

Semis Weekly 13-Oct-23: ARM Initiation and Cloud Instance Analysis

We highlight our key notes published this week and update our cycle charts. This week, we initiated on ARM with a Buy rating and \$64 PT and updated our monthly cloud instance analysis. Our top picks are NVDA, AMAT, TXN, CAMT, and ONTO. Going into earnings season, we think NVDA and AMAT have the best chance to post upside surprises.

Initiate on ARM with Buy and \$64 PT. We view Arm as a play on 3 Tectonic Shifts in computing: 1) in the cellphone, as AI workloads demand more processing power, 2) in the datacenter, as the center of gravity of CPUs shifts to Arm, 3) in IoT, as a 10x unit growth play. As a private company, Arm morphed from a CPU-only ISA play to a full-blown CPU+GPU ecosystem play, w/ upside risks from higher royalty rates, ASPs and IoT units/content and downside from valuation and SBC.

Near term, we forecast ARM revenues to increase to \$4.2bn in CY25 from \$2.8bn in CY23, driven largely by an increase in royalty rates that come with the expected adoption of its "V9" architecture, manifesting primarily in three segments: Mobile (+\$400m), Consumer (+\$350m), and DC Infrastructure (+\$200m) due largely to an increase in royalty rate to 3%-3.5% from 1.7%-2.4%.

Link to Initiation Note here: [Initiate at Buy: ARMageddon - Tectonic Ecosystem Play at the Edge](#)

Cloud Accelerators: NVDA Was 87% Of Incremental Instances Deployed in August. NVDA is at 85.3% of total accelerator instances in Aug-23, up from 85.2% as of Aug-22. Instances from AWS Inferentia / Trainium made up the remaining 13% of total accelerator instances this month. AWS is the only CSP where non-NVDA solutions have seen more material deployments; NVDA is at 62% share of AWS instances in contrast with NVDA at greater than 90% share at all 5 of the other CSPs tracked.

Cloud CPUs: AMD / INTC / AWS Graviton are 53% / 38% / 9% of total new instances in August. AMD CPU instances grew 4.5% MoM and is up 6.6% QTD and saw share increase by 55bps this month, primarily from 105/65/30bps share gain at Azure, GCP and AWS offset by share loss of 5bps at Aliyun while being flat at Oracle and Tencent. Intel grew 0.9% MoM and is up 1.5% QTD and saw share decline 55bps MoM. Graviton was up 5bps on share and makes up 22.7% of instances at AWS. Ampere Altra and Aliyun Yitian did not see new CPU deployments this month.

Link to Cloud Instance Analysis Note here: [Cloud Instance Aug '23: NVDA and AMD Share Up Again](#)

Buy: NVDA, AMAT, TXN, CAMT and ONTO. We view weakness as an opportunity to add our top picks: NVDA, AMAT, TXN, CAMT, and ONTO. We think NVDA and AMAT have the best chance to post upside surprises.

Join Our Channel Checks Call on October 18, at 10am ET / 7am PT / 2pm GMT with electronics components supply chain expert Richard Kwartek, who is conducting a series of checks across the supply chain. Topics will include order and inventory trends, demand trends across geographies and vertical markets, and an update on supply and logistics constraints. **Registration Link:** [here](#)

Register for Our Next Channel Checks
Call on 18-Oct-23 at 10am ET: <https://www.com/webcast/cc/jef29/1359360>

Links to Related Research:

Earnings: [SGH](#)

10-Oct-23: [Cloud Instance Aug '23: NVDA and AMD Share Up Again](#)

10-Oct-23: [Initiate at Buy: ARMageddon - Tectonic Ecosystem Play at the Edge](#)

10-Oct-23: [CAMT: Manufacturing Site Fully Operational](#)

9-Oct-23: [NVM's Israel Facilities Remain in Operation](#)

29-Sep-23: [Semis on Fire: Channel Checks, Marketing Feedback](#)

25-Sep-23: [Channel Checks: Inventories Flush, Backlogs Declining, Demand "OK"](#)

22-Sep-23: [Semis Weekly 22-Sep-23: Updated Cycle Charts](#)

18-Sep-23: [CAMT Building Metrology Portfolio for Packaging - Buying FORM's FRT Metrology](#)

14-Sep-23: [Advanced Packaging and Tectonic Shifts - a 10x Opportunity \(or is it 100x?\)](#)

8-Sep-23: [Sep '23 Lead Times Shrink, ASPs Flatten](#)

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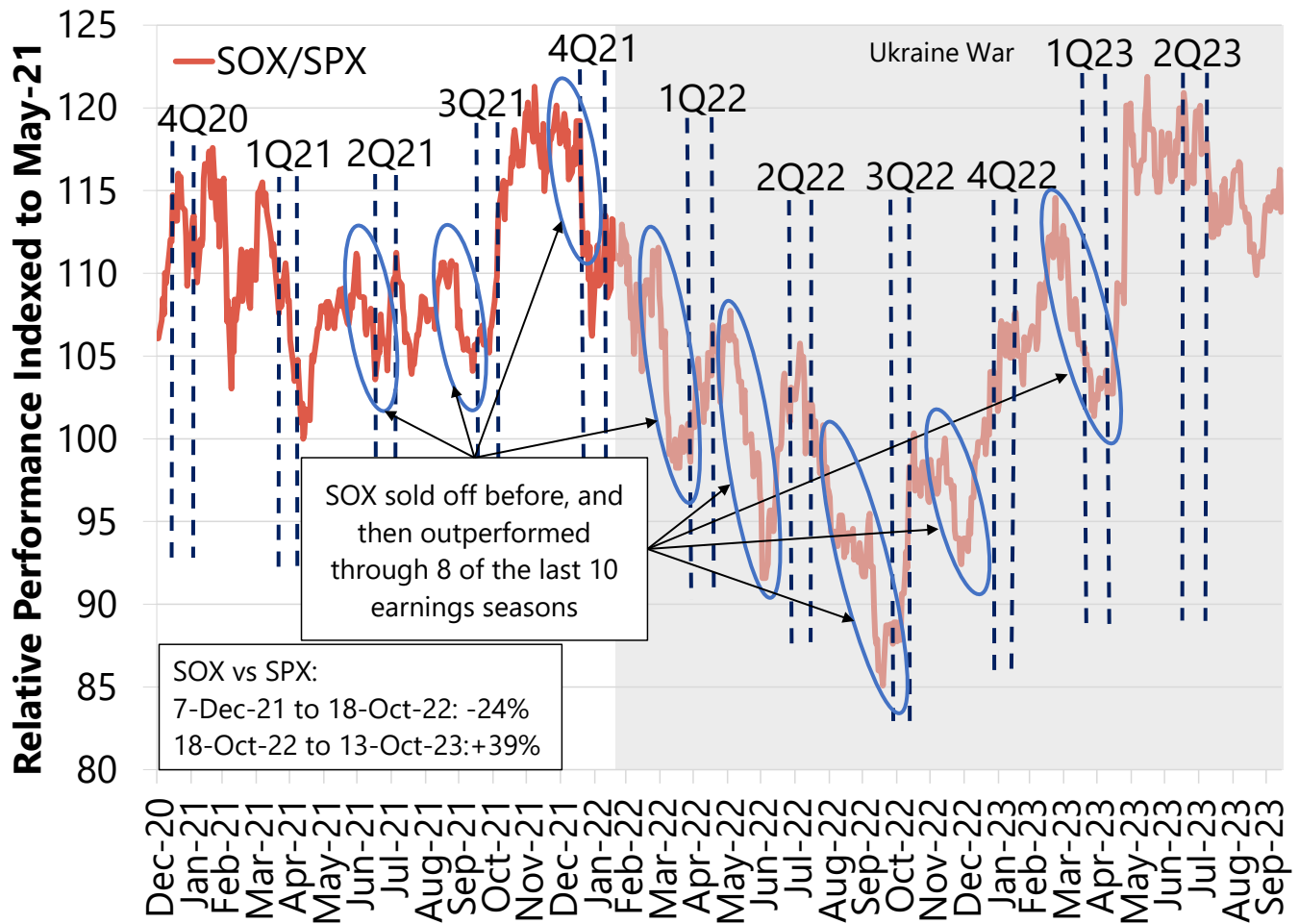
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Highlighted Charts

Chart 1 - After underperforming the SPX by 12% between 23-Mar-23 and 27-Apr-23, the SOX recaptured its underperformance, outperforming the SPX by 19% to 30-May-23 since the local trough in April. SOX has underperformed 110bps this week
SOX-SPX Relative Performance Indexed to May-2021



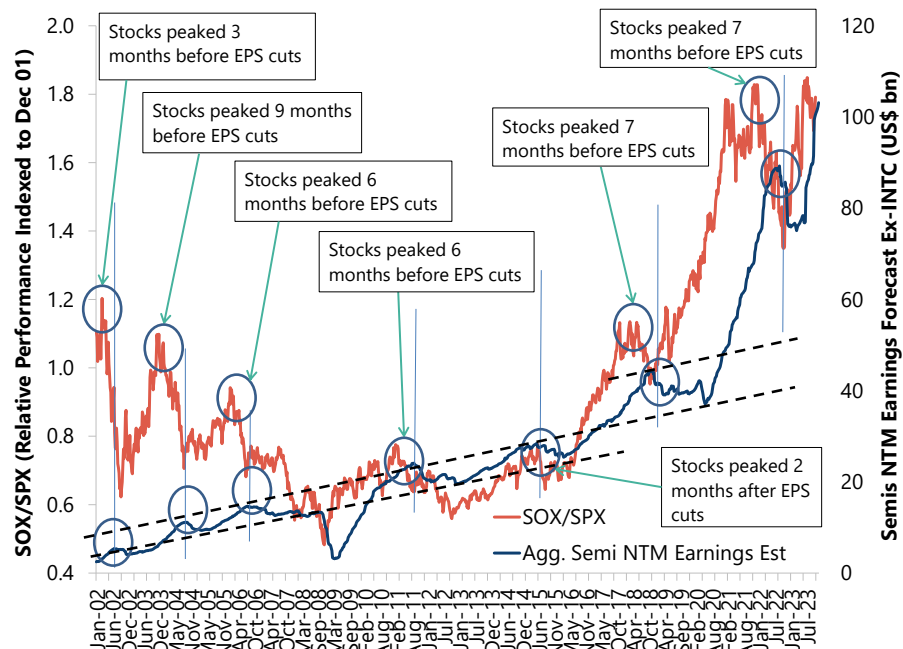
Source: Source: Jefferies, FactSet

The chart shows the SOX performance relative to the SPX with parallel vertical dashed lines representing earnings seasons

The SOX outperformed the SPX by 50% since bottoming in Oct '22, and hit its first higher-low in Dec '22, first higher-high in Feb '23 and subsequent higher-highs in mid-March and mid-June

The SOX underperformed the SPX by 110bps this week. After underperforming the SPX by 12% between 23-Mar and 27-Apr, SOX outperformed the SPX by 19% to 30-May since the local trough on 27-Apr, and SOX outperformed SPX by 6% trough to peak from 5-Jun to 14-Jun.

Chart 2 - Semis Peak 6 Months Before Cuts, and Bottom When Cuts Start
Semiconductor NTM Net Income Forecast



Source: FactSet, Jefferies

Blue Line: Aggregate NTM earnings estimates for a large sample of semiconductor stocks

Red Line: Relative performance of the SOX vs SPX

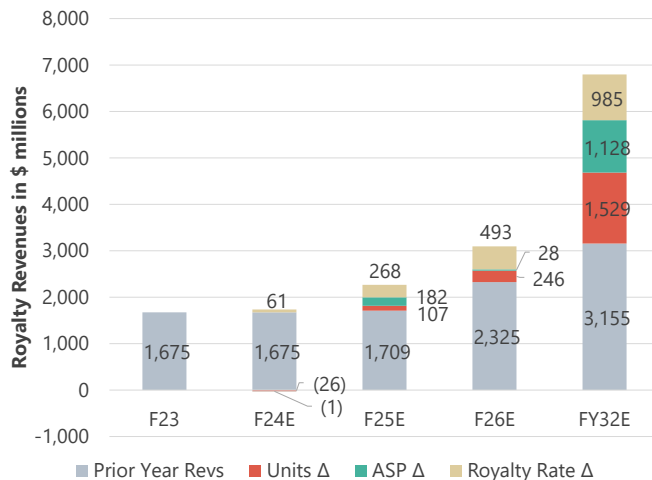
Over the past 20 years, the SOX relative performance vs SPX has typically peaked 3-9 months before aggregate semiconductor earnings cuts

In this cycle, estimate cuts started in July '22, and the SOX bottomed in Oct '22 after underperforming for 10.5 months.

We highlight that EPS downward revisions have paused recently. We note that pauses in EPS downward revisions in 2002, 2004, and 2019 coincided with a give-back of initial outperformance for 5-12 weeks in the early part of the cycle.

Chart 3 - ARM Revenues Growth is Driven by Royalty Rate Increases in Near-Term and Becomes Market Share Driven in Medium-Term

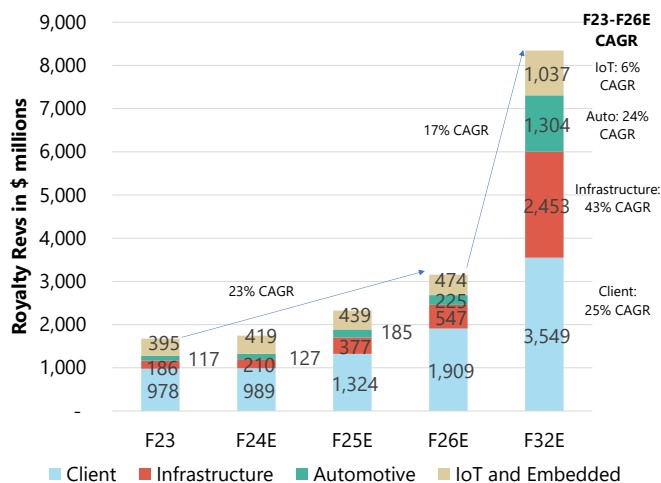
ARM Total Revenue Drivers



Source: Jefferies, company data

Chart 4 - JEF Estimated Royalty Revs by Segment

Fiscal Year Royalty Revs



Source: Jefferies, company data

Royalty Increases Provide Unique Visibility Into Near-Term Growth. One of the positive artifacts of ARM's business is that when it introduces an update to its ISA, it is usually more advanced, and ARM has successfully been able to "nudge up" its royalty rate. This is the foundation of the near-term growth story for ARM, as it recently launched its latest "v9" ISA, which we expect will be broadly adopted by the market.

Near term, we forecast ARM revenues will increase to \$4.2bn in CY25 from \$2.8bn in CY23, which we estimate will largely be driven by an increase in royalty rates across three segments (see tan part of bar chart in sidebar): Mobile (+\$400m), Consumer (+\$350m), and DC Infrastructure (+\$200m) due largely to an increase in royalty rate to 3%-3.5% from 1.7%-2.4%, in conjunction with the v9 ramp.

Long Term Upside - A Play on 3 Tectonic Shifts in Computing. Longer term, we think the expansion of ARM's portfolio into GPUs as well as into performance CPUs positions it to benefit from unit growth, ASP increases and royalty expansion across four segments (Client, Infrastructure, Autos and IoT) - due largely to three Tectonic Shifts in computing we think play out over the next 10 years:

- **AI in the Edge** - as Large Language Models (LLMs) proliferate, we expect more inferencing to occur in the handset, which would translate to higher demand for both Arm CPU and GPU technology, and view our FY32 handset ASP of \$28 and royalty rate of 4.3% as conservative
- **Datacenter** - Our fieldwork (links to notes [here](#), [here](#) and [here](#)) indicates Arm CPU instances outperform x86 by 20%, and that Arm instances now account for 8% of total public cloud CPUs, up from zero just 3.5 years ago. We model ARM at 37% DC CPU share by FY32, but believe that could approach 50%, as companies like AWS and Alibaba deliver their own, homegrown ARM CPUs, and Ampere provide merchant ARM-based CPUs to the market
- **IoT Play** - we currently model IoT ASPs flattish through FY32 at \$1.50 but believe AI could drive more ARM processing power into those devices, which in turn could drive ASPs and royalty rates higher

Chart 5 - We Estimate Bull Case EPS Power for FY32 of \$5.50

Bull Case EPS Power (FY2032)	
\$ in Millions	
Net Sales	12,128
Gross Profit	11,764
Gross Profit Margin, %	97%
Total OpEx	3,560
EBIT (Non-GAAP)	8,205
% Sales	68%
SBC	1,361
Net Income (incl-SBC)	5,652
% Sales	47%
EPS (incl-SBC)	5.50

Source: Jefferies, company data

We Estimate CY25 EPS of \$0.87 including SBC, and \$1.70 ex-SBC, w/ CY32 EPS Power Bull Case of \$5.50 including SBC

Our CY25 EPS is driven largely by our assumption that revenue growth will stem from an increase in royalty rates as mentioned above.

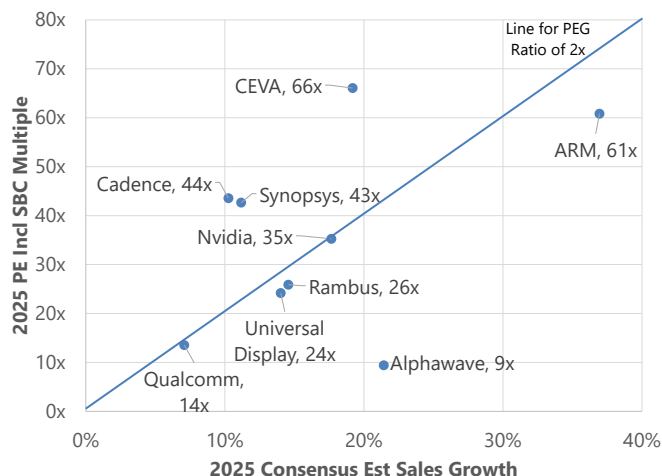
Our bull case FY32 EPS of \$5.50 implies an 18% revenue CAGR between FY23 and FY32 based on higher market penetration into cloud compute CPUs to 50%, 50% higher ASPs and Royalty Rate to ARM for IoT vs our Base Case, and 30% higher ASPs for handsets vs our Base Case.

We assume OpEx ex-SBC grows in-line with our base case at 8% between FY23 and FY32 and SBC grows in-line with OpEx beyond FY27.

The bull case assumes GMs in-line with management's target and EBIT above management's target of 60%.

Chart 6 - Our PT of \$64 assumes a 2025 PEG Ratio of 2x on 37% Estimated Rev Growth for ARM.

2025 PE Incl SBC Multiple vs 2025 Growth

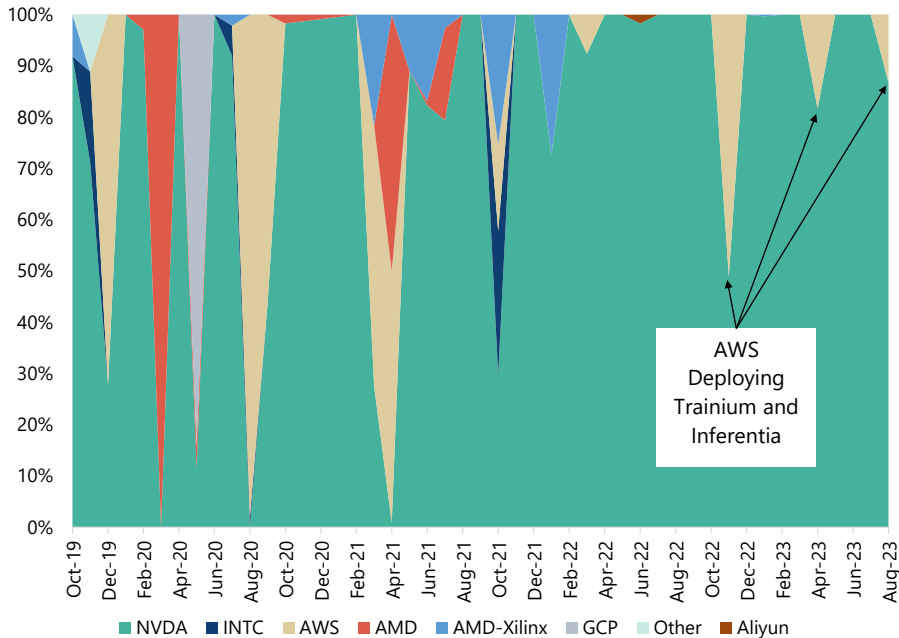


Source: Jefferies, FactSet, company data

Our PT of \$64 assumes a 2025 PEG Ratio of 2x on 37% estimated rev growth for ARM, in the 1.9x-4x range of ecosystem/IP peers (see chart in sidebar to the right). This translates to a P/E ratio of 74x our CY25 EPS including SBC of \$0.87, and 38x our CY25 EPS ex-SBC of \$1.70. These P/E ratios are at a premium to the market, but we believe will hold due to

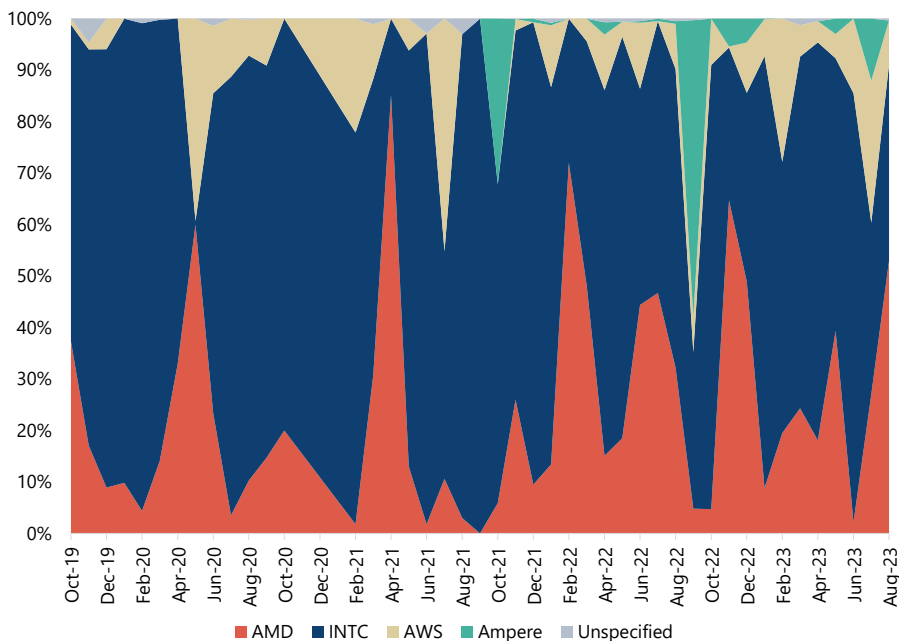
1. Arm's position as a de facto standard in handsets, with upside potential as an AI-Edge play, which we think would lead to higher ASPs and higher royalty rates
2. Arm emerging as a share gainer in the datacenter near-term in CPUs, and longer term on the CPU+GPU front
3. Its market share leadership position in IoT, which could translate to higher units, increased ASPs and higher royalty rates
4. Excellent visibility into revenue growth, driven by royalties near-term, and the combination of units, ASPs and royalty rates in four separate segments longer term

Chart 7 - NVDA has made up nearly 100% of incremental accelerator deployments over the past 18 months
Incremental Accelerator Instances Deployed by Month



Source: Liftr Insights, Jefferies. More current and detailed data available by Liftr Insights.

Chart 8 - Over the past year, AMD's percentage of total incremental instances deployed has averaged ~27% vs INTC at 56%, AWS at 10%, and Ampere at 6%
Incremental CPU Processor Instances Deployed by Month



Source: Liftr Insights, Jefferies. More current and detailed data available by Liftr Insights.

