Global Technology: Semiconductors

3rd Annual Global Semiconductor Conference — Top 10 Takeaways

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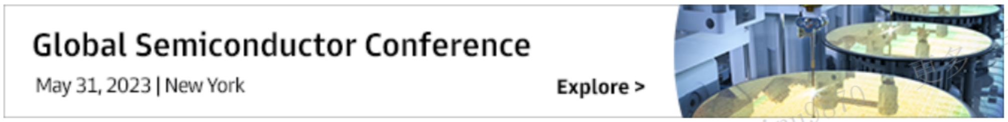

On May 29-30, we hosted our 3rd Annual Global Semiconductor Conference at our headquarters in New York and moderated fireside discussions and group investor meetings with management teams and IR representatives from 16 companies. We also hosted Todd Fisher, CIO of the CHIPS Program Office at the U.S. Department of Commerce to discuss the program's achievements to-date and its future goals. See our full note for a summary of the top takeaways.

Top 10 Takeaways

1) Broadening of AI Compute: while **Nvidia** in our view is undoubtedly the de facto standard today from an accelerated computing perspective with its hardware and software spanning Training to Inference in the core Data Center (note Inference accounted for ~40% of the company's Data Center segment revenue), speakers from **Intel**, **Cerebras Systems** and **Tenstorrent** all shared the view that AI is not and will not be a one-size fits all workload and that their respective solutions will have a place in the fast-growing AI Compute market. **Intel** reiterated a) its expectation for Gaudi accelerators to contribute ~$500mn in revenue in 2H24, b) Falcon Shores (i.e. discrete GPU) remains on track to launch in late-2025, and c) their view that broad-based adoption of AI will require Inference at the edge — a market in which they believe Intel CPUs are well-positioned to benefit. Similar to Intel, **Ampere Computing** noted that their CPUs, especially those with built-in accelerators, can be effective in addressing certain workloads including Inference and SLM Training (i.e. those with up to 70bn parameters) over the medium- to long-run. **Cerebras** spoke to its unique Wafer-Scale Engine architecture and emphasized its focus on complex models that require a large amount of compute — whether it be for Training or Inference. **Tenstorrent** described the advantages of the RISC-V ISA (Instruction Set Architecture) vis-à-vis x86 and Arm — specifically, the open nature of the platform —

and how certain customers (e.g. Google/Android) are beginning to embrace the ISA despite what is commonly considered a nascent ecosystem. Similar to Cerebras, Tenstorrent called out sovereign AI as a large and compelling market opportunity and highlighted the recent partnership it signed with Japan's Leading-Edge Semiconductor Technology Center (LSTC).

2) HBM remains a material growth driver: although **Micron** is coming off of a low base relative to market share in HBM vis-à-vis SK Hynix and Samsung Electronics, we expect this market within DRAM to drive sequential strength for the company in the coming quarters, as management noted that they have pricing and volumes set for LTAs in CY2024 and are increasingly close to finalizing terms for CY2025. In the near-term, the company spoke to a 50% bit CAGR in HBM, while the broader DRAM portion of the business is expected to progress at a mid-teens (%) through-cycle growth rate. On HBM3E specifically, Micron reiterated that the product has 30% lower power consumption than the next closest peer, and as the industry progresses to HBM4E, we view the incremental customization opportunity of the base die (and the almost ASIC-like model associated with that) as a positive dynamic, not only to the pricing trajectory of HBM but also to the gross margins that business segment can drive for the company.

3) AI's impact on storage: while the build-out of Gen AI infrastructure and its positive impact on Computing, Memory (specifically, HBM) and Networking are well-known at this point, the lack of upside in demand for enterprise SSD and nearline HDD throughout 2023 had previously called into question the need for additional storage. The narrative has shifted, however, with management teams from **Micron** and **Western Digital** speaking to strength in their respective enterprise SSD businesses and, in the case of WD, the recent inflection in its nearline HDD business. We recognize that a portion of the ongoing recovery is likely being driven by inventory re-stocking on the part of customers; however, with the proliferation of AI driving an acceleration in data growth and the need for 'hot storage' in particular growing at a fast clip, we expect the robust enterprise SSD demand environment to persist well into 2025. On the competitive front, in enterprise SSD, although Micron has recently gained share and WD has customer qualifications in motion that could drive better results in 2025, both companies still have work to do, in our view, given the large market share footprint possessed by Samsung Electronics and SK Hynix (especially with its ownership of Solidigm).

4) Wafer Fab Equipment outlook intact: based on comments from the likes of **Lam Research**, **Tokyo Electron** and **Kokusai**, we believe the near- and medium-term outlook for the Wafer Fab Equipment (WFE) market remains intact. By application, our views are as follows: **a) Leading-edge Logic/Foundry:** we expect WFE spending to increase hoh in 2H24 and for 2025 to be up double-digits (%) yoy, primarily driven by the transition to Gate-All-Around transistor structures and the associated increase in capital intensity; **b) DRAM:** we forecast robust WFE spending in DRAM throughout our forecast period (excluding China), as the three incumbents build HBM capacity to address ongoing strength in the AI accelerator market. We believe a recovery in conventional DDR5 DRAM could also catalyze an increase in WFE spending, although likely more impactful in 2025; **c) NAND:** WFE spending in NAND remains subdued and well below historical levels. While we do expect NAND equipment purchase orders intended for capacity expansion to resume over the next several quarters, we believe the NAND manufacturers will act prudently following what was the industry's worst downturn in terms of both duration and magnitude; **d) Trailing-edge/Other:** we expect WFE spending across trailing-edge nodes and specialty technologies to decline over the next 12-18 months as customers over-indexed to the Industrial and Automotive end-markets currently sitting on excess capacity/inventory adjust to the current (or what they consider a more normalized) demand environment. On China specifically, Lam Research noted that demand trends were stable/resilient, while Tokyo Electron shared its expectation for the market to decline in 2025. All in, we continue to forecast yoy WFE market growth of 6%/17%/9% in 2024/25/26, respectively.

5) Hybrid bonding to be a key enabler in the progression of advanced packaging: while Heterogeneous Integration (HI) is still a nascent technology and Thermocompression Bonding (TCB) will remain the go-to technology for High Bandwidth Memory over the next few years, we believe that hybrid bonding will be a key advanced packaging technology addressing the increasing manufacturing complexities that comes with the continued progression of leading-edge semiconductors aimed for high-performance applications. We are encouraged to see the recent broadening of Hybrid Bonding tool orders beyond only TSMC to another leading-edge Logic customer (with a significant volume of tool orders placed, rather than only testing units). Further, in Memory, **BESI** reiterated that most of its leading Memory customers are following a path of parallel development of both Hybrid Bonding and TCB tools for HBM, with final architectures and equipment yet to be fully decided upon. We continue to believe that the relaxation of HBM4 standards will only extend TCB's applicability to HBM in the short-term, with an eventual transition to Hybrid Bonding necessary in the long-term.

6) 300mm wafer market is bottoming but a slow recovery is expected: despite wafer inventories peaking in February-March 2024, customers still have 1.5 months above normal levels which **SUMCO** believes is an indication of a slow recovery through the year with the shape ultimately dependent on the pace of NAND inventory adjustments. Encouragingly, AI-related demand (e.g. larger die sizes in logic and HBM), a recovery across the broader market, and the prospective increase in wafer bonding for 3D NAND is expected to drive a material recovery in 2025 and 2026.

7) Technology transitions to drive higher consumption of semiconductor materials: following a sharp cyclical downturn in 2023, we believe the outlook for the semiconductor materials industry is positive with **Entegris** continuing to operate under a 2024 MSI (i.e. proxy for industry wafer starts) growth assumption of +5% yoy, supported by solid momentum on a sequential basis in leading-edge Logic/Foundry, DRAM and NAND (albeit off a low base). More importantly, we expect competitive players like Entegris that supply inputs that are critical to next-generation devices will outgrow the overall market on a consistent basis. For Entegris specifically, we see the transition to and/or introduction of a) Gate-All-Around logic transistor structures, b) Backside Power Delivery, and c) Molybdenum in 3D NAND (from Tungsten), to serve as drivers of outperformance over the next few years. While Entegris has already identified revenue synergies in some areas (i.e. combination of Entegris SiC CMP slurries and CMC's CMP pads) following the CMC Materials integration, we were encouraged to hear that there is still ample opportunity for synergy creation, in Entegris' view, with management looking to deliver solutions, for example, that integrate their capabilities in CMP slurries, pads, deposition materials, cleaning materials and filters.

8) Bottom is in for broad-based semiconductors but shape of recovery still uncertain: while there was no financial update from **Microchip**, we came away with the impression that their view on the cycle had not changed since their recent earnings call and that the expectation was still for revenue to trough in the June quarter and recover starting in the September quarter. The shape of the potential recovery in 2HCY24 and CY2025, however, remains uncertain and biased toward a more gradual pace, in our view, given elevated inventory and mixed demand signals across the supply chain. On Automotive specifically, **Amkor** cited persistent weakness, while **SUMCO** also noted order cuts from customers. **Infineon** commented that it still sees scope for absolute revenue growth in China in coming years, driven by the region's demand for reliability in chip supply, coupled with its broad auto portfolio (e.g. full suite of low to high-end MCUs) that can credibly offer scale and supply security to fast-ramping customers. We also believe Infineon offers differentiated expertise in system design and packaging, rather than only discrete solutions, with scope for Tier 1's to somewhat standardize around incumbent players in areas such as MCU, further entrenching the market position of current leaders.

