

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	3 Dec 2025 06:00, UTC

Sector

Technology

Industry

Semiconductors

Business Description

Micron is one of the largest semiconductor companies in the world, specializing in memory and storage chips. Its primary revenue stream comes from dynamic random access memory, or DRAM, and it also has minority exposure to not-and or NAND, flash chips. Micron serves a global customer base, selling chips into data centers, mobile phones, consumer electronics, and industrial and automotive applications. The firm is vertically integrated.

fiscal 2027. We project terrific profitability across these two years, with non-GAAP gross margins reaching 70%, well above our previous views of midcycle in the mid 30% range.

- We continue to worry about the cycle turning down after this torrid upcycle. Micron and peers are working to build out more supply, which takes years. If supply buildouts exceed demand toward the end of the decade, it could pressure pricing, sales, and profits, as seen in historical downturns.

Business Strategy & Outlook William Kerwin, CFA, Senior Equity Analyst, 24 Sep 2025

We see Micron Technology as a strong supplier of memory chips, but we don't believe the firm holds an economic moat. Micron benefits from large scale, being the fifth-largest chipmaker in the world, but we don't see enough scale to generate consistent economic profits. Micron holds a third-place market share in dynamic random access memory, or DRAM, chips and a fifth-place market share in not-and, or NAND, flash chips. We view both the DRAM and NAND markets as highly cyclical, and we expect Micron to thrive in periods of strong demand and pricing but to be vulnerable to downcycles that compress shipments, prices, and profits.

DRAM and NAND chips are vital components to data centers, consumer devices, cars, and industrial equipment. Nevertheless, we see these chips as commoditylike and suppliers like Micron producing mostly fungible chips. Thus, Micron and its peers are prone to market supply-and-demand dynamics. Periods of strong industry demand can be followed by periods of oversupply that crater pricing and firm profitability, as seen in Micron's fiscal 2023. As a vertically integrated chipmaker, Micron has a significant fixed cost base and thus periods of lower volume have a major impact on profitability.

In the medium term, we see artificial intelligence driving a strong and enduring upcycle for Micron. Micron's high-bandwidth memory, or HBM, chips supply into AI processors from the likes of Nvidia. We credit AI investments for Micron's strong growth in fiscal 2025 and they are a significant driver of our five-year forecast. We believe HBM will continue rising as a piece of Micron's total shipments and revenue, helping growth and margins. We also like Micron's shareholder distributions and view its balance sheet as good for a cyclical memory chipmaker.

Finally, we caution investors about risk from China. The Chinese government effectively cut off Micron's sales into Chinese data centers in 2023, which will have a material impact on sales and growth. Micron earns non-data-center revenue out of China, but we expect this to remain unrestricted, as these chips are for consumer and lagging-edge markets that are less critical to national security.

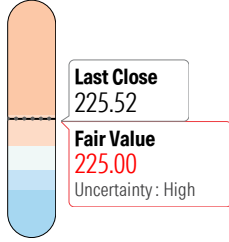
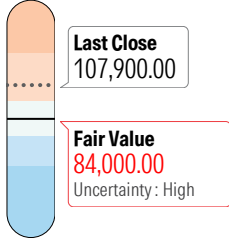
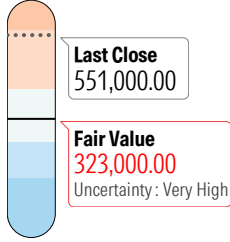
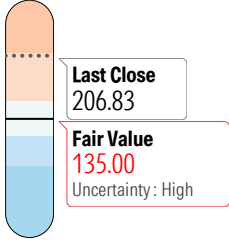
Bulls Say William Kerwin, CFA, Senior Equity Analyst, 18 Dec 2025

- When memory markets are in an upswing and demand is strong, Micron's sales growth and profitability can be impressive.
- Micron is benefiting from immense growth in HBM revenue, due to high investments in AI infrastructure. This boosts the firm's growth and margin profile.

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	3 Dec 2025 06:00, UTC

Competitors

	Micron Technology Inc MU	Samsung Electronics Co Ltd 005930	SK Hynix Inc 000660	SanDisk Corp Ordinary Shares SNDK
				
Economic Moat	None	None	None	None
Currency	USD	KRW	KRW	USD
Fair Value	225.00 18 Dec 2025 01:57, UTC	84,000.00 31 Oct 2025 06:29, UTC	323,000.00 30 Oct 2025 04:36, UTC	135.00 7 Nov 2025 02:41, UTC
1-Star Price	348.75	130,200.00	565,250.00	209.25
5-Star Price	135.00	50,400.00	161,500.00	81.00
Assessment	Overvalued 17 Dec 2025	Overvalued 17 Dec 2025	Overvalued 17 Dec 2025	Overvalued 17 Dec 2025
Morningstar Rating	★★★ 18 Dec 2025 02:00, UTC	★★ 17 Dec 2025 12:27, UTC	★★ 17 Dec 2025 12:29, UTC	★★ 17 Dec 2025 23:02, UTC
Analyst	William Kerwin, Senior Equity Analyst	Phelix Lee, Equity Analyst	Phelix Lee, Equity Analyst	William Kerwin, Senior Equity Analyst
Capital Allocation	Standard	Standard	Standard	Standard
Price/Fair Value	1.00	1.28	1.71	1.53
Price/Sales	7.00	1.81	4.76	3.93
Price/Book	4.82	1.78	3.81	3.27
Price/Earning	30.10	21.65	12.27	—
Dividend Yield	0.20%	1.43%	0.46%	0.00%
Market Cap	253.92 Bil	721,428.37 Bil	380,440.85 Bil	30.31 Bil
52-Week Range	61.54—264.75	50,800.00—112,400.00	162,700.00—646,000.00	27.89—284.76
Investment Style	Large Blend	Large Value	Large Growth	Mid Growth

► We like Micron's shareholder returns and view its balance sheet as strong for a cyclical firm.

Bears Say William Kerwin, CFA, Senior Equity Analyst, 18 Dec 2025

- Micron has a high fixed cost base that leaves it vulnerable to underutilization charges and major profit compression when memory markets enter a downturn.
- We see DRAM and NAND as commoditylike products, and we foresee little ability for Micron to build durable differentiation against its competitors.
- If AI investments slow down, or Micron faces steeper competition in HBM, it could dent our growth and profitability estimates, and potentially weigh on the firm's stock.


Economic Moat William Kerwin, CFA, Senior Equity Analyst, 15 Aug 2023

We do not believe Micron possesses an economic moat. The firm operates in the highly capital-intensive industries of DRAM and NAND flash semiconductors, and it doesn't earn good enough profit

Micron Technology Inc

MU★★★

18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

margins through the course of a cycle to give us confidence in enduring economic profits.


We view DRAM and NAND as commoditylike products prone to market supply-and-demand dynamics and steady pricing erosion that reduces industry profitability. While we see better margins in DRAM, which has consolidated to three primary players (versus six in NAND) we still don't see good enough returns on invested capital over the course of a cycle to merit a moat. We do expect to see years of positive economic profits during periods of tight supply and strong demand that help support good pricing, but we see steep downcycles giving rise to poor profitability and eroding the economic profits built up in a market upswing.

The majority of Micron's sales comes from DRAM chip sales. DRAM chips provide volatile random access memory, which is used to store memory during a system's operation, and only while a system is turned on. DRAM is a critical component for data center servers, computers, smartphones, and industrial applications. We see DRAM chips as commodity products, primarily sold by three suppliers—Samsung, SK Hynix, and Micron—that occupy over 90% of the market. DRAM technology generations last years, and we see the leading oligopoly players moving in step to successive generations and participating in an industry standards-setting body. DDR5 is the latest technology transition for mainstream DRAM, and while a player like Micron will cite technological leadership or being first to market, we view these chips as fungible and time-to-market differences of a quarter or two as immaterial to competitive positioning.

As a vertically integrated producer, Micron has massive capital investment needs that weigh on its returns on invested capital. The DRAM industry typically exhibits high-single-digit annual pricing declines, with the dominant players focusing not only on product advancement, but also advances in cost efficiency to keep up with their peers. This rapid pricing erosion makes it difficult for industry players to earn strong profits, even with large market shares. Consolidation of the DRAM industry and rational acting by players have helped improve industry margins. Still, we don't see current margin levels providing durable economic profit levels over the course of a cycle. The memory chip market is prone to bouts of undersupply that raise prices and profits, followed by gluts of supply that crater pricing. Downcycles can be severe, sometimes leading to negative returns on invested capital and negative profit margins.

Micron also has a meaningful NAND flash chip business that makes up the minority of sales. NAND flash chips provide nonvolatile memory for storage purposes. Compared with DRAM, NAND is used for longer-term storage of data for data centers and consumer hardware. NAND advancements happen at a much faster pace than those in DRAM, with suppliers putting out higher-density chip generations every 18-24 months. Similar to DRAM, while suppliers will tout technological differences like layer counts and being first to market, we view NAND chips as fungible and commoditylike among the leading players.

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

We view very similar dynamics in NAND as we do in DRAM: commodity products, high capital intensity, and volatile market cycles. NAND, however, is less consolidated of a market with six primary players. In our view, the more fragmented nature of the NAND market creates more volatile supply-and-demand dynamics with worse pricing and profitability in market downturns caused by oversupply. NAND is also even more capital intensive than DRAM is, which we attribute to faster advancement and shorter product generations, and exhibits steeper annual pricing declines typically in the midteens. All of this leads to a lower margin profile for NAND compared with DRAM, as well as lower returns on invested capital.

