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# North America Semiconductors

## 2Q22 Earnings Preview: We Remain Negative on Semis, Here Come the Cuts But it Will Get Worse Before it Gets Better

### CITI'S TAKE

We expect Consensus estimates to decline during earnings season given weakening demand in PCs and cell phones (roughly 50% of semi demand). We then expect a correction in the automotive and data center end markets over the next few quarters given lower demand and a buildup of inventory. While the SOX index has declined roughly 35%, we believe stocks can fall by at least another 15% given Consensus estimates should decline by 25%. ADI remains our top pick given our defensive stance. When the downturn ends, we prefer stocks with secularly increasing EPS such as Micron, ON, Global Foundries and AMD as they should offer the most upside.

**Conference call today 10:00 AM EST.** We will host a conference call with Atif Malik this morning at 10:00 AM EST to go through our thoughts via [webcast](#).

**Expect downside from PC/handset exposed companies...** We expect average Consensus estimates to decline during 2Q22 earnings season – mainly from companies with high exposure to the PC and handset end markets.

**...and later will get auto/data center correction.** We expect a correction in the Automotive and data center end markets as well, but not for another quarter or two. As a result, we expect every company to lower guidance at some point due to lower demand. We expect Consensus estimates to fall by roughly 25%, similar to the 2011/2012 downturn, and our 2023 EPS estimates are 18% below Consensus.

**So stocks fall at least another 15%.** We expected 30% downside to the stocks when we [downgraded](#) the sector earlier this year and given the SOX has fallen 15% since, we expect at least another 15% downside driven by estimate cuts.

**Expect more capex cuts – it's a good thing.** Micron was the first semi company to cut capex, and we expect more capex cuts by [September](#). We view these cuts positively as it mitigates oversupply and shortens the semi correction.

**Most pushback on data center/enterprise and auto correction.** Most investors realize some sort of correction is coming but believe that the correction has been priced into the stocks. The biggest pushback we receive is our call that the data center and auto end markets will correct as well.

**Valuation better - SOX multiple below S&P.** The SOX index has sold off roughly 35% since its peak and its valuation has declined from 26.1X NTM P/E to 14.8X, 10% below the S&P of 16.4X, and below a 4% historical discount to the S&P.

**When to Buy semis again? Follow [Rule 15](#) –** We believe it's time to buy when stocks stop going down on bad news, and most of the downside is priced in.

**ADI remains Top Pick.** ADI remains our top pick given our defensive stance. When the downturn ends, we prefer to own stocks with secularly increasing EPS such as Micron, ON, GlobalFoundries and AMD as they should offer the most upside.

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**Christopher Danely**<sup>AC</sup>

+1-415-951-1885  
christopher.danely@citi.com

**Kelsey Chia**

+1-415-951-1791  
kelsey.chia@citi.com

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**See Appendix A-1 for Analyst Certification, Important Disclosures and Research Analyst Affiliations.**

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## 2Q22 Earnings Preview: We Remain Negative on Semis, Here Come the Cuts But it Will Get Worse Before it Gets Better

We expect Consensus estimates to decline during earnings season given weakening demand in PCs and cell phones (roughly 50% of semi demand). We then expect a correction in the automotive and data center end markets over the next few quarters given lower demand and a buildup of inventory. While the SOX index has declined roughly 35%, we believe stocks can fall by at least another 15% given Consensus estimates should decline by 25%. ADI remains our top pick given our defensive stance. When the downturn ends, we prefer stocks with secularly increasing EPS such as Micron, ON, Global Foundries and AMD as they should offer the most upside.

### Worst Downturn in At Least a Decade – Why?

We believe this will be the worst downturn in at least a decade in semiconductors because of three aspects that have not existed for ten years – excessive valuation, excessive inventory build, and a recession. We would note that the excessive valuation has largely been wrung out of the stocks, but we still have an inventory correction combined with a recession to get through.

### Expect downside from PC/handset exposed companies

We expect average Consensus estimates to decline during 2Q22 earnings season – mainly from companies with high exposure to the PC and handset end markets.

### Our 2Q22 sales estimates are below Consensus

Our 2Q22 sales estimates are slightly below Consensus and guidance, primarily driven by weaker sales from INTC and ON. We are expecting INTC to report sales down 5% QoQ, below Consensus and guidance of down 2% QoQ.

Figure 1. Revenue Sequential Growth

	C1Q22 Revenue			C2Q22E Revenue				C3Q22E Revenue		
	Actual	Consensus	Seasonal	Citi	Consensus	Guidance	Seasonal	Citi	Consensus	Seasonal
AMD	22%	4%	2%	10%	10%	10%	9%	0%	6%	21%
GFS	5%	3%	-	2%	2%	2%	-	1%	2%	-
INTC	-6%	-6%	-8%	-5%	-2%	-2%	1%	0%	6%	6%
MCHP	5%	4%	2%	6%	6%	6%	7%	5%	2%	7%
NXPI	3%	2%	-8%	5%	4%	4%	-1%	3%	2%	10%
ON	5%	3%	-3%	3%	4%	4%	4%	2%	0%	6%
QCOM	4%	-1%	-3%	-2%	-2%	-2%	-2%	10%	11%	13%
TXN	2%	-3%	0%	-4%	-8%	-8%	4%	-4%	11%	8%
Average	6%	1%	2%	2%	2%	2%	1%	2%	5%	12%
Median	5%	3%	-3%	2%	3%	3%	1%	1%	2%	9%

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Source: Citi Research, FactSet

## But expect big guide down from Intel and AMD...

We expect lower than expected Consensus guidance from Intel and AMD given the deteriorating PC demand. We also expect weakness from semi companies leveraged to the handset end market given lower demand. Our 3Q22 sales estimates on average are up 2% QoQ, below Consensus of up 5% QoQ, and well below seasonality of up 12% QoQ.

As shown in the table below, our 3Q22 EPS estimates are roughly 3% below Consensus, primarily driven by downside from INTC and AMD due to the PC downturn. Our AMD EPS estimate is 16% below Consensus, and our INTC EPS estimate is 23% below Consensus.

**Figure 2. Citi 3Q22 sales and EPS estimates below Consensus**

	C3Q22E Sales			C3Q22E EPS		
	Citi	Cons	Delta	Citi	Cons	Delta
AMD	\$6,500	\$6,833	-5%	\$0.83	\$0.99	-16%
GFS	\$2,000	\$1,999	0%	\$0.43	\$0.36	19%
INTC	\$17,500	\$19,050	-8%	\$0.54	\$0.70	-23%
MCHP	\$2,050	\$1,987	3%	\$1.34	\$1.30	4%
NXPI	\$3,400	\$3,340	2%	\$3.25	\$3.21	1%
ON	\$2,050	\$2,025	1%	\$1.24	\$1.22	2%
QCOM	\$12,000	\$12,056	0%	\$2.89	\$2.99	-3%
TXN	\$4,500	\$5,014	-10%	\$2.02	\$2.32	-13%
<b>Average</b>			<b>-1%</b>			<b>-3%</b>
<b>Median</b>			<b>-1%</b>			<b>-3%</b>

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Source: Citi Research, FactSet

## ...and later will get auto/data center companies lowering as well.

We expect end markets which are strong now, such as Automotive and data center, to experience a correction but not for another quarter or two. We detail our automotive bear thesis later in the note but we look at the 40%+ unit growth in auto semis versus lower auto production as a red flag of inventory build. In addition, we believe a recession would result in lower demand for cars. On the data center side, we note companies such as Micron and Nanya have already called out excess inventory/slowing demand in the data center end market. In addition, we would expect declining ad revenue and start-up spending in a recession, both of which are major drivers of data center company end demand.

As a result, we expect every company to lower guidance at some point over the next few quarters due to lower demand and excess inventory. We expect Consensus estimates to fall by roughly 25%, similar to the 2011/2012 downturn, and our 2023 EPS estimates are 18% below Consensus.

Our C22 EPS estimates are 5% below Consensus as we expect Consensus estimates for AMD, INTC and GFS to start falling in 2H22 given the PC and handset correction. Our C23 EPS estimates for ON and TXN are well below Consensus driven by the automotive correction which we believe will start sometime in 2023.

Figure 3. Citi vs Consensus Estimates 2023

	C22E EPS			C23E EPS		
	Citi	Cons	Delta	Citi	Cons	Delta
AMD	\$3.46	\$3.82	-9%	\$4.08	\$4.41	-7%
GFS	\$2.04	\$2.29	-11%	\$1.50	\$2.54	-41%
INTC	\$2.33	\$2.63	-11%	\$1.55	\$2.79	-45%
MCHP	\$5.03	\$4.97	1%	\$5.38	\$5.40	0%
NXPI	\$12.77	\$12.59	1%	\$12.48	\$12.84	-3%
ON	\$4.93	\$4.87	1%	\$3.73	\$4.95	-25%
QCOM	\$11.11	\$11.38	-2%	\$10.78	\$11.72	-8%
TXN	\$8.52	\$9.17	-7%	\$7.57	\$8.99	-16%
<b>Average</b>			<b>-5%</b>			<b>-18%</b>
<b>Median</b>			<b>-5%</b>			<b>-12%</b>

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Source: Citi Research, FactSet, Assume SBC of \$0.85 for INTC.