We look at processor and accelerator instances made available to rent in public cloud at 6 top CSPs. This chart shows incremental accelerator instances deployed each month

NVDA Accelerators have accounted for nearly 100% of new deployments since Feb-22. It accounted for 49% in Nov-22 (AWS Trainium launch), 82% in Apr-23, 87% in Aug-23 and ~100% in all other months since Feb-22.

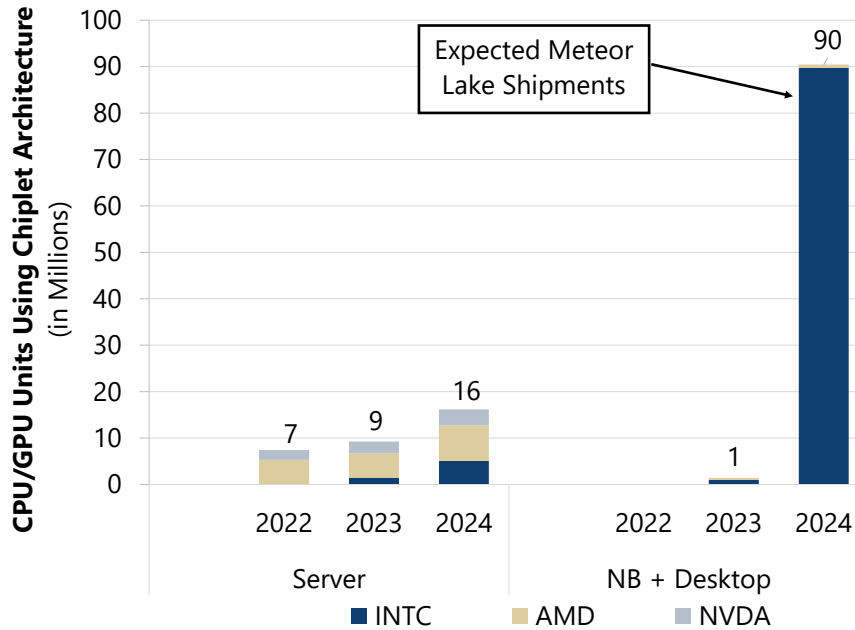
This chart shows incremental CPU instances deployed each month across the top 6 CSPs. AWS and Ampere CPU deployments are in brown and green, INTC CPU in dark blue, and AMD is in orange

AWS (tan) started deploying its Graviton CPU instances in 2019, while Ampere (green) started deploying in 2021

AMD's cumulative share of total instances has increased from 15% in Apr-22 to 20% in Aug-23

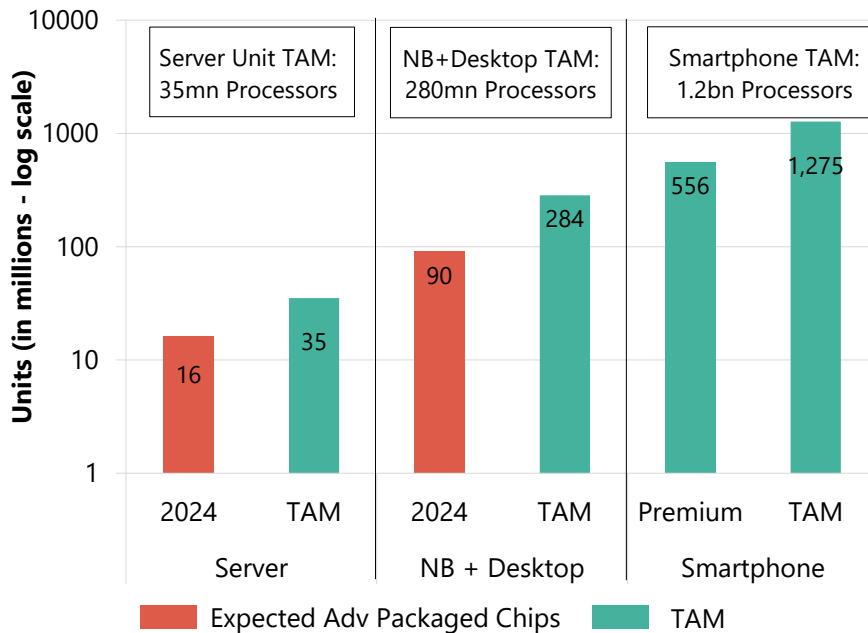
INTC's cumulative share has decreased from 78% in Apr-22 to 71% in Aug-23

Chart 9 - We Expect The Number of Chips That Ship Using Advanced Packaging Will Increase by 10x Over The Next 18 Months



Source: Jefferies, Mercury

Chart 10 - Should Advanced Packaging Penetrate Handsets, That Would Present a 100x Unit Opportunity over 2023



Source: Jefferies, Mercury, Gartner

AMD was one of the early volume users of advanced packaging for its server CPUs. NVDA embraced the technology for its A100/H100 processors, which use HBM and TSMC's CoWoS/2.5D packaging techniques. More recently, Intel's Sapphire Rapids server CPU shipped using advanced packaging to stitch together four 400mm² die, with some versions also using HBM, and we expect this will be followed by its Emerald Rapids server CPU in 4Q23

In aggregate, we estimate that in 2023, about 9 million datacenter processors will ship using advanced packaging technology, and that will expand to 16m in 2024

Perhaps more exciting, is that INTC expects to launch its first high-volume CPU that uses advanced packaging in 2H24, called Meteor Lake

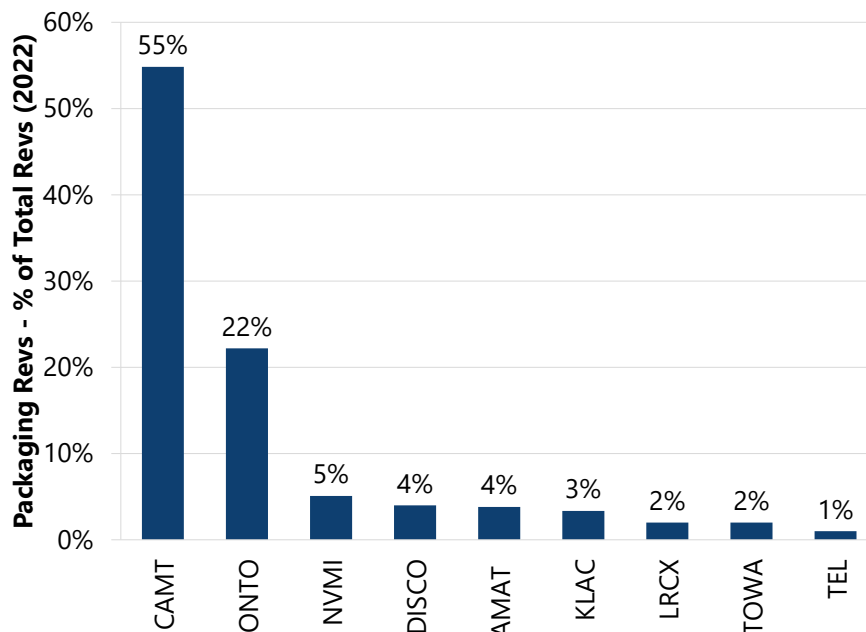
Meteor Lake uses a quad-tiled chiplet architecture using INTC's Foveros packaging technology. Post Meteor Lake, Intel's Arrow Lake is expected to launch late 2024 and is also expected to be a chiplet design. In 2024, Mercury expects INTC to ship 90m Meteor Lake and Arrow Lake CPUs

In the next 3-to-5 years, we expect chiplet architectures to capture 90-100% of the server and notebook/desktop units sold annually. This implies chiplet designed server processors units could grow 2x from 16mn to 35mn. In NB/desktop markets chiplet designed processor units could grow 3x from 90m to 280m

The dream scenario for the advanced packaging players would be the handset market. We believe that advanced packaging penetration into this market could potentially be driven by the demand for Large-Language-Models to be inferred locally in handsets, for the purposes of lower latency response to GenAI queries or the need to use LLMs while offline. We estimate the premium Smartphone market at over 500m units annually, while the TAM of all Smartphones to be approach 1.3bn units

Chart 11 - CAMT, ONTO Have Highest Rev Exposure to Packaging

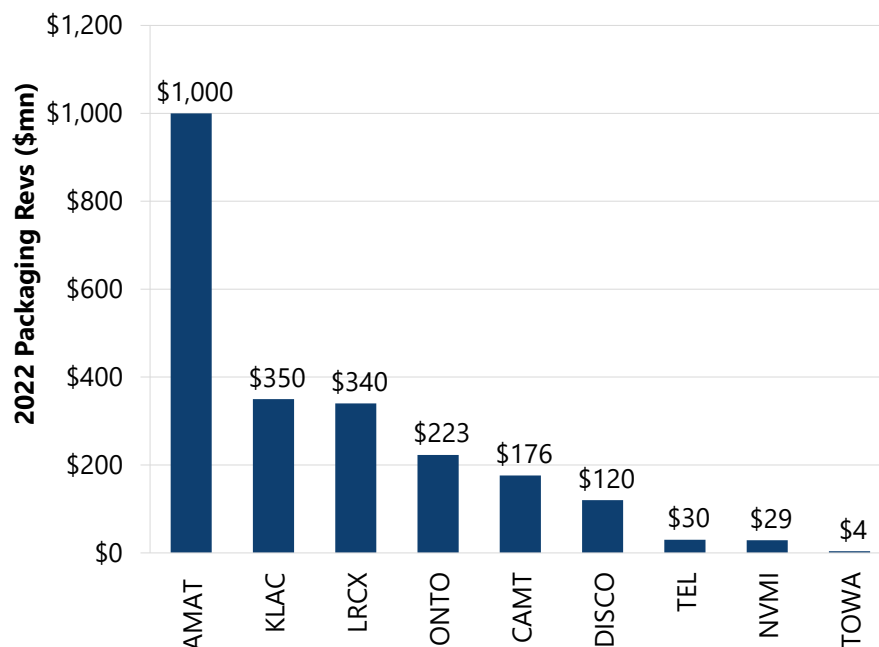
CAMT and ONTO have the highest packaging revenue exposure in our coverage universe



Source: Jefferies, Mgmt. Commentary, TechInsights

Chart 12 - AMAT has Highest Revs from Advanced Packages

AMAT has the highest revenues from packaging applications



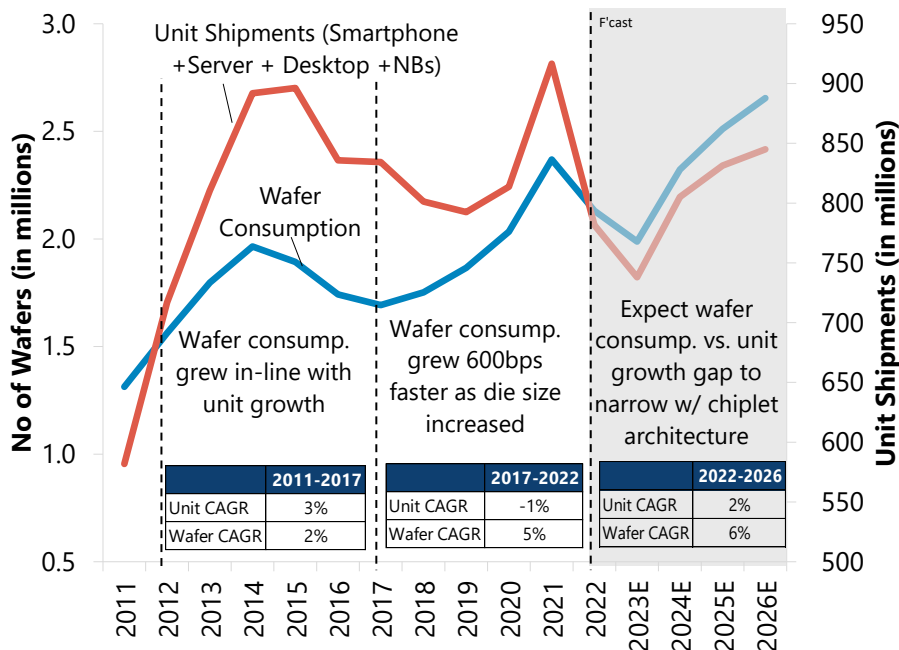
Source: Jefferies, Mgmt. commentary, TechInsights

Chart 13 - Semicap Earnings Recap

WFE Outlook		
2023 WFE Outlook: ~\$75bn	LRCX	"We see WFE spending in 2023 tracking to mid-\$70B range vs. prior low \$70s range, with the upside coming from domestic China-related spending, and strong growth in HBM demand"
	KLAC	"WFE outlook for 2023 remains largely unchanged at down approximately 20% from \$95 million in 2022."
Advanced Packaging		
All SCE companies in our coverage noted strong growth in packaging with growing investment in HBM and chiplet architectures. Most expect growth to continue into 2024	LRCX	" HBM and 3D chip stacking is a very fast-growing part of our business. " "what I would say is in this environment, those are the tool sets that people are actually pulling for in terms of accelerated deliveries "
	KLAC	" Packaging is a small part of the business right now but is growing "
	TER	" ...Although HBM represents a small portion of the overall memory market, it is in a rapid growth phase, moving from under 5% of the test market last year to 10% to 15% of the market in 2023 "
	CAMT	" We're definitely seeing customers are more ready to place orders. We're seeing a much higher conversion from the pipeline into the backlog. And if we look at the overall backlog for 2024 plus the pipelines , so we think we have a good visibility moving forward, and this goes to our expectation towards 2024"
	ONTO	"...surging demand for our Dragonfly inspection systems to support heterogeneous packaging and high-bandwidth memory customers..." "our support specifically for AI devices, i.e., NVIDIA and some of the CoWoS and HBM that were mentioned that we can see continuing to strengthen straight through the year... "
	AMAT	" Packaging, that's \$1 billion business for us now and we see an opportunity to double that over the next few years "
Trailing Node Demand		
SCE Companies noted continued strength in trailing node demand. Most companies haven't seen signs of this demand rolling over	LRCX	" ...continued strength in the specialty node investments , which are serviced by our Reliant systems business" "We haven't yet seen demand for those trailing-edge technologies to really be rolling over. "
	TER	"Automotive demand has remained strong "
	NVMI	Spread across IoT, automotive and advanced packaging
	ONTO	" Revenue from our power device customers grew over 35% and included our product portfolio of inspection, metrology and software solutions. This was our largest market in the quarter " " we see power semiconductors for the fourth quarter remaining fairly strong "
	AMAT	"...The ICAPS business growth has been strong enough to offset weakness in NAND and leading logic... " "We see ICAPS demand as sustainable , as these customers are delivering enabling technology for large, global inflections that will play out over the next decade.
Memory & Leading Edge Logic Spending		
Utilization remain low; limited signs of recovery in memory market. In Leading-edge logic, KLAC noted seeing higher forecast for utilization vs. prior Qtr	LRCX	" ...NAND spending is at the lowest levels we've seen since the advent of the 3D NAND architecture... " " ...we haven't really seen utilizations getting any better "
	KLAC	"...While the timing of a meaningful resumption in WFE investment growth remains unclear " " ...where utilization rates are higher than what have been forecasted by our customers at the beginning of the year, specifically in leading-edge logic foundry. So that has been an upside. " ...Memory looks a little bit slower in that regard...not really seeing any changes in overall utilization rates in memory "
	TER	"Memory Test, the growth of DDR5 and HBM devices for data center applications are driving retooling" " continued weakness in mobility has been offset by sustained strength in the automotive segment "
	ONTO	" We still see headwinds in the advanced nodes, primarily from DRAM manufacturers, and we expect revenue to decline again in the third quarter, which we believe will mark a bottom for front-end memory overall. We're optimistic for a possible recovery in the second half next year as customers like Samsung are beginning to talk about the launch of new smartphones and PC promotions in the second half of 2023 being a catalyst for customer inventory reductions going into next year"

Source: Jefferies, Company data, FactSet

Chart 14 - We Expect Wafer Consumption to Grow 400bps Faster than Unit Shipments



Source: Jefferies analysis. Unit shipments based on Counterpoint, Mercury and Gartner. Wafer consumption calculated based on die size data from Anandtech, techpowerup.com, wccftech.com, Locuza, Company data

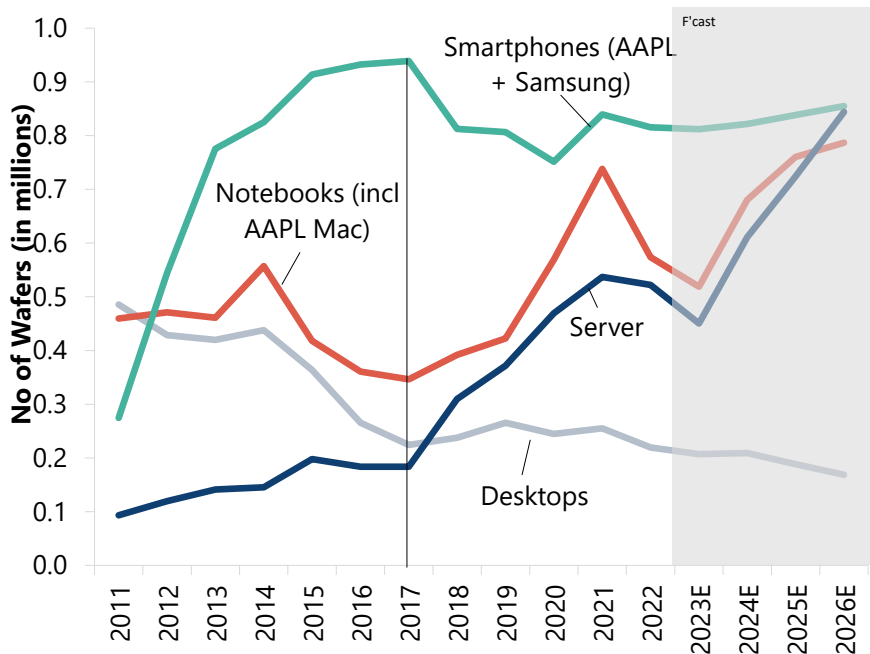
We use chip size data coupled with unit shipment data to calculate the increased demand for wafers for the Server and Client CPU and Smartphone markets

We show that from 2011 to 2017, when the die size remained constant, wafer consumption grew at CAGR of 2% in-line with chip unit growth of 3%.

From 2017 to 2022, the wafer consumption grew at a CAGR of 5%, 600bps faster than chip unit growth as the die sizes increased.

Over the next 4 years, we forecast wafer to consumption to continue to grow faster than chip unit growth. However, we expect the gap in growth rates to narrow, as chipmakers have adopted advanced packaging techniques such as chiplet architectures that consist of a larger number of smaller dies connected in a high performance package.

Chart 15 - Expect Server Wafer Volumes to Match Smartphone Wafer Volumes by 2026



Source: Jefferies analysis. Unit shipments based on Counterpoint, Mercury and Gartner. Wafer consumption calculated based on die size data from Anandtech, techpowerup.com, wccftech.com, Locuza, Company data

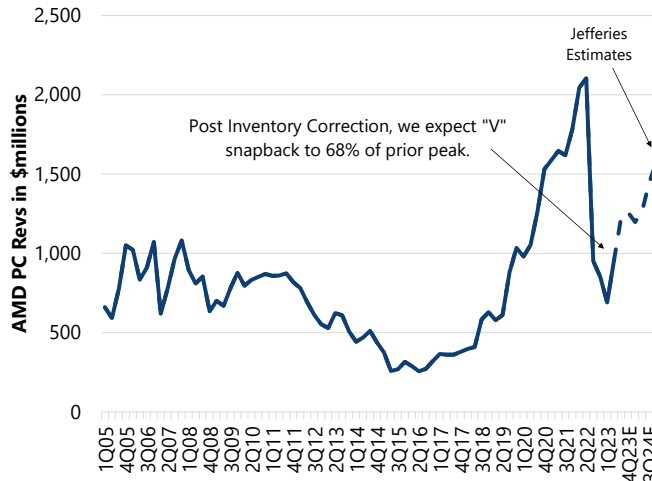
With faster CPU/GPU unit growth in server market coupled with die size increases, we expect server wafer volumes to approach smartphone wafer volumes by 2026 growing to ~845k wafers.

We estimate that server wafer consumption has grown at a CAGR of 23% from 2017 to 2022, with die size increases and 4% unit growth.

Over next 4 years, we expect server wafer consumption to grow at a CAGR of 13%; and we expect server wafer volumes to match smartphone volumes,

Chart 16 - AMD PC Revs Well Below Trendline

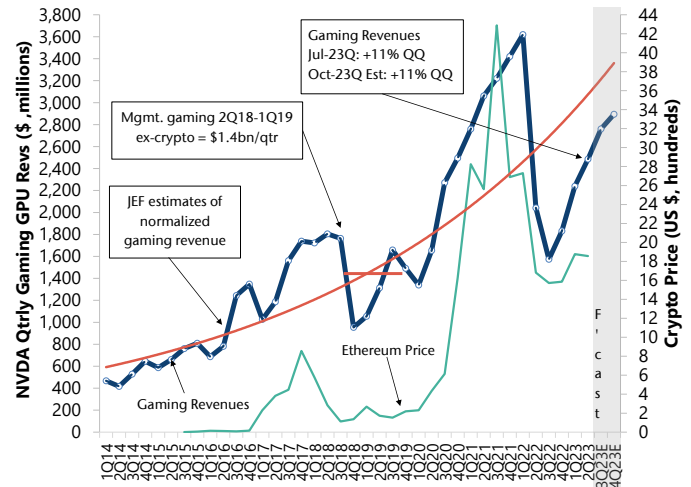
AMD Quarterly PC Revs in \$ millions



Source: Jefferies, company data

We estimate 2023 client revs of \$4.4bn, with 2H over 1H snapback on channel normalization. AMD reiterated its 2023 PC market guidance of down ~10% YY or ~260m units.

Chart 17 - NVDA Gaming Revenues Well Below Trendline



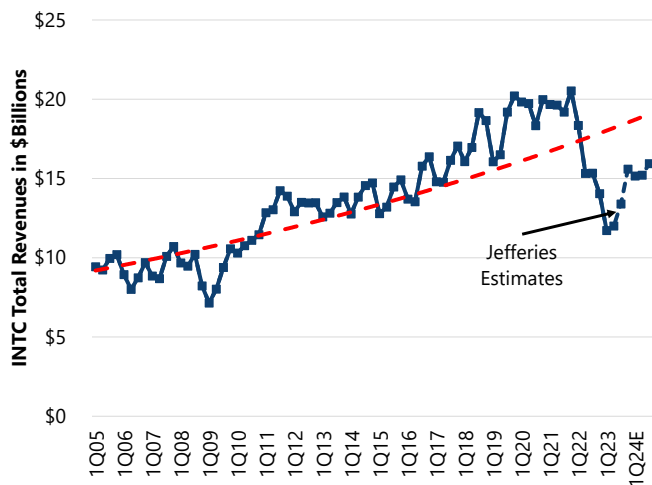
Source: Jefferies estimates, company data. Red line is exponential curve fit to NVDA gaming revs.

Gaming GPU revenues posted a stronger than expected 16% QQ increase, primarily attributable to ramp of new Ada Lovelace GPUs, partly offset by lower shipments of SoCs for game consoles.

Mgmt expects gaming to grow up QQ with strong growth in the Apr-23Q. For Apr-23Q, we model 8% QQ growth for gaming.