Fair Value and Profit Drivers William Kerwin, CFA, Senior Equity Analyst, 18 Dec 2025

Our fair value estimate for Micron is \$225 per share. Our valuation implies a fiscal 2026 adjusted price/earnings multiple of 7 times and an enterprise value/sales multiple of 3 times. The greatest drivers to our valuation are DRAM demand and pricing growth over a large fixed cost base, with growth primarily driven by AI infrastructure investments.

We forecast Micron's results to be cyclical in the long term, and note that fiscal 2023 represented one of the most severe downturns we've seen for the chipmaker, with gluts of chip supply for data centers, smartphones, and PCs following post-pandemic-era demand. Micron was also hampered in fiscal 2023 by the loss of revenue coming from memory sales into Chinese data center customers, thanks to retaliatory moves against other US government restrictions.

In the short to medium term, we see Micron benefiting from a snapback and tremendous cyclical upswing. We see AI-driven demand for Micron's HBM and DRAM chips as the firm's largest growth driver, going forward. After more than 60% revenue growth in fiscal 2024 and nearly 50% growth in fiscal 2025, we expect AI to drive more than 100% growth in fiscal 2026. We expect another strong year of growth in fiscal 2027. Thereafter, we model pricing to normalize and for growth to slow, with the potential for a steep downturn to follow the current torrid upcycle.

While the DRAM and NAND markets can be volatile, we view long-term trends exhibiting growth in bit shipments (which equates to volume) and declines in prices per bit. In DRAM, we expect high-teens bit growth and low-double-digit annual pricing declines over the long term. In NAND, we expect mid-teens bit growth and roughly 15% annual pricing declines over the long term. We see HBM boosting Micron's DRAM bit growth and pricing, but for it to exhibit DRAM-like pricing declines after fiscal 2027 against robust shipment growth. Still, we observe HBM as margin-accretive, with roughly four times the price and only three times the cost as traditional DRAM on a per-bit basis.

Practically all of Micron's costs of sales are fixed. Despite revenue cut in half in fiscal 2023, cost of sales was roughly flat, leading to a negative 8% non-GAAP gross margin. We expect Micron to continue investing in manufacturing for the long term, and gross margins to move in line with volumes. In the

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

medium term, we see impressive gross margin above 60% with a higher mix of HBM and tight pricing across HBM, DRAM, and NAND. Long-term, we think Micron can maintain a gross margin level in the low 40% range.

Micron's operating expenses are more flexible than its manufacturing costs. We forecast steady growth in research and development in the mid-single digits in the long term, and for other operating expenses to move with top-line volume. Still, Micron's operating margins will be heavily dictated by its gross margins. At midcycle, we think Micron can earn non-GAAP operating margins in the 30% range.

Risk and Uncertainty William Kerwin, CFA, Senior Equity Analyst, 21 Mar 2024

We assign Micron a Morningstar Uncertainty Rating of High. Micron's largest risk comes from its high cyclicality, in our view. As a memory chipmaker, Micron is susceptible to fluctuations in market supply and demand for commoditylike chips, and periods of oversupply can slash prices. Micron is vertically integrated with a high fixed cost base, so weak pricing can have an outsize effect on profitability, as seen in fiscal 2023.

Micron also bears risk from its China exposure, which sits at roughly 25% of sales. The Chinese government issued restrictions on Micron's sales into data centers in 2023, effectively cutting off roughly 10% of the firm's revenue. The other 15% sells into consumer electronics and autos, which we think poses less of a national security risk. Still, escalating trade tensions could see a complete barring of US-produced memory chips, or alleviated restrictions could see Micron regain its cutoff revenue.

We see some risk from the relatively unconsolidated NAND market. We expect consolidation over the long term in NAND, and if Micron is left on the outside of consolidation, it could be left with a gap in scale relative to peers in NAND production, which could hurt its ability to reduce costs and maintain profitability.


Finally, we note some customer concentration for Micron, with roughly half of its sales coming from its top 10 customers. This concentration is mainly from distributors, and we don't expect these customers to churn. Still, losing one or more of these material customers could have a negative impact on results.

On the environmental, social, and governance front, we foresee little risk to Micron. Its primary risks would arise from its environmental footprint as a manufacturer and its ability to retain human capital.

Capital Allocation William Kerwin, CFA, Senior Equity Analyst, 24 Sep 2025

We assign Micron a Standard Morningstar Capital Allocation Rating, primarily driven by our view of fair investments. We believe Micron invests adequately to maintain its position in the DRAM and NAND markets, and we don't believe greater investment would improve its position. We see the firm adequately investing in research and development to maintain a leadership position in HBM chips. Micron targets more than 30% of sales going to capital expenditure and roughly 10% of sales to go

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

toward research and development, both of which roughly match peers. While Micron benefited from DRAM consolidation a decade ago, we see little opportunity for acquisitions now, and we believe that shareholder distributions as a second priority to organic investment is appropriate. We see Micron's balance sheet as sound, and its distributions as appropriate. Micron is leveraged, but it holds long-dated debt and we believe its cash flow will be more than enough to cover its obligations over the long term. We also see Micron's quarterly dividend and opportunistic repurchases (in upcycle periods, typically) as a good return to investors with few other investment opportunities.

Analyst Notes Archive

Micron: Positive Preearnings Announcement Reflects Robust Short-Term Pricing William Kerwin, CFA, Senior Equity Analyst, 11 Aug 2025

Micron Technology raised its fiscal fourth quarter (August-end) guidance, citing stronger dynamic-random-access-memory, or dram, pricing. The new guidance implies \$500 million more revenue (new midpoint \$11.2 billion) and 250 basis points more non-GAAP gross margin (new midpoint 44.5%). Why it matters: Micron's initial guidance was strong already, so these higher figures reflect an even better demand environment than we'd expected. We see this driven in part by artificial intelligence data center buildouts that are supporting high demand and high pricing for Micron's high-bandwidth memory, or HBM, chips. We're impressed by the strong environment, but see the pricing support as short-term. Longer-term, we anticipate pricing to normalize and experience annual declines. We anticipate HBM to reflect more typical dram pricing dynamics starting in 2026. The bottom line: We raise our fair value estimate for no-moat Micron to \$120, from \$115, to reflect strong short-term pricing for dram. Long-term, we continue to expect cyclicalities in results. Shares rose modestly on the preearnings announcement, and we see them as fairly valued. We anticipate a strong pricing upcycle for Micron, across dram and NAND, continuing in 2026. We model more normalized midcycle dynamics, with pricing declines partially offsetting volume growth, in 2027 for both dram and NAND. We continue to have bullish forecasts for Micron's HBM sales, which we anticipate quickly becoming a majority of total dram revenue. We forecast \$6 billion in fiscal 2025 sales, more than doubling in fiscal 2026, with more than 3 times the price per bit of traditional dram.

Micron Earnings: HBM Highlights a Blowout Quarter as We Raise Our Valuation to \$115 William Kerwin, CFA, Senior Equity Analyst, 26 Jun 2025

Micron Technology's May-quarter results handily beat management guidance for growth and profitability. Revenue rose 37% year over year to \$9.3 billion, inclusive of 50% sequential growth for high-bandwidth memory. August-quarter guidance implies continuing strong growth. Why it matters: Micron's impressive results and guidance came well above our model. Artificial intelligence is benefitting Micron on multiple fronts, with strong demand from AI chipmakers for its HBM and rising

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

DRAM content in smartphones and PCs. Strong demand is keeping pricing robust, too. HBM revenue rose by more than 50% sequentially for the second straight quarter, and we estimate nearly \$2 billion in HBM revenue in the quarter (implying 20% of total firm revenue). We believe Micron is on track for its goal of 20% HBM market share exiting fiscal 2025. HBM offers higher pricing and better profitability than Micron's traditional DRAM, so we see strong AI demand boosting both growth and profitability over the medium term. The bottom line: We raise our fair value estimate for no-moat Micron to \$115, from \$100, after raising our HBM and total DRAM growth estimates over the next five years. Shares still look overvalued to us—in our view, they don't reflect the long-term cyclicalities we expect from Micron's results. We expect a tremendous cyclical upswing over the next two to three years, but we don't think AI is eliminating cyclicalities for Micron. While demand looks strong, a misalignment of supply with demand in the long term can lead to a cyclical downswing, as investors saw in 2023. We now expect \$6 billion in HBM revenue for Micron in fiscal 2025 (ending in August,) rising toward \$30 billion by the end of the decade. Our forecast implies HBM quickly becoming Micron's most meaningful driver in the next three years.

Micron Technology Earnings: HBM Momentum Continues, and a Better-Than-Expected Third-Quarter Outlook William Kerwin, CFA, Senior Equity Analyst, 21 Mar 2025

We maintain our \$100 fair value estimate for shares of no-moat Micron Technology after it reported solid fiscal second-quarter results. Revenue came within the guidance range, while adjusted EPS beat guidance as well as our model estimates. Management guided to robust third-quarter growth, supported by improved DRAM demand, especially from data centers and consumer artificial intelligence applications. Looking beyond, we see high-bandwidth memory as a key growth driver. We account for a greater mix of DRAM revenue over the medium term, driven primarily by HBM and data center demand, and boosted by stronger pricing for DRAM. In addition, we foresee cost improvements and a higher-margin product mix to gradually lift margins through 2025 and beyond. The market seems to share our view, and responded positively to results and guidance, with the stock now tracking our fair value estimate. Second-quarter revenue of \$8.05 billion rose 38% year over year, led by robust DRAM performance. We credit it to data center DRAM, which reached a new record high, as HBM revenue grew more than 50% sequentially to exceed \$1 billion. We forecast this acceleration to continue, as we model double-digit growth over the medium term. NAND revenue hit \$1.9 billion, up 18% year on year, on the back of robust customer shipments and bit growth, though sequential revenue fell 17% on softer pricing and underutilization charges. Along the same lines, we continue to expect a significantly weaker NAND revenue contribution for 2025 as NAND chip sales are more focused on PC and mobile shipments. On the other hand, we anticipate continued AI and data center demand, combined with a strategic mix shift toward premium DRAM solutions, to underpin ongoing growth.