## Current selloff worst since 2008

The SOX index has fallen roughly 35% since its peak in December, the worst selloff since 2008. We expected 30% downside to the stocks when we [downgraded](#) the sector earlier this year and given the SOX has fallen 15% since, we expect at least another 15% downside in semi stocks driven by estimate cuts.

Figure 4. Peak to Trough Index Declines in Prior Downturns

	Mar-00	Jul-07	Feb-11	Apr-12	Jun-15	Mar-18	Feb-20	Dec-21	
	Oct-02	Nov-08	Aug-11	Nov-12	Feb-16	Dec-18	Mar-20	Jul-22	Average
S&P 500	-44.3	-41.6	-14.9	-2.7	-10.9	-9.7	-31.8	-19.6	-22.3
SOX	-83.9	-63.1	-29.6	-15.9	-21.3	-19.3	-33.6	-36.7	38.1
Months	31.4	16.6	5.8	7.5	8.4	9.6	1.2	6.4	11.5

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Source: Citi Research, FactSet

## Valuation comparison – Still Above Previous Troughs

The current SOX valuation of 14.8X NTM P/E is now in line with the average historical trough valuation of 14.8X, and a 44% multiple contraction is almost equivalent to the magnitude of the dot-com bubble of 53%. However, the trough SOX multiple for the past five downturns is still below the current valuation. We believe the multiple can further re-rate when estimates start falling this earnings season coupled with increasing rates.

Figure 5. Peak to Trough NTM P/E in Prior Downturns

	Mar-00	Jul-07	Feb-11	Apr-12	Jun-15	Mar-18	Feb-20	Dec-21	
	Oct-02	Nov-08	Aug-11	Nov-12	Feb-16	Dec-18	Mar-20	Jul-22	Average
Peak SOX NTM P/E	51.5	21.3	12.9	14.4	14.6	16.2	19.5	26.1	21.5
Trough SOX NTM P/E	24.2	17.7	9.8	13.4	12.9	12.1	13.4	14.8	14.8
Multiple Contraction	-53%	-17%	-25%	-7%	-12%	-26%	-32%	-44%	-24%

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Source: Citi Research, FactSet

## How much will estimates be cut? 25% is our best guess

During the financial crisis and tech bust, the downturn in estimates lasted a year to a year and a half and estimates declined by over 80%. Given the improved profitability and consolidation in the space, we would expect a downturn more like the 2011/2012 where estimates declined roughly 25% over a period of two quarters.

**Figure 6. Consensus Estimates Correction during Downturns**

	Sep-00 Nov-01	Aug-07 Feb-09	Apr-11 Jan-12	Jul-12 Nov-12	Jun-15 Jan-16	Nov-18 Dec-18	Jul-22 Jun-22	Average
Peak SOX EPS	36.52	25.37	36.91	31.59	49.69	99.01	183.09	
Trough SOX EPS	6.13	3.14	28.18	26.53	43.60	94.54	?	
EPS Change	-83%	-88%	-24%	-16%	-12%	-5%	?	-34%
Length of period (Months)	14	19	9	5	7	2	?	9.1

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Source: Citi Research, FactSet

## We expect C23 EPS estimates below C22

As shown in the table below, C23 Consensus estimates, on average, are still 6% higher than C22E. We are expecting at least an 8% YoY decline in 2023 EPS, and we believe buy-side investors are expecting a YoY decline in C23 EPS before stepping in. Our C23 EPS estimates are 18% below Consensus.

**Figure 7. Citi vs Consensus Estimates YoY Growth**

	Citi Estimates			Consensus Estimates			2023 Estimates		
	C22E	C23E	Delta	C22E	C23E	Delta	Citi	Cons	Delta
AMD	\$3.46	\$4.08	18%	\$3.82	\$4.41	15%	\$4.08	\$4.41	-7%
GFS	\$2.04	\$1.50	-27%	\$2.29	\$2.54	11%	\$1.50	\$2.54	-41%
INTC	\$2.33	\$1.55	-34%	\$2.63	\$2.79	6%	\$1.55	\$2.79	-45%
MCHP	\$5.03	\$5.38	7%	\$4.97	\$5.40	9%	\$5.38	\$5.40	0%
NXPI	\$12.77	\$12.48	-2%	\$12.59	\$12.84	2%	\$12.48	\$12.84	-3%
ON	\$4.93	\$3.73	-24%	\$4.87	\$4.95	2%	\$3.73	\$4.95	-25%
QCOM	\$11.11	\$10.78	-3%	\$11.38	\$11.72	3%	\$10.78	\$11.72	-8%
TXN	\$8.52	\$7.57	-11%	\$9.17	\$8.99	-2%	\$7.57	\$8.99	-16%
<b>Average</b>			<b>-8%</b>			<b>6%</b>			<b>-18%</b>

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Source: Citi Research, FactSet, Assume SBC of \$0.85 for INTC.

## Base case – A correction like 2011/2012

As shown in the chart below, global GDP growth contracted for two straight years in 2011 and 2012 and an inventory burn started following a strong 22% unit growth in 2010. In this current cycle, we are expecting global GDP growth to fall to 3.0% YoY in 2022, down from 5.5% YoY in 2021. We believe the GDP contraction will create excess inventory as semi demand falls, similar to the 2011/2012 situation.

**Figure 8. 2022 Semi Sales to be Up 13% YoY, on 7% Unit Growth and 7% ASP Growth**

	Sales	Revenue Growth	Unit Growth*	ASP Growth*	GDP Growth	Inventory
2000	\$139.0	37%	26%	9%	4.3%	
2001	\$139.0	-32%	-19%	-16%	1.7%	Burn
2002	\$140.7	1%	13%	-10%	2.0%	
2003	\$166.4	18%	17%	2%	2.6%	Replenish
2004	\$213.0	28%	20%	7%	3.8%	Replenish
2005	\$227.5	7%	12%	-4%	3.5%	
2006	\$247.7	9%	20%	-9%	4.0%	
2007	\$255.6	3%	13%	-9%	3.9%	Burn
2008	\$248.6	-3%	6%	-8%	1.5%	
2009	\$226.3	-9%	1%	-10%	-2.1%	
2010	\$298.2	32%	22%	7%	4.2%	Replenish
2011	\$299.5	0%	4%	-4%	3.1%	Burn
2012	\$291.6	-3%	7%	-8%	2.5%	
2013	\$305.6	5%	7%	-1%	2.7%	
2014	\$335.8	10%	10%	0%	2.9%	Replenish
2015	\$335.2	0%	10%	-8%	2.9%	
2016	\$338.9	1%	5%	-4%	2.6%	
2017	\$412.2	22%	14%	7%	3.3%	Replenish
2018	\$467.1	13%	15%	-1%	3.2%	
2019	\$409.5	-12%	-6%	-7%	2.6%	Burn
2020	\$438.6	7%	1%	6%	-3.7%	
2021	\$555.9	27%	18%	7%	5.5%	Replenish
2022E	\$630.7	13%	7%	7%	3.0%	
Avg. '00-'21		6%	9%	-3%	2.5%	
Avg. '11-'21		6%	8%	-1%	2.5%	
Median '11-'21		5%	7%	-1%	2.9%	

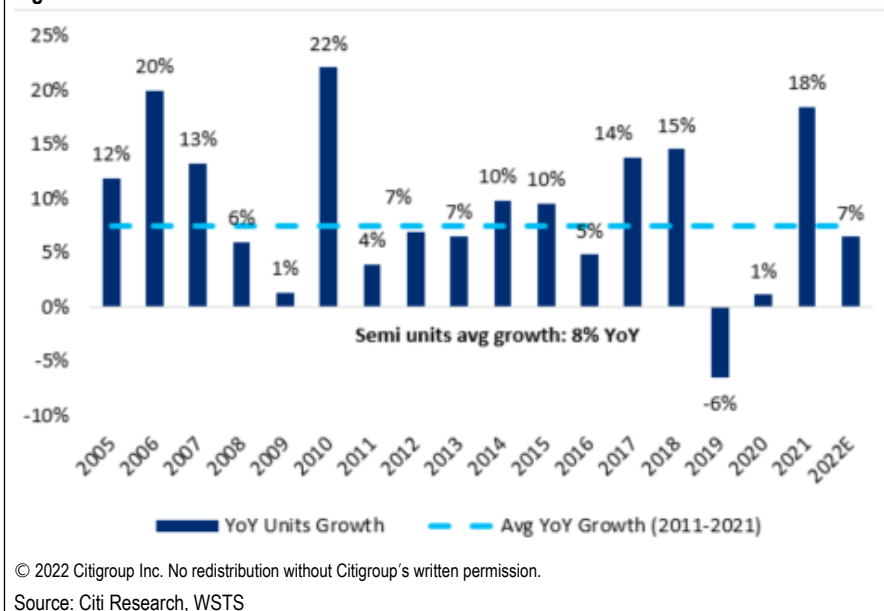
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Source: Citi Research, WSTS

## An inventory correction is coming

While semi units are expected to grow 7% in 2022 following 18% unit growth in 2021, we believe an inventory correction will soon happen as the macroeconomic environment weakens.

