

US Semiconductors

Core Wars: Q4 CPU review, near-term peak, increasing competition

Industry Overview

Strong Q4 CPU ramp, but Q1 slowdown

We review Q4 CPU trends based on Mercury Research data. Overall, Q4 marked a continued recovery in CPU shipments for both PCs and servers. PC units increased +12% QoQ (+47% YoY), while ASPs were flattish QoQ (-5% YoY). Importantly, both INTC and AMD ramped PC shipments in the quarter, with a combined shipment of 68.7mn units above IDC's PC estimate (61.4mn) for the first time in ten quarters. Given INTC's sub-seasonal MarQ PC outlook, we highlight a potential over-build of CPUs again, just a few months following signs of "channel normalization". Separately, AMD PC ASPs declined -13% QoQ (vs. INTC up +3%), suggesting potential discounting to maintain share against increasingly competitive INTC/ARM offerings. In servers, units increased +10% QoQ (-31% YoY) with ASPs continuing to expand +1% QoQ (+47% YoY), though we highlight a seasonal slowdown into Q1 and an ongoing enterprise weakness in China. Overall, near-term CPU trends are mixed, though new product launches (INTC Granite Rapids/Arrow Lake, AMD Zen 5, ARM PCs/servers) could help increase CPU TAM in an increasingly GPU-centric AI world into 2H/CY25E. We maintain Buy on ARM (content gains in mobile, PCs) and AMD (server value share gains, accelerator ramps), and Neutral on INTC (stabilizing PC/server shares but structural challenges as an IDM).

Q4 CPU trends in detail

We highlight the following Q4 CPU trends: (1) For notebooks, Q4 units increased +12% QoQ, and +50% YoY. AMD outperformed INTC in units (up +17% QoQ vs. INTC +11%), though significantly underperformed in ASPs (down -17% QoQ vs. INTC +3%). This resulted in 230bp of value share gains QoQ for INTC to 85.0%. (2) For desktops, Q4 units +11% QoQ/+42% YoY. AMD ASPs decreased -4% QoQ (vs. INTC's +2%), while units increased +15% QoQ (vs. INTC's +10%). (3) For servers, Q4 units were +10% QoQ and -31% YoY. AMD unit/value share of 23.1%/31.1% was -20/+110bp QoQ, with total AMD server sales of \$1.7bn up +16% QoQ (vs. INTC +10%). Despite a modest unit share loss, AMD continued to gain server value share from INTC in Q4, reaching 31.1% (+110bps QoQ) or the highest levels in 10+ years at (with ASPs ~50% above INTC's).

AMD server gain continues in CY24E, ARM proliferating

Our model suggests AMD's overall PC + Server CPU revenue share to reach 21.3% (vs. 22.3% prior) in CY24E YoY and increase to 21.5%/21.5% in CY25/26E. This includes a PC market share that stays largely within 14-15% (flattish since CY21), and a server share that expands to 32%+ by CY26E (from 28% in CY23). Though AMD's overall x86 share gains (PC + server) is modestly slowing, we note a continued increase in AMD server value share into CY24E, with AMD sales expected to rise +34% YoY vs. INTC's +13%. AMD is also expected to launch Zen 5 Turin products later in the year, the first major server update in two years, and we anticipate significant unit/ASP tailwinds associated with its upgraded process node (3nm) and AI (inference) features. Meanwhile, we highlight a continued proliferation of ARM products, with NVDA's Grace server CPU ramping today and numerous ARM-based PC products slated to launch in the coming quarters. We expect ARM to make up 10-15% of PC sales and 3-5% of server sales in CY24E, representing a total of 7.5% CPU value share.

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Key terms

AI: artificial intelligence**AMD:** Advanced Micro Devices**ARM:** Arm Holdings**ASP:** average selling price**CPU/MPU:** central processing
Unit/microprocessor**DT:** desktop**IDM:** integrated device manufacturer**INTC:** Intel**NB:** notebook**Nm:** nanometer**NVDA:** Nvidia**PC:** personal computer**TAM:** total addressable market

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Timestamp: 06 February 2024 11:56PM EST

PC client summary charts and tables

Key observations:

- **Units:** Overall PC CPU units +12% QoQ; AMD gained 80 bps of unit share QoQ.
- **ASPs:** Overall PC CPU ASPs were flat QoQ and -5% YoY; we note INTC's ASPs were up +3% QoQ while AMD's ASPs were down -13% QoQ.
- **Sales:** Total PC CPU revenue increased +1% QoQ. INTC revenue up +14% QoQ while AMD revenue increased +1% QoQ.