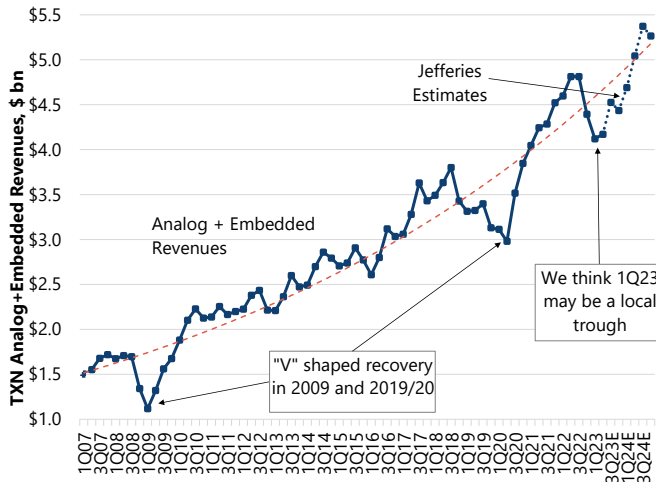
We believe INTC is materially undershipping end demand in 1H23; thus, we model a "V"-shaped snapback post inventory correction. We model snapback in 2H23 with 2H v 1H rev growth of 29%.

Chart 18 - INTC Revenues Well Below Trendline



Source: Jefferies, company data

Chart 19 - TXN Core Semi Revs Well Below Trendline

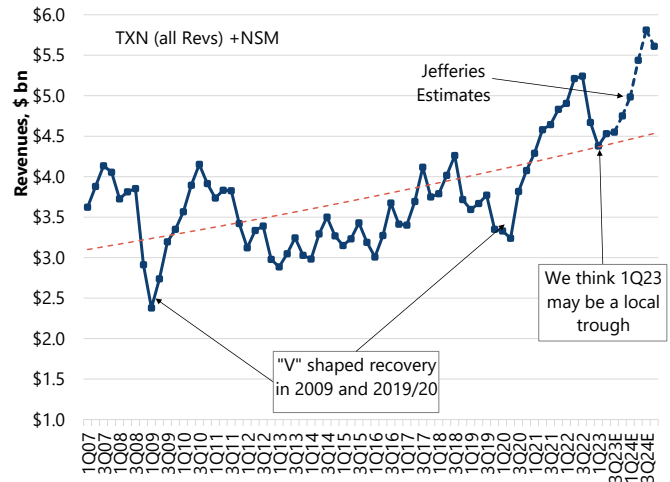


Source: Jefferies, company data; Jefferies estimates post 1Q23

We model a "V" recovery to start in 2H23, similar to the 2009 and 2019/20 cycles. TXN revs took 2 quarters to find the bottom in 2009 and again in 2019 before COVID hit and drove another leg down. TXN revs only took 2-to-4 quarters off the bottom to exceed previous peak revenues in both 2009/10 and 2021 recovery periods.

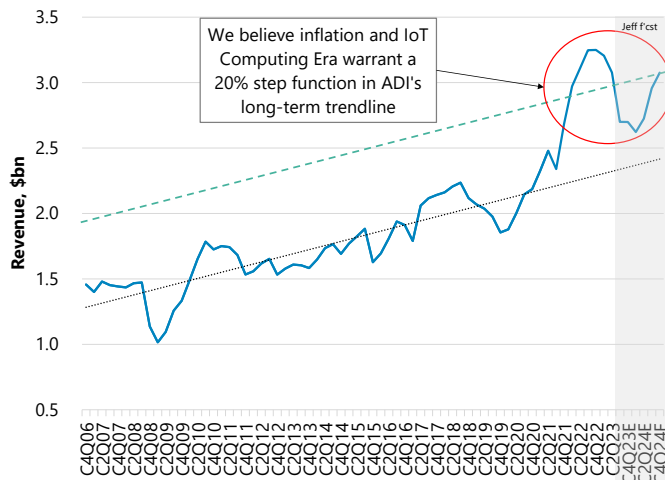
TXN's Core i.e. Analog+Embedded revs appear to be a low long-term trendline, but when considering all TXN revs and pro-forma revs of National Semiconductor (acquired in Apr-2011), TXN revs are at the long-term trendline.

Chart 20 - TXN Revenues At Trendline, When Looking on Pro-Forma Basis



Source: Jefferies, company data; Jefferies, company data; TXN revs adjusted pro-forma for NSM

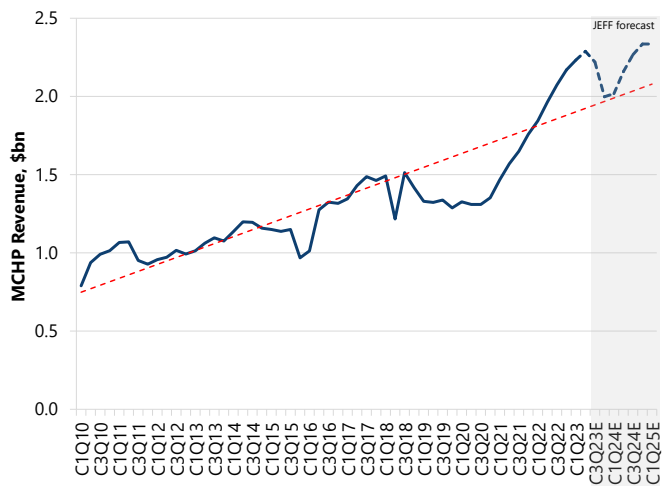
Chart 21 - We Model ADI Revs Decline by 17% Peak-to-Trough before Asymptoting to a Level 20% Higher than Historical



Source: Jefferies forecast C2Q23-onwards, FactSet. Pro-forma ADI+LLTC+MXIM revenues through MXIM acquisition closure in Sep-21

We forecast ADI QQ revenues decline by 8% QQ in the JulQ and by 10% in the AugQ before rebounding in the JanQ and through CY2024, back to what we view as its new normalized growth level

Chart 22 - We Model MCHP's Revs to Decline 3% QQ in SepQ and 10% QQ in DecQ

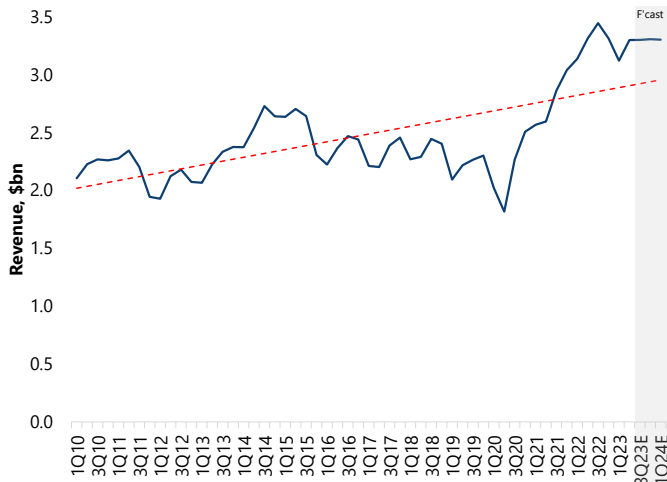


Source: Jefferies, company data; MCHP revs pro-forma for ATML and MSCC acquisitions

MCHP guided SepQ growing revs in the range of -3% to 1% QQ and expects DecQ weaker than seasonal (DecQ - weakest Q in the year)

We model MCHP's revs declining 10% QQ in DecQ reflecting a 13% peak-to-trough revs decline followed by a snapback in C2024

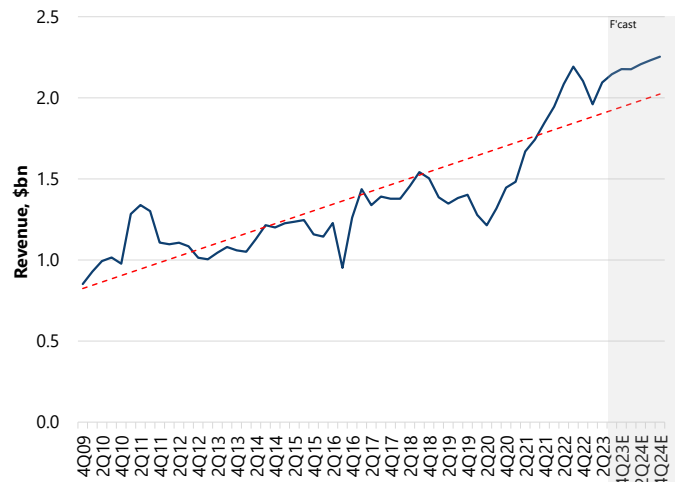
Chart 23 - NXPI's Revenues Above Trendline in 2H23



Source: Jefferies, company data; NXPI revs pro-forma for FSL acquisition

We are modeling a rev decline of 1% YY in C2023 to account for an inventory correction. Our model forecasts NTM earnings estimates to decrease by 2% in 2023. NXPI bottomed with-or-shortly-after estimate cuts started in past 4 cycles

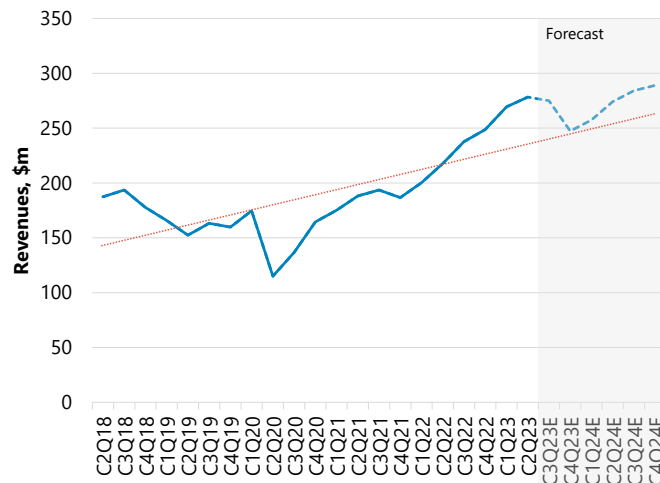
Chart 24 - We Model ON's Revenues Above LT Trendline



Source: Jefferies, company data; ON revs pro-forma for FCS

ON is expecting 3Q23 Revs to grow by 2% QQ, with growth expected from Auto and Industrial segments, while Other down mid to high single digits. We note that ON is expecting SiC revenues to be a growth driver in C23 and beyond while it expects to continue exiting non-core low-margin businesses

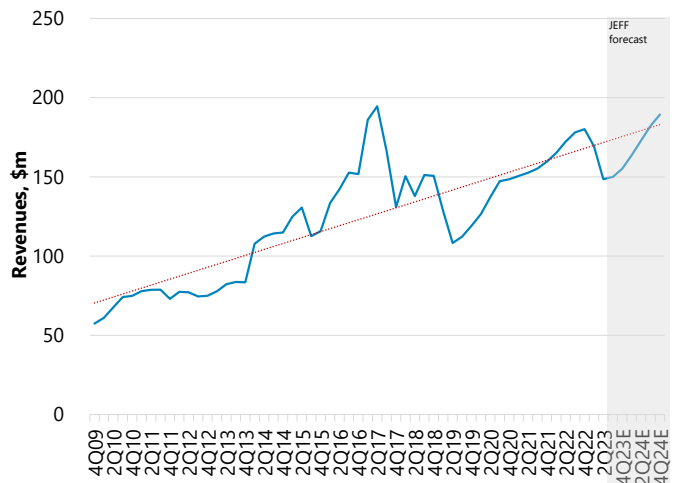
Chart 25 - We model ALGM's revs to increase 18% in C2023 and 3% in C2024, being at and above trendline levels



Source: Jefferies, company data

ALGM expects QQ revenues to decline by 1% in C3Q23, and we expect revenues to trough in C4Q23 with a 10% QQ decline before rebounding in C1Q24

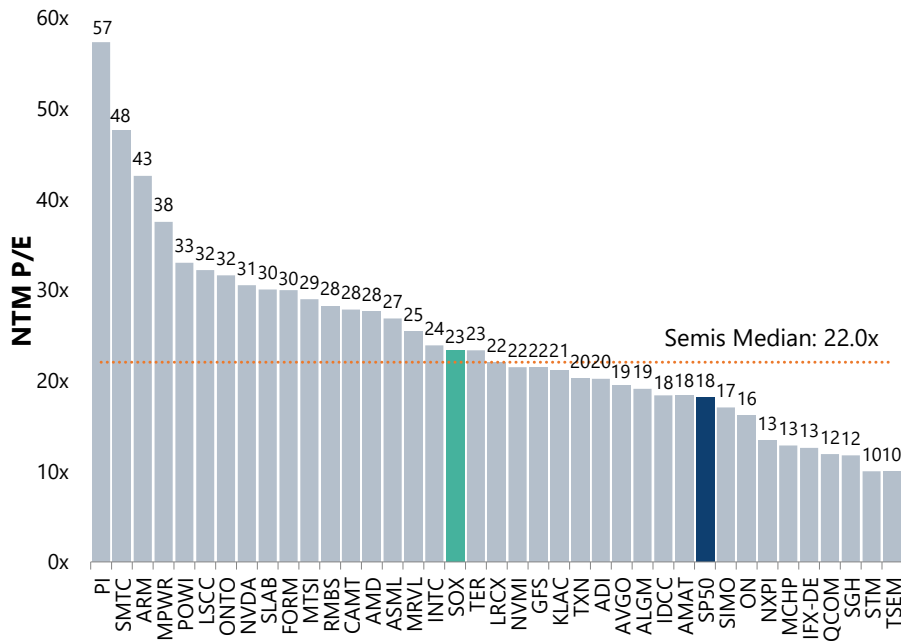
Chart 26 - We model MTSI revenues to decline by -10% in C2023, and to increase by 14% in C2024, exiting the year above trendline



Source: Jefferies, company data

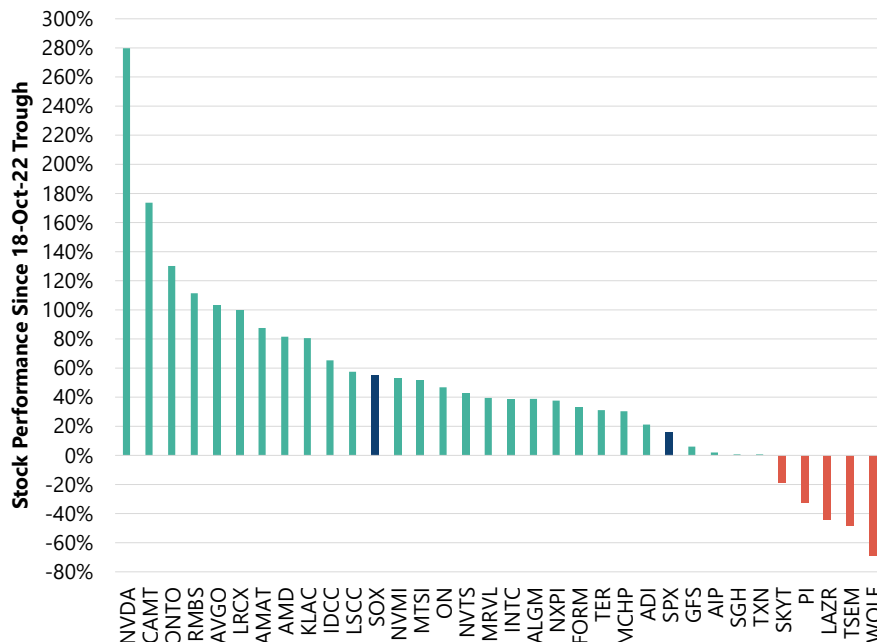
MTSI guided 1% QQ revenue growth in 3Q23, and we expect QQ revenue growth from there onwards, being below trendline in C2023, and exiting C2024 above trendline

Chart 27 - Semis Companies' Valuations on NTM P/E



Source: Jefferies, FactSet. Footnote: The chart includes companies that are outside of our coverage.

Chart 28 - Stock Performance of Coverage Universe Since 18-Oct-22 Relative Trough of SOX vs SPX



Source: Jefferies, FactSet

The SOX P/E currently trades at a 29% premium vs the SP50 PE.

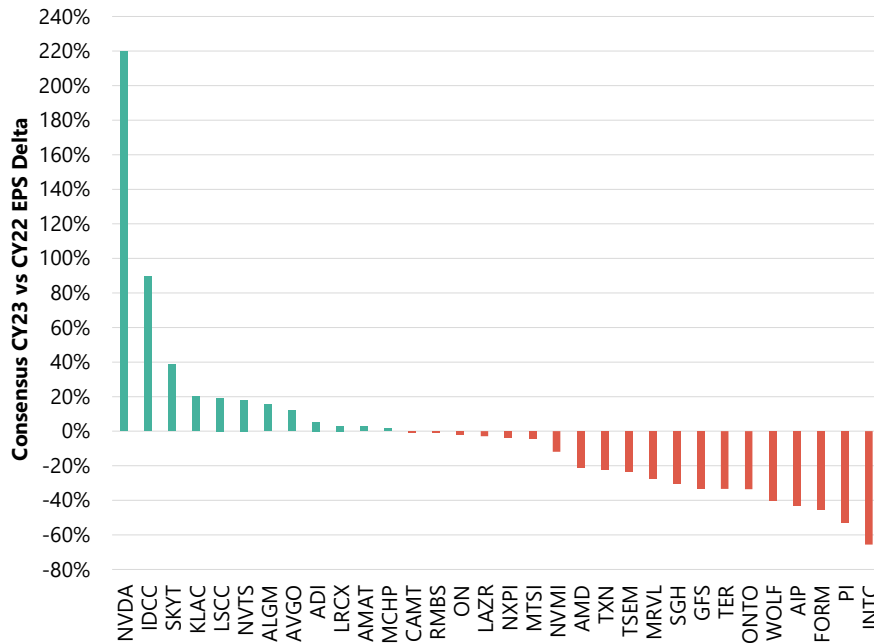
The median P/E in this semiconductor sample is 22.0x, 21% higher than the SPX and 6% lower than SOX, reflecting the skew of the index toward higher P/E, larger cap stocks like NVDA.

Historically, semis bottomed at a trough P/E of a 20-25% discount to the SPX.

NVDA and CAMT lead performance in coverage group since the 18-Oct-22 relative trough of SOX vs SPX, each with 280% and 174% growth since the 18-Oct-22 trough respectively.

WOLF, TSEM, LAZR, PI and SKYT are the only ones that have underperformed since the 18-Oct-22 trough.

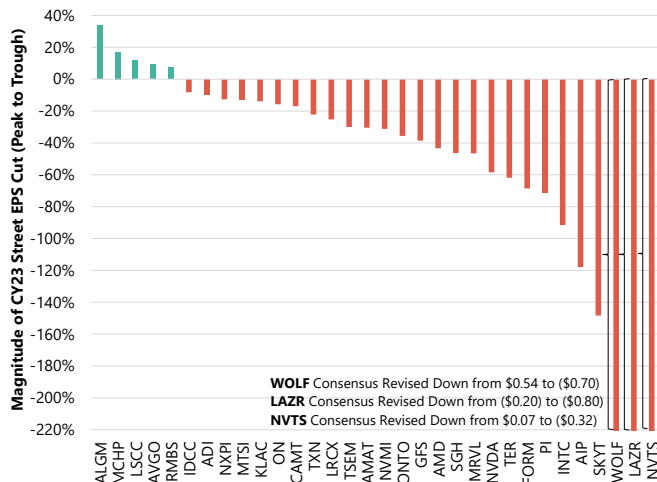
Chart 29 - CY23 vs CY22 EPS Delta for Covered Companies



NVDA, IDCC and SKYT leads expected CY23 EPS change over CY22, while INTC, PI, FORM and AIP are expected to see CY23 EPS decline the most over CY22.

Source: Jefferies, FactSet

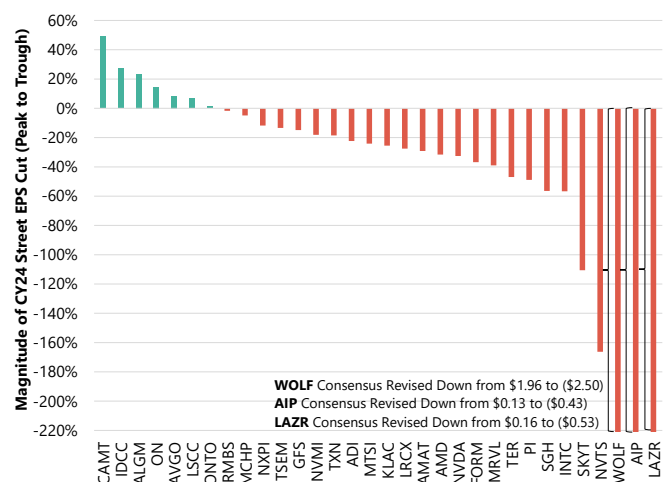
Chart 30 - CY23 EPS Peak to Trough Revisions



Source: Jefferies, FactSet. For companies with positive EPS revisions, we utilize May-22 as the reference date to calculate upward revisions from.

ALGM, MCHP, LSCC, AVGO and RMBS, have not seen their estimates for CY23 EPS cut materially by consensus. For these companies, we compare EPS estimates as of May-22 vs today's EPS estimates.

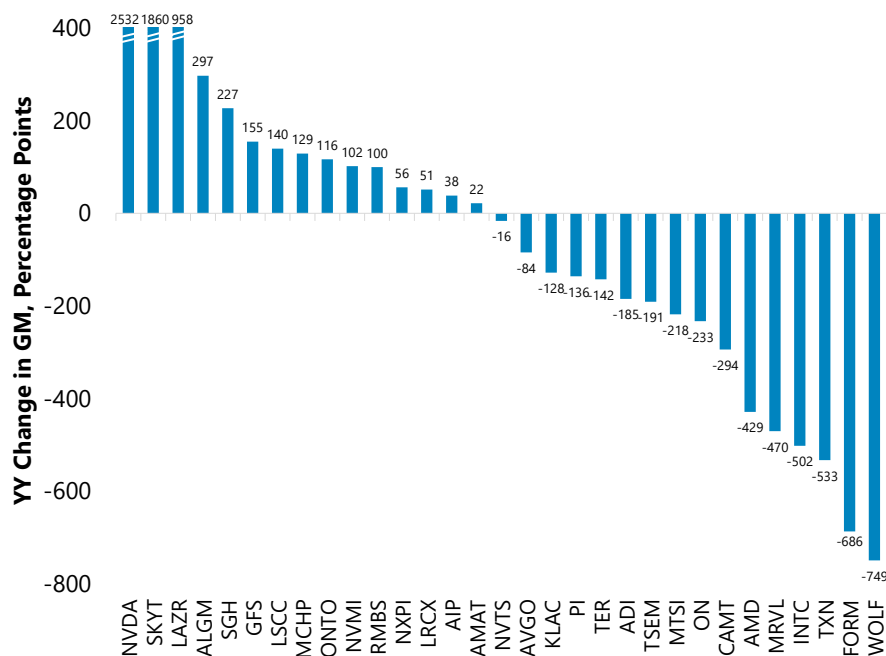
Chart 31 - CY24 EPS Peak to Trough Revisions



Source: Jefferies, FactSet

CAMT, IDCC, ALGM, ON, AVGO, and LSCC have not seen their estimates for CY23 EPS cut materially by consensus. For these companies, we compare EPS estimates as of Feb-23 vs today's EPS estimates.

