



TRINITY SMF

STUDENT MANAGED FUND

Technology Hardware Sector Report 2023-2024

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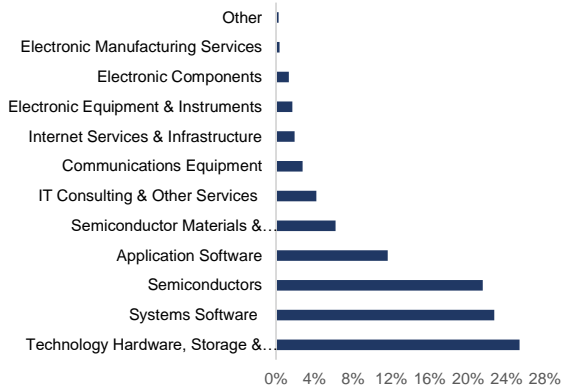


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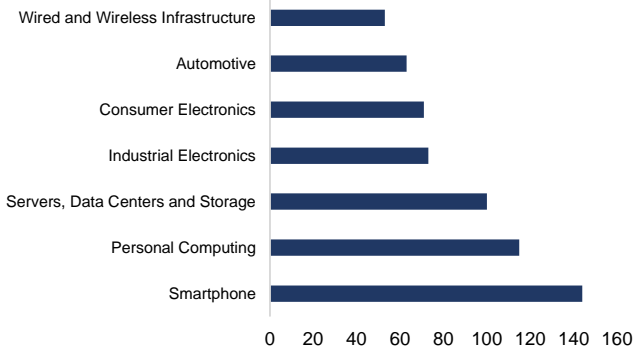
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Sector Overview

MSCI Sub-Industry Weights



Semiconductor Market Revenue by Category in 2022, bn \$



Cycle peak	Months from prior peak
Mar-96	52
Mar-98	26
Dec-00	31
Jan-05	49
Jul-08	42
Jun-11	35
Jun-15	38
Dec-18	42
Mar-22	39
Average	40

The Technology Hardware sector comprises companies manufacturing electronic components for a wide range of applications that are used in products such as computers, phones and cars. Examples of these products include semiconductors, integrated circuits (IC), memory devices and motherboards. The Hardware sector is the heart of the future economy, as it is essential to upcoming advancements in technological developments, digitalisation and decarbonisation. The market capitalisation for the Hardware sector is \$1.23 trillion, and it is expected to reach \$1.51 trillion by 2026 growing at 5.3% CAGR. Technology Hardware sector is part of a broader MSCI World Information Technology Index and accounts for 61.2% of it.

The sector is considered to be highly cyclical due to its nature. Companies tend to increase CapEx when the economy is doing well and decrease their spending in downturns to reduce costs. As a result, it affects the earnings of companies operating in the Hardware Industry. Nevertheless, as the sector experiences continual development some segments (PCs, smartphones) are maturing meaning less cyclicity in earnings. The average length of the cycle is 40 months.

One of the most important sub-sectors in the Hardware Industry is semiconductors. Taiwan produces more than 90% of the world's most advanced chips. During the last two years after the invasion of Russia into Ukraine, the world became more concerned about a possible war between China and Taiwan. In response governments of the US, EU and Japan started to invest heavily in the sector to diversify production and be more independent from Taiwan and China.

Key Players & Performance Indicators

The Technology Hardware Sector is a complex industry with companies manufacturing highly sophisticated products. The overall state of the economy, alongside consumer demand, is essential to the overall state of the industry.

For the continuous development of the hardware products companies must invest heavily in their R&D, resulting in capital –intensive business models. As a result, it creates many types of firms specialising in different products to decrease costs to decrease costs and maximise earnings.

Mobile Devices and PC Hardware

Manufacturing electronic devices such as smartphones, personal computers and tablets

Key Players: Apple, Intel, HP, Dell

KPIs: Consumer Demand & Interest Rates

Internet of Things Devices (IoT)

Manufacturing devices connected to the cloud that are used in infrastructure and home applications. Enables digitalisation of the physical world. Mostly, the IoT segment is not a main source of revenue for companies

Key Players: Cisco, Foxconn, IBM, Amazon

KPIs: GDP, Gov Spending & R&D

Semiconductor Equipment

Producing equipment for manufacturing various hardware parts (semiconductors, ICs and MCUs). The major sources of revenue are Pure Foundries and IDMs. Technical capabilities of these tools are vital in decreasing the cost of production and increasing performance.

