KGI

CIO Insights

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“Memory” Is Still Too Good to Forget

Diversify Into Other Ai-Bottleneck Supply Chain in Case the Music Stops

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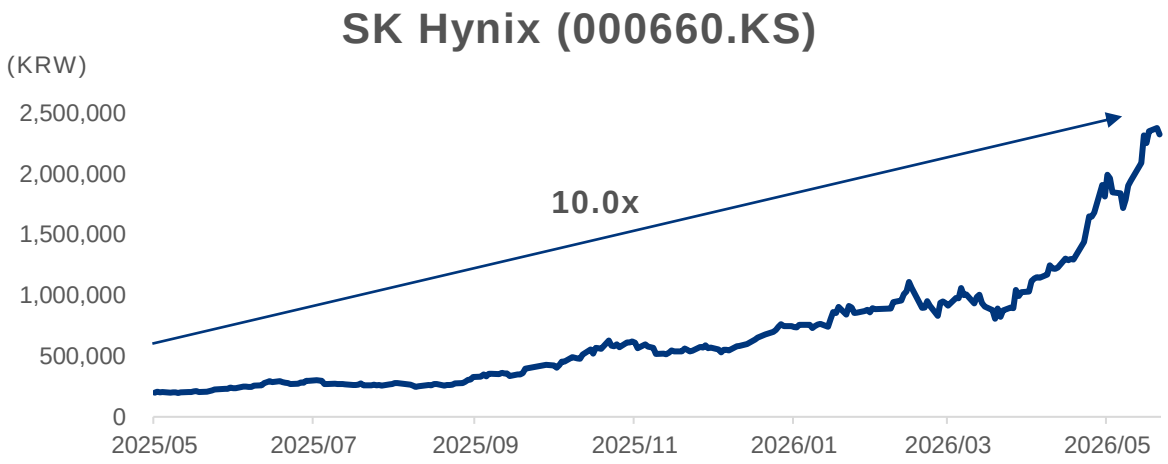
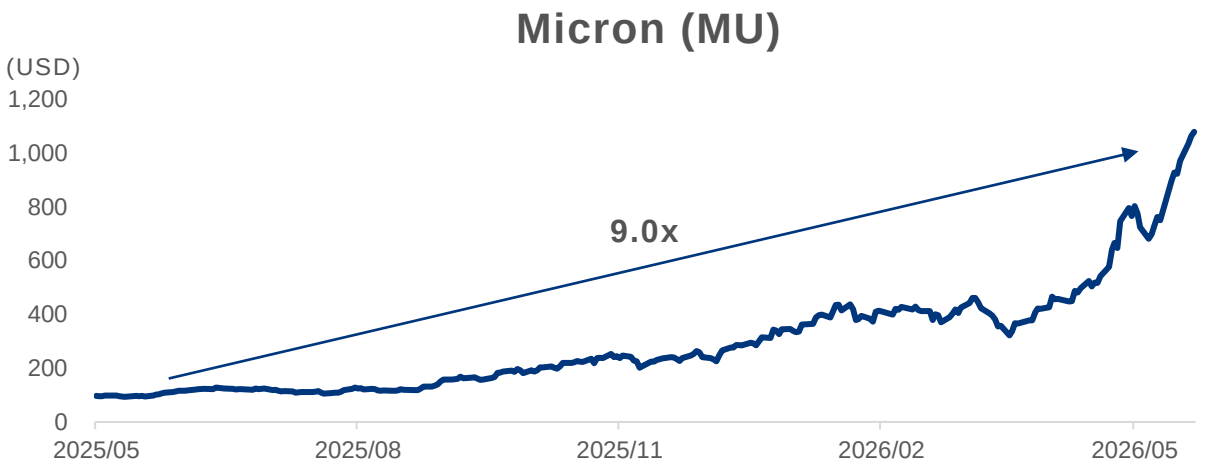
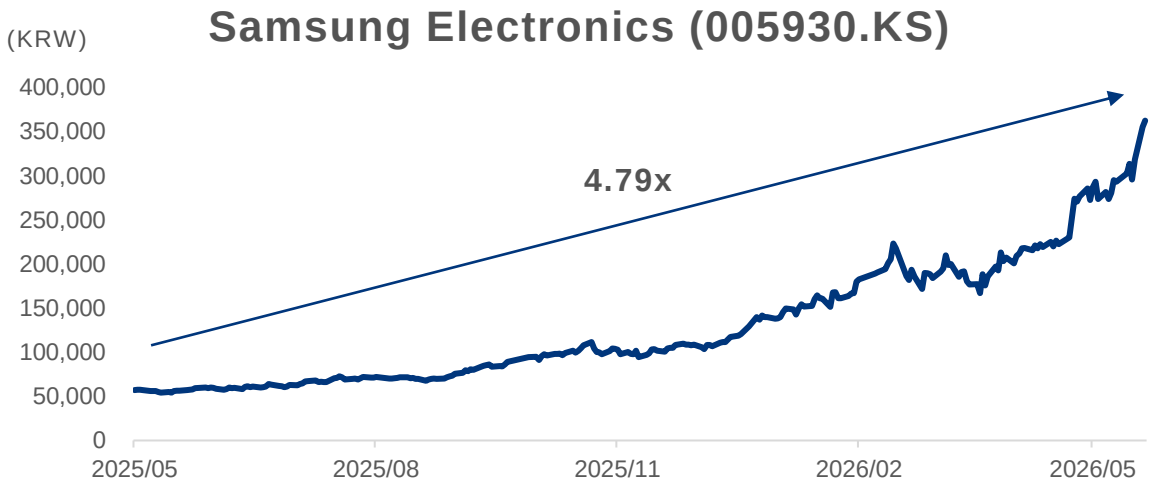
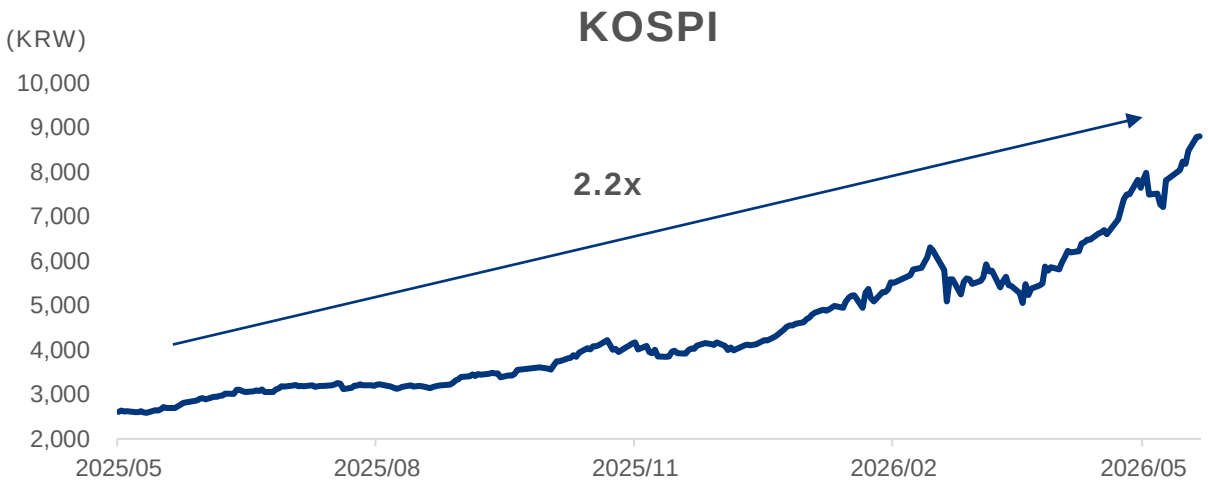
GPU and HBM Are Inseparable