9) Competition with China: given the evolving/challenging geopolitical backdrop, we questioned many of the participating companies if they had seen or were expecting a shift in the competitive landscape in China. In short, every company responded with the view that they either did not compete in the same markets as the local Chinese manufacturers or that any overlap was very limited. **Skyworks** noted that although their competitors had made some progress in transitioning to offering integrated (as opposed to discrete) RF front-end solutions, they have been able to defend their sockets in China. **Microchip**, **Infineon**, **Entegris** and **Lam Research** stated that they have been in competition with the local suppliers for many years, yet their respective China businesses are still in strong standing, although Lam did acknowledge that local competitors have been able to fill holes created by the implementation of export controls by the U.S. Government.

10) CHIPS Act update: from the public sector, we hosted Todd Fisher (CIO of the CHIPS Program Office at the U.S. Department of Commerce) who had spent 30 years in the finance and investment industry, including nearly 25 years at KKR & Co. Inc., prior to joining the Department of Commerce in 2021. Mr. Fisher highlighted, a) the over 200 applications received and 9 preliminary memorandums of terms (PMT) announced to date, b) productive partnerships forged with leading semiconductor companies, c) the considerations taken to supply funding (e.g. CHIPS Act funds can only to go to a manufacturing facility), and d) the concept of the grants being milestone based, as recipients pursue their indicated project timelines. Additionally, Mr. Fisher noted the importance of creating large-scale, leading-edge fab ecosystems (i.e. clusters) in the United States and the work that is being done across the supply chain to invest capital into sustaining workforce development programs (i.e. striving to create sufficient talent pools for the fabs).

Skyworks Solutions Inc. (SWKS)

Presenters: Kris Sennesael, SVP & CFO

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: There was no update to Skyworks' near-term outlook. Mr. Sennesael noted his expectation for RF content per phone to grow ~10% per year on a through-cycle basis even prior to the arrival of 6G. He also spoke to the company's commitment to grow the core Mobile business, but also reiterated their intent to diversify their revenue base through organic and potentially inorganic measures.

SWKS	12m Price Target: $97	Price: $90.68	Upside: 7%

Neutral	GS Forecast				
		9/23	9/24E	9/25E	9/26E
Market cap: $14.5bn	Revenue ($ mn)	4,772.4	4,164.6	4,184.5	4,702.1
Enterprise value: $14.1bn	EBITDA ($ mn)	2,007.2	1,297.6	1,285.6	1,559.3
3m ADTV :$253.9mn	EBIT ($ mn)	1,416.9	952.8	1,006.4	1,264.1
United States	EPS ($)	7.38	5.16	5.63	7.40
Americas Semiconductors and Semi Equipment	P/E (X)	14.0	17.6	16.1	12.3
	EV/EBITDA (X)	8.5	10.9	10.7	8.3
M&A Rank: 3	FCF yield (%)	10.0	9.9	7.5	10.0
	Dividend yield (%)	0.7	0.8	0.9	1.0
	Net debt/EBITDA (X)	0.3	(0.3)	(0.4)	(0.4)
		3/24	6/24E	9/24E	12/24E
	EPS ($)	1.27	0.97	1.28	1.55

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) Socket-loss clarified: Mr. Sennesael walked through their socket loss at their largest customer. While Skyworks was able to partially offset the socket loss with content gains elsewhere in the RF front-end, he expects their total content in this year's flagship phone to be down approximately 10% on a net basis. Although Skyworks will work to regain the socket in future models, Mr. Sennesael believes that it will be an uphill battle as long as the customer stays on the current modem.

2) AI: while Skyworks is not a direct enabler of AI, Mr. Sennesael believes that they are positioned to benefit as AI is pushed to the edge. AI enabled smartphones could drive a smartphone refresh cycle, particularly if their largest customer was to adopt and market AI within their flagship models (as was the case with Samsung's S24 model), per management. He believes that RF suppliers, including Skyworks, will play a critical role in freeing up space and reducing power consumption as smartphone OEMs leverage AI-enabling processors (that are larger in die size) and more memory.

3) Android market: consistent with their last EPS call, Skyworks expects the Android market to progressively return to $125-$150mn in quarterly revenue following the normalization of customer inventory.

4) Broad Markets growth drivers: currently Broad Markets represents ~35% of Skyworks' revenue. Per management, they expect to grow this business at a mid-teens% CAGR (vs. ~10% for Mobile) in a neutral economic environment. Growth will stem from the transition to Wi-Fi 6E/7 (i.e. 15-25% more BAW content), connectivity (Bluetooth, 5G, BAW, etc.) in Auto, and Data Center exposure through timing products, per management.

5) Diversification strategy: Mr. Sennesael spoke to the company's diversification strategy and reiterated their intent to grow Broad Markets revenue at a faster clip than the Mobile business through organic and inorganic measures. Given their strong balance sheet and sustained FCF generation, he believes the company is equipped to execute an acquisition in the $5-7bn range.

6) Gross margin outlook: while revenues need to improve for corporate gross margins to return to >50%, Mr. Sennesael highlighted the company's continued focus on yield improvement, die shrink, and reduction of internal inventory, and reiterated his expectation for gross margins to improve through the end of the calendar year. Additionally, given the higher average gross margins within the Broad Markets business, he expects mix to serve as a tailwind to profitability over the medium to long term.

Valuation/Risks: Our 12-month price target of $97 is based on 13x our normalized EPS estimate of $7.45. Key upside/downside risks to our estimates and Neutral rating include: 1) better- or weaker-than-expected smartphone (particularly, 5G) demand, 2) strength or weakness in any of the other key end-markets (i.e., Comms Infrastructure, Automotive, Consumer IoT), 3) fluctuations in market share, 4) better- or worse-than-expected gross margin execution; and 5) M&A that is accretive/dilutive to the long-term financial profile of the company.

SUMCO (3436.T)

Presenters: Mr. Hiro Shibuya, Head of IR and Media

Moderator: Toshiya Hari, US Semiconductor & SPE sector analyst, Goldman Sachs

Bottom Line: Customer inventories remain at a high level, but it is reassuring that 300 mm wafer demand is bottoming out, driven by logic and DRAM for AI. SUMCO expects the degree of recovery in 300 mm wafer purchase volume in 2H12/24 to depend on NAND inventory adjustments, but as a focus area for the stock market, it confirmed higher AI-related demand for silicon wafers, and we think SUMCO could steadily attract more attention, given its strength in these advanced areas.

3436.T	12m Price Target: ¥3000	Price: ¥2358	Upside: 27.2%

Buy	GS Forecast				
		12/23	12/24E	12/25E	12/26E
Market cap: ¥825.7bn / $5.3bn	Revenue (¥ bn)	425.9	424.6	528.6	588.6
Enterprise value: ¥948.4bn / $6.1bn	EBITDA (¥ bn)	144.5	137.5	215.1	247.1
3m ADTV :¥13.5bn/ $87.9mn	EBIT (¥ bn)	73.1	54.0	124.7	153.5
Japan	EPS (¥)	182.69	100.63	247.08	308.85
Japan Chemicals & Advanced Materials	P/E (X)	10.9	23.4	9.5	7.6
	EV/EBITDA (X)	5.7	6.9	4.0	3.0
M&A Rank: 3	FCF yield (%)	(31.6)	2.3	16.5	20.2
	Dividend yield (%)	2.8	1.7	4.2	5.3
	Net debt/EBITDA (X)	0.5	0.4	(0.2)	(0.7)
		3/24	6/24E	9/24E	12/24E
	EPS (¥)	14.44	21.99	35.41	28.66

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 31 May 2024 close.

(1) 300 mm wafer market is bottoming out, driven by generative AI demand, but 2H depends on NAND inventory adjustments: Customer inventories of 300 mm wafers peaked out on a turnover basis in February-March 2024, but they remain at a high level, and customers have about 1.5 months of inventories in excess of normal levels. SUMCO looks for a gradual recovery in 2H12/24, driven by continued strong demand for AI applications, but said the degree of increase in wafer purchases will depend on NAND inventory adjustments.

(2) Expect AI-related demand to increase silicon content: SUMCO expects AI-related demand to drive 300 mm wafer demand for the time being. AI servers use more silicon than regular servers, and HBM die sizes are roughly 2X larger than regular DDR5. Also considering yields, these factors are boosting wafer demand in terms of actual wafer input. In addition, SUMCO expects smartphones and PCs equipped with AI functions to start gaining traction. In particular, for AI-equipped smartphones, SUMCO expects logic die sizes to increase by 10-15% from existing products, and DRAM content to increase as well. SUMCO also expects a boost to demand from around 2025 from a prospective increase in wafer bonding of peripheral circuits and memory arrays to increase 3D NAND bit density and achieve high transfer speeds.

(3) Adherence to long-term contract prices: SUMCO expects the overall wafer market to be weak, but prices are stable as all customers are adhering to long-term agreements. In particular, 300 mm wafer price revisions are needed to cover both greenfield and brownfield investments, and although price growth could be delayed somewhat, SUMCO expects long-term agreement prices to rise over the medium term.

(4) Limited impact from rise of local Chinese companies: Regarding competitive conditions with local Chinese companies, although the domestic Chinese market has multiple suppliers of 200 mm wafers, consumption is limited to within the region, and

SUMCO emphasized that global supply/demand is unaffected. In addition, although a few companies have started supplying 300 mm wafers, the quality of these products is inferior, and SUMCO said they are often used in applications that do not require high quality, such as dummy wafers. The company said that the impact is limited because the technological gap with the wafer industry's top five companies is still large.

Valuation/Risks: We are Buy-rated on SUMCO with a 12-month target price of ¥3,000, based on the correlation between the materials sector EV/GCI and our FY12/25E CROCI/WACC estimates (using a cash return multiple of 0.45X, 30% discount to the sector average).

Key risks: A slowdown in semiconductor demand, yen appreciation, and moves by major shareholders.