AI DeepSeek Coverage Summary: Maintaining Our Fair Values; Pullback Was Healthy Eric Compton,

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

CFA,Director,28 Jan 2025

We have consolidated our recent DeepSeek-related coverage in this note. Artificial intelligence affects companies across much of our coverage, including semiconductors, cloud infrastructure, software, utilities, and energy. Many of the firms under our coverage with an “AI premium” were already trading in 1- to 2-star territory. Our valuations were already positioned for a pullback of this nature, as we were having a hard time justifying the increases in revenue implied by these valuations. We view the current pullback as healthy, even as we remain positive on the long-term potential of AI. We have maintained our fair value estimates across the affected companies. Our thesis, after the release of DeepSeek, is that we were going to see instances of sleeker, more-efficient AI models that would not rely on massive clusters of AI GPUs and related hardware. This was the only way the ecosystem was going to successfully address large numbers of use cases in the long term. We believe that lower costs—making AI cheaper, therefore more economical—will increase the number of use cases it is viable for, and as a result, should increase demand. This is the same path the PC revolution followed, with computing power becoming cheap enough that millions of individuals could use it at an affordable cost. The same happened with the cloud and SaaS revolution thereafter, where the incremental cost of adding users was close to zero. We believe a future where AI was both prohibitively expensive and also “taking over the world” was not likely. As such, we view the advancements made by DeepSeek as promising and healthy for the overall ecosystem. For more in-depth coverage on specific industries, please refer to our notes on Nvidia, the hyperscalers, semiconductor equipment companies, TSMC, Apple and networking, utilities, European utilities, HVAC, and industrials.

DeepSeek R1 Model Doesn't Alter Our Valuations or Forecasts for Technology Hardware Stocks


William Kerwin, CFA, Senior Equity Analyst, 27 Jan 2025

Many technology hardware stocks under our coverage plunged in Monday trading after reports of DeepSeek's R1 generative artificial intelligence model out of China offering performance parity to top US models at a much lower training cost. The iShares Semiconductor ETF was down 8% in midday trading. Why it matters: In our view, the market selloff implies fears of weaker future generative AI infrastructure investment resulting from cheaper models. We are less pessimistic and expect strong generative AI investment to continue. We've expected generative AI models to become slimmer and more efficient. We expect US model builders to develop more efficient models, but overall hardware spending will continue to rise, particularly with a serious competitive alternative out of China. In the longer term, we foresee a commoditization of AI models that shouldn't diminish investment in hardware infrastructure. Lower-cost models should accelerate the path to financial returns for model builders, but that they will continue to invest heavily in hardware to support them. The bottom line: We maintain our fair value estimates and moat ratings for our technology hardware coverage, including Apple, Broadcom, Marvell Technology, Arista Networks, and Micron Technology. The DeepSeek news and

Micron Technology Inc

MU★★★

18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

market selloff don't alter our long-term forecasts today. We don't expect a cut to infrastructure investment in the short term and believe US and European model builders will continue to invest heavily in developing larger and higher-performing models. Demand still exceeds chip supply, and we don't expect that to change due to the DeepSeek news. We believe the selloff largely reflects more uncertainty being priced into AI-exposed stocks, which we believe to be reasonable. We believe AI investment will continue to rise rapidly, but that more bullish forecasts might have underestimated efficiency gains in new models.

Micron Earnings: Weak Outlook Leads Us to Lower Our NAND Forecast and Trim Our Fair Value to \$100

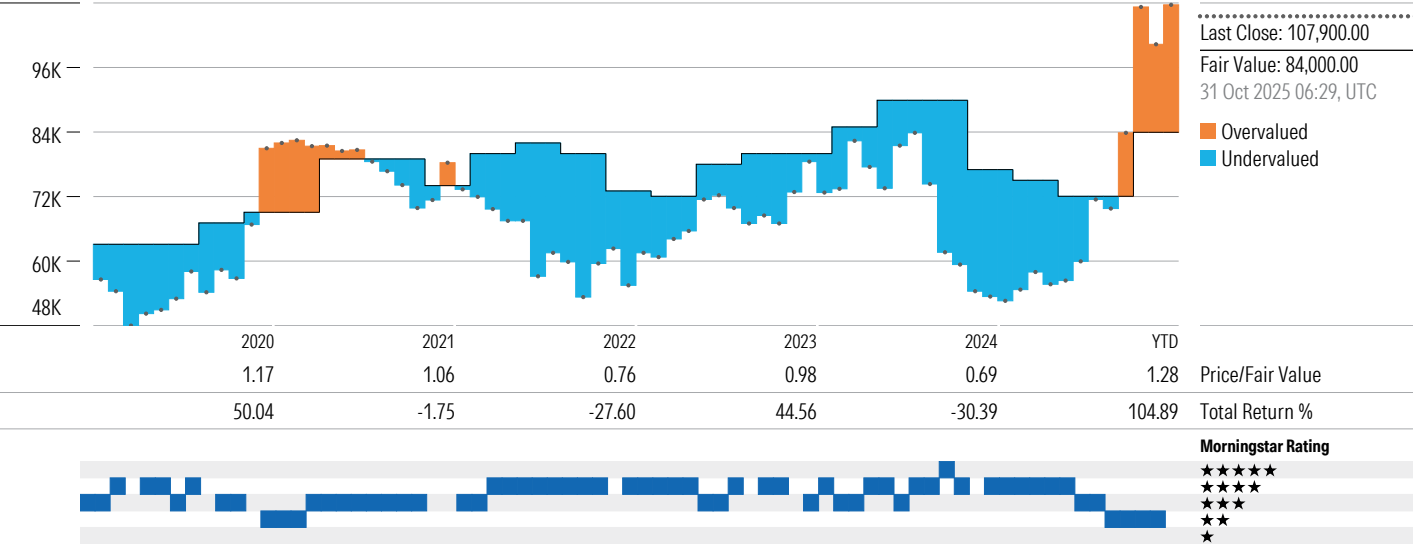
William Kerwin, CFA,Senior Equity Analyst,19 Dec 2024

Micron Technology's November-quarter results met management guidance, highlighted by revenue rising 12% sequentially to \$8.7 billion. The firm's outlook for the February quarter implies a 9% sequential decline in revenue, with management citing weakness in PC and mobile phone demand. Why it matters: Micron's outlook was more than 10% below our expectations. We now expect significantly weaker NAND revenue for Micron in fiscal 2025, as the firm's NAND chip sales are more exposed to PC and mobile phone shipments. We also expect this to weigh on gross margin. We expect lower medium-term NAND results as well, with management announcing plans to cut its capital investment in NAND production and to reduce utilization at its existing factories. We don't see a near-term upward inflection for PC and smartphone demand. Positively, management raised its expectations for high-bandwidth memory growth over the next five years. We expect better DRAM and HBM shipments into data centers to partially offset our weaker NAND forecast. The bottom line: We lower our fair value estimate for no-moat Micron to \$100 per share from \$110 based on our lower revenue forecast. Shares look slightly undervalued after a 15% decline after hours, but we remind investors of our High Morningstar Uncertainty Rating on the cyclical stock. Our updated forecast accounts for a greater mix of DRAM revenue for Micron over the next five years, with higher revenue growth for HBM chips into data centers and lower revenue for NAND flash chips. Long-term, we see Micron's most promising growth driver to be its DRAM and HBM chips. We are skeptical of a snapback in revenue after the February quarter, given that we expect increasing pricing pressure for both DRAM and NAND. We expect growth in bit shipments in the May and August quarters, but believe a return to normal pricing declines will offset the impact of this on revenue. ■■■

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

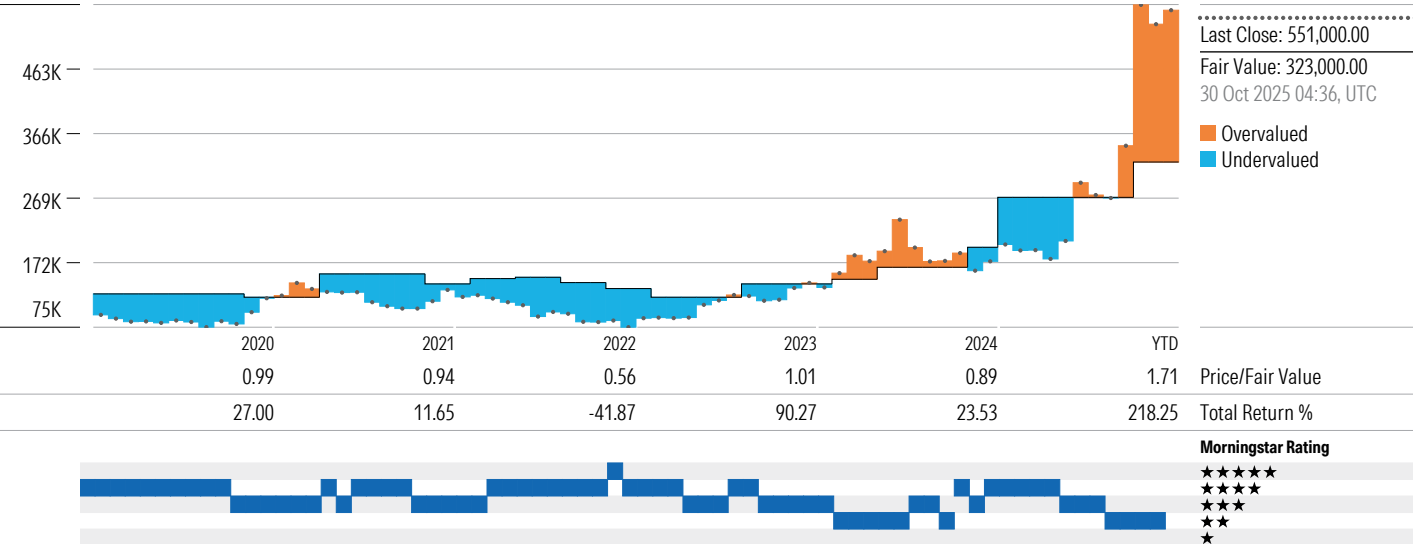
Competitors Price vs. Fair Value

Samsung Electronics Co Ltd 005930



Total Return % as of 17 Dec 2025. Last Close as of 17 Dec 2025. Fair Value as of 31 Oct 2025 06:29, UTC.