[March 2022 inventory](#) increased 8% sequentially and was meaningfully above the June 2022 sales outlook for a 5% decline QoQ. The total supply chain days of inventory was 66 days, above the 5-year median of 57 days. Total distributor inventories were also up 9% QoQ in March 2022, well in excess of 4% expected decline in June 2022 sales, suggesting double ordering.

Figure 9. Semi ex-discretes Unit Growth



## Many case studies for excess inventory – PCs..

We have seen different examples of an end market going from component shortages to excess inventory in a couple of quarters. In the PC space, back in December, Dell/Lenovo/HP mentioned that component shortages, labor and logistics delays were constraining revenue and the companies were carrying more inventory to better support the robust demand.

However, in June, HP mentioned that the component situation is getting better and Dell mentioned that they are working down those elevated inventory levels due to softening demand. [IDC](#) 2Q22 PC unit estimates indicated units declined 15% YoY, a deterioration from a 6% YoY decline in 1Q22 due to post-pandemic normalization amidst recessionary concerns.

## ...and retail...

We have also seen examples in the retail space. Best Buy entered the holiday season with supply chain challenges and constraints in appliances, gaming and mobile phones. The company recently lowered guidance in late May. Target mentioned supply constraints over the holiday season, however, in June, Target [reduced its outlook](#) and mentioned they now have too much inventory.

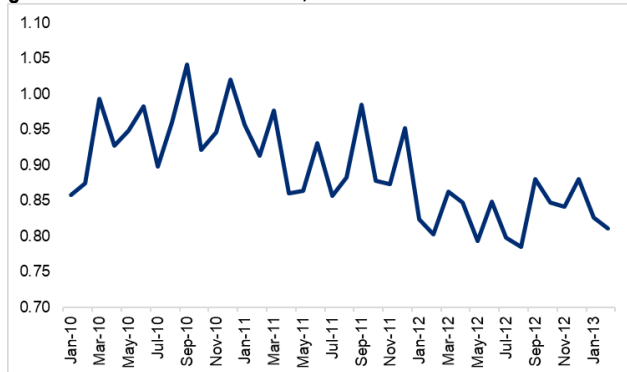
## ..and now data center...

We would note most recently there has been mounting evidence of excess inventory in the data center food chain as well. [Micron](#) stated last week that it sees excess inventory in the data center end market. In addition, Nanya Technology stated that demand in data center server is weakening more than they thought and they are clearly seeing a slowdown in the coming quarter, which may extend to the fourth quarter. We would also note the slew of press reports that Mark Zuckerberg, CEO of Facebook, told employees they are facing the worst downturn in their recent history (eg: New York Times, 1 July 2022).

## ..and a price correction to follow

In addition to a semi units contraction in 2011 and 2012, semi pricing also fell by 4% YoY in 2011 and 8% YoY in 2012, as illustrated in the chart below. We note that current semi pricing is at a 5-year high of \$0.96, and we believe pricing will correct from its current high.

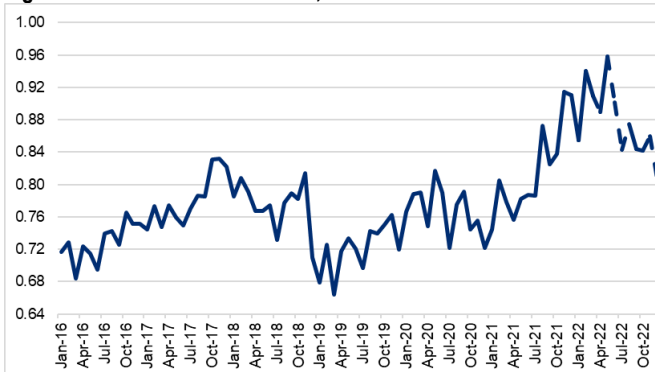
Figure 10. Semi ex-discretes ASP, 2010-2012



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Source: Citi Research, WSTS

Figure 11. Semi ex-discretes ASP, 2016-2022



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Source: Citi Research, WSTS

## ..and for Consensus estimates to fall across the board

As shown in the table below, Consensus estimates for all the stocks, except Qualcomm, fell by roughly 20% during the 2011-2012 downturns. Qualcomm benefitted from the secular adoption of smartphones where smartphone units were growing 64% YoY in 2011 and 45% YoY in 2012.

Figure 12. Consensus Estimates Change During Downturns

	Apr-11	Jan-12	Delta	Jul-12	Nov-12	Delta
MU	1.22	-0.16	NA	0.52	0.08	-84%
AMD	0.74	0.60	-18%	0.86	-0.24	NA
TXN	2.81	2.02	-28%	2.26	1.71	-24%
MXIM	1.99	1.62	-19%	1.95	1.86	-5%
ADI	2.96	2.36	-20%	2.71	2.58	-5%
MCHP	1.32	0.98	-26%	1.09	0.98	-10%
INTC	2.42	2.39	-1%	2.68	2.01	-25%
XLNX	2.31	1.86	-20%	2.26	1.96	-13%
QCOM	3.42	3.70	8%	4.28	4.40	3%
NXPI	3.02	1.61	-47%	2.74	2.53	-8%
Mean			-19%			-19%
Median			-19%			-9%
SOX	36.91	28.18	-24%	31.59	26.53	-16%

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Source: Citi Research, WSTS

## Bear case: A correction like 01-02

The increasing possibility of a recession led us to believe that a dot-com like correction could happen. The global GDP contraction that we are experiencing now is closer to the 2000 – 2002 period than in the last ten years. SOX peak valuation of 26X was the highest in the last two decades. We believe semi ASPs will decline in 2023 as seen in the prior corrections where ASPs were on average down 10% YoY during a semi downturn.



Figure 13. Semi Downturn Comparisons

	2001-2002 (Bear)	2011 (Base)	2012 (Base)	Current
Price Correction Period	Mar 2000 - Oct 2002	Feb 2011 - Aug 2011	Apr 2012 - Nov 2012	Dec 2021 - Current
Price Correction	-84%	-30%	-16%	-36%
Length (months)	31	6	8	7
Estimates Correction Period	Sep 2000 - Nov 2001	Apr 2011 - Jan 2012	Jul 2012 - Nov 2012	
Estimates Correction	-83%	-24%	-16%	
Length (months)	14	9	5	
Peak SOX Valuation	51.5	12.9	14.4	26.1
Trough SOX Valuation	24.2	9.8	13.4	14.8
SOX Valuation Contraction	-53%	-25%	-7%	-44%
GDP Growth Prior Year	4.3% in 2000	4.2% in 2000	3.1% in 2011	5.5% in 2021
GDP Growth During Downturn	1.7% in 2001	3.1% in 2011	2.5% in 2012	3.0% today
Semi Revenue Growth Prior Year	37% YoY in 2000	32% YoY in 2010	0% YoY in 2011	27% YoY in 2021
Semi Revenue Growth During Downturn	-32% YoY in 2001	0% YoY in 2011	-3% YoY in 2012	13% YoY in 2022E
Semi Unit Growth Prior Year	26% YoY in 2000	22% YoY in 2010	4% YoY in 2011	18% YoY in 2021
Semi Unit Growth During Downturn	-19% YoY in 2001	4% YoY in 2011	7% YoY in 2012	7% YoY in 2022E
Semi ASP Prior Year	9% in 2000	7% YoY in 2010	-4% in 2011	7% in 2021
Semi ASP During Downturn	-16% in 2001, -10% in 2002	-4% in 2011	-8% in 2012	7% YoY in 2022E

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Source: Citi Research, FactSet

Should macroeconomic conditions worsen, we may see estimates cuts of more than 25%. As shown in the chart below, estimates, except ADI, were down more than 50% across the board.

Figure 14. Consensus Estimates Change During 2000-2001

	Sep-00	Nov-01	Delta
MU	2.10	0.06	-97%
AMD	1.56	-0.39	NA
TXN	1.32	0.10	-92%
MXIM	2.29	0.87	-62%
ADI	0.60	0.67	12%
MCHP	1.78	0.26	-86%
INTC	1.43	0.57	-60%
XLNX	0.67	0.39	-41%
Mean			-61%
Median			-62%
SOX	36.52	6.13	-83%

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Source: Citi Research, WSTS

## More than 60% of semi demand is falling...

Micron's drastic cuts to their guidance confirmed that the PC and handset demand (52% of semi demand) is rapidly falling. Consumer electronics demand (10% of semi demand) is also deteriorating given the higher inflation and the normalization from work/school from home impact.

