Goldman Sachs | Equity Research

16 September 2024 | 1:38AM EDT

Americas Technology: Semiconductors

Top 10 Takeaways from Communacopia + Technology 2024

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We hosted 19 companies from our Semiconductor and Semiconductor Capital Equipment coverage universe at our Communacopia + Technology conference held in San Francisco last week. In our full note, we outline what we believe were the top 10 takeaways including: 1) strong conviction on the part of suppliers *and* consumers of AI infrastructure that the ongoing build-out is sustainable for the foreseeable future (notably, Microsoft stated that demand for AI infrastructure has so far *materially* outpaced their ability to supply it), 2) broad-based signs of a cyclical recovery in areas within the Data Center – such as general-purpose Compute, Networking and Storage – that had previously faced headwinds related to the prioritization of GPU spend in the Data Center, and 3) persistent weakness across the Analog semiconductor and MCU markets, driven by a combination of soft end-demand and disciplined inventory management across the Automotive and Industrial end-markets. See our full note for more details.

Top 10 Takeaways

1) The outlook for AI infrastructure remains bullish: Commentary by the key suppliers and consumers of AI infrastructure regarding the near-term supply/demand environment was universally constructive. If anything, the concern seems to be whether the industry will be able to build fast enough to meet growing demand for AI compute. Indicative of this, **Founder, President & CEO of Nvidia, Jensen Huang**, spoke to overwhelming customer demand for Blackwell (i.e. next-generation GPU architecture, succeeding Hopper) scheduled to ship in the January quarter and scale further in CY2025, while the **CTO of Microsoft, Kevin Scott**, stated that demand for AI infrastructure has so far *materially* outpaced the company's ability to supply it. Furthermore, although we do *not* expect the ongoing investor debate (i.e. whether the builder of AI infrastructure will be able to monetize their capital investments) to be settled any time soon, we also found comments from the likes of **Microsoft**, **Amazon** and **Anthropic** to be encouraging. Specifically, a) **Microsoft** highlighted how inference costs for GPT-4 have come down 12x since launch given reduction in AI infrastructure costs and foundational improvements to algorithms, b) **Amazon** shared AWS' long history of investing in capacity while matching those investment dollars with demand, and noted how customer conversations are increasingly focused on growing their respective businesses and competing more effectively vs. a focus on cost optimization, c) **Anthropic** stated that, while the sheer scale of ongoing capital investments in training next-generation models might make the ROI math difficult to comprehend, revenue from any LLM in deployment has exceeded the cost of developing the model.

Other notable comments from management teams at key suppliers/consumers of AI infrastructure related to the near-term supply/demand backdrop can be found in the following table.

Exhibit 1: Management commentary on AI infrastructure spend was universally constructive
Notable comments on AI infrastructure spend from various management teams

Company	Speaker	Commentary
TSMC	**Wendell Huang, SVP, Finance & CFO**	Mr. Huang stated that AI/HPC demand continues to be strong in the near-term and reiterated the company's long-term revenue growth target of 15-20% (5-year CAGR).
Nvidia	**Jensen Huang, Founder, President & CEO**	Mr. Huang reiterated his long-held view that Accelerated Computing is the solution to the ongoing inflation in compute costs, and noted that densification and acceleration of data centers alone would drive growth over the next decade. He stated that Blackwell remains on track to ship in the January quarter (and scale into CY2025) and implied that customers typically want to be first in line and want the most volume.
AMD	**Dr. Lisa Su, Chair & CEO**	Dr. Su stated that, while AMD's supply chain partners are increasing capacity, supply of key inputs like CoWoS and HBM is likely to remain tight into 2025 as demand is a moving target (i.e. demand is strengthening).
Broadcom	**Dr. Charlie Kawwas, President, Semiconductor Solutions Group**	Dr. Kawwas reiterated that the company expects to deliver strong yoy AI semiconductor revenue growth in FY2025 driven by further increases in Tier-1 hyperscaler capex.
Marvell	**Matt Murphy, Chairman & CEO**	consistent with the company's recent earnings call, Mr. Murphy spoke to potential upside to its FY2025/26 AI revenue targets of $1.5bn/$2.5bn, respectively, driven by both its custom compute and electro-optics businesses. He also noted the company's expectation to deliver sequential revenue grwoth in electro-optics through the end of FY2025.
ARM	**Rene Haas, CEO**	Mr. Haas highlighted his medium- to long-term optimism on the AI hardware market, while noting his expectation for significantly higher levels of compute as Gen AI moves toward AGI and ASI. He also noted that upside in Arm's Licensing revenues has primarily been a function of AI.
Dell	**Jeff Clarke, Vice Charman & COO**	Dell highlighted ongoing momentum in AI server demand with AI representing ~40% of total server and networking revenue in the July quarter.
HPE	**Antonio Neri, CEO**	HPE highlighted strong momentum in AI supported by broad-based demand from hyperscalers, Tier-2/3 CSPs, and sovereign and enterprise customers.
Microsoft	**Kevin Scott, CTO**	Mr. Scott stated that demand for AI infrastructure has so far materially outpaced the company's ability to supply it, and that Microsoft continues to add to their infrastructure in accordance to demand signals from their customers.
Google	**Thomas Kurian, Google Cloud CEO**	Google highlighted increased adoption of its Generative AI products and services across a wide variety of use cases, including broad-based and specialized use cases for enterprises.

Source: Company data, Goldman Sachs Global Investment Research

2) Merchant vs. custom compute: On the topic of merchant vs. custom in the field of Compute, as expected, we received divergent comments from the merchant accelerator suppliers (i.e. **Nvidia**, **AMD**) vs. the likes of **Broadcom** and Marvell who partner with the large hyperscale companies in designing their respective solutions. **Nvidia** spoke to its large GPU installed base spanning multiple platforms as well as its ability to innovate at a fast pace across various chips *and* software as key inputs to their competitive moat, while **AMD** noted that there is a place for custom solutions (i.e. merchant and custom will co-exist) and that they would be open to partnering with customers in designing ASICs (as they currently do in the game console space). **Broadcom** and **Marvell**, on the other hand, reiterated their view that custom accelerators will gain share from merchant over the medium- to long-term, at a minimum, in addressing internal workloads, given their TCO advantage (i.e. reduced capital spending + lower power consumption).

3) Cyclical recovery in general-purpose Compute, Networking and Storage: Outside of AI, **AMD**, **Broadcom**, and **Marvell** spoke to signs of a cyclical recovery in areas within the Data Center – such as general-purpose Compute, Networking and Storage – that had faced headwinds stemming from the prioritization of Data Center spend in favor of GPUs. In Compute, **AMD** noted positive demand signals in their server CPU business from both Cloud and Enterprise customers, while expressing confidence in its product roadmap and, in turn, ability to gain market share. In Networking, management teams from **Broadcom** and **Marvell** reiterated recent comments made on their respective earnings calls – specifically, **Broadcom** expects a recovery in its non-AI semiconductor business based on recent order patterns (i.e. up >20% yoy in the July quarter), while **Marvell** is also guiding to an acceleration in sequential revenue growth in its Enterprise Networking business in the January quarter. In Storage, **WD** highlighted continued strength in the enterprise SSD market, while **Marvell** shared its expectation for data center storage revenue to recover to what they consider a steady-state (i.e. $200mn/quarter) despite the business having already grown for 6 consecutive quarters on a sequential basis. Further downstream and outside of our coverage universe, **Dell** and **HPE** (covered by Michael Ng) similarly spoke to the ongoing recovery in traditional server demand.

4) Underwhelming demand for AI PCs (for now): Generally in-line with investor expectations, which had peaked initially around the Consumer Electronics Show (January) and then Computex (June), and recent ODM data points, management commentary pointed to a muted AI PC demand environment. While **AMD** expressed their medium-term optimism (i.e. described the AI PC as the most significant innovation in PCs in 10+ years), they struck a relatively measured tone on the near-term, and reminded the audience that the multi-year cycle was just getting started. Similarly, **Dell** highlighted that while the PC market recovery is ongoing, the pace of recovery is slower than what the company had expected earlier in the year.

5) Co-Packaged Optics: Dr. Kawwas (Broadcom) highlighted Co-Packaged Optics (CPO) as a technology that could drive significant power savings vis-a-vis incumbent pluggable transceivers, and also noted that while this technology is expected to be used first in switches, it could also migrate to other platforms including custom accelerators (or XPUs, per Broadcom) over time. During the fireside discussion, Dr. Kawwas showcased the company's 2nd-generation CPO solution that runs on 5kw and has the potential to replace 128 800Gbps pluggable transceivers that each consume 15-16kw. On its CPO roadmap, Dr. Kawwas shared that the company is a) currently in the proof of concept (POC) stage with 3 hyperscale customers and shipping tens of units, b) expected to ship hundreds of systems in CY4Q24 and early CY2025 for initial deployment for live traffic in CY1H25, and c) scheduled to enter volume production by the end of CY2025 or in CY2026. While predicting the exact timing and magnitude will prove difficult, evidence of volume shipments of CPO technology will undoubtedly have implications for not only Broadcom, but also for the likes of **Nvidia**, **Marvell** and **Credo Technology** in our coverage universe.