Infineon (IFXGn.DE)

Presenters: We hosted Alexander Foltin, Head of Investor Relations at Infineon, for a fireside chat and investor meetings at the GS Global Semiconductor Conference in New York.

Key takeaways include: 1) We highlight Infineon's strong competitive position in the automotive segment driven by robust MCU share gain momentum and design wins in the Chinese EV market, 2) Infineon sees proliferation of AI servers and adoption of backside power delivery as two strong growth drivers for its AI power semis business, with scope for further share gain as the ecosystem develops, 3) Infineon's PSS and CSS divisions have now experienced a prolonged downcycle of 6 quarters, with stabilising order trends, suggesting scope for a 2H recovery, 4) While demand for SIC has softened slightly in recent months, Infineon remains bullish on long-term trends, with scope for applications to broaden further, and 5) Infineon still expects healthy growth in the Chinese EV market, and remains confident in its competitive positioning due to greater system knowledge. Reiterate Buy.

IFXGn.DE	12m Price Target: €43.5	Price: €37.09	Upside: 17.3%

Buy	GS Forecast				
		9/23	9/24E	9/25E	9/26E
Market cap: €48.5bn / $52.5bn	Revenue (€ mn)	16,308.0	15,291.7	17,032.0	19,020.2
Enterprise value: €52.4bn / $56.8bn	EBITDA (€ mn)	5,701.0	4,494.1	5,581.3	6,646.0
3m ADTV :€165.4mn/ $178.6mn	EBIT (€ mn)	3,947.0	2,594.1	3,622.7	4,458.6
Germany	EPS (€)	2.65	1.72	2.33	2.83
European Semiconductors, Hardware and Gaming Tech	P/E (X)	12.4	21.5	15.9	13.1
	EV/EBITDA (X)	8.2	11.7	9.3	7.6
M&A Rank: 3	FCF yield (%)	2.2	0.2	1.9	4.3
	Dividend yield (%)	1.0	0.9	1.1	1.1
	Net debt/EBITDA (X)	0.5	0.7	0.5	0.2
		3/24	6/24E	9/24E	12/24E
	EPS (€)	--	--	--	--

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

We highlight Infineon's strong competitive position in the automotive segment driven by robust MCU share gain momentum and design wins in the Chinese EV market: While the company reiterated its recently lowered auto revenue guidance, Infineon remains confident that it can outperform other auto semis peers and market growth, driven by scope for further share gains in auto MCUs and its strong exposure to the China EV market (where trends are relatively stronger than in western markets), which has offset a double digit % drag from inventory correction in other areas of the legacy auto business for several quarters (suggesting that the auto cycle correction can correct in the next 1-2 quarters). Specifically, Infineon sees its strong auto MCU share gain momentum as sustainable due to the fact that the company is executing on a longstanding pipeline that was built over the last 3-5 years. Furthermore, it believes the market structure in which several OEMs have mandated certain auto MCU platforms, there is a tendency for Tier 1's to prefer incumbent winners, suggesting market share can remain sticky in our view.

Infineon sees proliferation of AI servers and adoption of backside power delivery as two strong growth drivers for its AI power semis business, with scope for further share gain as the ecosystem develops: Infineon reiterated that it views the rapid proliferation of AI as an attractive opportunity (given the high power requirements of GPUs and AI servers vs traditional CPU servers), and expects the business to contribute revenues of around €1bn in the coming years. We note that company currently has 30-40% market share in traditional server power semis, and sees scope for its AI server share to grow towards these levels, primarily driven by Infineon's vertical backside power offering, which it believes can enable 12% total cost of ownership savings in the datacentre through energy savings. Moreover, given the complexity of the ecosystem and need to be designed by several players, IFX sees a degree of stickiness in its product wins (and noted that it has wins with all three major

AI chipmakers).

Infineon's PSS and CSS divisions have now experienced a prolonged downcycle of 6 quarters, with stabilising order trends, suggesting scope for a 2H recovery: Infineon commented that its PSS and CSS divisions have now experienced a prolonged downcycle of 6 quarters, and have now seen order backlog stabilise, suggesting the cycle trough has been found and that 2H can show sequential improvements in topline. In our view, we see this as evidence that the industrial business is at a low point, suggesting some upside risks to a potentially conservative 2H guide (which IFX characterised as de-risked).

While demand for SiC has softened slightly in recent months, Infineon remains bullish on long-term trends, with scope for applications to broaden further: While Infineon acknowledged that demand for Silicon Carbide has softened as EV units have shown some weakness, it remains confident in the long-term structural adoption of EVs. While some investors have expressed concern that the SIC market could tip into oversupply, IFX noted that this may require all planned brownfield site announcements to be built, which may not happen in our view. Further, we believe that to the extent that oversupply could lead to device price pressure, this could help catalyse further SiC adoption in new applications, thereby helping the long-term health of the SiC market.

Infineon still expects healthy growth in the Chinese EV market, and remains confident in its competitive positioning due to greater system knowledge: Infineon commented that it still sees scope for absolute revenue growth in China in coming years, driven by the region's demand for reliability in chip supply, coupled with its broad auto portfolio that can credibly offer scale and supply security to fast-ramping customers. We also believe Infineon offers differentiated expertise in system design and packaging, rather than only discrete solutions, which can help support fast product launch cadence of new car platforms.

Valuation/Risks: We are Buy rated on Infineon with a 12-month price target of €43.5 based on a 10x CY25E EV/EBITDA multiple. Key risks to our view and price target include weaker end markets, a worsening semi cycle and negative macro dynamics.

Ampere Computing Inc.

Presenters: Renée J. James, Founder/Chairman and CEO

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Ms. James – highlighting Ampere's power-advantage vis-a-vis traditional x86 CPUs and GPUs – noted that growing power constraints in the Data Center will play to the company's advantage and that, within the context of AI, the company is well-positioned to play in the Inference and SLM Training markets in the medium to long term. From a demand perspective, while Ms. James believes the general-purpose server CPU market has bottomed following an unprecedented decline in 2023, she was reluctant to predict the timing and shape of the recovery.

1) Ampere's role in AI era: Ms. James acknowledged that the large cloud service providers (CSPs) will utilize their GPU-based AI servers for both Training and Inference to the fullest given the sunk costs. That said, she believes CPUs and, importantly, Ampere CPUs, especially those with built-in accelerators, can be effective in addressing certain workloads including Inference and SLM Training (i.e., those with up to 70bn parameters) over the medium to long run.

2) Power as a constraining factor: Ms. James noted that as Gen AI continues to proliferate and more data centers are equipped with accelerators (i.e., GPUs, custom accelerators), power will increasingly become a constraining factor for data center operators, particularly the hyperscalers. Ms. James believe this will play to the company's advantage given Ampere's energy-efficient design vis-a-vis traditional x86 CPUs, in-house Arm-based CPUs and GPUs. For context, per Ampere, a single GPU typically consumes ~1kW and most modern microprocessors consume ~450-500 watts, while Ampere's latest product with 192 cores run on 300-350 watts.

3) Customer traction: From a customer traction perspective, Ms. James shared that OCI (Oracle Cloud Infrastructure) runs on Ampere processors and that every single U.S.-based CSP but Amazon is a customer. Furthermore, she expressed her confidence, particularly with their 1-year product cadence, in designing processors that are performant and deliver superior TCO to the custom chips that are being worked on by the CSPs.

4) Near-term demand outlook: Ms. James highlighted that 2023 was a challenging year for general-purpose server CPUs as the CSPs prioritized spending on AI (i.e., GPUs). While she believes the demand environment has bottomed, she was reluctant to predict the rate of recovery and noted that the allocation of capex dollars continues to be biased in favor of accelerated computing.

5) Foundry partnership: Ms. James, who currently partners with TSMC, stated that Ampere will continue to work with the foundry with the best process technology. She also highlighted the challenges associated with moving designs from one foundry to another as chip designs are unique to a specific process from a specific foundry.

Amkor Technology Inc. (AMKR)

Presenters: Megan Faust - Executive Vice President, CFO and Treasurer; Kevin Engel - Executive Vice President, Business Units

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Despite persistent weakness in the Automotive end-market, management continues to expect revenue to grow ~30% hoh in 2H driven by a) seasonal strength in smartphone builds, b) content gains across Communications and Consumer (i.e. next-generation wearable device) and c) incremental revenue from expanding 2.5D capacity.

AMKR	12m Price Target: $36	Price: $32.64	Upside: 10.3%

Neutral	GS Forecast				
		12/23	12/24E	12/25E	12/26E
Market cap: $8.1bn	Revenue ($ mn)	6,503.1	6,707.4	7,465.4	8,139.0
Enterprise value: $8.6bn	EBITDA ($ mn)	1,134.3	1,181.6	1,402.3	1,579.2
3m ADTV :$30.3mn	EBIT ($ mn)	470.3	558.8	768.7	935.8
United States	EPS ($)	1.46	1.77	2.47	3.03
Americas Semiconductors and Semi Equipment	P/E (X)	17.9	18.5	13.2	10.8
	EV/EBITDA (X)	5.7	7.2	6.1	5.3
M&A Rank: 3	FCF yield (%)	8.1	(1.3)	1.6	3.8
	Dividend yield (%)	1.2	1.0	1.1	1.3
	Net debt/EBITDA (X)	0.1	0.4	0.3	0.2
		3/24	6/24E	9/24E	12/24E
	EPS ($)	0.24	0.26	0.65	0.62

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) Confidence in 2H recovery: despite persistent weakness in the Automotive end-market, management continues to expect total company revenue to grow ~30% hoh in 2H driven by a) seasonal strength in smartphone builds, b) content gains across Communications and Consumer (i.e. next-generation wearable device) and c) incremental revenue from expanding 2.5D capacity.