Exhibit 1: PC client (notebooks + desktops) MPU unit, revenue, and ASP summary

AMD gained 80bp of PC unit share QoQ

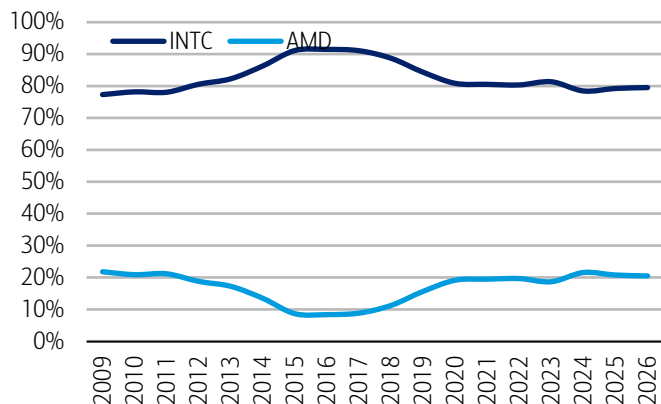
Total x86 PC MPU summary	4Q22	1Q23	2Q23	3Q23	4Q23	QoQ	YoY	2021	2022	2023	YoY	2024E	YoY
PC units (mn)	46.6	43.7	53.3	61.6	68.7	11.6%	47.3%	356.5	244.2	227.3	-6.9%	253.5	11.5%
INTC	38.7	36.3	44.1	49.7	54.9	10.5%	41.9%	287.1	196.2	184.9	-5.8%	198.9	7.6%
AMD	8.0	7.5	9.2	11.9	13.9	16.1%	73.3%	69.4	48.0	42.4	-11.6%	54.6	28.7%
Other	0.0	0.0	0.0	0.0	0.0	0.0%	900.0%	0.0	0.0	0.0	280.0%	0.0	-73.7%
PC sales (\$mn)	\$6,438	\$5,535	\$6,639	\$8,111	\$9,048	11.6%	40.6%	\$41,448	\$32,863	\$29,333	-10.7%	\$33,056	12.7%
INTC	\$5,581	\$4,845	\$5,701	\$6,737	\$7,659	13.7%	37.2%	\$34,813	\$26,898	\$24,942	-7.3%	\$27,534	10.4%
AMD	\$857	\$690	\$937	\$1,374	\$1,389	1.1%	62.1%	\$6,636	\$5,965	\$4,390	-26.4%	\$5,522	25.8%
Other	\$0	\$0	\$0	\$0	\$0	100.0%	100.0%	\$0	\$0	\$0	-87.5%	\$0	-100.0%
PC ASPs (\$)	\$138.0	\$126.6	\$124.5	\$131.7	\$131.7	0.0%	-4.6%	\$116.3	\$134.5	\$129.0	-4.1%	\$130.4	1.0%
INTC	\$144.4	\$133.7	\$129.3	\$135.7	\$139.6	2.9%	-3.3%	\$121.3	\$137.1	\$134.9	-1.6%	\$138.5	2.6%
AMD	\$107.3	\$92.6	\$101.7	\$115.2	\$100.3	-12.9%	-6.5%	\$95.6	\$124.2	\$103.4	-16.7%	\$101.1	-2.3%
Other	\$128.0	-\$512.0	-\$128.0	\$12.8	\$25.6	100.0%	-80.0%	\$30.1	\$204.8	\$6.7	-96.7%	\$0.0	-100.0%
Unit share													
INTC	82.9%	83.0%	82.7%	80.6%	79.8%	-0.8%	-3.0%	80.5%	80.3%	81.3%	1.0%	78.4%	-2.9%
AMD	17.1%	17.0%	17.3%	19.4%	20.2%	0.8%	3.0%	19.5%	19.7%	18.7%	-1.0%	21.6%	2.9%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Revenue share													
INTC	86.7%	87.5%	85.9%	83.1%	84.6%	1.6%	-2.0%	84.0%	81.8%	85.0%	3.2%	83.3%	-1.7%
AMD	13.3%	12.5%	14.1%	16.9%	15.4%	-1.6%	2.0%	16.0%	18.2%	15.0%	-3.2%	16.7%	1.7%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 2: PC MPU unit market share