6) Wafer Fab Equipment market outlook intact: In-line with industry consensus, management teams from **Lam Research** and **KLA** reiterated their views of the Wafer Fab Equipment (WFE) market shaping out to be in the mid-$90bn range for 2024, while citing DRAM (driven by the transition from DDR4 to DDR5 and increased investments in HBM capacity) and leading-edge Foundry/Logic (driven by investments in the initial N2 ramp and N3 capacity additions) as the key drivers. More importantly, although none of the companies were ready to provide numerical guidance, most, if not all, of them struck an optimistic tone on WFE market trends heading into 2025, and called out leading-edge Foundry/Logic, DRAM/HBM and, to a lesser extent, NAND as potential drivers. Recall that, for context, we forecast the WFE market to grow 17% yoy to $110bn next year and 9% yoy to $120bn in 2026. As it relates to investments in China, the WFE suppliers maintained that as a % of total revenue contribution China would decline from here; notably, **Applied Materials** reported 32% of July quarter revenue from the region and sees a normalized mix of ~30% going forward.

7) Strength in Leading-edge Foundry/Logic: Growth from Accelerators (i.e. GPUs) has served as a pillar of strength for leading-edge Foundry/Logic WFE spending in 2024, and will remain a catalyst for 2025, per **Lam Research**. Additionally, **Applied Materials** spoke to industry inflections that are set to take place into next year such as the shift to the Gate-All-Around transistor architecture (note 30% improvement in energy efficient computing) and incorporation of Backside Power (>20% improvement in energy efficient computing and 30% area savings). On the Process Control front, we believe the transition to N2 also creates healthy tailwinds from a capital intensity perspective, which should benefit the industry leader in the space that is **KLA**. In the device space, as mentioned in our colleagues' note (here), **TSMC** now envisions their revenue CAGR target of 15-20% extending through the next 5 years (vs. its initial target timeline of 2021-26), supported by notable strength in leading-edge nodes and associated AI/HPC applications.

8) Demand for NAND (excl. enterprise SSD) remains relatively soft but disciplined supply is a positive: Per our conversation with **Western Digital** and other industry contacts, the near-term NAND demand backdrop seems mixed with strength in the enterprise SSD market, particularly in the high-capacity and high-performance segments, offset by muted demand patterns across the consumer/channel and client SSD space. That said, the supply discipline demonstrated by the NAND suppliers over the past several quarters still appears to be intact with all **three U.S.-based WFE suppliers** speaking to persistent weakness in NAND WFE spending (albeit with expectations for a modest recovery in 2025) and **Entegris** noting only a gradual recovery in wafer starts. Per Entegris, NAND utilization rates have increased meaningfully off the cyclical lows (i.e. currently at 80-90% and up from 50-60% at the cyclical trough) primarily due to a shift in capacity away from NAND to DRAM/HBM (i.e. a reduction in the denominator).

9) Persistent weakness in Auto/Industrial semiconductors: Feedback from **NXP**, **Microchip**, **Texas Instruments** and **AMD** (FPGA) at last week's conference suggested persistent weakness in the Automotive and Industrial-related semiconductor markets, driven by an end-demand environment that seems to be deteriorating real-time (based on negative announcements from the likes of **BMW**) and continued inventory reductions on the part of distributors and Tier-1 suppliers. In fact, in the absence of a re-acceleration in bookings between now and year-end, we expect the Analog semiconductor and MCU markets to increasingly resemble an L-shaped recovery as opposed to a U-shaped recovery (that seemed to be the consensus view immediately following 2Q24 earnings season) or a V-shaped recovery (that was expected several months ago). Note, outside of our coverage universe, **Flex** (here), **Sensata** (here), **Rivian** (here) and **Keysight Technologies** (here) also shared cautious comments on the Automotive and/or Industrial end-markets.

Exhibit 2: Management commentary regarding the Automotive/Industrial end-markets was cautious
Notable comments on the Automotive/Industrial end-markets from various management teams

Company	Speaker	Commentary
Flex	**David Rubin, VP of IR**	Seeing a general weakening in Automotive (particularly in its 3Q24 volume outlook) driven by the macroeconomic and interest rate environment as well as inventory levels. Also seeing incremental weakness in core Industrials vis-a-vis 30-40 days ago.
Sensata	**Martha Sullivan, Interim President & CEO**	Has seen a slow construction market as well as inventory de-stocking in Industrial.
Rivian	**Claire McDonough, CFO**	Cited macroeconomic challenges relating to Auto demand and the incentive spend environment.
Keysight Technologies	**Neil Dougherty EVP & CFO**	Expressed weakness in the Automotive market driven by slower EV adoption and China trade dynamics.

Source: Company data, Goldman Sachs Global Investment Research

10) RF suppliers continue to operate under a flattish smartphone unit assumption: In Mobile RF, we heard broadly similar commentary from **Qorvo** and **Skyworks** relating to customer inventory, AI smartphones, and their respective non-Mobile businesses. Both companies spoke to a normalization in customer inventory levels across the Android ecosystem, while iOS inventory has largely remained normal. Despite the excitement around AI-enabled smartphones, the RF suppliers are not baking in a significant smartphone replacement cycle and are operating under the assumption that units will remain flattish. That said, both companies seem to ultimately expect an increase in RF complexity (and, in turn, content), as high-end processors and DRAM required to run an AI-enabled smartphone will likely put pressure on board space and power consumption. Outside of Mobile, Qorvo continues to focus on growth drivers in Connectivity & Sensors Products Group (CSG) and High Performance Analog (HPA) – specifically, Defense & Aerospace (e.g. electronic warfare) and Industrial – while Skyworks looks to leverage technology upgrade cycles such as the transition from Wi-Fi 6 to Wi-Fi 6E/7, 5G to 5G Advanced and eventually 6G, and Automotive technology upgrades (e.g. more radios, power isolation solutions, and digital radio tuners).

Individual Company Takeaways

Exhibit 3: GS Communacopia + Technology Conference Agenda
US Semiconductor and Semi Cap Equipment Coverage

Date/Time	Company	Speaker
Monday, September 9th, 2024		
11:30am - 12:05pm	**SambaNova Systems**	Prof. Kunle Olukotun, Co-Founder & Chief Technologist
12:25pm - 1:00pm	**Advanced Micro Devices, Inc.**	Dr. Lisa Su, Chair and CEO
4:25pm - 5:00pm	**Arm Holdings**	Rene Haas, CEO
Tuesday, September 10th, 2024		
7:30am - 8:05am	**Western Digital Corp.**	Rob Soderbery, EVP & Gen. Mgr. Flash Bus.
8:10am - 8:45am	**NXP Semiconductors NV**	Jeff Palmer, VP IR
9:30am - 10:05am	**Skyworks Solutions**	Kris Sennesael, SVP & CFO Raji Gill, VP IR
10:10am - 10:45am	**Texas Instruments, Inc.**	Rafael Lizardi, CFO
4:25pm - 5:00pm	**Qorvo, Inc.**	Grant Brown, SVP & CFO Philip Chesley, SVP & Pres. of High Perf. Analog
Wednesday, September 11th, 2024		
7:20am - 7:55am	**Nvidia Corporation**	Jensen Huang, Founder, President & CEO
8:10am - 8:45am	**Lam Research Corp.**	Doug Bettinger, EVP & CFO
9:30am - 10:05am	**KLA Corp.**	Bren Higgins, EVP & CFO Ahmad Kahn, EVP & President of SEMI-PC
10:10am - 10:45am	**Credo Technology Group Holding Ltd.**	Bill Brennan, President & CEO Dan Fleming, CFO
10:50am - 11:25am	**Impinj, Inc.**	Chris Diorio, CEO Cary Baker, CFO
12:25pm - 1:00pm	**Teradyne, Inc.**	Tyler Warren, CFO of Semiconductor Test
1:05pm - 1:40pm	**Broadcom, Inc.**	Charlie Kawwas, Ph.D, President, Semiconductor Solutions Group
1:45pm - 2:20pm	**Microchip Technology, Inc.**	Eric Bjornholt, SVP & CFO Sajid Daudi, Head of IR
2:25pm - 3:00pm	**Applied Materials, Inc.**	Gary Dickerson, President & CEO
3:45pm - 4:20pm	**Marvell Technology Inc.**	Matt Murphy, Chairman & CEO Ashish Saran, SVP of IR

all times are in PST

Source: Goldman Sachs Global Investment Research

SambaNova Systems Inc. (Not Covered)

Presenters: Dr. Kunle Olukotun, Co-Founder and Chief Technologist

Bottom line: We discussed with Dr. Olukotun the background of SambaNova Systems' (privately held) founding, management's view of the long-term market opportunity set, and SambaNova's key technological differentiation vis-a-vis the incumbent accelerator suppliers and other start-ups.

Key Takeaways

1) Key impetus of founding the company: Dr. Olukotun highlighted a) growing demand for AI/ML algorithms, b) lack of competing alternatives to Nvidia in the market and c) the team's desire to develop a full-stack solution that covers everything from silicon to models as the key drivers behind the founding of SambaNova.

2) Views on the AI TAM: On the company's opportunity set, Dr. Olukotun acknowledged that there is a wide range of potential outcomes, and noted that the Bull case that entails a material productivity increase and wide-spread adoption across virtually every industry could drive a TAM that is essentially infinite. Interestingly, Dr. Olukotun argued that, even in a relatively bearish case, AI could still present a multi-trillion dollar opportunity.

