

2025 Outlook Series: Global Semiconductors



From an investment perspective, we believe a diverse, global portfolio of high conviction, quality companies in these target industries offers an attractive, long-term risk-return profile underpinned by robust fundamentals, significant tailwinds, structural demand growth and earnings visibility.

Global semiconductor opportunities Strategy: connecting our global team to uncover connectivity opportunities

Why focus on semiconductors and AI beneficiaries?

As the technology sector converges with every part of our daily lives, semiconductors are increasingly in the investment spotlight, and with good reason. The semiconductor sector holds enormous growth potential. Dubbed the 'new oil' of the 21st century, this core technology segment is powering the future and is set to become a thriving US\$1 Trillion market by 2030¹.

The global semiconductor supply chain also holds significant growth potential as major economies push for self-sufficiency, opening the door to expanding government incentives to support the semiconductor industry. Furthermore, we believe that investing in this sector via a global lens offers a promising chance to diversify away from a US focus and tap into the rich and diverse opportunities the global semiconductor market provides.

Artificial intelligence (AI) is at the forefront of the digital economy, unlocking potentially unique investment opportunities across the value chain. This reach spans from AI itself to the robotics, electric vehicles, clean energy, software, hardware, electronic

equipment, interactive media, communication services and consumer discretionary industries and sectors. Moreover, the arrival of emerging and price-efficient AI-model development could trigger a ripple effect that will see product costs decline and, consequently, usage increase. As a result, there may be a further upswing in software usage in areas such as agentic AI, which automates planning and reasoning to simplify and solve challenging logistical problems in multiple industries.

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Key highlights

Our well-integrated global footprint can cover the entire opportunity set

- The investment team collaborates with an unparalleled on-the-ground internal research network comprised of Manulife Investment Management technology sector analysts located across the globe -- U.S., Europe/U.K. and Asia -- bringing local market knowledge with a global impact lens
- Fully integrated, deep research capabilities via a robust ecosystem

¹ McKinsey on Semiconductors, as of March 2024.

Our process is fundamental, rigorous, bottom-up and active

- Stock ideas are generated from our 20 technology analysts located across the globe
- An actively managed strategy that aims to identify and capture semiconductor-related opportunities amid the artificial intelligence (AI) revolution
- We adhere to a disciplined investment process that focuses on downside protection

Our differentiated strategy

- Compared to other active and passive strategies available in the market, investors can benefit from a globally diversified portfolio with multi-cap exposure and flexibility

Our core positioning centers on distinct emerging themes in 2025

- Connectivity
- Power semiconductors
- Data management

Our well-connected global footprint

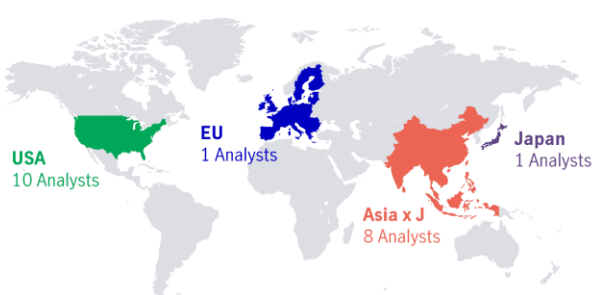
Manulife Investment Management (MIM) is well-placed to tap into the opportunities the semiconductor sector and AI value chain offers. We believe that our key strength lies in our extensive global platform featuring 20 technology analysts in various markets, including South Korea, Taiwan region, Mainland China, Japan, the U.S., and Europe/U.K. They provide a rich, daily stream of insights essential for informed decision-making to the Strategy's investment team, e.g. technical advancement information, demand/supply check as well as competitive landscape update etc.

Idea sourcing

Our investment ideas primarily emerge from a bottom-up research approach. We start by identifying a select group of companies that trade at a discount to fair value and can potentially generate strong free cash flow and earnings but *also* benefit from a specific trend. This process contrasts with a top-down approach, where certain themes are, perhaps prematurely, declared as megatrends from the outset. Instead, true megatrends become evident when we consistently hear similar success stories from multiple companies.