2) Weakness in Automotive: management noted that the Automotive was one of the last industry verticals to enter the cyclical downturn from a semiconductor sell-in perspective and that their customers may require another quarter or two to fully digest excess inventory. Longer-term, management remains confident in its Automotive business' growth trajectory predicated on secular trends such as electrification and ADAS, augmented by its leading and strengthening competitive position (note Amkor's deepened partnership with Infineon announced on April 8, here).

3) 2.5D packaging: following a tripling in its capacity over the past year, management noted that it will continue to invest in 2.5D packaging capacity as it looks to support both existing (GPU) and future customers. They also highlighted that, with demand far outpacing supply and additional applications expected to contribute, there is little expectation of reaching a state of over-capacity in the near-term.

4) Competitive landscape in the OSAT industry: Amkor believes that they are one of only two OSAT (Outsourced Semiconductor Assembly and Test) service providers who have a full and robust technology portfolio including Advanced Packaging. Furthermore, they highlighted that their diversified geographical footprint is increasingly resonating with customers who find themselves operating in an increasingly unstable geopolitical backdrop.

5) Capital allocation: having already met its leverage target, Amkor reiterated its intent to return 40-50% of FCF to shareholders over time and increase its dividend on an annual cadence as it has done in the past since inception. The top priority, however, continues to be investing in the business (e.g. capital intensity in the low-teens [%]).

Valuation/Risks: Our 12-month price target of $36 is based on 6.1x our Q5-Q8 EBITDA estimate of $1.45bn. Key upside/downside risks to our view include: 1) a stronger/weaker-than-expected demand recovery for smartphones, servers, wearables and PCs, 2) an accelerated/delayed adoption of advanced packaging at foundries/IDMs, 3) gain/loss of a significant customer, and 4) increased/decreased competition from new entrants (particularly in China) which could compress/improve profit margins.

Tokyo Electron (8035.T)

Presenters: Aki Sekiguchi, Ph.D., Corporate Fellow, Corporate Innovation Division; Koichi Yatsuda, VP, Global Head of IR

Moderator: Shuhei Nakamura, Japan SPE & precisions sector analyst, Goldman Sachs

Bottom Line: TEL's WFE market outlook has not changed much compared with three months ago. While it expects China demand to slow, it looks for double-digit (%) growth in CY25 driven by NAND and advanced logic. TEL said it is actively investing in R&D and recruiting staff for sustained growth going forward, and is working to expand its served addressable market (SAM) to achieve above WFE market growth. The company also discussed extremely low temperature etching equipment for 3D-NAND channel holes, which has attracted market attention. It reiterated its expectations for acquiring a certain share of projected TAM of around US$2 bn in CY27.

8035.T	12m Price Target: ¥43000	Price: ¥33630	Upside: 27.9%

Buy	GS Forecast				
		3/24	3/25E	3/26E	3/27E
Market cap: ¥15.8tr / $100.6bn	Revenue (¥ bn)	1,830.5	2,266.3	2,757.0	3,120.2
Enterprise value: ¥15.5tr / $98.9bn	EBITDA (¥ bn)	508.6	701.8	936.8	1,106.7
3m ADTV :¥148.3bn/ $971.5mn	EBIT (¥ bn)	456.3	638.8	865.5	1,026.9
Japan	EPS (¥)	779.43	1,098.75	1,501.66	1,799.90
Japan SPE & Precision	P/E (X)	29.8	30.6	22.4	18.7
	EV/EBITDA (X)	20.2	21.3	15.8	13.2
M&A Rank: 3	FCF yield (%)	2.9	1.6	3.0	4.4
	Dividend yield (%)	1.7	1.6	2.2	2.7
	Net debt/EBITDA (X)	(0.9)	(0.4)	(0.2)	(0.3)
		3/24	6/24E	9/24E	12/24E
	EPS (¥)	263.14	238.46	241.70	281.66

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 31 May 2024 close.

(1) WFE market outlook: The company's outlook is largely unchanged compared with three months ago. TEL continues to expect slight growth yoy of US$100 bn in CY24 and double-digit (%) growth in CY25. By application, TEL expects DRAM to drive CY24 growth, and DRAM to remain high in CY25. At the same time, it said it expects NAND to grow by 2X or more yoy in CY25 due partly to a recovery in customer capacity utilization after being sluggish. TEL said China is likely to peak out in 1HFY24, and that CY25 could see negative growth yoy.

(2) Future growth initiatives: With the semiconductor market expected to reach US$1 tn by around 2030, TEL reiterated that increasing growth potential for AI servers, in addition to smartphones and PCs, which have driven market growth up to now, has positive implications for the production equipment market (from the standpoint of larger die sizes and increasing value-added). In addition, TEL is expanding its R&D bases globally, and is continuously increasing its R&D investment to advance R&D broadly without delay. TEL also discussed business sustainability. It said that it has been able to hire talented personnel, which are essential for future growth, and that the staff turnover rate is relatively low compared with other companies.

(3) SAM expansion for above WFE market growth: TEL already has a high market share in a wide range of products, including coater/developers, etching (mainly dielectric), deposition, and cleaning, but it noted that it is strengthening product development to further expand its SAM, including conductor etch and advanced packaging. In discussing extremely low temperature etching systems for 3D-NAND channel holes, which has attracted market attention, TEL said it believes its systems can provide optimal solutions for devices with 400 layers or more (from the standpoint of etching rates, etc.), and it reiterated expectations for acquiring a certain share of projected TAM of around US$2 bn in CY27.

Valuation/Risks: Our 12-month target price of ¥43,000 is based on our FY3/26 EBITDA estimates and the global SPE sector average EV/EBITDA multiple of 20X (implies a FY3/26E P/E of 29X and P/B of 10X). We are Buy-rated.

Key risks: A prolonged inventory adjustment phase in the semiconductor industry, further strengthening of export restrictions, and a depressed valuation multiple amid upward pressure on interest rates and other factors.

Kokusai Electric (6525.T)

Presenters: Fumiyuki Kanai, President & CEO, Kazunori Tsukada, EVP & Executive Officer, Corporate Planning, PR, IR, Sustainability, Export Control, Legal and IP

Moderator: Shuhei Nakamura, Japan SPE & precisions sector analyst, Goldman Sachs

Bottom Line: In terms of the current business environment, DRAM is buoyant, logic/foundry are recovering, and NAND is sluggish. The company expects sales for NAND to recover from Jan-Mar in CY25. In terms of China demand, the company assumes a slowdown in 2H3/25 in guidance, but said that investment sentiment remains strong at present, and no slowdown is evident yet.

The company plans to hold an IR Day on June 18 at 9:00 a.m. (JST). It plans to invite Applied Materials (AMAT), which owns 15% of its shares, as a guest speaker. Kokusai Electric is targeting sales of ¥300 bn-¥330 bn and a gross margin of at least 43% when the WFE market reaches US$110 bn-US$120 bn as medium-term financial targets. It expressed the view that it will be somewhat difficult to achieve these targets in FY3/26, but they are well within reach in FY3/27 at this stage.

6525.T	12m Price Target: ¥4500	Price: ¥4300	Upside: 4.7%

Neutral	GS Forecast				
		3/24	3/25E	3/26E	3/27E
Market cap: ¥1.0tr / $6.4bn	Revenue (¥ bn)	180.8	221.2	261.7	290.9
Enterprise value: ¥999.7bn / $6.4bn	EBITDA (¥ bn)	41.5	59.0	73.2	83.1
3m ADTV :¥12.2bn/ $79.8mn	EBIT (¥ bn)	30.6	46.2	60.3	70.2
Japan	EPS (¥)	95.23	133.09	189.33	219.81
Japan SPE & Precision	P/E (X)	36.8	32.3	22.7	19.6
	EV/EBITDA (X)	19.7	16.9	13.3	11.4
M&A Rank: 3	FCF yield (%)	(2.1)	0.9	3.2	4.4
	Dividend yield (%)	0.3	0.8	1.1	1.2
	Net debt/EBITDA (X)	0.0	(0.0)	(0.3)	(0.7)
		3/24	6/24E	9/24E	12/24E
	EPS (¥)	23.42	31.34	33.49	32.20

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 31 May 2024 close.

(1) Current business environment: DRAM is strong in the WFE market at present, and logic/foundry are seeing a recovery of sorts, but the company said that there is still no major change in NAND and a full-fledged recovery will take time. The company said it expects sales for NAND to recover from Jan-Mar in CY25. In terms of China demand, the company assumes a slowdown in 2H3/25 from 1H in guidance due to the timing of orders and delivery, but said that investment sentiment remains strong at present, and no slowdown is evident yet.

(2) Future growth drivers and medium-term financial targets: The company said it expects batch atomic layer deposition (ALD) equipment and treatment equipment, which have high market shares, to continue to drive growth. In 3D-NAND, where it already has a high market share, the company expects higher layering (increased aspect ratio). In logic, it noted changes in transistor structure (FinFET to GAA), the adoption of backside power delivery networks (BSPDNs), and the transition to CFET over the medium term. In DRAM, Kokusai Electric sees business opportunities mainly in expanded application of batch ALD equipment and the transition to 3D-DRAM (the market will remain divided from single-wafer deposition equipment). Kokusai Electric is targeting sales of ¥300 bn-¥330 bn and a gross margin of at least 43% when the WFE market reaches US$110 bn-US$120 bn as medium-term financial targets. It expressed the view that it will be somewhat difficult to achieve these targets in FY3/26, but they are well within reach in FY3/27 at this stage.

(3) Alliance with AMAT: Applied Materials (AMAT) currently owns 15% of Kokusai Electric. While not much collaboration has taken place yet, the company is exploring various possibilities for the future, and it believes it can leverage each other's technological strengths and integrate them into single equipment. The company plans to hold an IR Day on June 18 at 9:00 a.m. (JST) and invite AMAT as a guest speaker.

