

Micron Technology: Where to Place the Next Memory Dollar?

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A strategy case for MBA students and working professionals

The question in December 2024

On December 18, 2024, Micron Technology reported record quarterly revenue. Its data-center business had become a larger part of the company, and its high-bandwidth memory (HBM) products were part of the hardware supporting artificial-intelligence computing. At the same time, Micron remained a capital-intensive manufacturer of memory products exposed to recurring swings in supply, demand, and prices.

The quarterly release described weaker near-term consumer-oriented markets, even as Micron forecast a record fiscal year. Micron was already investing in manufacturing, advanced packaging, technology transitions, and new U.S. fabs. Some commitments stretched years into the future. New HBM programs were also moving through production and customer qualification, while competitors were announcing their own advanced products.

Consider a hypothetical assignment to Micron's executive committee at the information cutoff in this case. The committee must set the principles for allocating the next discretionary increments of capital and capacity across HBM, other DRAM products, and NAND. It must decide what evidence would justify accelerating investment, what should be staged, and what would cause the company to redirect or defer a tranche. The public information available to the committee does not reveal a specific internal project choice or the standalone return on Micron's HBM investments.

The issue is not simply whether AI demand will grow. An investment in memory capacity requires equipment, facilities, engineering, customer qualification, and time. Capacity directed toward one product may not be immediately available for another. A decision made during a shortage can secure customers and experience; a decision made too aggressively can leave the company with costly capacity if demand, pricing, or product leadership changes.

From a steep downturn to record revenue

Micron designs and manufactures DRAM, NAND, and NOR memory and storage products. DRAM stores data temporarily and is used in servers, PCs, phones, graphics and other systems. HBM is a three-dimensional stacked form of DRAM designed for high bandwidth and lower power consumption than other memory types. NAND provides nonvolatile storage and is used in solid-state drives, phones, removable storage, and other products.

Memory is both a technology business and a manufacturing business. Customers value performance, power efficiency, density, reliability, and compatibility with their systems.

Suppliers must invest in process development, equipment, facilities, and assembly and test operations. These investments are large and take time; demand and average selling prices can change faster than new capacity can be built and qualified.

Micron's reported revenue fell from \$30.8 billion in fiscal 2022 to \$15.5 billion in fiscal 2023, then recovered to \$25.1 billion in fiscal 2024. The company said it reduced capital spending and wafer starts for DRAM and NAND beginning in late 2022 as market conditions weakened and inventories rose. It later described its high-volume manufacturing nodes as fully utilized through most of 2024, with capacity structurally lower than before the downturn.

Fiscal 2024 was a recovery year. Revenue was up 62% from fiscal 2023, but remained below fiscal 2022. In the fourth quarter, revenue was \$7.75 billion, 93% above the same quarter a year earlier. Chief Executive Officer Sanjay Mehrotra attributed the strong quarter to AI demand and growth in data-center DRAM and HBM. Data-center solid-state-drive sales also exceeded \$1 billion in quarterly revenue for the first time. These descriptions came from management; the company's financial statements did not separately report HBM revenue or margins.

A product opportunity with a manufacturing trade-off

Micron's fiscal 2024 annual report said the company began volume production of its 8-high, 24-gigabyte HBM3E product during the year. It also began shipping production-capable 12-high, 36-gigabyte units to customers for qualification. Qualification matters because customers integrate HBM into complex processor systems and must establish that the complete platform meets performance, reliability, and production requirements.

In June 2024 prepared remarks, Micron said it had generated more than \$100 million of HBM3E revenue in fiscal Q3. Management described HBM3E margins as accretive to DRAM and company margins. It forecast hundreds of millions of dollars of HBM revenue for fiscal 2024 and multiple billions for fiscal 2025. Management also said its HBM output was sold out for calendar 2024 and 2025, with pricing contracted for most of 2025. These statements provide evidence of early demand and product mix, but do not disclose HBM's precise unit economics, the terms of customer agreements, or the amount of capacity required.

Micron had broader ambitions. The June remarks said the company expected HBM market share to become comparable with its overall DRAM share sometime in calendar 2025. This was a management goal, not a realized result or independent market-share measurement. By the fiscal 2024 year-end filing, Micron said it was producing 8-high HBM3E and shipping 12-high products for qualification.

Competitors were also advancing. SK hynix announced in September 2024 that it had begun volume production of 12-layer HBM3E and expected to supply customers before year-end. Samsung had announced a 36-gigabyte HBM3E 12-high product in February, saying it had begun customer sampling and planned mass production in the first half of 2024. These were the companies' own announcements. Public disclosures available by the cutoff did not provide a comparable, independently verified view of yields, customer qualifications, shipments, or margins across suppliers.