Chart 32 - Change in GM from 2Q22 to 2Q23



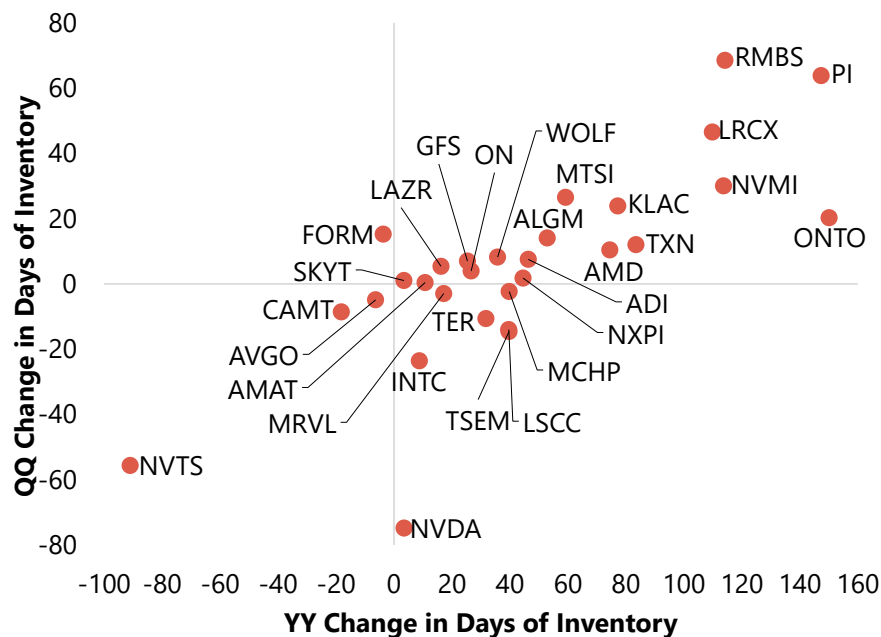
Source: Jefferies, company data; Non-GAAP GM

In 2Q23, NVDA saw the largest margin increase (~2530bps), followed by SKYT (~1860bps) and LAZR (~960bps).

WOLF and FORM saw the largest GM declines in 2Q22 vs 2Q23 as the GM delined by ~750bps and ~685bps, respectively

Inventory and Lead Time Charts

Chart 33 - Thus far, 18 out of 29 companies have reported QQ and YY increase
QQ/YY Change in Days of Inventory

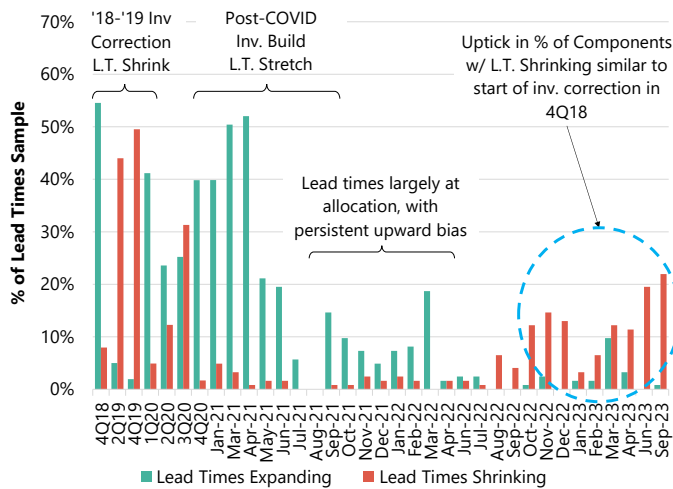


Source: Jefferies, company data

Within our coverage, all semis except NVTS, FORM, CAMT, INTC, MCHP, TER, TSEM, LSCC, MRVL, AVGO and NVDA reported 2Q23 earnings saw QQ and YY DOI increases.

Ultimately, we would expect higher DOI to translate to lower lead times, and ultimately lead to an inventory correction

Chart 34 - Lead Times Declining for 22% of Our Sample in Sep

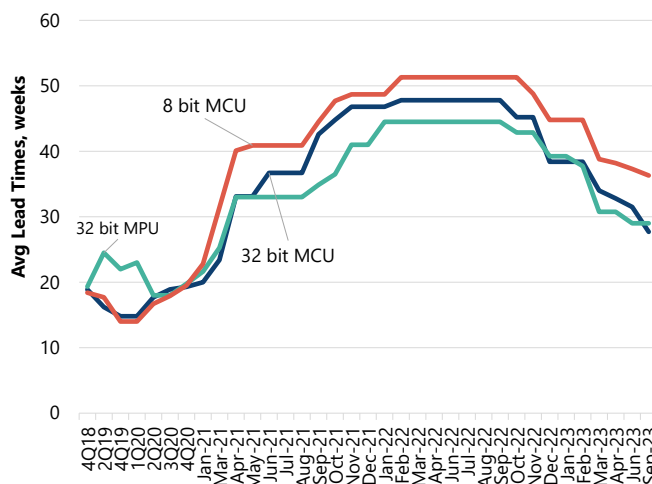


Source: Jefferies, Future Electronics Market Conditions Reports

Lead times started contracting in August 2022. In Sep-23, lead times contracted for 22% of our sample vs 20% in May-June, the highest level this cycle. We expect the inventory correction to play out for most analog and MCU companies during 2H23

Chart 36 - 8 bit MCU and 32 bit MCU Lead Times Down in Sep

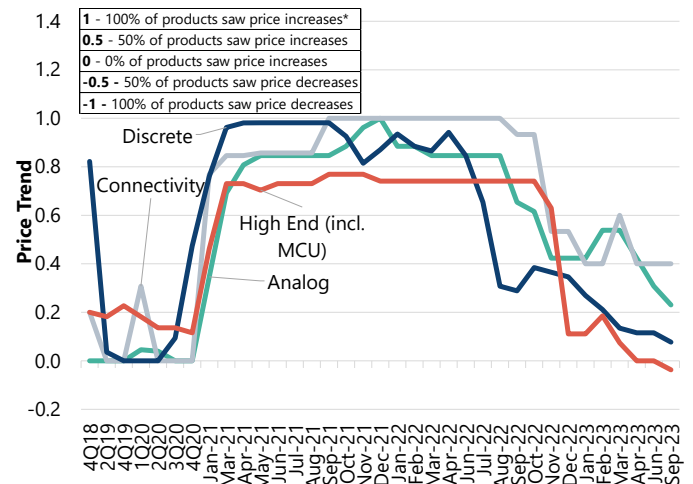
Avg Lead Times Across Players in the MCU/MPU Selected Categories



Source: Jefferies, Future Electronics Markets Conditions Reports

32-bit and 8-bit MCU lead times continued to decline in September, while 32-bit MPUs lead times were stable

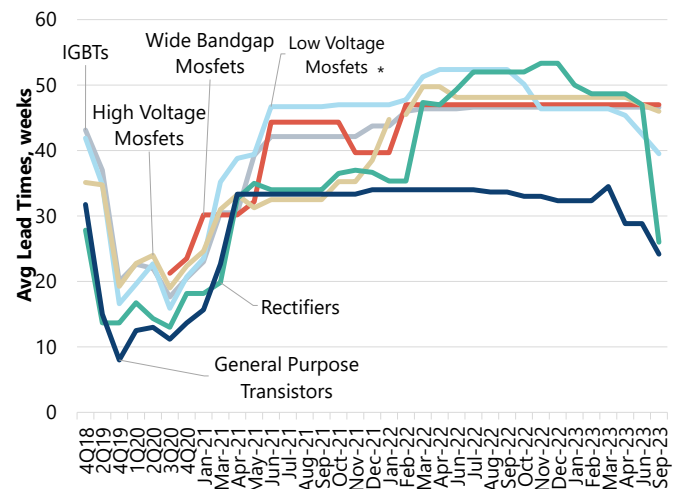
Chart 35 - Except for Connectivity, Analog Trended Down in Sep-23 Pricing Trends



Source: Jefferies, Future Electronics Markets Conditions Reports; *during the reported period

Although we do not have raw ASP data, we plotted directional indicators for semiconductor pricing ("down," "flat," "up" as a score "-1", "0", "1"). We note that pricing started the flattening process in August - September with only 1 in 8 components seeing price increases vs 4 out 5 a year ago. In Sep, the overall score for the data set was 0.13 (down from 0.17 in June), with 1 component (in High-end/MCUs) indicating negative pricing trends. This is consistent with our channel checks that indicate much lower tolerance in the supply chain for premium pricing.

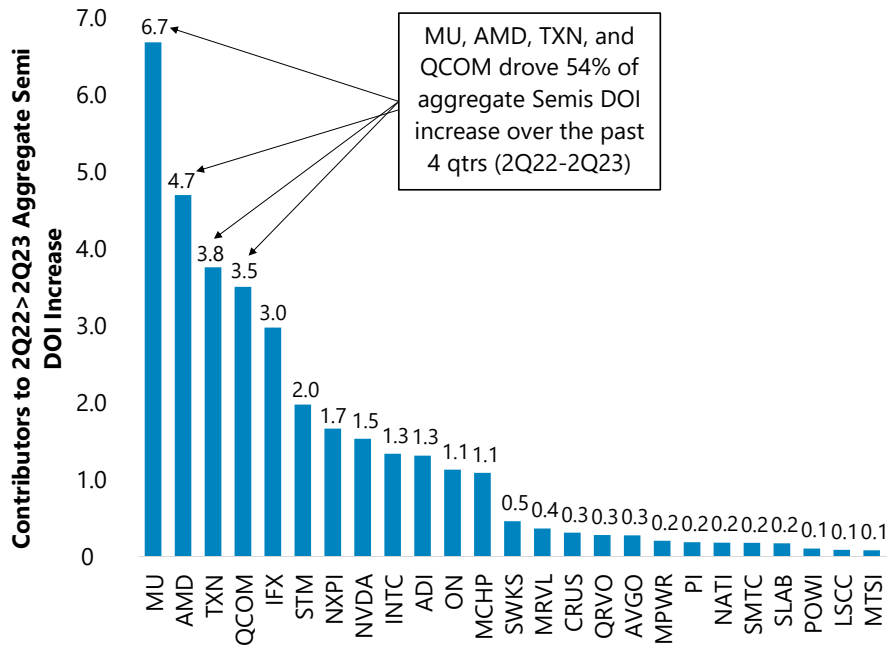
Chart 37 - High/Low Voltage Mosfets, Rectifiers and General Purpose Transistors Lead Times Down in Sep



Source: Jefferies, Future Electronics Markets Conditions Report; * in Feb-2022 FEMC report has stopped tracking ON-Fairchild MOSFETs resetting the lead times for the group, ex-ON-Fairchild Jan-22 level was at 45 weeks increased by 1 week in Feb-22

In Discretes, lead times declined for 17 components, 12 of them from ON. Lead times increased for MCHP's WBG MOSFETs by 4 weeks on average.

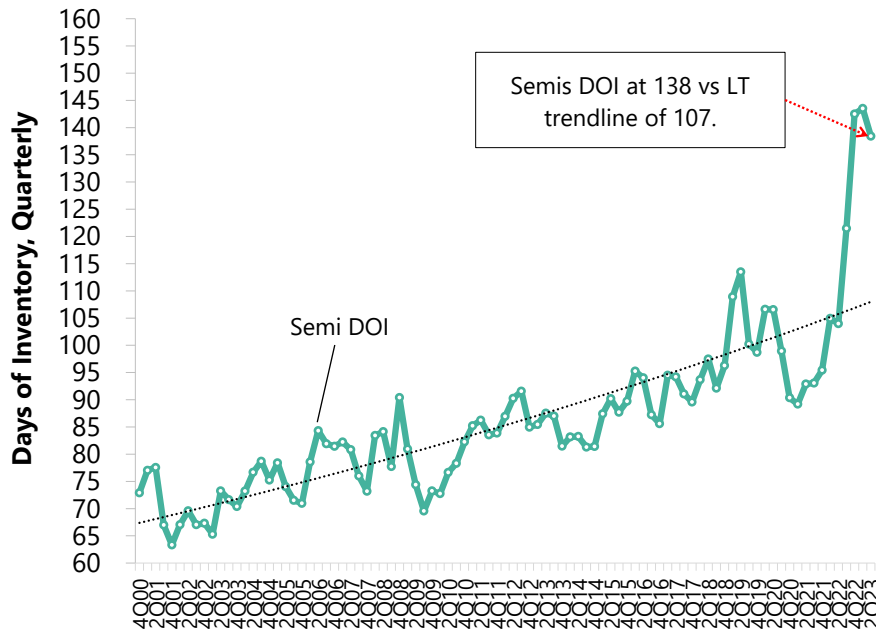
Chart 38 - 54% of the Past 4Qs Increase Comes from 4 Players



The largest contributors to the DOI increase over the past 4 quarters were MU, AMD, TXN, and QCOM

Source: Jefferies, FactSet

Chart 39 - Semis Days of Inventory



Semis DOI is at 138 days in 2Q23, down 5 day QQ, far above the LT trendline of 107 days.

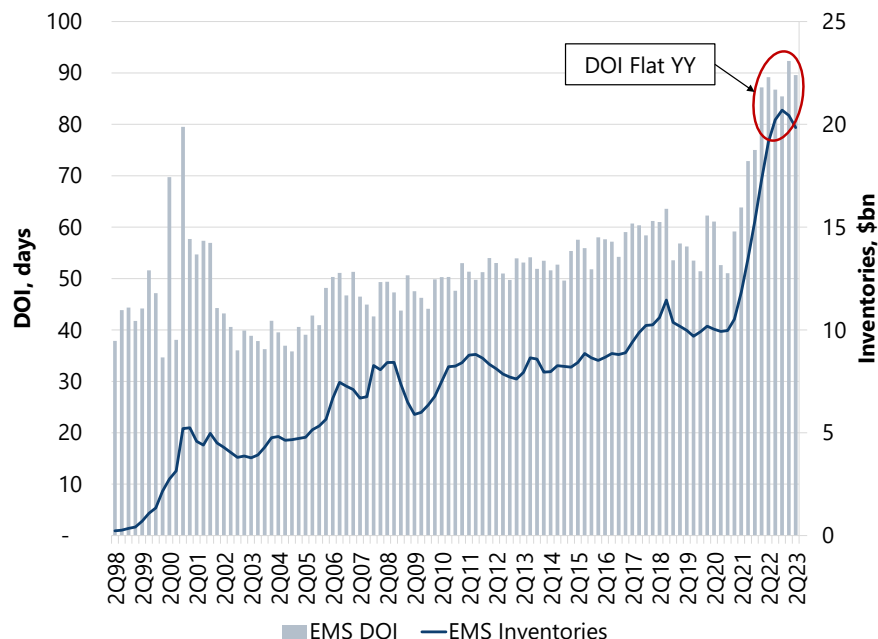
In 1Q23, DOI increased by 1 day QQ to 144 days. In 4Q22, DOI increased by 21 days and was at 143 days. This followed a 17 days increase in 3Q22.

We believe higher Semi DOI will ultimately lead to a loosening of component availability in 2023.

Source: Jefferies, company data, FactSet

Chart 40 - EMS DOI Decreased 3 Days QQ from 1Q23

EMS Inventory and DOI

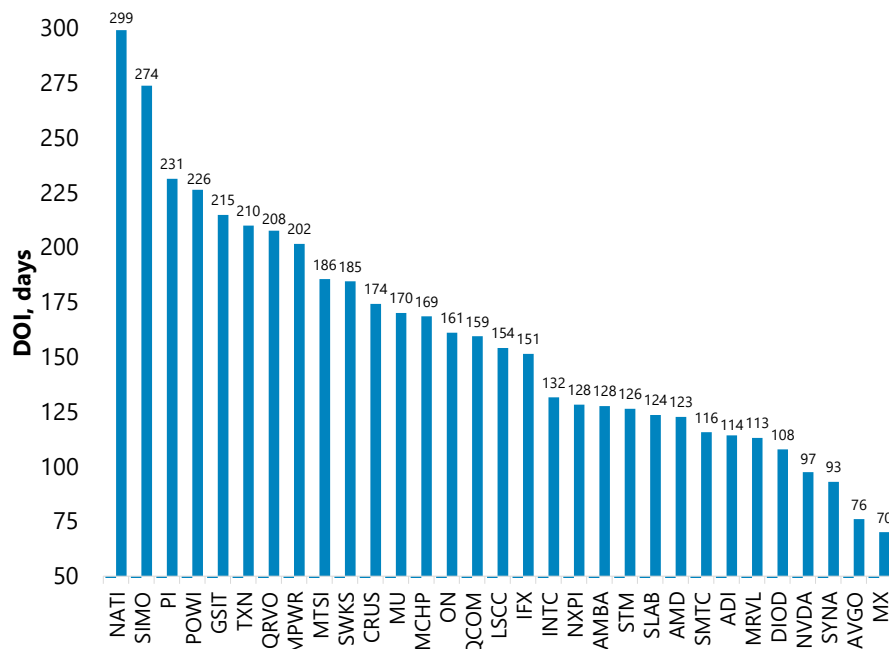


In 2Q23, EMS DOI remained flat YY and decreased by 3 days QQ to 90 days. In dollar terms, Inventories increased by \$692m YY and decreased by \$590m QQ. We believe that buildup of partly-built manufacturing kits is driving the increase.

EMS sample includes Celestica, Jabil, Flex, Sanmina, Plexus and Benchmark Electronics.

Source: Jefferies, Factset, company data; EMS sample includes CLS, JBL, FLEX, SANM, PLXS, BHE.

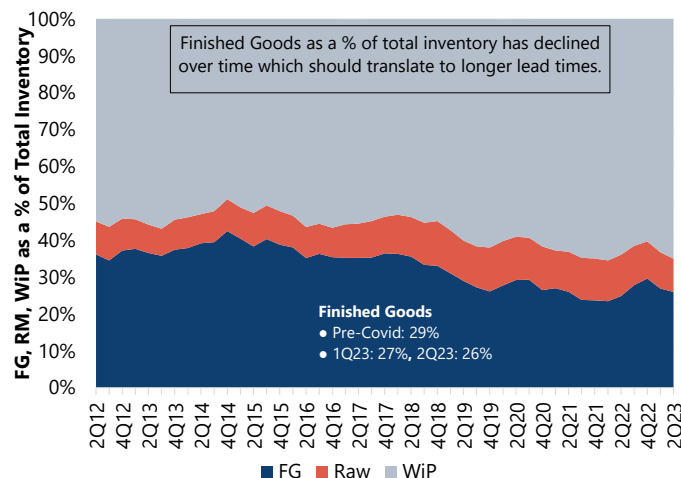
Chart 41 - 2Q23 DOI Inventory for Semiconductors



Median DOI for sample is 154 days

Source: Jefferies, FactSet

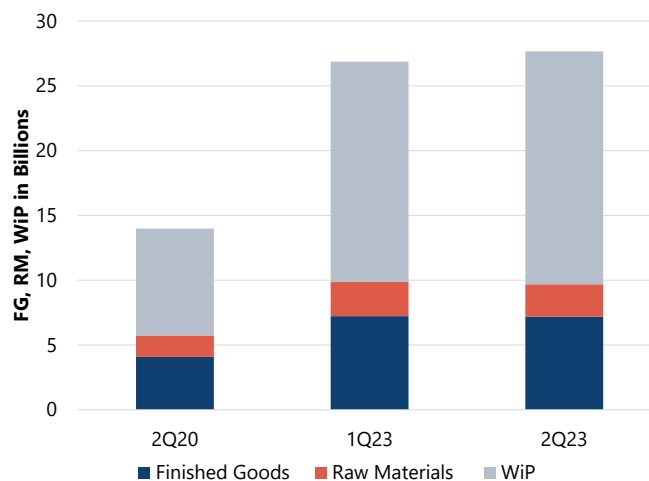
Chart 42 - Finished Goods as a % of Total Inventory Decreased to 26% in 2Q23 from 27% in 1Q23, below pre-covid levels



Source: Jefferies, Factset. Jefferies, Factset. Sample Set includes 12 semis companies (MU, AMD, DIOD, LSCC, MTSI, NATI, ON, POWI, QCOM, SLAB, SWKS, TXN) that have reported inventory breakdown.

While aggregate Semi-DOI went above the trendline in 1Q22 for the first time in 1.5 yrs, lead times have not materially improved yet. We believe the reason is that all the inventory build was in WiP, while Finished Goods Inventories are at the lowest levels in at least 10 years. Finished Goods as a % of Total Inventory has begun to show some decline, now 26% in 2Q23, down from 27% in 1Q23 and from 30% in 4Q22.

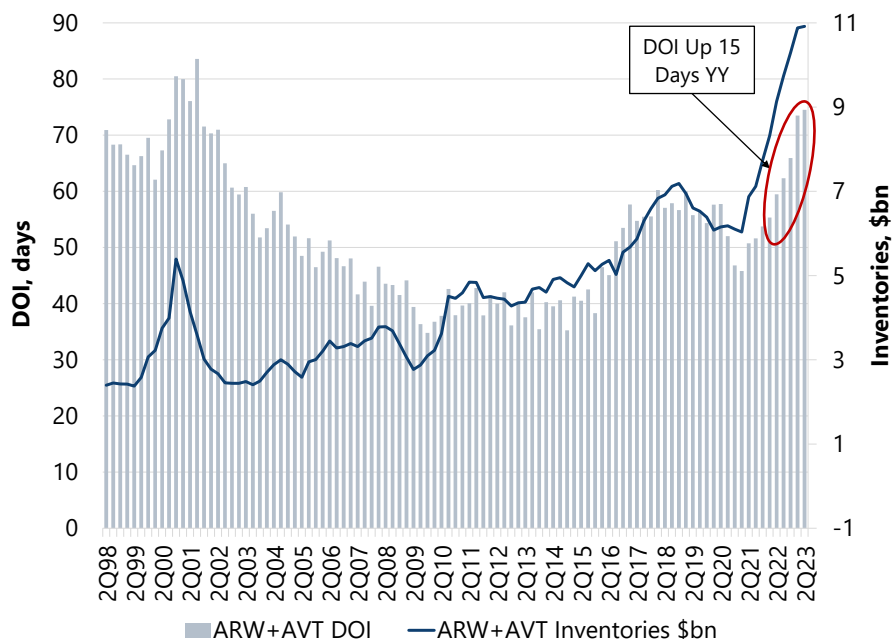
Chart 43 - Finished Goods as a % of Total Inventory Decreased by 1% in 2Q23



Source: Jefferies, Factset. Jefferies, Factset. Sample Set includes 12 semis companies (MU, AMD, DIOD, LSCC, MTSI, NATI, ON, POWI, QCOM, SLAB, SWKS, TXN) that have reported inventory breakdown.

Chart 44 - Chip Distributor Inventory Days Increased 1 Day QQ from 1Q23

Chip Distributor Inventory and DOI

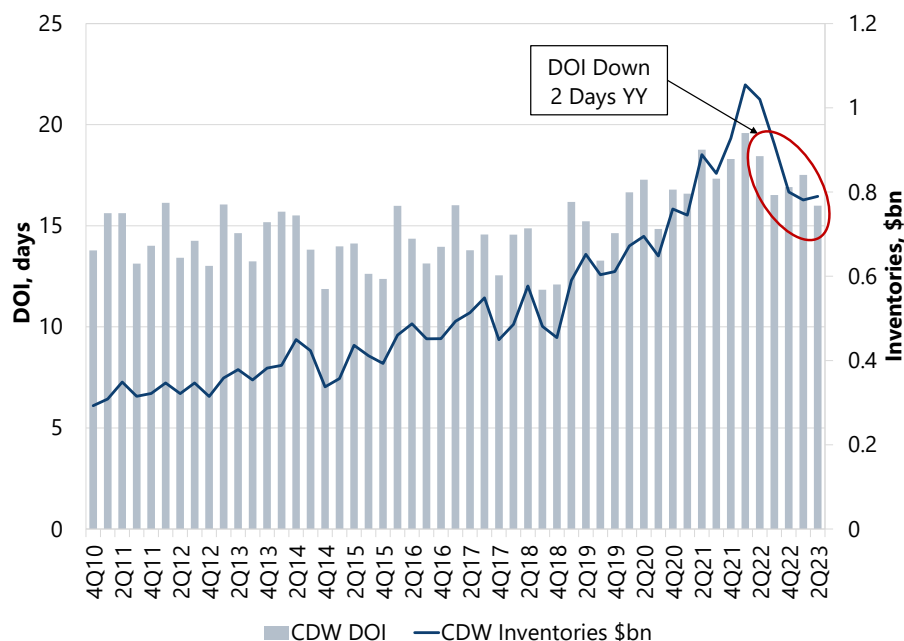


In 2Q23, chip distributor DOI increased 15 days YY and 1 day QQ to 75 days. Balance Sheet inventories increased by \$1.80bn YY and \$37m QQ to \$10.92bn.