Chart 1: The Strategy investment team utilize global platform for opportunities in semiconductor sector and AI value chain, supported by 20 technology analysts

Global Technology Coverage



Strategy Investment Team






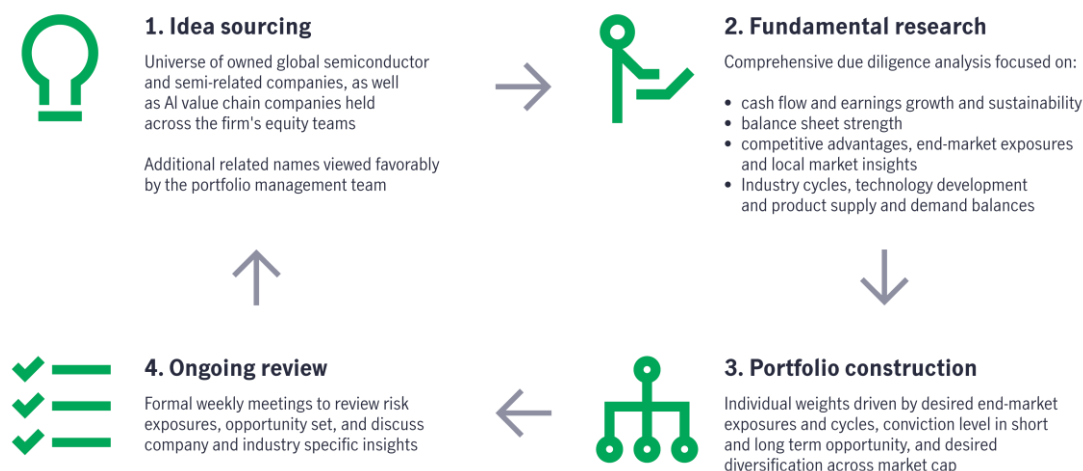
	Ryan Davies, CFA Lead Portfolio Manager Joined the company 2018 26 years' experience
	Michael J. Scanlon, CFA Portfolio Manager Joined the company 2018 22 years' experience
	Leigh Pressman Senior Investment Analyst Joined the company 2023 12 years' experience
	Geoff Kelly, CFA Portfolio Manager Joined the company 2018 28 years' experience
	Kosuke Takahashi Research (Equity) Senior Associate Joined the company 2022 9 years' experience

Chart 2: Our process is fundamental, rigorous, bottom-up and active

Source: Manulife Investment Management, February 2025. For illustrative purpose.

Our global team plays a crucial role in this process, as we continuously share ideas across regions. Based on the universe of owned global semiconductor and semi-related companies, AI value chain companies held across the firm's equity teams, and new differentiated companies identified by the Strategy's investment team, we can validate our ideas by accessing localized information.

Indeed, we believe that accessing to localized information is one of our key competitive advantages and a stand-out characteristic of our business. In the competitive semiconductor industry, memory is a crucial segment dominated by three companies: Hynix and Samsung in South Korea and Micron in the U.S. Having a Korean-speaking team member allows us to engage directly with local industry players, providing insights otherwise unavailable to other analysts. Team members based in Hong Kong assist with regional insights, while mainland Chinese colleagues gather information from mainland China leveraging their language skills. This collaborative approach extends to Japan where our analyst exchanges data with U.S. team members, enhancing our collective analysis.

Fundamental research

Once we've sourced potential ideas, our investment team starts to review the investment thesis including target market exposures, balance-sheet quality, profitability, earnings trends, valuations, and price targets. We build detailed models for all the companies we evaluate and take a pragmatic approach to valuations. Every investment has a price target. A notable aspect of our approach is that we validate the team's stock ideas via our technology-platform analysts, who have access to local supply chain knowledge and can provide differentiated insights, allowing us to cross-examine these names. This reduces our reliance on sell-side research or third-party data, placing greater importance on our in-house analysts and their regional knowledge.

An example of our collaborative approach is a recent evaluation of a new U.S.-based semiconductor company. While considering the potential risks, our local team member provided information from Taiwan, highlighting supply constraints for the company's chip packaging. This local connectivity helps us capture value and avoid less beneficial investment decisions, which we believe is invaluable and difficult to obtain for firms without a global presence.