SK Hynix Inc 000660



Total Return % as of 17 Dec 2025. Last Close as of 17 Dec 2025. Fair Value as of 30 Oct 2025 04:36, UTC.

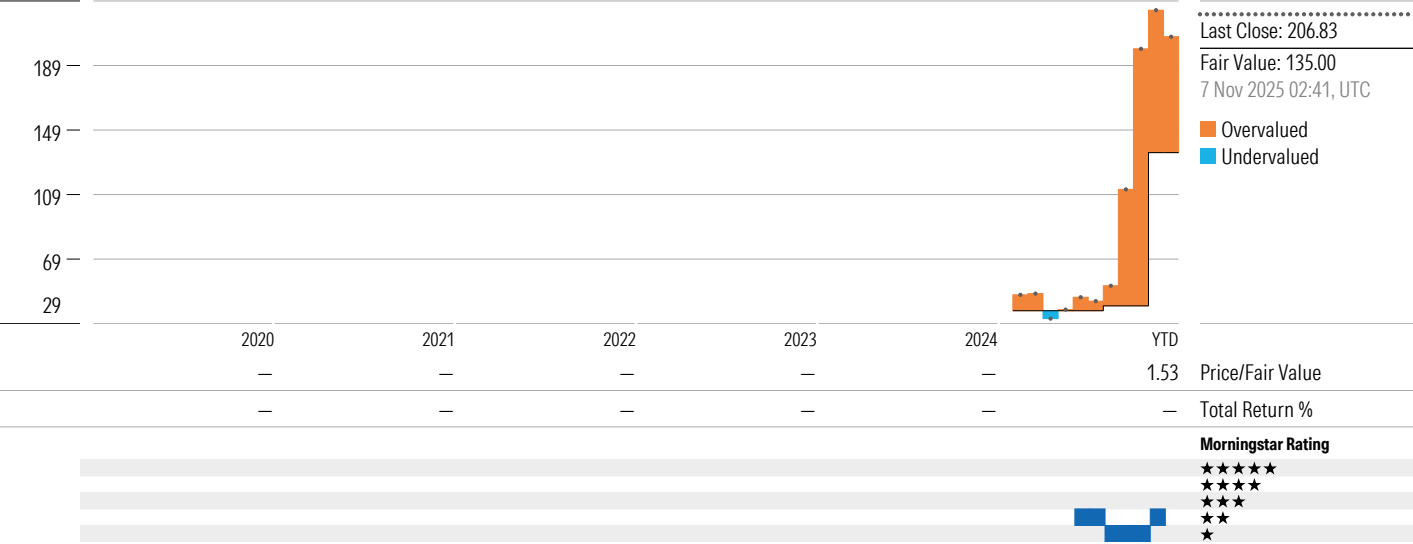
Micron Technology Inc

MU★★★

18 Dec 2025 02:00, UTC

Competitors Price vs. Fair Value

SanDisk Corp Ordinary Shares SNDK



Total Return % as of —. Last Close as of —. Fair Value as of 7 Nov 2025 02:41, UTC.

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

Morningstar Valuation Model Summary

Financials as of 23 Sep 2025

Fiscal Year, ends 31 Aug	Actual			Forecast				
	2023	2024	2025	2026	2027	2028	2029	2030
Revenue (USD Mil)	15,540	25,111	37,378	53,685	57,494	57,678	59,317	60,093
Operating Income (USD Mil)	-5,450	1,054	9,870	21,630	21,118	17,465	16,658	17,245
EBITDA (USD Mil)	2,011	9,084	18,122	36,068	37,104	34,079	34,340	35,160
Adjusted EBITDA (USD Mil)	2,937	9,715	19,198	37,128	38,289	35,267	35,561	36,397
Net Income (USD Mil)	-5,833	778	8,539	17,768	16,821	13,890	13,292	13,822
Adjusted Net Income (USD Mil)	-4,864	1,453	9,326	18,443	17,646	14,756	14,198	14,735
Free Cash Flow To The Firm (USD Mil)	-7,992	-73	945	9,169	13,260	11,333	10,228	10,778
Weighted Average Diluted Shares Outstanding (Mil)	1,093	1,118	1,125	1,128	1,122	1,117	1,112	1,107
Earnings Per Share (Diluted) (USD)	-5.34	0.70	7.59	15.75	14.99	12.44	11.96	12.49
Adjusted Earnings Per Share (Diluted) (USD)	-4.45	1.30	8.29	16.35	15.73	13.22	12.77	13.31
Dividends Per Share (USD)	0.46	0.46	0.46	0.46	0.50	0.54	0.58	0.62

Margins & Returns as of 23 Sep 2025

	Actual				Forecast					
	3 Year Avg	2023	2024	2025	2026	2027	2028	2029	2030	5 Year Avg
Operating Margin %	-1.9	-35.1	4.2	26.4	40.3	36.7	30.3	28.1	28.7	32.6
EBITDA Margin %	32.5	12.9	36.2	48.5	67.2	64.5	59.1	57.9	58.5	61.4
Adjusted EBITDA Margin %	—	18.9	38.7	51.4	69.2	66.6	61.2	60.0	60.6	63.5
Net Margin %	-3.9	-37.5	3.1	22.8	33.1	29.3	24.1	22.4	23.0	26.4
Adjusted Net Margin %	-0.2	-31.3	5.8	25.0	34.4	30.7	25.6	23.9	24.5	27.8
Free Cash Flow To The Firm Margin %	-16.4	-51.4	-0.3	2.5	17.1	23.1	19.7	17.2	17.9	19.0

Growth & Ratios as of 23 Sep 2025

	Actual				Forecast					
	3 Year CAGR	2023	2024	2025	2026	2027	2028	2029	2030	5 Year CAGR
Revenue Growth %	6.7	-49.5	61.6	48.9	43.6	7.1	0.3	2.8	1.3	10.0
Operating Income Growth %	0.5	-156.1	-119.3	836.4	119.2	-2.4	-17.3	-4.6	3.5	11.8
EBITDA Growth %	99.4	-88.0	351.7	99.5	99.0	2.9	-8.2	0.8	2.4	38.8
Adjusted EBITDA Growth %	3.3	-83.1	230.8	97.6	93.4	3.1	-7.9	0.8	2.4	13.7
Earnings Per Share Growth %	-0.7	-168.9	-113.1	984.3	107.5	-4.8	-17.0	-3.9	4.4	10.5
Adjusted Earnings Per Share Growth %	-0.7	-153.3	-129.2	537.7	97.2	-3.8	-16.0	-3.4	—	10.5

Valuation as of 23 Sep 2025

	Actual			Forecast				
	2023	2024	2025	2026	2027	2028	2029	2030
Price/Earning	-21.6	91.5	27.2	13.8	14.3	17.1	17.7	—
Price/Sales	6.9	5.3	6.8	4.7	4.4	4.4	4.3	—
Price/Book	2.4	2.9	4.7	3.6	3.0	2.6	2.3	—
Price/Cash Flow	—	—	—	—	—	—	—	—
EV/EBITDA	38.2	14.3	13.5	7.0	6.8	7.3	7.3	—
EV/EBIT	-20.6	131.7	262.2	12.0	12.3	14.8	15.5	—
Dividend Yield %	0.5	0.4	0.2	0.2	0.2	0.2	0.3	—
Dividend Payout %	-10.3	35.4	5.6	2.8	3.2	4.1	4.5	4.7
Free Cash Flow Yield %	—	—	—	—	—	—	—	—

Operating Performance / Profitability as of 23 Sep 2025

Fiscal Year, ends 31 Aug	Actual			Forecast				
	2023	2024	2025	2026	2027	2028	2029	2030
ROA %	13.1	-9.1	1.1	10.3	17.7	14.6	11.0	9.7
ROE %	17.4	-13.2	1.7	15.8	25.2	19.6	14.2	12.1
ROIC %	17.7	-7.7	2.5	14.1	27.3	23.5	18.4	16.6

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	3 Dec 2025 06:00, UTC

Financial Leverage (Reporting Currency)	Actual			Forecast				
Fiscal Year, ends 31 Aug	2023	2024	2025	2026	2027	2028	2029	2030
Debt/Capital %	15.4	11.6	8.0	7.1	5.8	5.1	4.0	3.4
Assets/Equity	1.5	1.5	1.5	1.4	1.3	1.3	1.3	1.2
Net Debt/EBITDA	2.2	0.6	0.2	-0.1	-0.4	-0.7	-1.0	-1.2
Total Debt/EBITDA	4.7	1.4	0.8	0.4	0.3	0.3	0.3	0.2
EBITDA/ Net Interest Expense	-33.8	151.8	165.5	185.6	189.6	210.7	364.2	1,164.6

Forecast Revisions as of 23 Sep 2025	2026		2027		2028	
Prior data as of 11 Aug 2025	Current	Prior	Current	Prior	Current	Prior
Fair Value Estimate Change (Trading Currency)	225.00	119.77	—	—	—	—
Revenue (USD Mil)	53,685	44,482	57,494	47,570	57,678	47,674
Operating Income (USD Mil)	21,630	13,377	21,118	13,615	17,465	12,223
EBITDA (USD Mil)	37,128	26,390	38,289	28,005	35,267	27,121
Net Income (USD Mil)	18,443	11,490	17,646	11,673	14,756	10,618
Earnings Per Share (Diluted) (USD)	15.75	9.56	14.99	9.67	12.44	8.76
Adjusted Earnings Per Share (Diluted) (USD)	16.35	10.25	15.73	10.48	13.22	9.59
Dividends Per Share (USD)	0.46	0.46	0.50	0.50	0.54	0.54

Key Valuation Drivers as of 23 Sep 2025


Cost of Equity %	9.0
Pre-Tax Cost of Debt %	5.8
Weighted Average Cost of Capital %	8.7
Long-Run Tax Rate %	19.0
Stage II EBI Growth Rate %	6.0
Stage II Investment Rate %	27.5
Perpetuity Year	10

Additional estimates and scenarios available for download at <https://pitchbook.com/>.

