

### Semis on Fire 20-Oct-23: Checks, China, LRCX v AMAT

In our "Semis on Fire" videos, we strive to highlight differentiated insights and distill them into a short video format. This week, we highlight our recent Channel Checks and the recent China restrictions and implications from LAM's earnings report. Our top picks are ONTO, CAMT, AMAT, LRCX, NVDA and TXN. Video link [here](#)

**Channel Checks Bad News: Inventories High, Backlog Declining.** We hosted a conference call with our top supply chain expert – it was a good-news/bad-news story: On the negative side: 1) supply chain inventories remain high, 2) lead times and backlog are declining, 3) Demand seems to be softening broadly.

**Channel Checks Good New: AI Demand Robust, Semi Prices Firm.** On the Positive side: 1) Demand for AI, datacenter and Automotive markets remains robust, and 4) Semiconductor pricing remains firm broadly and appears to be increasing in memory

**China Restrictions SemiCap: Nominal Impact.** On the Recently Updated US Restrictions on China. On the Semi-Cap Equipment side, there doesn't seem to be any material change on negative impact to our SemiCap equipment coverage.

**China Restrictions AI: Broad-based Demand Trumps Restrictions.** Regarding the shipments of AI chips, the processing threshold is becoming more stringent, and in our coverage universe, this would be a focus on NVDA. We think about Near-term and medium-term impacts.

- Near term, we think demand is so robust for NVDA GPUs that any chips that cannot be shipped into China will be absorbed by non-China markets
- Medium term, we don't think restrictions dampen demand for AI Chips in China. Over the past 7 years, we know of a number of examples where Cloud companies purchased N-1 or even N-2 AI GPUs from NVDA, and we think China will continue to buy older chips like the V100 and A10 for their AI workloads under these revised set of restrictions. We sense investor caution on NVDA, and think it could post a beat-and-raise quarter when it reports in November.

**LRCX Report: China Upside Surprise -> Positive for AMAT.** LAM Research reported results, and the big surprise was that its China revenues doubled to nearly 50% of revenues. We sense a lot of investor skepticism around the sustainability of demand for semi-cap equipment from China, either because of further US restrictions or because of the fear that China is overbuilding. Our fieldwork suggests the demand sustains for the foreseeable future, and we do not expect any more material restrictions, as the equipment is for trailing node chips that do not appear to pose a material threat to national security. Bottom line, we view LAM's report is a positive indicator for Applied Materials.

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



#### Links to Related Research:

Earnings: [LRCX](#)

18-Oct-23: [Channel Checks: Inventories Higher, Lead Times + Backlogs Lower](#)

13-Oct-23: [Semis Weekly 13-Oct-23: ARM Initiation and Cloud Instance Analysis](#)

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](#)

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](#)

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](#)

**Mark Lipacis \* | Equity Analyst**  
(415) 229-1438 | [mlipacis@jefferies.com](mailto:mlipacis@jefferies.com)

**Vedvati Shrotre \* | Equity Analyst**  
(415) 229-1574 | [vshrotre@jefferies.com](mailto:vshrotre@jefferies.com)

**Natalia Winkler, CFA \* | Equity Analyst**  
(415) 229-1511 | [nwinkler@jefferies.com](mailto:nwinkler@jefferies.com)

**Brian Chen, CFA \* | Equity Associate**  
(415) 229-1478 | [bchen1@jefferies.com](mailto:bchen1@jefferies.com)

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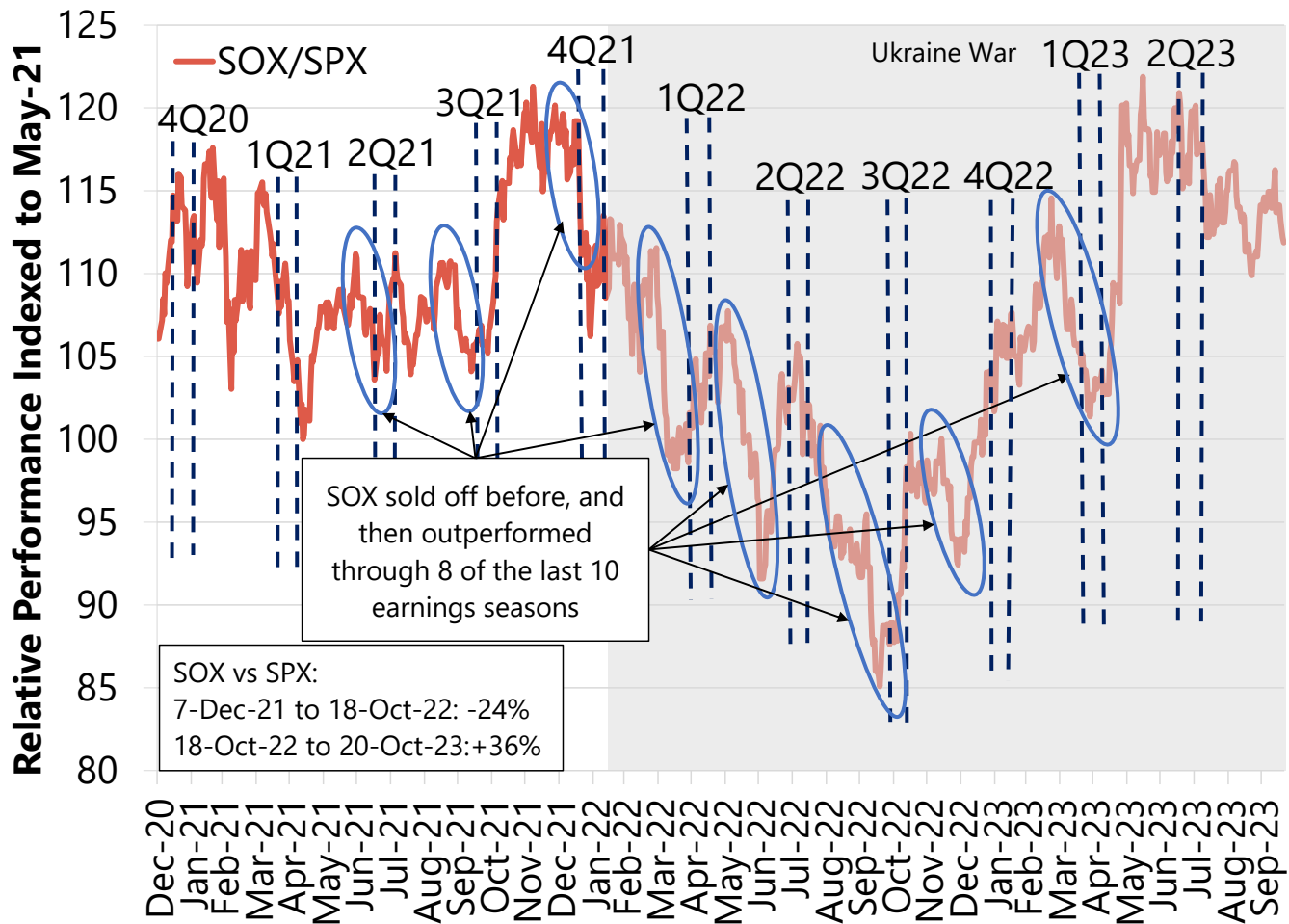
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## Highlighted Charts

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 155bps this week

SOX-SPX Relative Performance Indexed to May-2021



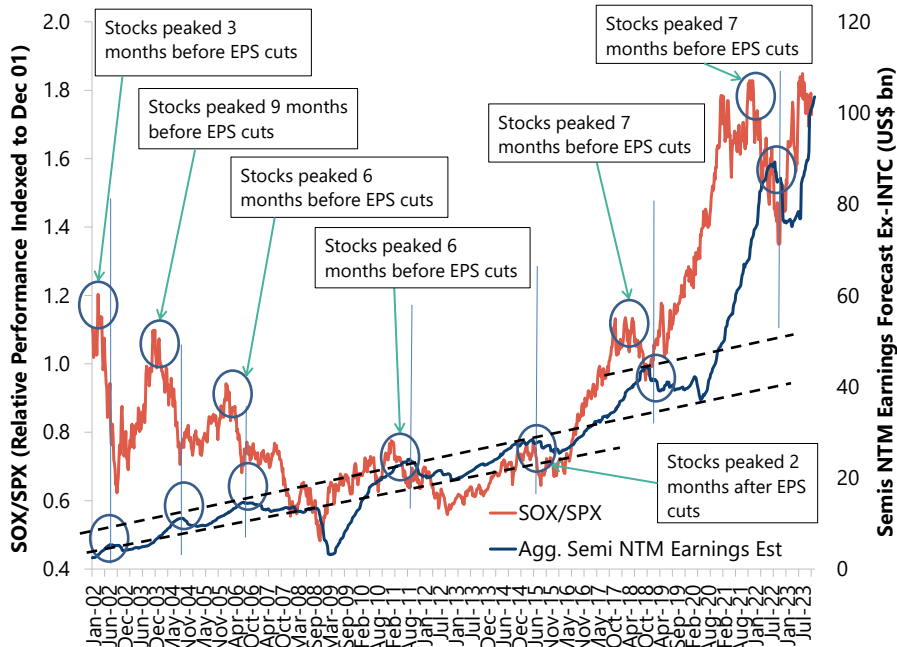
Source: Source: Jefferies, FactSet

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 155bps 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

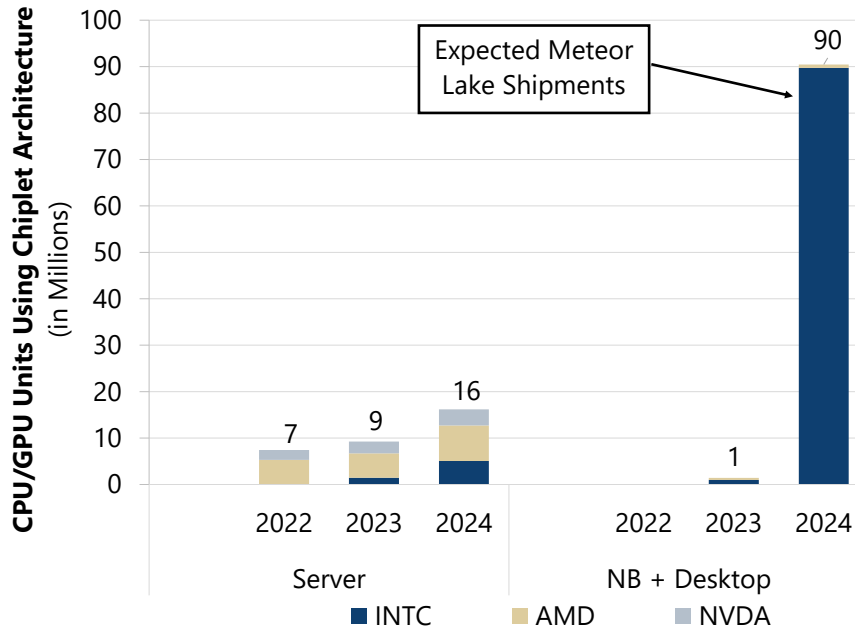
**Red Line:** Relative performance of the SOX vs SPX

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.

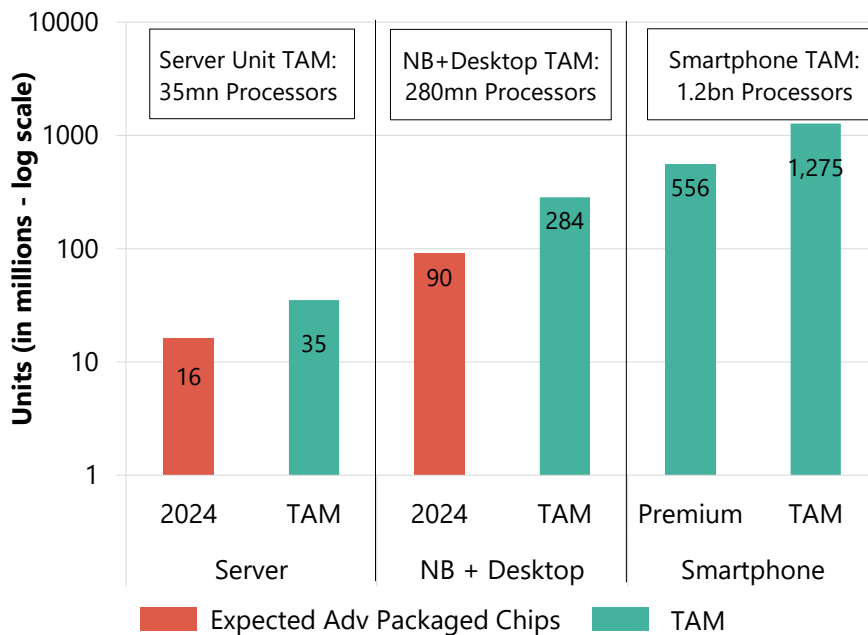
We highlight that EPS downward revisions have paused recently. We note that pauses in EPS downward revisions in 2002, 2004, and 2019 coincided with a give-back of initial outperformance for 5-12 weeks in the early part of the cycle.

**Chart 3 - We Expect The Number of Chips That Ship Using Advanced Packaging Will Increase by 10x Over The Next 18 Months**



Source: Jefferies, Mercury

**Chart 4 - 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 400mm<sup>2</sup> 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

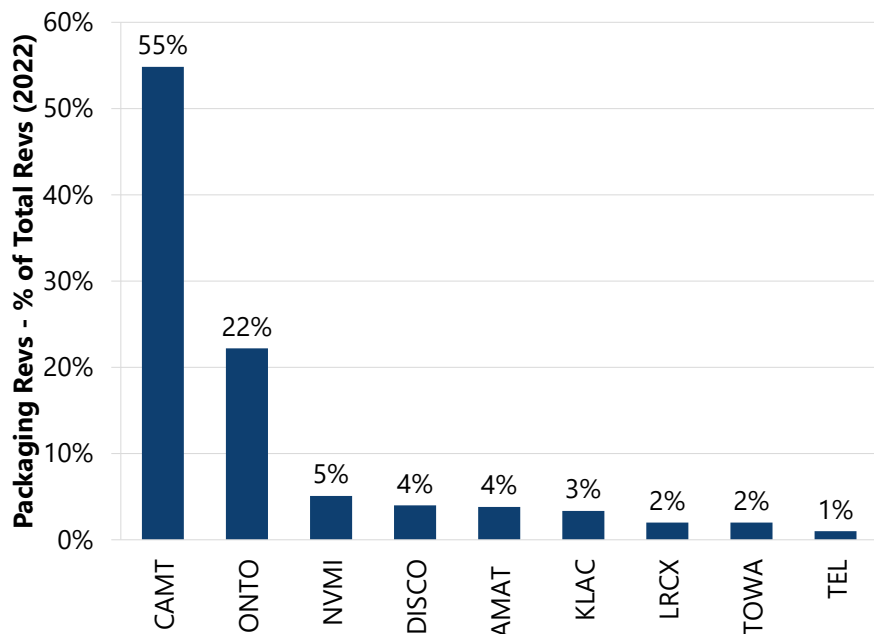
Perhaps more exciting, is that INTC expects to launch its first high-volume CPU that uses advanced packaging in 2H24, called Meteor Lake

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

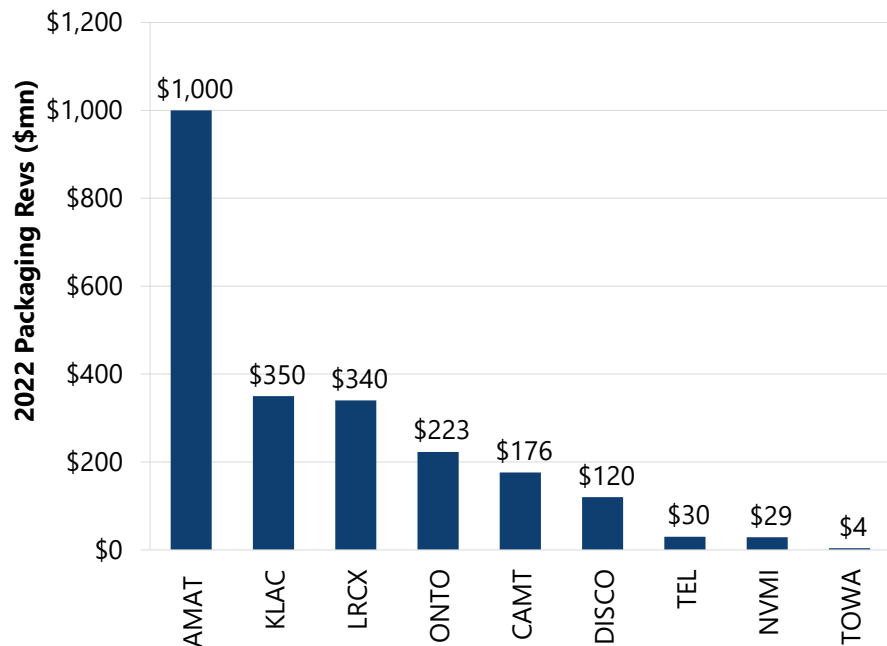
Chart 5 - CAMT, ONTO Have Highest Rev Exposure to Packaging



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

Source: Jefferies, Mgmt. Commentary, TechInsights

Chart 6 - AMAT has Highest Revs from Advanced Packages



*AMAT has the highest revenues from packaging applications*

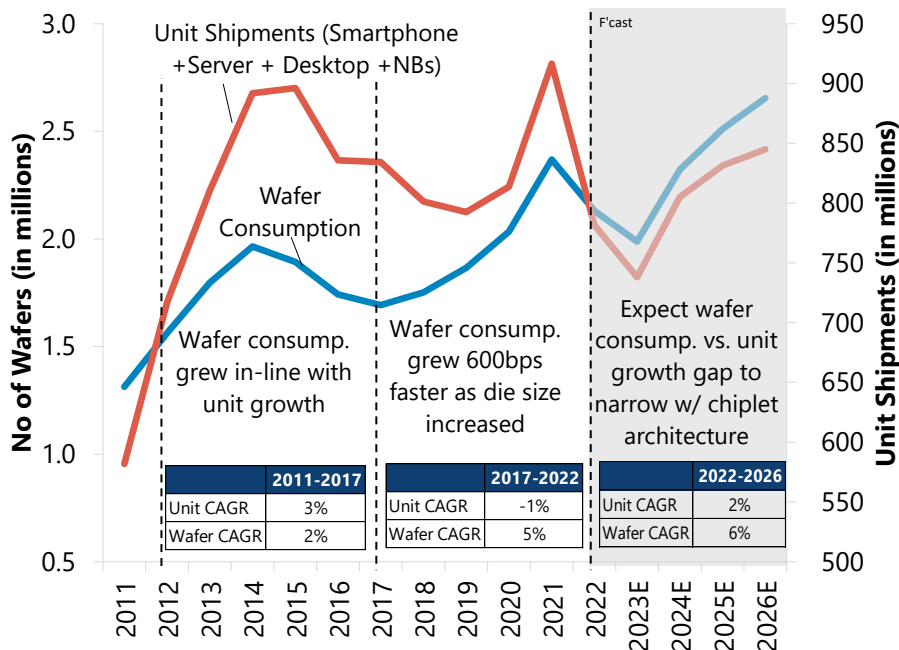
Source: Jefferies, Mgmt. commentary, TechInsights

