sales of *Ryzen 7000 series* processors and an improved PC market environment. Market research agency Counterpoint believes that the PC market is expected to see a moderate recovery in H2 2023.

Company	Updates
Apple	· Apple will cut production of the iPhone 15 series due to supply and demand concerns
ASUS	· PC revenue expected to increase 20% sequentially in the third quarter
HP	· HP will produce laptops in Thailand with supply chain shifts intensifying ODM competition
Honor	· It is expected that *Magic V2* sales will increase by 5 to 10 times compared to the previous two generations
Lenovo	· The first Intel AI PCs will be released in the third quarter

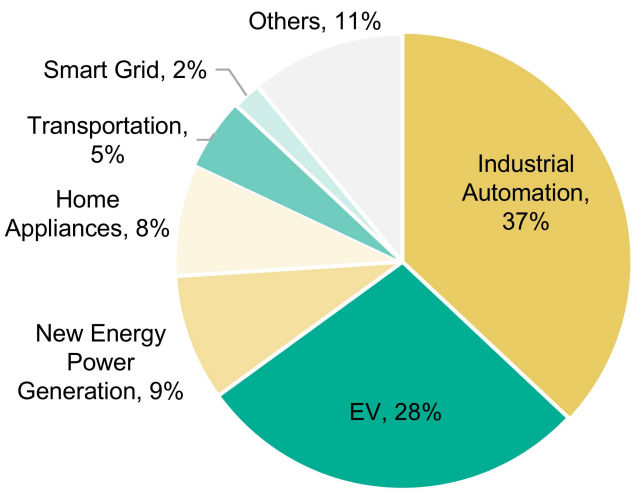
3. Market Trend of Products

3.1 Discrete

IGBT is currently experiencing a shortage resulting in price hikes primarily due to the following factors. Firstly, there is a strong demand with a significant increase in the requirement for IGBTs in both automotive and industrial applications. Secondly, the supply falls short, and the expansion of production capacity is slow. Thirdly, the strong demand for wind energy and energy storage is driving the increased need for IGBTs. Additionally, the use of SiC as an alternative is gaining traction.

According to industry experts, it appears that the shortage of IGBTs may persist until mid 2024. As a result, certain manufacturers have raised OEM prices for IGBT production lines by 10%.

Applications of IGBT



Data Source: Yole, Omedia

Judging from the product prices of various manufacturers, the prices of various discrete devices remained stable. Compared with the products of Vishay and Infineon, the delivery time of ON Semiconductor MOSFET is longer.

Product	Brand	Pricing	Lead Time (Weeks)
MOSFETs	ONSEMI	→	26-50/+
	VISHAY	→	16-30/+
	INFINEON	→	10-26/+
TVS	LITTELFUSE	→	35-70/+
	MICROCHIP	→	25-50/+
	ONSEMI	→	12-45/+
Low Voltage MOSFETs	ONSEMI	→	36-70/+
Rectifiers	ONSEMI	→	12-52/+

3.2 Analog

The overall demand for analog devices is expected to show a downward trend. Judging from the applications, the demand from automotive sector is expected to recover MoM while that from consumer electronics sector remains sluggish. Regarding pricing, leading international manufacturers in the general analog devices domain have consistently lowered prices since the previous year, even aligning them with China's domestic products. This strategy aims to regain market share, clear existing inventory, and incentivise customers to place larger orders.

Product	Brand	Pricing	Lead Time (Weeks)
Operational Amplifiers (OP AMPs)	TI	↘	12-28/+
	ADI	→	12-20/+
Analog to Digital Converters (ADCs)	TI	→	12-26/+
Clock Generators and Synthesisers	ADI	→	12-20/+