Figure 15. Semiconductor End-Market Demand

End Market	% of Semi TAM	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22E
PC	32%	better	stable	stable	stable	stable	solid	strong	strong	stable	mixed	strong	stable	falling	falling
Wireless	20%	poor	stable	stable	weak	improving	solid	strong	strong	stable	stable	stable	stable	falling	falling
Industrial	12%	sluggish	sluggish	sluggish	sluggish	sluggish	improving	improving	strong	strong	strong	strong	stable	good	good
Consumer	10%	sluggish	sluggish	sluggish	weak	weak	improving	improving	Improving	strong	strong	strong	stable	good	falling
Comm Infra	6%	mixed	mixed	mixed	mixed	mixed	mixed	mixed	mixed	improving	improving	improving	improving	stable	stable
Automotive	12%	weak	bad	improving	bad	bottoming	improving	improving	strong	strong	strong	strong	strong	strong	strong
Server	8%	sluggish	improving	better	strong	strong	sluggish	sluggish	Improving	stable	strong	strong	strong	strong	strong

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Source: Citi Research, Company Reports

## Consumer demand decelerating

IDC expects a slowdown in the wearables market and forecast a decline in spending of 7% to 9% on gaming accessories and peripherals. They expect the smart home market to grow at 2.5% to 3%, as pandemic-driven demand cools down, alongside inflation (see: [note](#)).

Based on Citi's proprietary credit card analysis, computer and electronics sales are fast decelerating from down 13.4% YoY at the start of June to down 21.4% YoY by the end of June (see: [note](#)) Same-store traffic to electronics stores were down 15-20% vs 2019 levels (see: [note](#)).

Figure 16. Last 4 weeks total spending change vs last year ago by sub-sector

Sub Sector	Week Ending	4-Jun-22	11-Jun-22	18-Jun-22	25-Jun-22
Food Retail		8.2%	6.4%	6.6%	8.7%
Hypermarkets & Super Centers		10.3%	6.4%	12.1%	8.7%
General Merchandise Stores		(0.5%)	2.6%	(0.0%)	(0.0%)
Department Stores		2.1%	1.1%	(0.8%)	(0.9%)
Specialty Stores		11.5%	10.4%	8.9%	(6.2%)
Apparel Retail		(1.0%)	(4.2%)	(4.0%)	(3.9%)
Footwear		3.6%	2.1%	2.3%	1.3%
Home Improvement Retail		3.8%	0.3%	0.3%	4.8%
Homefurnishing Retail		(8.0%)	(7.8%)	(9.3%)	(11.5%)
Household Appliances		2.0%	(4.1%)	(3.5%)	(3.4%)
Computer & Electronics Retail		(13.4%)	(17.5%)	(19.2%)	(21.4%)
Automotive Retail		27.4%	28.9%	26.0%	27.4%
Total Retail		8.5%	7.8%	6.9%	3.2%

Source: Citi Research.

## PC demand slowdown

### Notebook shipments missed expectations for six consecutive months

June notebook shipments were up 31% MoM, below Citi's expectation of up 40% due to continued demand deceleration driven by inflationary concerns amidst operational challenges post COVID-reopening in China. 2Q22 was the second quarter since 3Q18 where notebook shipments missed expectations.

Carrie Liu, our Taiwan notebook analyst, expects 3Q22E notebook shipments of up 7% QoQ, below normal seasonality of double-digit sequential growth due to demand uncertainties and elevated inventories.

Figure 17. TWN ODM NB Shipment, 2Q19-3Q22E

	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22E
Taiwan Notebook Shipment QoQ	25%	1%	2%	-30%	74%	7%	13%	-11%	2%	5%	9%	-20%	-14%	7%
Prior Year Comparable	10%	6%	-1%	-17%	25%	1%	2%	-30%	74%	7%	13%	-11%	74%	7%
Normal Seasonality	8%	9%	0%	-19%	11%	8%	1%	-20%	10%	7%	3%	-20%	8%	11%

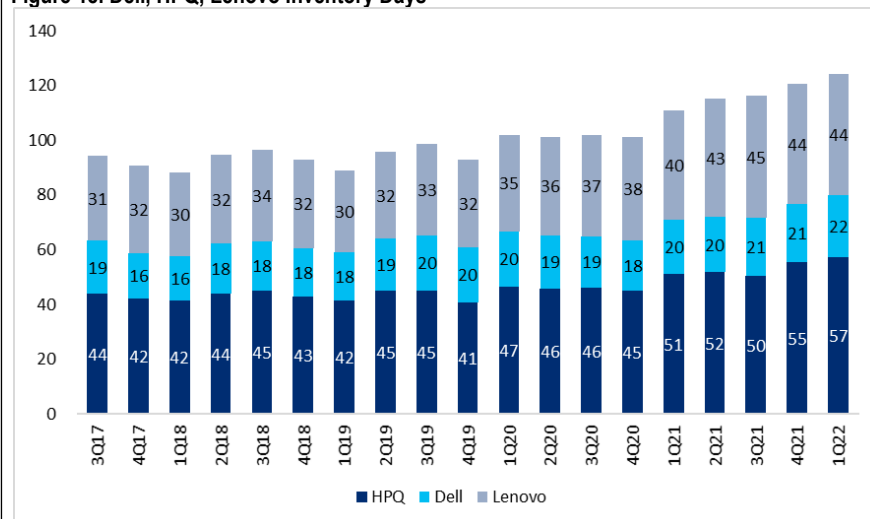
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Source: Citi Research, Company Reports

## PC inventory build

As shown in the chart below, inventory days for Dell, HPQ and Lenovo have been rising for five consecutive quarters, from 101 days in 4Q20 to 124 days in 1Q22, suggesting an inventory build.

Figure 18. Dell, HPQ, Lenovo Inventory Days



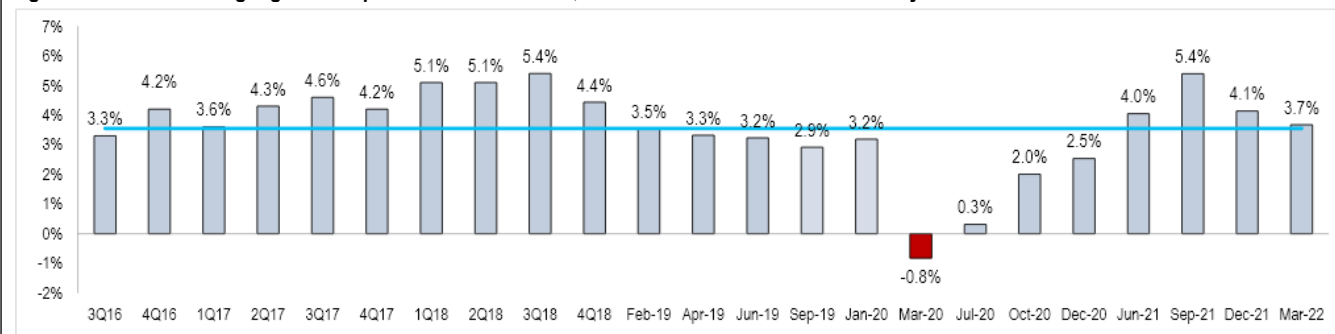
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Source: Citi Research, Factset

## Enterprise PC inventories are elevated too

Citi's CIO IT survey shows a deceleration in CIOs IT budget, from the recent high of 5.4% YoY growth back in 3Q21 to 3.7% over the next twelve months. Enterprise PC and hardware spending have seen the greatest increase in spend earlier this year due to the return to office/reopening, and we believe will start to decelerate in 2H22. Micron mentioned that inventories in the enterprise channels are elevated, and is expecting some inventory adjustments.

Figure 19. Global IT budget growth expectation of +3.7% Y/Y, down from +4.1% in the Dec. survey



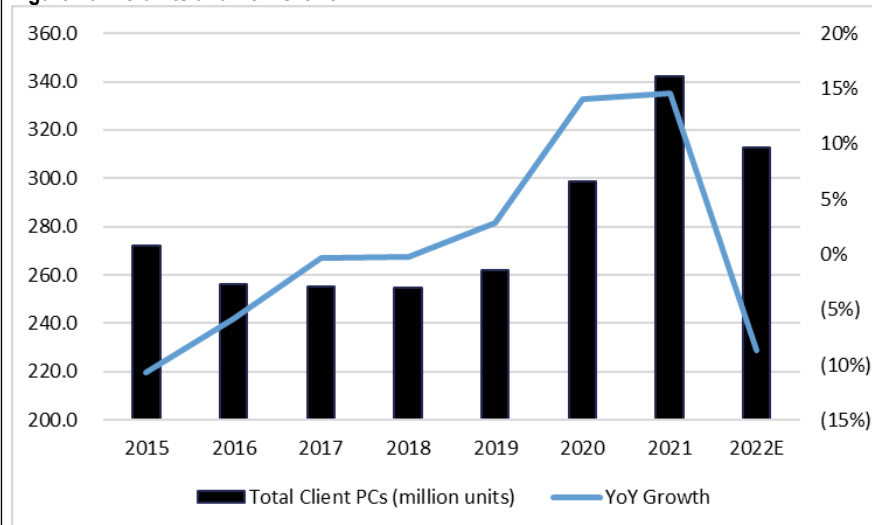
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Source: Citi Research, Company Reports

## PC units to decline 9% YoY in 2022

Citi lowered its PC unit growth from down 1% YoY to be down 9% YoY, to roughly 312 million units, above historical average of 260 million units. Conversations with top ODMs suggest there are still [more downside](#) to go.

Figure 20. PC units and YoY Growth



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Source: Citi Research, IDC

## Intel and AMD should lower guidance

We believe a deceleration in PC demand will negatively impact AMD (58% of C21 revenue) and Intel (48% of C21 revenue) and expect both to lower guidance during the upcoming earnings season.