Key Players: ASML, Lam Research, Tokyo Electron, Applied Materials, Canon

KPIs: Consumer Demand, CapEx & R&D

Pure Foundries

Only manufacturing semiconductors with the design provided by other companies. Also, can provide packaging, testing and assembling.

Key Players: TSMC, GlobalFoundries, UMC

KPIs: Gov Spending & Consumer Demand

Fabless Manufacturers

Create semiconductors design. Companies do not manufacture chips themselves

Key Players: NVIDIA, AMD, Qualcomm, Arm

KPIs: Consumer Demand, CapEx & R&D

Electronic Design Automation (EDA)

Providing software to Fabless Manufacturers and IDMs to enhance the speed of product designing and decrease costs

Key Players: Synopsys, Cadence

KPIs: CapEx & R&D

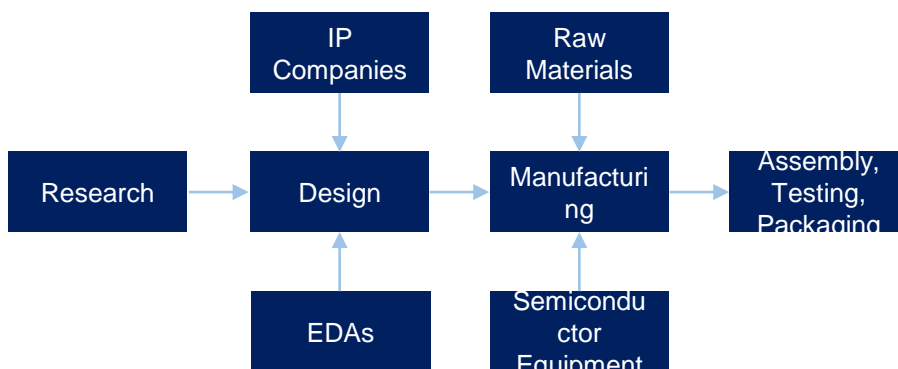
Integrated Device Manufacturing (IDM)

Companies both design and manufacture semiconductors. They combine processes of Pure Foundries and Fabless Manufacturers

Key Players: Samsung, Intel, Infineon

KPIs: Consumer Demand & Gov Spending

Semiconductor Industry Value Chain



Current Climate

Geopolitical Dynamics and Industry Realities:

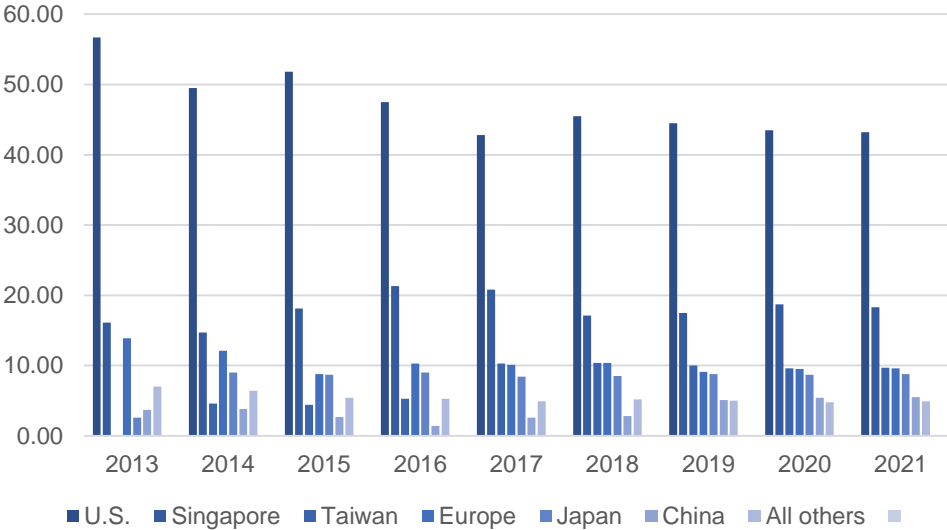
Amidst prevailing political unrest and escalating geopolitical tensions, there is significant ongoing conflict in the tech realm – commonly termed the ‘Chip War’, between the United States and China. While the US holds the mantle for chip design, a pivotal role in the chip manufacturing landscape is played by a Taiwanese firm, TSMC, which is responsible for manufacturing 92% of the advanced chip supply. This situates China in a precarious position within the supply chain, reliant on both US chip designs and Taiwan’s manufacturing power.