Portfolio construction: discipline and active management

Our universe encompasses approximately 1,000 global names. From this, we look to select between 40 and 50 individual names, driven by desired end-market exposures and cycles, conviction level in short and long-term opportunities, as well as desired diversification across market capitalization, meaning we take a highly selective approach.

We establish upside and downside valuation targets based on our analysts' fundamental research. Price targets are dynamic, and can change when we receive new information, for instance, the release of fresh earnings data. The most common reason we sell is because the stock reaches our estimate of fair value. We also actively manage position sizes based on remaining upside to our targets and other available opportunities.

Ongoing review: downside management

Our weekly meeting is the highlight of the investment team's week. During the meeting, the team discusses market events, macro releases, company and industry news, portfolio weights and valuations risk exposures and other developments pertinent to the Strategy. Everyone's opinion is welcome and encouraged and discussions are usually thought-provoking and robust.

Throughout the year, market fluctuations present opportunities for active managers: when stocks decline, we may increase our positions. Conversely, we might reduce a position to raise cash or invest in more stable names when they rise.

In 2024, some of our connectivity stocks surged by 100% in just two months as we approached year-end. In response, we trimmed our positions to raise cash. With 30% of our portfolio in non-semiconductor holdings, we have the flexibility to increase our positions in core companies, which helps mitigate downside risk. While this approach is still evolving, it enables us to better protect against downturns and

capitalize on market opportunities. By tactically adjusting our positions a few times a year when the market dips, we can potentially enhance returns and remain agile and responsive to market conditions.

Our differentiated strategy – an overview

Manulife IM's actively managed global strategy identifies and aims to capture semiconductor-related opportunities amid the AI revolution. The strategy can allow investors to benefit from a globally diversified portfolio with multi-cap flexibility, offering a differentiated return/risk profile.

Our experienced portfolio managers and global specialist investment team of 20 technology analysts actively oversee a high-conviction equity portfolio. Growth potential is harvested from four types of companies with significant competitive edges that could potentially be winners within the competitive industry value chain. These are:

1. **Dominators:** companies with "strength" in their business foundation backed by leading market share, technological capabilities, and production capacity.
2. **Emerging Disruptors:** companies with high growth potential based on their strengths in new technologies, products, and business models that overturn conventional thinking.
3. **Niche Leaders:** companies with a strong presence in specialty markets that are difficult for larger businesses to enter.
4. **AI Value Chain Firms:** companies at the forefront of AI innovation or are critical to building AI infrastructure.

Semiconductors, or 'chips', are the 'core' technology for all industry. Technology can offer alternatives, unlike energy stocks, which are sensitive to sector underperformance. Product cycles present new opportunities and generate a continuous source of promising tech investment ideas. For example, while semiconductors faced challenges during the 2008 and 2009 downturn, some small US companies looked elsewhere and began integrating into Apple's supply chain. More recently, the healthcare segment has seen certain semiconductors focus on wireless

connectivity, vital for medical applications and emerging wireless protocols.

The semiconductor sector is like a supermarket produce section with numerous choices of fresh fruits and vegetables. If one choice isn't in season, something else will be ripe and ready for picking. With around 30% of our portfolio targeting AI advancement or beneficiaries, there are always ideas to pursue. We believe that diversifying away from mega-cap U.S. technology names into non-U.S. and small- and mid-cap names provides a rich opportunity set to choose from and may reduce certain inherent risks.

Outlook: key themes for 2025

Our strategy consists of quality, high-conviction companies diversified by global geography and market cap, rather than concentrating solely on mega-cap or household names in the semiconductor universe. While we have a long-term investment horizon, these are some of the exciting themes we see for 2025 and beyond:

- 1) **Connectivity:** With the rise of AI, market headlines tout the increased amount of investment spending and the role of data centers and semiconductor chips. This trend is “connectivity” and it involves a multitude of companies in the chain. In the past, a typical data center consisted of a rack of servers stacked vertically, each connected by a single wire to the top.