Chart 7 - 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, <b>those are the tool sets that people are actually pulling for in terms of accelerated deliveries</b> "
	KLAC	" <b>Packaging is a small part of the business right now but is growing</b> "
	TER	" <b>...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</b> "
	CAMT	" <b>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</b> , 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 <b>CoWoS and HBM</b> that were mentioned that <b>we can see continuing to strengthen straight through the year...</b> "
	AMAT	" <b>Packaging, that's \$1 billion business for us now and we see an opportunity to double that over the next few years</b> "
Trailing Node Demand		
SCE Companies noted continued strength in trailing node demand.  Most companies haven't seen signs of this demand rolling over	LRCX	" <b>...continued strength in the specialty node investments</b> , which are serviced by our Reliant systems business" "We <b>haven't yet seen demand for those trailing-edge technologies to really be rolling over.</b> "
	TER	"Automotive demand has remained strong "
	NVMI	Spread across IoT, automotive and advanced packaging
	ONTO	" <b>Revenue from our power device customers grew over 35%</b> and included our product portfolio of inspection, metrology and software solutions. <b>This was our largest market in the quarter</b> " " <b>we see power semiconductors for the fourth quarter remaining fairly strong</b> "
	AMAT	"...The ICAPS business growth has been <b>strong enough to offset weakness in NAND and leading logic...</b> " "We see <b>ICAPS demand as sustainable</b> , 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	" <b>...NAND spending is at the lowest levels we've seen since the advent of the 3D NAND architecture...</b> " " <b>...we haven't really seen utilizations getting any better</b> "
	KLAC	"...While the timing of a meaningful <b>resumption in WFE investment growth remains unclear</b> " " <b>...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.</b> So that has been an upside. " <b>...Memory looks a little bit slower in that regard...not really seeing any changes in overall utilization rates in memory</b> "
	TER	"Memory Test, the growth of DDR5 and HBM devices for data center applications are driving retooling" " <b>continued weakness in mobility has been offset by sustained strength in the automotive segment</b> "
	ONTO	" <b>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.</b> 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 8 - 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

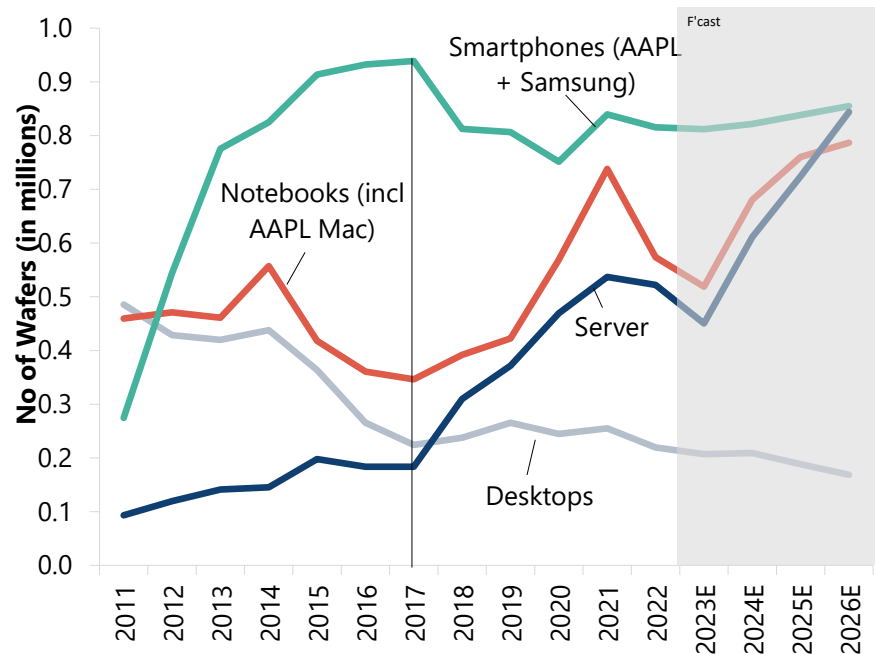
We use chip size data coupled with unit shipment data to calculate the increased demand for wafers for the Server and Client CPU and Smartphone markets

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 9 - 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.

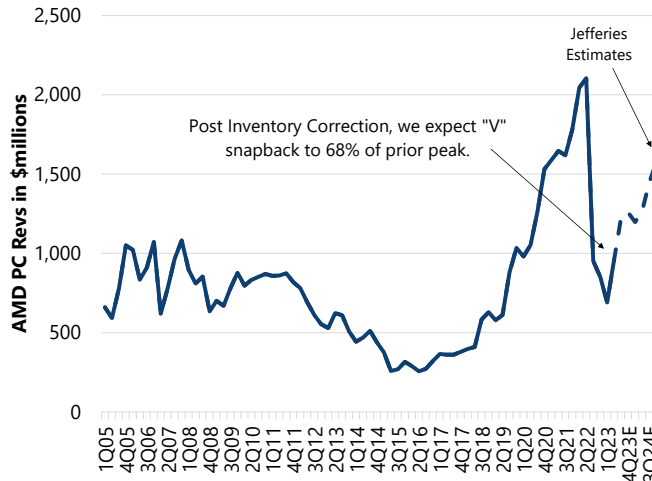
We estimate that server wafer consumption has grown at a CAGR of 23% from 2017 to 2022, with die size increases and 4% unit growth.

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 10 - AMD PC Revs Well Below Trendline**

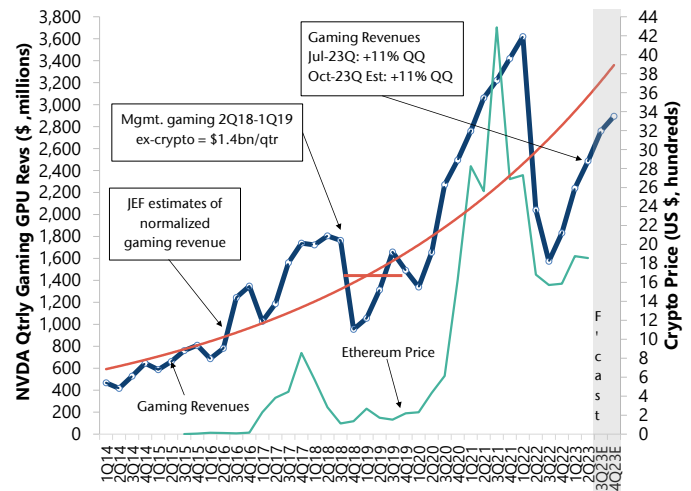
AMD Quarterly PC Revs in \$ millions



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 11 - NVDA Gaming Revenues Well Below Trendline**



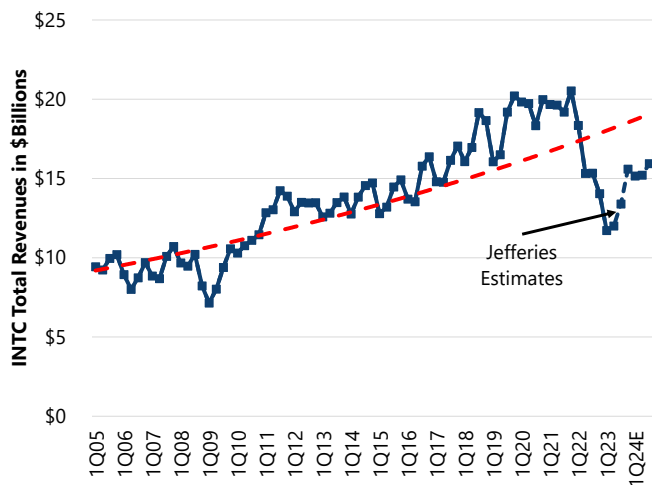
Source: Jefferies estimates, company data. Red line is exponential curve fit to NVDA gaming revs.

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.

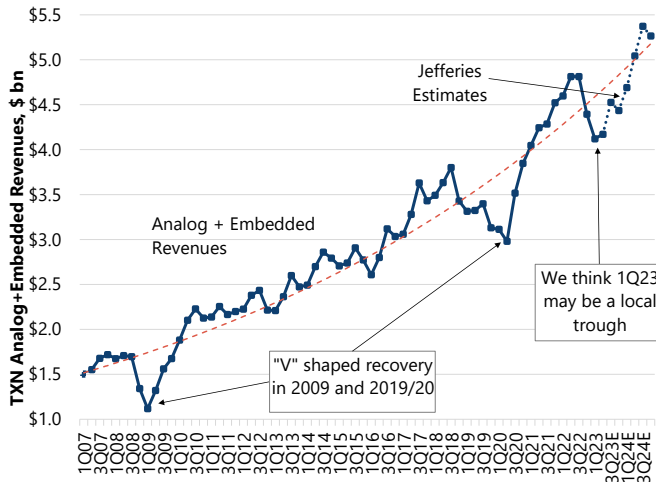
We believe INTC is materially undershipping end demand in 1H23; thus, we model a "V"-shaped snapback post inventory correction. We model snapback in 2H23 with 2H v 1H rev growth of 29%.

**Chart 12 - INTC Revenues Well Below Trendline**



Source: Jefferies, company data

Chart 13 - TXN Core Semi Revs Well Below Trendline

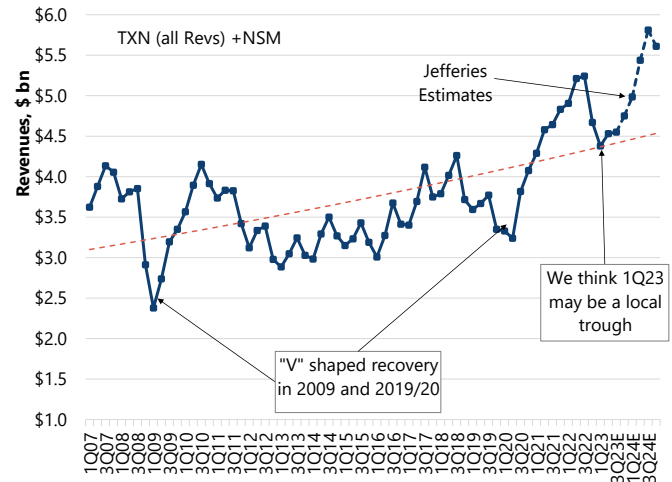


Source: Jefferies, company data; Jefferies estimates post 1Q23

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.

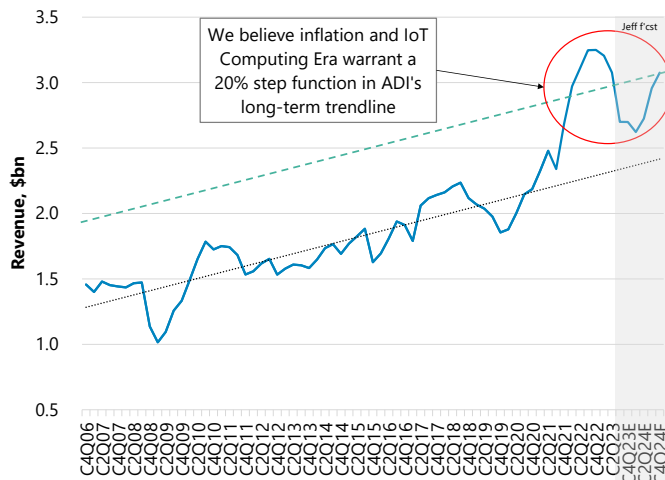
TXN's Core i.e. Analog+Embedded revs appear to be a low long-term trendline, but when considering all TXN revs and pro-forma revs of National Semiconductor (acquired in Apr-2011), TXN revs are at the long-term trendline.

Chart 14 - TXN Revenues At Trendline, When Looking on Pro-Forma Basis



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

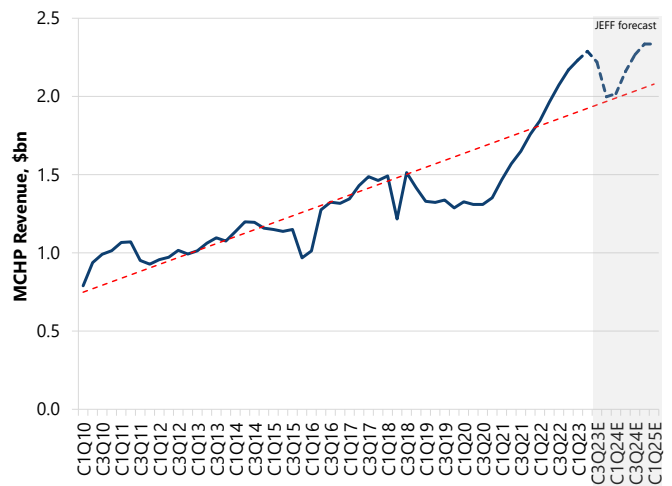
Chart 15 - We Model ADI Revs Decline by 17% Peak-to-Trough before Asymptoting to a Level 20% Higher than Historical



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

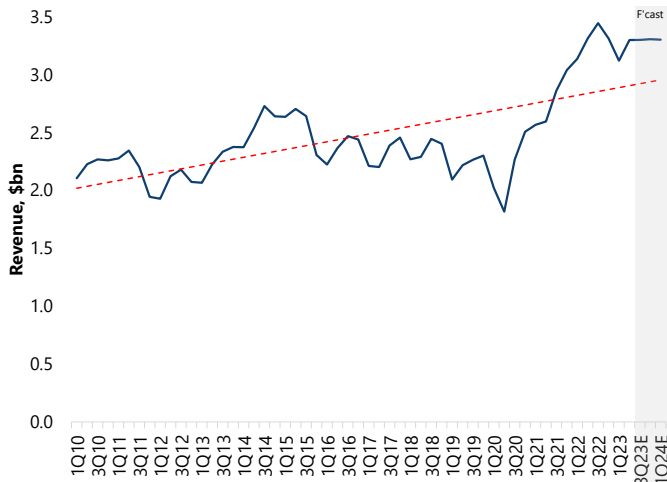


Source: Jefferies, company data; MCHP revs pro-forma for ATML and MSCC acquisitions

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

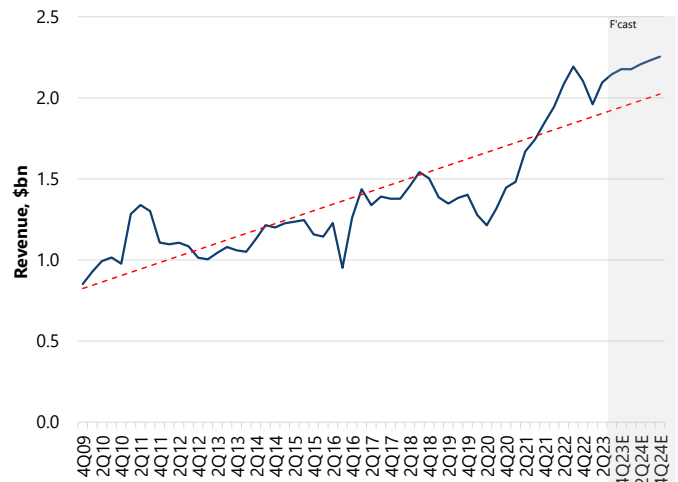
Chart 17 - NXPI's Revenues Above Trendline in 2H23



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

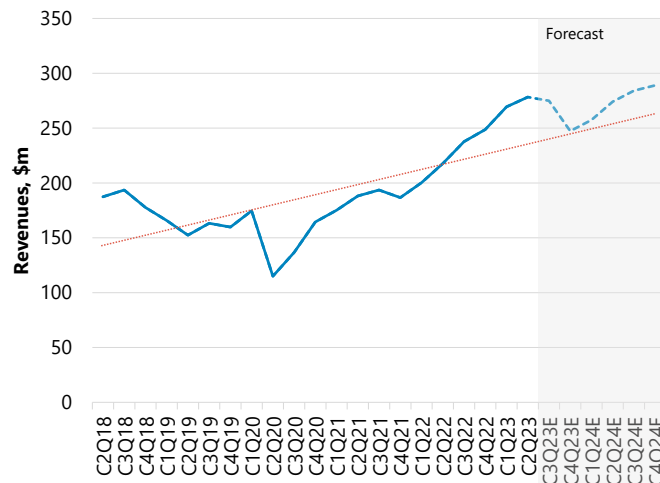
Chart 18 - We Model ON's Revenues Above LT Trendline



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

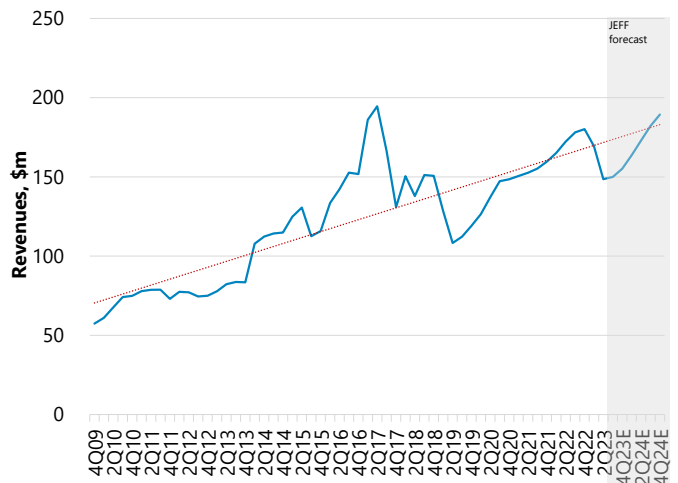
Chart 19 - We model ALGM's revs to increase 18% in C2023 and 3% in C2024, being at and above trendline levels