Valuation methodology: Our 12-month target price of ¥4,500 is based on our FY25E earnings estimates and an EV/EBITDA multiple of 20X, which is derived from the global SPE sector average. We then apply a sector-relative discount of 30% (our TP implies FY3/26E P/E of 24X and P/B of 4.2X).

Key risks: Changes in investment at key customers, additional changes in export controls, and changes in the competitive landscape due to strategic changes at competitors.

Western Digital Corp. (WDC)

Presenters: David Goeckeler, CEO and Wissam Jabre, EVP & CFO

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Management spoke to constructive supply/demand conditions across the NAND and HDD markets. On the scheduled business separation, Mr. Goeckeler noted that they expect to complete the process by the end of the year, while Mr. Jabre announced that he will serve as the CFO of the HDD company post separation. We expect continued supply-side discipline on the part of management as they remain committed to the company's through-cycle gross margin target range of 35-37% in NAND and aspire to outperform the gross margin target of 31-34% in HDD.

WDC	12m Price Target: $79	Price: $75.51	Upside: 4.6%

Neutral	GS Forecast				
		6/23	6/24E	6/25E	6/26E
Market cap: $25.3bn	Revenue ($ mn)	12,318.0	13,027.7	18,349.5	18,043.3
Enterprise value: $31.5bn	EBITDA ($ mn)	(217.0)	712.2	4,641.5	3,938.4
3m ADTV :$468.5mn	EBIT ($ mn)	(912.0)	145.2	4,085.5	3,382.4
United States	EPS ($)	(4.51)	(1.27)	8.93	7.18
Americas Semiconductors and Semi Equipment	P/E (X)	NM	NM	8.5	10.5
	EV/EBITDA (X)	NM	43.4	6.3	6.9
M&A Rank: 3	FCF yield (%)	(9.8)	(0.4)	10.4	9.5
	Dividend yield (%)	0.0	0.0	0.0	0.0
	Net debt/EBITDA (X)	--	7.5	0.6	0.1
		3/24	6/24E	9/24E	12/24E
	EPS ($)	0.48	1.12	1.78	2.44

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) Enterprise SSD demand stemming from AI: Mr. Goeckeler and Mr. Jabre spoke to the tailwinds they are seeing in the market relative to eSSD demand, particularly from broader emphasis on AI model training, as they expect this portion of the portfolio to be materially stronger in 2HCY24. On top of incremental demand from AI applications, Mr. Goeckeler called out the return of more normal enterprise demand in 2HCY24, supported by improved ordering patterns. Management noted that the enterprise SSD AI demand was primarily a new growth vector, and would not cause cannibalization of WD's existing HDD business.

2) Continuation of NAND under-supply: Western Digital expects NAND bit demand to grow in the high-teens (%) yoy in 2024 and in the low-20% range yoy in 2025. The company projects that the NAND market will continue to be undersupplied which, in our view, underpins sustained positive pricing momentum. We believe that prudent supply-side management will remain critical as the NAND suppliers continue to increase utilization rates.

3) NAND capex discipline: in the near-term, management plans to maintain its capital discipline in the NAND business given their commitment to achieving its previously-announced through-cycle gross margin target of 35-37%. To this point, Mr. Jabre noted that gross margins must track above the 35-37% through-cycle target for an extended period of time in order to justify the addition of wafer capacity.

4) ePMR and UltraSMR traction: Mr. Goeckeler highlighted the company's advantageous competitive position in high-capacity nearline HDDs, supported by its portfolio of ePMR and UltraSMR-based drives. On HAMR, the company reiterated its intent to only introduce product when the technology becomes economically viable — most likely at the 40TB+ capacity points.

5) Business separation on track: as the company proceeds through various legal documentation (i.e. establishing entities) and adjusts customer contracts, management reiterated that the separation of the NAND and HDD businesses will be completed by the end of the year. Additionally, Mr. Jabre announced that he will serve as the CFO of the HDD company post separation alongside CEO Irving Tan (note, post separation, Mr. Goeckeler will serve as the CEO of the NAND company).

Valuation/Risks: Our 12-month price target of $79 is based on a fundamental component (50% weighting) of $68 (13x our normalized EPS estimate of $5.20) and an SOTP component (50% weighting) of $91 (i.e., 2.2x EV/Sales Q5-Q8 for HDD and 1.6x EV/Sales Q5-Q8 for NAND). Key upside/downside risks to our view include: 1) stronger/weaker-than-expected demand in key end-markets including cloud, smartphones, and PCs; 2) any material changes in supply-side behavior in the NAND market; 3) better/worse-than-expected customer traction in enterprise SSDs; 4) market share swings in Nearline HDDs, and 5) execution on the company's HDD technology roadmap, particularly in relation to Seagate.

Entegris Inc. (ENTG)

Presenters: Bill Seymour, VP of Investor Relations, Treasury and Corporate Communications

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Seymour discussed 1) the overall semiconductor unit and capex market outlook, 2) key technology inflections that are expected to support Entegris' outperformance vis-à-vis the market, 3) primary focus areas following the integration of CMC, 4) margin outlook and 5) capital allocation priorities.

ENTG	12m Price Target: $147	Price: $130.14	Upside: 13%

Buy	GS Forecast				
		12/23	12/24E	12/25E	12/26E
Market cap: $19.7bn	Revenue ($ mn)	3,523.9	3,389.0	3,959.8	4,450.7
Enterprise value: $23.4bn	EBITDA ($ mn)	942.3	1,019.3	1,293.6	1,514.5
3m ADTV :$180.9mn	EBIT ($ mn)	769.7	824.0	1,081.6	1,286.5
United States	EPS ($)	2.64	3.41	4.94	6.16
Americas Semiconductors and Semi Equipment	P/E (X)	35.4	38.2	26.3	21.1
	EV/EBITDA (X)	19.2	22.8	17.6	14.7
M&A Rank: 3	FCF yield (%)	1.2	1.6	2.8	2.7
	Dividend yield (%)	0.4	0.3	0.4	0.4
	Net debt/EBITDA (X)	4.4	3.5	2.4	1.7
		3/24	6/24E	9/24E	12/24E
	EPS ($)	0.68	0.70	0.93	1.10

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) Market outlook: Entegris continues to operate under a 2024 market assumption of +4% yoy with MSI (i.e. proxy for wafer starts) expected to grow 5% yoy and capital spending expected to be flattish yoy. On the former, the company expects solid momentum in leading-edge Logic/Foundry, DRAM and NAND (albeit off a low base).

2) Drivers of outperformance: Highlighting Entegris' long-term target to outperform the market by 3-6% on a through-cycle basis, Mr. Seymour explained that customer technology transitions (e.g. Gate-All-Around transistors, Backside Power Delivery, transition from Tungsten to Molybdenum) will continue to serve as the primary drivers. As illustrated by the company in the past, Entegris expects materials spending per logic wafer to increase by 50% from 5nm to 1.4nm and materials spending per NAND wafer to increase by 90% from 176L to 5xxL 3D NAND. On the Molybdenum opportunity, Mr. Seymour stated that a) the transition will be a net gain for the company, particularly given its lack of presence in Tungsten deposition materials, and b) the company expects POR (Process of Record) decisions to made as early as later this year.

3) Focus areas following the integration of CMC: with the CMC integration complete (i.e. $75mn in cost synergies materialized + divestitures done), Entegris is now squarely focused on delivering on its revenue synergy goals. Mr. Seymour shared that although they have already identified synergies in some areas (i.e. combination of Entegris SiC CMP slurries + CMC's CMP pads), there is ample opportunity looking ahead as they look to co-market, for example, CMP slurries and pads with deposition materials, cleaning materials and filters.

4) Margin outlook: consistent with prior commentary, Mr. Seymour stated that there is potential for gross margin expansion as, a) volumes recover, b) mix improves (i.e. Microcontamination Control segment revenue grows faster than the corporate average) and c) the company grows into the new Taiwan facility. With most of the opex leverage to stem from SG&A, the company continues to expect the EBITDA drop-through to be ~40%, consistent with its long-term model.

5) Capital allocation priorities: in the near-term, Entegris' top priority is to reduce gross leverage to <4.0x and net leverage to <3.5x by the end of 2024. Over the medium- to long-run, Mr. Seymour stated that the company will continue to pursue bolt-on acquisitions, consistent with its long-standing strategy, in key and adjacent markets.

Valuation/Risks: Our 12-month price target of $147 is based on 35x our normalized EPS estimate of $4.20. Key risks to our estimates and Buy thesis include: 1) a deterioration in the end-demand environment; 2) delays in customer technology transitions; and 3) gross margin execution.

Micron Technology Inc. (MU)

Presenters: Sumit Sadana, Executive Vice President and Chief Business Officer

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Sadana reiterated Micron's plan to grow HBM revenue from several hundred million dollars in FY2024 revenue to multiple billions of dollars in FY2025, as it looks to achieve a market share in HBM that is comparable to its position in overall DRAM by the end of CY2025. Based on current LTAs, he noted strong visibility into HBM volumes and pricing through CY2025, and his expectation for HBM margins to exceed overall DRAM and corporate gross margins for the foreseeable future. Micron also expects overall DRAM supply/demand to remain tight through CY2024 and into CY2025, supported by the HBM transition as well as prudent industry supply-side actions and the potential for demand growth stemming from Edge AI.