We expect AMD to gain 290 bps of PC unit share in 2024E

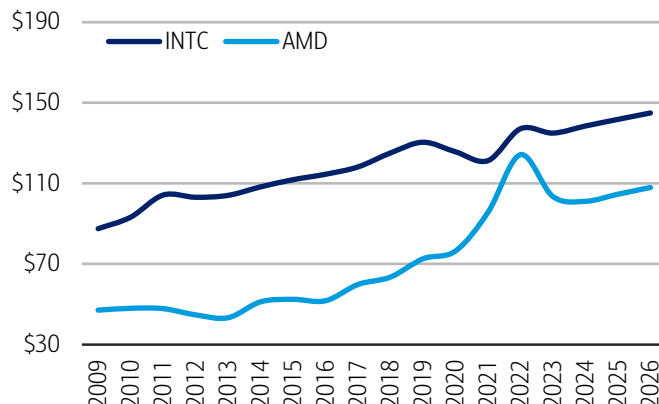


Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 3: PC MPU ASPs

We expect AMD ASPs to decline -2% in 2024E, below INTC's



Source: Mercury Research, BofA Global Research estimates, company reports

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Notebook summary charts and tables

Key observations:

- Units:** Notebook units increased +12% QoQ in Q4, as channel inventories normalized. AMD gained 90bp of unit share QoQ.
- ASPs:** AMD ASPs decreased -17% QoQ and down -6% YoY, while INTC's ASPs increased +3% QoQ and down -1% YoY. AMD ASPs again below Intel's.
- Sales:** INTC gained 230bp of value share QoQ to 85.0%, down -250bp YoY.

Exhibit 4: Notebook MPU unit, revenue, and ASP summary

Notebook MPU units up +50% YoY in Q4

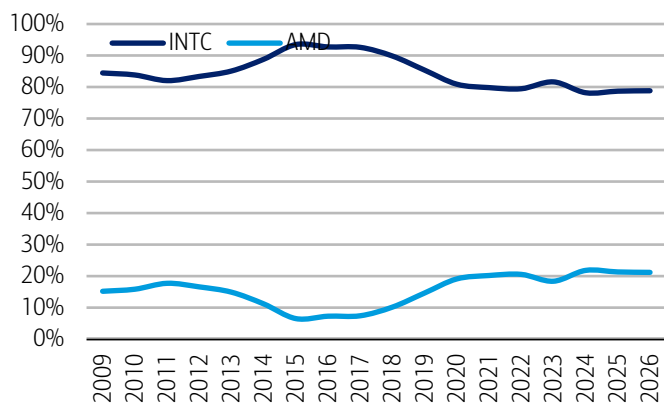
Notebook x86 MPU summary	4Q22	1Q23	2Q23	3Q23	4Q23	QoQ	YoY	2021	2022	2023	YoY	2024E	YoY
Notebook units (mn)	31.7	31.5	38.6	42.6	47.6	11.8%	49.9%	268.4	172.8	160.3	-7.3%	178.5	11.4%
INTC	26.5	26.4	32.2	34.3	37.9	10.6%	43.0%	214.2	137.3	130.8	-4.7%	139.6	6.7%
AMD	5.2	5.1	6.4	8.3	9.7	16.8%	85.3%	54.2	35.5	29.4	-17.1%	38.9	32.2%
Other	0.0	0.0	0.0	0.0	0.0	NA	NA	0.0	0.0	0.0	NA	0.0	NA
Notebook sales (\$mn)	\$3,939	\$3,603	\$4,231	\$5,163	\$5,733	11.0%	45.5%	\$28,266	\$21,916	\$18,731	-14.5%	\$21,348	14.0%
INTC	\$3,447	\$3,211	\$3,674	\$4,270	\$4,871	14.1%	41.3%	\$23,911	\$17,636	\$16,025	-9.1%	\$17,840	11.3%
AMD	\$492	\$392	\$558	\$893	\$862	-3.5%	75.2%	\$4,355	\$4,279	\$2,706	-36.8%	\$3,508	29.6%
Other	NA	NA	NA	NA	NA	NA	NA	\$0	\$0	\$0	NA	\$0	NA
Notebook ASPs (\$)	\$124.1	\$114.3	\$109.6	\$121.3	\$120.5	-0.7%	-2.9%	\$105.3	\$126.8	\$116.9	-7.8%	\$119.6	2.3%
INTC	\$130.0	\$121.6	\$113.9	\$124.5	\$128.5	3.2%	-1.1%	\$111.6	\$128.4	\$122.5	-4.6%	\$127.8	4.4%
AMD	\$94.3	\$76.9	\$87.5	\$107.8	\$89.1	-17.3%	-5.5%	\$80.4	\$120.5	\$91.9	-23.7%	\$90.1	-1.9%
Other	NA	NA	NA	NA	NA	NA	NA	\$0.0	\$0.0	\$0.0	NA	\$0.0	NA
Unit share													
INTC	83.6%	83.8%	83.5%	80.5%	79.7%	-0.9%	-3.9%	79.8%	79.5%	81.6%	2.2%	78.2%	-3.4%
AMD	16.4%	16.2%	16.5%	19.5%	20.3%	0.9%	3.9%	20.2%	20.5%	18.4%	-2.2%	21.8%	3.4%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Revenue share													
INTC	87.5%	89.1%	86.8%	82.7%	85.0%	2.3%	-2.5%	84.6%	80.5%	85.6%	5.1%	83.6%	-2.0%
AMD	12.5%	10.9%	13.2%	17.3%	15.0%	-2.3%	2.5%	15.4%	19.5%	14.4%	-5.1%	16.4%	2.0%
Other	NA	NA	NA	NA	NA	NA	NA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 5: Notebook MPU unit market share