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

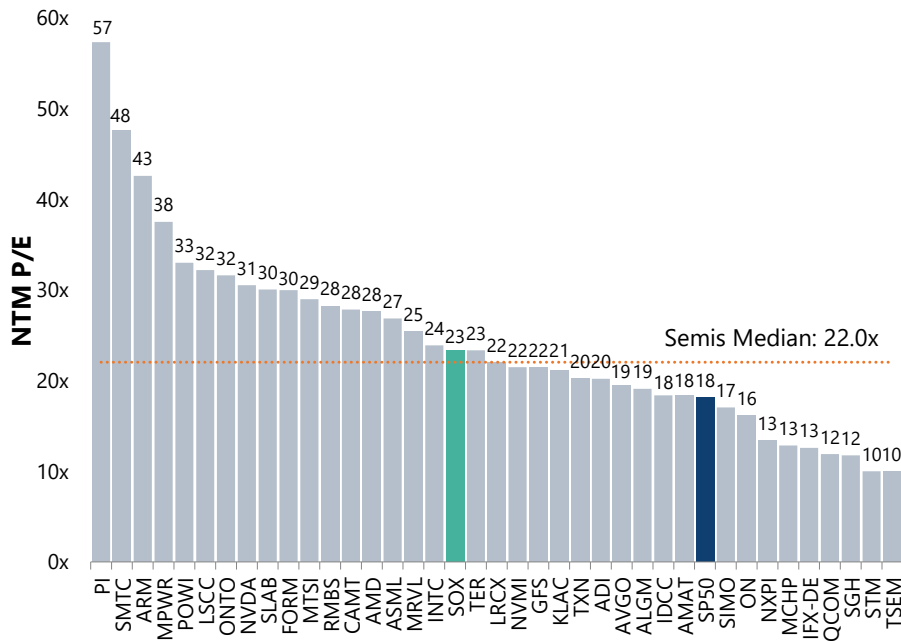
Chart 20 - We model MTSI revenues to decline by -10% in C2023, and to increase by 14% in C2024, exiting the year above trendline



Source: Jefferies, company data

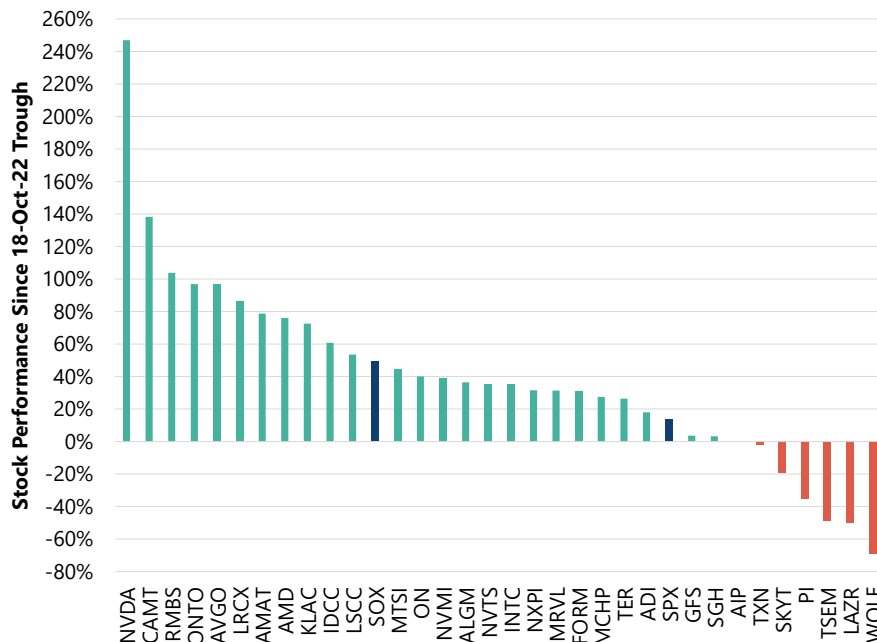
MTSI guided 1% QQ revenue growth in 3Q23, and we expect QQ revenue growth from there onwards, being below trendline in C2023, and exiting C2024 above trendline

Chart 21 - Semis Companies' Valuations on NTM P/E



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

Chart 22 - 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 24% premium vs the SP50 PE.

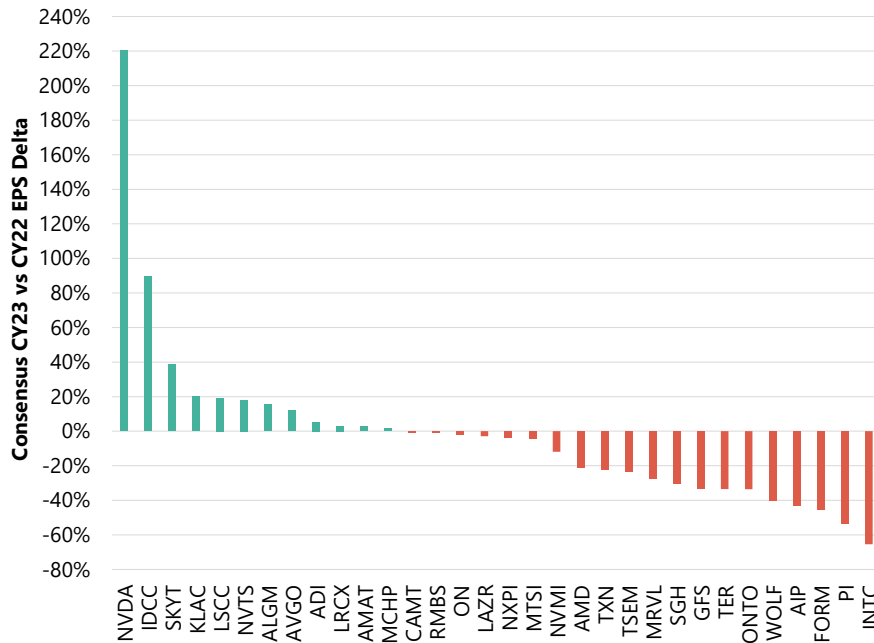
The median P/E in this semiconductor sample is 22.0x, 17% higher than the SPX and 6% lower than SOX, reflecting the skew of the index toward higher P/E, larger cap stocks like NVDA.

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 247% and 138% growth since the 18-Oct-22 trough respectively.

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

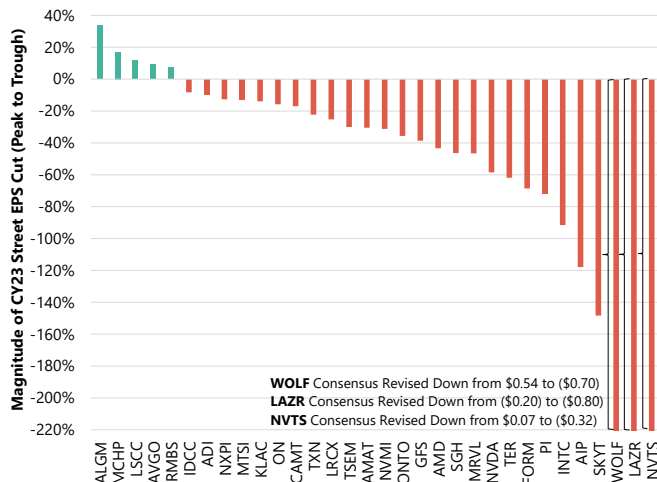
Chart 23 - CY23 vs CY22 EPS Delta for Covered Companies



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

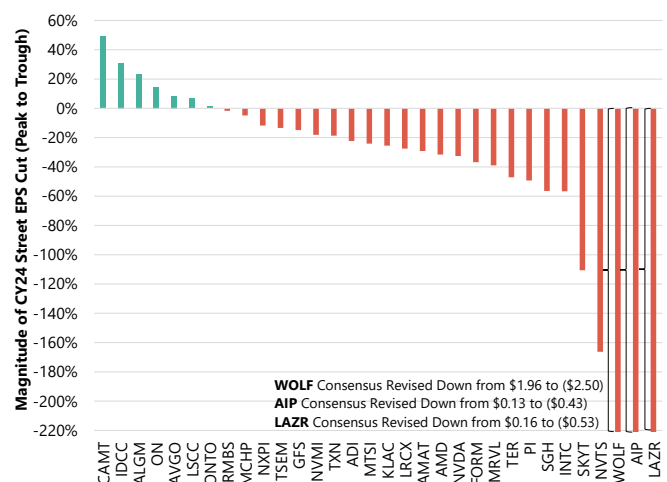
Chart 24 - CY23 EPS Peak to Trough Revisions



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.

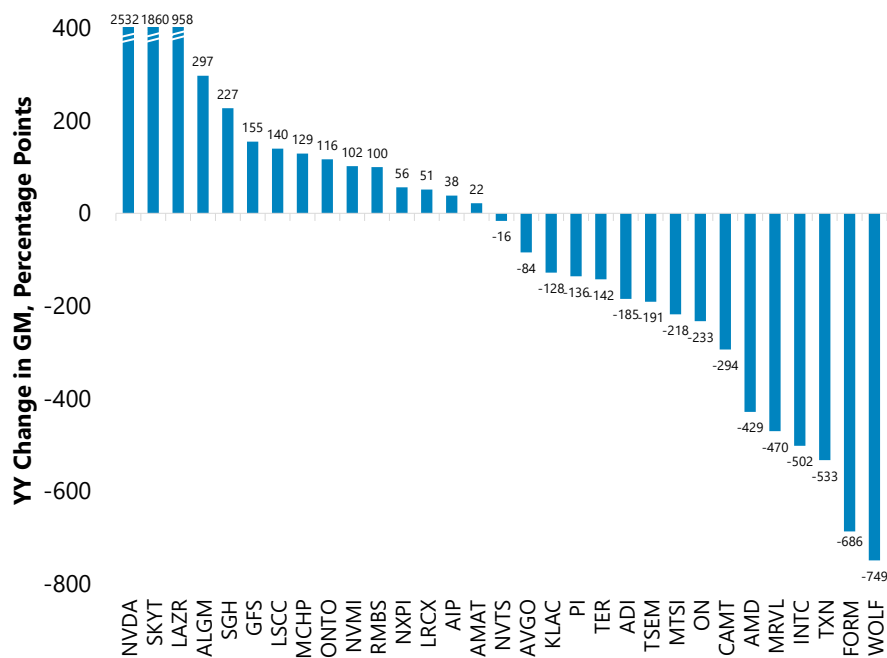
Chart 25 - CY24 EPS Peak to Trough Revisions



Source: Jefferies, FactSet

CAMT, IDCC, ALGM, ON, AVGO, and LSCC have not seen their estimates for CY24 EPS cut materially by consensus. For these companies, we compare EPS estimates as of Feb-23 vs today's EPS estimates.

Chart 26 - Change in GM from 2Q22 to 2Q23



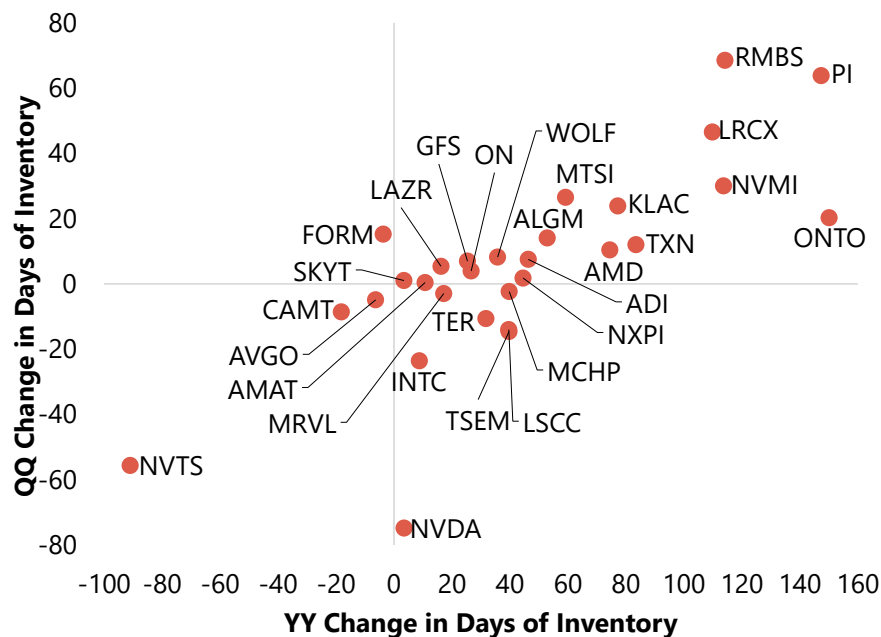
Source: Jefferies, company data; Non-GAAP GM

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

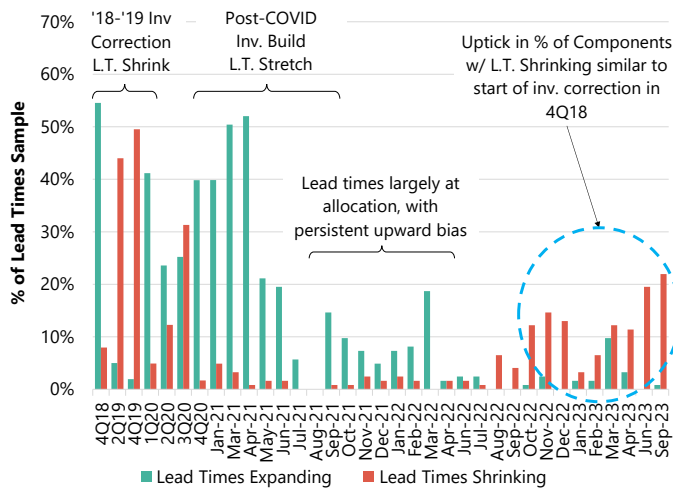


Source: Jefferies, company data

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

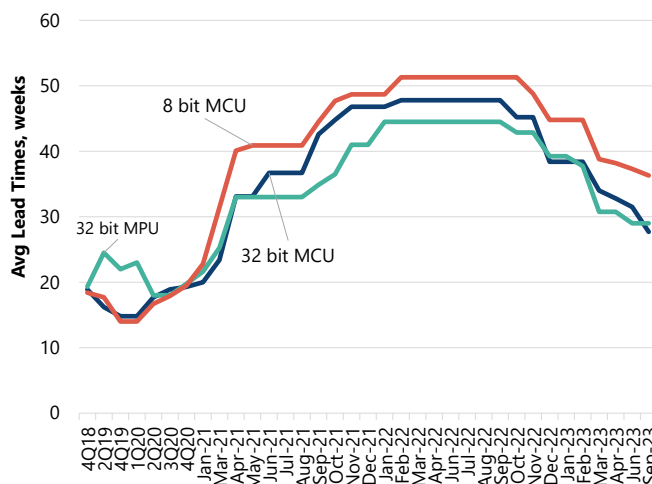


Source: Jefferies, Future Electronics Market Conditions Reports

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 30 - 8 bit MCU and 32 bit MCU Lead Times Down in Sep

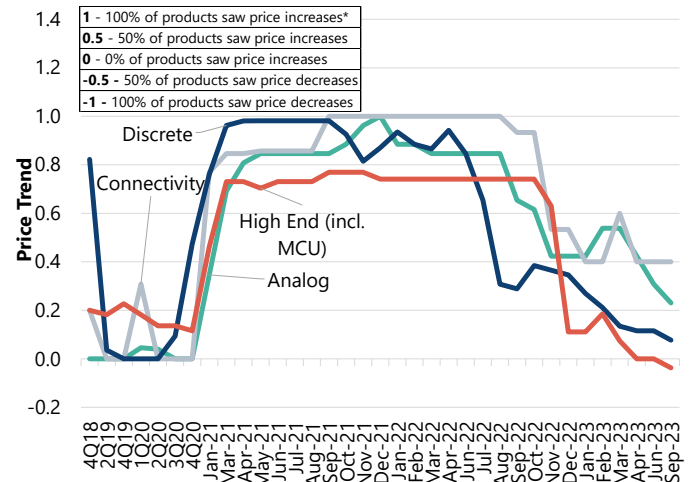
Avg Lead Times Across Players in the MCU/MPU Selected Categories



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

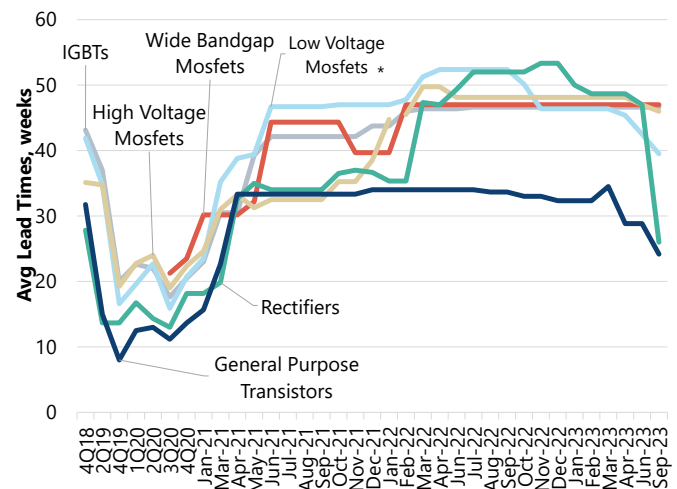
Chart 29 - Except for Connectivity, Analog Trended Down in Sep-23 Pricing Trends



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

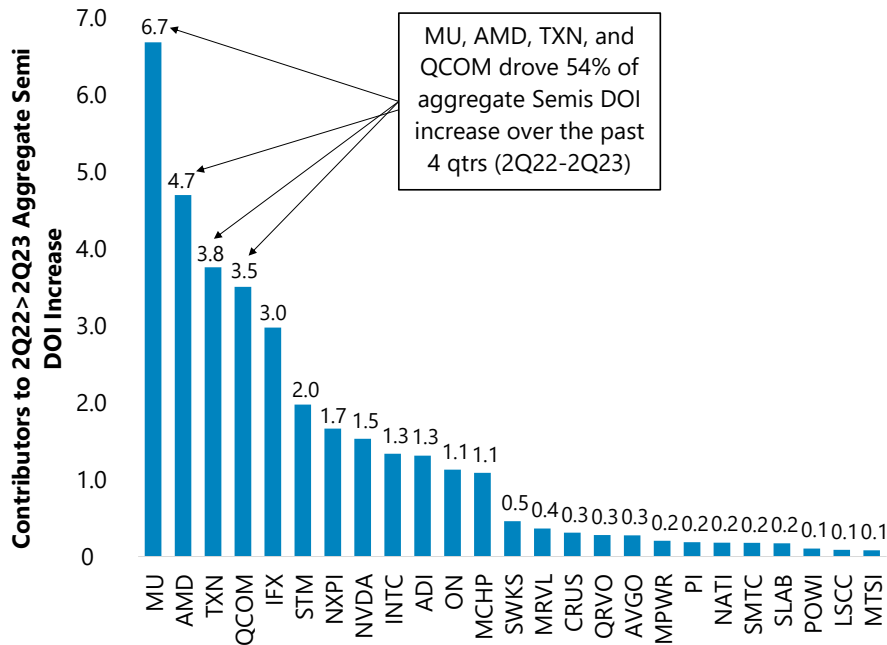


Source: Jefferies, Future Electronics Markets Conditions Report; \* in Feb-2022 FEMC report has stopped tracking ON-Fairchild MOSFETs resetting the lead times for the group, ex-ON-Fairchild Jan-22 level was at 45 weeks increased by 1 week in Feb-22

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.