MU	12m Price Target: $122	Price: $126.29	Downside: 3.4%

Buy	GS Forecast				
		8/23	8/24E	8/25E	8/26E
Market cap: $144.0bn	Revenue ($ mn)	15,540.0	24,977.2	36,773.9	39,523.5
Enterprise value: $146.0bn	EBITDA ($ mn)	2,373.0	8,577.3	17,233.4	17,161.3
3m ADTV :$2.6bn	EBIT ($ mn)	(5,383.0)	877.3	9,431.4	9,279.3
United States	EPS ($)	(4.97)	0.35	7.25	7.55
Americas Semiconductors and Semi Equipment	P/E (X)	NM	NM	17.4	16.7
	EV/EBITDA (X)	28.5	16.4	7.8	7.5
M&A Rank: 3	FCF yield (%)	(9.4)	0.4	4.8	5.2
	Dividend yield (%)	0.8	0.4	0.4	0.4
	Net debt/EBITDA (X)	1.0	0.2	(0.2)	(0.4)
		2/24	5/24E	8/24E	11/24E
	EPS ($)	0.24	0.38	0.82	1.49

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) Improvement in Data Center inventory: Data Center inventories, particularly tied to traditional compute, have improved over the last several quarters, while inventories specific to PCs and smartphones are a bit more mixed, as some customers stocked up inventory in anticipation of sequential price increases.

2) AI-enabled PCs and smartphones: Mr. Sadana highlighted the proliferation of AI at the edge as a potential tailwind to future demand growth, albeit likely a 2025/beyond dynamic, given the need for higher DRAM content in AI-enabled PCs and smartphones (i.e. at least 12GB in smartphones and 16GB in PCs).

3) Robust growth outlook for HBM: Mr. Sadana reiterated Micron's expectation for HBM industry bits to grow at a 50% CAGR in the near-term and the company's plan to grow HBM revenue from several hundred million dollars in FY2024 revenue to multiple billions of dollars in FY2025 as it looks to achieve a market share in HBM that is comparable to its position in overall DRAM by the end of CY2025. Mr. Sadana stated that Micron's demonstrated power advantage (i.e. 30% lower power consumption) has been instrumental in the company gaining recent customer traction.

4) Increased HBM visibility via LTAs: Mr. Sadana stated that, based on the long-term agreements (LTAs) currently in place, HBM pricing and volume have largely been fixed through CY2025 and that negotiations with customers are already taking place for CY2026 capacity. Additionally, Micron noted that HBM gross margins are already accretive to both DRAM and overall gross margins, and are expected to remain above the corporate average through the course of the cycle.

5) Tightness in overall DRAM: management expects the combination of DRAM bit supply shifting to HBM and the associated wafer loss (i.e. HBM3E consumes 3x the number of wafers on a per bit basis vs. conventional DDR5) to support a tight supply/demand environment across the overall DRAM market through the balance of CY2024 and into 2025.

6) Data Center SSD growth from AI: following a quarter in which Data Center SSD revenue increased >100% yoy, Micron noted that they are seeing strong demand, especially at high capacity points (e.g. 30TB). Notably, management commented that this segment is the most profitable within the context of its overall NAND portfolio and that it will continue to be an area of focus for the company from a resource allocation standpoint.

Valuation/Risks: Our 12-month price target of $122 is based on 18x our normalized EPS estimate of $6.80. Key downside risks to our estimates include 1) weaker-than-expected demand for servers, smartphones, and/or PCs, 2) lack of supply discipline on the part of Micron and/or any of its competitors in DRAM and NAND, and 3) execution on node transitions (and cost downs).

Socionext (6526.T, NC)

Presenter: Jun Hatsumi, Deputy Director, Public Relations & IR Office

Moderated by: Daiki Takayama, Japan electronic components & semiconductor analyst, Goldman Sachs

Bottom Line: Socionext discussed a number of topics, including (1) a steady buildup of business for automotive applications; (2) the possibility of securing business for hyperscalers (data centers) and a strengthened focus on this area; (3) a rising North America weighting and growth in 3-7 nano products in terms of process nodes; (4) accelerated growth from FY26 driven by demand for automotive and data center applications, despite expectations for earnings to mark time in FY24-FY25 due to 5G base station projects coming to an end; (5) its unique business model for solutions SoCs; and (6) capital allocation.

Automotive: In SoCs for automotive applications, the company said it is steadily building up business for ADAS, mainly in North America. While it will take 2-3 years for full-scale contributions from mass production and sales from business acquisition, the company has been able to differentiate itself from application-specific standard product (ASSP) vendors through its joint development approach and proposal capabilities, including front- and back-end process, and has been able to build up future business. Margins remain largely unchanged for all applications, but the company said it expects overall margins to improve as sales expand.

Hyperscalers: Socionext is increasingly focusing on hyperscalers (data centers). It is currently in the final stage of contracting with a major customer. The company said it is able to leverage its overall design strengths in both front- and back-end processes, and that its proposal capabilities through collaboration with IP vendors leads to higher evaluation. The company believes this approach will be difficult for Taiwanese and other competitors to emulate, and the same business model as for automotive applications is being used. The company said it aims to further expand its customer base and is strengthening its focus on this area, but plans to appropriately manage resources at the same time. While margins for hyperscalers are somewhat lower than for other applications, the company plans to increase companywide margins as the scale increases.

Companywide earnings trend: The company sees flat companywide earnings in the near term in FY24-FY25, partly due to sales for 5G base stations running their course and full-scale sales contributions from automotive and data center applications not arising until FY26. However, it expressed confidence that earnings growth will accelerate from FY26 and margins will also continue to rise.

Business model: Socionext stressed the uniqueness of its business model centered on solution SoCs within custom SoCs. The company said ASSPs find it difficult to fully capture customer needs. On the other hand, in traditional ASICs (customers lead many custom designs) efficiency issues arise at small customers with limited resources. The company said its strength is having the resources to handle both front- and back-end processes by adopting a joint development approach.

Capital allocation: The company basically targets a dividend payout ratio of around 40% and total payout ratio of around 50%, and if a shortfall emerges it will enhance returns over multiple years. However, it plans to actively invest in development in advanced areas, including 2-nano products, with Arm and TSMC.

Lam Research Corp. (LRCX)

Presenters: Doug Bettinger, EVP and CFO

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Bettinger discussed 1) Lam's view of the 2024 WFE market, 2) the transition to 3D structures playing to the strengths of the company, 3) the outlook for NAND WFE spend, 4) China demand sustainability, 5) Lam's expansive global footprint, 6) the outlook for CSBG (Customer Support Business Group), and 7) Lam's capital return policy.

LRCX	12m Price Target: $960	Price: $950.7	Upside: 1%

Buy	GS Forecast				
		6/23	6/24E	6/25E	6/26E
Market cap: $124.7bn	Revenue ($ mn)	17,428.5	14,894.1	17,800.2	21,330.0
Enterprise value: $124.0bn	EBITDA ($ mn)	5,697.7	4,849.6	5,885.4	7,455.6
3m ADTV :$919.1mn	EBIT ($ mn)	5,355.3	4,488.3	5,525.7	7,095.9
United States	EPS ($)	34.10	29.91	37.14	48.43
Americas Semiconductors and Semi Equipment	P/E (X)	14.0	31.8	25.6	19.6
	EV/EBITDA (X)	11.3	25.7	20.9	16.1
M&A Rank: 3	FCF yield (%)	7.2	3.6	3.6	5.1
	Dividend yield (%)	1.4	0.8	0.9	1.0
	Net debt/EBITDA (X)	(0.1)	(0.1)	(0.1)	(0.2)
		3/24	6/24E	9/24E	12/24E
	EPS ($)	7.79	7.75	8.17	8.87

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) 2024 Wafer Fab Equipment (WFE) market outlook: regarding the 2024 Wafer Fab Equipment (WFE) market outlook, Mr. Bettinger noted that, by application, a) leading-edge Logic/Foundry is expected to be strong driven by initial investments in the Gate-All-Around (GAA) transition; b) DRAM is also expected to be robust driven by investments in HBM and DDR5; c) NAND, albeit off a low base, will grow slightly; and d) mature spending will be weak outside of China but relatively resilient in China.

2) 3D structures benefit Lam: while NAND led the charge into the 3D era, Mr. Bettinger emphasized that transitions to 3D structures across different device types (i.e. leading-edge Logic/Foundry and DRAM) will play into Lam's strength and, in turn, drive growth at the company. Recall that Lam expects to achieve ~$1bn in revenue in GAA and Advanced Packaging in 2024.

3) Near-term NAND update: although management only expects NAND WFE to increase slightly in 2024 following a ~75% decline in 2023, Mr. Bettinger did highlight the recent inflection in the company's CSBG revenue stream as well as what he believes is a positive set-up into CY2025.

4) China sustainability: consistent with past comments, Mr. Bettinger stated that equipment demand in China is likely to remain resilient as a broad set of customers are being incentivized to build capacity in pursuit of self-sufficiency at the national level over the long-term.

5) Lam's expansive global footprint: Mr. Bettinger highlighted the importance of its expansion into new regions (e.g. Malaysia) as it looks to a) ensure collaborative relationships with customers through all stages of R&D and manufacturing, b) improve customers' time-to-market, and c) lower costs (i.e. manufacturing, logistics) and, in turn, improve through-cycle margins over the long-term.

6) CSBG outlook: although CSBG (Customer Support Business Group) revenue declined 10% in CY2023 and is expected to be flattish yoy in CY2024, per company guidance, Mr. Bettinger remains convicted in the company's ability to drive double-digit (%) growth per annum on a through-cycle basis, supported by a constantly-increasing installed base coupled with its growing suite of services (e.g. using data analytics for predictive maintenance).

7) Capital return: Mr. Bettinger noted the recently announced $10bn share repurchase authorization (here) was a statement on the company's continued commitment to return 75-100% of FCF, while the 10:1 stock split is to provide its employees with a more affordable way to purchase shares and participate in the company's employee stock plans.