3) SambaNova's SAM: From a Serviceable Addressable Market (SAM) perspective, Dr. Olukotun believes SambaNova's solution is well-positioned to address, in particular, low-latency Inference. He also spoke to customers who are in search of a second source to Nvidia and/or those who do not have great access to Nvidia's products as potential opportunities.

4) Differentiation vs. Nvidia and other start-ups: Dr. Olukotun highlighted that, given its differentiated architecture (e.g. only system with three-tier Memory, ~10x more on-chip SRAM), customers are able to run Llama 3.1 (405bn parameters) at up to 120 tokens per second at roughly 4x the average speed of GPUs with 16 RDUs (Reconfigurable Dataflow Unit) with a power footprint of 10kw. Similarly, relative to other AI start-ups, Dr. Olukotun noted that SambaNova is the only company that has a viable solution to Nvidia in terms of performance and power efficiency.

Advanced Micro Devices, Inc. (AMD, Buy)

Presenters: Dr. Lisa Su, Chair and CEO

Bottom line: We discussed with Dr. Su AMD's market outlook and strategy across the Data Center GPU and CPU as well Client CPU and Embedded markets. In AI, she highlighted AMD's progress in advancing its Software (i.e. ROCm) and the robust demand environment. Outside of AI, she struck a constructive tone as it pertains to the Server CPU market recovery and AMD's ability to gain further share, particularly in Enterprise.

Key Takeaways

1) Software advancements: Reflecting on the past year, Dr. Su noted that she was most proud of the advancements they had achieved in Software and that, for select Inference workloads, they were delivering better performance than the incumbent competitor.

2) One-year Data Center GPU product cadence: Dr. Su stated that the transition to a one-year Data Center GPU product cadence, originally announced in June at Computex, was a change they decided on given the expanding range of customer needs, and not necessarily a competitive response.

3) End-to-end AI solutions provider: Dr. Su emphasized the company's strategy to grow as an end-to-end AI solutions provider covering the core Data Center, Edge and Client with their GPU, CPU and FPGA offerings.

4) Rationale for proposed acquisition of ZT Systems: Dr. Su stated that the pending ZT Systems acquisition will be accretive to AMD's competitiveness in the Data Center as it pertains to delivering rack-level solutions that are increasingly required by the large cloud hyperscalers. She also noted that, by integrating ZT Systems, AMD could shorten the time required by customers to validate AMD's solutions.

5) Server CPU market outlook and AMD's competitive position: On the Server CPU market, Dr. Su noted that she was beginning to see positive demand trends. She also reiterated the company's confidence in taking further share, particularly in Enterprise – a market in which they have historically been under-represented – highlighting how Enterprise customers are increasingly perceiving AMD as a trusted partner not only in server CPU, but also across a wide range of solutions including Data Center GPU and commercial PC CPU.

6) Merchant vs custom silicon: Dr. Su highlighted that there is a place for custom CPUs and accelerators and that they will in the long-run co-exist with merchant solutions. That said, given the rate at which AI is evolving, AMD continues to believe that the vast majority of the AI Accelerator TAM (i.e. ~$400bn by 2027, per AMD) will be addressed by merchant GPUs which are much more agile than chips that are designed to address a specific application or workload.

7) AI PCs: Dr. Su mentioned that we are at the start of a multi-year AI PC cycle and that demand is likely to pick up more in 2025 and beyond, and highlighted her expectation for the commercial market to serve as a key driver of replacement demand. On the competitive landscape, she noted that the progress AMD has made as a partner to customers in its server CPU franchise has and will continue to support the company to gain traction in the PC market.

8) Embedded demand has bottomed but the rate of recovery will be gradual: On the Embedded business, Dr. Su noted that while the market environment has bottomed, the rate of recovery in 2H24 and beyond could be more gradual than they would have liked. From an end-market perspective, she called out A&D and Test & Measurement as areas of relative strength and Industrial as an area of relative weakness.

9) Advanced packaging and HBM supply to remain tight: Dr. Su stated that, while AMD's supply chain partners are increasing capacity, she expects supply of key inputs like CoWoS and HBM to remain tight into 2025 given strengthening demand (i.e. demand is a moving target).

10) Opex leverage: Although Dr. Su stressed that AMD will be front-footed with its growth investments, given the AI opportunity, she also stated that the company remains disciplined and that opex will grow at a slower rate than revenue going forward, ultimately driving leverage in the model.

Valuation/Risks: We are Buy-rated on AMD with a 12-month price target of $175 based on a normalized EPS estimate of $4.85 and a target multiple of 36x. Key downside risks to our investment thesis and price target include: 1) a weaker-than-expected PC and Server market backdrop; 2) muted customer traction for AMD's AI solutions (e.g. MI300); 3) increased competition in the Client and Server CPU markets; 4) execution on the technology/product roadmap, and 5) lack of opex leverage.

ARM Holdings (ARM, Buy)

Presenters: Mr. Rene Haas, CEO

Bottom line: Mr. Haas discussed, 1) the long-term opportunity associated with AI, particularly given its strong presence at the Edge, 2) Arm's growing market presence across the Data Center, Edge and Client markets due to its superior power efficiency relative to competing architectures, 3) his confidence in delivering more value to customers over time and, in turn, sustaining the current positive trajectory in Arm's blended royalty rate, and more.

Key Takeaways

1) Medium- to long-term growth opportunity in AI: Mr. Haas shared his medium- to long-term optimism on the overall AI hardware market, noting that significantly more compute would be needed in the Cloud as well as at the Edge to develop Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI). He noted that AI has also been the primary driving force behind its Licensing business which has materially exceeded the company's (and investors') expectations.

2) Role of CPUs in AI and Arm's progress: Mr. Haas spoke about the importance of CPUs in running AI workloads, particularly at the Edge where power efficiency tends to be more critical. On Arm's progress in the Server CPU space, Mr. Haas cited Graviton (Amazon), Cobalt (Microsoft) and Axion (Google) as proof points of Arm's superior value proposition, and noted that Arm can deliver, on average, 40-50% more power efficiency vs. the competition.

3) Early days in AI PCs: Mr. Haas noted that it is still early days for the AI PC, specifically in terms of development of a killer app, and that it could take some time for the market to inflect.

4) Arm's market share aspirations in PCs: On the overall PC market, Mr. Haas reiterated the company's medium- to long-term market share target of 50%, and highlighted a) improved software compatibility, b) superior battery life, and c) Arm-based CPU offerings from a broader set of vendors that are on the come in 2025/beyond, to serve as drivers of sustained market share gains for the company.

5) Sustainability in the increase of royalty rates: Mr. Haas noted that the company is still in the early stages of the transition to v9 (from v8) and that customer demand for Compute Subsystems (CSS) has been strong across Data Center and, more recently, in Mobile (where they have signed a handful of customers to date). All in, he expressed confidence in sustaining the current positive trajectory in Arm's blended royalty rate.

6) Competition with RISC-V: While Mr. Haas acknowledged the adoption of RISC-V in select markets (i.e. Embedded), he believes that – similar to Arm's position ~15 years ago in the PC space – RISC-V lacks the software ecosystem to gain broad acceptance in the market, and expressed his confidence in fending off any meaningful competition from RISC-V based processors in Arm's core markets for the foreseeable future.

7) Potential entry into chips: Mr. Haas noted that Arm has the potential to serve up to ~90% of the entire chip design (specifically, in the case of chiplets) and did not entirely deny the possibility of entering the device market.

Valuation/Risks: We are Buy-rated on ARM with a 12-month price target of $144 based on 65x our Q5-Q8 non-GAAP EPS (excl. SBC) estimate of $2.22. Key downside risks to our investment thesis and price target include: 1) a weaker-than-expected end demand environment; 2) underwhelming market share gains, particularly in Data Center; 3) lower-than-expected royalty rates; 4) any changes in regulation that impact Arm's ability to participate in certain markets (e.g. China); and 5) ongoing litigation with Qualcomm.

Western Digital Corp. (WDC, Neutral)

Presenters: Rob Soderbery, EVP and General Manager, Flash Business

Bottom line: Key takeaways include 1) demand for enterprise SSD remains strong driven by AI and, as a market, is expected to account for ~10% of WD's total NAND bits in FY2025, 2) WD believes the BiCS 8 architecture can drive better performance than peers' 9th generation NAND, and that it will remain a foundational node to build off for the years ahead, 3) the scheduled business separation remains on track with the company planning to execute a soft spin in October.

Key Takeaways

1) Continued robust demand for Enterprise SSDs: Mr. Soderbery spoke to significant demand for high-capacity and high-performance enterprise SSDs (eSSD) for training/inference, as well as AI data lake applications. On the source of near-term strength, Mr. Soderbery noted that upside in high-capacity eSSDs was underpinned entirely by AI, whereas AI was also driving a significant part of the strength in lower-capacity higher performance PCIe Gen 5 SSDs. Additionally, Mr. Soderbery stated that high-capacity SSDs are fully sold out, and the company – consistent with comments on their recent earnings call – expects to ship 10% of NAND bits to the eSSD market in FY2025.

2) NAND ASP outlook: Mr. Soderbery noted that incremental softness in the consumer-facing transactional markets is driving the deceleration in NAND ASP growth that is embedded in the company's September quarter outlook.