HBM's product value does not make its capacity economics transparent. Micron did not report the conversion of DRAM wafer capacity into HBM output, the incremental assembly and test cost, product-level yields, or the returns on a marginal HBM investment. Its reported segment called Cloud Memory and Networking Business Unit (CNBU) included HBM alongside other DRAM products sold to data-center, PC, graphics, and networking markets.

Capital commitments stretch beyond the cycle

Micron's fiscal 2024 capital spending reflected both current technology transitions and longer-term capacity plans. The company reported \$8.39 billion of cash expenditures for property, plant, and equipment (PP&E) in fiscal 2024, partly offset by \$315 million of cash contributions from government incentives. In a separate investor-defined measure, it reported \$8.12 billion of net capital expenditures and \$386 million of adjusted free cash flow for the year. These figures use different definitions and should not be treated as interchangeable.

In its annual report, Micron estimated fiscal 2025 capital expenditures, net of government incentive proceeds, at around the mid-30% range of revenue. It also reported approximately \$1.17 billion in PP&E purchase obligations as of August 29, 2024, with approximately \$1.10 billion expected to be paid within a year. The company noted that actual spending could vary with market conditions and the timing of incentive proceeds. Its published figures did not identify how much capital expenditure was assigned to HBM.

The company's longer-term plans included new U.S. DRAM capacity. Construction of a leading-edge Boise, Idaho, fab had begun, with production targeted to start in early calendar 2026 and initial output expected in mid-2026. Micron's New York plan contemplated as many as four fabs built over more than 20 years. The company expected site preparation to begin in 2025 and production to ramp in the latter half of the decade. Those schedules were company plans, not completed capacity. They also addressed DRAM capacity generally, not a disclosed near-term volume of HBM.

Government support formed part of the investment picture. Micron disclosed that qualified U.S. semiconductor manufacturing investment received a 25% investment tax credit under the CHIPS and Science Act. Government incentives had reduced the carrying amount of PP&E by \$2.34 billion by August 29, 2024, including \$1.10 billion related to fiscal 2024 expenditures. Incentives came with conditions, including spending and operational milestones, and could be reduced or clawed back. The timing of tax credits and grants also differed from the timing of construction cash flows.

A new quarter, with mixed signals

Micron's fiscal first quarter of 2025 ended November 28. In its December 18 release, the company reported revenue of \$8.71 billion, compared with \$7.75 billion in the preceding quarter and \$4.73 billion in the year-earlier quarter. GAAP net income was \$1.87 billion, and cash from operations was \$3.24 billion. The company's investor-defined net capital expenditures were \$3.13 billion, and its adjusted free cash flow was \$112 million.

Management said data-center revenue exceeded half of total revenue for the first time. In the same release, the company described consumer-oriented markets as weaker in the near term and anticipated a return to growth in the second half of fiscal 2025. Its fiscal Q2 outlook was revenue of \$7.90 billion, plus or minus \$200 million, and non-GAAP gross margin of 38.5%, plus or minus one percentage point. Guidance was a forecast, not a reported outcome.

The quarter's revenue rebound coexisted with modest adjusted free cash flow after investment. That does not determine whether Micron should add or defer capacity. Fab projects, equipment orders, packaging capacity, technology transitions, and government incentives have different lead times and degrees of flexibility. Public reports did not disclose how much of the near-term capex could be shifted among product lines, nor which spending was already committed, avoidable, or eligible for incentives.

Micron's annual report identified several risks to the investment decision: memory-market price and supply changes, competitor capacity additions and aggressive pricing, execution and product-yield challenges, construction delays, competition for skilled labor, and restrictions on sales in China. The report also noted that Micron did not internally report assets or capital expenditures by segment. As a result, an outside analyst could not directly compare HBM project returns with those of conventional DRAM or NAND using the company's published segment data.

The committee's allocation problem

The hypothetical committee has two broad paths. It could accelerate selected HBM and advanced-packaging investments to support qualification, customer relationships, and high-value product mix. Or it could sequence incremental capacity more cautiously, preserving the ability to respond to clearer evidence on yields, customer demand, memory pricing, conventional-market recovery, project costs, and incentive timing. A mixed allocation is possible, but it requires explicit rules for which commitments move first and what evidence would change the sequence.

No option eliminates risk. Acceleration could improve timing and customer access if HBM demand continues to grow and Micron executes its product roadmap. It could also commit resources before product yields, market size, customer programs, and pricing are fully visible. A staged approach could retain flexibility and protect capital during a cyclical market, while risking slower qualification, missed customer opportunities, or a later capacity shortfall. The company's public disclosures do not establish which path has the higher expected return.

The executive committee must leave the meeting with a decision rule, not just a forecast. Which indicators should govern the next tranche of spending? How should the committee weigh a product that management says has attractive margins against the cash required to build and qualify it? What portion of the investment should be committed now, and what portion should remain conditional? How should government support, conventional memory customers, and competing suppliers affect the plan?