Source: Jefferies, Factset, company data.

Chart 45 - Electronic Equipment Distributor DOI Decreased 2 Days QQ from 1Q23

Electronic Equipment Distributor Inventory and DOI

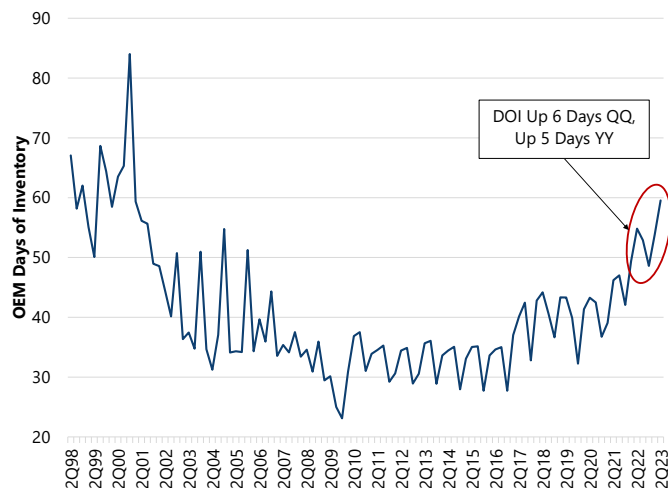


In 2Q23, Electronics distributor CDW's DOI decreased 2 days YY and decreased 2 days QQ. Balance sheet inventories decreased by \$230m YY and by \$9m QQ.

Source: Jefferies, Factset, company data

Chart 46 - 2Q23 OEM DOI 5 Days Higher YY

OEM Days of Inventory

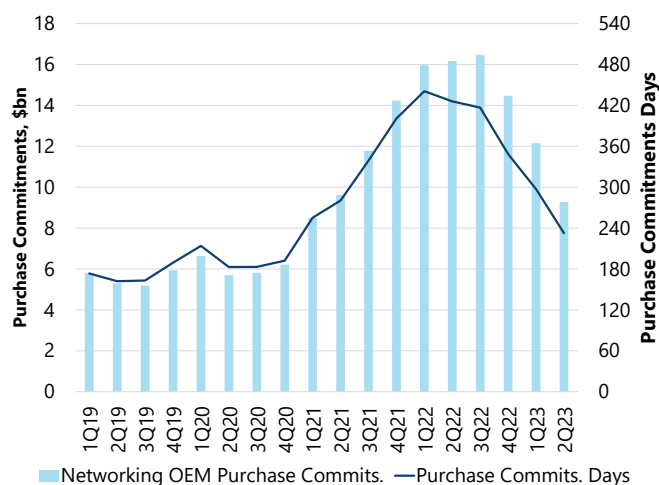


Source: Jefferies, Factset, company data

OEM DOI increased by 6 days QQ and by 5 days YY in 2Q23. In dollar terms, inventories decreased by \$1.39bn QQ, and by \$937m YY.

Chart 47 - Networking OEM Purchase Commitment Days have Decreased 193 Days YY and 64 Days QQ in 2Q23.

Networking OEM Total Purchase Commitments and Days

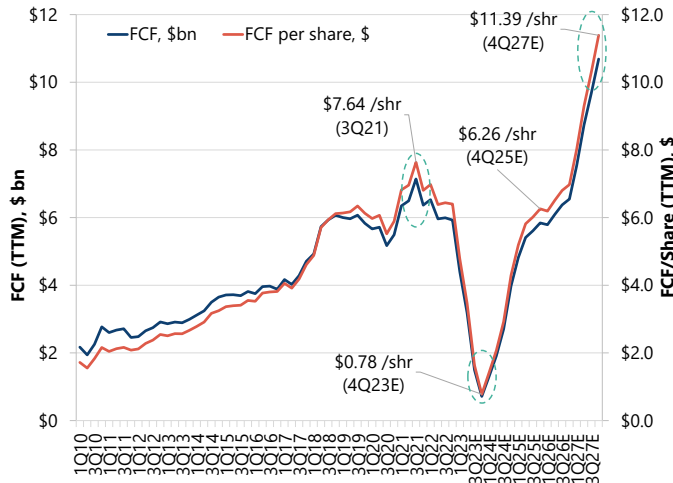


Source: Jefferies, Factset, company data

OEM purchase commitment days decreased by 64 days QQ and by 193 days YY in 2Q23. In dollar terms, purchase commitments decreased by \$2.3bn QQ and \$6.9bn YY.

Broad-based Semis Performance

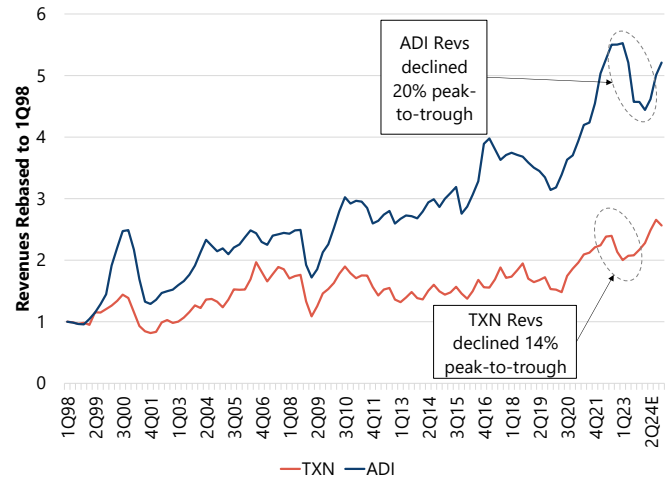
Chart 48 - TXN FCF vs FCF/Share Since 2010



Source: Jefferies, FactSet, company data

We model 2026E as a "steady state" TXN year, reaching 8% revs growth and capex at 21% of revs. We estimate TXN TTM FCF/shr to reach \$11.39 from the trough of \$0.78 in 4Q23E.

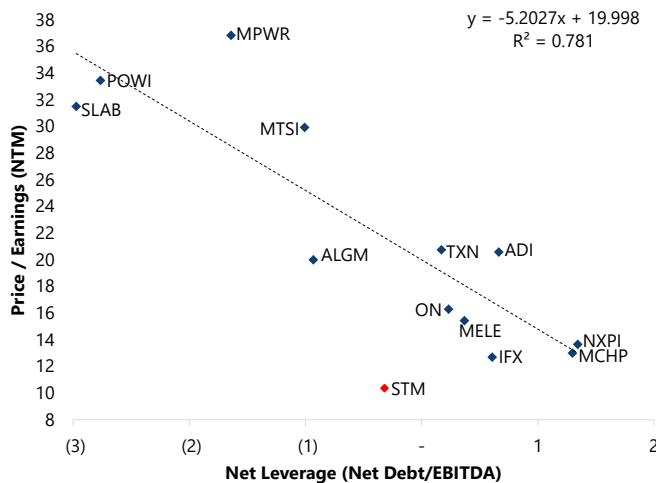
Chart 49 - Our Model Suggests a TXN/ADI Revs Declining 14%/20% Peak-to-Trough



Source: Jefferies, company data; ADI revs adjusted pro-forma for LLTC and MXIM acquisitions, TXN revs adjusted pro-forma for NSM acquisition

We estimate TXN Qtrly revenues declining 14% peak-to-trough, compared to ADI's 20%.

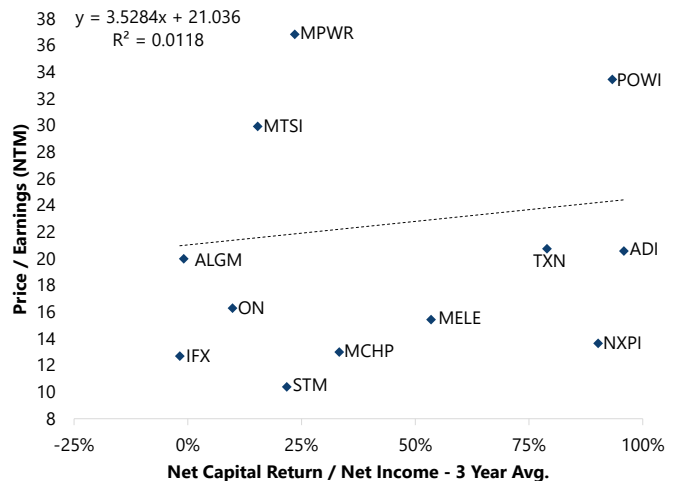
Chart 50 - The Correlation Between Analog PE and Net Leverage Has Increased Over the Past 12 months



Source: Jefferies, Factset, company data. Using latest reported Net Leverage and TTM EBITDA. Excluded from regression STM and SMTC

Broad-based large-cap semi P/E ratios are inversely correlated with leverage ratios (R-squared 78%). MCHP is targeting a 1.5x leverage in the long run, and ADI targeting to keep leverage below 1.0x.

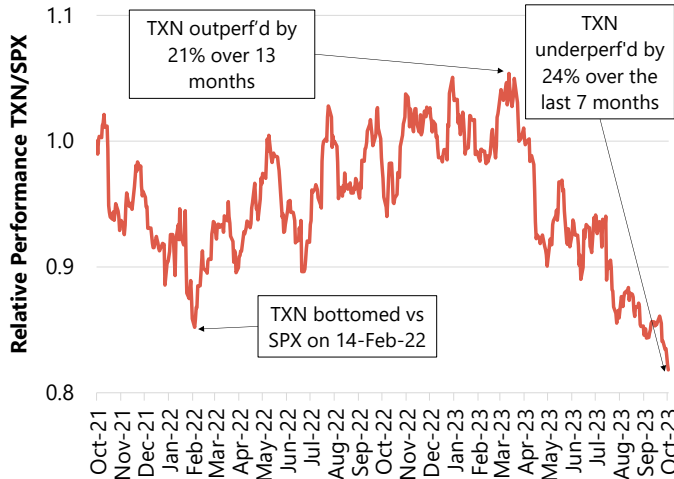
Chart 51 - The Correlation Between Analog PE vs Capital Return Has Broken Down



Source: Jefferies, Factset, company data. Net Cap Return/Net Income 3 yr. Avg (2020-2022). Net Capital Return is dividend plus share buyback minus cash from share/options issuance. Ex SLAB

We have observed a high correlation (Rsq of 78%) between P/E and Net Leverage Ratio. We find that leverage regression typically has a tighter fit than Net Capital Return ratio during a challenging macro environment.

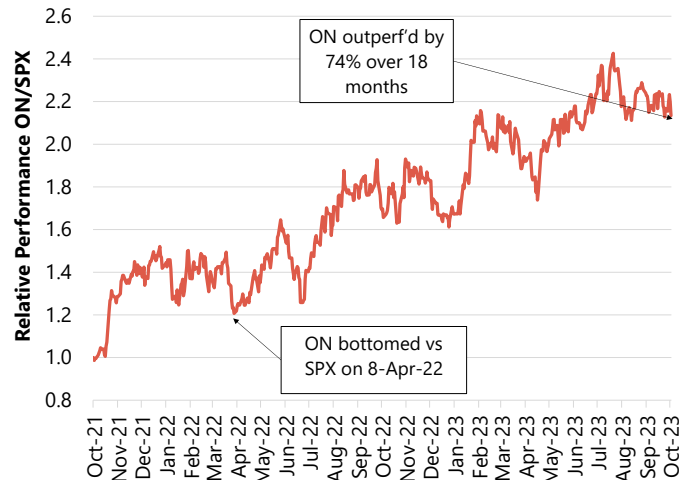
Chart 52 - TXN Outperformed SPX by 21% peak-to-trough over 13 months, and has underperformed by 24% over the last 7 months as of today



Source: Jefferies, FactSet. Relative performance rebased to Oct-21 or 24 months ago

TXN Outperformed SPX by 21% peak-to-trough over 13 months, and has underperformed by 24% over the last 7 months as of today

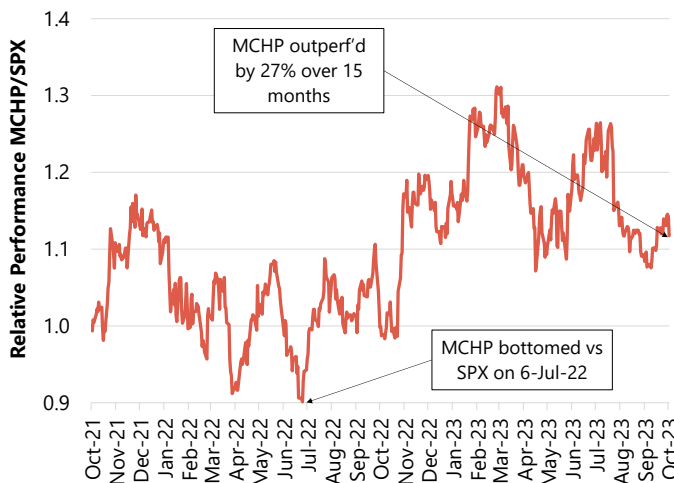
Chart 53 - ON Outperformed by 74% over the past 18 months



Source: Jefferies, FactSet. Relative performance rebased to Oct-21 or 24 months ago

ON bottomed vs SPX on 8-Apr-22 and has outperformed SPX by 74% over the past 18 months

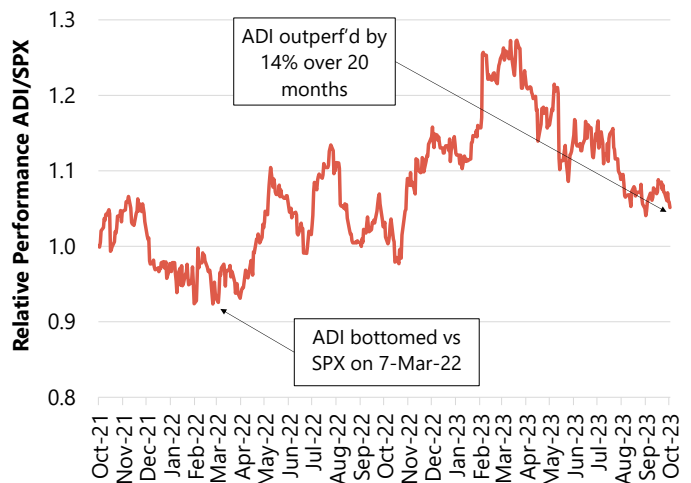
Chart 54 - MCHP Outperformed SPX by 27% over the past 15 months



Source: Jefferies, FactSet. Relative performance rebased to Oct-21 or 24 months ago

MCHP bottomed vs SPX on 6-Jul-22 and has outperformed SPX by 27% over the past 15 months.

Chart 55 - ADI Outperformed SPX by 14% over the past 20 months

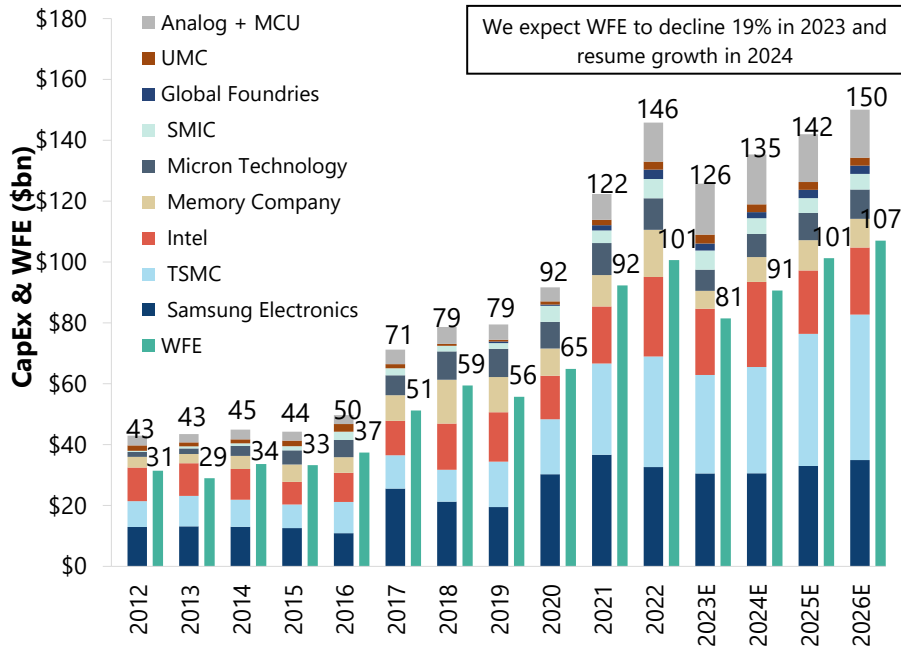


Source: Jefferies, FactSet. Relative performance rebased to Oct-21 or 24 months ago

ADI bottomed vs SPX on 7-Mar-22 and has outperformed SPX by 14% over the past 20 months.

Highlighted Semi-Cap Charts

Chart 56 - We Revised 2023 WFE Spend to \$81bn vs prior estimate of \$75bn

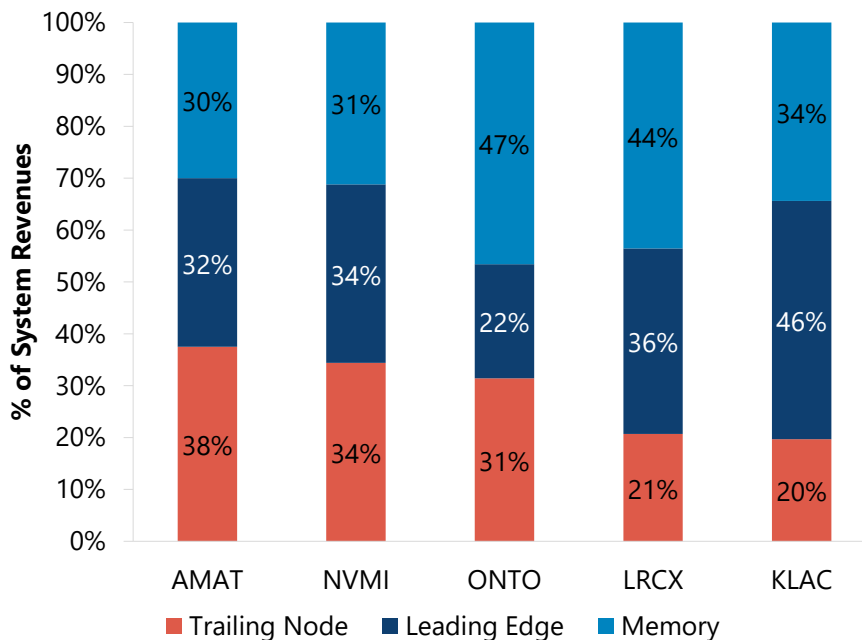


Source: Jefferies, Gartner, FactSet

We revised our 2023 WFE estimate to \$81bn vs prior \$75bn driven by the strength in trailing node investments driven by "The 4th Tectonic Shift to an IoT Computing Era" which are being powered by chips manufactured on trailing node WFE. We think most investors are underestimating the impact this computing era will have on trailing node WFE demand

We updated our bottom-up model to include CapEx of analog and MCU players. Our sample set includes 17 semiconductor companies, which represent ~80-82% of total semiconductor industry CapEx. Of the total industry CapEx, ~55-60% is spent on front-end equipment and the remainder is spent on facilities and back-end. For 2023 and 2024, we are assuming ~56% of the spend is front-end equipment as most companies are investing in shells.

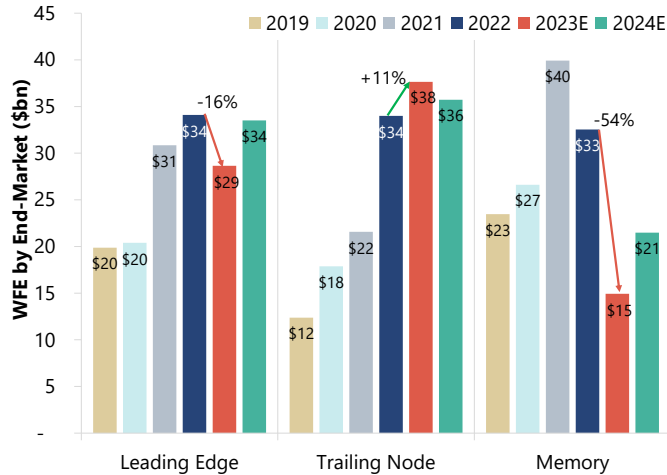
Chart 57 - AMAT has the Highest Exposure to Trailing Nodes



Source: Jefferies, Company data

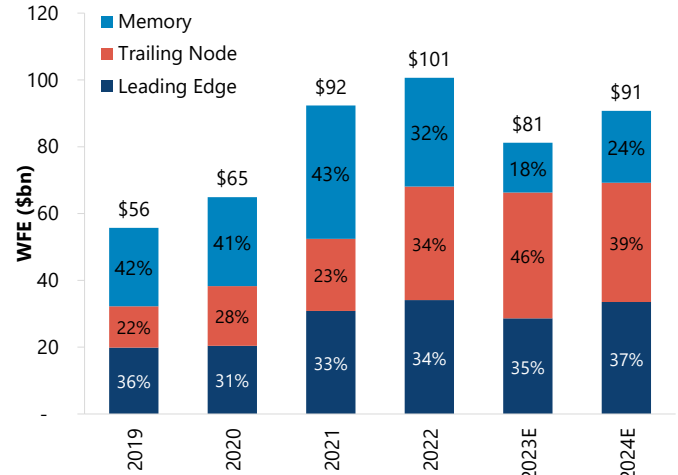
Within our coverage of SCE companies, AMAT has the highest exposure to Trailing nodes, followed by NVMI and ONTO

Chart 58 - Trailing Node Are Becoming More Important Part of WFE Aggregating to \$38bn in 2023



Source: Jefferies, Historicals based on SEMI (2019-2022)

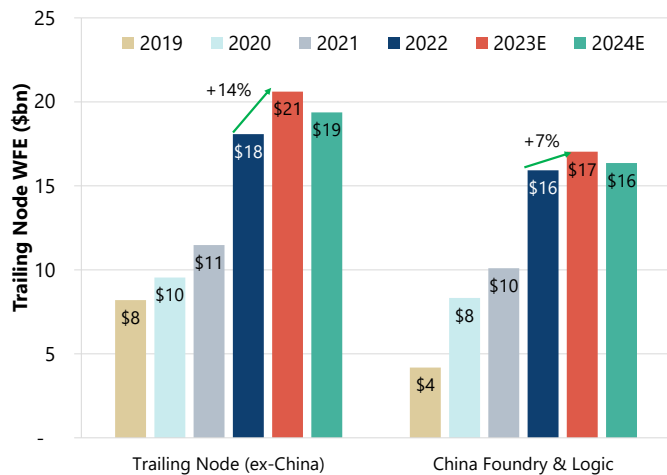
Chart 59 - Trailing Node Spend Share Expected to Increase to 46%; And Memory Expected to Decline to 18%



Source: Jefferies, Historical data (2019-2022) based on SEMI

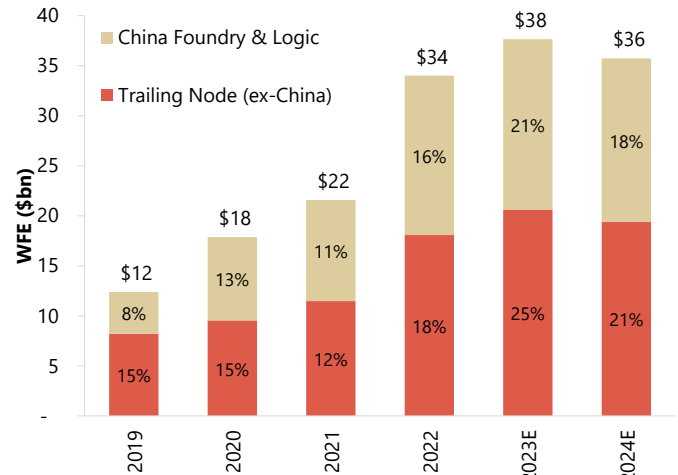
In 2019 & 2020, leading edge node and memory captured ~75% of total WFE spend aggregating to \$43-47bn and trailing nodes captured ~25% of WFE spend. With the shift to IoT era, trailing nodes have become an important part of WFE. In 2022, WFE spend was spread evenly between leading edge, trailing node and memory, and in 2023, we expect trailing nodes to be 46% of total WFE, growing 11% vs. 2022. We also note that in 2023, memory spend is expected to be 18% of WFE at \$15bn, which is the lowest levels since 2019. We expect memory spend to recover in 2024, growing to \$21bn up 44%YoY.