HBM (High Bandwidth Memory) Is Like Having 10 Assistants Passing Ingredients to a Chef at Once







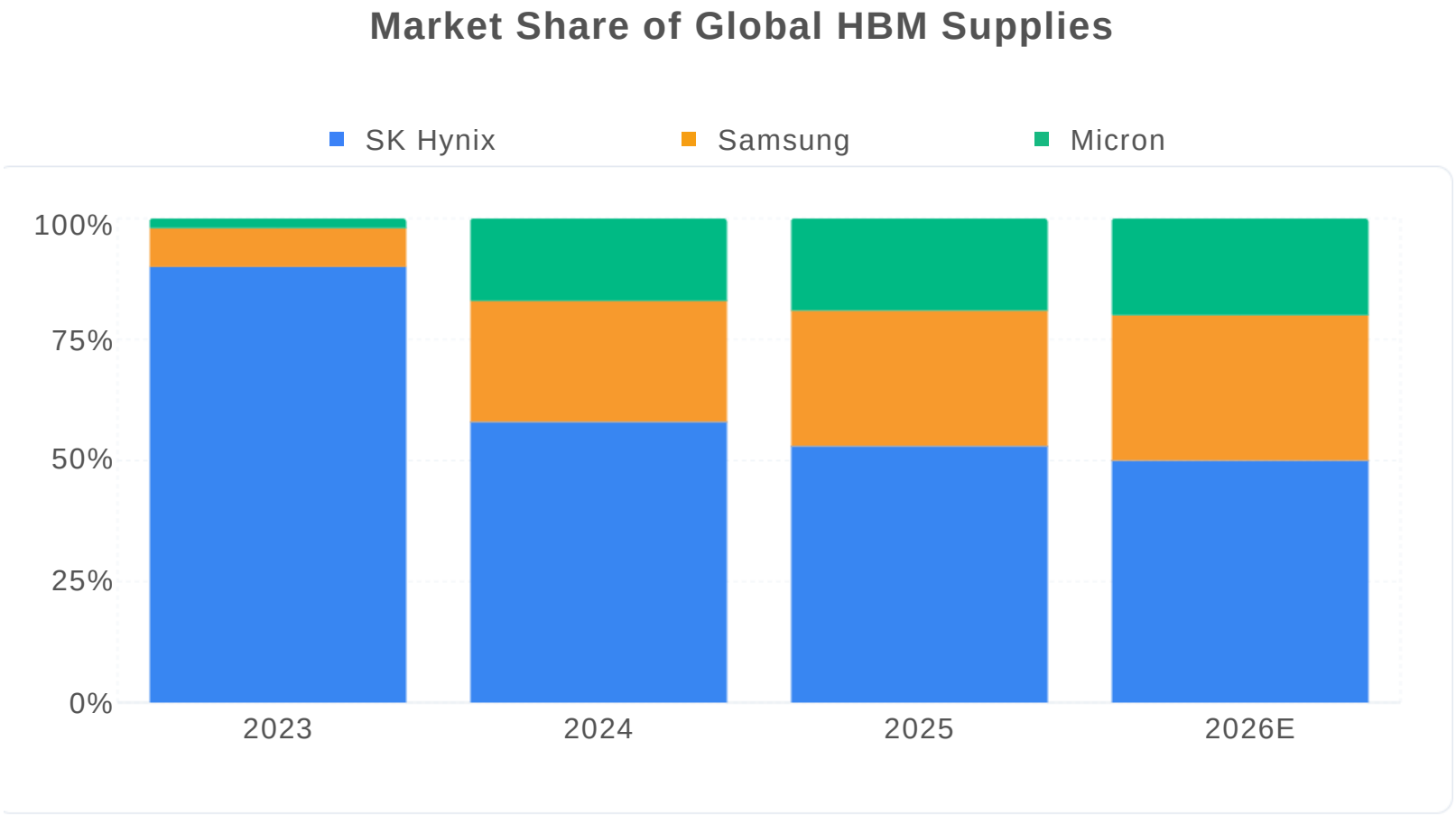


Source: Bloomberg, KGI

Only Three Companies in the World Can Make HBM

SK Hynix Is Still the World Largest Supplier Despite Market Share Gain From Samsung and Micron

- Producing one HBM chip consumes roughly three times the wafer area of a standard DRAM chip, which means that every HBM chip made is effectively three standard memory chips that were never made. This is why the broader memory market — the chips in your phone, laptop, and TV — has been experiencing shortages and price increases. The entire industry has pivoted its manufacturing lines toward HBM, leaving conventional memory supply constrained.