In an effort to curtail China’s access to cutting-edge equipment, the US has strategically implemented export restrictions, simultaneously incentivizing domestic manufacturing through grants and subsidies. This strategy culminates in the forthcoming activation of restrictions on a key player in the Netherlands, ASML. Foreseeing this move, China has notably escalated its procurement of equipment from ASML, setting a record for its recent import volume. Notably, ASML’s recent earnings call unveiled that the machinery procured by China is likely earmarked for producing electric vehicles.

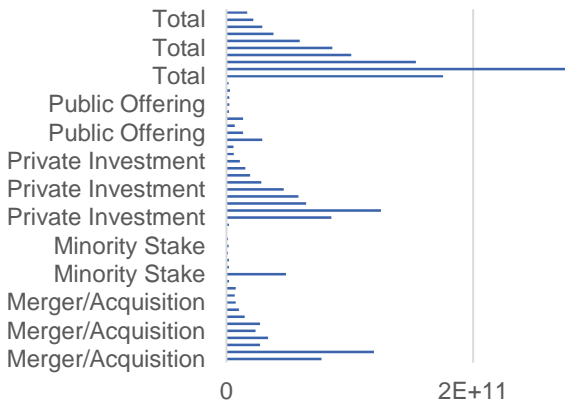
However, China's chip industry landscape is also intertwined with advanced persistent threats which pose inherent risks to the industry’s growing reliance on these services.

Responding to these complex dynamics, the EU has introduced its version of a chips act. This legislative move is accompanied by a commitment of €43bn in policy-driven investment, although closer inspection has revealed that only 15bn of this is new investment. The EU has also articulated an ambitious goal: to produce 20% of global chips by 2030.

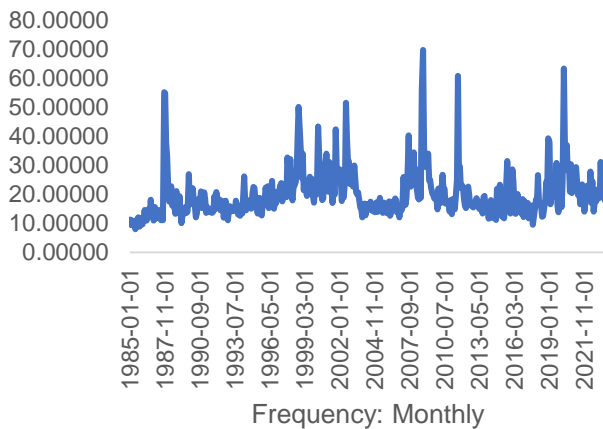
Semiconductor manufacturing capacity worldwide 2013-2021, by region



Total corporate investment in AI - inflation adjusted



Equity Market Volatility Tracker



Technological Advancement and Innovation:

In an era characterized by global complexities encompassing geopolitical tensions, supply chain volatility, raw material shortages, and the emergence of novel regulatory frameworks, our focus is on identifying enterprises that exhibit a proactive commitment to risk mitigation. We are actively seeking companies that not only navigate these challenges but also prioritize technological innovation. Through harnessing cutting-edge advancements and fostering innovation within their operations, these companies can not only safeguard against risks but also position themselves to capitalize on new opportunities that arise from disruption.

Sustainability and Eco-Friendly Hardware:

The impacts of climate change and societal influences are exerting a growing influence on the operational landscape of technology firms. Concurrently, global governments and stakeholders are urging companies to augment transparency concerning environmental impacts and tax contributions, while also committing to carbon emissions reduction. Anticipated and ongoing regulatory changes will necessitate updates to business management software tools, empowering companies to attain real-time visibility and providing authorities with the data indispensable for intricate compliance procedures.

Resilience and Risk Mitigation:

In times of uncertainty, the theme of risk mitigation and resilience becomes paramount. Investors seek assets and strategies that can weather market volatility and economic fluctuations. The emphasis lies on diversification to create a portfolio that is well-prepared to weather adverse market conditions. Moreover, assets that play a critical role in the broader supply chain are particularly favoured.

Priced in Sector Drivers

Cyclicality

As mentioned earlier, the Technology Hardware sector is currently in the down cycle. The rebound in sales is expected to be at the start of 2024. Currently, the industry is on track to achieve that. The consensus in the market is that the bottom was reached in Q2 2023, and gradual improvements are anticipated in the second half of 2023. If this assumption proves to be true, shares will rally on increasing earnings for companies.