Chart 60 - Trailing Node Demand is Driven by Both Non-China & China Spend



Source: Jefferies, Historical data (2019-2022) based on SEMI








Chart 61 - Trailing Node Non-China /China Split was 53%/47% in 2022



Source: Jefferies, Historicals (2019-2022) based on SEMI data

We show that the strength in trailing node WFE spend is driven by strength in both China and non-China (US & EU) regions. We show that in 2022, the trailing node spend was split 53/47 between non-China and China. In 2023, we expect the split to be 55/45.

Chart 62 - Global Semiconductor Manufacturing Incentives Aggregate to \$66bn/yr

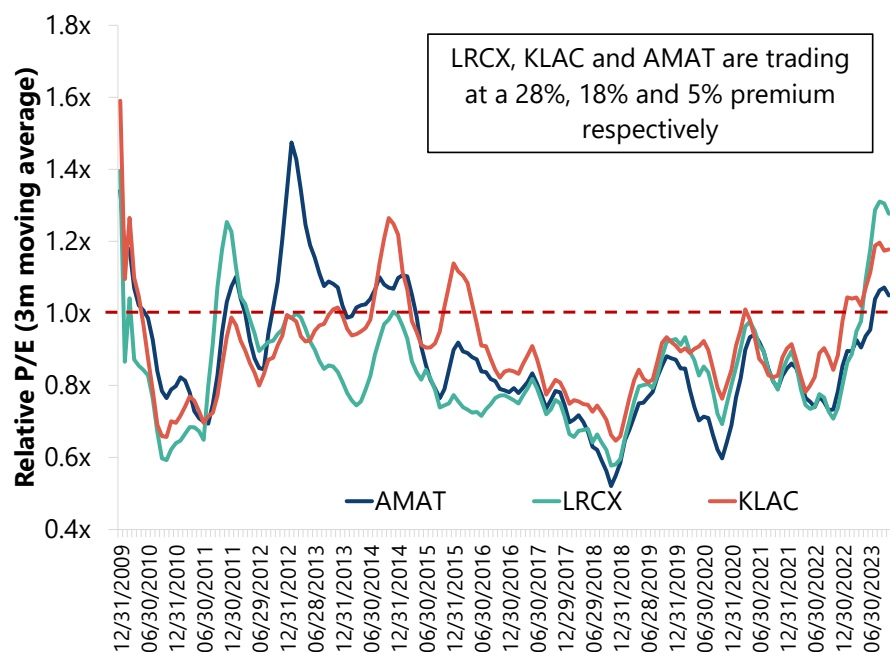
Global Annual Incentives over next 5 years = ~\$66bn Annually							
							
Manufacturing Capacity*	USA 12%	Europe 9%	S. Korea 21%	Japan 15%	Taiwan 22%	China 15%	India 0%
Value of Incentives	\$66bn	\$47bn	\$3bn/year	\$15bn	N.A	\$143bn	\$30bn
Incentives Structure	\$39bn grants \$2.5bn adv pkg \$24bn tax credits of 25%	~\$33bn directed to new fab construction	Tax credit 15% (vs. prior 8%) for large companies & 25% (vs. prior 16%) mid to small companies	\$3.6bn TSMC & Sony \$2bn Rapidus \$0.7bn Kioxia \$0.3bn Micron	Tax break 25% (vs. prior 15%) for R&D investments - 5% tax credit for spend on new equipment	- subsidies and tax credits to domestic semiconductor production & research	- 50% subsidy on eligible expenditures
Period	2022-2026	2023-2030	N.A	2022-2023	2023-2030	2022-2027	2022-2027
Annual Incentive	\$13bn	\$7bn	\$3bn	\$7bn	\$2bn	\$28bn	\$6bn

Source: Jefferies, Gov't reports

300mm equivalent capacity as of 2020. Manufacturing capacity based on BCGxSIA report "Government Incentives and US Competitiveness in Semiconductor Manufacturing Sept 2020"

We updated our survey of incentives offered by governments to build semiconductor manufacturing facilities in local markets. We estimate over \$300bn of total incentives, which translates to \$66bn/yr for the next 5 years

Chart 63 - SemiCap Relative P/E



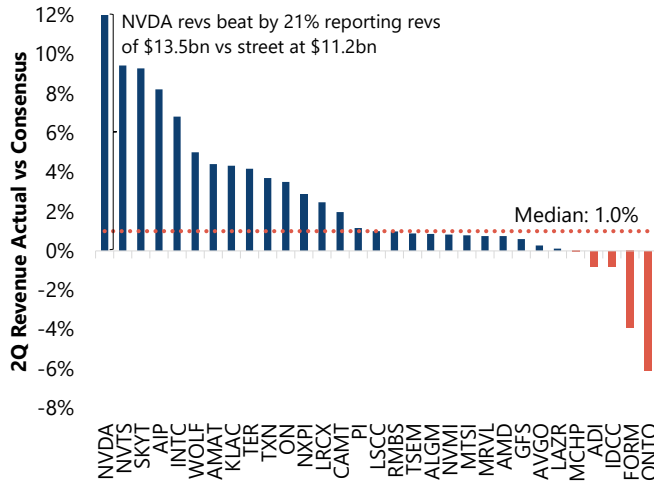
Source: Jefferies, FactSet

LRCX, KLAC and AMAT are trading at a 28%, 18% and 5% premium respectively.

We continue to expect SCE companies to re-rate higher as the market appreciates secular growth from: 1) "Moore's Bend"/bigger chips; 2) increasing manufacturing complexity; 3) trailing node demand; and 4) semi-nationalization à la CHIPS Act et.al.

2Q23 Earnings Season Summary

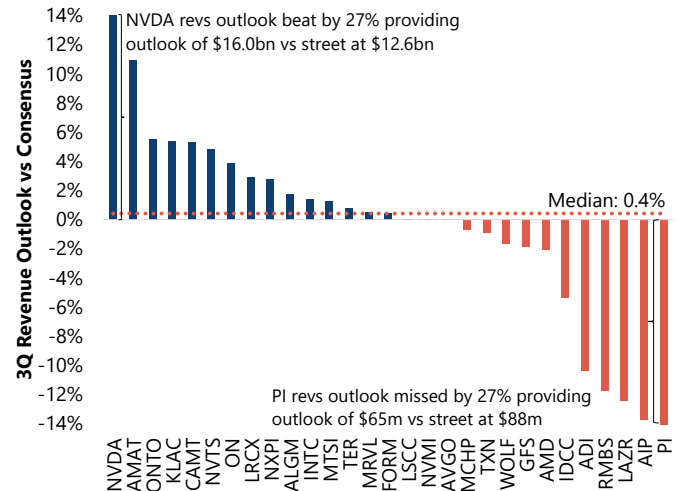
Chart 64 - Median 2Q23 Revenue Beat = 1.0%



Source: Jefferies, FactSet, company data

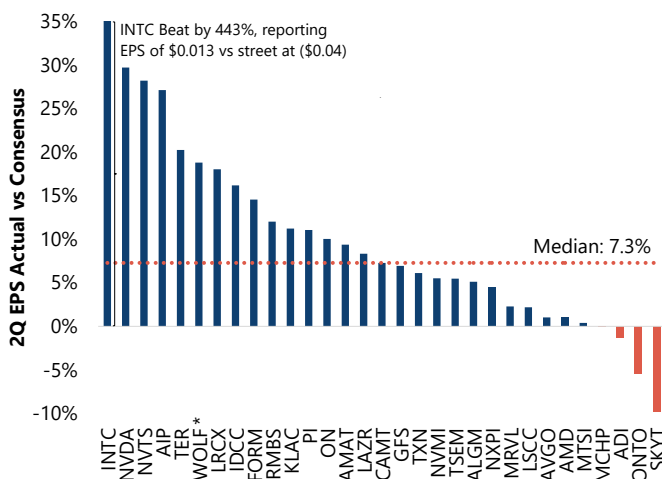
All companies except ONTO, FORM, IDCC, ADI and MCHP reported 2Q23 revs above Street estimates, and at the median, 2Q23 revs beat by 1.0%. All companies except PI, AIP, LAZR, RMBS, ADI, IDCC, AMD, GFS, WOLF, TXN, MCHP, NVMI and AVGO reported 3Q23 revs outlooks that were above consensus expectations, and at the median, 3Q23 revs outlook was 0.4% above consensus.

Chart 65 - Median 3Q23 Rev Outlook = 0.4% Above Consensus



Source: Jefferies, FactSet, company data

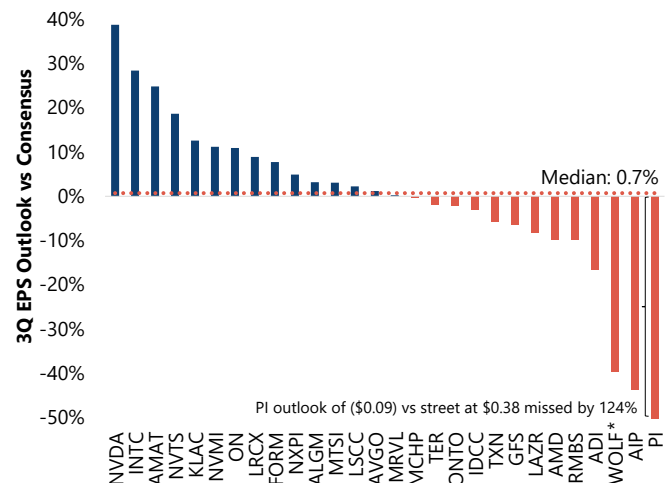
Chart 66 - Median 2Q23 EPS Beat = 17.1%



Source: Jefferies, FactSet, company data. *WOLF Pro-forma as prior presentation excluding start-up costs from Non-GAAP OpEx

All companies except MCHP that was in-line, and SKYT, ONTO and ADI which were below consensus, reported 2Q23 EPS above Street estimates. At the median, semis beat 2Q23 consensus EPS by 17.1%.

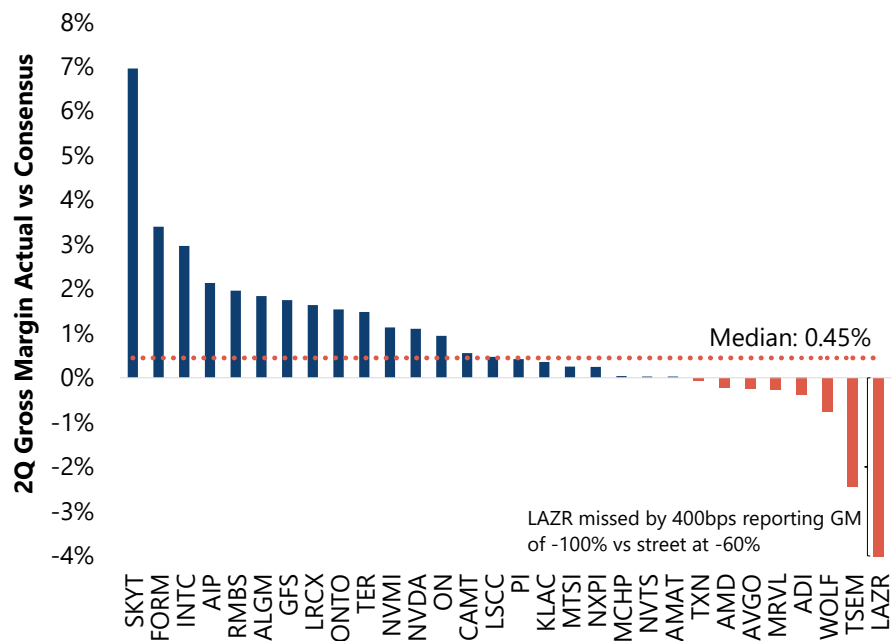
Chart 67 - Median 3Q EPS Outlook = 0.7% Above Consensus



Source: Jefferies, FactSet, company data. *WOLF Pro-forma excludes \$37m underutilization from GM and \$8m start-up costs from OpEx

All companies except PI, AIP, WOLF, ADI, RMBS, AMD, LAZR, GFS, TXN, IDCC, ONTO, TER and MCHP reported EPS outlook above street estimates. At the median, semis provided a 3Q23 EPS outlook, (explicitly or implied) that was 0.7% above consensus.

Chart 68 - Median 2Q23 Gross Margin Beat Consensus by 45bps



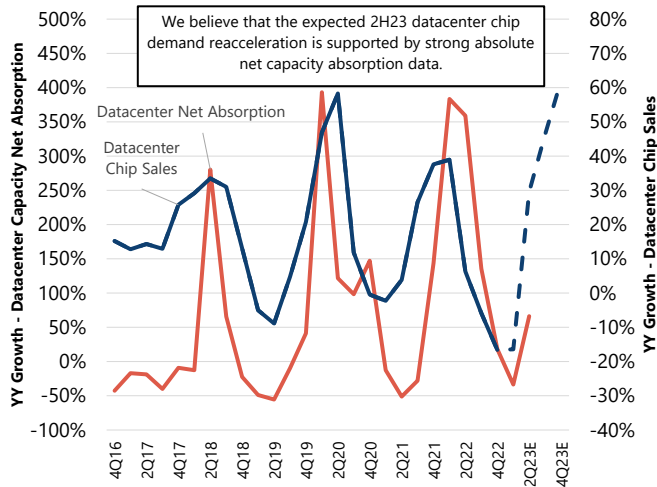
Source: Jefferies, FactSet, company data

All companies in our coverage universe except LAZR, TSEM, WOLF, ADI, MRVL, AVGO, AMD and TXN beat gross margin consensus expectations.

At the median, 2Q23 gross margin beat consensus by 45bps.

Datacenter Trends

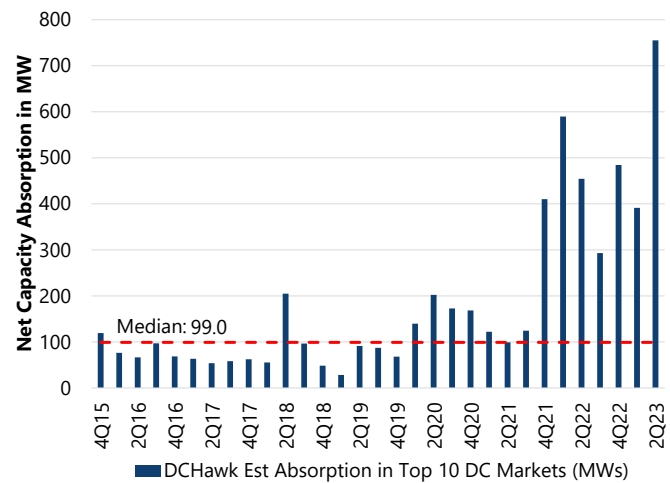
Chart 69 - YY Growth for Datacenter Net Absorption and Datacenter Chip Sales are Correlated



Source: DatacenterHawk via Factset, Jefferies

Chart 70 - 2Q23 US leasing volume increased 93% QQ and 66% YY and set a new quarterly record for leasing volume.

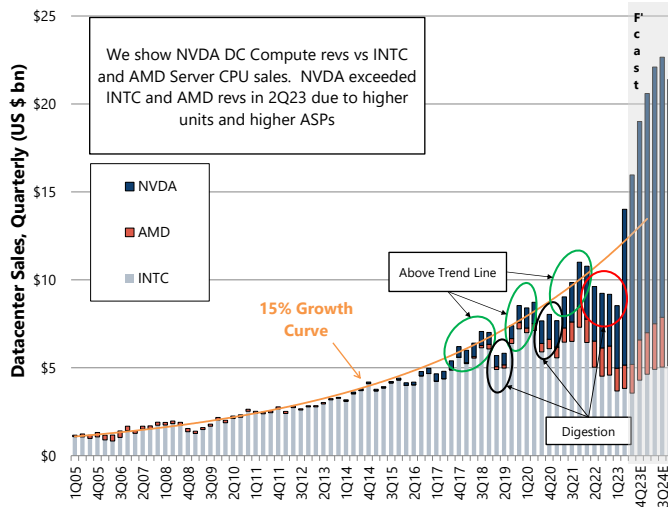
Net Capacity Absorption in MW



Source: DatacenterHawk via Factset, Jefferies

DatacenterHawk reports that the top 10 datacenter markets had aggregate net absorption of 755MW of space in 2Q23, up 93% QQ from 391MW in 1Q23 and up 66% YY from 454MW in 2Q22. Over the past 6 quarters, the absorption levels continue to be much higher than the LT median absorption of 99MW. YY growth for net absorption of capacity of the Top 10 DC markets as measured by DatacenterHawk (red bar), has been a strong coincident-to-leading indicator for YY spending growth on datacenter processors (blue line) sold by **INTC**, **NVDA** and **AMD/XLNX**. We also view networking chip companies **AVGO** and **MRVL** as beneficiaries of this absorption.

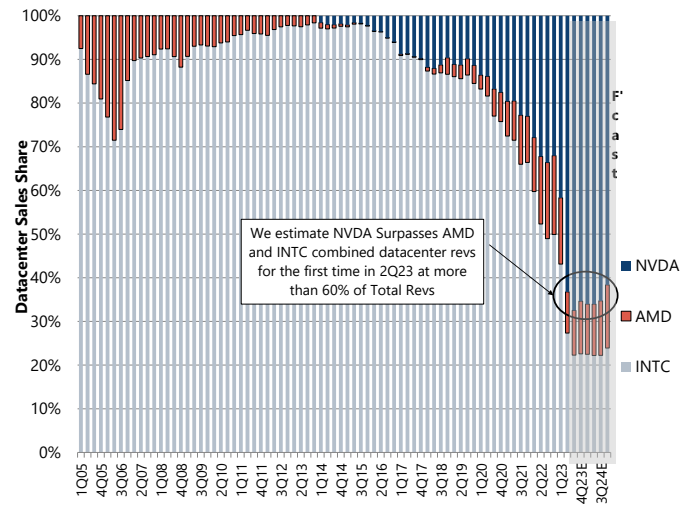
Chart 71 - Datacenter Processor Revenues



Source: Jefferies, company data

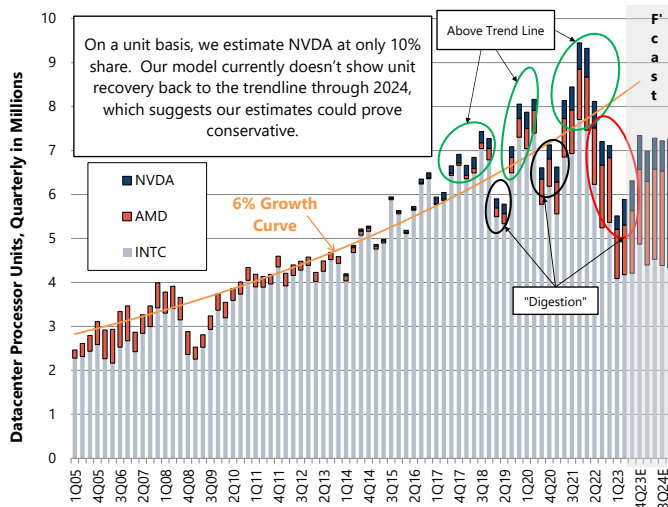
After 4 quarters of below trend line datacenter processors revenues between 2Q23 and 1Q23 primarily on x86 server digestion, revenues are expected to accelerate significantly through the rest of this year primarily on NVDA's generative AI tailwinds and secondarily on x86 server 2H over 1H recovery. NVDA surpassed AMD and INTC combined datacenter revs for the first time in 2Q23 at more than 60% of total revs, officially marking a Tectonic Shift in Computing to a Parallel Processing Era

Chart 72 - Datacenter Revenues Processor Share



Source: Jefferies, company data

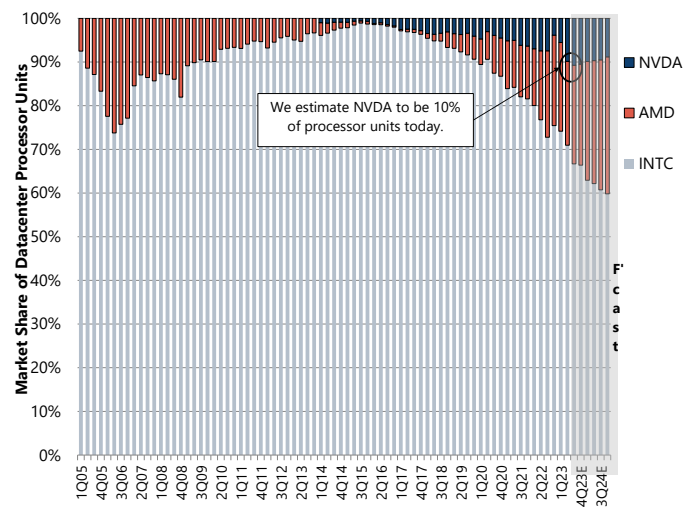
Chart 73 - Datacenter Processor Units



Source: Jefferies, company data

On a units basis (GPUs + CPUs), we estimate NVDA is still only 10% share. As such, our models for NVDA, AMD, INTC don't embed unit recovery back to trendline through 2024 which may prove conservative.

Chart 74 - Datacenter Processor Units

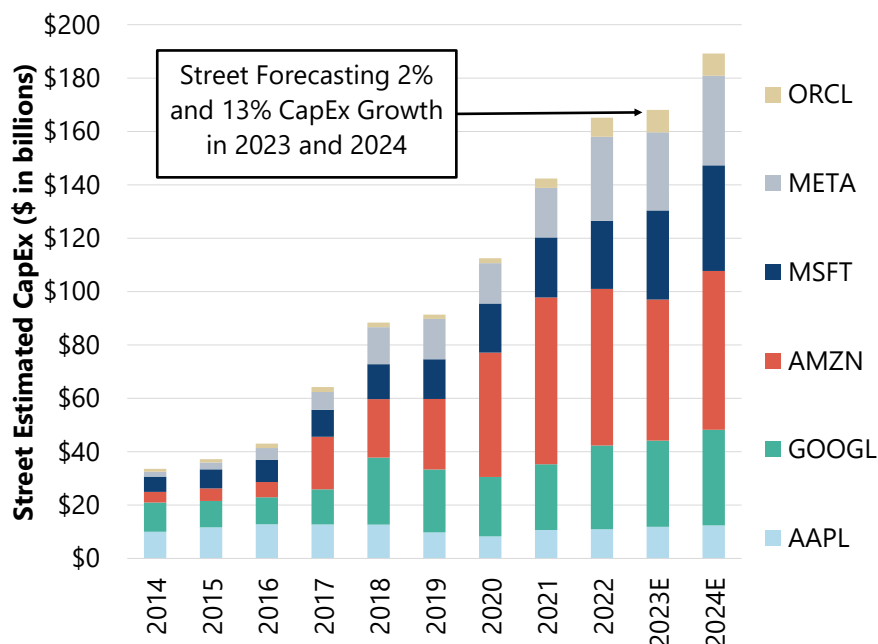


Source: Jefferies, company data

Chart 75 - North American Cloud CapEx is now modeled by Street to increase by 2% and 13% YY in 2023 and 2024.