Valuation/Risks: Our 12-month price target of $960 is based on 24x our normalized EPS estimate of $40. Key risks to our estimates and constructive investment thesis include: 1) a weaker-than-expected demand recovery for smartphones, servers, and PCs, 2) a short-lived recovery in Memory spending, 3) increased competition in Etch and Deposition, and 4) changes in the geopolitical backdrop, including the evolution of export controls, that adversely impact Lam's ability to conduct business.

Intel Corp. (INTC)

Presenter: John Pitzer, Corporate Vice President, Corporate Planning and IR

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Pitzer highlighted the company's conviction in achieving 5 nodes in 4 years and reiterated that the evolution in mix away from Intel 7 (i.e. pre-EUV) to Intel 18A (i.e. EUV) as well as insourcing of tiles currently outsourced to TSMC, particularly in the Client business starting in 2026, will drive a meaningful improvement in IFS profitability over the medium-term. In server CPUs, Intel expects market share to be flat +/- through CY2024 vs. 3Q23 levels and hopes to regain share in 2025 as Sierra Forest and Granite Rapids increase as a % of mix. Mr. Pitzer also highlighted management's focus on creating value as evidenced by what has been achieved through Mobileye (IPO) and IMS (i.e. minority stake sale to TSMC) as well as what is currently planned for Altera (i.e. potential IPO).

INTC	12m Price Target: $29	Price: $30.19	Downside: 3.9%

Sell

	GS Forecast				
		12/23	12/24E	12/25E	12/26E
Market cap: $127.5bn	Revenue ($ mn)	54,228.0	55,486.8	62,088.8	69,712.3
Enterprise value: $159.7bn	EBITDA ($ mn)	11,040.0	11,366.6	16,287.4	21,336.4
3m ADTV :$1.8bn	EBIT ($ mn)	1,438.0	433.6	2,973.4	5,842.4
United States	EPS ($)	0.28	0.11	0.64	1.21
Americas Semiconductors and Semi Equipment	P/E (X)	120.3	NM	47.1	24.9
	EV/EBITDA (X)	15.1	14.2	10.0	7.6
M&A Rank: 3	FCF yield (%)	(10.0)	(11.7)	(6.4)	(4.2)
	Dividend yield (%)	1.5	1.7	1.7	1.7
	Net debt/EBITDA (X)	2.2	2.8	2.0	1.4
		3/24	6/24E	9/24E	12/24E
	EPS ($)	(0.11)	(0.08)	0.08	0.22

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) IFS profitability outlook: Mr. Pitzer highlighted the company's conviction in achieving 5 nodes in 4 years and reiterated that the evolution in manufacturing mix away from Intel 7 (i.e. pre-EUV) to Intel 18A (i.e. EUV) as well as insourcing of tiles currently outsourced to TSMC, particularly in the Client business starting in 2026, will drive a meaningful improvement in IFS profitability over the medium-term. On the shift from Intel 7 to Intel 18A, consistent with past commentary, Mr. Pitzer stated that wafer price will increase by nearly 3x while cost per wafer will not increase nearly as much. Recall that, in IFS, Intel aims to achieve break-even at the EBIT level by ~2027 and generate 30% EBIT margins by 2030.

2) AI PCs: Intel remains constructive on the AI PC opportunity and expects to ship 40mn+ AI PC CPUs in 2024 and 60mn in 2025. Mr. Pitzer highlighted that the company is currently working with >500 ISVs to bring more applications that could, in turn, catalyze an upgrade cycle. Intel believes this dynamic could be further augmented by an Enterprise refresh cycle predicated on Windows 10's scheduled end of support in October 2025.

3) Participation in AI: In the near-term, Intel expects to participate in AI through its Gaudi accelerators which is expected to contribute ~$500mn in revenues in 2H24. Beyond Gaudi, Falcon Shores (i.e. discrete GPU) remains on track to launch in late 2025. Mr. Pitzer also stressed that broad-based adoption of AI will require Inference at the edge — a market in which he believes Intel CPUs are well-positioned to benefit.

4) Server CPU demand environment: Mr. Pitzer noted that, while the ongoing strength in accelerators remains a headwind to compute budgets in the data center, the company continues to expect server CPU units to grow low-single digits (%) yoy in 2H24 vs. a low-single digit (%) decline in 1H24. More importantly, Intel continues to expect server CPU revenues to improve in 2H24 driven by core count and ASP growth.

5) Server CPU product roadmap and market share: Intel's server CPU product roadmap is intact with Sierra Forest already in production and Granite Rapids expected to move to production in 3Q24. On the competitive front, Intel expects its server CPU market share to be flat +/- through CY2024 vs. 3Q23 levels and hopes to regain share in 2025 as Sierra Forest and Granite Rapids increase as a % of mix.

6) Value creation: Mr. Pitzer highlighted the broader management team's intense focus on creating value as evidenced by what has been achieved through Mobileye (IPO) and IMS (i.e. minority stake sale to TSMC) as well as what is currently planned for Altera (i.e. potential IPO).

Valuation/Risks: Our 12-month price target of $29 is based on 15x our normalized EPS estimate of $1.90. Upside risks to our estimates and our cautious investment thesis include: 1) stronger-than-expected PC/server demand; 2) better execution on process node transitions and, as a result, higher market share than we assume in our base case; 3) business portfolio optimization, 4) early/significant success in foundry, 5) timing/magnitude of government incentives related to the on-shoring of semiconductor manufacturing and 6) better than expected traction in AI acceleration.

Cerebras Systems Inc.

Presenter: Andrew Feldman, Co-Founder and CEO

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Feldman spoke to various topics spanning 1) Cerebras' Wafer-Scale Engine architecture, 2) the product cadence it envisions for both its hardware and software, 3) its target workloads, and 4) the competitive landscape in training and inference.

1) Wafer-Scale Engine architecture: a specific point of differentiation for Cerebras is on the specifications the company derives from its Wafer-Scale Engine architecture. Mr. Feldman mentioned that their AI processor contains 900,000 AI cores, and has a chip size that is 57 times larger than Nvidia's H100. The product builds in redundancy, which helps bolster yields as Mr. Feldman noted that their yields are at/or better than the yields of competitive offerings.

2) Product strategy: specific to the company's product roll-out, Mr. Feldman noted that software is typically released on a 3-month cadence with new chips coming out every couple of years. Rather than releasing a new hardware product every year, the company envisions a larger value proposition from a slowed cadence, as customers are not left questioning if they should hold off ordering a product until the newest iteration in one year's time.

3) Customer base: a large proportion of Cerebras' current customer base is centralized around sovereign clouds. Citing a few examples, Mr. Feldman highlighted their partnership with G42 (who recently announced a partnership with OpenAI; here), as well as the work they have done with the Mayo Clinic.

4) Targeted workloads: while Cerebras' largest customers today are tied to the sovereign clouds, the company remains committed to large enterprises with robust datasets, as opposed to interfacing with smaller models that may, for instance, have less than 500mn parameters. In essence, the higher complexity problems are the ones in which Cerebras finds its products most effective, given the system price-points and overall computational capabilities.

5) Competition: Mr. Feldman noted that Cerebras competes with Nvidia in sovereign cloud, and these two are the only major players in that area. In terms of software, he believes that developers are increasingly moving towards PyTorch as the preferred framework for writing applications as it is more movable across different hardware platforms. Notably, Mr. Feldman spoke to the importance of the compiler, and the company's focus on dedicating personnel for its development, as they continue to emphasize the role of PyTorch's functionality and interoperability.

6) Training vs. Inference: on the topic of training and inference, Mr. Feldman noted that there is not an outsized emphasis on one of these portions of the market over the other. He noted that slightly different from training (whereby the focus remains on the size of the model), in inference, the number of users is an additional variable that will ultimately help the market surpass training. The growth trajectory of the training market will still be robust (albeit not as strong as the inference market), as the need for driving accuracy continues to be a focal point of interest.

Microchip Technology Inc. (MCHP)

Presenters: Rich Simoncic, Chief Operating Officer and Sajid Daudi, Head of IR

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: There was no update to the company's June quarter outlook. Mr. Simoncic, as the recently appointed COO, is focused on leveraging AI internally as well as accelerating growth in Microchip's Data Center exposed businesses (i.e. 17% of total revenue). Organically, the Total System Solution approach continues to be at the core of the company's strategy, while management also remains open to tuck-in deals as evidenced by the recent acquisition of Neuronix AI Labs. Management expects pricing to return to more historical patterns (i.e. flat to slightly down) over the medium- to long-term, but does not expect absolute pricing to revert to pre-pandemic levels given elevated depreciation costs across the industry.

MCHP	12m Price Target: $88	Price: $96.33	Downside: 8.6%

Neutral	GS Forecast				
		3/24	3/25E	3/26E	3/27E
Market cap: $52.5bn	Revenue ($ mn)	7,634.4	5,727.8	7,366.5	8,343.7
Enterprise value: $57.0bn	EBITDA ($ mn)	3,357.8	2,067.0	2,981.8	3,526.2
3m ADTV :$494.6mn	EBIT ($ mn)	3,167.4	1,863.8	2,746.6	3,259.0
United States	EPS ($)	4.59	2.51	3.86	4.67
Americas Semiconductors and Semi Equipment	P/E (X)	18.0	38.4	25.0	20.6
	EV/EBITDA (X)	14.7	27.3	19.1	16.1
M&A Rank: 3	FCF yield (%)	6.5	3.3	4.7	5.8
	Dividend yield (%)	2.1	0.5	2.0	2.2
	Net debt/EBITDA (X)	1.4	2.2	1.4	1.2
		3/24	6/24E	9/24E	12/24E
	EPS ($)	0.49	0.45	0.57	0.70

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

1) New initiatives: Mr. Simoncic shared that he spends a disproportionate amount of his time working on Microchip's AI initiatives. Specifically, he focuses on a) how the company can be more productive through utilizing AI, b) growing sales into GPU-based AI servers, and c) identifying potential tuck-in acquisitions that could improve their overall portfolio.