Interest Rates

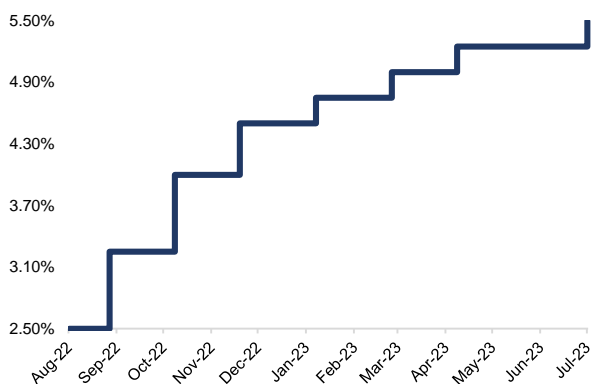
So far, the hardware sectors companies' stock prices have proved to be quite resilient in a higher interest rate environment (FDCPX graph). However, if the rates start limiting the economic growth leading to a recession it might have a tremendous impact on the Hardware Sector. Increased inventory costs with depressed earnings due to cyclicality will only worsen the potential situation.

AI Boom

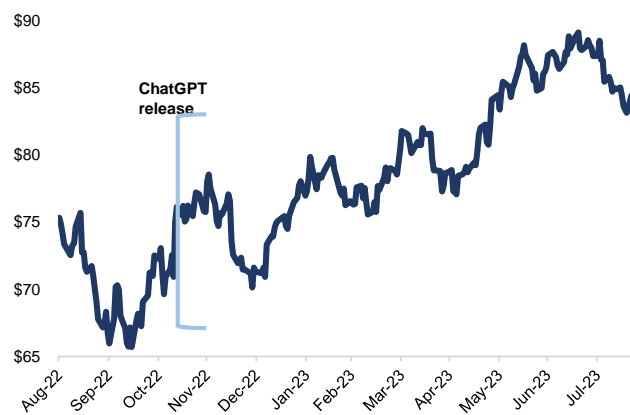
The hype around ChatGPT attracted a lot of attention from the investors. Share prices of various companies have skyrocketed on this news. While some of the growth could be justified, the other part reminds me of the early days of a Dot-com bubble in the early 2000s. There is no doubt that this technology is a breakthrough and that many companies are trying to be the first in this space by buying many top-performing chips and other needed products. Essentially, it boosts the earnings of the likes of NVIDIA, Super Micro Computer, Marvel Technologies, etc.

The biggest problem so far is that running large LLMs is very expensive, and the 'killer app' is not there yet, underlying that AI products do not create any meaningful revenue for their companies. The biggest question is how long will it take firms to think of the answer. If the 'killer app' does not make an appearance on the market soon enough, it may decrease investments in AI. This could cause the growth numbers for AI to drop and not be met causing valuations to drop.

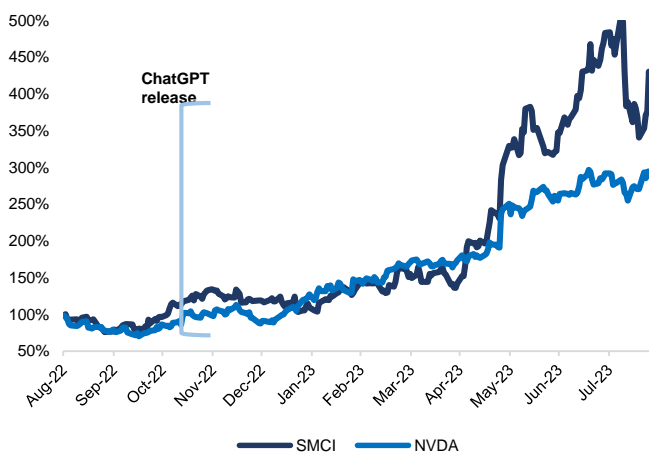
Federal Fund Target rate - Upper Bound



FDCPX Performance



Shares Performance (rebased to 100%)



Current Holdings

APPL

Apple is a multinational technology company based in the US. It is the world's largest technology company by revenue and the biggest company by market capitalisation. Apple is the fourth-largest PC vendor and the second-largest phone manufacturer in the world. It is considered one of the big five American information system companies.

From a hardware perspective, Apple is known for its integrated ecosystem of hardware, software and services. The company designs all of the chips and orders them from TSMC.