We model INTC to capture 78% of the NB unit market this year

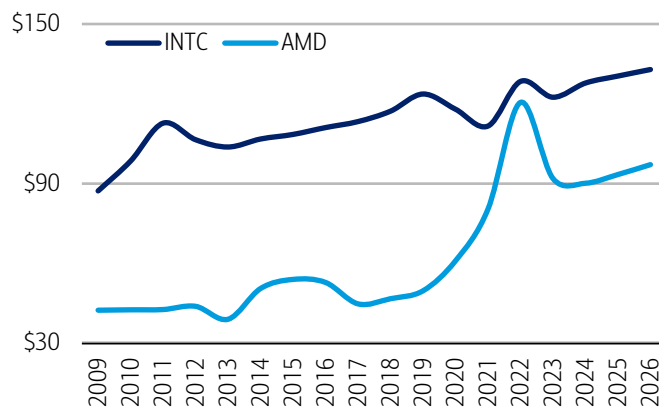


Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 6: Notebook MPU ASPs

AMD ASPs trail INTC



Source: Mercury Research, BofA Global Research estimates, company reports

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Desktop summary charts and tables

Key observations:

- **Units:** Desktop units increased +11% QoQ and up +42% YoY. AMD gained 60bp of unit share QoQ to 19.8%.
- **ASPs:** Overall ASPs up +1% QoQ, down -6% YoY. AMD's ASP down -4% QoQ.
- **Sales:** Overall desktop sales increased +13% QoQ (+33% YoY). INTC gained 40bp of value share QoQ to 84.1%, though ceded -130bp YoY.

Exhibit 7: Desktop MPU unit, revenue, and ASP summary

Desktop units up +11% YoY; AMD gained 60bp of unit share but ceded 40bp of revenue share QoQ