Figure 21. PC Exposure by Company

PC Exposure by Company, % of 2021 Revenue

Company	PC Exposure
AMD	58%
Intel	48%
Micron	25%
Nvidia	20%
Microchip	15%
ON Semiconductor	13%
Texas Instruments	8%

Source: Company Reports and Citi Research Estimates

## Handset demand slowing

The recent smartphone [shipment data](#) from the 6.18 festival sales in China was below Citi's expectations. On June 2, Citi [lowered](#) our smartphone unit shipment forecast from down 2% YoY to down 7% YoY, at 1.26 billion units, driven by double booking and the weakening economic outlook. We also expect smartphone ASP to decline in 2022, and expect the total smartphone market to be down 9% YoY in 2022 to US \$472 billion. We believe a recession will further weaken handset unit shipment, which will impact QCOM.

Figure 22. Citi Global Smartphone Unit Shipment Forecasts – Revisions

(Unit:Mn)	2015A	2016A	2017A	2018A	2019A	2020A	2021A	New 2022E	2023E	Old 2022E	2023E	Diff. 2022E	2023E
North America	179	187	188	175	163	147	163	154	155	154	155	0.0%	0.0%
Western Europe	152	139	131	127	123	112	118	111	116	118	121	-6.5%	-3.6%
China (incl in APAC)	430	467	444	397	367	326	329	285	313	312	317	-8.8%	-1.5%
India (incl in APAC)	104	109	124	141	152	150	161	155	176	166	177	-6.9%	-0.7%
Other APAC	160	158	160	159	160	157	168	162	158	173	169	-6.3%	-6.5%
Asia Pacific ex Japan	693	734	729	696	679	632	658	602	646	652	663	-7.7%	-2.5%
Eastern Europe	132	129	128	125	129	126	137	112	125	128	131	-12.7%	-4.8%
Middle East / Africa	108	106	105	105	109	108	112	112	113	110	113	1.8%	0.0%
Japan	30	31	34	34	31	33	37	34	34	34	34	0.0%	0.0%
Latin America	143	143	151	141	139	124	135	134	138	134	138	0.0%	0.0%
<b>Total</b>	<b>1,437</b>	<b>1,469</b>	<b>1,465</b>	<b>1,403</b>	<b>1,373</b>	<b>1,281</b>	<b>1,360</b>	<b>1,258</b>	<b>1,327</b>	<b>1,330</b>	<b>1,355</b>	<b>-5.4%</b>	<b>-2.0%</b>
<b>Y/Y Growth</b>													
North America	4%	4%	1%	-7%	-7%	-10%	11%	-6%	1%	-2%	1%		
Western Europe	4%	-8%	-6%	-3%	-3%	-9%	6%	-6%	5%	2%	2%		
China (incl in APAC)	2%	9%	-5%	-11%	-8%	-11%	1%	-14%	10%	-9%	2%		
India (incl in APAC)	29%	5%	14%	14%	8%	-2%	7%	-4%	13%	3%	6%		
Asia Pacific ex Japan	8%	6%	-1%	-4%	-2%	-7%	4%	-9%	7%	-3%	2%		
Eastern Europe	40%	-2%	-1%	-2%	3%	-3%	9%	-18%	11%	-3%	2%		
Middle East / Africa	40%	-2%	-1%	0%	4%	-1%	4%	-1%	1%	0%	3%		
Japan	-2%	2%	8%	1%	-8%	6%	11%	-7%	-1%	-6%	-1%		
Latin America	6%	0%	6%	-7%	-1%	-11%	9%	0%	3%	-2%	3%		
<b>Total</b>	<b>11%</b>	<b>2%</b>	<b>0%</b>	<b>-4%</b>	<b>-2%</b>	<b>-7%</b>	<b>6%</b>	<b>-7%</b>	<b>5%</b>	<b>-2%</b>	<b>2%</b>		

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Source: Citi Research, IDC

## Industrial end market stable but likely deteriorating

We believe a recession will affect all end markets including the Industrial end market (12% of semi TAM). US ISM manufacturing in June was softer than expected at 53.0, with new orders index falling into contractionary territory (see: [note](#)). Industrial production in Japan fell sharply by 7.2% MoM in May well below market expectation of 0.3% MoM drop due to lockdowns in China.

Citi analyst Andy Kaplowitz stated that industrial inventories are high due an accumulation of unfinished products given supply chain constraints (see: [note](#)). We believe a slowdown in end demand driven by the recession will lead to an inventory correction in the industrial end market too.

The US PMI index was 53.0, the lowest since the start of the year. While the Chinese PMI index recovered from the COVID lockdowns in from March-May, they remain below market expectations. (see: [note](#))

Figure 23. US PMI, 2018-2022

	2018	2019	2020	2021	2022
January	56.6	56.6	50.9	58.7	57.6
February	60.8	54.2	50.1	60.8	58.6
March	59.3	55.3	49.1	64.7	57.1
April	57.3	52.8	41.5	60.7	55.4
May	58.7	52.1	43.1	61.2	56.1
June	60.2	51.7	52.6	60.6	53.0
July	58.1	51.2	54.2	59.5	
August	61.3	49.1	56.0	59.9	
September	59.8	47.8	55.4	61.1	
October	57.7	48.3	59.3	60.8	
November	59.3	48.1	57.5	61.1	
December	54.3	47.8	60.7	58.7	

Source: Citi Research, FactSet

Figure 24. China PMI, 2018-2022

	2018	2019	2020	2021	2022
January	51.3	49.5	50.0	51.3	50.1
February	50.3	49.2	35.7	50.6	50.2
March	51.5	50.5	52.0	51.9	49.5
April	51.4	50.1	50.8	51.1	47.4
May	51.9	49.4	50.6	51.0	49.6
June	51.5	49.4	50.9	50.9	50.2
July	51.2	49.7	51.1	50.4	
August	51.3	49.5	51.0	50.1	
September	50.8	49.8	51.5	49.6	
October	50.2	49.3	51.4	49.2	
November	50.0	50.2	52.1	50.1	
December	49.4	50.2	51.9	50.3	

Source: Citi Research, FactSet

We expect the stable Industrial end market to benefit ADI (50% exposure to the Industrial end market), Microchip (41%) and Texas Instruments (41%).

Figure 25. Industrial Exposure by Company, % of C21 Revenue

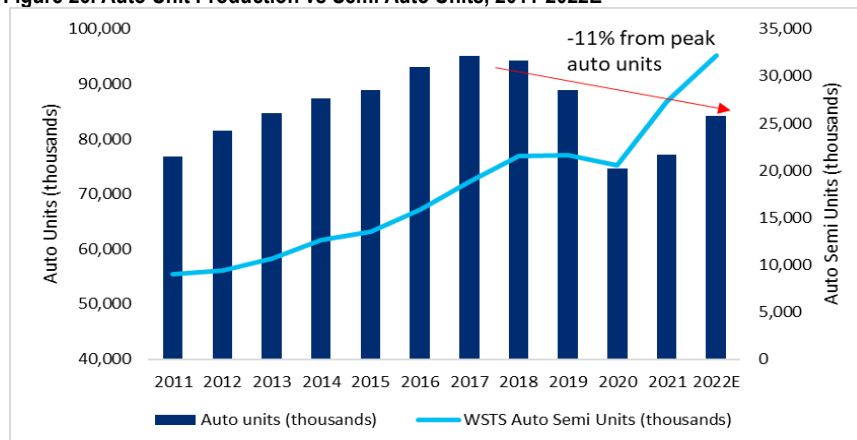
Company	Industrial Exposure
Analog Devices	50%
Texas Instruments	41%
Microchip	41%
ON Semiconductor	29%
NXP Semiconductors	22%
Qualcomm	15%
Micron	8%
Intel	7%

Source: Company Reports and Citi Research Estimates.

## Automotive demand strong but moderating

We expect foundry capacity to shift from the PC to auto end market. We believe a correction will also hit the automotive semiconductor space at some point in 2023 given slowing demand due to impending recession and the large disparity in auto semi unit growth versus auto unit growth. As shown in the chart below, 2022 semi auto units of 32.2 million are expected to be up 50% from prior peak of 21.6 million units in 2018. On the other hand, 2022 auto units of 84.1 million units are still down 11% from peak of 94.1 million auto units in 2018.