2) Total Systems Solution strategy: management spoke to the success it has had with its Total System Solution (TSS) strategy. By combining its various hardware and software assets acquired through past M&A, the company has been able to better address customer demand and, in turn, drive higher market share.

3) PSP post-mortem: while the PSP (Preferred Supply Program) had many advantages and functioned well toward the beginning of the recent cyclical upturn, Mr. Simoncic acknowledged that there were some shortcomings and that the company would consider various tweaks (e.g. shorter duration, offer to only a select group of customers) should they decide to launch an NCNR program in the future.

4) FPGA business: while originally over-indexed to the A&D end-market, Microchip has been successful in leveraging Microsemi's strengths (e.g. ~60% lower power than traditional FPGAs) across other applications such as Industrial. Importantly, Mr. Simoncic believes that they can gain further share as customers continue to target ESG requirements and move away from other FPGA solutions. Note, Microchip's FPGA business grew by 22% yoy in FY2024, a period in which others were struggling due to steep customer inventory corrections.

5) Pricing: while management expects pricing to return to more historical patterns (i.e. flat to slightly down per annum) over the medium- to long-run, they do not foresee a situation in which absolute pricing reverts to pre-pandemic levels in the near-term given elevated depreciation costs across the industry and a more inflationary environment in general.

6) Gross margins: although gross margins are currently depressed due to cyclical factors, management remains comfortable with its long-term target of 67.5-68.5% and expects a) higher revenue, b) higher utilization rates, and c) improving mix, to drive an improvement in gross margins going forward.

Valuation/Risks: Our 12-month price target of $88 is based on 20x our normalized EPS estimate of $4.40. Key upside/downside risks to our investment thesis and price target include stronger/weaker than expected cyclical and macroeconomic backdrop, strengthened/weakened market share trends in the MCU and/or Analog markets, and any M&A that is accretive/dilutive to growth, margins, and/or returns.

Tenstorrent Inc.

Presenter: Keith Witek, Chief Operating Officer

Moderated by: Toshiya Hari, US Semiconductors & Semi Cap Equipment Equity Research, Goldman Sachs

Bottom Line: Mr. Witek talked through the 1) flexibility and openness of the RISC-V ISA, 2) opportunity set for sovereign AI, 3) outlook on the potential transition from incumbents (especially, ARM) to RISC-V, and 4) incremental progress made in Japan on building out an ecosystem with more control on the supply chain.

1) RISC-V: while we see the RISC-V instruction set architecture (ISA) as relatively nascent, Mr. Witek noted the open nature of the platform, which can, in his view, rationalize the broader market. From an adoption standpoint, he highlighted how Google, in particular, has embraced the RISC-V ISA as announced last October (here).

2) ISA transition: Mr. Witek commented on the difficulty in initially migrating from Intel to AMD within the context of x86, but noted that the transition from x86 to ARM became easier, albeit still a challenging endeavor (given the associated software reconfiguration required). He believes that if/when the industry looks to pivot to the RISC-V architecture, the transition would become even more streamlined, as companies will be able to leverage the learnings from prior shifts, thereby shortening the time it would take to migrate over.

3) Sovereign AI: currently, sovereign AI is a large market opportunity with investments being made in Japan, India, the Middle East, among other regions as they look to build out their respective AI infrastructures. Tenstorrent sees Nvidia's incumbency in this market, but expects there to be a wider array of winners in AI more broadly speaking. Specific to the Middle East, Mr. Witek noted that the region is seeing a surge in investment on proof of concepts tied to AI and computing.

4) Traction in Japan: specific to Japan, Mr. Witek highlighted Tenstorrent's multi-tiered partnership with Japan's Leading-Edge Semiconductor Technology Center (LSTC), which encompasses a) LSTC's selection of Tenstorrent's RISC-V and Chiplet IP for its 2nm AI accelerator, b) the co-design of a chip tailored to AI in Japan, and c) the intent to work with Rapidus, a newly founded foundry supplier with plans to begin large-scale manufacturing on 2nm by 2027.

BE Semiconductor Industries (BESI.AS)

Presenters: We hosted Edmond Franco (BESI) for investor meetings at the GS Global Semiconductor Conference in New York.

Key takeaways include: **1)** BESI continues to see the transition to chiplets, particularly in chips for advanced AI applications, as a key driver in adoption of Hybrid Bonding tools, **2)** Memory customers are pursuing a parallel development approach between TCB and Hybrid Bonding, with standards relaxation only extending TCB in the short-term, **3)** BESI continues to offer meaningfully better accuracy and performance than other Hybrid Bonding competitors, **4)** BESI continues to believe that Hybrid Bonding has inherent advantages over TCB, including better performance, higher levels of accuracy and lower energy consumption, and **5)** While demand trends in the core non-Hybrid Bonding business remain muted, there is scope for a 2H recovery driven by end-market improvement. Reiterate Buy.

BESI.AS	12m Price Target: €160	Price: €136.95	Upside: 16.8%

Buy	GS Forecast				
		12/23	12/24E	12/25E	12/26E
Market cap: €11.2bn / $12.2bn	Revenue (€ mn)	578.9	766.8	1,026.0	1,344.9
Enterprise value: €11.4bn / $12.3bn	EBITDA (€ mn)	239.1	337.2	500.4	658.9
3m ADTV :€68.7mn/ $74.3mn	EBIT (€ mn)	213.4	309.2	468.6	619.9
Netherlands	EPS (€)	2.14	3.19	4.91	6.57
European Semiconductors, Hardware and Gaming Tech	P/E (X)	43.8	43.0	27.9	20.9
	EV/EBITDA (X)	32.9	33.8	22.5	16.9
M&A Rank: 3	FCF yield (%)	2.6	1.3	3.6	4.2
	Dividend yield (%)	2.3	2.1	3.0	3.3
	Net debt/EBITDA (X)	0.5	0.5	0.2	0.1
		3/24	6/24E	9/24E	12/24E
	EPS (€)	0.41	0.50	0.92	1.36

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 30 May 2024 close.

BESI continues to see the transition to chiplets, particularly in chips for advanced AI applications, as a key driver in adoption of Hybrid Bonding tools: In Logic, BESI continues to see the transition to chiplets, particularly in chips for advanced AI applications, as a key driver in adoption of Hybrid Bonding tools. In this vein, we are encouraged to see high volume adoption broaden beyond only TSMC with BESI's recent announcement that it has received 26 orders for Hybrid Bonding tools from another leading-edge Logic customer.

Memory customers are pursuing a parallel development approach between TCB and Hybrid Bonding, with standards relaxation only extending TCB in the

short-term: BESI reiterated that most of its leading Memory customers are following a path of parallel development of both Hybrid Bonding and TCB tools for High Bandwidth Memory, with final architectures and equipment yet to be fully decided upon. We continue to believe that the relaxation of HBM4 standards will only extend TCB's applicability to High Bandwidth Memory in the short-term, with an eventual transition to Hybrid Bonding necessary in the long-term. For example, we see scope for Hybrid Bonding to be the main technology of choice for HBM5.

BESI continues to offer meaningfully better accuracy and performance than other Hybrid Bonding competitors: While certain other players have started to offer Hybrid Bonding machines, BESI reiterated that it still offers the highest accuracy and throughput tool. For example, no competitor has yet released a Hybrid Bonding machine with 200nm placement accuracy, as compared to BESI's latest generation tools already offering 100nm placement accuracy. We also continue to believe that BESI's partnership with AMAT to offer integrated lines also offers competitive advantages and better credibility when ramping at large sophisticated customers.

BESI continues to believe that Hybrid Bonding has inherent advantages over TCB, including better performance, higher levels of accuracy and lower energy consumption: BESI continues to believe that Hybrid Bonding has inherent advantages over TCB, including better performance, higher levels of accuracy and lower energy consumption (which is particularly important in applications such as AI datacentres where heat dissipation is a key metric). We continue to believe that TCB will have price/cost advantages over Hybrid Bonding, but we expect Hybrid Bonding to increasingly take share as demand for high-performance applications grows (e.g. advanced AI, or HBM5).

While demand trends in the core non-Hybrid Bonding business remain muted, there is scope for a 2H recovery driven by end-market improvement: BESI acknowledged that demand trends in the core non-Hybrid Bonding business remain muted. That said, while inventories are still somewhat elevated, utilisation rates are increasing, suggesting scope for a 2H recovery. We note that there has now been over 8 quarters of downturn, which we also see as indicative of an upcoming upturn, with commentary from analog peers of troughing demand also supportive of this view.

Analysis and implications: At BESI's upcoming CMD on 6th June, we believe investors will focus on any colour provided on 1) competitive position, 2) implications of recent win at a major leading-edge Logic customer, 3) clarification on roadmap for Hybrid Bonding adoption for HBM, and 4) evolution of the HBM market, specifically related to AI.

Valuation/Risks: We are Buy rated on BESI with a 12-month price target of €160 based on a 27x CY25E EV/EBITDA multiple. Key risks to our view and price target include customer spend cyclicality, Hybrid Bonding adoption delays and increasing competition.

Disclosure Appendix

Reg AC

We, Toshiya Hari, Daiki Takayama, Alexander Duval, Shuhei Nakamura, Atsushi Ikeda, Anmol Makkar, Trevor Janoskie, Chris Kress and David Balaban, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our coverage universe) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

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Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

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Company-specific regulatory disclosures

Compendium report: please see disclosures at https://www.gs.com/research/hedge.html. Disclosures applicable to the companies included in this compendium can be found in the latest relevant published research

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Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	48%	36%	16%	64%	56%	41%

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Price target and rating history chart(s)

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