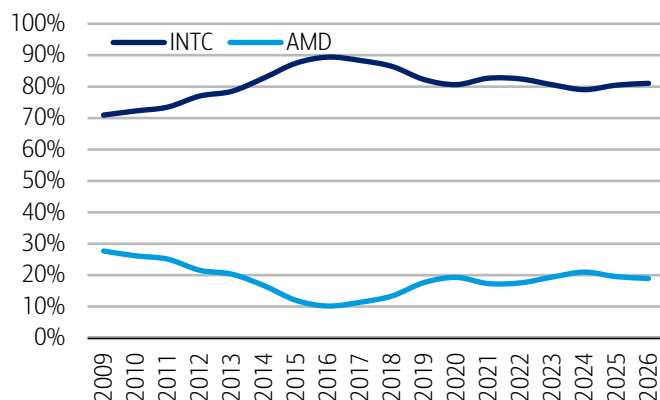
Desktop x86 MPU summary	4Q22	1Q23	2Q23	3Q23	4Q23	QoQ	YoY	2021	2022	2023	YoY	2024E	YoY
Desktop units (mn)	14.9	12.2	14.7	19.0	21.1	11.2%	41.8%	88.2	71.4	67.0	-6.2%	75.0	11.9%
INTC	12.1	9.8	11.8	15.4	17.0	10.4%	39.7%	72.9	58.9	54.0	-8.3%	59.3	9.8%
AMD	2.8	2.3	2.8	3.6	4.2	14.7%	50.7%	15.3	12.5	13.0	3.8%	15.7	20.9%
Other	0.0	0.0	0.0	0.0	0.0	0.0%	-300.0%	0.0	0.0	0.0	-160.0%	0.0	-333.3%
Desktop sales (\$mn)	\$2,499	\$1,931	\$2,407	\$2,947	\$3,315	12.5%	32.7%	\$13,183	\$10,947	\$10,602	-3.2%	\$11,708	10.4%
INTC	\$2,134	\$1,634	\$2,028	\$2,467	\$2,788	13.0%	30.7%	\$10,901	\$9,261	\$8,917	-3.7%	\$9,694	8.7%
AMD	\$365	\$297	\$380	\$480	\$527	9.7%	44.5%	\$2,281	\$1,686	\$1,684	-0.1%	\$2,014	19.6%
Other	\$0	\$0	\$0	\$0	\$0	100.0%	100.0%	\$0	\$0	\$0	-87.5%	\$0	-100.0%
Desktop ASPs (\$)	\$167.6	\$158.5	\$163.9	\$155.1	\$156.9	1.1%	-6.4%	\$149.5	\$153.3	\$158.2	3.2%	\$156.1	-1.3%
INTC	\$175.8	\$166.0	\$171.2	\$160.6	\$164.4	2.4%	-6.5%	\$149.5	\$157.3	\$165.1	5.0%	\$163.5	-1.0%
AMD	\$131.7	\$126.7	\$133.4	\$132.0	\$126.2	-4.4%	-4.2%	\$149.3	\$134.6	\$129.5	-3.8%	\$128.1	-1.1%
Other	-\$128.0	-\$512.0	-\$128.0	\$64.0	\$128.0	100.0%	-200.0%	\$102.4	-\$204.8	\$42.7	-120.8%	\$0.0	-100.0%
Unit share													
INTC	81.4%	80.8%	80.6%	80.8%	80.2%	-0.6%	-1.2%	82.7%	82.5%	80.6%	-1.9%	79.0%	-1.6%
AMD	18.6%	19.2%	19.4%	19.2%	19.8%	0.6%	1.2%	17.3%	17.5%	19.4%	1.9%	21.0%	1.6%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Revenue share													
INTC	85.4%	84.6%	84.2%	83.7%	84.1%	0.4%	-1.3%	82.7%	84.6%	84.1%	-0.5%	82.8%	-1.3%
AMD	14.6%	15.4%	15.8%	16.3%	15.9%	-0.4%	1.3%	17.3%	15.4%	15.9%	0.5%	17.2%	1.3%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 8: Desktop MPU unit market share

AMD share in desktops now up YoY

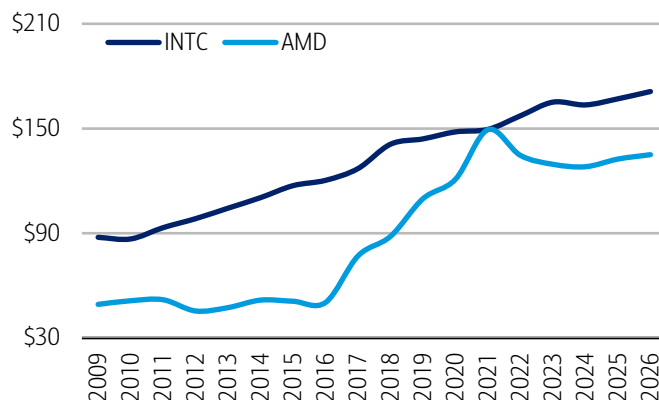


Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 9: Desktop MPU ASPs

AMD ASPs trail INTC



Source: Mercury Research, BofA Global Research estimates, company reports

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Server summary charts and tables