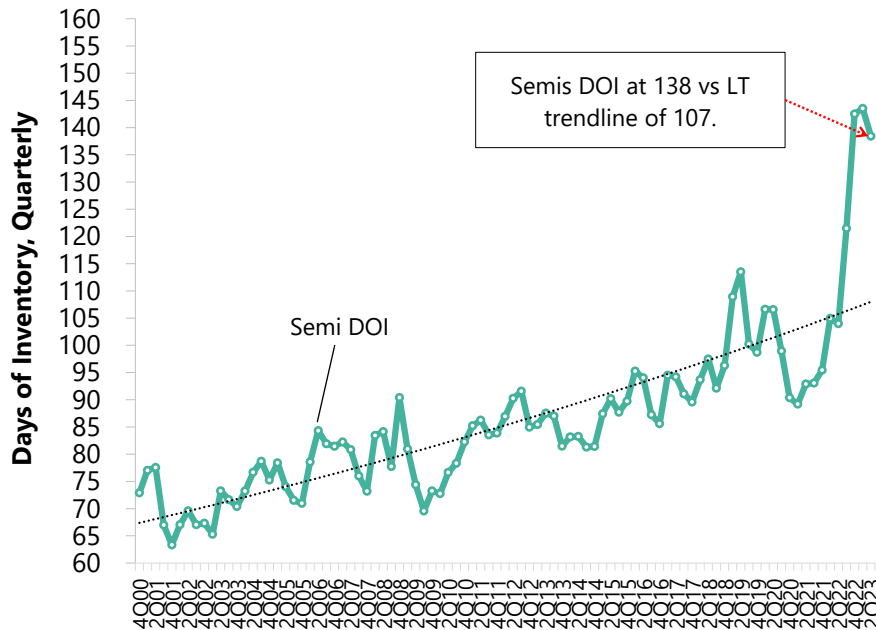
Chart 32 - 54% of the Past 4Qs Increase Comes from 4 Players



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

Source: Jefferies, FactSet

Chart 33 - Semis Days of Inventory



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

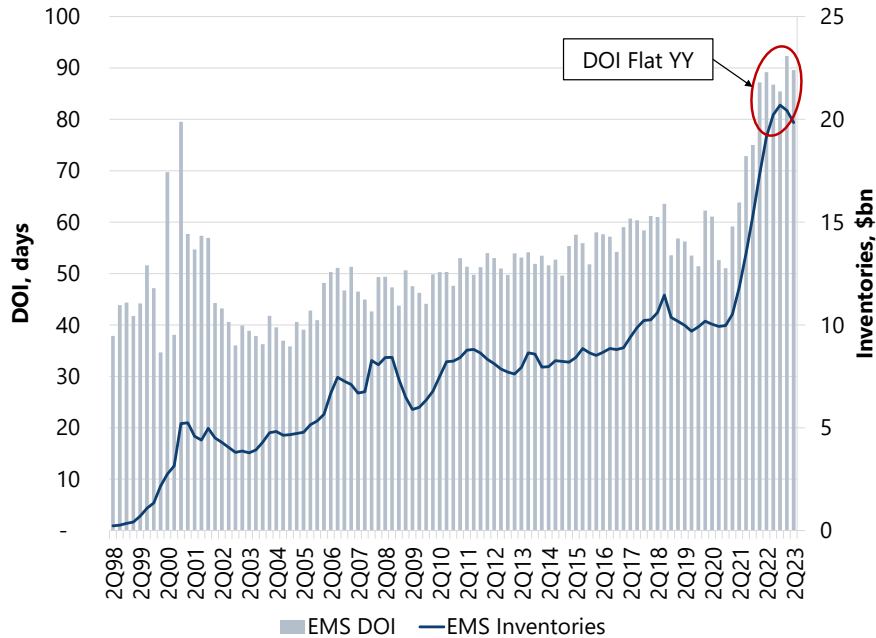
In 1Q23, DOI increased by 1 day QQ to 144 days. In 4Q22, DOI increased by 21 days and was at 143 days. This followed a 17 days increase in 3Q22.

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

Source: Jefferies, company data, FactSet

**Chart 34 - EMS DOI Decreased 3 Days QQ from 1Q23**

EMS Inventory and DOI

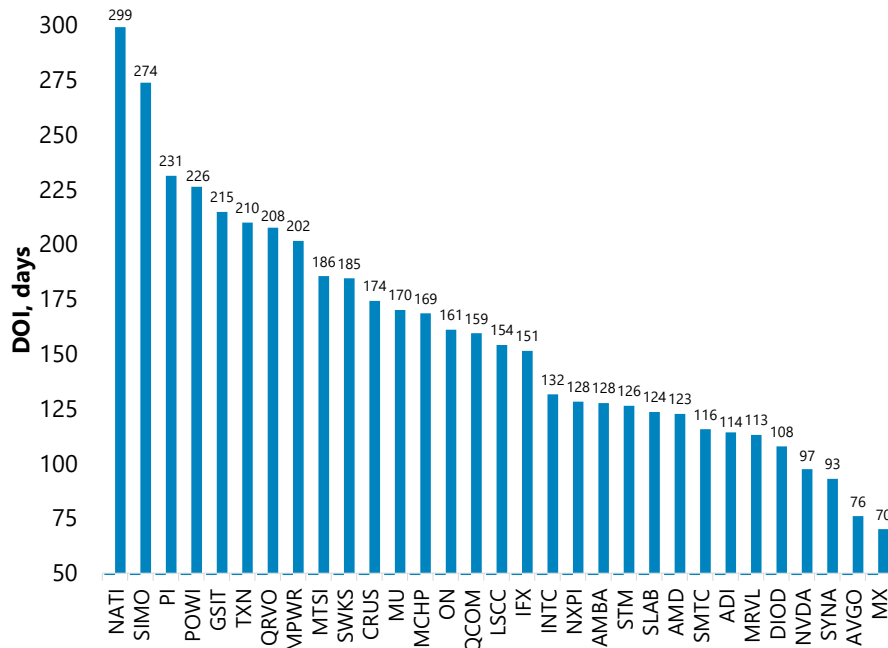


In 2Q23, EMS DOI remained flat YY and decreased by 3 days QQ to 90 days. In dollar terms, Inventories increased by \$692m YY and decreased by \$590m QQ. We believe that buildup of partly-built manufacturing kits is driving the increase.

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.

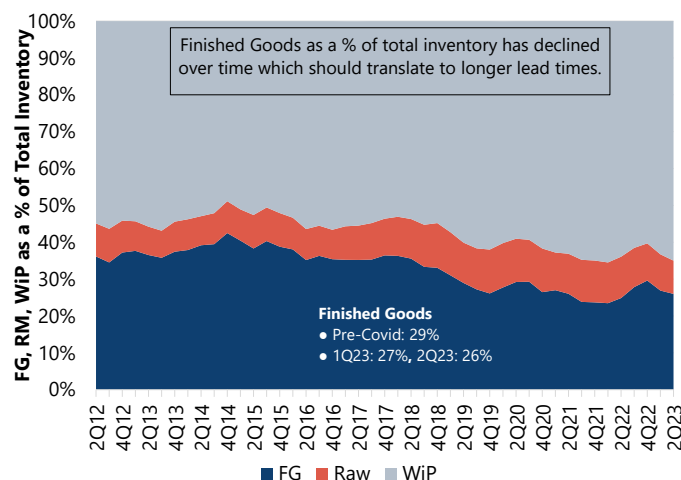
**Chart 35 - 2Q23 DOI Inventory for Semiconductors**



Median DOI for sample is 154 days

Source: Jefferies, FactSet

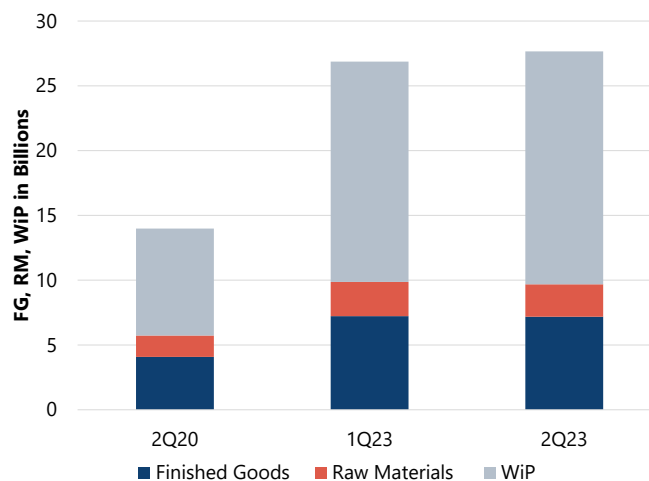
**Chart 36 - Finished Goods as a % of Total Inventory Decreased to 26% in 2Q23 from 27% in 1Q23, below pre-covid levels**



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.

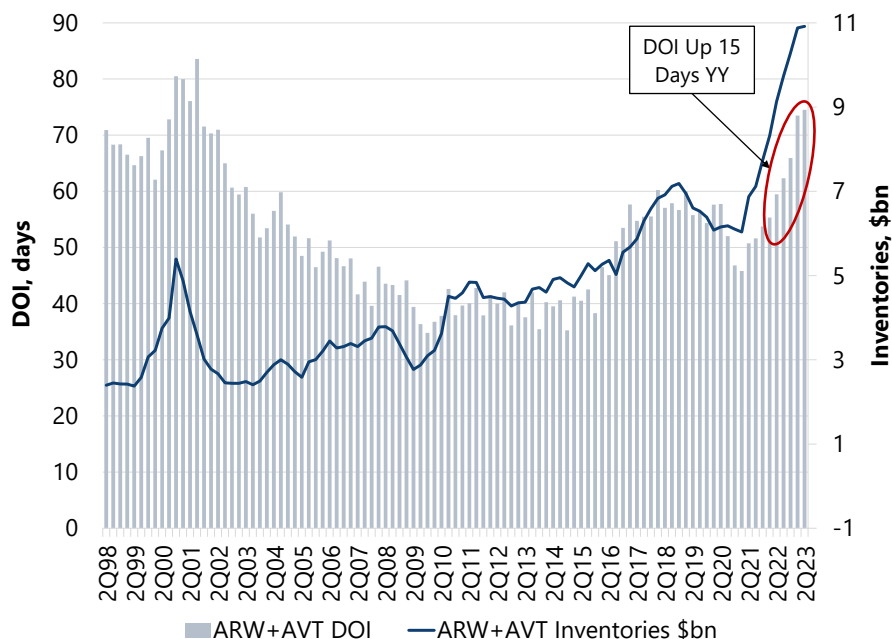
**Chart 37 - Finished Goods as a % of Total Inventory Decreased by 1% in 2Q23**



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 38 - Chip Distributor Inventory Days Increased 1 Day QQ from 1Q23**

Chip Distributor Inventory and DOI

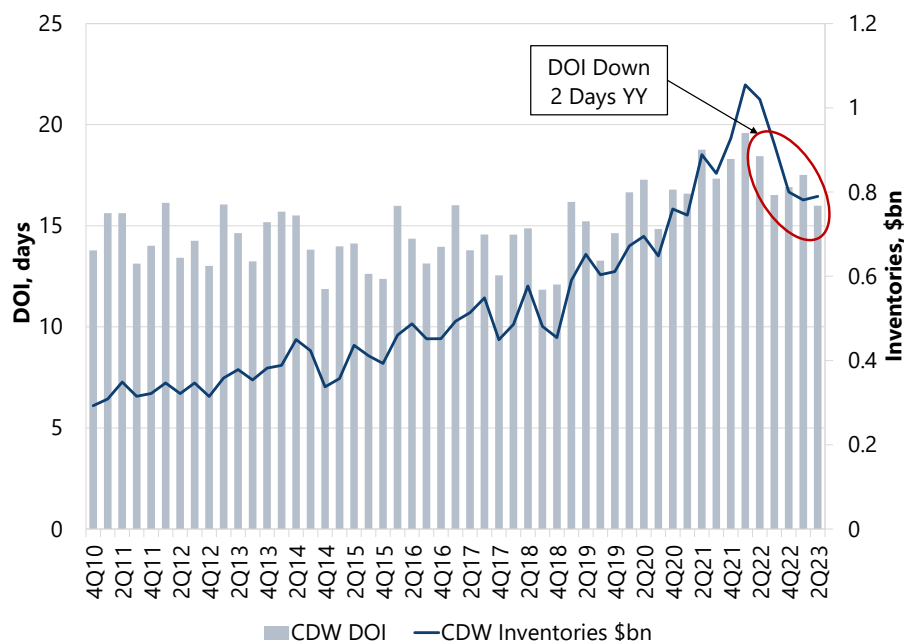


In 2Q23, chip distributor DOI increased 15 days YY and 1 day QQ to 75 days. Balance Sheet inventories increased by \$1.80bn YY and \$37m QQ to \$10.92bn.

Source: Jefferies, Factset, company data.

**Chart 39 - Electronic Equipment Distributor DOI Decreased 2 Days QQ from 1Q23**

Electronic Equipment Distributor Inventory and DOI

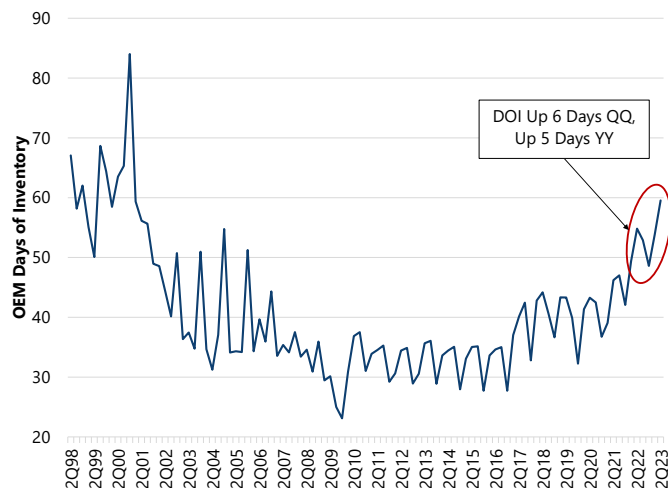


In 2Q23, Electronics distributor CDW's DOI decreased 2 days YY and decreased 2 days QQ. Balance sheet Inventories decreased by \$230m YY and by \$9m QQ.

Source: Jefferies, Factset, company data

**Chart 40 - 2Q23 OEM DOI 5 Days Higher YY**

OEM Days of Inventory

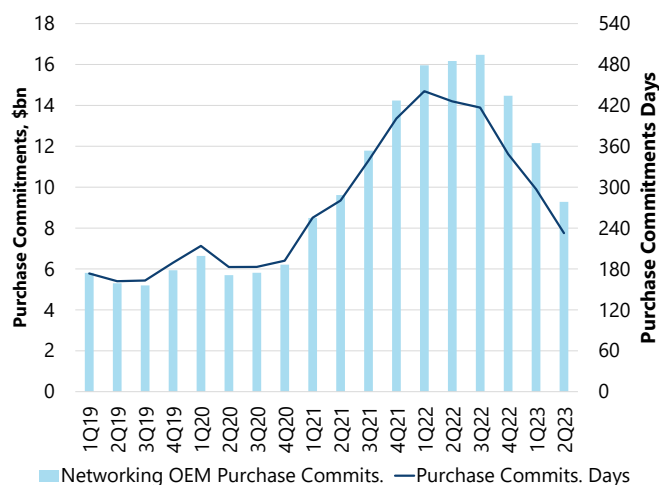


Source: Jefferies, Factset, company data

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

Networking OEM Total Purchase Commitments and Days

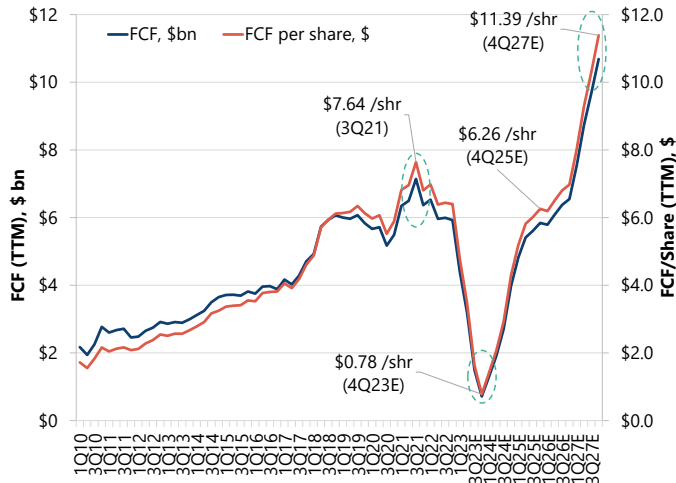


Source: Jefferies, Factset, company data

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

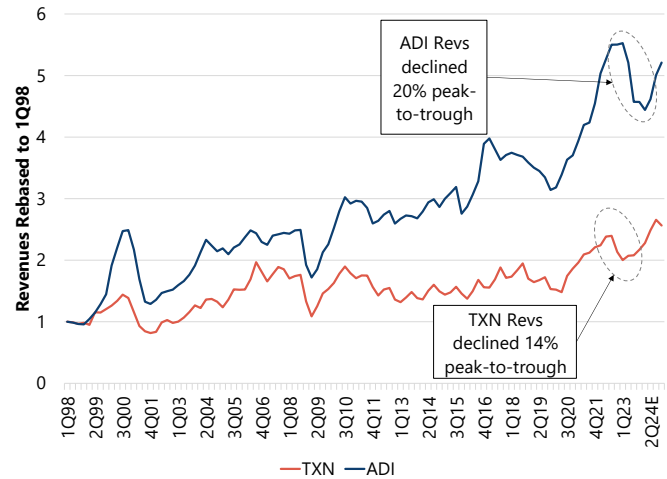
Chart 42 - TXN FCF vs FCF/Share Since 2010



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.

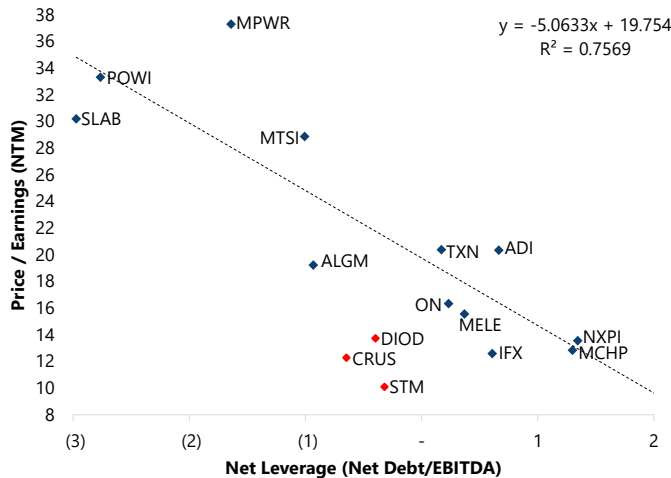
Chart 43 - Our Model Suggests a TXN/ADI Revs Declining 14%/20% Peak-to-Trough



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%.