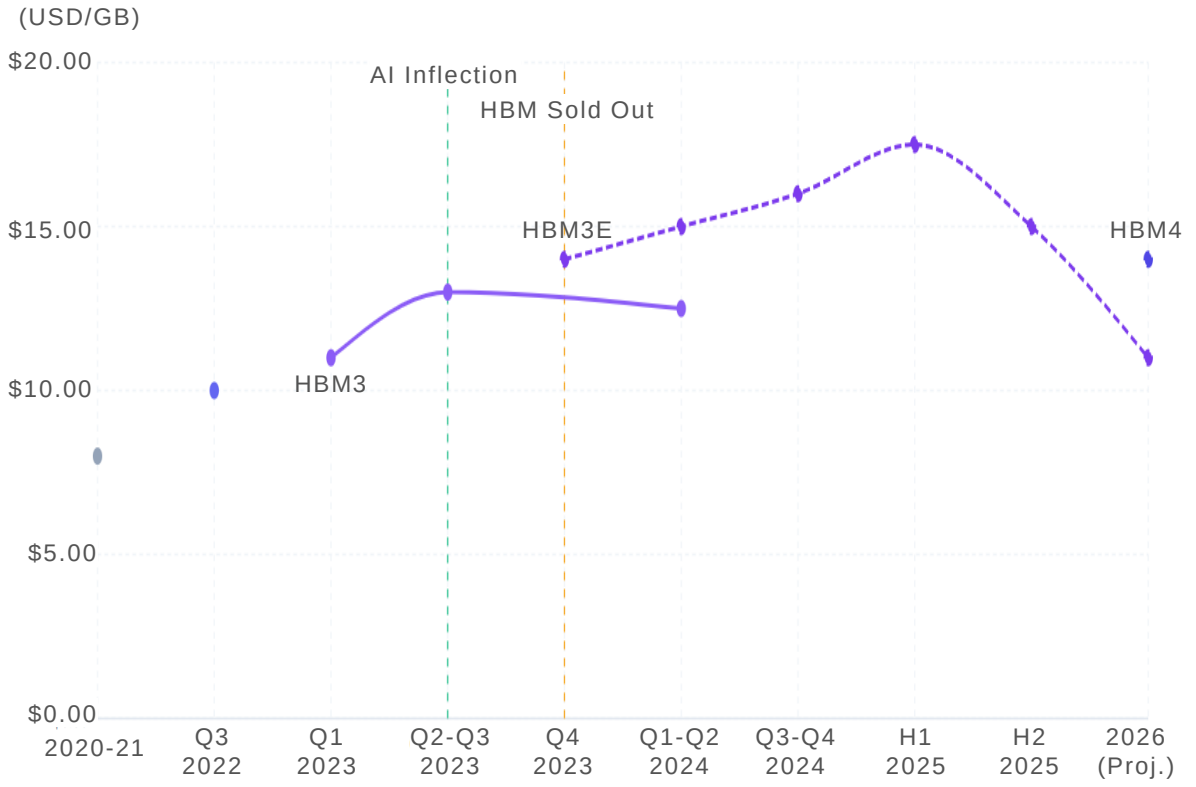


Source: KGI

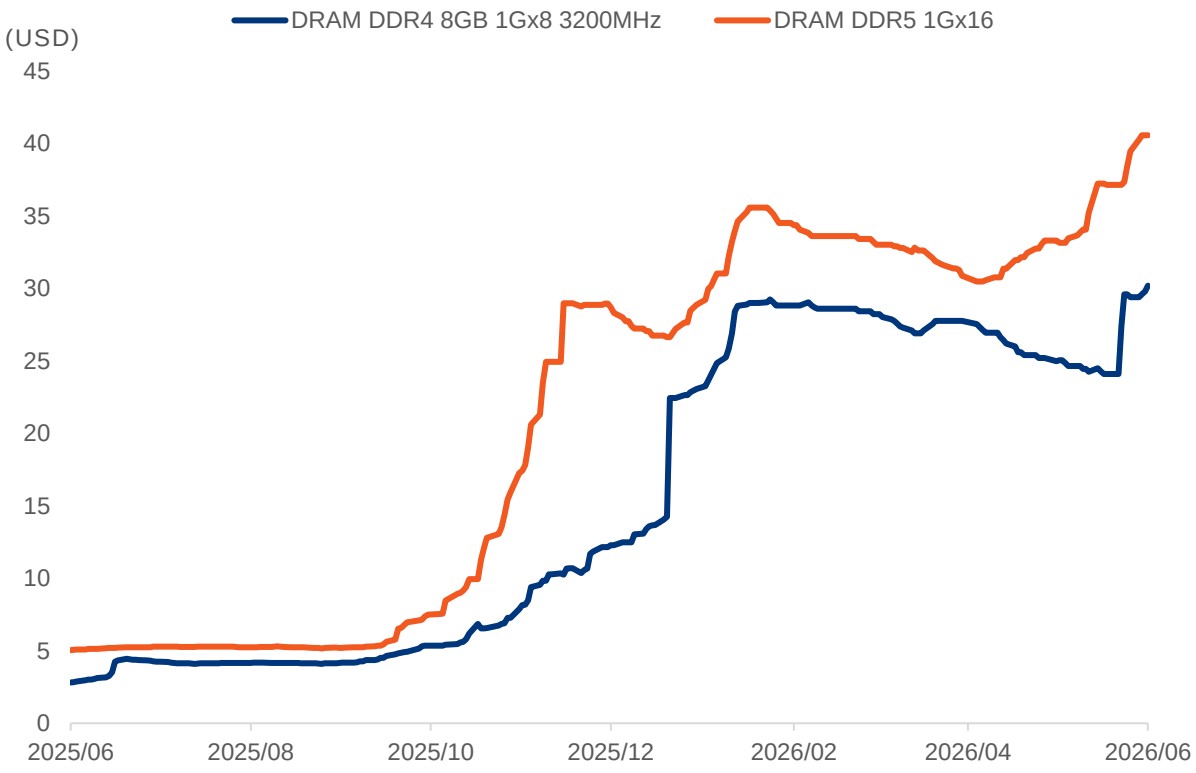
Short-Term Pause in Memory Prices

Does It Mean Peaking of Share Price Momentum?

HBM Spot Price



DRAM Spot Price



Source: Bloomberg, Silicon Analyst, KGI

Supply Constraints Is the Only Guardrail for Prices

Three Players Have Committed US$100bn Of Capex But Supply Ramp Up Needs 18 To 24 Months

- All three major memory producers have announced historic capital expenditure programs. SK Hynix (000660.KS) is constructing an entirely new semiconductor city in Yongin, South Korea — a campus so large it will eventually house four advanced fabs and is expected to cost over $94 billion when fully built out by 2047.
- Samsung Electronics (005930.KS) is ramping its massive Pyeongtaek campus in Korea — the world's largest semiconductor facility — and is simultaneously building a $17 billion fab in Taylor, Texas.
- Micron (MU.US), the only US-based player, is investing $25 billion in its fiscal year 2026 capital expenditure alone, its largest ever, and has signed its first-ever five-year customer supply agreement, signaling a fundamental shift from spot-market selling to long-term contracted revenue.
- The critical caveat for investors is timing: expansion of production capacity takes at least 18-24 months. The capacity being committed today will not produce chips until 2027 at the earliest, and in large volumes not until 2028. This creates a window of continued supply tightness — and elevated pricing — through at least the next 18 to 24 months.