3) Performance gains and customization from CBA: By building the CMOS and Memory arrays on separate wafers and then bonding them together, Mr. Soderbery mentioned that the BiCS 8 architecture can drive better performance than peers' 9th generation NAND. WD views these performance gains as a result of the superior CMOS technology, and believes that BiCS 8 will remain a foundational node to build off for the years ahead.

4) Cost differential to shift positively for SSDs in the near-term: on TCO between HDD and SSD, Mr. Soderbery noted that the per bit cost differential is currently at ~4-5x (in favor of HDD), and stated that this differential could shift to 3-4x moving forward. Additionally, from a use case standpoint, management noted that the industry prefers to leverage enterprise SSDs over HDDs for AI data lake applications, given the performance advantages.

5) On track for business separation: On the scheduled business separation, the company remains focused on the dis-aggregation of back-office capabilities/functions such as the ERP systems, and expects to perform a soft spin in early October.

6) Significant productivity savings from AI/ML: Mr. Soderbery commented on WD's usage of AI/ML internally to optimize on the engineering front, with an expectation of roughly $100mn in productivity gains to be captured in the next 2 years.

Valuation/Risks: We are Neutral-rated on WDC with a 12-month price target of $79 based on a fundamental component (50% weighting) of $73 (13x our normalized EPS estimate of $5.60 and an SOTP component (50% weighting) of $85 (i.e. 2.3x EV/Sales Q5-Q8 for HDD and 1.3x 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.

NXP Semiconductors NV (NXPI, Neutral)

Presenters: Jeff Palmer, Senior Vice President of Investor Relations

Bottom line: Key takeaways include 1) NXP's long-term growth drivers in Automotive, including radar, zonal processors and electrification, remain intact, 2) persistent weakness in Industrial is mostly due to softness in end demand (as opposed to inventory dynamics), 3) NXP believes they will have the ability to offer low-single digit (%) price declines to select customers in 2025 without sacrificing gross margins, 4) NXP remains confident in their competitive position in China, and 5) gross margin of ~58% is not a destination and Mr. Palmer believes there could be further upside driven by an increase in utilization rates, replenishing of the distribution channel, and accretion associated with new product introductions.

Key Takeaways

1) Long-term drivers in Auto remain intact: Given NXP's upcoming Analyst Day on November 7, Mr. Palmer did not share a new growth outlook for Automotive; however, he did note that any update to the long-term model would likely be more evolutionary, not revolutionary. Recall that, at its 2021 Analyst Day, they provided a long-term revenue growth CAGR of 9-14% for the Automotive business.

2) Automotive Tier-1 inventory levels: Mr. Palmer reiterated NXP's prior commentary from their earnings call that Auto Tier 1 customers continue to target inventory levels of 2-12 weeks. Given manufacturing cycle times of 3-6 months, NXP believes a healthy inventory level for customers would be in the 10-12 week range. As evidenced by the recent reduction to its full-year revenue outlook, variability in customers' inventory management is driving uncertainty around the rate and duration of the ongoing auto inventory digestion.

3) Persistent weakness in Industrial: While Mr. Palmer remained confident on the long-term growth outlook of NXP's Industrial market, he cited persistent weakness in the core Industrial business (which accounts for ~60% of segment revenue). For the overall business, he stated that although the company is at a cyclical bottom, the pace and shape of the recovery was difficult to predict and that a V-shaped recovery was unlikely.

4) JV with Vanguard: On NXP's recent JV announcement with Vanguard (i.e., 300mm foundry), Mr. Palmer reaffirmed that a) the company will have 40% ownership (i.e., the JV will not be consolidated into NXP's financials) and b) it will provide a 200bps yoy gross margin increase in 2029. Furthermore, Mr. Palmer believes that the JV will gradually serve as a landing point for NXP's products currently running on 200mm, aligning with their strategy to further transition towards a variable cost business model.

5) Pricing: Relative to the recent historical price increases of 2022 (+14% yoy) and 2023 (+8% yoy), NXP continues to expect blended pricing in 2024 to be flattish yoy. On 2025, Mr. Palmer noted that the company could offer low-single-digit (%) price declines, supported by internal cost downs, to select customers. Importantly, Mr. Palmer does not expect any price reductions to adversely affect gross margins.

6) China competition: While the competitive environment in China remains intense, Mr. Palmer expressed confidence in the company's ability to compete in the market. He believes that competition from local Chinese players rests primarily in the a) power discrete markets (where NXP does not participate), b) low-end catalog Analog markets, and c) consumer MCU markets.

7) Gross margin: Mr. Palmer noted that the company's current gross margin of ~58% was not a destination and that dynamics such as a) an increase in utilization rates (i.e., from the current low-70s back to the mid-80s), b) re-filling the channel (which is accretive to corporate gross margin), and c) the introduction of new products, could drive further upside over the medium- to long-run.

Valuation/Risks: We are Neutral rated on NXPI with a 12-month price target of $285 based on 19x our normalized EPS estimate of $15.00. Key upside/downside risks to our estimates and investment thesis include: 1) better- or worse-than-expected demand in the Automotive and Industrial end-markets; 2) margin execution (i.e., balance between input cost a and pricing); 3) changes in the MCU competitive landscape; and 4) M&A that is accretive/dilutive to growth, margin and/or returns.

Skyworks Solutions Inc. (SWKS, Neutral)

Presenters: Kris Sennesael, SVP & CFO and Raji Gill, VP of Investor Relations

Bottom line: Key takeaways include 1) Skyworks believes inventory at its Mobile customers have largely normalized, 2) while Skyworks continues to operate with the assumption that smartphone units will remain flattish, management is optimistic that AI could drive a multi-year replacement cycle, 3) they expect the proliferation of AI to drive more complexity (i.e. more integration) in the RFFE and, in turn, higher dollar content, and 4) Skyworks continues to expect gradual sequential growth in Broad Markets, primarily driven by its Edge/IoT business (e.g. Wi-Fi).

Key Takeaways

1) Mobile order patterns normalizing: Between the two primary operating ecosystems (i.e. iOS and Android), Mr. Sennesael stated that the dragged out Android inventory digestion has been worked through, while iOS inventory levels remain normal. Specific to the company's guide of +20% qoq revenue growth in Mobile for the September quarter, Mr. Sennesael noted that their largest customer would see growth beyond that level (i.e. supported by the ramp of new products), and that Android would be roughly flattish.

2) Uplift from AI still nascent: While management continues to operate the business under the assumption that smartphone units will remain flattish, they believe that the proliferation of AI at the edge could drive upside to units over multiple years. With high-end processors expected to take up more board space and consumer more power vis-à-vis traditional models, OEMs are turning to RF suppliers to drive more integration.

3) Ongoing Android 5G transition: Although Android revenue for Skyworks (i.e. <$100mn quarterly run-rate) lags considerably behind the opportunity set at its largest customer, Mr. Sennesael noted that Android customers (specifically Google, which represents 1/2 of Android revenue) are focused on delivering the highest quality phone, and at times incorporating more Skyworks content per phone than at their largest customer. Outside of Google, Skyworks remains selective in the Android market as many customers tend to focus on cost rather than performance. Additionally, Mr. Sennesael noted that the transition to 5G is still ongoing in China where 5G penetration of 40-50% lags many other geographies.

4) Broad Markets recovery: Mr. Sennesael reiterated his expectation for the Broad Markets business to gradually grow sequentially in September and December and for the segment to return to yoy growth in the December quarter. Over the long-run, Skyworks sees a multi-year technology upgrade cycle driven by structural growth drivers such as a) the transition from Wi-Fi 6 to Wi-Fi 6E/7 (Wi-Fi 6E/7 represents a 20%-30% content uplift compared to Wi-Fi 5/6), b) ongoing transitions from 5G to 5G Advanced and eventually 6G, and c) Automotive technology upgrades specifically more radios, power isolation solutions, and digital radio tuners.

5) Gross margins: After bottoming out in the March quarter at ~45%, management remains confident on the recovery in gross margins into FY2025/26 and beyond. Mr. Sennesael indicated that the primary drivers of gross margin expansion include a) revenue growth, b) increase in utilization rates, and c) improving mix (i.e. faster growth in Broad Markets vs. Mobile).

6) Capital allocation: Skyworks generated $1.3bn in FCF through the first three quarters of FY2025 (on track for $1.8bn) and while the company remains open to M&A, management maintains a disciplined approach in the near-term. Mr. Sennesael also reiterated the company's long-term FCF margin target of 30% as well as its commitment to returning all excess cash to shareholders.

Valuation/Risks: We are Neutral-rated on SWKS with a 12-month price target of $102 based on 14x our normalized EPS estimate of $7.30. 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.

Texas Instruments Inc. (TXN, Sell)

Presenters: Rafael Lizardi, CFO, and Mike Beckman, Director of Investor Relations

Bottom line: Key takeaways include 1) TI is constructive on the growth opportunity set across Automotive and Industrial, 2) TI remains confident in their competitive position, irrespective of the pricing environment, and 3) although the competitive landscape has become more intense over the past few years, TI remains committed to China and intends to grow share over time.