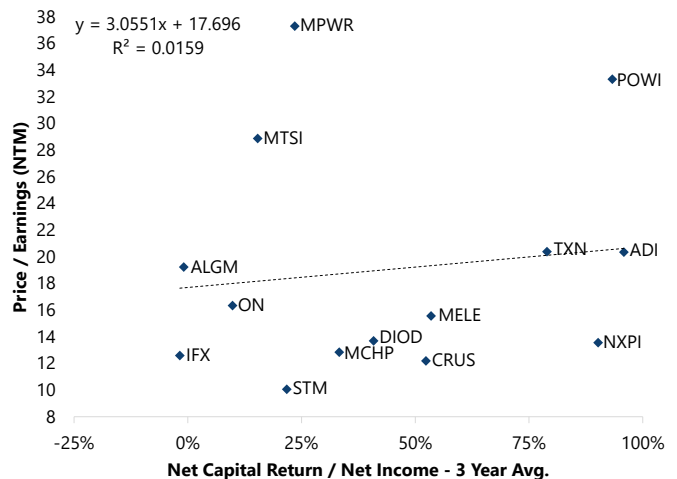
Chart 44 - The Correlation Between Analog PE and Net Leverage Has Increased Over the Past 12 months



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 76%). MCHP is targeting a 1.5x leverage in the long run, and ADI targeting to keep leverage below 1.0x.

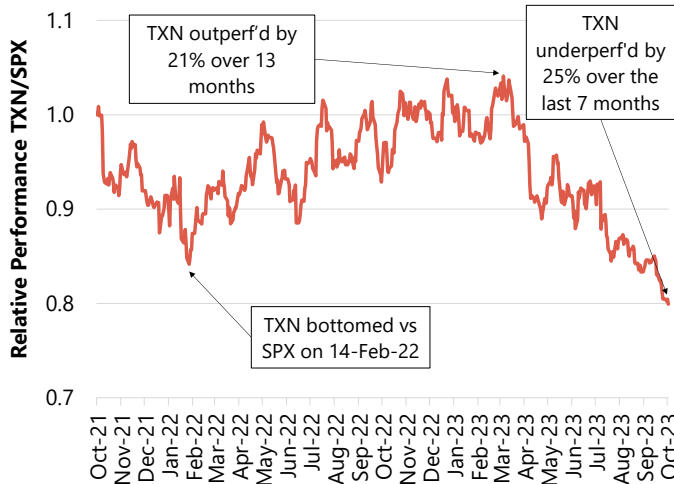
Chart 45 - The Correlation Between Analog PE vs Capital Return Has Broken Down



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 76%) 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.

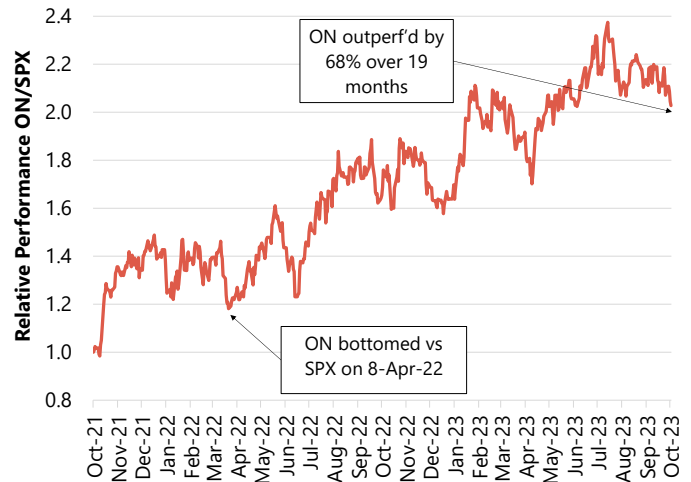
**Chart 46 - TXN Outperformed SPX by 21% peak-to-trough over 13 months, and has underperformed by 25% over the last 7 months as of today**



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 25% over the last 7 months as of today

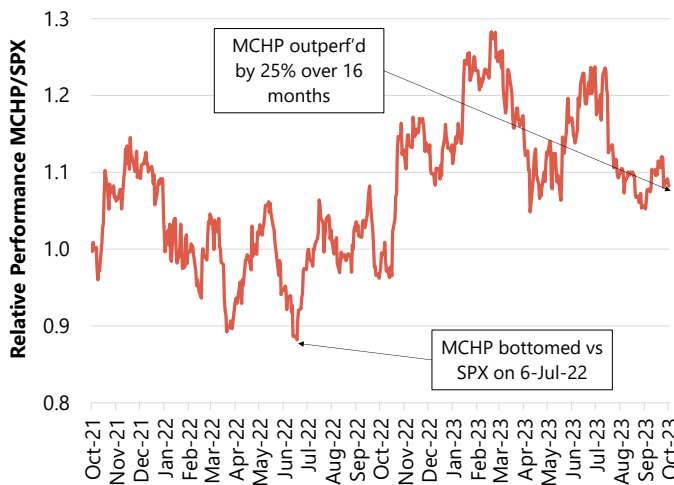
**Chart 47 - ON Outperformed by 68% over the past 19 months**



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 68% over the past 19 months

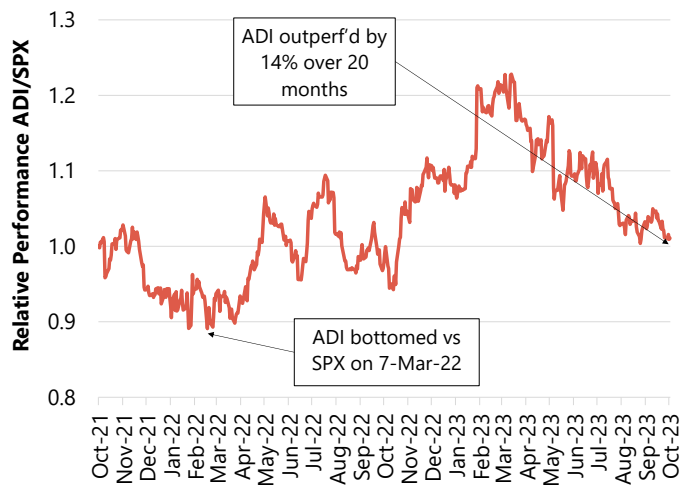
**Chart 48 - MCHP Outperformed SPX by 25% over the past 16 months**



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 25% over the past 16 months.

**Chart 49 - ADI Outperformed SPX by 14% over the past 20 months**

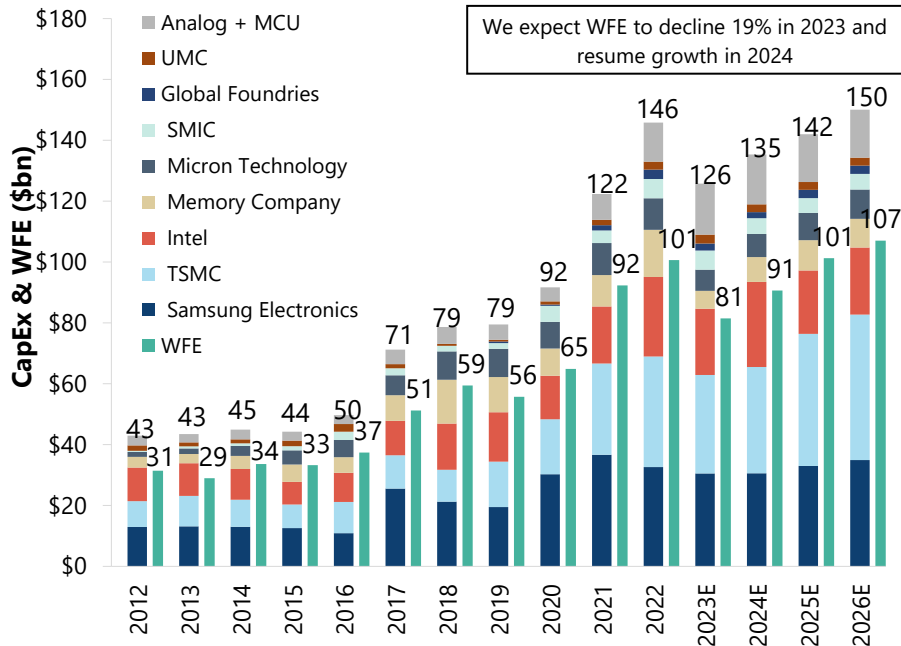


Source: Jefferies, FactSet. Relative performance rebased to Oct-21 or 24 months ago

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

## Highlighted Semi-Cap Charts

Chart 50 - We Revised 2023 WFE Spend to \$81bn vs prior estimate of \$75bn

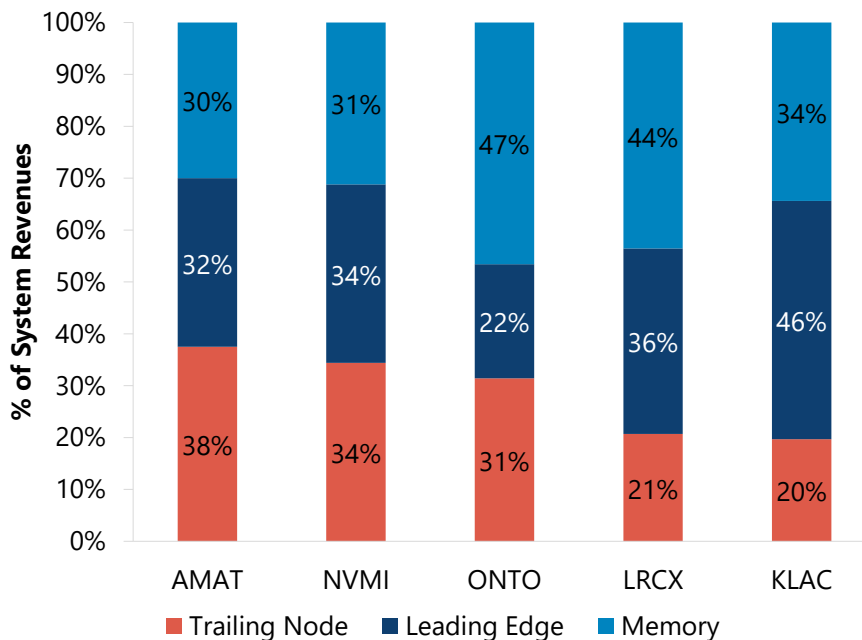


Source: Jefferies, Gartner, FactSet

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 51 - AMAT has the Highest Exposure to Trailing Nodes

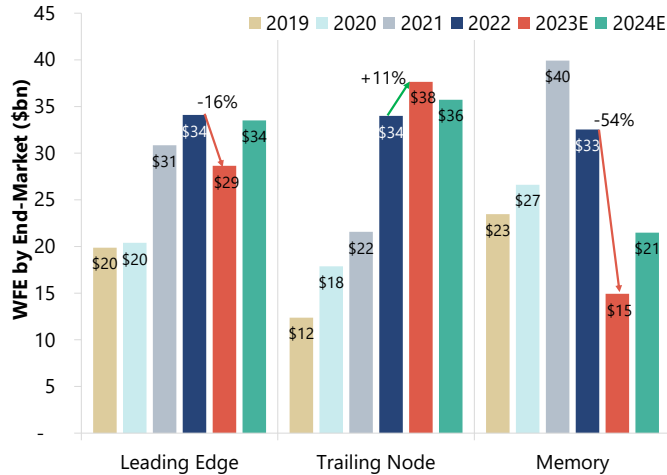


Source: Jefferies, Company data

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

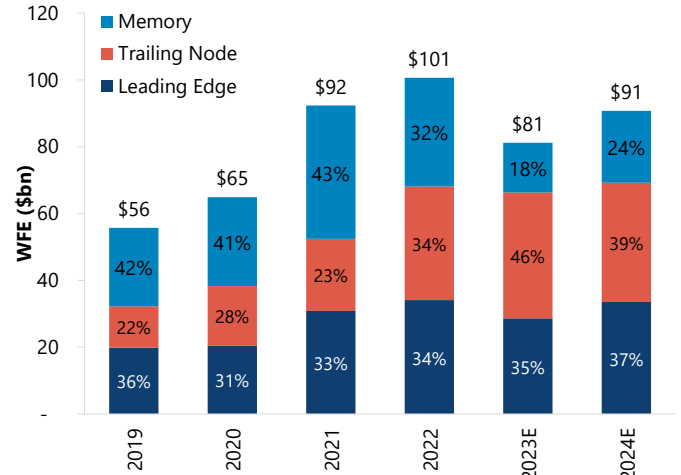


Chart 52 - Trailing Node Are Becoming More Important Part of WFE Aggregating to \$38bn in 2023



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

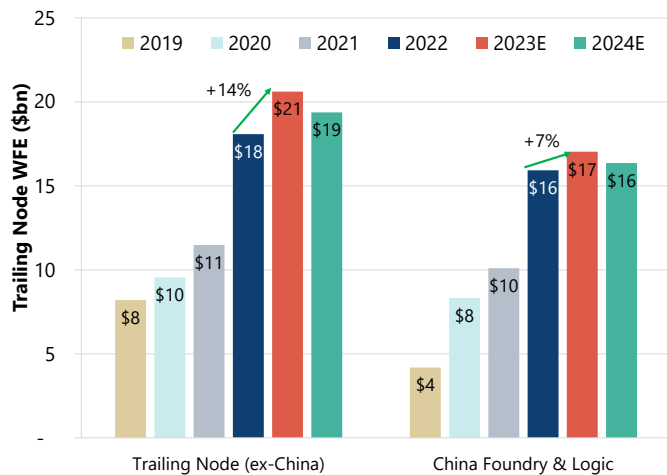
Chart 53 - Trailing Node Spend Share Expected to Increase to 46%; And Memory Expected to Decline to 18%



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

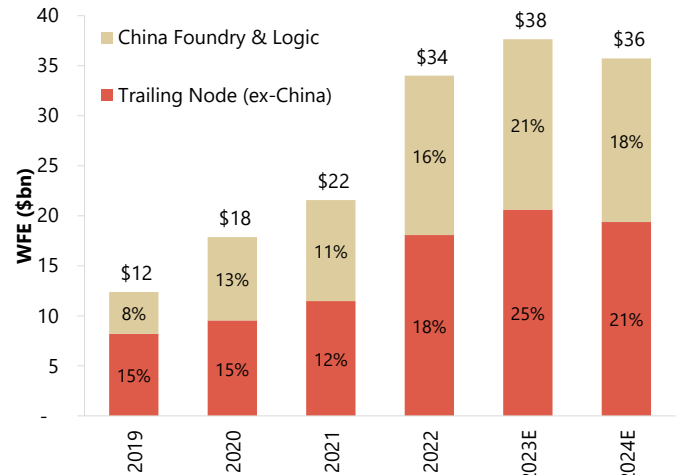
In 2019 & 2020, leading edge node and memory captured ~75% of total WFE spend aggregating to \$43-47bn and trailing nodes captured ~25% of WFE spend. With the shift to IoT era, trailing nodes have become an important part of WFE. In 2022, WFE spend was spread evenly between leading edge, trailing node 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 54 - Trailing Node Demand is Driven by Both Non-China & China Spend



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

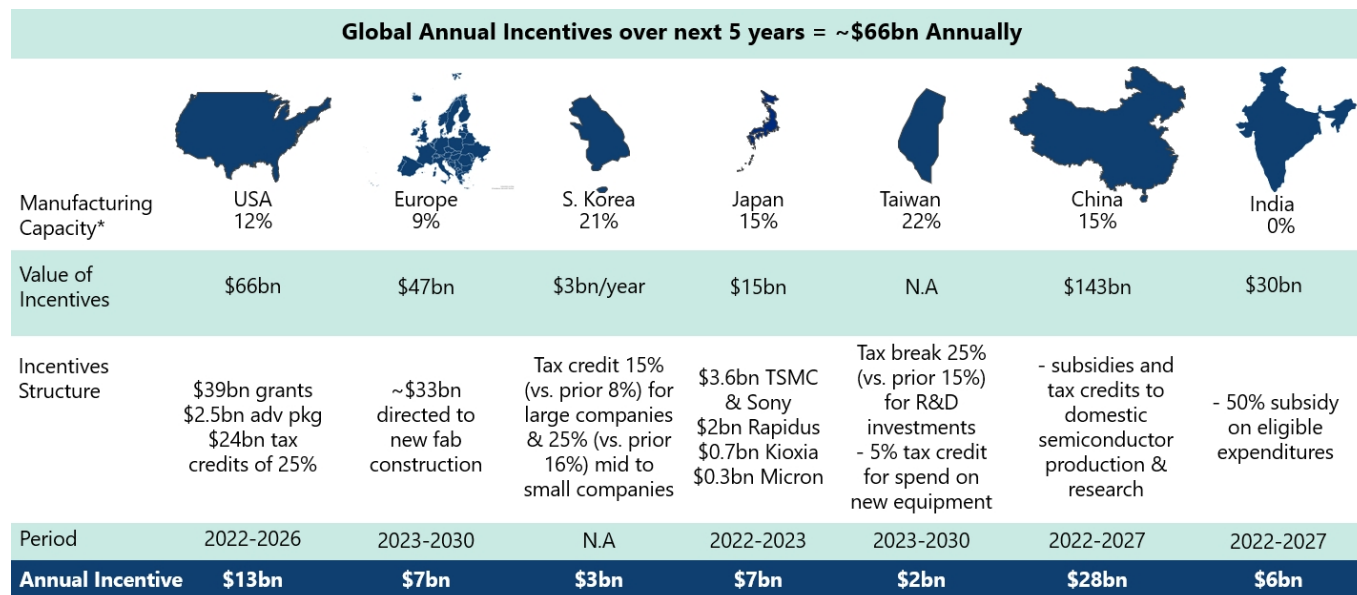
Chart 55 - Trailing Node Non-China /China Split was 53%/47% in 2022