Source: KGI

The Memory Trade Has Become Crowded

We Are Not Sure When Everyone Will Forget the “Memory” – It Is Beyond a Fundamental Call

- Retail participation at high level (if not at its peak). When a sector's investment thesis becomes widely understood and retail investors begin participating at scale, it is often a sign that the easy money has already been made. In 2026, the memory trade has reached exactly this point. South Korea's stock market has surged nearly 96% year-to-date, driven almost entirely by Samsung Electronics (005930.KS) and SK Hynix (000660.KS). A new US-listed ETF called the Roundhill Memory ETF (DRAM) attracted over $10 billion in assets within just 50 days of its April 2026 launch — one of the fastest ETF growth stories in history.
- In South Korea, regulators approved the country's first-ever single-stock leveraged ETFs in May 2026, with 16 products tied exclusively to Samsung Electronics (005930.KS) and SK Hynix (000660.KS) listing on the Korea Exchange. On their debut day alone, these products generated $6.9 billion in trading volume. While the underlying demand for HBM is real and structural, the risks are equally real: memory is the most cyclical corner of the semiconductor industry, with past downturns seeing chip prices fall 50–60% within 18 months.
- The market liquidity and the current market sentiment is too strong to be ignored. The fundamental story for HBM is real but the risk is also real. It would be too early for us to call it a day on memory. Instead, we guide investors to focus on the next AI bottleneck rather than chasing the crowd.

Source: KGI

The Bottleneck Migration

The Game of Finding the Weakest Link

- The development of AI is not a smooth, linear progression. It is a shifting-constraint problem. In any complex system — like a massive computer cluster or a global factory network — there is always one component that is the slowest, the tightest, or the most expensive. That component is the bottleneck. It dictates the speed of the entire system.

- As soon as engineers and billions of dollars of capital resolve that bottleneck, the limit immediately migrates to the next adjacent component. We have already seen this play out in phases: Phase 1 was raw computing power (GPUs). Phase 2 was advanced chip packaging (TSMC's CoWoS). Phase 3, which is peaking in 18-24 months, is memory bandwidth (HBM).

- As the memory industry commits $100 billion to expand production, the HBM shortage will eventually ease. But this will not make AI development infinitely fast. Instead, the bottleneck is shifting again. We believe the three physical-world constraints that are emerging as the next critical chokepoints are: **Optical networking**, **Thermal management**, and **Power grid infrastructure.**

Source: KGI

Bottleneck One: Optical Networking – the Speed of Light

Connecting 100,000 GPU Together Requires Moving Data in Light Waves Instead of Copper Wires

- Building a modern AI supercomputer is not like building a regular server. You cannot just put 100,000 GPUs in a room and turn them on. They must all talk to each other constantly, sharing billions of data points every millisecond to train a single model. If the connection between them is slow, the GPUs sit idle, wasting expensive computing power. This is what engineers call the "communication wall."

- To break this wall, the industry is transitioning from copper cables (which are too slow and generate too much heat over distance) to optical networking. Instead of electricity, data is converted into light waves and sent through fiber-optic cables. This requires a highly specialized component called an **“optical transceiver”**.

- As clusters scale to 100,000-plus GPUs in 2026, hyperscalers are rapidly upgrading from 800G to 1.6T (Terabit) transceivers. The critical material bottleneck here is a rare semiconductor called **“Indium Phosphide (InP)”**, which is used to make the microscopic lasers inside these transceivers. Because only a handful of specialized companies can manufacture these advanced optical components, lead times are stretching, making optics the next major chokepoint in cluster construction.

Source: KGI

Bottleneck Two: Liquid Cooling – Air Is No Longer Enough

Cooling Down the Sprint Is as Essential as the Sprint Itself

A single NVIDIA Blackwell GPU generates up to 1,200 watts of heat — roughly the same as a small electric space heater. Imagine 72 of these chips packed into a single server rack. The heat density is so extreme that blowing air over them, the way the laptop fan works is simply no longer sufficient. The industry has moved to liquid cooling: running chilled water through pipes directly attached to the chips, the same basic principle as the radiator in a car.

Source: KGI

Bottleneck Three: The Power Grid

Half of the US's Planned AI Data Centers in 2026 Have Been Delayed Due to Grid Connection Limits

- A large AI data center consumes as much electricity as a small city. To connect to the national power grid, it needs a piece of equipment called a "**Large Power Transformer**" — a massive, custom-built device that steps down the high-voltage electricity from transmission lines to the lower voltages that buildings and computers can use.

- These transformers are not off-the-shelf products. They are custom-engineered for each installation, weigh hundreds of tonnes, and are assembled largely by hand by skilled workers winding miles of copper wire around enormous steel cores. Before the AI boom, lead times for these transformers were around 30 to 50 weeks. **Today, they have stretched to between 128 weeks and four years**.

- The reason is a combination of surging demand from AI data centers, electric vehicle charging infrastructure, and renewable energy projects — all competing for the same limited manufacturing capacity. The steel used in transformers — a specialized product called Grain-Oriented Electrical Steel (GOES) — is itself in short supply, with only a handful of mills in the United States, Europe, and Japan capable of producing it.

Source: KGI

Moving From Silicon to the Physical Infrastructure

Nothing Is Untouched Along the AI Supply-Chain but They May Not Be as Crowed as “Memory”

- Optical Networking: The transition to 1.6T transceivers creates immense pricing power for laser diode leaders like **Lumentum** (LITE.US) and **Coherent** (COHR.US), and high-precision manufacturer **Fabrinet** (FN.US). In Taiwan, **LandMark Optoelectronics** (3081.TW) is a critical chokepoint as the primary foundry for the Indium Phosphide (InP) epi-wafers used to grow these lasers.

