

NO.1 FEB23
**MEMPHIS
MEMORY
ESSENTIALS**

Everything you need to know about the semiconductor memory industry, from legacy technologies to latest innovations.

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Will 2023 be the worst or best year yet for memory?

It's been a swift descent from the memory chip pandemic sales surge to one of the worst setbacks ever. The industry that is famous for its boom-and-bust cycles, is suffering from a unique combination of circumstances — a pandemic hangover, the war in Ukraine, historic inflation and supply-chain disruptions — that have made the slump much worse than a regular cyclical downturn that have changed purchasing behaviors significantly (as we have outlined here).

What does that mean? [Micron Technology](#) and [Sk Hynix](#) scale back output and reduce budgets for new plants and equipment. [Samsung Semiconductor](#) is the only manufacturer to continue with its chip output and investment, thanks to its diversified business and [Winbond](#) has kickstarted its output ramp-up at the first-phase facility of its new fab in Kaohsiung, southern Taiwan, with a monthly capacity of 10,000 wafers.

Still, in DRAM all three giants are reducing supply. In NAND memory the market is more fragmented, and analysts see a more severe battle and also expect that the recovery will follow one quarter after the DRAM market recovery.

The memory industry had mergers during previous downturns, and this one may be no exception. The longer-term question is when customers' demand will bounce back. China's recent exit from Covid-related restrictions could be one catalyst to help the industry as we outline below. But every cloud has a silver lining, and in memory, we expect to see this in late Q2, beginning for Q3. Plus technological advancements keep our hopes up.



Will we see the genesis of the world's largest NAND manufacturer?

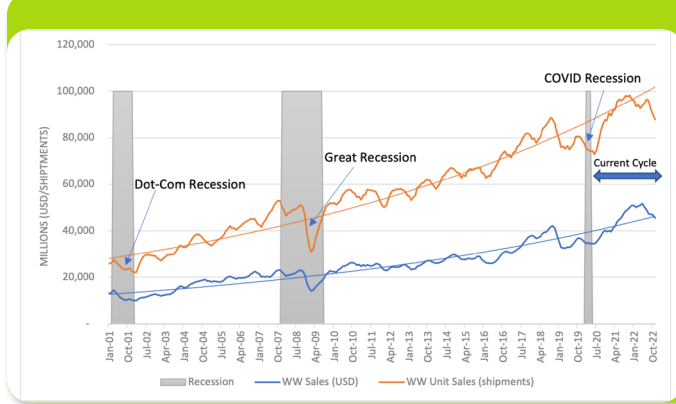
You probably heard the rumors about Western Digital and KIOXIA Group being in discussions about a merger again (after a buyout attempt in 2018).

What would this mean for the two companies and the industry?

1. Combining the two might not automatically get them to #1 as it's likely that some customers would move some of their business to other vendors to reduce their dependency on one vendor.
2. From a revenue perspective, Western Digital's HDD revenue usually is higher than that of its NAND flash, but the gross margin of its NAND business exceeds that of HDD.
3. Kioxia and Western Digital take their NAND flash from the same Kioxia fabs. WD can take up to 50%, but doesn't have to. So when demand is slow and prices declining, WD can control loss while Kioxia has to try and sell their part as well as the share that WD didn't take.

There are pros and cons as to most deals. Read the full perspective from [Thomas Coughlin](#).

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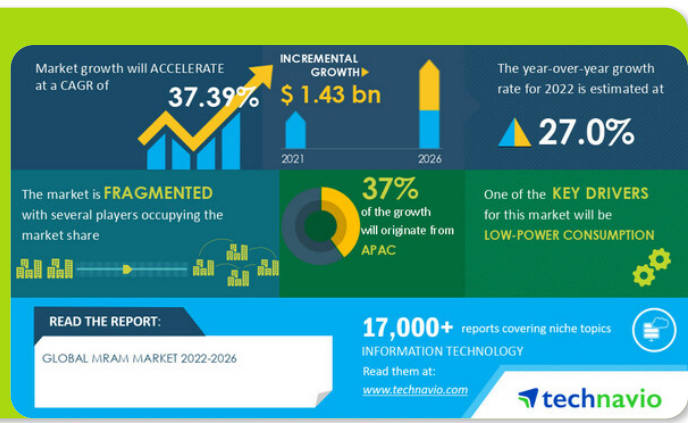
Long-term Global Semiconductor Outlook is strong

Macroeconomic headwinds have created significant short-term challenges for the semiconductor industry in 2022, but zooming out from short-term demand fluctuations and looking at the long-term trend over the last two decades, the semiconductor industry has shown consistent growth (figure 1). Annual sales grew from \$139 billion in 2001 to \$573.5 billion in 2022, an increase of 313 percent. And according to a recent SIA report, the global demand for semiconductor manufacturing capacity is projected to increase by 56% by 2030.