3.3 Passives

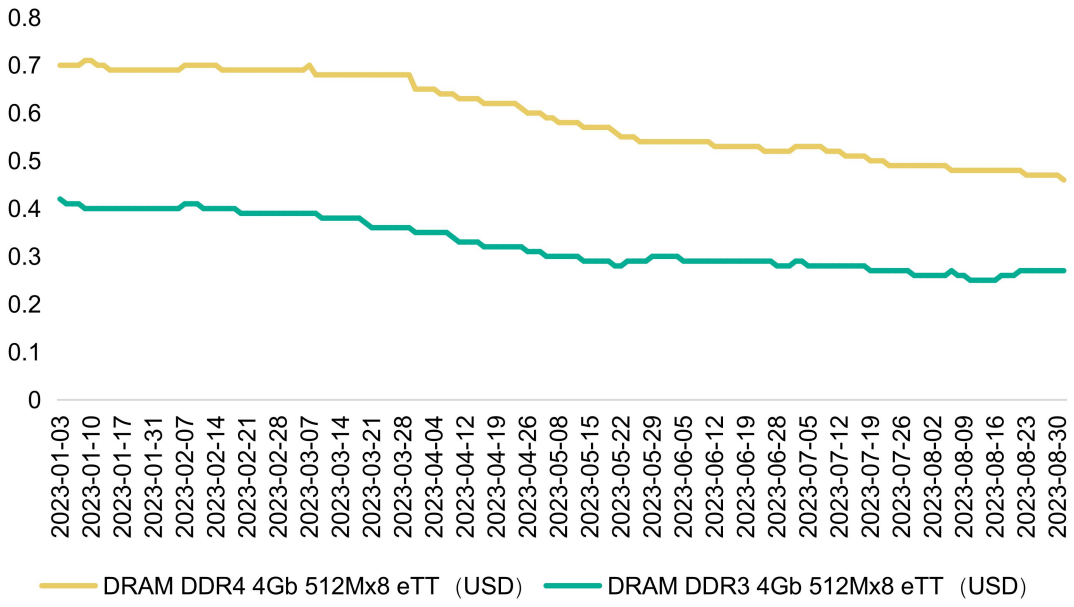
With EVs becoming more popular, the market for automotive capacitors and resistors continues to grow. Due to the shortage of raw materials, the lead time of some products will be extended with the upward price. For example, the insufficient supply of ceramic materials, resulting in the increasing prices of trimmers and potentiometers. At present, the average delivery time of passive components of various manufacturers is 19 to 38 weeks, and the delivery time of other market segments has eased greatly compared with last year, but that of automotive capacitors is still 35 to 40 weeks.

Series	Lead Time (Weeks)	Trend
Capacitors Tantalum (AVX, KEMET, MURATA)	20-28	→
MLCC (AVX, KEMET, VISHAY)	20-40	→
Capacitors Film (EPCOS, VISHAY)	18-70	↘ (in Q4)
Other Capacitors (AVX, KEMET, MURATA)	35-40	↘ (in Q4)
Over-Voltage Protection Varistors (LITTELFUSE, BOURNS)	20-54	↘ (in Q4)

3.4 Memory

In recent months, the price of DRAM has continued to decline and is currently at its bottom. There is a consensus among the three companies that the price-increase policy is the best way to prevent further losses. Hence, the probability of the manufacturer's quotation rebounding in the fourth quarter is positive.

Price of DRAM



Data Source: Choice

There is still a downward trend for Flash's price.

Product	Brand	Pricing	Lead Time (Weeks)
Flash Memories	MICRON	↘	12-20/+
Flash Memories, NOR Flash	INFINEON	→	10-20/+

3.5 MCUs

Since 2022, the MCUs inventory has shown a significant upward trend. In Q2 2023, the MCUs inventory has rebounded, and it remains high. Benefiting from the general trend of electrification and intelligent development in the automotive field, the demand for original automotive-grade MCUs such as Renesas, NXP, and ST has continued to rise in both volume and price. It is expected that in Q3 2023, industrial demand will gradually stabilise, PC demand will pick up, and other MCU categories may start to recover.

Company	Orders	Updates
RENESAS	↗	Automotive MCU achieved 100% increase
NXP	↗	Strong demand for automotive MCUs, while consumer MCUs are declining month-on-month
INFINEON	↗	Stable pricing of automotive MCU
ST	→	Rapid growth in demand for automotive MCUs and decline in consumption MCU revenues
MICROCHIP	↗	Except for automotive-grade MCUs, analog and other related categories, other demand remained sluggish
TI	↘	Except for automotive-grade MCUs, analog and other related categories, other demand continued to be weak

MCU pricing trend remains stable, while the delivery times for 32-bit MCU products have seen an increase.

Product	Brand	Pricing	Lead Time (Weeks)
MCU, 8-bit	MICROCHIP	→	16-32/+
	RENESAS	→	12-36/+
MCU, 16-bit	RENESAS	→	36-46/+
	NXP	→	12-32/+
	MICROCHIP	→	18-52/+
MCU, 32-bit	RENESAS	→	26-52/+
	NXP	→	12-32/+
	MICROCHIP	→	35-52/+

3.6 FPGA

The price of FPGA has recently stabilised, and the delivery time is generally around 24 to 40 weeks or more.