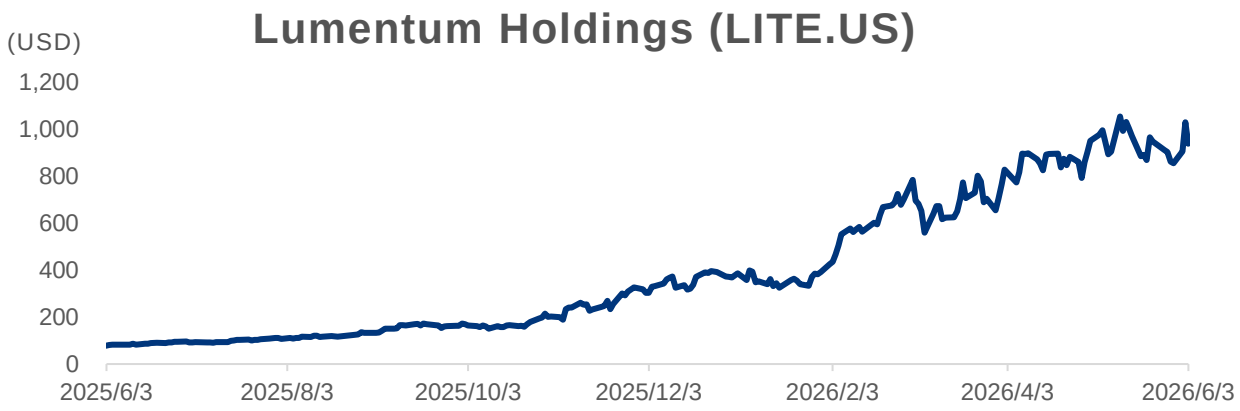
- Liquid Cooling: Direct-to-chip cooling demands zero-leak mechanical tolerances. While US-based **Vertiv** (VRT.US) dominates system design, Taiwanese thermal giants **Asia Vital Components** (AVC, 3017.TW) and **Auras Technology** (3324.TW) are the leading global suppliers of the advanced cold plates and liquid cooling modules required for NVIDIA's GB200 systems.

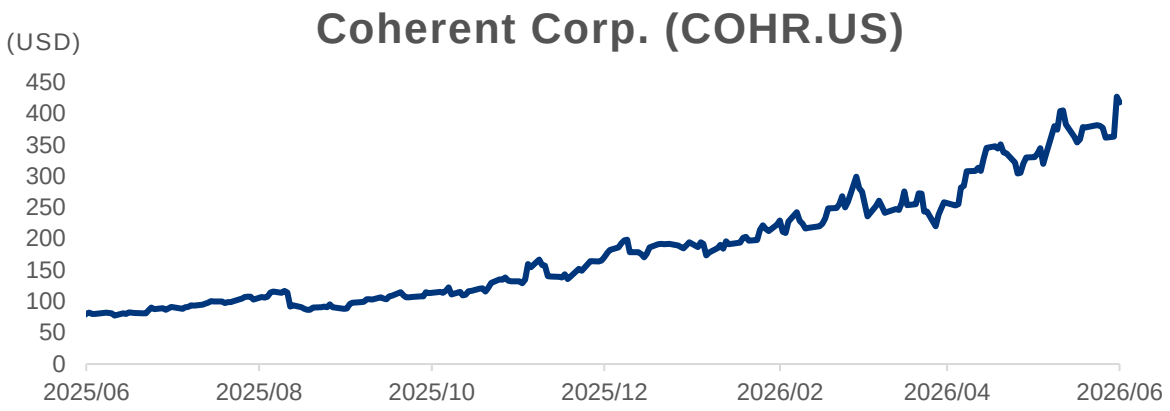
- Grid Hardware: Connecting gigawatt-scale data centers is blocked by 4-year transformer lead times. Alongside global giants like **Eaton** (ETN.US) and **Siemens Energy** (ENR.DE), Taiwan's **Fortune Electric** (1519.TW) has emerged as a high-growth play, actively exporting custom high-voltage transformers directly to US utilities to bypass domestic supply constraints