ASML

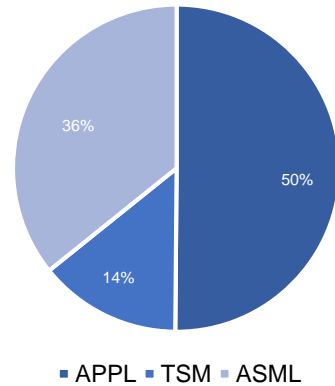
ASML Holding N.V. is a leading Dutch semiconductor equipment manufacturer at the forefront of technological innovation in the semiconductor industry. The company has established itself as a linchpin in the production of semiconductor chips, enabling the advancement of various technologies. ASML has a monopolistic market share in the semiconductor tools market, having a revenue market share of over 90% with its Deep Ultraviolet (DUV) and Extreme Ultraviolet (EUV) machines. In 2022, the company sold around 140 EUV machines each priced up to \$200 million.

TSMC

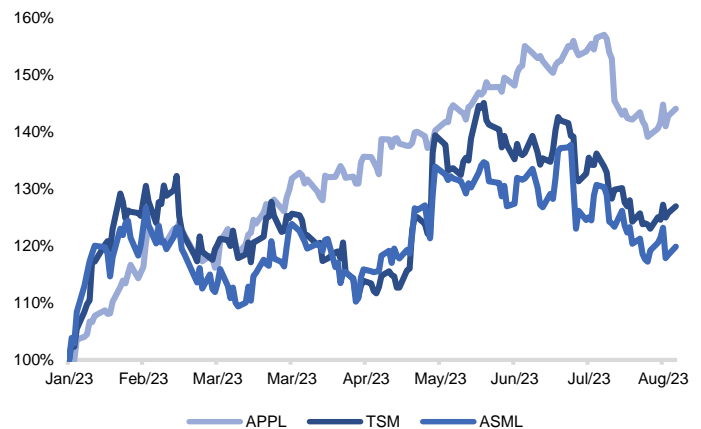
Taiwan Semiconductor Manufacturing Company is a prominent semiconductor company that manufactures, packages and sells microchips using a wide range of electronic devices and industries. They produce chips for clients worldwide, including tech giants like Apple, NVIDIA and AMD. TSMC specializes in the manufacturing process and does not brand its chips, operating as a pure-play foundry. It plays a crucial role in advancing technology and innovation by producing chips based on clients' designs.

Current Performance

Sector Holdings Weights



Holdings Performance (rebased to 100%)



Navigating the US-China Chip War:

The intricate interplay between the United States and China in the global chip industry has not only set the stage for a technological tug-of-war but has also ushered in a multitude of potential risks that demand vigilant consideration. It is important to watch for any regulatory hurdles that companies may face.

Economic Uncertainty:

The implications of said 'Chip War' reach beyond this industry. It is also important to watch this from a macroeconomic perspective as it could disrupt trade flows, impact economic growth and cast uncertainty over international markets.

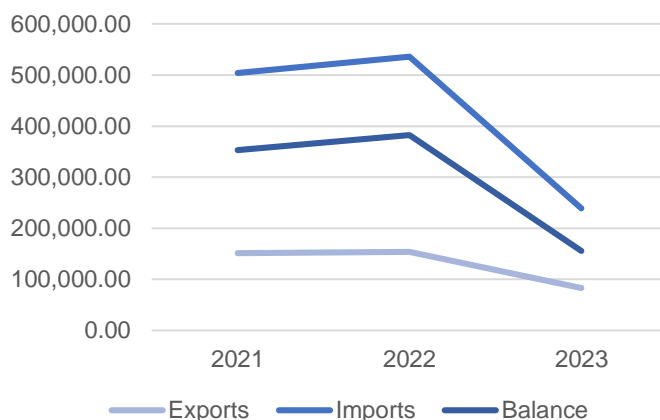
Increasing Geopolitical Tensions:

Due to Taiwan's critical position in this industry, China is insisting that it is a breakaway province and will eventually be under Beijing's control. The threat of Chinese military action has encouraged the US to speak out and promise their support to Taiwan should it be necessary. Due to these tensions, Warren Buffet cut Berkshire Hathaway's position in TSMC back in November by 86%, just one quarter after buying. This saw the share price drop slightly and many investors followed suit. In May of 2023, he decided to sell the rest of their holdings with them, stating that it was these geopolitical risks that caused his views to change and not the company itself, which has proven resilient.