Product	Brand	Pricing	Lead Time (Weeks)
Cyclone 10 LP, 10CLxxx series	INTEL/ ALTERA	→	24-40/+
MAX 10, 10Mxxx series		→	
Cyclone V, 5Cxxx series		→	
Cyclone IV, EP4Cxxx series		→	
Cyclone III, EP3Cxxx series		→	
Spartan 6, XC6Sxxx series	Xilinx/ AMD	→	16-26/+
Spartan 7, XC7Sxxx series		→	18-24/+
Kintex UltraScale, XCKUxx series		→	18-40/+

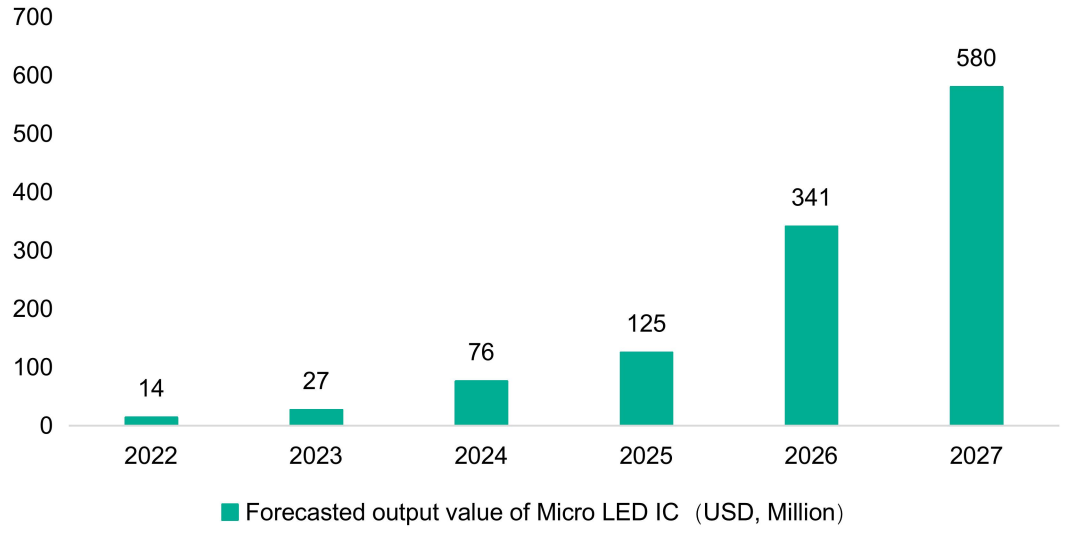
4. Market Opportunities and Risks

4.1 Opportunities

4.1.1 The Promising Micro LED Market

Driven by the mass production of large displays and wearable devices, the micro LED chip market will grow by 92% YoY from USD 14 million in 2022 to USD 127 million in 2023. It is also rising at a compound annual growth rate (CAGR) of about 136% between 2022 and 2027 to USD 580 million due to the scaling of existing application shipments and the introduction of new applications.

Output Value of Micro LED IC



Data Source: TrendForce

On the other hand, Samsung Electronics and LG Electronics recently have both launched ultra-high-end, oversized TVs that are priced at over KRW 100 million (USD 75,000) and feature next-generation micro LED display technology. As mass production of micro LED begins, there will be a surge in the micro LED IC market. There will be a surge in the micro LED IC market as mass production begins.

4.1.2 BMIC can be Benefited from the Surging Energy Storage Market

The growth of battery energy storage in the United States, the United Kingdom, Australia and Germany has ushered in a record high.

In the first half of 2023, according to data from the U.S. Energy Information Administration (EIA), the scale of new battery energy storage (≥1MW) put into operation in the United States was 1,786MW, a 6% increase YoY. Australia's new operating battery energy storage scale was 500MW, eight times more than the same period last year. The installed capacity of new battery energy storage projects in Germany is 1428MW/2159MWh, close to the level of last year.

In Q2 2023, UK will operate 11 new battery energy storage projects (>7MW), with a total energy storage scale of 413MW. The new battery storage system is anticipated to be operational in Q3 with a 500MW capacity. According to CNESA DataLink's global energy storage database, as of June 2023, the cumulative installed capacity of power energy storage projects in China had been put into operation to 70.2GW, an increase of 44% YoY. Among them, the new energy storage scale was 8.0GW/16.7GWh in the first half of 2023, exceeding the level of new scale last year.