Key Takeaways

1) Current cycle vs. past cycles: Mr. Lizardi noted that, while the Analog and MCU markets historically have moved in tandem across various applications and geographies, this cycle has been unique given its asynchronous nature. Management remains uncertain if the asynchronous behavior displayed will be the new normal going forward. Mr. Beckman noted that, by application, a) Personal Electronics, after bottoming in 1Q23, has been growing sequentially, b) Industrial remains a mixed bag, and c) Auto could be experiencing a shallow dip (but refrained from giving forward commentary).

2) Auto/Industrial growth drivers remain robust: TI continues to be focused on the Auto and Industrial end markets. Specifically within Automotive, Mr. Beckman noted that socket and content opportunities related to Body & Lighting (for both BEVs and traditional ICE vehicles) and ADAS are plentiful – including application specific products – which should continue to drive Automotive growth for the company ahead of overall industry Auto unit growth. In the Industrial market, he believes that applications related to Automation (factory, building, robotics), agriculture, greenhouse gas emission reduction, and the smart grid, have the potential to drive material growth for TI over multiple decades.

3) Capex: Consistent with TI's recent 'off-cycle' Capital Management Call (see note here), Mr. Lizardi noted that the low-end of the 2026 capex target range of $2-5bn represents spending that would be required for the company to achieve its previously stated strategic objectives, while the delta between the low-end and the high-end represents any equipment spending that would be required to serve excess growth. The updated 2026 capex range as well the reduced capital intensity target beyond 2026 (i.e., ~1.2x vs. ~1.5x prior) are both a product of more time on target as TI is ~60% through their investment cycle, per management.

4) Pricing outlook: Mr. Lizardi stated that a) pricing does not move quickly in their industry, b) TI continues to see 2-3% price declines in aggregate, c) importantly, TI is ready for any pricing environment – inflationary or deflationary – given their cost advantage.

5) Competitive environment: Management believes that the competitive environment in China has intensified over the past few years with emerging competitors often pursuing specific sockets with high volume. For context, Mr. Lizardi noted that of everything manufactured in China, ~15% is serviced by local suppliers, ~15% by TI, and the remaining ~70% by other European or American suppliers. Furthermore, management stated that TI continues to operate in China with the intent to grow share.

Valuation/Risks: We are Sell rated on TXN with a 12-month price target of $189 based on 28x our normalized EPS estimate of $6.75. Potential upside risks to our earnings estimates, price target, and/or cautious investment thesis include, 1) upside to end-demand across key verticals including Automotive and Industrial, 2) a reversal in recent market share dynamics; 3) better-than-expected gross margin performance and/or opex leverage, 4) upside to earnings and FCF as a result of government funding, and 5) capital return that exceeds what we already incorporate in our model.

Qorvo Inc. (QRVO, Neutral)

Presenters: Grant Brown, SVP & CFO and Philip Chesley, SVP & President of High Performance Analog

Bottom line: Key takeaways include 1) Qorvo believes inventory at its Mobile customers have largely normalized, 2) while Qorvo continues to operate under the assumption that smartphone units will remain flattish, management sees the potential for AI to drive a multi-year replacement cycle and the need for more and better RF capabilities, 3) management expects A&D to drive robust growth in the High Performance Analog (HPA) segment, 4) on capital allocation, management remains committed to investing in growth, opportunistic buybacks and retiring their 2024 notes, and 5) Qorvo continues to expect gross margins to improve towards their long-term target of 50%.

Key Takeaways

1) Normalization in customer inventory: Mr. Brown shared that customer inventory levels across the Android ecosystem have largely normalized and, as such, believes that Qorvo is shipping to end-demand, albeit at lower levels than previous years. On the iOS side, Mr. Brown believes there is very little inventory as Qorvo sells direct to contract manufacturers who work according to a master production schedule.

2) AI smartphones: Mr. Brown reiterated that the company is not operating under the assumption that there will be a strong smartphone replacement cycle in the near-term, as they continue to take a 'wait and see' approach to AI's impact on smartphone volumes. That said, Mr. Brown noted that AI-enabled smartphones will require more and better RF (e.g. better power management) and, in turn, drive higher content per phone. Outside of power management, management discussed the possible use cases of Ultra-Wideband (UWB) technology in AI smartphones including digital key and building navigation.

3) HPA growth drivers: Consistent with the company's recent Analyst Day, Mr. Chesley discussed multiple growth drivers within the HPA business – specifically, a) Aerospace & Defense (e.g. electronic warfare), and b) Industrial, which includes base stations, broadband, and power management. Furthermore, Mr. Chesley emphasized that he is seeing the fastest cycle of new technologies and upgrades in his 20 years of developing products for A&D in areas such as active electronically scanned arrays (AESA). He also highlighted that Qorvo is well-positioned in SATCOM and that they plan to expand into the terminal market.

4) Capital allocation: Management noted that, while they had discussed internally the possibility of introducing a dividend, it was not something that investors, according to a survey, were interested in. Instead, management remains committed to a) investing in growth opportunities, b) opportunistic buybacks, and c) in the near-term, retiring their 2024 notes. Notably, Qorvo remains open to potential M&A, with a particular interest in A&D.

5) Gross margin: While Qorvo's September quarter gross margin guide of 46.5% implies a 560bps qoq improvement, it remains ~350bps below the company's long-term target of 50%. As a bridge to ~50%, Mr. Brown noted that, a) by the end of the September quarter, Qorvo will have sold through much of their higher cost inventory, b) in FY2H25 and into FY2026, fab utilization rates will continue to improve, further reducing under-utilization related headwinds, c) as of last quarter, 100% of Qorvo's BAW manufacturing is on 8-inch wafers at their Texas facility, and they continue to shrink the die size for their latest generation products, and d) beyond FY2026, they will see an improved business mix as Qorvo shifts towards a 50/50 model (i.e. 50% of revenue derived from non-Mobile applications that are margin-accretive).

Valuation/Risks: We are Neutral rated on QRVO with a 12-month price target of $118 based on 14x our normalized EPS estimate of $8.40. Key upside/downside risks to our investment thesis and price target are: 1) stronger or weaker-than-expected smartphone (particularly, 5G) demand; 2) strength or weakness in any of the other key end-markets (i.e. Communications Infrastructure, A&D, Automotive, Industrial, and WiFi); 3) market share fluctuations; 4) execution on gross margin enhancing initiatives; and 5) M&A that is accretive/dilutive to the long-term financial profile of the company.

Nvidia Corp. (NVDA, Buy)

Presenters: Mr. Jensen Huang, Founder, President and CEO

Bottom line: Mr. Huang discussed 1) The trend toward densification and acceleration in

Data Center, 2) evidence of instant customer ROI, 3) Nvidia's competitive moat, 4) the agility of Nvidia's Asia-centric supply chain, and 5) the ongoing Blackwell ramp.

Key Takeaways

1) Accelerated Computing: Mr. Huang highlighted his long-held view that Moore's Law was no longer delivering the rate of innovation it had in the past and, as such, was driving computation inflation in Data Centers. Further, he noted that the densification and acceleration of the $1 trillion data center infrastructure installed base alone would drive growth over the next 10 years, as it would deliver material performance improvement and/or cost savings.

2) Customer ROI: Mr. Huang noted that we have hit the end of transistor scaling that enabled better utilization rates and cost reductions in the previous virtualization and cloud computing cycles. He explained that, while using a GPU to augment a CPU will drive an increase in cost in absolute terms (~2x) in the case of Spark (distributed processing system and analytics engine for big data), the net cost benefit could be as large as ~10x for an application like Spark given the speed up of ~20x. From a revenue generation perspective, Mr. Huang shared that hyperscale customers can generate $5 in rental revenue for every $1 spent on Nvidia's infrastructure, given sustained strength in the demand for accelerated computing.

3) Competitive moat: When describing the company's competitive moat, Mr. Huang highlighted the company's a) large installed base of GPUs across multiple platforms (with backward/forward software compatibility), b) ability to augment their hardware with software (e.g., domain-specific libraries), and c) ability to build rack-level systems and innovate across various chips (Nvidia designs 7 chips for the Blackwell platform).

4) Thoughts on supply chain: Mr. Huang spoke to Nvidia's supply chain partners' agility. He noted that without the help of its partners, including key suppliers like TSMC, the company would not have been able to deliver the hockey stick-like revenue growth in 2H23/2024. That said, he did note that Nvidia has adequate in-house Intellectual Property to shift manufacturing without material disruption should they be required to do so.

5) Reiterated Blackwell schedule: Mr. Huang reiterated that the company will begin shipping Blackwell-based products in FY4Q25 and that shipments will scale in FY2026. He also stated that demand is strong and that he feels a sense of responsibility given the company's position as the key provider to essentially all CSPs (+ other companies) developing AI.

Valuation/Risks: We are Buy rated on NVDA (also on the Americas Conviction List) with a 12-month price target of $135 based on 50x our normalized EPS estimate of $2.70. Key downside risks to our estimates, investment view and price target include: 1) a sudden decline in Gen AI infrastructure spend by the major CSPs and/or enterprises; 2) further restrictions on GPU exports; 3) delays in new product introductions; 4) weaker-than-expected demand for Gaming GPUs; and 5) supply chain issues.

Lam Research Corp. (LRCX, Buy)

Presenters: Doug Bettinger, EVP & CFO

Bottom line: Key takeaways include 1) outlook for 2024 WFE intact and growth expected in leading-edge Foundry/Logic and NAND into 2025, 2) numerous inflections set to elevate the industry such as Gate-All-Around (GAA) and Backside Power, 3) continuation of spending for equipment in the China region, and 4) relative softness as it relates to the Reliant business outside of China, as part of the Services business (i.e. CSBG).