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

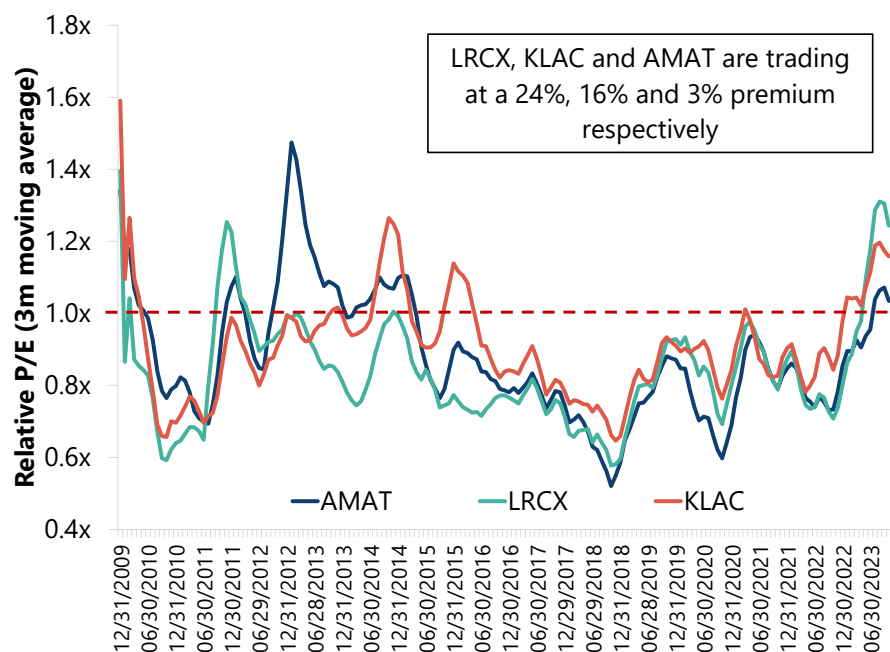


Source: Jefferies, Gov't reports

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 57 - SemiCap Relative P/E



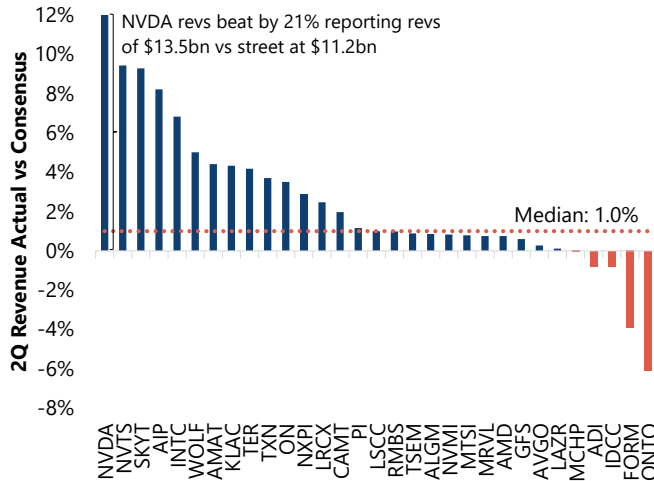
Source: Jefferies, FactSet

LRCX, KLAC and AMAT are trading at a 24%, 16% and 3% 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

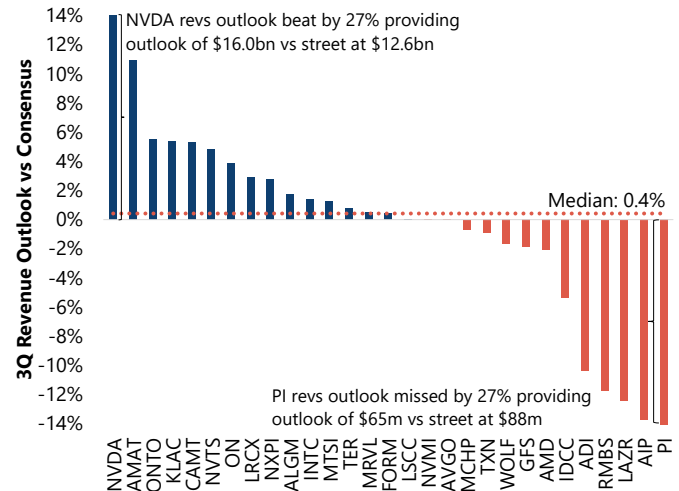
Chart 58 - Median 2Q23 Revenue Beat = 1.0%



Source: Jefferies, FactSet, company data

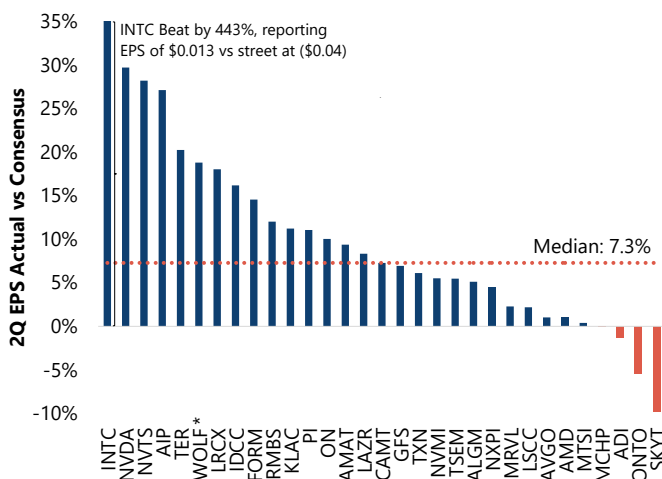
All companies except ONTO, FORM, IDCC, ADI and MCHP reported 2Q23 revs above Street estimates, and at the median, 2Q23 revs beat by 1.0%. All companies except PI, AIP, LAZR, RMBS, ADI, IDCC, AMD, GFS, WOLF, TXN, MCHP, NVMI and AVGO reported 3Q23 revs outlooks that were above consensus expectations, and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

Chart 59 - Median 3Q23 Rev Outlook = 0.4% Above Consensus



Source: Jefferies, FactSet, company data

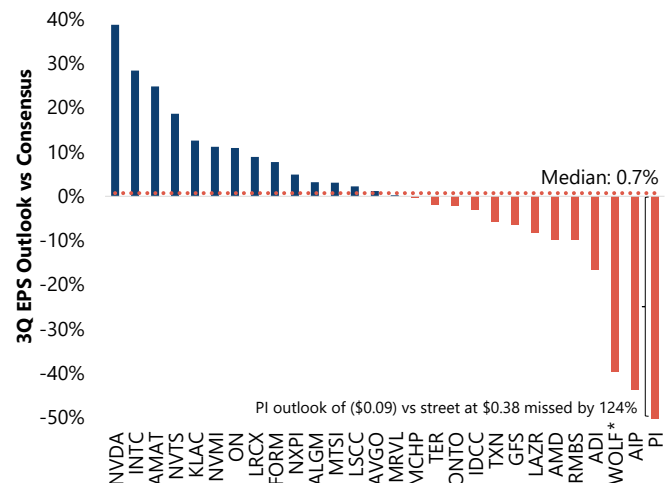
Chart 60 - Median 2Q23 EPS Beat =17.1%



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%.

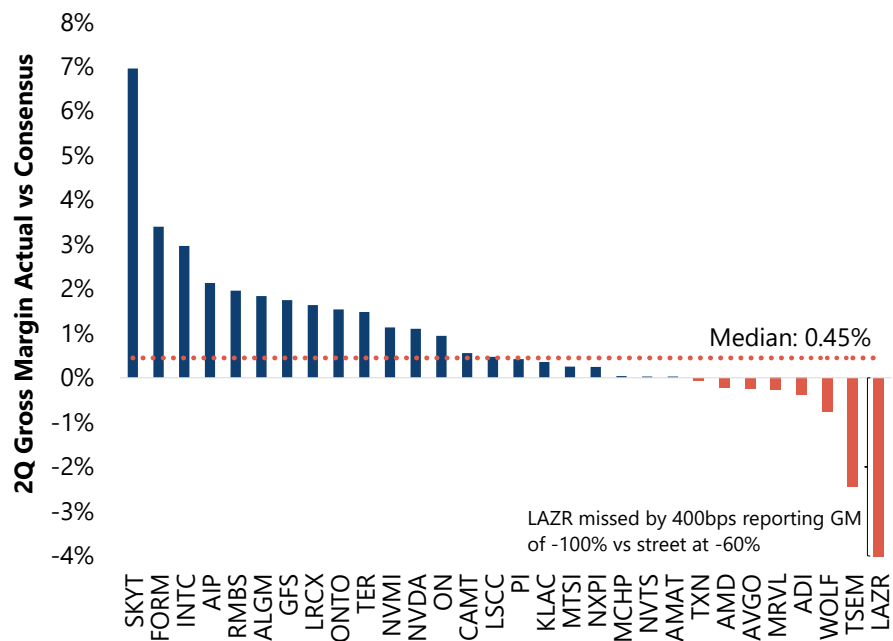
Chart 61 - Median 3Q EPS Outlook = 0.7% Above Consensus



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 62 - Median 2Q23 Gross Margin Beat Consensus by 45bps



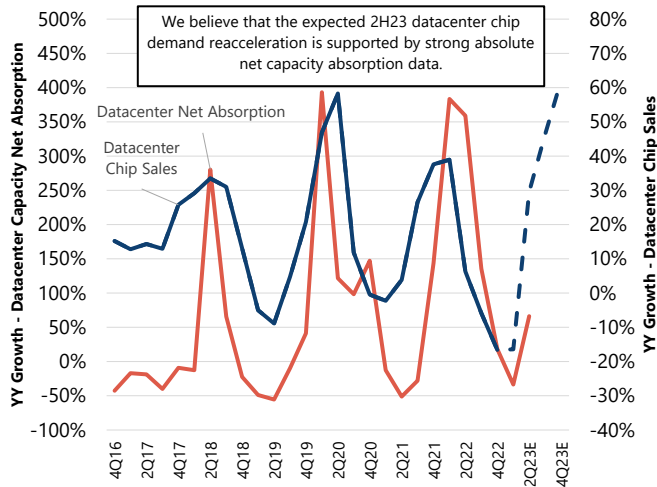
Source: Jefferies, FactSet, company data

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

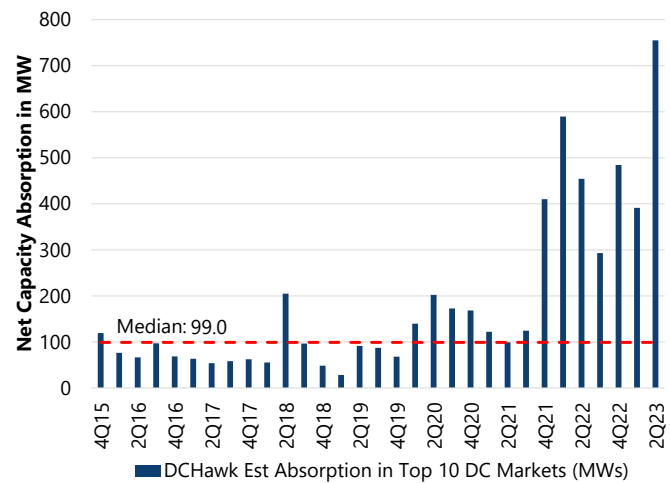
Chart 63 - YY Growth for Datacenter Net Absorption and Datacenter Chip Sales are Correlated



Source: DatacenterHawk via Factset, Jefferies

Chart 64 - 2Q23 US leasing volume increased 93% QQ and 66% YY and set a new quarterly record for leasing volume.

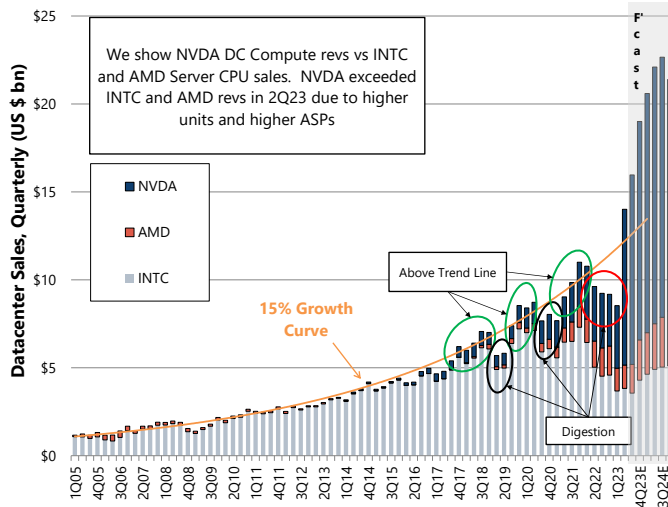
Net Capacity Absorption in MW



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.

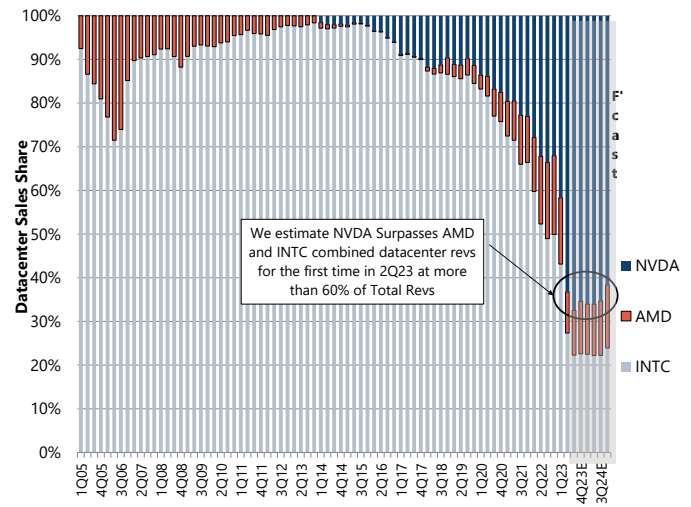
Chart 65 - Datacenter Processor Revenues



Source: Jefferies, company data

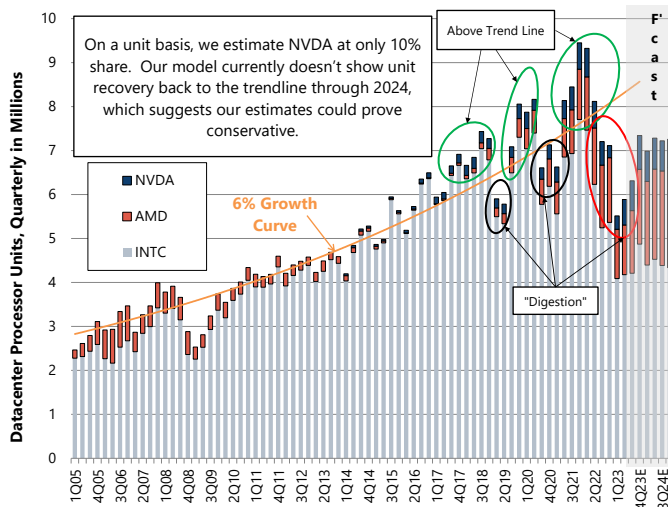
After 4 quarters of below trend line datacenter processors revenues between 2Q23 and 1Q23 primarily on x86 server digestion, revenues are expected to accelerate significantly through the rest of this year primarily on NVDA's generative AI tailwinds and secondarily on x86 server 2H over 1H recovery. NVDA 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 66 - Datacenter Revenues Processor Share



Source: Jefferies, company data

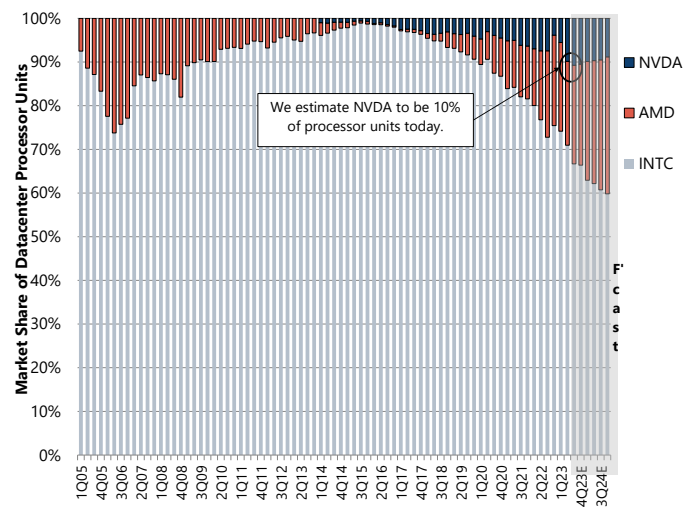
Chart 67 - Datacenter Processor Units



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 68 - Datacenter Processor Units