Industry experts expect the supply chain's supply-demand disparity to gradually ease while the energy storage economic sector to improve and bolster growth. In the next few years, the CAGR of energy storage market demand is expected to exceed 100%, and it will continue to provide growth impetus for the BMIC market.

4.1.3 The AI GPU Market Soars Due to the Wave of Artificial Intelligence

According to Gartner, the market for chips used to perform AI workloads is growing at a rate of more than 20% per year. It is estimated that the AI chip market will reach USD 53.4 billion in 2023, an increase of 20.9% YoY. In 2024, it will increase by 25.6%, reaching USD 67.1 billion. By 2027, AI chip revenue is expected to grow twice the size of the market in 2023, reaching USD 119.4 billion.

Aletheia reports that it is estimated that the AI server market will double in size in 2024 and reach USD 135 billion in 2025, which is 4.5 times the size in 2022. Among them, GPU accounts for the highest cost in AI servers. Aletheia believes that the GPU market is growing rapidly, and the GPU market size will triple in 2025 compared to 2023.

In order to meet the huge demand of the AI server market, Nvidia will start to increase AI GPU production capacity significantly. It is estimated that Nvidia AI GPU production capacity will increase by 2.5 times in 2024; the company's data center business revenue will have a compound annual growth rate of 85% from 2023 to 2026.

4.2 Risks

4.2.1 The Recovery of Optical Component Market Demand is Limited

LightCounting has highlighted that the global demand for optical modules will slow down in 2023 as leading telecom companies and cloud computing companies plan to reduce their capital expenditures. At the same time, optical component vendors continue to face difficulties as a result of the ongoing inventory imbalance.

U.S. telecom companies capital spending entered a downward cycle. Verizon plans to cut its capital spending budget by billions of dollars by 2024. In 2022, Verizon's network investment will be nearly USD 22 billion, and the capital expenditure is expected to be USD 18.25 billion to USD 19.25 billion in 2023. AT&T said it will pass the "peak" of capital investment after 2022 and 2023, with company capital investment of around USD 24.3 billion in 2022 and an expected USD 24 billion in 2023, which will begin to decline from 2024. In addition, the capital expenditure of the three major China’s telecom companies (China Mobile, China Telecom, and China Unicom) has also declined.

4.2.2 The Market Price of Driver ICs may Continue to be Under Pressure

The latest report by Morgan Stanley Securities pointed out that considering the impact of weak consumer demand and intensified market competition, it has a conservative attitude towards driving IC-related companies in the future, and the VIS, PSMC, Qibang and other related Taiwan factories are facing greater downside risk. The cost of large panel driver ICs (LDDIs) will decrease by 5% to 10% in the second half of the year as consumer demand for large-sized displays continues poor and Novatek anticipates a major drop in PC sales in the second half of the year. Due to the intensification of market competition, Touch and Display Integration (TDDI) and Organic Light-Emitting Diode (OLED) driver ICs are expected to face greater price pressure in the second half of the year.

Affected by the consumer product dynamics, most driving IC companies anticipate a relatively flat to declining revenue outlook for the third quarter compared to the previous quarter, highlighting the ongoing need for enhanced penetration of automotive applications.

Conclusion

Reviewing the happenings in August, the global manufacturing industry has experienced a slight pickup, with production partially resuming. The United States, Japan, and South Korea have established their own semiconductor supply chain information exchange mechanisms, while Japan and other countries have adopted various preferential policies to encourage the return of production, which may have a certain impact on the global semiconductor supply chain. In terms of applications, the consumer electronics market continues to be weak, but the AI wave is surging, prompting major manufacturers to accelerate AI chip shipments. Additionally, there is rapid growth in the demand for chips in the electric vehicles, energy storage sectors which will contribute to the chip demand.

Looking ahead to September, economic fundamentals may further stablise, and the semiconductor market is expected to recover. Given that the demand in the telecommunication market has not improved significantly and telecom companies continue to reduce capital expenditures, the recovery in demand for chips such as passive and active optical devices remains limited. At the same time, the price of driver ICs will also continue to be under pressure. The energy storage sector is showing rapid growth, which may contribute to the increasing demand for BMIC. In addition, the demand for micro LED chip is expected to increase steadily with the accelerating commercialisation of micro LED.