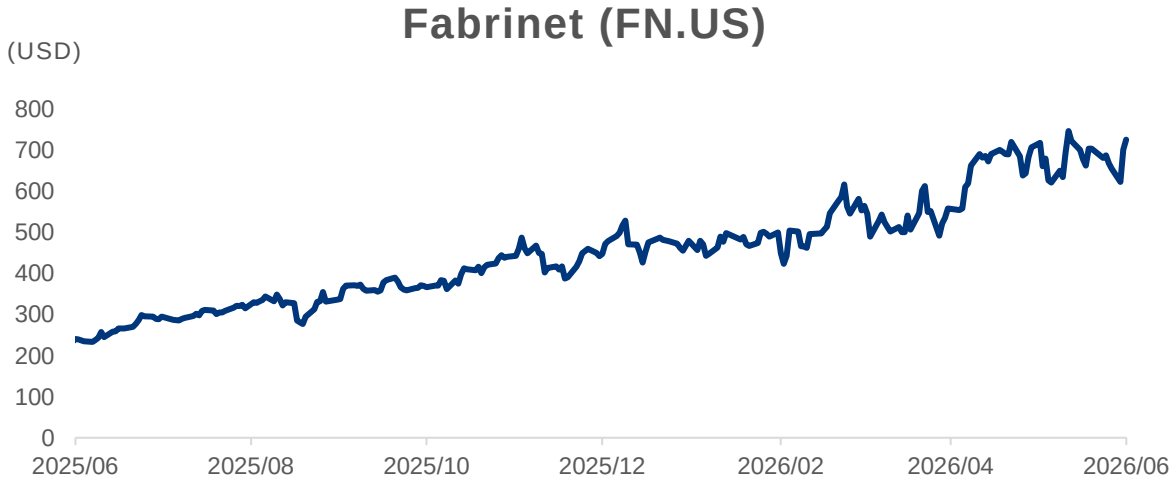
Source: KGI

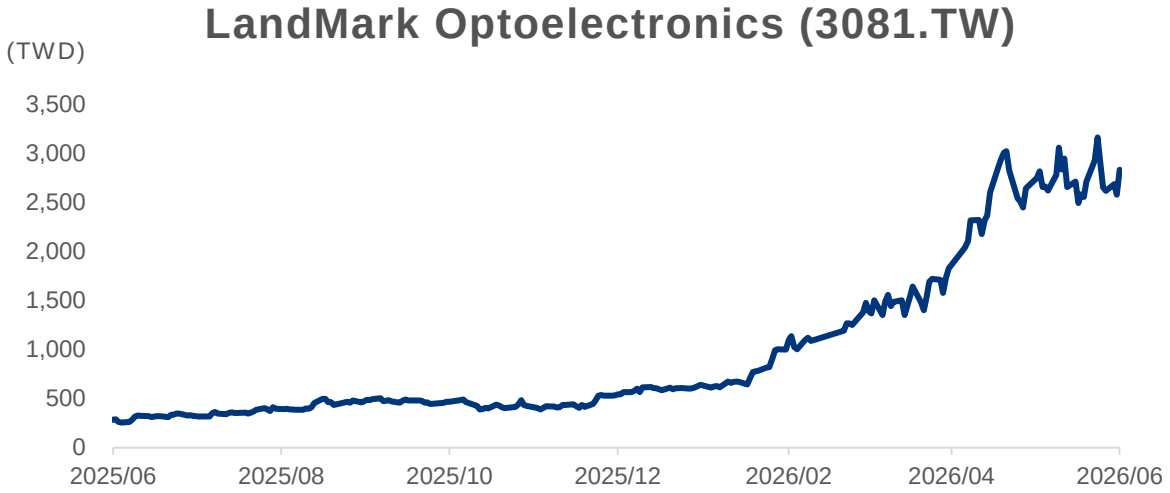
Optical Networking

Their Share Price Performances Has Been the Closest to the Memory Stocks





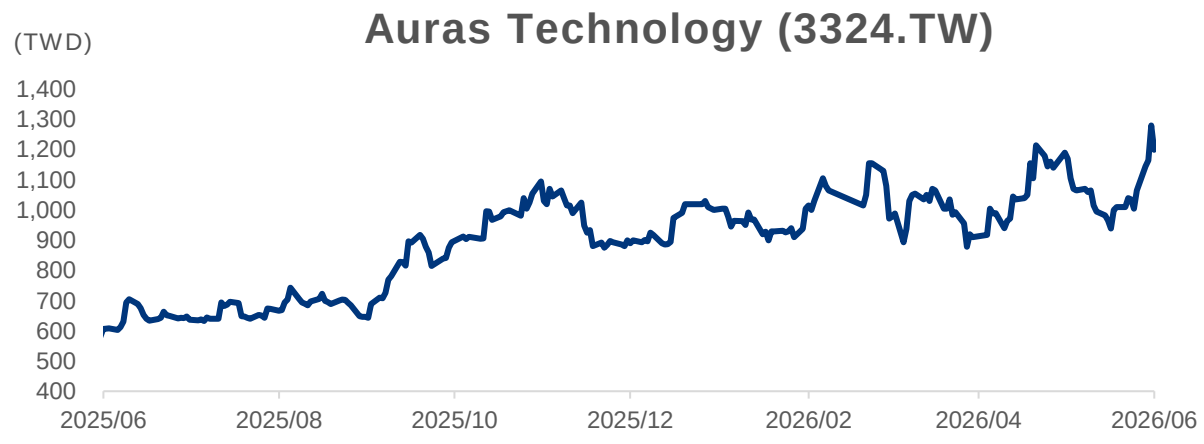




Source: Bloomberg, KGI

Liquid Cooling

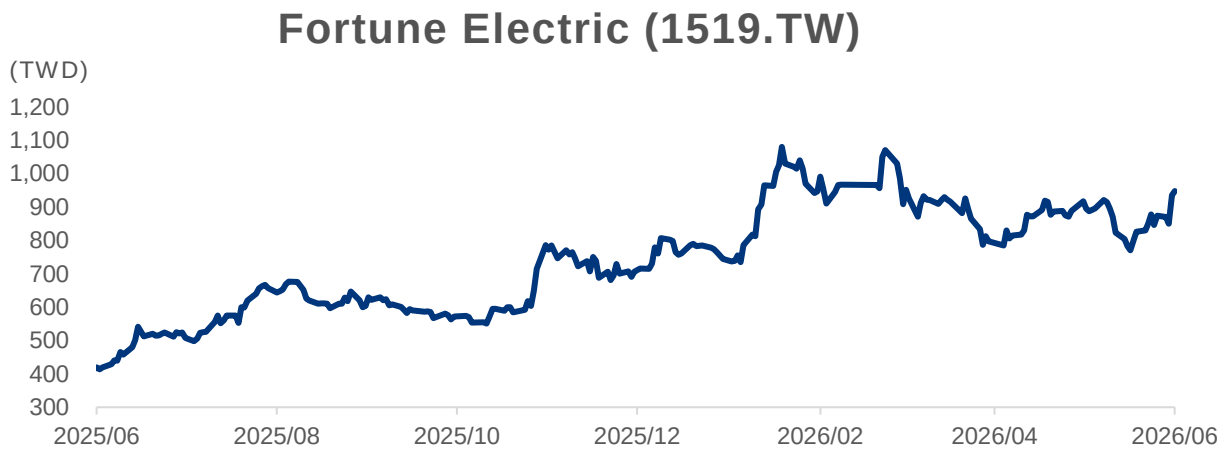