Figure 26. Auto Unit Production vs Semi Auto Units, 2011-2022E

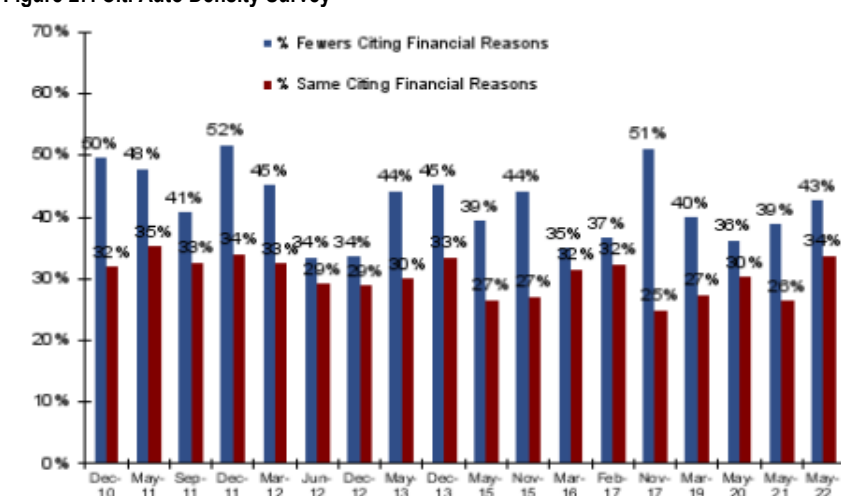


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Source: Citi Research, IHS Markit, WSTS

Macroeconomic concerns appear to be negatively affecting automotive demand as well. In our latest automotive density survey in May, we saw some softening in automotive demand. As shown in the chart below, the number of respondents who expects fewer vehicles per household edged up from 39% to 43%, citing financial reasons, primarily higher gas prices and inflation (see: [note](#))

Figure 27. Citi Auto Density Survey



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Source: Citi Research

Based on the guidance provided, we expect semiconductor revenue from the auto end market to increase 5% QoQ in 2Q22, relatively in line with sequential growth in 1Q22. Semi companies such as NXP and STM, MCHP noted that they are sold out for 2022, and sales are being constrained by supply. However, auto semi revenue has peaked, and will start decelerating from here through 2023.

Figure 28. Automotive Revenue of Major Analog Companies vs Auto Production, QoQ and YoY Growth										
\$ millions (USD)	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22E
<b>Infineon</b>	<b>\$917</b>	<b>\$958</b>	<b>\$1,244</b>	<b>\$1,378</b>	<b>\$1,467</b>	<b>\$1,429</b>	<b>\$1,459</b>	<b>\$1,587</b>	<b>\$1,570</b>	<b>\$1,655</b>
QoQ Growth	1%	4%	30%	11%	6%	-3%	2%	9%	-1%	5%
YoY Growth	-6%	-2%	27%	51%	60%	49%	17%	15%	7%	16%
<b>NXP</b>	<b>\$994</b>	<b>\$674</b>	<b>\$964</b>	<b>\$1,193</b>	<b>\$1,229</b>	<b>\$1,262</b>	<b>\$1,455</b>	<b>\$1,547</b>	<b>\$1,557</b>	<b>\$1,646</b>
QoQ Growth	-9%	-32%	43%	24%	3%	3%	15%	6%	1%	6%
YoY Growth	-4%	-35%	-8%	9%	24%	87%	51%	30%	27%	30%
<b>Renesas</b>	<b>\$874</b>	<b>\$687</b>	<b>\$761</b>	<b>\$909</b>	<b>\$947</b>	<b>\$967</b>	<b>\$1,064</b>	<b>\$1,135</b>	<b>\$1,175</b>	<b>\$1,216</b>
QoQ Growth	-5%	-21%	11%	19%	4%	2%	10%	7%	4%	3%
YoY Growth	15%	-22%	-11%	-1%	8%	41%	40%	25%	24%	26%
<b>TXN</b>	<b>\$717</b>	<b>\$433</b>	<b>\$760</b>	<b>\$908</b>	<b>\$908</b>	<b>\$944</b>	<b>\$982</b>	<b>\$1,001</b>	<b>\$1,089</b>	<b>\$1,144</b>
QoQ Growth	-3%	-40%	75%	19%	0%	4%	4%	2%	9%	5%
YoY Growth	-2%	-42%	-2%	22%	27%	118%	29%	10%	20%	21%
<b>STM</b>	<b>\$753</b>	<b>\$727</b>	<b>\$851</b>	<b>\$953</b>	<b>\$1,043</b>	<b>\$1,077</b>	<b>\$1,005</b>	<b>\$1,226</b>	<b>\$1,256</b>	<b>\$1,404</b>
QoQ Growth	-19%	-3%	17%	12%	9%	3%	-7%	22%	2%	12%
YoY Growth	-17%	-18%	-5%	3%	39%	48%	18%	29%	20%	30%
<b>ON</b>	<b>\$439</b>	<b>\$327</b>	<b>\$419</b>	<b>\$491</b>	<b>\$515</b>	<b>\$556</b>	<b>\$576</b>	<b>\$641</b>	<b>\$715</b>	<b>\$719</b>
QoQ Growth	-5%	-26%	28%	17%	5%	8%	4%	11%	11%	1%
YoY Growth	-6%	-25%	-6%	6%	17%	70%	37%	30%	39%	29%
<b>ADI+MXIM</b>	<b>\$340</b>	<b>\$284</b>	<b>\$391</b>	<b>\$434</b>	<b>\$460</b>	<b>\$513</b>	<b>\$615</b>	<b>\$553</b>	<b>\$634</b>	<b>\$644</b>
QoQ Growth	-3%	-17%	38%	11%	6%	12%	20%	-10%	15%	2%
YoY Growth	-12%	-26%	6%	24%	35%	81%	57%	27%	38%	25%
<b>Auto Semi Revenue (\$ millions)</b>	<b>\$5,034</b>	<b>\$4,090</b>	<b>\$5,390</b>	<b>\$6,266</b>	<b>\$6,569</b>	<b>\$6,748</b>	<b>\$7,156</b>	<b>\$7,690</b>	<b>\$7,996</b>	<b>\$8,428</b>
QoQ Growth	-7%	-19%	32%	16%	5%	3%	6%	7%	4%	5%
YoY Growth	-4%	-24%	0%	16%	30%	65%	33%	23%	22%	25%
<b>Global auto units (thousands)</b>	<b>17,847</b>	<b>12,640</b>	<b>20,540</b>	<b>23,554</b>	<b>20,558</b>	<b>18,746</b>	<b>16,574</b>	<b>21,117</b>	<b>20,103</b>	<b>18,086</b>
QoQ Growth	-22%	-29%	62%	15%	-13%	-9%	-12%	27%	-5%	-9%
YoY Growth	-22%	-43%	-2%	3%	15%	48%	-19%	-10%	-2%	-4%

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Source: Citi Research, Company Reports, Citi estimates are used for NXP, TXN, ON, ADI and MXIM. Factset estimates are used for Infineon, Renesas and STM. STM auto revenue includes power discretes.

We [downgraded](#) NXP in April (50% exposure to the automotive end market) due to limited margin upside, and have recently lowered sales for ON semiconductor (34%) driven by the decelerating auto demand.

Figure 29. Automotive Exposure by Company, % of C21 Revenue		
Company	Auto Exposure	Internal Wafer Fabrication
NXP Semiconductors	50%	Low 40%
ON Semiconductor	34%	67%
Texas Instruments	21%	80%
Analog Devices	16%	50%
Microchip	15%	39%
Micron	4%	
Qualcomm	3%	
Intel	1%	

Source: Company Reports and Citi Research Estimates



## Expect more capex cuts – it's a good thing.

Micron was the first semi company to cut capex, and we expect more capex cuts by [September](#). We view these cuts positively as it mitigates oversupply and shortens the semi correction. Atif Malik, our semi equipment analyst, maintains an \$80 billion WFE estimate, down 16% YoY from \$95 billion in 2022. We also expect capex cuts eventually from Intel and TSMC.

## Most pushback on data center/enterprise and auto correction

Most investors realize some sort of correction is coming but believe that the correction has been priced in to the stocks. The biggest pushback we receive is our call that the data center and auto end markets will correct as well.

## Where to hide – high margins, good history, right end markets

Our top pick is ADI as we anticipate ADI's EPS to be more sustainable compared to peers given the cost and revenue synergies from the Maxim acquisition. ADI has been one of the better performers during downturns as shown in the chart below.