In conclusion, the semiconductor industry's supply chain is evolving as more and more nations support domestic production and the downstream market continuously shapes chip demand and supply. With this, various players in the semiconductor sector may presented with opportunities and hazards as a result.

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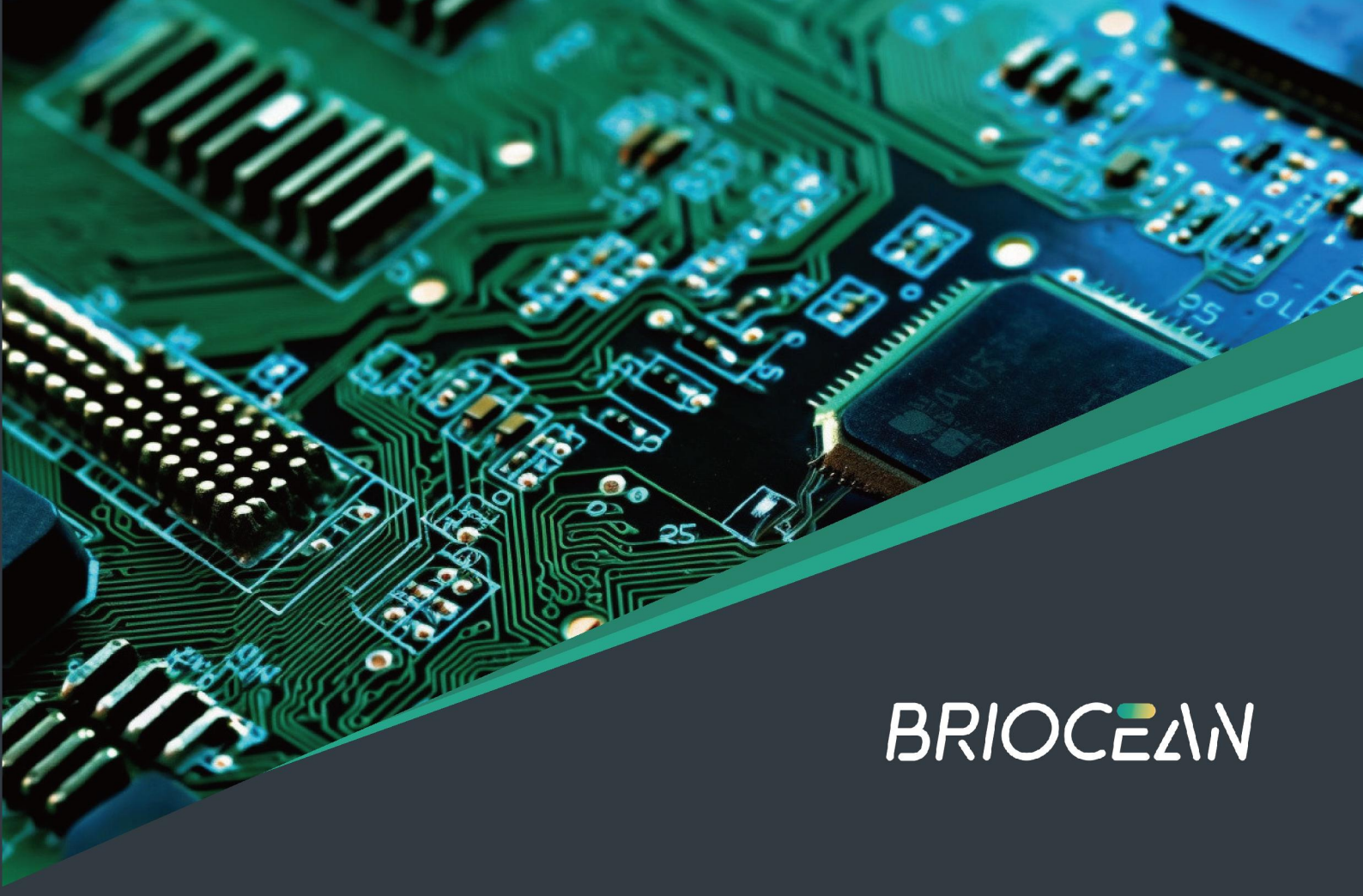
Briocean Technology Co., Ltd.
September 2023



BRIOCEAN

Founded in 2008, Briocean is a leading independent electronic components distributor in Asia where we work directly with electronic manufacturing clients across different industries to provide componenet sourcing and supply chain services.

Working with over 4,000 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.