Discounted Cash Flow Valuation as of 23 Sep 2025

	USD Mil
Present Value Stage I	41,959
Present Value Stage II	30,873
Present Value Stage III	99,197
Total Firm Value	172,030
Cash and Equivalents	10,307
Debt	14,577
Other Adjustments	0
Equity Value	167,160
Projected Diluted Shares	1,125
Fair Value per Share (USD)	225.00

Micron Technology Inc MU ★★★ 18 Dec 2025 02:00, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
225.52 USD 17 Dec 2025	225.00 USD 18 Dec 2025 01:57, UTC	1.00	253.79 USD Bil 17 Dec 2025	None	Large Blend	High	Standard	 3 Dec 2025 06:00, UTC

ESG Risk Rating Breakdown

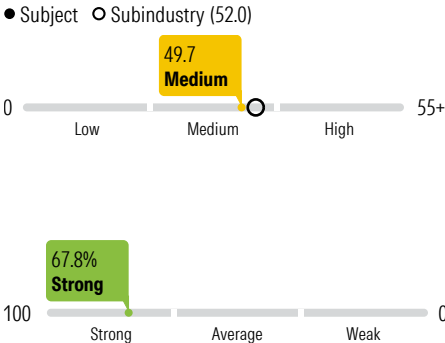
Exposure

Company Exposure¹	49.7
- Manageable Risk	45.8
Unmanageable Risk²	3.9

Management

Manageable Risk	45.8
- Managed Risk³	31.1
Management Gap⁴	14.7

Overall Unmanaged Risk 18.6



- Exposure represents a company's vulnerability to ESG risks driven by their business model
- Exposure is assessed at the Subindustry level and then specified at the company level
- Scoring ranges from 0-55+ with categories of low, medium, and high-risk exposure

- Management measures a company's ability to manage ESG risks through its commitments and actions
- Management assesses a company's efficiency on ESG programs, practices, and policies
- Management score ranges from 0-100% showing how much manageable risk a company is managing

ESG Risk Rating



ESG Risk Ratings measure the degree to which a company's value is impacted by environmental, social, and governance risks, by evaluating the company's ability to manage the ESG risks it faces.

1. A company's Exposure to material ESG issues 2. Unmanageable Risk refers to risks that are inherent to a particular business model that cannot be managed by programs or initiatives 3. Managed Risk = Manageable Risk multiplied by a Management score of 67.8% 4. Management Gap assesses risks that are not managed, but are considered manageable 5. ESG Risk Rating Assessment = Overall Unmanaged Risk = Management Gap plus Unmanageable Risk

ESG Risk Rating Assessment⁵



ESG Risk Rating is of Dec 03, 2025. Highest Controversy Level is as of Dec 08, 2025. Sustainalytics Subindustry: Semiconductor Design and Manufacturing. Sustainalytics provides Morningstar with company ESG ratings and metrics on a monthly basis and as such, the ratings in Morningstar may not necessarily reflect current Sustainalytics' scores for the company. For the most up to date rating and more information, please visit: sustainalytics.com/esg-ratings/.

Peer Analysis 03 Dec 2025

Company Name	Exposure	Management	ESG Risk Rating
Micron Technology Inc	49.7 Medium 0 — 55+	67.8 Strong 100 — 0	18.6 Low 0 — 40+
Western Digital Corp	32.1 Low 0 — 55+	66.8 Strong 100 — 0	11.7 Low 0 — 40+
Analog Devices Inc	43.6 Medium 0 — 55+	68.8 Strong 100 — 0	15.7 Low 0 — 40+
Samsung Electronics Co Ltd	37.5 Medium 0 — 55+	71.1 Strong 100 — 0	12.7 Low 0 — 40+
SK Hynix Inc	51.7 Medium 0 — 55+	71.0 Strong 100 — 0	17.9 Low 0 — 40+

Appendix

Historical Morningstar Rating

Micron Technology Inc MU 17 Dec 2025 22:32, UTC

Dec 2025 ★★	Nov 2025 ★★	Oct 2025 ★★	Sep 2025 ★★★	Aug 2025 ★★★★	Jul 2025 ★★★★	Jun 2025 ★★★★	May 2025 ★★★★	Apr 2025 ★★★★	Mar 2025 ★★★★	Feb 2025 ★★★★	Jan 2025 ★★★★
Dec 2024 ★★★★	Nov 2024 ★★★★	Oct 2024 ★★★★	Sep 2024 ★★★★	Aug 2024 ★★★★	Jul 2024 ★★★★	Jun 2024 ★★	May 2024 ★	Apr 2024 ★★	Mar 2024 ★★	Feb 2024 ★★	Jan 2024 ★★
Dec 2023 ★★	Nov 2023 ★★★★	Oct 2023 ★★★★	Sep 2023 ★★★★	Aug 2023 ★★★★	Jul 2023 ★★★★	Jun 2023 ★★★★	May 2023 ★★★★	Apr 2023 ★★★★	Mar 2023 ★★★★	Feb 2023 ★★★★	Jan 2023 ★★★★
Dec 2022 ★★★★	Nov 2022 ★★★★	Oct 2022 ★★★★	Sep 2022 ★★★★	Aug 2022 ★★★★	Jul 2022 ★★★★	Jun 2022 ★★★★	May 2022 ★★★★	Apr 2022 ★★★★	Mar 2022 ★★★★	Feb 2022 ★★★★	Jan 2022 ★★★★
Dec 2021 ★★★★	Nov 2021 ★★★★	Oct 2021 ★★★★	Sep 2021 ★★★★	Aug 2021 ★★★★	Jul 2021 ★★★★	Jun 2021 ★★★★	May 2021 ★★★★	Apr 2021 ★★★★	Mar 2021 ★★★★	Feb 2021 ★★	Jan 2021 ★★★★
Dec 2020 ★★	Nov 2020 ★★	Oct 2020 ★★★	Sep 2020 ★★★★	Aug 2020 ★★★★	Jul 2020 ★★★★	Jun 2020 ★★★★	May 2020 ★★★★	Apr 2020 ★★★★	Mar 2020 ★★★★	Feb 2020 ★★★★	Jan 2020 ★★★★

Samsung Electronics Co Ltd 005930 17 Dec 2025 12:27, UTC

Dec 2025 ★★	Nov 2025 ★★	Oct 2025 ★★	Sep 2025 ★★	Aug 2025 ★★★★	Jul 2025 ★★★★	Jun 2025 ★★★★	May 2025 ★★★★	Apr 2025 ★★★★	Mar 2025 ★★★★	Feb 2025 ★★★★	Jan 2025 ★★★★
Dec 2024 —	Nov 2024 ★★★★	Oct 2024 ★★★★★	Sep 2024 ★★★★	Aug 2024 ★★★★	Jul 2024 ★★★★	Jun 2024 ★★★★	May 2024 ★★★★	Apr 2024 ★★★★	Mar 2024 ★★★★	Feb 2024 ★★★★	Jan 2024 ★★★★
Dec 2023 —	Nov 2023 ★★★★	Oct 2023 ★★★★	Sep 2023 —	Aug 2023 ★★★★	Jul 2023 ★★★★	Jun 2023 ★★★★	May 2023 ★★★★	Apr 2023 ★★★★	Mar 2023 ★★★★	Feb 2023 ★★★★	Jan 2023 ★★★★
Dec 2022 —	Nov 2022 ★★★★	Oct 2022 ★★★★	Sep 2022 ★★★★	Aug 2022 ★★★★	Jul 2022 ★★★★	Jun 2022 ★★★★	May 2022 ★★★★	Apr 2022 ★★★★	Mar 2022 ★★★★	Feb 2022 ★★★★	Jan 2022 —
Dec 2021 —	Nov 2021 ★★★★	Oct 2021 ★★★★	Sep 2021 ★★★★	Aug 2021 ★★★★	Jul 2021 ★★★★	Jun 2021 ★★★★	May 2021 ★★★★	Apr 2021 ★★★★	Mar 2021 ★★	Feb 2021 ★★	Jan 2021 ★★
Dec 2020 —	Nov 2020 ★★★★	Oct 2020 ★★★★	Sep 2020 —	Aug 2020 ★★★★	Jul 2020 ★★★★	Jun 2020 ★★★★	May 2020 ★★★★	Apr 2020 —	Mar 2020 ★★★★	Feb 2020 ★★★★	Jan 2020 ★★★★