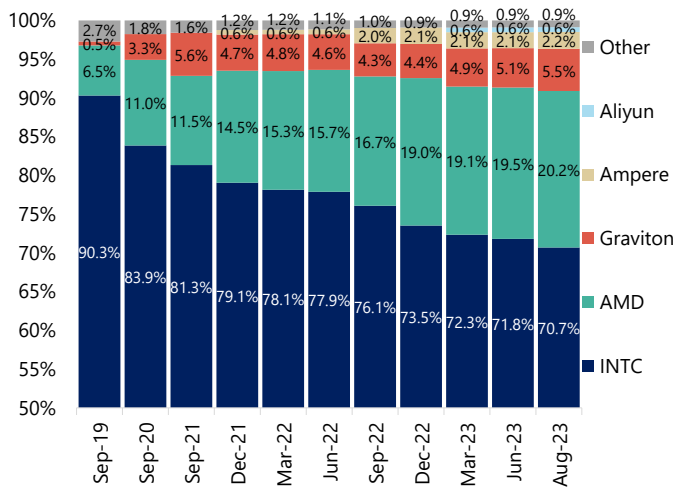
Street Estimated CapEx for CSPs

Street forecasts for our set of six top North American cloud companies now estimate CapEx to rise by 2% and 13% YY in 2023 and 2024.



Source: Jefferies, Factset, company data

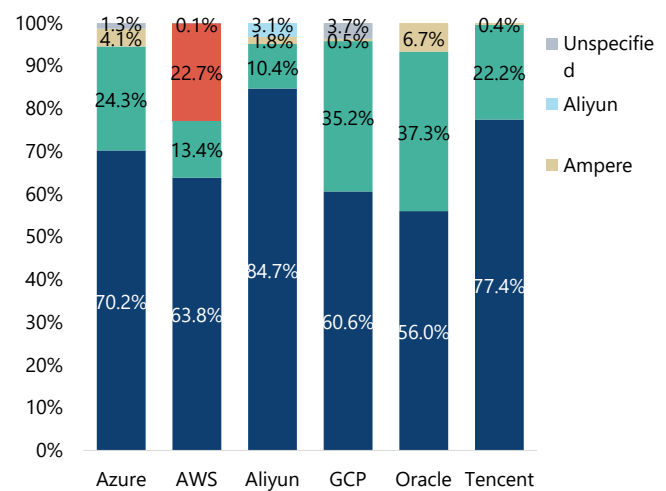
Chart 76 - INTC vs. AMD vs. Graviton Share of CPU Instances



Source: Liftr Insights, Jefferies. More current and detailed data available by Liftr Insights. Footnote: Jul-22 is first month in chart that tracks Tencent instances and Jan-23 is first month in chart that tracks Aliyun instances.

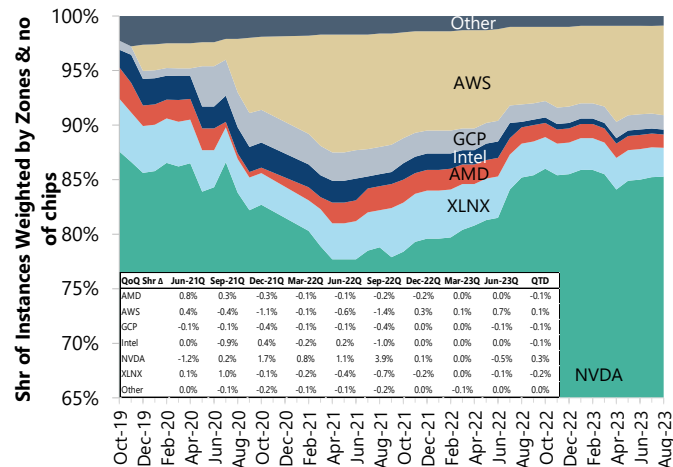
This month, AMD gained 105/65/30bps at Azure, GCP and AWS, lost 5bps at Aliyun, and was flat at Oracle and Tencent. INTC gained 5bps at Aliyun, lost 95/55/30bps at Azure, GCP and AWS, and was flat at Oracle and Tencent. Within AWS, Graviton's share remained flat. Within AWS, Graviton instances are 22.7% of total CPU instances available as of Aug-23, taking share from INTC, which is down 24% share at AWS since Jun-19. Graviton share gains align with our field work (see related research) on Graviton, which indicates an ecosystem inflection and a 40-50% price performance improvement over INTC instances.

Chart 77 - Processor Instance Share by CSP and Vendor at Aug-23



Source: Liftr Insights, Jefferies. More current and detailed data available by Liftr Insights.

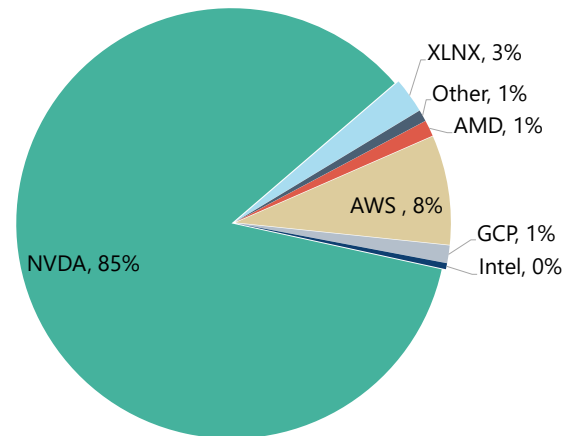
Chart 78 - Dedicated Accelerator Share



Source: Liftr Insights, Jefferies. Footnote: Sep-22 QoQ share is inclusive of Tencent Instances for first time. More current and detailed data available by Liftr Insights. Please note that we did not obtain monthly data between Oct-20 and Feb-21.

NVDA dominates Dedicated Accelerator instances with approx. 85% share. NVDA share was up 10bps in Aug-23. NVDA made up 87% of incremental overall accelerator deployments in Aug-23. After announcing general availability in Oct-22, AWS Trainium, purpose-built for training of ML models, was detected for the first time in our data set, and made up 51% of new accelerator instances deployed in Nov-22. NVDA made up nearly all of incremental overall accelerator deployments since Feb-22, except for Nov-22 (49%), Apr-23 (82%), and Aug-23 (87%). GPUs are 87.7% of the total accelerator instances available as of Aug-23.

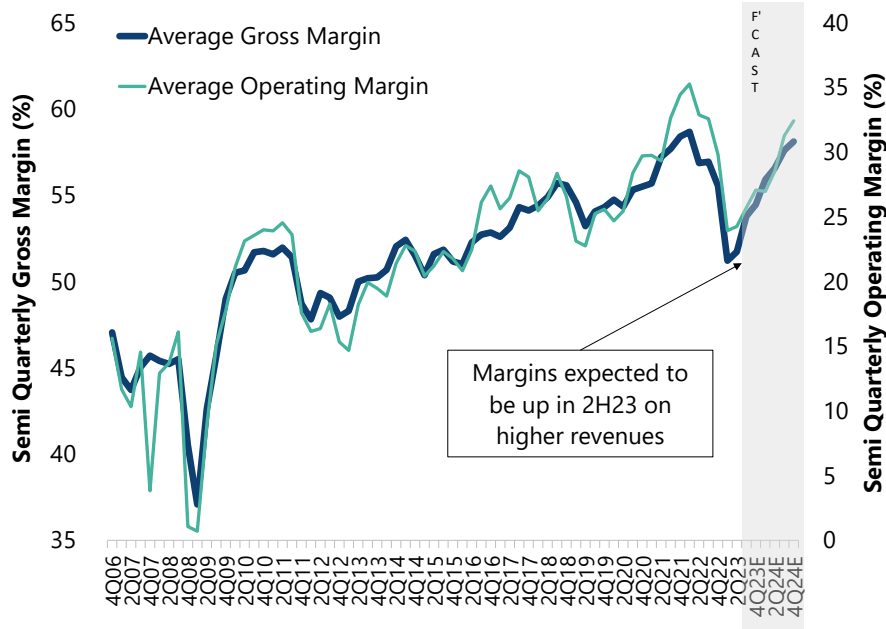
Chart 79 - Accelerator-based Share as of Aug-23



Source: Liftr Insight, Jefferies. More current and detailed data available by Liftr Insights.

Semis Cycle Charts

Chart 80 - Consensus Semiconductor Gross and Operating Margins Project Recovery that started in 2Q23
Semis Gross and Operating Margins

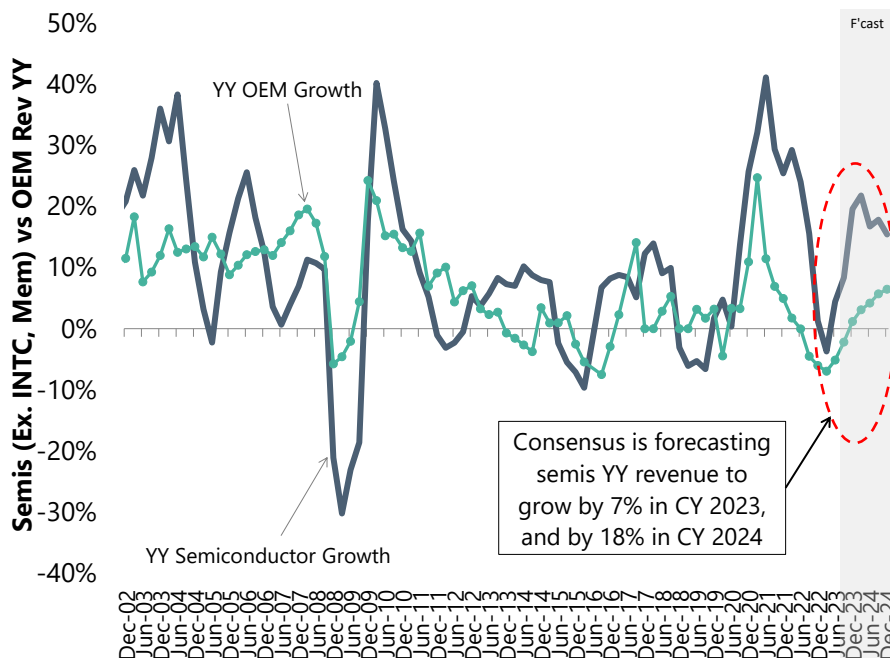


Semiconductor Operating Margins have increased by 2,000bps over the past 10 years as the group has consolidated

Margins bottomed in 1Q23 and consensus forecasts margins to recover after rebounding in 2Q23 and grow back to 2022 levels by the end of 2024

Source: Jefferies, company data, Factset

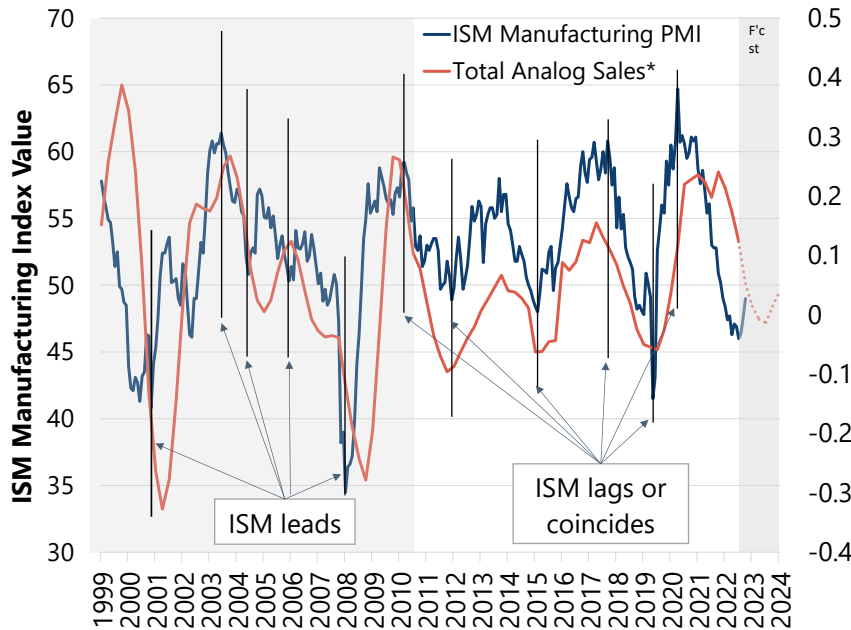
Chart 81 - Semis vs. OEMs revenue growth (YY)



Consensus is currently forecasting 7% growth YY in CY 2023 and 18% in CY 2024 vs. 17% growth in CY 2022 and 31% YY in C2021. Consensus expects semis YY growth to closely match YY OEM growth.

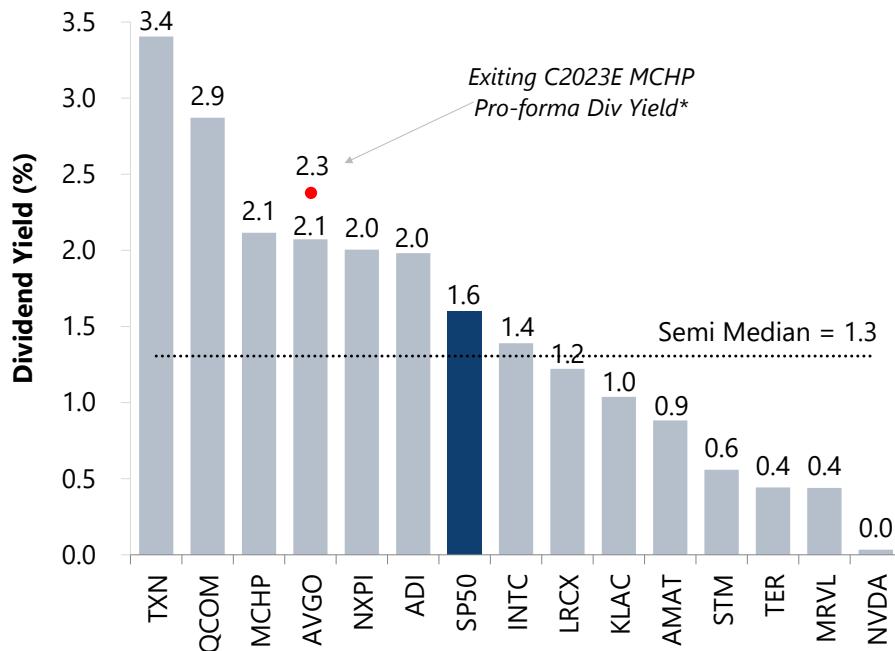
Source: Jefferies, FactSet, company data

Chart 82 - ISM Manufacturing PMI vs Total Analog Sales Growth YY



Source: Jefferies, Bloomberg, FactSet, *Total Analog sales include TTM sales for TXN, NSM, ADI, LLTC, MXIM, MCHP, IRF, ON, STM, FCS, IFX, FSL, NXPI, AMIS, MCSS, ATML, MCRL

Chart 83 - Semis Dividend Yield



Source: Jefferies, FactSet, C2023E MCHP Pro-forma Div Yield based on C3Q23E Dividend, assuming 9%/Q increases and current share price

We plotted ISM Manufacturing PMI and Analog semis YoY growth rates. ISM Manufacturing PMI has been a leading indicator for analog semis revenues growth rate in 2000-2011 and a coinciding/lagging indicator from 2012 onwards.

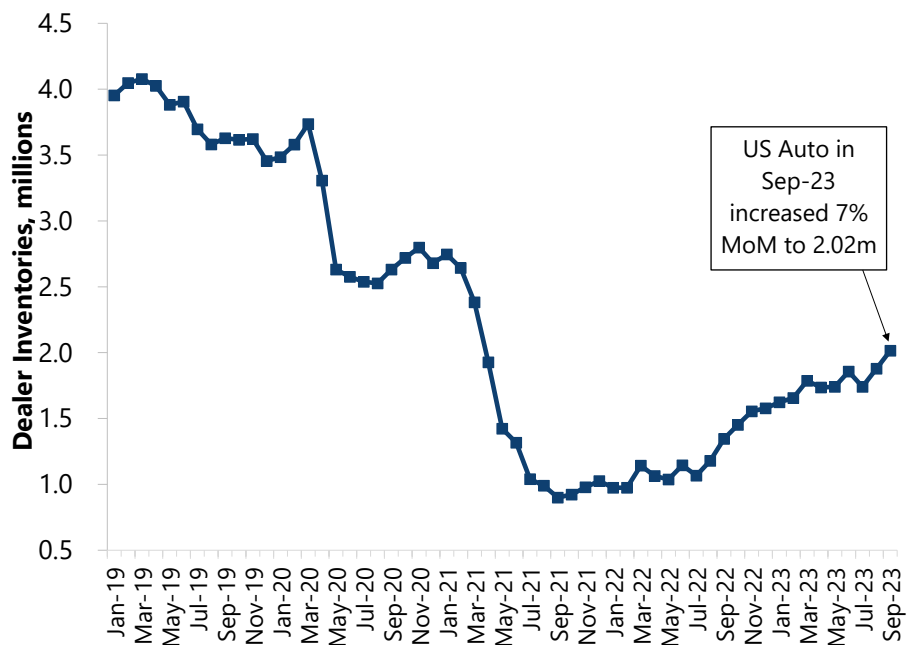
We think TXN and AVGO offer compelling dividend yields.

MCHP is our top dividend-growth story, having committed to increasing the dividend by 9% per quarter until reaching 50% of free cash flow. We estimate MCHP's dividend will increase at a 40% CAGR in 2022 and 2023, bringing its dividend yield to 2.3% exiting C2023, assuming the current share price.

TXN has recently increased its dividend by 5% to \$1.30, reaching a 3.2% dividend yield.

AVGO also recently raised its dividend by 12% to \$18.40, reaching a 2.2% dividend yield.

Chart 84 - U.S. Dealer Inventories increased 7% MoM in Sep
U.S. Dealer Inventories



Source: Motor Intelligence, Jefferies

US Auto Dealer inventories increased 7% MoM in September 2023 after increasing 8% in August, and decreasing in 6% in July, increasing 7% in June, remaining flat in May, decreasing 3% in April and after 8 months of continuous increases before that.

US Auto Dealer inventories hit multi-year lows in Sep-21 of 0.900m.

Chart 85 - Semis Comp Table

Company	Rating	Market Cap (bn)	Price Target	10/13/23 Price	P/E 2023 2024	EV/FCF 2023 2024	EV/S 2023 2024	P/TanBk	Gross Margin [1]	Operating Margin [1]
Logic / Neural Networking:										
AMD	Buy	\$ 171	\$ 145	\$ 106	38x 26x	66x 41x	7x 6x	21x	34%	-1%
INTC	Hold	\$ 151	\$ 38	\$ 36	57x 20x	n.m. 1177x	3x 3x	2x	38%	-4%
NVDA	Buy	\$ 1,138	\$ 610	\$ 461	43x 27x	47x 28x	21x 13x	53x	65%	33%
LSCC	Buy	\$ 11	\$ 105	\$ 76	37x 31x	39x 27x	14x 12x	46x	65%	30%
Analog / MCU:										
<i>Large Cap</i>										
ADI	Buy	\$ 85	\$ 209	\$ 171	18x 20x	25x 20x	8x 8x	n.a	57%	34%
Infineon	Hold	EUR 42	EUR 40	EUR 32	13x 12x	47x 26x	3x 3x	8x	46%	24%
MCHP	Buy	\$ 43	\$ 104	\$ 79	12x 13x	16x 18x	5x 6x	n.a	60%	38%
NXPI	Buy	\$ 50	\$ 257	\$ 195	14x 13x	18x 16x	4x 4x	n.a	54%	28%
STM	Hold	\$ 39	\$ 51	\$ 43	10x 10x	30x 19x	2x 2x	3x	49%	28%
TXN	Buy	\$ 139	\$ 216	\$ 153	21x 20x	74x 30x	8x 7x	12x	66%	47%
ON	Buy	\$ 39	\$ 125	\$ 90	17x 16x	53x 19x	5x 4x	8x	47%	33%
<i>SMID Cap</i>										
ALGM	Buy	\$ 6	\$ 54	\$ 30	20x 19x	33x 19x	5x 5x	6x	57%	21%
ams OSRAM	Hold	CHF 1	CHF 6	CHF 4	11x 7x	n.m. 18x	1x 1x	n.a	30%	7%
LAZR	Buy	\$ 1	\$ 10	\$ 4	n.m. n.m.	n.m. n.m.	17x 6x	n.a	-120%	-991%
Melexis	Hold	EUR 3	EUR 98	EUR 83	16x 18x	66x 21x	4x 4x	7x	45%	27%
MTSI	Buy	\$ 6	\$ 95	\$ 80	32x 27x	40x 31x	9x 8x	11x	57%	19%
NVTS	Buy	\$ 1	\$ 12	\$ 6	n.m. n.m.	n.m. n.m.	11x 6x	9x	8%	-238%
PI	Buy	\$ 1	\$ 91	\$ 53	112x 49x	n.m. n.m.	5x 5x	2054x	51%	-4%
WOLF	Hold	\$ 4	\$ 46	\$ 33	n.m. n.m.	n.m. n.m.	6x 5x	4x	29%	-21%
Comms:										
AVGO	Buy	\$ 369	\$ 1,035	\$ 894	21x 19x	21x 19x	11x 10x	n.a	64%	46%
MRVL	Buy	\$ 46	\$ 68	\$ 53	35x 23x	56x 28x	9x 8x	n.a	45%	-2%
Memory:										
RMBS [2]	Buy	\$ 6	\$ 66	\$ 58	39x 27x	28x 30x	11x 9x	11x	67%	17%
SGH	Buy	\$ 1	\$ 25	\$ 13	7x 10x	n.m. n.m.	1x 1x	n.a	25%	5%
Foundry:										
GFS	Buy	\$ 30	\$ 73	\$ 56	27x 20x	41x 30x	4x 4x	3x	29%	17%
Hua Hong - 1347	Hold	HKD 26	HKD 25	HKD 20	11x 19x	n.m. n.m.	1x 1x	1x	34%	22%
SKYT	Hold	\$ 0.3	\$ 10	\$ 6	n.m. 30x	n.m. 43x	1x 1x	5x	23%	-3%
SMIC - 981	Hold	HKD 164	HKD 20	HKD 21	22x 26x	n.m. n.m.	3x 2x	n.a	34%	20%
TSEM	Hold	\$ 2	\$ 31	\$ 22	11x 10x	n.m. 307x	1x 1x	1x	28%	18%
IP:										
AIP	Buy	\$ 0.2	\$ 14	\$ 6	n.m. n.m.	n.m. n.m.	3x 2x	12x	88%	-66%
ARM	Buy	\$ 51.4	\$ 64	\$ 50	63x 46x	79x 48x	17x 15x	22x	96%	28%
Alphawave	Buy	GBP 0.8	GBP 2.7	GBP 1.1	0x 0x	244x 21x	3x 2x	n.a	46%	0%
IDCC	Buy	\$ 2.1	\$ 106	\$ 79	14x 20x	12x 8x	4x 4x	9x	60%	29%
Wafers:										
Shin-Etsu - 4063	Buy	JPY 9,084	JPY 5,500	JPY 4,488	16x 15x	13x 15x	3x 3x	2x	42%	34%
Siltronic	Buy	EUR 2	EUR 100	EUR 83	14x 19x	n.m. n.m.	2x 1x	1x	33%	22%
Soitec	Buy	EUR 5	EUR 270	EUR 154	34x 19x	34x 68x	5x 4x	5x	35%	23%
Sumco - 3436	Hold	JPY 702	JPY 2,100	JPY 2,006	12x 15x	n.m. n.m.	2x 1x	1x	31%	23%

[1] Please note that Gross Margin and Operating Margin are in GAAP terms.