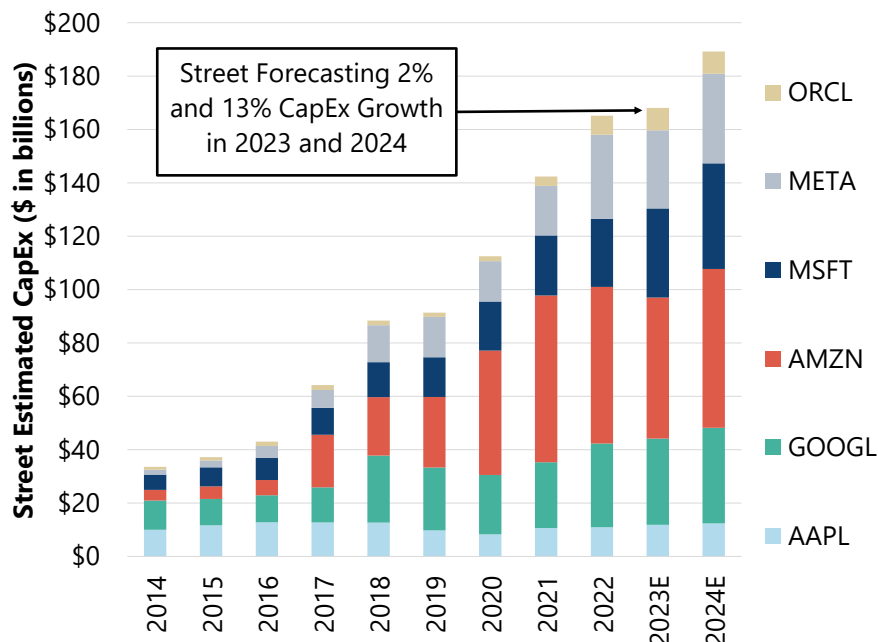


Source: Jefferies, company data

**Chart 69 - North American Cloud CapEx is now modeled by Street to increase by 2% and 13% YY in 2023 and 2024.**

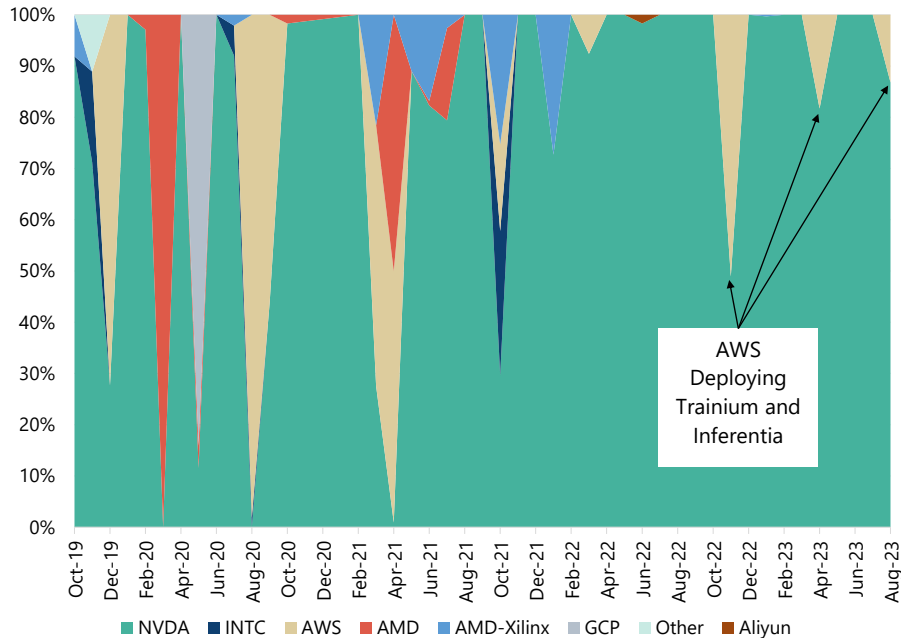
Street Estimated CapEx for CSPs

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

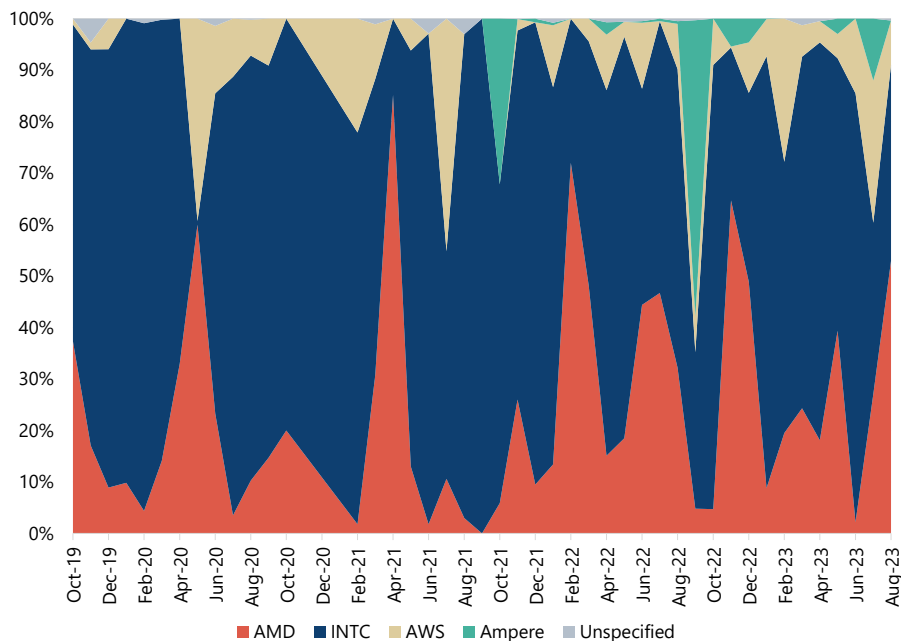


We look at processor and accelerator instances made available to rent in public cloud at 6 top CSPs. This chart shows incremental accelerator instances deployed each month

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.

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

**Chart 71 - 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



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

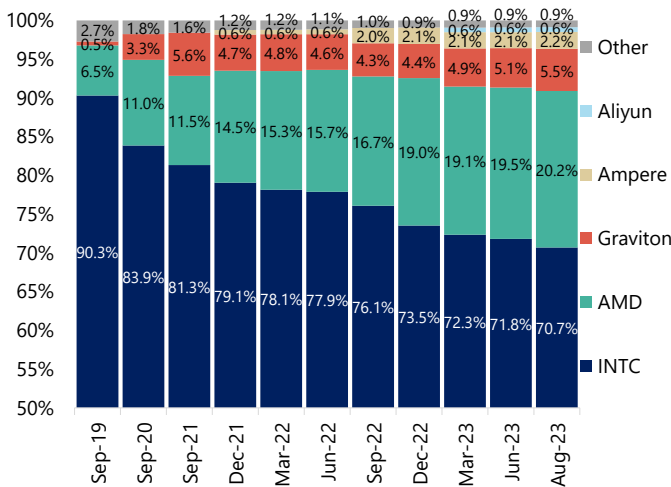
AMD's cumulative share of total instances has increased from 15% in Apr-22 to 20% in Aug-23

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

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

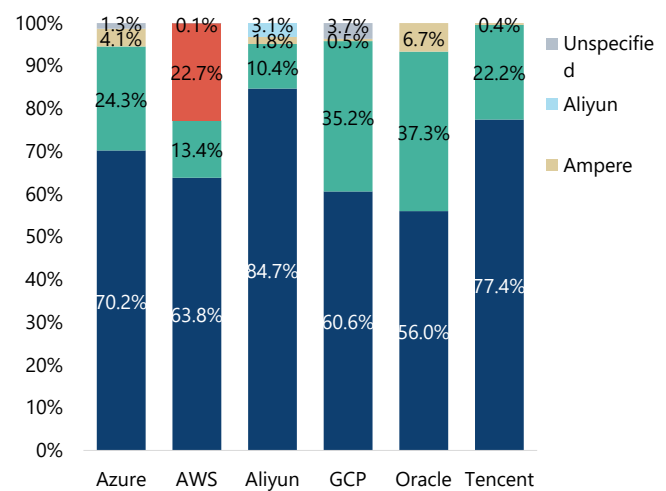


Chart 72 - INTC vs. AMD vs. Graviton Share of CPU Instances



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.

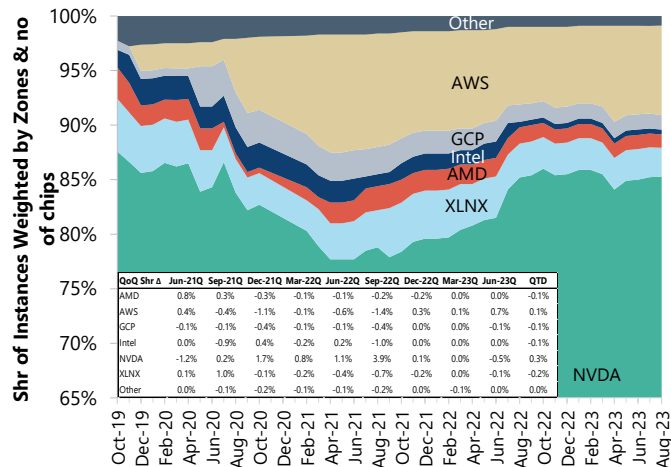
Chart 73 - Processor Instance Share by CSP and Vendor at Aug-23



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

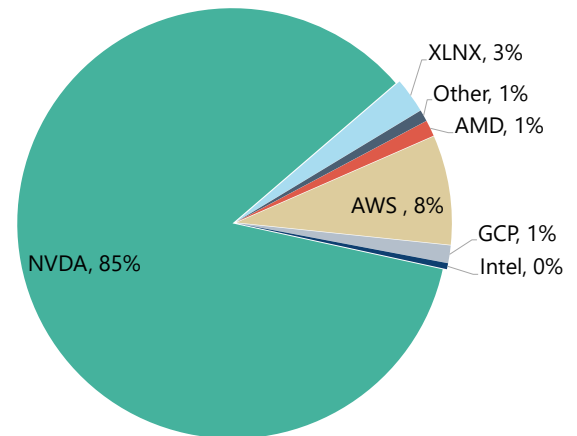
This month, AMD gained 105/65/30bps at Azure, GCP and AWS, lost 5bps at Aliyun, and was flat at Oracle and Tencent. INTC gained 5bps at Aliyun, lost 95/55/30bps at Azure, GCP and AWS, and was flat at Oracle and Tencent. Within AWS, Graviton's share remained flat. Within AWS, Graviton instances are 22.7% 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 74 - 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.

Chart 75 - Accelerator-based Share as of Aug-23

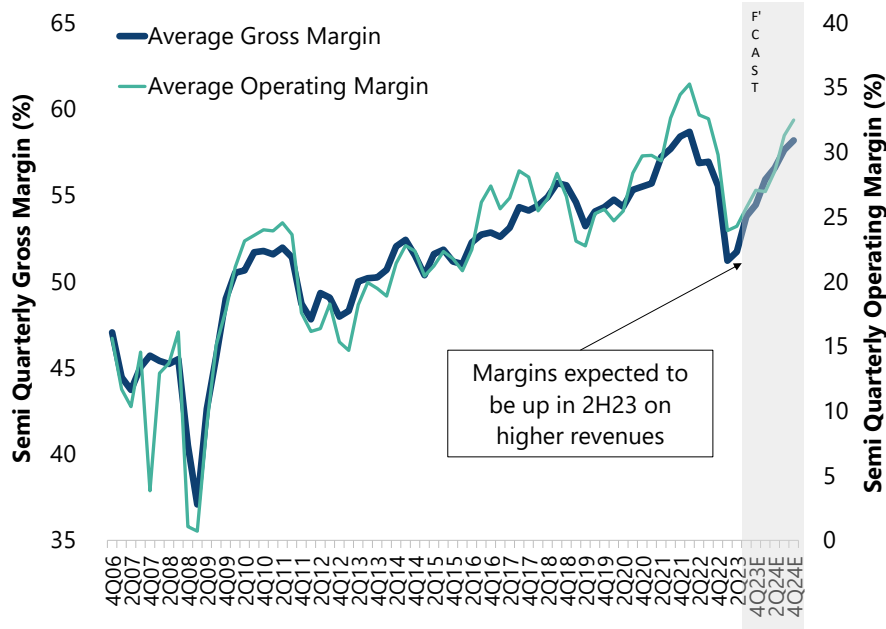


Source: Liftr Insight, Jefferies. More current and detailed data available by Liftr Insights.

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.

## Semis Cycle Charts

**Chart 76 - Consensus Semiconductor Gross and Operating Margins Project Recovery that started in 2Q23**  
Semis Gross and Operating Margins

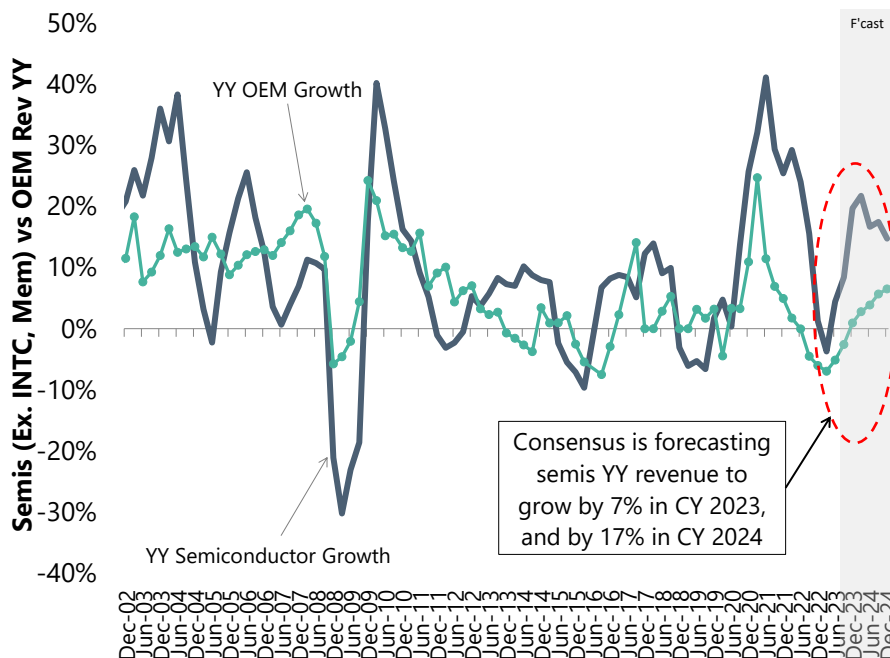


Semiconductor Operating Margins have increased by 2,000bps over the past 10 years as the group has consolidated

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

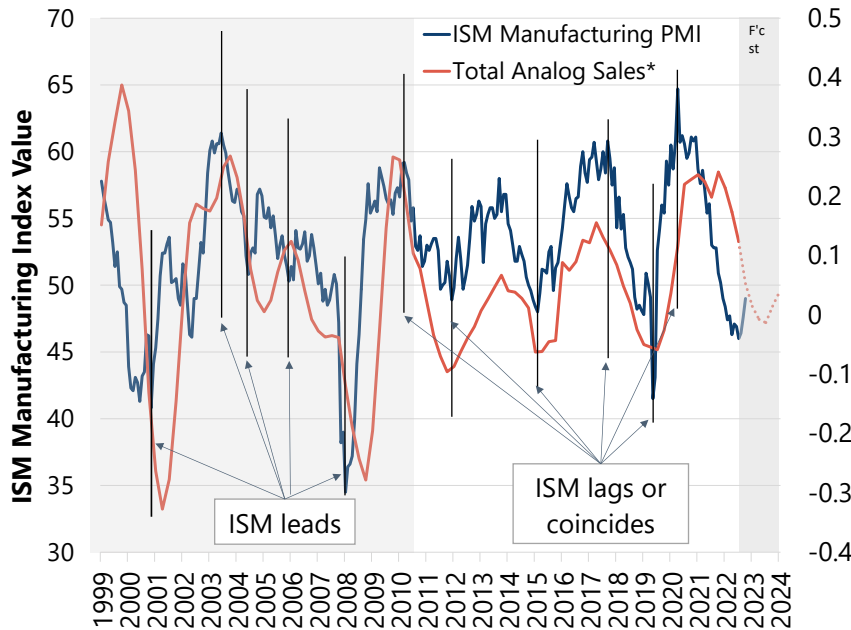
**Chart 77 - Semis vs. OEMs revenue growth (YY)**



Consensus is currently forecasting 7% growth YY in CY 2023 and 17% 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.

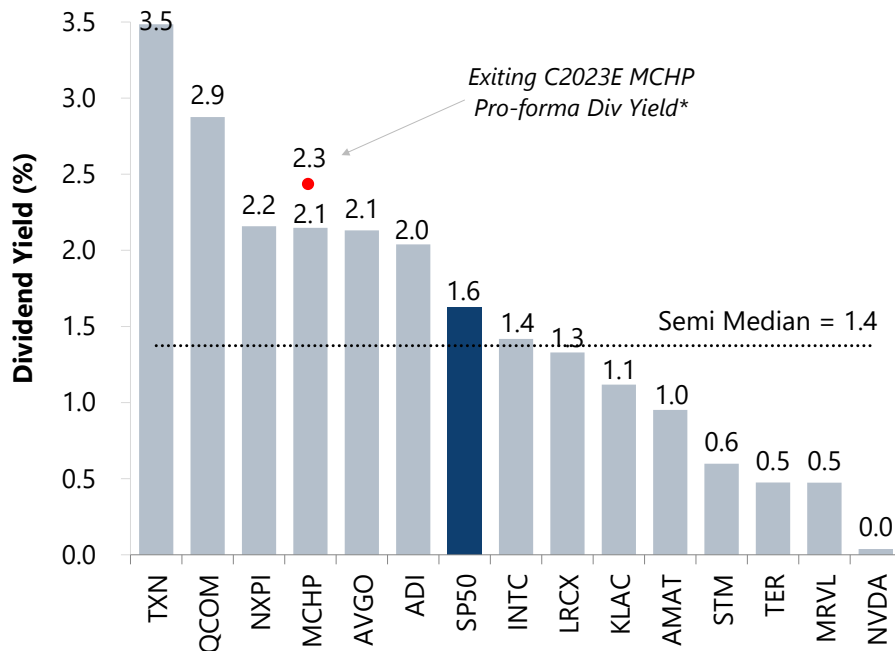
Source: Jefferies, FactSet, company data

Chart 78 - 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 79 - 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.

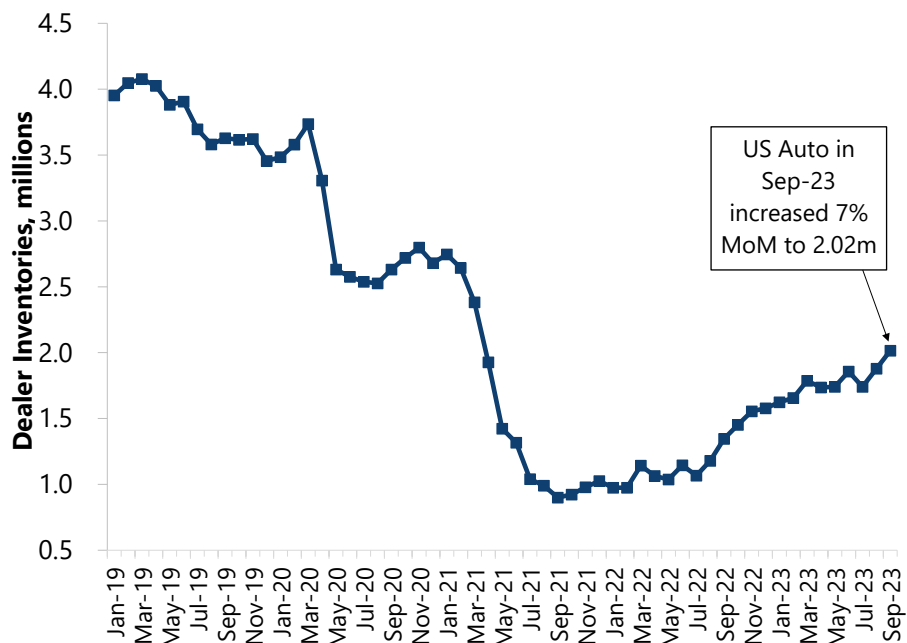
We think TXN and AVGO offer compelling dividend yields.

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 3.5% dividend yield.

AVGO also recently raised its dividend by 12% to \$18.40, reaching a 2.1% dividend yield.