SK Hynix Inc 000660 17 Dec 2025 12:29, UTC

Dec 2025 ★★	Nov 2025 ★★	Oct 2025 ★★	Sep 2025 ★★	Aug 2025 ★★★★	Jul 2025 ★★★★	Jun 2025 ★★★★	May 2025 ★★★★	Apr 2025 ★★★★	Mar 2025 ★★★★	Feb 2025 ★★★★	Jan 2025 ★★★★
Dec 2024 ★★★★	Nov 2024 ★★★★	Oct 2024 ★★	Sep 2024 ★★★★	Aug 2024 ★★★★	Jul 2024 ★★	Jun 2024 ★★	May 2024 ★★	Apr 2024 ★★	Mar 2024 ★★	Feb 2024 ★★★★	Jan 2024 ★★★★
Dec 2023 ★★★★	Nov 2023 ★★★★	Oct 2023 ★★★★	Sep 2023 ★★★★	Aug 2023 ★★★★	Jul 2023 ★★★★	Jun 2023 ★★★★	May 2023 ★★★★	Apr 2023 ★★★★	Mar 2023 ★★★★	Feb 2023 ★★★★	Jan 2023 ★★★★
Dec 2022 ★★★★★	Nov 2022 ★★★★	Oct 2022 ★★★★	Sep 2022 ★★★★	Aug 2022 ★★★★	Jul 2022 ★★★★	Jun 2022 ★★★★	May 2022 ★★★★	Apr 2022 ★★★★	Mar 2022 ★★★★	Feb 2022 ★★★★	Jan 2022 ★★★★
Dec 2021 ★★★★	Nov 2021 ★★★★	Oct 2021 ★★★★	Sep 2021 ★★★★	Aug 2021 ★★★★	Jul 2021 ★★★★	Jun 2021 ★★★★	May 2021 ★★★★	Apr 2021 ★★★★	Mar 2021 ★★★★	Feb 2021 ★★★★	Jan 2021 ★★★★
Dec 2020 ★★★★	Nov 2020 ★★★★	Oct 2020 ★★★★	Sep 2020 ★★★★	Aug 2020 ★★★★	Jul 2020 ★★★★	Jun 2020 ★★★★	May 2020 ★★★★	Apr 2020 ★★★★	Mar 2020 ★★★★	Feb 2020 ★★★★	Jan 2020 ★★★★

SanDisk Corp Ordinary Shares **SNDK** 17 Dec 2025 23:02, UTC

Dec 2025 ★★	Nov 2025 ★	Oct 2025 ★	Sep 2025 ★	Aug 2025 ★★	Jul 2025 ★★	Jun 2025 —	May 2025 —	Apr 2025 —	Mar 2025 —	Feb 2025 —	Jan 2025 —
Dec 2024 —	Nov 2024 —	Oct 2024 —	Sep 2024 —	Aug 2024 —	Jul 2024 —	Jun 2024 —	May 2024 —	Apr 2024 —	Mar 2024 —	Feb 2024 —	Jan 2024 —
Dec 2023 —	Nov 2023 —	Oct 2023 —	Sep 2023 —	Aug 2023 —	Jul 2023 —	Jun 2023 —	May 2023 —	Apr 2023 —	Mar 2023 —	Feb 2023 —	Jan 2023 —
Dec 2022 —	Nov 2022 —	Oct 2022 —	Sep 2022 —	Aug 2022 —	Jul 2022 —	Jun 2022 —	May 2022 —	Apr 2022 —	Mar 2022 —	Feb 2022 —	Jan 2022 —
Dec 2021 —	Nov 2021 —	Oct 2021 —	Sep 2021 —	Aug 2021 —	Jul 2021 —	Jun 2021 —	May 2021 —	Apr 2021 —	Mar 2021 —	Feb 2021 —	Jan 2021 —
Dec 2020 —	Nov 2020 —	Oct 2020 —	Sep 2020 —	Aug 2020 —	Jul 2020 —	Jun 2020 —	May 2020 —	Apr 2020 —	Mar 2020 —	Feb 2020 —	Jan 2020 —

Research Methodology for Valuing Companies

Overview

At the heart of our valuation system is a detailed projection of a company's future cash flows, resulting from our analysts' research. Analysts create custom industry and company assumptions to feed income statement, balance sheet, and capital investment assumptions into our globally standardized, proprietary discounted cash flow, or DCF, modeling templates. We use scenario analysis, in-depth competitive advantage analysis, and a variety of other analytical tools to augment this process. Moreover, we think analyzing valuation through discounted cash flows presents a better lens for viewing cyclical companies, high-growth firms, businesses with finite lives (e.g., mines), or companies expected to generate negative earnings over the next few years. That said, we don't dismiss multiples altogether but rather use them as supporting cross-checks for our DCF-based fair value estimates. We also acknowledge that DCF models offer their own challenges (including a potential proliferation of estimated inputs and the possibility that the method may miss short-term market-price movements), but we believe these negatives are mitigated by deep analysis and our long-term approach.

Morningstar's equity research group ("we," "our") believes that a company's intrinsic worth results from the future cash flows it can generate. The Morningstar Rating for stocks identifies stocks trading at a discount or premium to their intrinsic worth—or fair value estimate, in Morningstar terminology. Five-star stocks sell for the biggest risk adjusted discount to their fair values, whereas 1-star stocks trade at premiums to their intrinsic worth.

Four key components drive the Morningstar rating: (1) our assessment of the firm's economic moat, (2) our estimate of the stock's fair value, (3) our uncertainty around that fair value estimate and (4) the current market price. This process ultimately culminates in our single-point star rating.

1. Economic Moat

The concept of an economic moat plays a vital role not only in our qualitative assessment of a firm's long-term investment potential, but also in the actual calculation of our fair value estimates. An economic moat is a structural feature that allows a firm to sustain excess profits over a

long period of time. We define economic profits as returns on invested capital (or ROIC) over and above our estimate of a firm's cost of capital, or weighted average cost of capital (or WACC). Without a moat, profits are more susceptible to competition. We have identified five sources of economic moats: intangible assets, switching costs, network effect, cost advantage, and efficient scale.

Companies with a narrow moat are those we believe are more likely than not to achieve normalized excess returns for at least the next 10 years. Wide-moat companies are those in which we have very high confidence that excess returns will remain for 10 years, with excess returns more likely than not to remain for at least 20 years. The longer a firm generates economic profits, the higher its intrinsic value. We believe low-quality, no-moat companies will see their normalized returns gravitate toward the firm's cost of capital more quickly than companies with moats.

When considering a company's moat, we also assess whether there is a substantial threat of value destruction, stemming from risks related to ESG, industry disruption, financial health, or other idiosyncratic issues. In this context, a risk is considered potentially value destructive if its occurrence would eliminate a firm's economic profit on a cumulative or midcycle basis. If we deem the probability of occurrence sufficiently high, we would not characterize the company as possessing an economic moat.

2. Estimated Fair Value

Combining our analysts' financial forecasts with the firm's economic moat helps us assess how long returns on invested capital are likely to exceed the firm's cost of capital. Returns of firms with a wide economic moat rating are assumed to fade to the perpetuity period over a longer period of time than the returns of narrow-moat firms, and both will fade slower than no-moat firms, increasing our estimate of their intrinsic value.

Our model is divided into three distinct stages:

Stage I: Explicit Forecast

In this stage, which can last five to 10 years, analysts make full financial statement forecasts, including items such as revenue, profit margins, tax rates, changes in working capital accounts, and capital spending. Based on these projections, we calculate earnings before interest,

after taxes (EBI) and the net new investment (NNI) to derive our annual free cash flow forecast.

Stage II: Fade

The second stage of our model is the period it will take the company's return on new invested capital—the return on capital of the next dollar invested ("RONIC")—to decline (or rise) to its cost of capital. During the Stage II period, we use a formula to approximate cash flows in lieu of explicitly modeling the income statement, balance sheet, and cash flow statement as we do in Stage I. The length of the second stage depends on the strength of the company's economic moat. We forecast this period to last anywhere from one year (for companies with no economic moat) to 10–15 years or more (for wide-moat companies). During this period, cash flows are forecast using four assumptions: an average growth rate for EBI over the period, a normalized investment rate, average return on new invested capital (RONIC), and the number of years until perpetuity, when excess returns cease. The investment rate and return on new invested capital decline until a perpetuity value is calculated. In the case of firms that do not earn their cost of capital, we assume marginal ROICs rise to the firm's cost of capital (usually attributable to less reinvestment), and we may truncate the second stage.

Stage III: Perpetuity

Once a company's marginal ROIC hits its cost of capital, we calculate a continuing value, using a standard perpetuity formula. At perpetuity, we assume that any growth or decline or investment in the business neither creates nor destroys value and that any new investment provides a return in line with estimated WACC.

Because a dollar earned today is worth more than a dollar earned tomorrow, we discount our projections of cash flows in stages I, II, and III to arrive at a total present value of expected future cash flows. Because we are modeling free cash flow to the firm—representing cash available to provide a return to all capital providers—we discount future cash flows using the WACC, which is a weighted average of the costs of equity, debt, and preferred stock (and any other funding sources), using expected future proportionate long-term, market-value weights.

3. Uncertainty Around That Fair Value Estimate

Morningstar's Uncertainty Rating is designed to capture the range of potential outcomes for a company's intrinsic value. This rating is used to assign the margin of safety required before investing, which in turn explicitly drives our stock star rating system. The Uncertainty Rating is aimed at identifying the confidence we should have in assigning a fair value estimate for a given stock.

Our Uncertainty Rating is meant to take into account anything that can increase the potential dispersion of future

Morningstar Equity Research Star Rating Methodology



Research Methodology for Valuing Companies

outcomes for the intrinsic value of a company, and anything that can affect our ability to accurately predict these outcomes. The rating begins with a suggested rating produced by a quantitative process based on the trailing 12-month standard deviation of daily stock returns. An analyst overlay is then applied, with analysts using the suggested rating, historical rating data, and their own knowledge of the company to inform them as they make the final Uncertainty Rating decision. Ultimately, the rating decision rests with the analyst. Analysts take into account many characteristics when making their final decision, including cyclical factors, operational and financial factors such as leverage, company-specific events, ESG risks, and anything else that might increase the potential dispersion of future outcomes and our ability to estimate those outcomes.