Figure 30. Corrections/ Recession Performance since 2000

	Corrections/ Recessions since 2000								Avg Performance across Prior
	10-Mar-00	20-Jul-07	25-Feb-11	6-Apr-12	5-Jun-15	16-Mar-18	14-Feb-20	27-Dec-21	
	9-Oct-02	30-Nov-08	19-Aug-11	16-Nov-12	12-Feb-16	28-Dec-18	20-Mar-20	11-Jul-22	
MU	-77.2	-79.6	-54.1	-27.9	-62.3	-47.9	-38.3	-38.6	-55.3
QRVO	-93.3	-79.8	-34.9	-14.4	-55.1	-24.7	-33.2	-37.7	-47.9
SWKS	-93.9	-38.6	-47.8	-26.4	-45.5	-39.2	-38.1	-38.4	-47.1
ON		-74.7	-41.0	-31.4	-45.3	-36.9	-49.5	-24.5	-46.5
LRCX	-87.6	-65.9	-35.0	-18.7	-20.8	-39.0	-44.6	-44.2	-44.5
TER	-91.9	-78.3	-41.6	-8.5	-16.3	-36.6	-36.9	-46.6	-44.3
MRVL		-70.5	-33.0	-51.1	-39.4	-32.5	-25.7	-50.2	-42.0
AMAT	-78.4	-55.4	-32.9	-15.6	-20.3	-45.5	-43.2	-45.5	-41.6
NVDA	-75.0	-75.2	-49.3	-22.2	15.6	-46.6	-29.0	-51.1	-40.2
AMD	-86.2	-84.8	-35.6	-76.4	-21.5	55.4	-28.4	-50.1	-39.6
NXPI			-47.8	-11.9	-37.1	-41.0	-46.3	-34.6	-36.8
KLAC	-71.3	-69.6	-31.2	-17.4	12.0	-26.5	-35.3	-29.0	-34.2
TXN	-85.4	-59.0	-30.3	-12.8	-4.9	-14.7	-26.2	-20.0	-33.3
ADI	-78.8	-55.1	-23.0	1.4	-26.3	-9.2	-27.7	-15.9	-31.3
MCHP	-35.1	-51.0	-20.7	-18.7	-14.9	-27.0	-45.5	-34.1	-30.4
INTC	-77.6	-43.8	-12.2	-28.1	-10.1	-8.6	-31.9	-28.3	-30.3
QCOM	-79.5	-21.9	-21.2	-7.8	-34.7	-6.3	-32.0	-28.9	-29.1
GFS								-33.1	
S&P 500	-44.3	-41.6	-14.9	-2.7	-10.9	-9.7	-31.8	-19.6	-22.3
SOX	-83.9	-63.1	-29.6	-15.9	-21.3	-19.3	-33.6	-36.7	-38.1
Best	MCHP	QCOM	INTC	ADI	NVDA	AMD	MRVL	ADI	
Worst	SWKS	AMD	MU	AMD	MU	MU	ON	NVDA	

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Source: Citi Research, FactSet. Pricing as of 7/11/2022, as of market close.

## What to own coming out of this –AMD, ON, GFS and the ‘Cron.

Whenever the stock downturn ends, we prefer to own stocks with secularly increasing margins and/or EPS such as AMD, ON, GFS and MU as they should offer the most upside.

As shown in the table below, we expect GFS's gross margins to expand the most by 11.3%, followed by AMD at 6.3%, ON semi at 5.7% and MU at 5.1%, from 2021-2023E.

Figure 31. Gross Margin Expansion 2021-2023E

	2021	2022E	2023E	2021 to 2023 Gross margin expansion
Global Foundries	15.4%	25.8%	26.7%	11.3%
AMD	48.2%	53.7%	54.5%	6.3%
ON Semiconductor	40.4%	49.5%	46.0%	5.7%
Micron	42.6%	44.2%	47.7%	5.1%
Analog Devices	71.4%	74.3%	74.5%	3.1%
Microchip	64.6%	66.7%	66.5%	1.9%
NXP	55.7%	57.4%	57.5%	1.8%
Qualcomm	58.6%	57.8%	57.9%	-0.8%
Texas Instruments	67.5%	69.3%	66.0%	-1.5%
Intel	57.7%	49.8%	47.0%	-10.7%
<b>Average</b>	<b>52.2%</b>	<b>54.9%</b>	<b>54.4%</b>	<b>2.2%</b>

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Source: Citi Research

Similarly, we expect GFS operating margins to expand the most by 17.6%, followed by AMD at 6.8%, ON at 5.8%, and ADI at 5.7% from 2021-2023E.

Figure 32. Operating Margin Expansion 2021-2023E

	2021	2022E	2023E	2021 to 2023 Op. margin expansion
Global Foundries	-0.9%	12.8%	16.7%	17.6%
AMD	22.3%	27.8%	29.1%	6.8%
ON Semiconductor	21.8%	33.3%	27.5%	5.8%
Analog Devices	43.8%	49.8%	49.5%	5.7%
Micron	30.4%	30.2%	34.0%	3.6%
Microchip	39.1%	42.3%	42.5%	3.4%
NXP	29.7%	33.0%	32.0%	2.3%
Qualcomm	31.7%	33.1%	32.3%	0.6%
Texas Instruments	49.9%	51.8%	46.5%	-3.4%
Intel	29.7%	16.8%	10.5%	-19.2%
<b>Average</b>	<b>31.9%</b>	<b>35.2%</b>	<b>34.2%</b>	<b>2.4%</b>

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Source: Citi Research

As shown in the table below, we expect Micron to have the largest EPS expansion in 2023 at 19% YoY, followed by AMD at 18% YoY, and ADI at 6% YoY.

Figure 33. EPS YoY Growth Expansion 2021-2023E

	2021	2022E	2023E
MU	150%	4%	19%
AMD	134%	39%	18%
ADI	30%	38%	6%
MCHP	38%	38%	0%
NXPI	97%	35%	-2%
QCOM	87%	33%	-6%
TXN	43%	8%	-15%
ON	248%	69%	-24%
GFS	NA	NA	-26%
INTC	3%	-57%	-34%

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Source: Citi Research

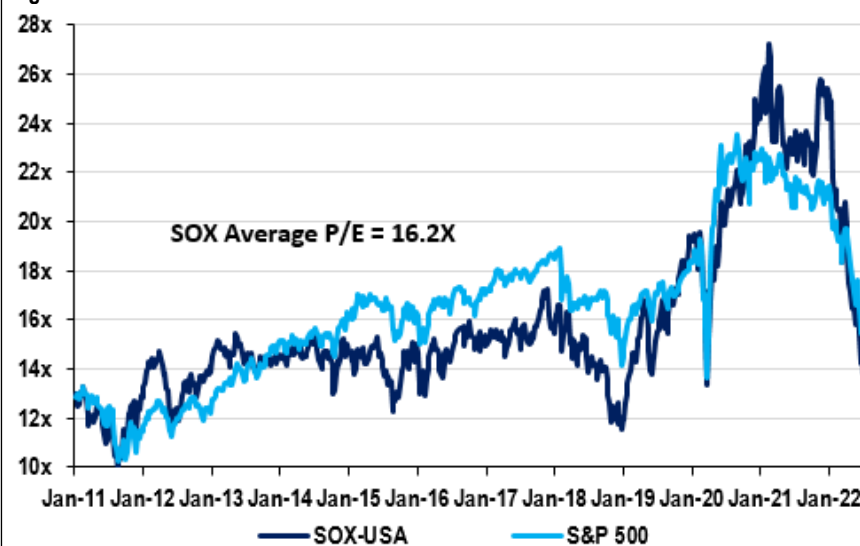
## When to Buy semis again?

Follow [Rule 15](#). We believe it's time to buy when stocks stop going down on bad news, and most of the downside is priced in.

## Valuation looking better - SOX trading below S&P 500

The SOX index has sold off roughly 35% since its peak and its valuation has declined from 26.1X NTM P/E in November 2021 to 14.8X, 10% below the S&P of 16.4X, well below a 4% historical discount to the S&P.

Figure 34. SOX vs S&P 500 NTM P/E



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Source: Citi Research, FactSet

## Large-cap semis are trading below the S&P500

As the following table illustrates, semiconductor stocks within our coverage universe are trading at roughly 14.7x our C23 EPS estimates, slightly above the SOX index of 13.8x but below the S&P 500 of 15.5X.

Figure 35. Semiconductor Valuation Table

Ticker	Citi Rating	07/12/22 Price	07/12/22 Market Cap	Price Target	% Upside	Citi Estimate				Citi Estimate			
						EPS		P/E		Revenue		P/S	
						C22E	C23E	C22E	C23E	C22E	C23E	C22E	C23E
<b>Chris Danely, Semiconductors</b>													
415-951-1885, christopher.danely@citi.com													
<b>Digital</b>													
MU	Buy	\$59.18	\$64,555	\$80.00	35%	\$7.35	\$8.72	8.1	6.8	\$30,628	\$32,500	2.1	2.0
QCOM	Neutral	\$132.95	\$148,109	\$150.00	13%	\$11.11	\$10.78	12.0	12.3	\$46,558	\$45,000	3.2	3.3
INTC	Neutral	\$37.21	\$152,111	\$45.00	21%	\$2.33	\$1.55	16.0	24.0	\$71,853	\$69,500	2.1	2.2
AMD	Neutral	\$76.36	\$124,698	\$110.00	44%	\$3.46	\$4.08	22.1	18.7	\$25,387	\$29,500	4.9	4.2
<b>Analog/Mixed Signal/Embedded*</b>													
ON	Buy	\$52.77	\$22,855	\$73.00	38%	\$4.93	\$3.73	10.7	14.2	\$8,045	\$7,600	2.8	3.0
ADI	Buy	\$148.05	\$76,703	\$192.00	30%	\$9.54	\$10.09	15.5	14.7	\$11,872	\$12,200	6.5	6.3
NXPI	Neutral	\$152.24	\$39,899	\$190.00	25%	\$12.77	\$12.48	11.9	12.2	\$13,336	\$13,500	3.0	3.0
TXN	Neutral	\$154.46	\$141,603	\$160.00	4%	\$8.52	\$7.57	18.1	20.4	\$18,405	\$17,800	7.7	8.0
MCHP	Neutral	\$59.20	\$32,643	\$72.00	22%	\$5.03	\$5.38	11.8	11.0	\$7,944	\$8,000	4.1	4.1
<b>Foundry</b>													
GFS	Buy	\$41.48	\$23,150	\$70.00	69%	\$2.04	\$1.50	20.4	27.7	\$7,965	\$7,900	2.9	2.9
<b>Semiconductor Universe Average</b>								<b>13.5</b>	<b>14.7</b>	<b>3.8</b>			
<b>SOX</b>		<b>2,558</b>						<b>14.9</b>	<b>13.8</b>				
<b>S&amp;P500</b>		<b>3,819</b>						<b>17.0</b>	<b>15.5</b>				

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Source: Citi Research, FactSet, Market pricing as of 7/12/2022, market close.