“Temperature” of the Share Prices Are Still Under Control

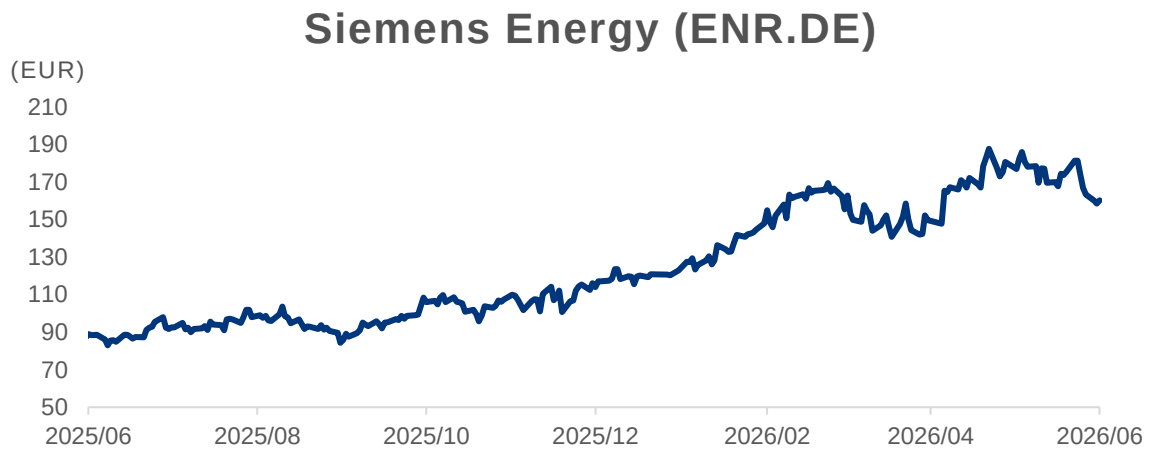


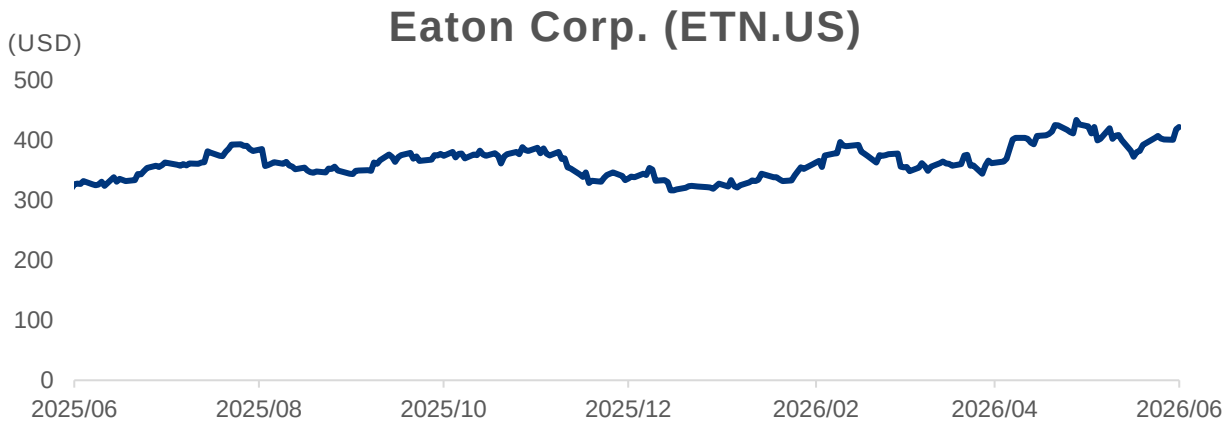
Source: Bloomberg, KGI

Grid Hardware

More Opportunity in Powering up the Electricity Grid







Source: Bloomberg, KGI

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