Our recommended margin of safety—the discount to fair value demanded before we'd recommend buying or selling the stock—widens as our uncertainty of the estimated value of the equity increases. The more uncertain we are about the potential dispersion of outcomes, the greater the discount we require relative to our estimate of the value of the firm before we would recommend the purchase of the shares. In addition, the Uncertainty Rating provides guidance in portfolio construction based on risk tolerance.

Our Uncertainty Ratings are: Low, Medium, High, Very High, and Extreme.

Margin of Safety		
Qualitative Analysis	★★★★★ Rating	★ Rating
Uncertainty Ratings		
Low	20% Discount	25% Premium
Medium	30% Discount	35% Premium
High	40% Discount	55% Premium
Very High	50% Discount	75% Premium
Extreme	75% Discount	300% Premium

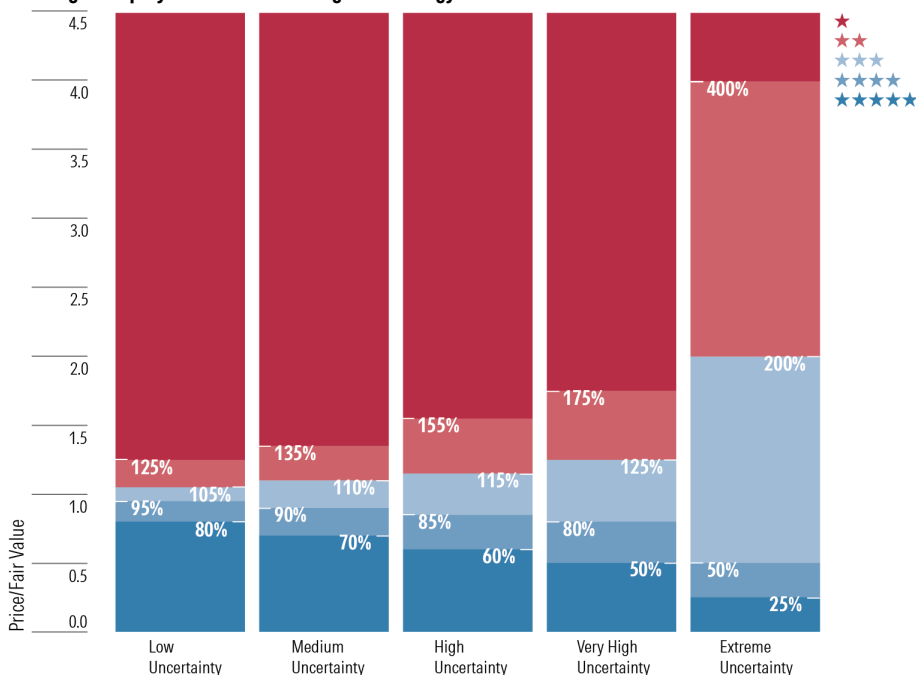
Our uncertainty rating is based on the interquartile range, or the middle 50% of potential outcomes, covering the 25th percentile–75th percentile. This means that when a stock hits 5 stars, we expect there is a 75% chance that the intrinsic value of that stock lies above the current market price. Similarly, when a stock hits 1 star, we expect there is a 75% chance that the intrinsic value of that stock lies below the current market price.

4. Market Price

The market prices used in this analysis and noted in the report come from exchange on which the stock is listed which we believe is a reliable source.

For more details about our methodology, please go to <https://shareholders.morningstar.com>

Morningstar Equity Research Star Rating Methodology



Morningstar Star Rating for Stocks

Once we determine the fair value estimate of a stock, we compare it with the stock's current market price on a daily basis, and the star rating is automatically re-calculated at the market close on every day the market on which the stock is listed is open. Our analysts keep close tabs on the companies they follow, and, based on thorough and ongoing analysis, raise or lower their fair value estimates as warranted.

Please note, there is no predefined distribution of stars. That is, the percentage of stocks that earn 5 stars can fluctuate daily, so the star ratings, in the aggregate, can serve as a gauge of the broader market's valuation. When there are many 5-star stocks, the stock market as a whole is more undervalued, in our opinion, than when very few companies garner our highest rating.

We expect that if our base-case assumptions are true the market price will converge on our fair value estimate over time generally within three years (although it is impossible to predict the exact time frame in which market prices may adjust).

Our star ratings are guideposts to a broad audience and individuals must consider their own specific investment goals, risk tolerance, tax situation, time horizon, income needs, and complete investment portfolio, among other factors.

The Morningstar Star Ratings for stocks are defined below:

★★★★★ We believe appreciation beyond a fair risk-adjusted return is highly likely over a multiyear time frame. Scenario analysis developed by our analysts indicates that the current market price represents an excessively pessimistic outlook, limiting downside risk and maximizing upside potential.

★★★★ We believe appreciation beyond a fair risk-adjusted return is likely.

★★★ Indicates our belief that investors are likely to receive a fair risk-adjusted return (approximately cost of equity).

★★ We believe investors are likely to receive a less than fair risk-adjusted return.

★ Indicates a high probability of undesirable risk-adjusted returns from the current market price over a multi-year time frame, based on our analysis. Scenario analysis by our analysts indicates that the market is pricing in an excessively optimistic outlook, limiting upside potential and leaving the investor exposed to Capital loss.

Other Definitions

Last Price: Price of the stock as of the close of the market of the last trading day before date of the report.

Capital Allocation Rating: Our Capital Allocation (or Stewardship) Rating represents our assessment of the quality of management's capital allocation, with particular emphasis on the firm's balance sheet, investments,

Research Methodology for Valuing Companies

and shareholder distributions. Analysts consider companies' investment strategy and valuation, balance sheet management, and dividend and share buyback policies. Corporate governance factors are only considered if they are likely to materially impact shareholder value, though either the balance sheet, investment, or shareholder distributions. Analysts assign one of three ratings: "Exemplary", "Standard", or "Poor". Analysts judge Capital Allocation from an equity holder's perspective. Ratings are determined on a forward looking and absolute basis. The Standard rating is most common as most managers will exhibit neither exceptionally strong nor poor capital allocation.

Capital Allocation (or Stewardship) analysis published prior to Dec. 9, 2020, was determined using a different process. Beyond investment strategy, financial leverage, and dividend and share buyback policies, analysts also considered execution, compensation, related party transactions, and accounting practices in the rating.

Capital Allocation Rating: Our Capital Allocation (or Stewardship) Rating represents our assessment of the quality of management's capital allocation, with particular emphasis on the firm's balance sheet, investments, and shareholder distributions. Analysts consider companies' investment strategy and valuation, balance sheet management, and dividend and share buyback policies. Corporate governance factors are only considered if they are likely to materially impact shareholder value, though either the balance sheet, investment, or shareholder distributions. Analysts assign one of three ratings: "Exemplary", "Standard", or "Poor". Analysts judge Capital Allocation from an equity holder's perspective. Ratings are determined on a forward looking and absolute basis. The Standard rating is most common as most managers will exhibit neither exceptionally strong nor poor capital allocation.

Capital Allocation (or Stewardship) analysis published prior to Dec. 9, 2020, was determined using a different process. Beyond investment strategy, financial leverage, and dividend and share buyback policies, analysts also considered execution, compensation, related party transactions, and accounting practices in the rating.

Sustainalytics ESG Risk Rating Assessment: The ESG Risk Rating Assessment is provided by Sustainalytics; a Morningstar company.

Sustainalytics' ESG Risk Ratings measure the degree to which company's economic value at risk is driven by environment, social and governance (ESG) factors.

Sustainalytics analyzes over 1,300 data points to assess a company's exposure to and management of ESG risks. In other words, ESG Risk Ratings measures a company's unmanaged ESG Risks represented as a quantitative score.

Unmanaged Risk is measured on an open-ended scale starting at zero (no risk) with lower scores representing less unmanaged risk and, for 95% of cases, the unmanaged ESG Risk score is below 50.

Based on their quantitative scores, companies are grouped into one of five Risk Categories (negligible, low, medium, high, severe). These risk categories are absolute, meaning that a 'high risk' assessment reflects a comparable degree of unmanaged ESG risk across all subindustries covered.

The ESG Risk Rating Assessment is a visual representation of Sustainalytics ESG Risk Categories on a 1 to 5 scale. Companies with Negligible Risk = 5 Globes, Low Risk = 4, Medium Risk = 3 Globes, High Risk = 2 Globes, Severe Risk = 1 Globe. For more information, please visit sustainalytics.com/esg-ratings/

Ratings should not be used as the sole basis in evaluating a company or security. Ratings involve unknown risks and uncertainties which may cause our expectations not to occur or to differ significantly from what was expected and should not be considered an offer or solicitation to buy or sell a security.

Risk Warning

Please note that investments in securities are subject to market and other risks and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not be sustained in future and is no indication of future performance. A security investment return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost. A security's current investment performance may be lower or higher than the investment performance noted within the report. Morningstar's Uncertainty Rating serves as a useful data point with respect to sensitivity analysis of the assumptions used in our determining a fair value price.

General Disclosure

Unless otherwise provided in a separate agreement, recipients accessing this report may only use it in the country in which the Morningstar distributor is based. Unless stated otherwise, the original distributor of the report is Morningstar Research Services LLC, a U.S.A. domiciled financial institution.