Exhibits

Exhibit 1. Micron revenue recovery

Fiscal period	Revenue (\$ billions)	Status
FY2022	30.76	Reported
FY2023	15.54	Reported
FY2024	25.11	Reported
Q4 FY2023	4.01	Reported quarter
Q4 FY2024	7.75	Reported quarter

Source: Micron FY2024 annual report, consolidated statements, and FY2024 results release. Rounded to two decimals. Fiscal years end in late August.

Exhibit 2. Q1 FY2025 results and Q2 guidance

Measure	Q1 FY2025 result	Q2 FY2025 outlook
Revenue	\$8.71B	\$7.90B ± \$0.20B
GAAP net income	\$1.87B	-
Operating cash flow	\$3.24B	-
Net capital expenditures ¹	\$3.13B	-
Adjusted free cash flow ¹	\$0.112B	-
Non-GAAP gross margin ¹	-	38.5% ± 1.0%

¹Company-defined measure; see Micron Q1 FY2025 earnings release for definition. Q2 outlook as released Dec. 18, 2024. A sequential midpoint change can be calculated from the rounded revenue figures; it is not a full-year forecast.

Source: Micron Q1 FY2025 Form 8-K, Exhibit 99.1, “Fiscal Q1 2025 highlights,” cash flow and “Business Outlook.”

Exhibit 3. Fiscal 2024 investment measures

Measure	Amount	Definition / status
Cash PP&E expenditures	\$8.39B	Cash-flow statement / 10-K discussion
Incentive contributions received toward capex	\$0.315B	Cash receipts, reported separately
Net capital expenditures	\$8.12B	Company investor-defined metric
Adjusted free cash flow	\$0.386B	Company investor-defined metric
FY2025 planned net capex	Mid-30% range of revenue	Management estimate in FY2024 10-K
PP&E purchase obligations at Aug. 29, 2024	\$1.17B	\$1.10B expected to be paid within one year

Source: Micron FY2024 Form 10-K, Item 7, cash flows/capital expenditures and commitments; FY2024 results release and footnotes. Measures have different definitions and timing; do not subtract one row from another without reconciliation.

Exhibit 4. Selected product and capacity milestones announced by the companies

Company / date	Announced milestone	Evidence status
Micron, FY2024	Began volume production of 8-high 24GB HBM3E; began shipping production-capable 12-high 36GB units for qualification	Company filing statement
Micron, June 2024	More than \$100M fiscal Q3 HBM3E revenue; sold out HBM output for calendar 2024 and 2025; pricing contracted for most of 2025	Management prepared remarks; contract detail not disclosed
SK hynix, Sep. 2024	Announced volume production of 12-layer HBM3E	Company announcement; shipment/yield not independently verified
Samsung, Feb. 2024	Announced 36GB HBM3E 12H product, customer sampling, and planned first-half 2024 mass production	Company announcement; schedule and realized output not independently verified

Sources: Micron FY2024 Form 10-K and June 26, 2024 earnings prepared remarks; SK hynix newsroom, Sept. 26, 2024; Samsung Global Newsroom, Feb. 27, 2024.

Discussion questions

1. What is the strategic decision facing Micron's hypothetical executive committee at the case cutoff? What is known and what remains uncertain?
2. What are the strongest reasons to accelerate HBM and related capacity investment? What are the strongest reasons to stage incremental commitments?
3. Which indicators should trigger an increase, pause, or reallocation of investment? Set out a decision rule that accounts for product qualification, yield, customer commitments, prices, and conventional-memory demand.
4. What can the reported revenue, cash flow, capex, and outlook figures tell you about Micron's investment capacity? What can't they tell you about HBM's standalone returns?
5. How should the committee account for competitor announcements, government incentives, and Micron's multiyear fab plans without treating announced plans as realized capacity?

Information boundary and sources

The case information set closes at **December 18, 2024, 4:10 p.m. ET**. It includes the Micron Form 8-K accepted at 4:00:20 p.m. ET and its Exhibit 99.1 earnings release. The scheduled earnings call began at 4:30 p.m. ET; the call and its remarks are excluded. The December 19 Form 10-Q and later events are excluded. No financial model, project NPV, HBM-specific margin or capacity-conversion figure is provided.

Principal sources: Micron FY2024 Form 10-K (SEC accession 0000723125-24-000027); Micron FY2024 results release, Sept. 25, 2024; Micron FY2024 Q3 earnings prepared remarks, June 26, 2024; Micron Q1 FY2025 Form 8-K (accession 0000723125-24-000046), Exhibit 99.1; SK hynix, Sept. 26, 2024 HBM3E announcement; Samsung, Feb. 27, 2024 HBM3E announcement. Full links and locators are recorded in the accompanying source register.