

High Bandwidth Memory: Key to AI Growth

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Technology analyst Dan Ives declared 2024 as the “year of AI (artificial Intelligence)” in late 2023. If mentions of AI in companies’ earnings calls is any indication, Mr. Ives may be correct. According to FactSet, the term AI was mentioned by 179 companies during earnings calls held from December 15, 2023 to March 14, 2024 – well above the 5-year average of 73 and the 10-year average of 45. Like many others, we are considering the implications of AI, but through the lens of bottom-up, fundamental investors with an investment universe outside the US.



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One area that has caught our attention with direct implications to companies in our investment universe is memory chips. Some background: AI is enabled mainly by logic processing chips called graphic processing units (GPUs), which can quickly process vast amounts of data. The most well-known GPU designer is Nvidia, a US-based company. However, GPUs cannot function in isolation. They must be used in combination with memory chips, which store the data and then transmit information to the GPU for processing. The older generation of memory chips, called DDR5, do not have the bandwidth (data transfer speeds) to supply high amounts of data needed by GPUs and AI models. This has resulted in the development and rise of high bandwidth memory (HBM) chips. Unlike the US-domiciled Nvidia, the leading HBM companies are located outside of the US and within our opportunity set.

History of High Bandwidth Memory

The first high bandwidth memory chip, produced by South Korean company SK Hynix, was completed in 2014 to meet an increasing need to store larger amounts of data for computing. While AI was still in its infancy at the time, there was a clear need to continue building on the first HBM chips. Samsung was first to design a second generation of HBM chips in 2015, with SK Hynix and Micron Technology, an American company, following suit. Development of future generations has continued, and the demand for HBM chips has dramatically increased as the need for greater speed, capacity and efficiency has exploded with AI development.

Speed, Capacity and Efficiency

Imagine an HBM chip as a library. Early generations of HBM chips were the equivalent of a small-town library – a one-story building with a couple librarians retrieving books. The amount of space to store information and speed to deliver the information was small and slow. Fast forward to today, the latest generation of HBM chips are the equivalent of a 50-story library with thousands of librarians. The amount of data on the chips and the processing speed is significantly better than early generations. Additionally, the latest generation of chips process data more efficiently which keeps temperatures down and better prevents damage to the chip. The development of these HBM chips in the last 10 years is a remarkable feat of innovation with no signs of slowing down.

Leaders in High Bandwidth Memory

The HBM chip market is still dominated by those three early movers: SK Hynix, Samsung and Micron Technology, two of which are located outside the US. This dynamic is no accident as the developing economies in Asia have been favorites for decades when US technology companies want to outsource production to places with lower labor costs yet more educated workforces. While Micron competes with the other two companies, SK Hynix and Samsung are the clear leaders.

From an investor perspective, Samsung represents a good business in an attractive industry. Even better, from our standpoint, we believe the company remains attractively valued, as its ability to gain market share in the fast-growing HBM chip market does not appear to be fully appreciated in the current stock price. Additionally, Samsung has high operating margins, a strong balance sheet, and more diversified business relative to its industry peers.

2024 may be the year of AI. However, AI's rise is likely to have implications into 2025 and beyond. The impact of major technological developments is rarely limited to only a few select companies that lead the change. By considering the direct and indirect beneficiaries of such developments and possessing a long-term investment mindset and valuation discipline, investors should be able to continue to find interesting opportunities the market continues to overlook or underprice.

As of 31 May 2024, Diamond Hill International Strategy owned shares of Samsung Electronics Co. Ltd.

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