Key Takeaways

1) 2024 and 2025 WFE outlook: Mr. Bettinger reiterated the view that WFE will be in the mid-$90bn range for 2024, and emphasized strength across leading-edge Foundry/Logic and DRAM. In leading-edge Foundry/Logic, he noted that a significant portion of the recent growth is due to the development of Accelerators (e.g. GPU), which should continue into next year, while in DRAM, the growth in 2024 was mainly driven by the underlying transition from DDR4 to DDR5 and the investments made in HBM. While Mr. Bettinger noted that DRAM would also continue to show signs of strength in 2025, in both conventional DRAM and HBM, the outlook for NAND equipment orders remains weak, albeit an uptick in customer fab utilization rates.

2) Key technology inflections: As it relates to key technology inflections, Mr. Bettinger called out the Gate-All-Around (GAA) transistor architecture, Backside Power, the incorporation of Molybdenum in 3D NAND, and the advancement being made within Advanced Packaging. Mr. Bettinger noted that both GAA and Backside Power could present a $1bn revenue opportunity per 100k wafer starts per month over time. Beyond the near-term, management spoke to dry photo resist (i.e. $1.5bn opportunity over 5 years) and 3D DRAM as incremental opportunities.

3) Continuation of China spending: In the most recent quarter (i.e. 2Q24), China contributed 39% of the company's total revenue, as Mr. Bettinger noted the heightened level of innovation happening in the region, primarily around 28nm and above technology. The customer base in China remains broad for Lam, and management maintains the view that spending will persist, as the local companies have roadmaps that extend across multiple years.

4) Competitive positioning in cryogenic etch: Mr. Bettinger commented that Lam is well positioned as the only WFE supplier that is in production today with cryogenic etch technology, and reiterated that there are roughly 1k chambers in the installed base currently.

5) CSBG: Representing roughly 40% of Lam's total business, Mr. Bettinger noted that Services (i.e. CSBG) continues to be an under-appreciated contributor to the company's outperformance and competitive footing. He also noted that Lam has been able to grow CSBG revenue dollars at a faster rate than the installed base (i.e. chamber count), and this continues to be the growth algorithm by which the company looks to gauge its relative success.

Valuation/Risks: We are Buy-rated on LRCX with a 12-month price target of $1,050 based on 25x our normalized EPS estimate of $42. 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.

KLA Corp. (KLAC, Buy)

Presenters: Bren Higgins, EVP & CFO, and Ahmad Khan, EVP & President of SEMI-PC

Bottom line: Key takeaways include 1) management views 2024 as a transition year for the Wafer Fab Equipment (WFE) market with an expectation for leading-edge Foundry/Logic to drive yoy growth in 2025, 2) the shift to N2, and robust growth in HBM to drive an increase in Process Control intensity going forward, 3) KLA remains constructive on its market share trajectory, 4) the NAND WFE market remains relatively weak, albeit an area with lower relative Process Control requirements, 5) KLA expects China as a % of revenue to decline, given growth elsewhere, and 6) on High-NA EUV, management noted that, while devices leveraging the technology would likely require more Process Control, the potential insertion timing seems to be shifting out due to economics.

Key Takeaways

1) Transition year for WFE in 2024 with growth in 2025: KLA reiterated their 2024 Wafer Fab Equipment (WFE) market forecast in the mid-$90bn range and pointed to potential growth in 2025, primarily driven by strength in leading-edge Foundry/Logic and DRAM/HBM.

2) Process Control intensity: KLA views the shift to N2 as a positive dynamic as it relates to the Process Control market, as intensity increases from N3 to N2 with the transition to CFET transistor architectures expected to drive even higher intensity over the medium- to long-run. Additionally, KLA expects HBM to also drive a sustained increase in Process Control intensity, given the need to stack DRAM dies and the incorporation of a separate logic die at the bottom of the stack.

3) KLA's market position: On the company's competitive position, Mr. Higgins highlighted how KLA had improved its WFE market share from the low-6% range in 2021 to the mid-7% range today. More importantly, KLA expects to at least maintain share going forward given the various technology inflections and their implications for Process Control intensity.

4) NAND remains muted: Specific to the various applications within WFE, Mr. Higgins noted that Memory will become a bigger driver and overall opportunity for KLA in 2025 vs. 2024, as the business fundamentals of the company's customers improve. There remains less optimism on NAND equipment orders, albeit Mr. Higgins still expects growth in 2025, while DRAM, with the overarching focus on HBM, is set for more investment into the out year. Over the medium- to long-run, management anticipates that >60% of the WFE market will be centered around Foundry/Logic.

5) China: Consistent with prior guidance, management expects a) legacy investments in China to stay relatively stable on an absolute basis into next year, and b) China revenue as a % of total to decline in 2H24 and into 2025 as customers in other geographies grow capital spending.

6) High-NA: Management noted that, while devices leveraging High-NA lithography would likely require more Process Control, the potential insertion timing seems to be shifting out due to economics.

Valuation/Risks: We are Buy rated on KLAC with a 12-month price target of $838 based on 25x our normalized EPS estimate of $33.50. Key downside risks to our estimates and Buy investment case include: 1) a significant correction in overall WFE demand, 2) a decline in Process Control intensity, and 3) correspondingly, a discounted growth trajectory relative to the broader WFE market, 4) increased competition in the Process Control market, from peers such as Applied Materials and ASML, that manifests in either market share and revenue loss or a decline in ASPs and gross margins, and 5) changes in the geopolitical backdrop, including the evolution of export controls, that adversely impact KLA's ability to conduct business, for example, in China.

Credo Technology Group (CRDO, Buy)

Presenters: Mr. Bill Brennan, President and CEO and Mr. Dan Fleming, CFO

Bottom line: Key takeaways include 1) management remains bullish on the AEC (Active Electrical Cable) opportunity, 2) management expects customer concentration to decrease over time given a broad set of growth drivers, 3) Credo continues to have near-100% market share in AECs, 4) strong customer traction in Optical DSP, and 5) management is confident that they can deliver opex leverage.

Key Takeaways

1) AEC (Active Electrical Cable) opportunity: Mr. Brennan believes that AECs have grown to become the de facto standard for in-rack connectivity and, more importantly, has the potential to also serve other applications, particularly as lane speeds continue to increase (i.e. 100G/lane) and AI data center operators try to prevent episodes of link flap (i.e. unstable physical interface of the switch).

2) Customer concentration: Credo had a 52% revenue customer in the most recent July quarter. However, over time, management expects the company's customer profile to broaden as a) additional hyperscale customers adopt Credo's AECs, b) emerging CSPs grow in contribution (note there is one specific emerging CSP that is expected to account for >10% of total revenue in the October quarter), and c) Credo improves its market position in Optical DSP.

3) AEC competition: Mr. Brennan noted that they currently have near-100% market share in the AEC market, with their competitors still going through the sampling and qualification phase. Mr. Brennan noted that Credo's competitive strength lies not only in the company's superior products, but also its ability to provide end-to-end solutions based on its vertically integrated operating model. Credo is also able to simultaneously work on multiple customized solutions, per management.

4) Optical DSP: Mr. Brennan highlighted the company's customer traction in Optical DSP and its role as a disruptor. He noted that, the relatively low gross margin profile of the optical transceiver module industry (i.e. 30-40% gross margins for the leaders), allows for a disruptor like Credo to grow its presence. He also highlighted that, in response to customers' need for lower power solutions, the company introduced a first-to-market 3nm-based 1.6Tbps Optical DSP (which represents a shift from its previous n-1 node strategy).

5) Opex leverage: Mr. Fleming reiterated that opex will grow at roughly half the rate of revenue growth and, highlighted the company's use of its core SerDes IP across different connectivity solutions (i.e. AECs, Optical DSPs) as the main source of leverage in their model.

Valuation/Risks: We are Buy-rated on CRDO with a 12-month price target of $31 based on a 10x NTM EV/Sales multiple applied to our Q5-Q8 revenue estimate of $573mn, from which we discount our calculated terminal value and unlevered FCF back for a 1-year forward equity value. We use an 11.5% cost of capital composed of a 4.6% risk-free rate, an unlevered beta of 1.5, and an equity risk premium of 4.6%. Key downside risks to our earnings estimates, price target, and investment thesis include: 1) increased competition from industry incumbents; 2) increased customer concentration and/or negative customer capex revisions; and 3) failure to execute on new product generations and erosion of SerDes IP.

Impinj Inc (PI, Neutral)

Presenters: Chris Diorio, CEO, Vice Chair, and Co-Founder and Cary Baker, CFO

Bottom line: Key takeaways include 1) the long-term market opportunities in RAIN RFID remain intact, 2) emerging opportunities that once seemed far off are approaching reach, 3) Impinj retains a robust competitive technology position, and 4) the outlook for Endpoint IC pricing is stable.

Key Takeaways

1) Long-term secular growth outlook remains intact: Mr. Diorio remains confident in the Endpoint IC (EIC) unit growth outlook of 25-30% (CAGR) on a through-cycle basis, which is consistent with the rate of growth the industry has witnessed over the past 10-15 years. Additionally, Mr. Diorio believes that Impinj will continue to penetrate their largest markets of Retail Apparel and General Merchandise, as well as a long tail of differentiated applications.