[2] Given footnote 1 and ASC 606, please note that RMBS's gross margin and operating margin presented in the table are not reflective of its cash flow from fixed-fee licensing agreements.

Source: Jefferies, FactSet, company data

Chart 86 - Semis Comp Table

Company	Rating	Market Cap (bn)	Price Target	10/13/23 Price	P/E		EV/FCF		EV/S		P/TanBk	Gross Margin [1]	Operating Margin [1]
					2023	2024	2023	2024	2023	2024			
Semi Cap Equipment:													
<i>Front-End</i>													
ACMR	Buy	\$ 1	\$ 25	\$ 19	15x	15x	n.m.	7x	2x	1x	2x	50%	19%
Adv Micro - 688012	Buy	CNY 101	CNY 230	CNY 163	66x	47x	208x	107x	15x	11x	6x	45%	21%
Aixtron	Buy	EUR 3	EUR 52	EUR 30	22x	19x	36x	25x	5x	5x	6x	43%	21%
AMAT	Buy	\$ 119	\$ 175	\$ 142	18x	18x	16x	22x	5x	4x	11x	46%	29%
ASM International	Buy	EUR 19	EUR 600	EUR 385	32x	25x	34x	35x	7x	6x	10x	48%	26%
ASML Holding	Buy	EUR 231	EUR 950	EUR 574	30x	27x	65x	41x	8x	8x	44x	51%	33%
Canon - 7751	Hold	JPY 4,824	JPY 3,600	JPY 3,617	13x	12x	19x	16x	1x	1x	2x	46%	9%
KLAC	Buy	\$ 67	\$ 580	\$ 491	23x	21x	19x	22x	7x	7x	n.a.	59%	39%
Lasertec - 6920	Buy	JPY 2,534	JPY 28,000	JPY 26,875	48x	33x	89x	63x	13x	10x	24x	55%	41%
LRCX	Buy	\$ 85	\$ 750	\$ 646	25x	21x	20x	24x	6x	5x	14x	45%	30%
Nikon - 7731	Buy	JPY 550	JPY 2,200	JPY 1,566	15x	13x	n.m.	156x	1x	1x	1x	45%	7%
NVMI	Buy	\$ 3	\$ 140	\$ 107	24x	20x	39x	27x	6x	5x	6x	56%	26%
ONTO	Buy	\$ 7	\$ 160	\$ 140	38x	30x	44x	22x	8x	7x	6x	47%	19%
TEL - 8035	Buy	JPY 10,003	JPY 24,000	JPY 21,210	30x	26x	24x	29x	5x	5x	7x	44%	27%
<i>Back-End</i>													
Advantest - 6857	Buy	JPY 3,501	JPY 5,750	JPY 4,570	42x	7x	40x	34x	7x	7x	12x	55%	26%
A&D Holon - 7745	Buy	JPY 45	JPY 2,400	JPY 1,633	8x	7x	12x	12x	1x	1x	1x	46%	15%
CAMT	Buy	\$ 3	\$ 67	\$ 60	32x	27x	41x	34x	8x	7x	7x	48%	23%
Disco - 6146	Buy	JPY 3,191	JPY 33,000	JPY 29,450	40x	37x	42x	39x	11x	10x	10x	65%	38%
FORM	Hold	\$ 3	\$ 35	\$ 34	50x	27x	n.m.	40x	4x	3x	4x	36%	0%
TER	Buy	\$ 15	\$ 135	\$ 97	34x	21x	44x	29x	5x	4x	8x	59%	22%
Tokyo Seimitsu - 7729	Buy	JPY 321	JPY 9,300	JPY 7,630	15x	15x	32x	23x	2x	2x	2x	42%	23%
TOWA - 6315	Buy	JPY 123	JPY 5,000	JPY 4,895	20x	16x	n.m.	n.m.	3x	2x	3x	35%	17%
USHIO - 6925	Buy	JPY 238	JPY 2,200	JPY 1,931	20x	18x	38x	21x	1x	1x	1x	36%	8%

Source: Jefferies, FactSet, company data

Chart 87 - Semis Comp Table

Company	Consensus Sales (m)		Cash (m)	Debt (m)	Net Debt /EBITDA	Net Debt /Shr	JEF EPS		Cons. EPS		ROIC									
	2023	2024					2023	2024	2023	2024										
Logic / Neural Networking:																				
AMD	\$	22,799	\$	27,415	\$	6,285	\$	2,860	-0.92x	\$	(2.12)	\$	2.69	\$	4.28	\$	2.75	\$	4.11	7%
INTC	\$	52,537	\$	59,203	\$	24,257	\$	49,046	2.71x	\$	5.92	\$	0.66	\$	2.51	\$	0.63	\$	1.77	2%
NVDA	\$	54,413	\$	84,895	\$	16,023	\$	10,954	-0.51x	\$	(2.05)	\$	10.87	\$	17.02	\$	10.78	\$	17.21	37%
LSCC	\$	762	\$	859	\$	104	\$	61	-0.23x	\$	(0.31)	\$	2.09	\$	2.43	\$	2.09	\$	2.44	46%
Analog / MCU:																				
Large Cap																				
ADI	\$	11,750	\$	11,189	\$	1,149	\$	6,982	0.66x	\$	11.71	\$	9.24	\$	8.68	\$	9.27	\$	8.65	13%
Infineon	EUR	16,281	EUR	17,646	EUR	2,986	EUR	6,241	0.58x	EUR	2.49	EUR	2.54	EUR	2.74	EUR	2.55	EUR	2.73	16%
MCHP	\$	8,900	\$	8,578	\$	271	\$	6,063	1.30x	\$	10.64	\$	6.18	\$	5.93	\$	6.34	\$	5.87	28%
NXPI	\$	13,254	\$	14,072	\$	3,863	\$	11,170	1.34x	\$	28.34	\$	13.44	\$	14.57	\$	13.88	\$	14.91	20%
STM	\$	17,371	\$	17,929	\$	4,563	\$	2,862	-0.28x	\$	(1.87)	\$	4.30	\$	3.16	\$	4.33	\$	4.34	29%
TXN	\$	17,996	\$	19,178	\$	9,552	\$	11,219	0.17x	\$	1.84	\$	7.44	\$	9.04	\$	7.30	\$	7.78	32%
ON	\$	8,387	\$	8,954	\$	2,633	\$	3,746	0.23x	\$	2.58	\$	5.23	\$	5.56	\$	5.22	\$	5.70	26%
SMID Cap																				
ALGM	\$	1,092	\$	1,140	\$	362	\$	46	-0.93x	\$	(1.64)	\$	1.44	\$	1.48	\$	1.49	\$	1.54	30%
ams OSRAM	CHF	3,465	CHF	3,582	CHF	875	CHF	2,779	1.90x	CHF	6.94	CHF	0.51	CHF	0.63	CHF	0.34	CHF	0.59	0%
LAZR	\$	84	\$	244	\$	368	\$	637	-0.79x	\$	0.92	\$	(0.84)	\$	(0.64)	\$	(0.80)	\$	(0.57)	-56%
Melexis	EUR	962	EUR	953	EUR	36	EUR	139	0.35x	EUR	2.55	EUR	5.21	EUR	4.40	EUR	5.15	EUR	4.67	37%
MTSI	\$	624	\$	699	\$	588	\$	614	-1.01x	\$	0.37	\$	2.46	\$	2.87	\$	2.48	\$	2.97	16%
NVTS	\$	77	\$	149	\$	178	\$	6	7.71x	\$	(0.99)	\$	(0.23)	\$	(0.17)	\$	(0.23)	\$	(0.12)	-11%
PI	\$	303	\$	347	\$	109	\$	295	4.29x	\$	6.94	\$	0.48	\$	0.87	\$	0.47	\$	1.07	11%
WOLF	\$	869	\$	1,141	\$	2,955	\$	4,310	53.01x	\$	10.82	\$	(1.83)	\$	(2.14)	\$	(1.90)	\$	(1.94)	-2%
Comms:																				
AVGO	\$	36,315	\$	39,600	\$	12,055	\$	39,341	1.19x	\$	66.11	\$	42.99	\$	47.09	\$	42.92	\$	47.28	30%
MRVL	\$	5,523	\$	6,513	\$	423	\$	4,688	1.52x	\$	4.94	\$	1.50	\$	2.28	\$	1.53	\$	2.33	7%
Memory:																				
RMBS	\$	560	\$	660	\$	333	\$	31	-1.26x	\$	(2.76)	\$	1.76	\$	2.22	\$	1.47	\$	2.11	22%
SGH	\$	1,404	\$	1,295	\$	401	\$	888	2.03x	\$	9.72	\$	1.88	\$	1.18	\$	1.93	\$	1.23	12%
Foundry:																				
GFS	\$	7,426	\$	8,242	\$	2,787	\$	2,429	-0.03x	\$	(0.65)	\$	2.02	\$	2.47	\$	2.08	\$	2.74	6%
Hua Hong - 1347	HKD	18,889	HKD	19,661	HKD	15,815	HKD	14,255	-0.19x	HKD	(1.19)	HKD	1.56	HKD	0.94	HKD	1.78	HKD	1.07	11%
SKYT	\$	271	\$	320	\$	16	\$	101	2.60x	\$	1.84	\$	(0.50)	\$	0.04	\$	(0.45)	\$	0.19	-14%
SMIC - 981	HKD	49,474	HKD	57,419	HKD	103,816	HKD	72,675	-1.06x	HKD	(3.93)	HKD	0.94	HKD	0.86	HKD	0.95	HKD	0.81	6%
TSEM	\$	1,430	\$	1,540	\$	914	\$	220	-0.17x	\$	(6.30)	\$	2.10	\$	2.19	\$	2.04	\$	2.26	14%
IP:																				
AIP	\$	55	\$	69	\$	55	\$	5	2.70x	\$	(1.39)	\$	(0.65)	\$	(0.41)	\$	(0.65)	\$	(0.41)	-50%
ARM	\$	2,885	\$	3,321	\$	2,049	\$	223	-2.01x	\$	(1.78)	\$	0.81	\$	1.05	\$	0.80	\$	1.09	16%
Alphawave	GBP	286.54	GBP	385.61	GBP	96.56	GBP	189.08	2.38x	GBP	0.13	GBP	6.73	GBP	11.64	GBP	5.49	GBP	8.51	166%
IDCC	\$	505	\$	450	\$	841	\$	610	-0.70x	\$	(8.76)	\$	5.86	\$	6.13	\$	5.72	\$	4.05	14%
Wafers:																				
Shin-Etsu - 4063	JPY	2,518,468	JPY	2,793,833	JPY	1,557,453	JPY	29,789	-1.32x	JPY	(755)	JPY	300	JPY	318	JPY	282	JPY	294	19%
Siltronic	EUR	1,513	EUR	1,711	EUR	950	EUR	771	-0.30x	EUR	(5.95)	EUR	5.59	EUR	6.40	EUR	5.87	EUR	4.37	15%
Soitec	EUR	1,018	EUR	1,443	EUR	789	EUR	648	-0.40x	EUR	(3.96)	EUR	5.58	EUR	8.09	EUR	4.49	EUR	8.21	13%
Sumco - 3436	JPY	429,639	JPY	496,191	JPY	208,273	JPY	166,113	-0.25x	JPY	(120)	JPY	189	JPY	157	JPY	172	JPY	137	14%

Source: Jefferies, FactSet, company data

Chart 88 - Semis Comp Table

Company	Consensus Sales (m)		Cash (m)	Debt (m)	Net Debt /EBITDA	Net Debt /Shr	JEF EPS		Cons. EPS		ROIC									
	2023	2024					2023	2024	2023	2024										
Semi Cap Equipment:																				
Front-End																				
ACMR	\$	562	\$	662	\$	270	\$	81	-2.10x	\$	(3.44)	\$	1.12	\$	1.17	\$	1.30	\$	1.29	9%
Adv Micro - 688012	CNY	6,076	CNY	8,263	CNY	9,785	CNY	522	-8.26x	CNY	(14.98)	CNY	3.18	CNY	3.44	CNY	2.47	CNY	3.43	8%
Aixtron	EUR	636	EUR	699	EUR	210	EUR	-	-1.72x	EUR	(1.86)	EUR	1.28	EUR	1.54	EUR	1.36	EUR	1.56	14%
AMAT	\$	25,960	\$	26,696	\$	6,535	\$	6,099	-0.11x	\$	(0.52)	\$	7.79	\$	8.34	\$	7.73	\$	7.88	35%
ASM International	EUR	2,600	EUR	3,072	EUR	490	EUR	21	-0.54x	EUR	(9.50)	EUR	12.18	EUR	14.80	EUR	12.23	EUR	15.68	24%
ASML Holding	EUR	27,135	EUR	28,404	EUR	6,346	EUR	4,518	-0.20x	EUR	(4.54)	EUR	19.81	EUR	23.34	EUR	19.32	EUR	21.23	50%
Canon - 7751	JPY	4,307,690	JPY	4,489,600	JPY	545,275	JPY	662,839	-0.01x	JPY	88	JPY	281	JPY	264	JPY	273	JPY	289	7%
KLAC	\$	9,515	\$	9,907	\$	3,243	\$	6,063	0.60x	\$	20.69	\$	22.15	\$	25.38	\$	21.73	\$	23.43	41%
Lasertec - 6920	JPY	186,618	JPY	256,070	JPY	29,773	JPY	5,040	-0.38x	JPY	(262)	JPY	537	JPY	707	JPY	564	JPY	807	89%
LRCX	\$	14,141	\$	15,688	\$	5,375	\$	5,249	-0.07x	\$	(0.95)	\$	25.67	\$	34.12	\$	25.85	\$	30.23	37%
Nikon - 7731	JPY	664,227	JPY	688,209	JPY	209,959	JPY	136,619	-0.95x	JPY	(209)	JPY	102	JPY	109	JPY	108	JPY	123	6%
NVMI	\$	505	\$	585	\$	416	\$	243	-1.41x	\$	(6.01)	\$	4.49	\$	5.58	\$	4.47	\$	5.23	21%
ONTO	\$	820	\$	934	\$	610	\$	19	-2.54x	\$	(12.03)	\$	3.61	\$	4.50	\$	3.67	\$	4.65	14%
TEL - 8035	JPY	1,792,475	JPY	1,916,395	JPY	401,029	JPY	16,170	-0.58x	JPY	(816)	JPY	718	JPY	839	JPY	719	JPY	831	32%
Back-End																				
Advantest - 6857	JPY	487,408	JPY	536,700	JPY	78,873	JPY	71,745	-0.04x	JPY	(9)	JPY	130	JPY	150	JPY	108	JPY	635	34%
A&D Holon - 7745	JPY	61,715	JPY	63,805	JPY	14,867	JPY	20,842	0.56x	JPY	215	JPY	203	JPY	221	JPY	206	JPY	227	16%
CAMT	\$	307	\$	360	\$	431	\$	196	-3.16x	\$	(5.26)	\$	1.90	\$	2.30	\$	1.86	\$	2.26	16%
Disco - 6146	JPY	264,616	JPY	315,950	JPY	153,201	JPY	-	-1.27x	JPY	(1,414)	JPY	711	JPY	738	JPY	732	JPY	790	26%
FORM	\$	664	\$	751	\$	238	\$	49	-8.56x	\$	(2.43)	\$	0.67	\$	1.34	\$	0.68	\$	1.28	5%
TER	\$	2,678	\$	3,277	\$	708	\$	118	-0.91x	\$	(3.83)	\$	2.78	\$	4.57	\$	2.83	\$	4.54	23%
Tokyo Seimitsu - 7729	JPY	136,672	JPY	136,043	JPY	28,433	JPY	12,300	-0.44x	JPY	(384)	JPY	481	JPY	529	JPY	511	JPY	525	17%
TOWA - 6315	JPY	47,021	JPY	56,567	JPY	17,134	JPY	14,795	-0.22x	JPY	(93)	JPY	239	JPY	306	JPY	245	JPY	298	15%
USHIO - 6925	JPY	178,163	JPY	188,410	JPY	64,568	JPY	21,146	-2.04x	JPY	(352)	JPY	84	JPY	99	JPY	95	JPY	110	6%

Source: Jefferies, FactSet, company data

Company Valuation/Risks

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Investment Recommendation Record

(Article 3(1)e and Article 7 of MAR)

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Company Specific Disclosures

Steven DeSanctis owns shares of Apple Inc. common shares.

David Lustberg owns shares of Amazon.com common stock.

David Lustberg owns shares of Amazon.com common stock. Steven DeSanctis owns shares of Amazon.com common shares.

Steven DeSanctis owns shares of Alphabet Inc. common shares.

JEF is acting as financial advisor to Oclaro Inc. in the proposed sale of the company to Lumentum.

James Heaney has a long position in Facebook.

Steven DeSanctis owns shares of Microsoft Inc. common shares.

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Within the past twelve months, Jefferies LLC and/or its affiliates received compensation for products and services other than investment banking services from non-investment banking, securities related compensation for client services it provided to STMicroelectronics N.V..

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Buy - Describes securities that we expect to provide a total return (price appreciation plus yield) of 15% or more within a 12-month period.

Hold - Describes securities that we expect to provide a total return (price appreciation plus yield) of plus 15% or minus 10% within a 12-month period.

Underperform - Describes securities that we expect to provide a total return (price appreciation plus yield) of minus 10% or less within a 12-month period.

The expected total return (price appreciation plus yield) for Buy rated securities with an average security price consistently below \$10 is 20% or more within a 12-month period as these companies are typically more volatile than the overall stock market. For Hold rated securities with an average security price consistently below \$10, the expected total return (price appreciation plus yield) is plus or minus 20% within a 12-month period. For Underperform rated securities with an average security price consistently below \$10, the expected total return (price appreciation plus yield) is minus 20% or less within a 12-month period.

NR - The investment rating and price target have been temporarily suspended. Such suspensions are in compliance with applicable regulations and/or Jefferies policies.

CS - Coverage Suspended. Jefferies has suspended coverage of this company.

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Risks which may impede the achievement of our Price Target

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Other Companies Mentioned in This Report

- A&D Holon HD (7745 JP: ¥1,633, BUY)
- ACM Research Inc (ACMR: \$19.00, BUY)
- Advanced Micro Devices, Inc. (AMD: \$105.09, BUY)
- Advanced Micro-Fabrication Eqp Inc China (688012 CH: CNY162.82, BUY)
- Advantest (6857 JP: ¥4,570, BUY)
- Aixtron SE (AIXA GR: €30.10, BUY)
- Alibaba Group Holding Limited (BABA: \$84.02, BUY)
- Allegro MicroSystems, Inc. (ALGM: \$29.52, BUY)
- Alphabet, Inc. (GOOGL: \$137.36, BUY)
- Alphawave Semi (AWE LN: p108.00, BUY)
- Amazon.com, Inc (AMZN: \$129.79, BUY)
- Ambarella, Inc. (AMBA: \$52.85, BUY)
- ams OSRAM (AMS SW: CHF3.88, HOLD)
- Analog Devices, Inc. (ADI: \$171.07, BUY)
- Apple Inc. (AAPL: \$178.85, BUY)
- Applied Materials Inc. (AMAT: \$141.14, BUY)
- Arista Networks, Inc. (ANET: \$189.85, HOLD)
- Arm Holdings plc (ARM: \$50.78, BUY)
- Arteris, Inc. (AIP: \$5.96, BUY)
- ASM International N.V. (ASM NA: €385.45, BUY)
- ASML Holding NV (ASML NA: €573.60, BUY)
- Broadcom (AVGO: \$883.18, BUY)
- Calix Inc. (CALX: \$43.34, BUY)
- Camtek Ltd (CAMT: \$59.91, BUY)
- Canon Inc. (7751 JP: ¥3,617, HOLD)
- Cisco Systems, Inc. (CSCO: \$53.77, BUY)
- Disco (6146 JP: ¥29,450, BUY)
- FormFactor Inc (FORM: \$33.87, HOLD)
- GLOBALFOUNDRIES Inc. (GFS: \$55.65, BUY)
- Harmonic Inc. (HLIT: \$9.66, BUY)

- Hua Hong Semiconductor (1347 HK: HK\$19.88, HOLD)
- Impinj, Inc. (PI: \$52.69, BUY)
- Infineon Technologies (IFX GR: €32.11, HOLD)
- Intel Corporation (INTC: \$35.97, HOLD)
- InterDigital (IDCC: \$80.10, BUY)
- JEOL (6951 JP: ¥4,762, BUY)
- Juniper, Inc. (JNPR: \$25.66, BUY)
- Kakaku.com, Inc. (2371 JP: ¥1,380, BUY)
- KLA Corporation (KLAC: \$486.81, BUY)
- LAM Research Corporation (LRCX: \$645.12, BUY)
- Lasertec Corp (6920 JP: ¥26,875, BUY)
- Lattice Semiconductor Corporation (LSCC: \$75.08, BUY)
- Lumentum Holdings Inc. (LITE: \$41.42, BUY)
- Luminar Technologies, Inc. (LAZR: \$4.12, BUY)
- M/A-COM Technology Solutions Holdings, Inc. (MTSI: \$79.68, BUY)
- Marvell Technology Group Ltd. (MRVL: \$52.62, BUY)
- Melexis NV (MELE BB: €83.25, HOLD)
- Meta Platforms, Inc. (META: \$314.69, BUY)
- Microchip Technology Inc. (MCHP: \$77.46, BUY)
- Microsoft Corporation (MSFT: \$327.73, BUY)
- Navitas Semiconductor Corporation (NVTS: \$5.89, BUY)
- Nikon (7731 JP: ¥1,566, BUY)
- Nova Ltd (NVMI: \$106.06, BUY)
- NVIDIA Corporation (NVDA: \$454.61, BUY)
- NXP Semiconductors NV (NXPI: \$194.50, BUY)
- ON Semiconductor Corporation (ON: \$89.14, BUY)
- Onto Innovation Inc (ONTO: \$138.10, BUY)
- Oracle Corporation (ORCL: \$108.25, BUY)
- Rambus, Inc. (RMBS: \$57.23, BUY)
- Semiconductor Manufacturing International Corporation (981 HK: HK\$20.70, HOLD)
- Shibaura Mechatronics Corp (6590 JP: ¥7,310, BUY)
- Shin-Etsu Chemical (4063 JP: ¥4,488, BUY)
- Siltronic AG (WAF GR: €82.90, BUY)
- SkyWater Technology, Inc. (SKYT: \$5.59, HOLD)
- SMART Global Holdings, Inc. (SGH: \$13.10, BUY)
- Soitec (SOI FP: €153.75, BUY)
- STMicroelectronics N.V. (STMPA FP: €41.16, HOLD)
- SUMCO (3436 JP: ¥2,006, HOLD)
- TAZMO (6266 JP: ¥3,080, BUY)
- Tencent Holdings Ltd. (700 HK: HK\$306.80, BUY)
- Teradyne Inc (TER: \$95.60, BUY)
- Tesla, Inc. (TSLA: \$251.12, HOLD)
- Texas Instruments Incorporated (TXN: \$152.75, BUY)
- Tokyo Electron (8035 JP: ¥21,210, BUY)
- Tokyo Seimitsu (7729 JP: ¥7,630, BUY)
- TOWA (6315 JP: ¥4,895, BUY)
- Tower Semiconductor Ltd (TSEM: \$21.98, HOLD)
- Ushio (6925 JP: ¥1,931, BUY)
- Wolfspeed, Inc. (WOLF: \$32.53, HOLD)

Distribution of Ratings

			IB Serv./Past12 Mos.		JIL Mkt Serv./Past12 Mos.	
	Count	Percent	Count	Percent	Count	Percent
BUY	1866	58.51%	319	17.10%	111	5.95%
HOLD	1173	36.78%	110	9.38%	14	1.19%
UNDERPERFORM	150	4.70%	4	2.67%	2	1.33%

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