SIA concludes: While the chip industry is notoriously cyclical and experiences brief periods of weakness in the short-term, the long-term prospects for this critical sector are incredibly bright. Chips are key to the big emerging technologies, such as AI, IoT, and 6G. They are essential to breakthroughs in medicine and innovation in medical devices. Our electric grid and climate solutions all rely on these tiny pieces of silicon that have become so important to our lives. And that reality will not change in the short-term or the long-term.

The image above shows the three months average sales and unit shipments average from January 2001 to November 2022.

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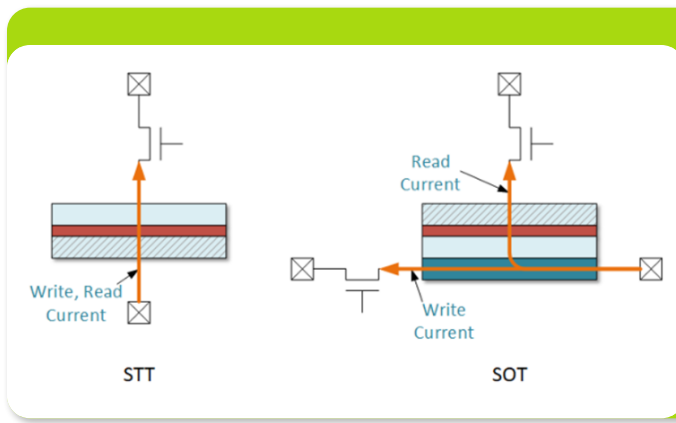


MRAM Market to grow by \$1.43 Billion by 2026

According to Technavio, the global MRAM market size is estimated to grow by \$1.43 billion from 2021 to 2026. It is estimated to grow at a CAGR of 37.39%. The main growth drivers are:

- Low-power consumption is driving the growth of the market.
- MRAM technologies are used in battery-powered wireless sensors, as they consume 50% less power than other flash memories, which increases the battery life.
- This also enables OEMs to integrate MRAM technology into the devices.
- The MRAM module has features such as faster access time and non-volatile data storage.
- These factors drive the demand for MRAM modules, which, in turn, will fuel the growth of the market during the forecast period.

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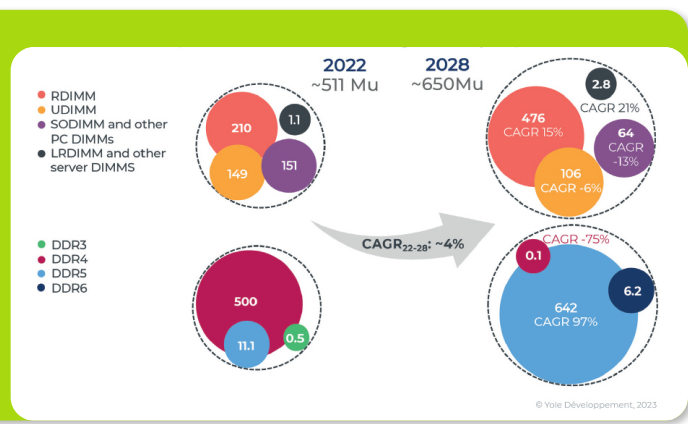
SOT-MRAM to challenge SRAM

In an era of new non-volatile memory (NVM) technologies, yet another variation is poised to join the competition — a new version of MRAM called spin-orbit torque, or SOT-MRAM. What makes this one particularly interesting?

STT uses a two-terminal cell, while SOT requires an additional terminal for the write current.

SOT-MRAM shows promise for removing the current tradeoff between speed and endurance with a write performance that is 10 times higher than prior-generation STT-MRAM at a much longer endurance. These are important elements, but replacing SRAM still is a challenge, although SOT-MRAM promises relief in area efficiency and adds non-volatility – and while it can't replace the fastest SRAM, it may help with larger arrays using slower SRAM. Interested in more details? Then dive deeper and check out the full article

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DDR5 boost DRAM modules and DIMM chiplets

The DRAM market is cyclical in nature. It is characterized by periods of shortages and oversupply that give rise to significant price variations and revenue volatility which we are seeing today. But by 2028 the total DRAM module market will reach about \$96.3 billion, according to Yole Intelligence and its brand-new memory report, DRAM Modules 2023.

With this Annual Report, the company offers a detailed technology and market analysis of DIMMs for servers and PCs. Including market forecasts, market and technology trends, and a supplychain analysis, this new study delivers an in-depth analysis of DRAM-module technologies and their markets as a function of the interfaces and the module types.

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Join us at embedded world 2023

Going to embedded world in Nuremberg from March 14 to 16? Then make sure to swing by our booth to find out more about the latest memory news and trends. In hall 1, booth 340 you can jog your memory and tell us all about your applications and memory needs over a coffee or a cool beer.

Claim your **free show ticket** with this code:

ew23492856

[Get your ticket](#)

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Let us know how we are doing and what topics you would like to read more about.