2) Emerging opportunities: Impinj cited the emerging opportunity within Food and the EU Digital Product Passport (DPP). In Food, Mr. Diorio noted that, although the opportunity is potentially orders of magnitude larger than current applications, the pace of the ramp could be measured. That said, Impinj is beginning to see demand from grocers related to food freshness, with Mr. Diorio citing how a bakery business could lose more than $2bn in food waste a year. On the DPP opportunity, the EU will require every item manufactured and sold there to be traceable, beginning with batteries and then textiles in 2027, which provides a large opportunity set for Impinj as major EU retailers are already discussing how they will provide improved consumer readability.

3) Impinj Authenticity: Last year at Impinj's Investor Day (see note here), management introduced Impinj Authenticity. Mr. Diorio discussed the benefits associated with Authenticity, specifically, a cryptographic engine and key for authentication, which provides a broad-based opportunity to authenticate items as genuine and sustainable. Authenticity is seeing adoption in tax tracking, over the counter healthcare, and medical devices. That said, Mr. Diorio stated that the pace of adoption is expected to be modest.

4) Competitive technologies: Mr. Diorio believes that RAIN RFID technology is well-positioned to address a wide range of applications, and cited RAIN RFID's characteristic of being a zero-power radio that lasts for the entire life of an item where you can read up to a 30-foot range at 1,000 items per second at an incremental cost measured in pennies. Interestingly, he spoke to 'vision' as a complementary technology and shared the following examples: an EIC can track a package but it cannot see the condition the package is in and, similarly, an EIC can alert when an item has been stolen but it cannot take a picture of who stole it.

5) Long-term financial model: Mr. Baker reaffirmed that the company's long-term financial model of 1) revenue of $500-750mn, 2) non-GAAP gross margin of 55-56% at the low-end of the revenue range and 56-57% at the high-end, 3) adjusted EBITDA margin of 19-21% at the low-end and 23-25% at the high-end, and 4) capital intensity of 5%, remains intact despite the unanticipated downturn in the months following the announcement of their financial model.

6) Endpoint IC pricing: Management noted that they are not expecting any wafer price increases in 2025. On Endpoint IC pricing, they stated that they would consider a price discount for their inlay partners for higher share. They also commented that partners could benefit from a price discount by transitioning to the M800 which is priced slightly below the M700.

Valuation/Risks: We are Neutral rated on PI with a 12-month price target $165 based on 11x our Q5-Q8 revenue estimate of $479mn. Key upside/downside risks to our estimates and/or Neutral investment thesis include, 1) persistent inventory correction of Endpoint ICs at end customers and/or Impinj's inlay partners, 2) slower- or faster-than-anticipated adoption of RAIN RFID in the emerging end-markets, 3) pricing pressure from large end customers and/or inlay partners, 4) quarter-to-quarter volatility in the Systems business, and 5) the RFID competitive environment.

Teradyne Inc. (TER, Buy)

Presenters: Tyler Warren, CFO of Semiconductor Test

Bottom line: Key takeaways include 1) an expectation for a rebound in the Mobility Test market, 2) Teradyne's continued focus on driving share gains in Vertically Integrated Producers (VIP), 3) secular growth drivers underlying the long-term opportunity set in

Automotive Test, 4) robust momentum in HBM Test, and 5) relative weakness in NAND Test.

Key Takeaways

1) Mobility Test market: Mr. Warren believes the Mobility Test market, following a >50% peak-to-trough decline, could grow in 2025 given, a) the re-allocation of test capacity away from Mobility to Compute, and b) the proliferation of AI, which has the potential to lead to an increase in chip complexity (e.g. shift to N2) as well as a smartphone replacement cycle.

2) Focus on Vertically Integrated Producers (VIPs): within Compute Test, Mr. Warren reiterated management's view that the company can drive share gains at the Vertically Integrated Producers (VIPs) who design custom processors for Data Center and Automotive applications. Teradyne continues to forecast an increase in the VIP market opportunity from ~$200mn today to $400-600mn by 2026, while targeting a market share position of ~50% (vs. a low-20% market share in the traditional Compute Test market).

3) Secular drivers in Automotive: Consistent with recent datapoints, Mr. Warren stated that the environment in Automotive Test remains weak. That said, he also spoke to multiple secular tailwinds that could drive growth going forward, including the transition to EVs (i.e. 2x content vis-a-vis ICE vehicles) and an increase in ADAS adoption.

4) Robust growth in HBM Test: In-line with prior commentary from the company, Mr. Warren spoke to a 5x inflection in the HBM Test TAM in 2024 (i.e. $500mn from $100mn in 2023), as the test intensity for HBM scales roughly 5-10x vis-a-vis conventional DRAM. Looking ahead, Teradyne is optimistic that it can gain share starting in 2025 as it enters the HBM performance test market (note the company is currently exclusively exposed to single-die HBM test).

5) Relative softness in NAND: Mr. Warren noted that in Memory Test, the current market split is 80% DRAM and 20% NAND, whereas historically the split had been more even between the two applications. Although fundamentals in NAND Test – a market in which Teradyne maintains ~80% market share – remain relatively soft in the near-term, Teradyne expects the market to grow in 2025.

Valuation/Risks: We are Buy rated on TER with a 12-month price target of $151 based on 27x our normalized EPS estimate of $5.60. Key downside risks to our estimates and investment thesis include: 1) persistent weakness in Semiconductor Test demand, 2) renewed weakness in Robotics demand, 3) negative market share dynamics in Semiconductor Test, and 4) potential dilution from any future M&A.

Broadcom Inc. (AVGO, Buy)

Presenters: Dr. Charlie Kawwas, President, Semiconductor Solutions Group

Bottom line: Dr. Kawwas believes 1) increased spending by the large Tier-1 hyperscalers will drive growth in Broadcom's AI semiconductor business in FY2025, 2) custom accelerators have benefits over merchant solutions (i.e. GPUs) specifically when addressing internal workloads at hyperscalers with consumer platforms, 3) Ethernet will prevail as the preferred AI networking protocol for hyperscalers, and 4) Broadcom's 2nd-generation Co-Packaged Optics (CPO) product will be in volume production by the end of CY2025 or in CY2026.

Key Takeaways

1) AI Semiconductor FY2025 outlook: Broadcom through the fiscal year has positively revised its FY2024 AI semiconductor revenue outlook from $7.5bn at the beginning of FY2024 to $12bn as of last week. On FY2025, although Dr. Kawwas did not provide a numerical guide, he noted that increased spending by their large Tier-1 hyperscale customers will drive strong growth on a yoy basis.

2) Sources of competitive advantage: Dr. Kawwas reiterated that Broadcom only pursues and participates in markets in which they are able to build a sustainable franchise founded on technological leadership. Regarding its technology, Dr. Kawwas shared that Broadcom has a central engineering team that develops foundational technologies such as SerDes IP, that are then leveraged by the various franchises that make up Broadcom's Semiconductor Solutions business. By operating with this structure, Broadcom has been able to, for example, reduce the XPU development cycle from ~3 years to less than a year.

3) Merchant vs. Custom Compute: Broadcom continues to be of the view that merchant solutions ultimately prevail across the broader Semiconductor industry. However, in AI accelerators specifically, following the growth in consumer-facing internal workloads at hyperscalers over time, the company believes that custom XPUs will have significant benefits over merchant solutions (i.e. GPU), particularly in the form of reduced costs (i.e. reduced capital spending and reduced power consumption).

4) Ethernet vs. InfiniBand: Dr. Kawwas believes Ethernet will prevail as the preferred AI networking protocol for the cloud hyperscalers due to its open-sourced nature and superior power efficiency, and expects InfiniBand to be more prevalent at Enterprise customers who tend to prefer more of a turn-key solution vis-a-vis hyperscale customers.

5) Co-Packaged Optics (CPO) technology: Dr. Kawwas showcased Broadcom's 2nd-generation CPO solution that runs on 5kw and has the potential to replace 128 800G pluggable transceivers that each consume 15-16kw. He shared that Broadcom is currently in the proof of concept (POC) stage with 3 hyperscale customers, with an expectation a) for initial deployment for live traffic in CY1H25, and b) to enter volume production by the end of CY2025 or in CY2026, and to launch their next-generation solution in parallel.

Valuation/Risks: We are Buy-rated on AVGO with a 12-month price target of $190 based on a SOTP-based valuation approach. For the Semiconductor Solutions segment, we apply a 21.5x EV/EBITDA multiple to our Q5-Q8 Semiconductor Solutions EBITDA estimate of $25.0bn. For the Infrastructure Software segment, we apply a 22.5x EV/EBITDA multiple to our Q5-Q8 EBITDA estimate of $19.1bn. Key downside risks to our investment thesis and price target include: 1) slowdown in AI infrastructure spending; 2) slower-than-expected inventory digestion in Non-AI; and 3) delay in synergy capture.

Microchip Technology (MCHP, Neutral)

Presenters: Eric Bjornholt SVP, CFO and Sajid Daudi, Head of IR

Bottom line: Key takeaways include 1) Microchip continues to see fewer requests for cancellations and push-outs, as well as more pull-ins, 2) distribution inventory continues to decline, per Microchip, 3) the company aims to grow at roughly 2x the rate of the market and continues to invest in the key mega-trends including Data Center, 4) the company's long-term gross and operating margin targets are reasonable, per management, despite the recent cyclical correction, and 5) the pricing environment remains stable although competitive at the point of design.