Generating Revenue with AI:

In the past year, the dominance of AI has become increasingly evident. Open AI, a prominent company in the field, has garnered immense attention, shattering industry records soon after unveiling its platform. However, the cost associated with maintaining this AI model is reported to be approximately \$700,000 per day. While the projections suggest that Open AI could surpass the \$1 billion milestone by 2024, it's important to note that Microsoft's initial investment to kickstart this venture amounted to \$10 billion.

US - CHINA Trade
(all figures in million USD)

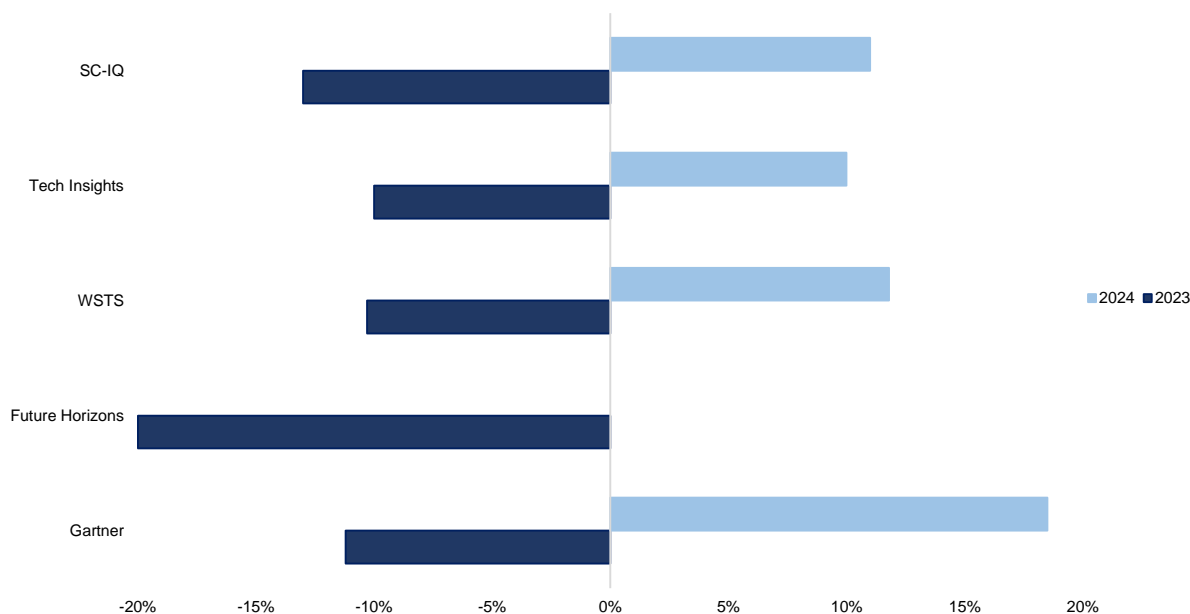


Strategy for the Year Ahead

Outlook:

We are approaching the year ahead being cautiously optimistic. The Technology Hardware sector has performed very well considering being in the down earnings cycle and uncertainties around economies. AI boom, resilient economies and high government spending have contributed significantly to this performance. While the outlook for the next year looks bright with projected low double-digit growth, nobody is sure for now if the market has reached its earnings bottom or it is yet to happen. Uncertainties over the soft landing, high inflation, AI developments, geopolitics, and sluggish recovery in China make us more prudent in the short term. Nevertheless, strategically we are bullish on the performance of Technology Hardware.

Semiconductor Market Forecasts



Our strategy for the year ahead is to find winners of government investments in the Technology Hardware space. Specifically, we are looking at smaller European companies that are valued cheaper in comparison to their US and Asian peers. While the lower premiums for European companies in many cases look justified due to the lack of technologies, the mispricing is possible to find because of the lack of attention to these small companies from Wall Street. This strategy is aimed to benefit from being a smaller-sized fund allowing to have positions in small-cap companies and act faster while being oriented on the long term.

September Watchlist Review:

1. INFICON (IFCN.SW) – European company with CHF2.8B capitalisation. They are an important supplier to ASML creating unique , therefore a potential ‘hidden’ winner of the developments in the semiconductor market.
2. Infineon Technologies (IFX.DE) – Integrated Device Manufacturing company based in Germany. This company has a leading market share in its key market products with 33% MS in power semiconductors and 22% in MCU’s.