For instance, a rack of ten servers would be connected by ten wires. However, with AI, the setup is evolving. Imagine three racks of servers, side by side. Now, each server not only connects vertically but also needs to connect horizontally to the servers in the adjacent rack. This results in an exponential increase in the number of connections. Consequently, data centers are expanding, and the complexity of these connections is growing. You may even have multiple data centers that need to be interconnected, often requiring underground

connections. For AI to function effectively, especially for large language models, everything must be interconnected seamlessly. In the past, if one server was unplugged, the system would continue to operate, much like an office network that remains functional (albeit slower) even if one connection is disrupted. However, with the intricate web of connections required for AI, disconnecting a single server can cause the entire system to fail.

We invest in numerous semiconductor companies that specialize in connectivity. These companies produce the chips that facilitate connections, including semiconductors that enhance signal clarity as data moves from one location to another. Our portfolio includes firms focused on optical and electrical technologies, with optical referring to light-based signals and electrical to electric signals. These innovations are crucial for data transmission, and represent significant, long-term trends that could shape the future of data centers, which differ vastly from their past configurations. We're particularly focused on the theme of connectivity within data centers.

- 2) **Power semiconductors** play a crucial role in today's technology landscape, particularly as data centers require vast amounts of energy. For instance, a leading cloud service provider recently signed a 20-year agreement to source nuclear power starting in 2028. It's unprecedented to see most large cloud services providers entering exclusive agreements for nuclear energy, highlighting the critical importance of reliable power sources. Amidst these developments, our focus on connectivity remains a key differentiator in our strategy, aligning with the broader trends shaping the industry. Power management is a major theme that is expected to have a long-lasting impact across various industries and our investments here reflect our commitment to investing in technologies that address the evolving needs of modern infrastructure.

- 3) **Data management:** What sets this strategy apart is that it goes beyond semiconductors, with 30% of our portfolio encompassing AI value chain companies. As vast AI clusters or farms are developed, meticulous data management becomes crucial to ensure the safety and security of the data being used.

Nowadays, in the age of GenAI, cyberattacks have become increasingly a threat for data management with identity security risks, machine identities, and third- and fourth-party risks in the digital ecosystems. AI-powered cyberattacks can utilize AI or machine learning algorithms and techniques to streamline, speed up, or enhance different stages of a cyberattack. These cyberattacks can learn and evolve over time, adjusting and adapting to avoid detection. As such, data and password protection have become more vital. Business may also need a way to secure their data, monitor for data risks, and quickly recover data no matter where it lives, thereby building resilience.

We invest in data management software companies that help secure this information. These solutions can scan networks to identify files lacking password protection, ensuring that all data is safeguarded before being processed

by AI servers. This protection is ongoing, as new files will continuously be created and added to these servers. We believe that our investment in data management companies is essential to maintaining long-term data security.

Conclusion

Semiconductors continue to be the cornerstone of our strategy, consistently serving as the most critical theme. At the same time, we capitalize on tactical investment opportunities in companies that benefit from advancements in AI. As AI evolves rapidly, we anticipate a wave of new innovations that will drive sustained demand for both semiconductors and AI applications. Our well-integrated global footprint enables us to leverage a collaborative investment team and an unparalleled internal research network that can allow us to cover the entire opportunity set effectively. We maintain a long-term focus and are poised to use short-term volatility to our advantage, ensuring that our strategy adapts and thrives in this dynamic landscape.

Chart 3: Data management facts, with AI – data management is going to be more important



All Roads Lead to Identity

93%

of organizations were victims of identity-related cyberattack.

2.4x

average annual growth of number of identities

#1

organizations identify machine identities as both the riskiest identity type and driver of identity growth

68%

of organizations report that more than half their machine identities have access to sensitive data

Important Information

Investing involves risks, including the potential loss of principal. Financial markets are volatile and can fluctuate significantly in response to company, industry, political, regulatory, market, or economic developments. These risks are magnified for investments made in emerging markets. Currency risk is the risk that fluctuations in exchange rates may adversely affect the value of a portfolio's investments.

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Manulife Investment Management

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