**Chart 80 - 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 81 - Semis Comp Table

Company	Rating	Market Cap (bn)	Price Target	10/20/23 Price	P/E 2023 2024	EV/FCF 2023 2024	EV/S 2023 2024	P/TanBk	Gross Margin [1]	Operating Margin [1]
<b>Logic / Neural Networking:</b>										
AMD	Buy	\$ 166	\$ 145	\$ 103	37x 25x	64x 40x	7x 6x	20x	34%	-1%
INTC	Hold	\$ 148	\$ 38	\$ 35	55x 20x	n.m. 1157x	3x 3x	2x	38%	-4%
NVDA	Buy	\$ 1,032	\$ 610	\$ 418	39x 25x	43x 26x	19x 12x	48x	65%	33%
LSCC	Buy	\$ 10	\$ 105	\$ 74	35x 30x	38x 26x	13x 12x	43x	65%	30%
<b>Analog / MCU:</b>										
<i>Large Cap</i>										
ADI	Buy	\$ 84	\$ 209	\$ 168	18x 19x	24x 20x	8x 8x	n.a	57%	34%
Infineon	Hold	EUR 38	EUR 40	EUR 29	12x 11x	44x 25x	3x 2x	7x	46%	24%
MCHP	Buy	\$ 42	\$ 104	\$ 76	12x 13x	15x 18x	5x 6x	n.a	60%	38%
NXPI	Buy	\$ 48	\$ 257	\$ 187	13x 13x	18x 15x	4x 4x	n.a	54%	28%
STM	Hold	\$ 37	\$ 51	\$ 40	9x 9x	28x 17x	2x 2x	3x	49%	28%
TXN	Buy	\$ 136	\$ 216	\$ 149	20x 19x	72x 30x	8x 7x	12x	66%	47%
ON	Buy	\$ 37	\$ 125	\$ 86	16x 15x	51x 18x	5x 4x	7x	47%	33%
<i>SMID Cap</i>										
ALGM	Buy	\$ 6	\$ 54	\$ 29	20x 19x	33x 19x	5x 5x	6x	57%	21%
ams OSRAM	Hold	CHF 1	CHF 6	CHF 4	11x 6x	n.m. 18x	1x 1x	n.a	30%	7%
LAZR	Buy	\$ 1	\$ 10	\$ 4	n.m. n.m.	n.m. n.m.	16x 6x	n.a	-120%	-991%
Melexis	Hold	EUR 3	EUR 98	EUR 76	15x 16x	60x 19x	3x 3x	6x	45%	27%
MTSI	Buy	\$ 5	\$ 95	\$ 76	31x 26x	38x 29x	9x 8x	10x	57%	19%
NVTS	Buy	\$ 1	\$ 12	\$ 6	n.m. n.m.	n.m. n.m.	11x 5x	8x	8%	-238%
PI	Buy	\$ 1	\$ 91	\$ 51	111x 48x	n.m. n.m.	5x 5x	2010x	51%	-4%
WOLF	Hold	\$ 4	\$ 46	\$ 33	n.m. n.m.	n.m. n.m.	6x 5x	4x	29%	-21%
<b>Comms:</b>										
AVGO	Buy	\$ 356	\$ 1,035	\$ 863	20x 18x	21x 18x	11x 10x	n.a	64%	46%
MRVL	Buy	\$ 43	\$ 68	\$ 50	33x 22x	54x 27x	9x 7x	n.a	45%	-2%
<b>Memory:</b>										
RMBS [2]	Buy	\$ 6	\$ 66	\$ 56	38x 27x	27x 29x	10x 9x	10x	67%	17%
SGH	Buy	\$ 1	\$ 25	\$ 14	7x 11x	n.m. n.m.	1x 1x	n.a	26%	4%
<b>Foundry:</b>										
GFS	Buy	\$ 30	\$ 73	\$ 55	26x 20x	41x 30x	4x 4x	3x	29%	17%
Hua Hong - 1347	Hold	HKD 25	HKD 25	HKD 19	11x 18x	n.m. n.m.	1x 1x	1x	34%	22%
SKYT	Hold	\$ 0.3	\$ 10	\$ 6	n.m. 30x	n.m. 44x	1x 1x	5x	23%	-3%
SMIC - 981	Hold	HKD 167	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. 306x	1x 1x	1x	28%	18%
<b>IP:</b>										
AIP	Buy	\$ 0.2	\$ 14	\$ 6	n.m. n.m.	n.m. n.m.	3x 2x	12x	88%	-66%
ARM	Buy	\$ 49.3	\$ 64	\$ 48	60x 44x	80x 46x	16x 14x	21x	96%	28%
Alphawave	Buy	GBP 0.7	GBP 2.7	GBP 1.0	0x 0x	225x 20x	3x 2x	n.a	46%	0%
IDCC	Buy	\$ 2.1	\$ 106	\$ 78	14x 19x	12x 8x	4x 4x	9x	60%	29%
<b>Wafers:</b>										
Shin-Etsu - 4063	Buy	JPY 8,698	JPY 5,500	JPY 4,297	15x 15x	13x 14x	3x 3x	2x	42%	34%
Siltronic	Buy	EUR 2	EUR 100	EUR 78	13x 18x	n.m. n.m.	1x 1x	1x	33%	22%
Soitec	Buy	EUR 5	EUR 270	EUR 136	30x 17x	30x 60x	5x 3x	4x	35%	23%
Sumco - 3436	Hold	JPY 684	JPY 2,100	JPY 1,954	11x 14x	n.m. n.m.	1x 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 82 - Semis Comp Table

Company	Rating	Market Cap (bn)	Price Target	10/20/23 Price	P/E		EV/FCF		EV/S		P/TanBk	Gross Margin [1]	Operating Margin [1]
					2023	2024	2023	2024	2023	2024			
<b>Semi Cap Equipment:</b>													
<i>Front-End</i>													
ACMR	Buy	\$ 1	\$ 25	\$ 18	14x	14x	n.m.	7x	1x	1x	2x	50%	19%
Adv Micro - 688012	Buy	CNY 99	CNY 230	CNY 160	62x	47x	267x	107x	15x	11x	6x	45%	21%
Aixtron	Buy	EUR 3	EUR 52	EUR 29	21x	18x	35x	25x	5x	4x	5x	43%	21%
AMAT	Buy	\$ 113	\$ 175	\$ 136	18x	17x	15x	21x	4x	4x	10x	46%	29%
ASM International	Buy	EUR 18	EUR 600	EUR 360	29x	23x	32x	32x	7x	6x	9x	48%	26%
ASML Holding	Buy	EUR 221	EUR 950	EUR 547	28x	28x	93x	38x	8x	8x	33x	51%	33%
Canon - 7751	Hold	JPY 4,928	JPY 3,600	JPY 3,695	14x	13x	20x	16x	1x	1x	2x	46%	9%
KLAC	Buy	\$ 64	\$ 580	\$ 469	22x	20x	18x	21x	7x	7x	n.a.	59%	39%
Lasertec - 6920	Buy	JPY 2,499	JPY 28,000	JPY 26,500	48x	33x	87x	63x	13x	11x	23x	55%	41%
LRCX	Buy	\$ 80	\$ 750	\$ 607	23x	21x	18x	22x	6x	5x	13x	45%	29%
Nikon - 7731	Buy	JPY 524	JPY 2,200	JPY 1,490	14x	12x	n.m.	147x	1x	1x	1x	45%	7%
NVMI	Buy	\$ 3	\$ 140	\$ 97	22x	18x	35x	25x	5x	4x	5x	56%	26%
ONTO	Buy	\$ 6	\$ 160	\$ 120	33x	26x	37x	19x	6x	6x	5x	47%	19%
TEL - 8035	Buy	JPY 9,473	JPY 24,000	JPY 20,085	28x	24x	22x	28x	5x	5x	6x	44%	27%
<i>Back-End</i>													
Advantest - 6857	Buy	JPY 3,263	JPY 5,750	JPY 4,259	39x	7x	37x	32x	7x	6x	11x	55%	26%
A&D Holon - 7745	Buy	JPY 43	JPY 2,400	JPY 1,555	8x	7x	12x	11x	1x	1x	1x	46%	15%
CAMT	Buy	\$ 2	\$ 67	\$ 52	28x	23x	35x	29x	7x	6x	6x	48%	23%
Disco - 6146	Buy	JPY 3,034	JPY 33,000	JPY 28,000	39x	35x	40x	37x	10x	9x	9x	66%	37%
FORM	Hold	\$ 3	\$ 35	\$ 34	50x	26x	n.m.	40x	4x	3x	4x	36%	0%
TER	Buy	\$ 14	\$ 135	\$ 93	33x	21x	43x	28x	5x	4x	7x	59%	22%
Tokyo Seimitsu - 7729	Buy	JPY 298	JPY 9,300	JPY 7,080	14x	13x	29x	21x	2x	2x	2x	42%	23%
TOWA - 6315	Buy	JPY 134	JPY 5,000	JPY 5,370	22x	18x	n.m.	n.m.	3x	2x	3x	35%	17%
USHIO - 6925	Buy	JPY 239	JPY 2,200	JPY 1,936	20x	18x	38x	21x	1x	1x	1x	36%	8%

Source: Jefferies, FactSet, company data

Chart 83 - 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	\$ 22,802	\$ 27,387	\$ 6,285	\$ 2,860	-0.92x	\$ (2.12)	\$ 2.69	\$ 4.28	\$ 2.74	\$ 4.10	7%
	INTC	\$ 52,556	\$ 59,213	\$ 24,257	\$ 49,046	2.71x	\$ 5.92	\$ 0.66	\$ 2.51	\$ 0.64	\$ 1.75	2%
	NVDA	\$ 54,492	\$ 84,176	\$ 16,023	\$ 10,954	-0.51x	\$ (2.05)	\$ 10.87	\$ 17.02	\$ 10.80	\$ 17.05	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 16,283	EUR 17,640	EUR 2,986	EUR 6,241	0.58x	EUR 2.49	EUR 2.54	EUR 2.74	EUR 2.55	EUR 2.73	17%
	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	\$ 17,988	\$ 19,171	\$ 9,552	\$ 11,219	0.17x	\$ 1.84	\$ 7.44	\$ 9.04	\$ 7.30	\$ 7.70	32%
	ON	\$ 8,387	\$ 8,961	\$ 2,633	\$ 3,746	0.23x	\$ 2.58	\$ 5.23	\$ 5.56	\$ 5.22	\$ 5.69	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 3,449	CHF 3,548	CHF 875	CHF 2,779	1.90x	CHF 6.94	CHF 0.51	CHF 0.63	CHF 0.34	CHF 0.58	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	38%
	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	\$ 346	\$ 109	\$ 295	4.29x	\$ 6.94	\$ 0.48	\$ 0.87	\$ 0.46	\$ 1.06	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	\$ 559	\$ 655	\$ 333	\$ 31	-1.26x	\$ (2.76)	\$ 1.76	\$ 2.22	\$ 1.47	\$ 2.11	22%
	SGH	\$ 1,404	\$ 1,295	\$ 391	\$ 857	2.03x	\$ 9.31	\$ 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 18,892	HKD 19,668	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 49,482	HKD 57,438	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	\$ 2,887	\$ 3,318	\$ 2,049	\$ 223	-2.01x	\$ (1.78)	\$ 0.81	\$ 1.05	\$ 0.80	\$ 1.10	16%
	Alphawave	GBP 288.23	GBP 387.88	GBP 96.56	GBP 189.08	2.38x	GBP 0.13	GBP 6.76	GBP 11.68	GBP 5.52	GBP 8.56	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 84 - 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 6,071	CNY 8,188	CNY 9,785	CNY 522	-8.26x	CNY (14.98)	CNY 3.18	CNY 3.44	CNY 2.57	CNY 3.38	8%
Aixtron	EUR 636	EUR 702	EUR 210	EUR -	-1.72x	EUR (1.86)	EUR 1.28	EUR 1.54	EUR 1.36	EUR 1.56	14%
AMAT	\$ 25,964	\$ 26,770	\$ 6,535	\$ 6,099	-0.11x	\$ (0.52)	\$ 7.79	\$ 8.34	\$ 7.73	\$ 7.91	35%
ASM International	EUR 2,600	EUR 3,072	EUR 490	EUR 21	-0.54x	EUR (9.50)	EUR 12.01	EUR 13.98	EUR 12.21	EUR 15.68	24%
ASML Holding	EUR 27,250	EUR 27,306	EUR 4,981	EUR 4,522	-0.05x	EUR (1.14)	EUR 19.52	EUR 20.47	EUR 19.51	EUR 19.51	49%
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	\$ 9,909	\$ 3,243	\$ 6,063	0.60x	\$ 20.69	\$ 22.15	\$ 25.38	\$ 21.73	\$ 23.43	41%
Lasertec - 6920	JPY 183,507	JPY 232,124	JPY 29,773	JPY 5,040	-0.38x	JPY (262)	JPY 537	JPY 707	JPY 556	JPY 807	89%
LRCX	\$ 14,255	\$ 15,706	\$ 5,157	\$ 4,984	-0.04x	\$ (1.30)	\$ 26.81	\$ 33.14	\$ 26.88	\$ 29.57	32%
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 487,325	JPY 532,693	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 278,935	JPY 323,578	JPY 175,847	JPY -	-1.46x	JPY (1,623)	JPY 711	JPY 738	JPY 712	JPY 790	25%
FORM	\$ 664	\$ 751	\$ 238	\$ 49	-8.56x	\$ (2.43)	\$ 0.67	\$ 1.34	\$ 0.68	\$ 1.28	5%
TER	\$ 2,676	\$ 3,266	\$ 708	\$ 118	-0.91x	\$ (3.83)	\$ 2.78	\$ 4.57	\$ 2.83	\$ 4.53	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)

Recommendation Published	October 20, 2023 , 17:11 ET.
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Steven DeSanctis owns shares of Apple Inc. common shares.

David Lustberg owns shares of Amazon.com common stock.

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## Other Companies Mentioned in This Report

- A&D Holon HD (7745 JP: ¥1,569, BUY)
- ACM Research Inc (ACMR: \$17.48, BUY)
- Advanced Micro Devices, Inc. (AMD: \$102.40, BUY)
- Advanced Micro-Fabrication Eqp Inc China (688012 CH: CNY162.00, BUY)
- Advantest (6857 JP: ¥4,248, BUY)
- Aixtron SE (AIXA GR: €29.11, BUY)
- Alibaba Group Holding Limited (BABA: \$81.61, BUY)
- Allegro MicroSystems, Inc. (ALGM: \$29.34, BUY)
- Alphabet, Inc. (GOOGL: \$137.75, BUY)
- Alphawave Semi (AWE LN: p105.60, BUY)
- Amazon.com, Inc (AMZN: \$128.40, BUY)
- Ambarella, Inc. (AMBA: \$50.20, BUY)
- ams OSRAM (AMS SW: CHF3.68, HOLD)
- Analog Devices, Inc. (ADI: \$168.72, BUY)
- Apple Inc. (AAPL: \$175.46, BUY)
- Applied Materials Inc. (AMAT: \$134.43, BUY)
- Arista Networks, Inc. (ANET: \$191.48, HOLD)
- Arm Holdings plc (ARM: \$49.74, BUY)
- Arteris, Inc. (AIP: \$5.95, BUY)
- ASM International N.V. (ASM NA: €370.05, BUY)
- ASML Holding NV (ASML NA: €562.50, BUY)
- Broadcom (AVGO: \$867.83, BUY)
- Calix Inc. (CALX: \$43.94, BUY)
- Camtek Ltd (CAMT: \$54.52, BUY)
- Canon Inc. (7751 JP: ¥3,777, HOLD)
- Cisco Systems, Inc. (CSCO: \$53.32, BUY)
- Disco (6146 JP: ¥28,405, BUY)
- FormFactor Inc (FORM: \$33.91, HOLD)
- GLOBALFOUNDRIES Inc. (GFS: \$55.83, BUY)
- Harmonic Inc. (HLIT: \$10.93, BUY)

- Hua Hong Semiconductor (1347 HK: HK\$19.50, HOLD)
- Impinj, Inc. (PI: \$51.87, BUY)
- Infineon Technologies (IFX GR: €30.07, HOLD)
- Intel Corporation (INTC: \$35.67, HOLD)
- InterDigital (IDCC: \$78.06, BUY)
- JEOL (6951 JP: ¥4,681, BUY)
- Juniper, Inc. (JNPR: \$25.07, BUY)
- Kakaku.com, Inc. (2371 JP: ¥1,405, BUY)
- KLA Corporation (KLAC: \$465.05, BUY)
- LAM Research Corporation (LRCX: \$601.95, BUY)
- Lasertec Corp (6920 JP: ¥26,540, BUY)
- Lattice Semiconductor Corporation (LSCC: \$73.98, BUY)
- Lumentum Holdings Inc. (LITE: \$39.35, BUY)
- Luminar Technologies, Inc. (LAZR: \$3.67, BUY)
- M/A-COM Technology Solutions Holdings, Inc. (MTSI: \$76.66, BUY)
- Marvell Technology Group Ltd. (MRVL: \$50.69, BUY)
- Melexis NV (MELE BB: €78.50, HOLD)
- Meta Platforms, Inc. (META: \$312.81, BUY)
- Microchip Technology Inc. (MCHP: \$76.79, BUY)
- Microsoft Corporation (MSFT: \$331.32, BUY)
- Navitas Semiconductor Corporation (NVTS: \$5.74, BUY)
- Nikon (7731 JP: ¥1,486, BUY)
- Nova Ltd (NVMI: \$98.18, BUY)
- NVIDIA Corporation (NVDA: \$421.01, BUY)
- NXP Semiconductors NV (NXPI: \$187.93, BUY)
- ON Semiconductor Corporation (ON: \$87.01, BUY)
- Onto Innovation Inc (ONTO: \$121.19, BUY)
- Oracle Corporation (ORCL: \$108.34, BUY)
- Rambus, Inc. (RMBS: \$55.34, BUY)
- Semiconductor Manufacturing International Corporation (981 HK: HK\$20.95, HOLD)
- Shibaura Mechatronics Corp (6590 JP: ¥7,100, BUY)
- Shin-Etsu Chemical (4063 JP: ¥4,366, BUY)
- Siltronic AG (WAF GR: €80.80, BUY)
- SkyWater Technology, Inc. (SKYT: \$5.76, HOLD)
- SMART Global Holdings, Inc. (SGH: \$14.27, BUY)
- Soitec (SOI FP: €140.45, BUY)
- STMicroelectronics N.V. (STMPA FP: €38.94, HOLD)
- SUMCO (3436 JP: ¥1,948, HOLD)
- TAZMO (6266 JP: ¥3,040, BUY)
- Tencent Holdings Ltd. (700 HK: HK\$291.20, BUY)
- Teradyne Inc (TER: \$92.74, BUY)
- Tesla, Inc. (TSLA: \$220.11, HOLD)
- Texas Instruments Incorporated (TXN: \$150.94, BUY)
- Tokyo Electron (8035 JP: ¥20,180, BUY)
- Tokyo Seimitsu (7729 JP: ¥7,190, BUY)
- TOWA (6315 JP: ¥5,810, BUY)
- Tower Semiconductor Ltd (TSEM: \$22.17, HOLD)
- Ushio (6925 JP: ¥1,921, BUY)
- Wolfspeed, Inc. (WOLF: \$34.00, HOLD)

## Distribution of Ratings

			IB Serv./Past12 Mos.		JIL Mkt Serv./Past12 Mos.	
	Count	Percent	Count	Percent	Count	Percent
BUY	1892	58.72%	319	16.86%	112	5.92%
HOLD	1181	36.65%	111	9.40%	15	1.27%
UNDERPERFORM	149	4.62%	3	2.01%	1	0.67%

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