Key Takeaways

1) Near-term demand environment: While the near-term demand environment remains largely unchanged, Mr. Bjornholt noted that Microchip a) continues to see fewer requests for cancellations and push-outs, b) more pull-ins, and c) the percentage of bookings coming in with shorter delivery times (i.e. more in-line with Microchip's lead times) is increasing. From an end-market perspective, Mr. Bjornholt highlighted that while the Industrial market remains weak and the Automotive market continues to experience an inventory correction, the Data Center market is experiencing some strength, and he expects it to grow sequentially in both the September and December quarters.

2) Through-cycle revenue growth outlook: Mr. Bjornholt stated that the company aims to grow revenue at roughly 2x the rate of the market and cited the six mega-trends (i.e. 5G, IoT, Data Center, EV, Sustainability, and ADAS) as key drivers. At the device level, Mr. Bjornholt called out FPGAs as a high performer throughout the cycle, with aspirations to expand their FPGA offerings from the mid-range to the lower-end of the high-end, and the higher-end of the low-end.

3) Customer/Distributor inventory dynamics: Microchip believes distribution inventory is improving as sell-through is once again expected to exceed sell-in in the current quarter. Mr. Bjornholt noted that customers appear comfortable in reducing inventory to pre-covid levels for now, given excess inventory on chip suppliers' balance sheets and reduced lead times.

4) China competition: Mr. Bjornholt shared that only ~5% of Microchip's total revenue (i.e. more standard MCU/Analog products) is at risk to local Chinese competitors. That said, due to Microchip's wide range of product offerings and more complete solution offerings, he believes that they will be able to compete effectively with current and emerging competition in China.

5) Long-term margin targets intact: Despite the recent decline in margins, Mr. Bjornholt stated that the long-term gross margin (67.5-68.5%) and operating margin

(44-46%) targets were still intact.

6) Pricing expectations: Mr. Bjornholt noted that, while the near-term pricing environment was stable, the pricing environment was extremely competitive at the point of design, as new products are typically priced with the assumption that profitability improved over the life cycle of the product.

Valuation/Risks: We are Neutral rated on MCHP with a 12-month price target of $80 based on 20x our normalized EPS estimate of $4.00. 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.

Applied Materials Inc. (AMAT, Buy)

Presenters: Gary Dickerson, President & CEO

Bottom line: Key takeaways include 1) excitement around key inflections in leading-edge Foundry/Logic including Gate-All-Around transistor architectures and Backside Power Delivery, 2) compelling opportunity set in Advanced Packaging, 3) inflections in DRAM such as the shift to 4F2 and robust growth of HBM, 4) normalization of China revenue going forward, and 5) expectation for Applied's Services offering to outgrow the overall company going forward.

Key Takeaways

1) Key technology inflections in leading-edge Foundry/Logic: Mr. Dickerson provided commentary on the key growth drivers underpinning strength in leading-edge Foundry/Logic, notably the industry's transition to the Gate-All-Around transistor architecture (note 30% improvement in energy efficient computing). Management continues to anticipate GAA driving >$2.5bn in revenue for Applied in 2024, with the potential to at least double in 2025. Additionally, Mr. Dickerson spoke to the area savings that Backside Power provides (i.e. 30%) combined with a potential >20% improvement in energy efficient computing.

2) Advanced Packaging: Ramping from $500mn in FY2020 to an expected $1.7bn in FY2024, Mr. Dickerson called out the wider adoption of Advanced Packaging techniques within AI servers, as the revenue opportunity for Applied that has the potential to double over the next several years. The single largest contributor to the outsized growth in Advanced Packaging remains HBM, whereby Applied expects to increase revenue 6x from FY2023 levels (i.e. $100mn to >$600mn in FY2024).

3) Inflections in DRAM: Mr. Dickerson highlighted that, over the last 10 years, Applied gained roughly 10% share in the DRAM WFE market, and as it pertains to the impending transition to 4F2 DRAM, the company is also positioned to capture >50% share of the associated SAM (i.e. $6.5bn per 100k wafer starts). Applied's foothold in areas such as microbumps and through-silicon vias (TSVs) for HBM, are additional dynamics that should benefit Applied's offerings within the context of the DRAM equipment market.

4) China normalization: Mr. Dickerson expects China, in a normalized environment, to account for ~30% of total revenue going forward (vs. 32% in the July quarter). Within China, he emphasized that the primary domain for the region is in ICAPS (IoT, Communications, Automotive, Power and Sensors), where Applied sees mid-single to high-single digit (%) growth more broadly over the long-term.

5) Services to outgrow WFE: Mr. Dickerson indicated that revenue growth in Applied Global Services (AGS) is primarily driven by an increase in chip complexity. In the medium- to long-term, management envisions low double-digit (%) growth for the segment, which can ultimately accelerate from current levels and outgrow the trajectory of revenue growth for the broader Applied portfolio.

Valuation/Risks: We are Buy rated on AMAT with a 12-month price target of $240 based on 24x our normalized EPS estimate of $10. Key risks to our estimates and Buy thesis include: 1) persistent weakness in end demand; 2) a prolonged downturn in Applied's ICAPS business, 3) outcome of the ongoing investigation by the U.S. Attorney's Office for the District of Massachusetts, and 4) increased competition.

Marvell Technology Inc. (MRVL, Buy)

Presenters: Mr. Matt Murphy, Chairman and CEO and Mr. Ashish Saran, SVP of IR

Bottom line: Key takeaways include 1) Marvell expects FY2025/26 AI revenue to exceed its prior targets driven by strength in both custom compute and AI optics, 2) the company is targeting 20% market share in accelerated custom compute by CY2028, implying high-single digit billions in revenue (vs. CY2026 GSe of $1.9bn), 3) although they are cognizant of emerging technologies (e.g. Co-Packaged Optics), they believe pluggables will hold majority share for the foreseeable future, 4) Marvell expects gross margin to remain at around 61% for the next few quarters; however, is not prepared to update its long-term target of 64-66% due to various uncertainties.

Key Takeaways

1) AI revenue: Consistent with their recent earnings call, Mr. Murphy highlighted strength in the company's AI business (i.e. custom compute, electro-optics) and spoke to potential upside to its prior FY2025/26 revenue targets of $1.5bn/$2.5bn, respectively. In the near-term, management also noted that they expect the electro-optics business to grow sequentially through the end of FY2025.

2) Custom compute: In accelerated custom compute, Mr. Murphy noted that the company aspires to achieve a market share of ~20% by CY2028, implying high-single digit billions in revenue which compares with our current CY2026 estimate of $1.9bn. From a competitive standpoint, Mr. Murphy stated that, over the long-run, he expects companies with a holistic portfolio of IP related to, for example, front-end design, back-end design and leading-edge packaging technology would be more successful in the market. Finally, Mr. Murphy noted that Marvell pursues projects that are mission-critical to customers and have buy-in from top management, as opposed to those that lack volume and/or are deemed to be science projects.

3) Interconnect: Management is cognizant of and continues to invest in emerging technologies such as Linear Receive Optics (LRO) and Co-Packaged Optics (CPO), and intends to have a complete portfolio in Connectivity. That said, they believe pluggables will hold majority share for the foreseeable future.

4) Switching opportunity: Mr. Murphy highlighted that the company's first 51.2T/sec Data Center switch will be going into production this year, and the company is seeing strong interest. However, Mr. Murphy mentioned that it would take some time to ramp the product, given the presence of a large formidable competitor in the space.

5) Storage: Mr. Murphy highlighted that Storage was the first business to enter the downturn, and has been slowly recovering for the past 6 quarters. He also mentioned that customer inventory is being digested and Storage revenue should return to $200mn/quarter (i.e. steady state, per Marvell) some time in FY2026.

6) Enterprise Networking and Carrier: Mr. Murphy reiterated that they expect the Enterprise Networking and Carrier segments to grow MSD% qoq in FY3Q and for sequential growth to accelerate in FY4Q driven by healthier inventory levels at customers and improving order trends.

7) Margin outlook: Marvell expects gross margin to remain at around 61% for the next few quarters; however, is not prepared to update the long-term gross margin target of 64%-66% given uncertainties around, a) the shape of the cyclical recovery in the traditional merchant businesses (which are margin accretive) and b) the rate of growth in the custom compute business (which is margin dilutive). Mr. Murphy noted that instead the company is focused on achieving 38-40% operating margin as soon as possible, as opex is more in their control.

8) M&A: Mr. Murphy stated that the company is in a good position to pursue its long-term goals, and although they are always open to technology-centric deals, they are not actively looking to execute on a large-scale, transformational deal as they have in the past (e.g. Inphi).

Valuation/Risks: We are Buy-rated on MRVL with a 12-month price target of $87 based on 38x our normalized EPS estimate of $2.30. Key downside risks to our earnings estimates, view and price target include: 1) a moderation in AI infrastructure spending; 2) persistent weakness in the Enterprise Networking and Carrier businesses; 3) persistent degradation in gross margins; and 4) supply-side challenges.

Disclosure Appendix

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We, Toshiya Hari, Anmol Makkar, 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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