This Report is for informational purposes, should not be the sole piece of information used in making an investment decision, and has no regard to the specific investment objectives, financial situation or particular needs of any specific recipient. This publication is intended to provide information to assist investors in making their

own investment decisions, not to provide investment advice to any specific investor. Therefore, investments discussed herein may not be suitable for all investors; investors must exercise their own independent judgment as to the suitability of such investments and recommendations in the light of their own investment objectives, experience, taxation status and financial position. Morningstar encourages Report recipients to read all relevant issue documents (e.g., prospectus) pertaining to the security concerned, including without limitation, information relevant to its investment objectives, risks, and costs before making an investment decision and when deemed necessary, to seek the advice of a financial, legal, tax, and/or accounting professional. The information, data, analyses and opinions presented herein are not warranted to be accurate, correct, complete or timely. Unless otherwise provided in a separate agreement, neither Morningstar, Inc. or the Equity Research Group represents that the report contents meet all of the presentation and/or disclosure standards applicable in the jurisdiction the recipient is located.

Except as otherwise required by law or provided for in a separate agreement, the analyst, Morningstar, Inc. and the Equity Research Group and their officers, directors and employees shall not be responsible or liable for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions within the report.

The Report and its contents are not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject Morningstar, Inc. or its affiliates to any registration or licensing requirements in such jurisdiction.

Where this report is made available in a language other than English and in the case of inconsistencies between the English and translated versions of the report, the English version will control and supersede any ambiguities associated with any part or section of a report that has been issued in a foreign language. Neither the analyst, Morningstar, Inc., or the Equity Research Group guarantees the accuracy of the translations.

This report may be distributed in certain localities, countries and/or jurisdictions ("Territories") by independent third parties or independent intermediaries and/or distributors ("Distributors"). Such Distributors are not acting as agents or representatives of the analyst, Morningstar, Inc. or the Equity Research Group. In Territories where a Distributor distributes our report, the Distributor is solely responsible for complying with all applicable regulations, laws, rules, circulars, codes and guidelines established

Research Methodology for Valuing Companies

by local and/or regional regulatory bodies, including laws in connection with the distribution third-party research reports.

Conflicts of Interest

- ▶ No interests are held by the analyst with respect to the security subject of this investment research report.
- ▶ Morningstar, Inc. may hold a long position in the security subject of this investment research report that exceeds 0.5% of the total issued share capital of the security. To determine if such is the case, please click <http://msi.morningstar.com> and <http://mdi.morningstar.com>
- ▶ Analysts' compensation is derived from Morningstar, Inc.'s overall earnings and consists of salary, bonus and in some cases restricted stock.
- ▶ Neither Morningstar, Inc. or the Equity Research Group receives commissions for providing research nor do they charge companies to be rated.
- ▶ Morningstar's overall earnings are generated in part by the activities of the Investment Management and Research groups, and other affiliates, who provide services to product issuers.
- ▶ Morningstar employees may not pursue business and employment opportunities outside Morningstar within the investment industry (including but not limited to, working as a financial planner, an investment professional or investment professional representative, a broker-dealer or broker-dealer agent, a financial writer, reporter, or analyst) without the approval of Morningstar's Legal and if applicable, Compliance teams.
- ▶ Neither Morningstar, Inc. or the Equity Research Group is a market maker or a liquidity provider of the security noted within this report.
- ▶ Neither Morningstar, Inc. or the Equity Research Group has been a lead manager or co-lead manager over the previous 12-months of any publicly disclosed offer of financial instruments of the issuer.
- ▶ Morningstar, Inc.'s investment management group does have arrangements with financial institutions to provide portfolio management/investment advice some of which an analyst may issue investment research reports on. However, analysts do not have authority over Morningstar's investment management group's business arrangements nor allow employees from the investment management group to participate or influence the analysis or opinion prepared by them.
- ▶ Morningstar, Inc. is a publicly traded company (Ticker Symbol: MORN) and thus a financial institution the security of which is the subject of this report may own more than 5% of Morningstar, Inc.'s total outstanding shares. Please access Morningstar, Inc.'s proxy statement, "Security Ownership of Certain Beneficial Owners and Management" section <https://shareholders.morningstar.com/investor-relations/financials/sec-filings/default.aspx>

- ▶ Morningstar, Inc. may provide the product issuer or its related entities with services or products for a fee and on an arms' length basis including software products and licenses, research and consulting services, data services, licenses to republish our ratings and research in their promotional material, event sponsorship and website advertising.

Further information on Morningstar, Inc.'s conflict of interest policies is available from <http://global.morningstar.com/equitydisclosures>. Also, please note analysts are subject to the CFA Institute's Code of Ethics and Standards of Professional Conduct.

Risk Warning Please note that investments in securities are subject to market and other risks and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not be sustained in future and is no indication of future performance. A security's investment return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost. A security's current investment performance may be lower or higher than the investment performance noted within the report. For investments in foreign markets there are further risks, generally based on exchange rate changes or changes in political and social conditions.

For more information about Morningstar's methodologies, please visit global.morningstar.com/equitydisclosures

For a list of securities which the Equity Research Group currently covers and provides written analysis on please contact your local Morningstar office. In addition, for historical analysis of securities covered, including their fair value estimate, please contact your local office.

For recipients in Australia: This Report has been issued and distributed in Australia by Morningstar Australasia Pty Ltd (ABN: 95 090 665 544; ASFL: 240892). Morningstar Australasia Pty Ltd is the provider of the general advice ('the Service') and takes responsibility for the production of this report. The Service is provided through the research of investment products.

To the extent the Report contains general advice it has been prepared without reference to an investor's objectives, financial situation or needs. Investors should consider the advice in light of these matters and, if applicable, the relevant Product Disclosure Statement before making any decision to invest. Refer to our Financial Services Guide (FSG) for more information at <http://www.morningstar.com.au/fsg.pdf>

For recipients in New Zealand: This report has been is-

sued and distributed by Morningstar Australasia Pty Ltd and/or Morningstar Research Ltd (together 'Morningstar'). This report has been prepared and is intended for distribution in New Zealand to wholesale clients only and has not been prepared for use by New Zealand retail clients (as those terms are defined in the Financial Markets Conduct Act 2013). The information, views and any recommendations in this material are provided for general information purposes only, and solely relate to the companies and investment opportunities specified within. Our reports do not take into account any particular investor's financial situation, objectives or appetite for risk, meaning no representation may be implied as to the suitability of any financial product mentioned for any particular investor. We recommend seeking financial advice before making any investment decision.

For recipients in Hong Kong: The Report is distributed by Morningstar Investment Management Asia Limited, which is regulated by the Hong Kong Securities and Futures Commission to provide services to professional investors only. Neither Morningstar Investment Management Asia Limited, nor its representatives, are acting or will be deemed to be acting as an investment professional to any recipients of this information unless expressly agreed to by Morningstar Investment Management Asia Limited.

For recipients in India: This investment research is issued by Morningstar Investment Adviser India Private Limited. Morningstar Investment Adviser India Private Limited is registered with SEBI as a Portfolio Manager (registration number INP000006156) and as a Research Entity (registration number INH000008686). Morningstar Investment Adviser India Private Limited has not been the subject of any disciplinary action by SEBI or any other legal/regulatory body. Morningstar Investment Adviser India Private Limited is a wholly owned subsidiary of Morningstar Investment Management LLC. In India, Morningstar Investment Adviser India Private Limited has one associate, Morningstar India Private Limited, which provides data-related services, financial data analysis, and software development. The research analyst has not served as an officer, director, or employee of the fund company within the last 12 months, nor have they or their associates engaged in market-making activity for the fund company. The ESG-related information, methodologies, tool, ratings, data and opinions contained or reflected herein are not directed to or intended for use or distribution to India-based clients or users and their distribution to Indian resident individuals or entities is not permitted, and Morningstar/Sustainalytics accepts no responsibility or liability whatsoever for the actions of third parties in this respect.

*The Conflicts of Interest disclosure above also applies to relatives and associates of Manager Research Analysts in

Research Methodology for Valuing Companies

India # The Conflicts of Interest disclosure above also applies to associates of Manager Research Analysts in India. The terms and conditions on which Morningstar Investment Adviser India Private Limited offers Investment Research to clients, varies from client to client, and are detailed in the respective client agreement.

For recipients in Japan: The Report is distributed by Ibbotson Associates Japan, Inc., which is regulated by Financial Services Agency, for informational purposes only. Neither Ibbotson Associates Japan, Inc., nor its representatives, are acting or will be deemed to be acting as an investment professional to any recipients of this information.

For recipients in Singapore: The Report is intended for Institutional Investor audiences and is distributed by Morningstar Investment Adviser Singapore Pte. Limited, which is licensed by the Monetary Authority of Singapore to provide financial advisory services in Singapore. Morningstar Investment Adviser Singapore Pte. Limited is the entity responsible for the creation and distribution of the research services described in this Report.

This content is provided for informational purposes only and may be shared or redistributed by Institutional Investors to their clients or other permitted persons, subject to obtaining the appropriate licence from Morningstar. Redistribution of this content is subject to any applicable conditions or limitations, including those agreed commercially or contractually with Morningstar. The person who shares or redistributes this content shall be solely responsible for compliance with all relevant legal and regulatory obligations in the jurisdictions in which the material is made available.

Investors should consult a financial adviser regarding the suitability of any investment product, taking into account their specific investment objectives, financial situation or particular needs, before making any investment decision.

Morningstar, Inc., and its affiliates rely on certain exemptions (Financial Advisers Regulations, Section 27(1)(e), Section 32B and 32C) to provide its investment research to recipients in Singapore.

For recipients in Korea: The report is distributed by Morningstar Korea Ltd., which has filed to the Financial Services Committee, for informational purposes only. Neither Morningstar Korea Ltd. nor its representatives are acting or will be deemed to be acting as an investment advisor to any recipients of this information.