## ADI is our Top Pick

ADI is now our top pick given our defensive stance. Whenever the stock downturn ends, we prefer to own stocks with secularly increasing margins and/or EPS such as Micron, ON, GlobalFoundries and AMD as they should offer the most upside.

Figure 36. Semi Stock Ranking

	Company	Rating	Current Price	Price Target	% Upside	Target Valuation Multiple	Investment Thesis
1	Analog Devices	Buy	\$148.05	\$192.00	30%	19X C23 EPS	Expect EPS upside due to revenue and cost synergies from the Maxim acquisition
2	Micron	Buy	\$59.18	\$80.00	35%	1.5 F23 P/B	Secular gross margins and EPS increases. Currently at trough valuation, 1.0x price-to-book.
3	ON Semi	Buy	\$52.77	\$73.00	38%	20X C23 EPS	Expect EPS upside due to manufacturing consolidation
4	Global Foundries	Buy	\$41.48	\$70.00	69%	5X C23 PS	Margin and EPS expansion driven by higher pricing and restructuring initiatives
5	Microchip	Neutral	\$59.20	\$72.00	22%	14X C23 EPS	Multiple under pressure from less chance of M&A
6	AMD	Neutral	\$76.36	\$110.00	44%	27X C23 EPS	Server share gains accelerating but PC demand to revert to the mean in 2H22
7	NXPI	Neutral	\$152.24	\$190.00	25%	15X C23 EPS	Limited margin upside
8	Texas Instruments	Neutral	\$154.46	\$160.00	4%	21X C23 EPS	Declining margins due to higher capex / fab expansion
9	Qualcomm	Neutral	\$132.95	\$150.00	13%	14X C23 EPS	Losing share to Mediatek and threat of lower royalties
10	Intel	Neutral	\$37.21	\$45.00	21%	29X C23 EPS	PC end market slowdown in 2H22 and losing server market share

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Source: Citi Research, FactSet, Market pricing as of 7/12/2022, market close.

## Company Reviews

### Advanced Micro Devices (AMD.O)

We expect AMD to report 2Q22 revenue in line with guidance, our estimate and Consensus of \$6.50 billion (up 10% QoQ) as AMD's share gains were enough to offset the weakening PC market. Our 2Q22 EPS estimate of \$0.81 is below Consensus of \$0.93 due to higher opex.

We expect AMD to guide 3Q22 revenue to \$6.50 billion (flat QoQ), below Consensus of \$6.83 billion (up 6% QoQ) due to the PC correction. We are forecasting 3Q22 EPS of \$0.83, below Consensus of \$0.99 due to lower sales and gross margins.

Our Neutral rating on AMD is driven by our expectation of a microprocessor inventory correction as PC end market demand reverts to the mean. Our estimates are below Consensus.

### GlobalFoundries (GFS.O)

We expect GlobalFoundries to report 2Q22 revenue of \$1.98 billion (up 2% QoQ), roughly in line with guidance and Consensus of \$1.97 billion (up 2% QoQ) as long lead times and minimal exposure to the PC end market allows GFS to avoid the correction for the time being. Our 2Q22 EPS estimate of \$0.35 is in line with Consensus.

We expect GlobalFoundries to guide 3Q22 revenue to \$2.00 billion (up 1% QoQ), in line with Consensus, as the company's long lead times and minimal exposure to the PC space allow GFS to avoid the correction for the time being. We are forecasting 3Q22 EPS estimate of \$0.43, above Consensus of \$0.36, due to higher gross margins.

We are Buy-rated on GlobalFoundries as we expect GFS to experience the biggest margin and EPS expansion in the group, driven by higher pricing and restructuring initiatives.

### Intel Corp (INTC.O)

We expect Intel to report 2Q22 revenue of \$17.5 billion (down 5% QoQ), below guidance and Consensus of \$18.0 billion (down 2% QoQ) due to share loss and the PC correction. Our 2Q22 EPS (incl. SBC) of \$0.49 is below Consensus of \$0.53 due to lower revenue, gross margin, and higher SBC. We note that Consensus SBC is \$0.17, lower than guide of \$0.23.

We expect Intel to guide 3Q22 revenue to \$17.5 billion (flat QoQ), below Consensus of \$19.1 billion (up 6% QoQ) due to the PC correction. We are forecasting 3Q22 EPS estimate (incl. SBC) of \$0.54, below Consensus of \$0.70 due to lower sales and gross margins.

Our Neutral rating on Intel is driven by our expectation of cuts to Consensus estimates driven by share loss to AMD and microprocessor inventory correction as PC end market demand reverts to the mean. Our estimates are below Consensus.

## Microchip Technology (MCHP.O)

We expect Microchip to report F1Q23 revenue of \$1.95 billion (up 6% QoQ), roughly in line with guidance/Consensus of \$1.96 billion (up 6% QoQ) as the company's long lead times and minimal exposure to the PC and handset space allow MCHP to avoid the correction for the time being. Our F1Q23 EPS estimate of \$1.27 is slightly above Consensus of \$1.25 due to lower opex.

We expect Microchip to guide F2Q23 revenue to \$2.05 billion (up 5% QoQ), above Consensus of \$1.99 billion (up 2% QoQ) as the long lead times and minimal exposure to the PC and handset space allow MCHP to avoid the correction for the time being. We are forecasting F2Q23 EPS of \$1.34, slightly above Consensus of \$1.30 due to higher revenue.

We rate Microchip Neutral as we expect the stock to perform in line with the group due to the slowing EPS growth and multiple compression given the "conglomerate discount" applied to semiconductor companies with high M&A.

## NXP Semiconductors NV (NXPI.O)

We expect NXP to report 2Q22 revenue of \$3.30 billion (up 5.0% QoQ), slightly above Consensus of \$3.28 billion (up 4% QoQ) due to higher pricing. Our 2Q22 EPS estimate of \$3.15 is above Consensus of \$3.06 due to higher revenue and gross margin.

We estimate NXP to guide 3Q22 revenue to \$3.40 billion (up 3% QoQ), above Consensus of \$3.34 billion (up 2% QoQ) due to continued strong demand from the automotive end market. We are forecasting 3Q22 EPS of \$3.25, above Consensus of \$3.21 due to the higher revenue.

We are Neutral-rated on NXP given limited margin upside and our belief of an impending correction in the Automotive end market.

## ON Semiconductor (ON.O)

We expect ON to report 2Q22 revenue of \$2.00 billion (up 3% QoQ), roughly in line with Consensus of \$2.02 billion (up 4% QoQ). Our 2Q22 EPS estimate of \$1.25 is roughly in line with Consensus of \$1.26.

We expect ON Semi to guide 3Q22 revenue to \$2.05 billion (up 2% QoQ) above Consensus of \$2.03 billion (flat QoQ) due to improved supply and strong pricing. Our 3Q22 EPS of \$1.24, is above Consensus of \$1.22 due to higher sales and gross margins.

We are Buy rated on ON due to its margin and EPS expansion potential driven by its manufacturing optimization plans.

## Qualcomm Inc (QCOM.O)

We expect Qualcomm to report F3Q22 revenue in line with guidance and Consensus of \$10.9 billion (down 2% QoQ) due to share gains offsetting overall weakness in the handset end market. Our F3Q22 EPS estimate of \$2.50 is slightly below Consensus of \$2.53 due to slightly lower gross margins.

We expect Qualcomm to guide F4Q22 revenue to \$12.00 billion (up 10% QoQ), slightly below Consensus of \$12.06 billion (up 11% QoQ) due to softness in the wireless market. We are forecasting F4Q22 EPS of \$2.89, below Consensus of \$2.99 due to lower revenue and gross margins.

We rate QCOM as Neutral as we believe most of the 5G upside in handsets (64% of QCT revenues) is over. We expect more downside for QCOM due to the handset correction and increased competition from Mediatek

## **Texas Instruments Inc (TXN.O)**

We expect TXN to report 2Q22 revenue of \$4.70 billion (down 4% QoQ), above guidance of \$4.50 billion (down 8% QoQ) and Consensus of \$4.55 billion (down 8% QoQ) as we believe the company guided conservatively. Our 2Q22 EPS estimate of \$2.15 is below Consensus of \$2.22 due to higher opex.

We expect TXN to guide 3Q22 revenue to \$4.50 billion (down 4% QoQ), below Consensus of \$5.01 billion (up 11% QoQ) due to the weakening semi demand. We are forecasting 3Q22 EPS of \$2.02, below Consensus of \$2.32 due to lower revenue.

We rate Texas Instruments Neutral, as we believe its margins will decline due to increasing depreciation and the acquisition of a fab. We estimate the new fab and higher depreciation will negatively impact gross margins by roughly 1%-3% in 2022.



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## Appendix A-1

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