Key observations:

- **Units:** Overall server CPU units up +10% QoQ (down -31% YoY). INTC gained 20bp of unit share QoQ to 76.9% (down -540bp YoY).
- **ASPs:** AMD ASPs increased +6% QoQ (up +29% YoY) while INTC's down -1% QoQ; AMD server ASPs still at a very strong ~50% premium to INTC.
- **Sales:** Server CPU sales increased +12% QoQ and up +2% YoY. AMD gained 110bp of value share from INTC QoQ to 31.1% (up 400bp YoY).

Exhibit 10: Server MPU unit, revenue, and ASP summary

Server MPU units fell +10% QoQ

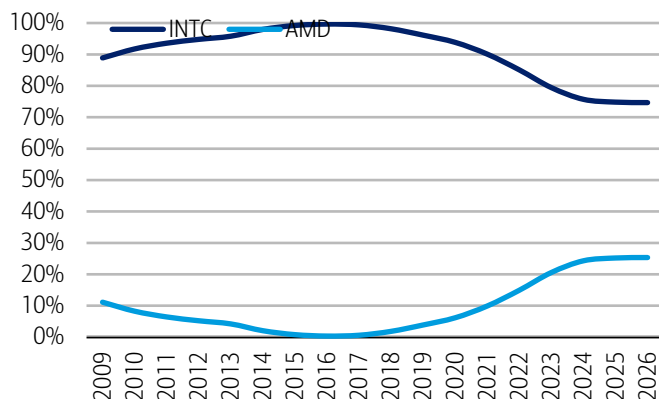
Server x86 MPU summary	4Q22	1Q23	2Q23	3Q23	4Q23	QoQ	YoY	2021	2022	2023	YoY	2024E	YoY
Server units (mn)	8.4	6.2	6.1	5.2	5.8	10.4%	-31.0%	37.7	36.1	23.3	-35.5%	23.2	-0.5%
INTC	6.9	5.1	5.0	4.0	4.4	10.7%	-35.5%	34.0	30.7	18.5	-39.8%	17.6	-5.2%
AMD	1.5	1.1	1.1	1.2	1.3	9.5%	-9.6%	3.7	5.4	4.8	-11.1%	5.6	17.5%
Server sales (\$mn)	\$5,475	\$4,267	\$4,770	\$4,980	\$5,572	11.9%	1.8%	\$26,036	\$24,026	\$19,589	-18.5%	\$23,313	19.0%
INTC	\$3,993	\$3,106	\$3,574	\$3,488	\$3,839	10.1%	-3.8%	\$22,668	\$18,446	\$14,007	-24.1%	\$15,846	13.1%
AMD	\$1,483	\$1,161	\$1,196	\$1,492	\$1,733	16.2%	16.9%	\$3,368	\$5,580	\$5,582	0.0%	\$7,467	33.8%
Server ASPs (\$)	\$655.6	\$685.0	\$783.1	\$953.7	\$966.5	1.4%	47.4%	\$690.0	\$665.0	\$840.5	26.4%	\$1,005.6	19.6%
INTC	\$580.4	\$607.9	\$720.5	\$870.5	\$865.6	-0.6%	49.1%	\$666.8	\$600.1	\$756.6	26.1%	\$902.9	19.3%
AMD	\$1,007.2	\$1,036.7	\$1,058.0	\$1,227.9	\$1,303.0	6.1%	29.4%	\$901.0	\$1,034.9	\$1,164.0	12.5%	\$1,325.5	13.9%
Unit share													
INTC	82.4%	82.0%	81.4%	76.7%	76.9%	0.2%	-5.4%	90.1%	85.1%	79.4%	-5.6%	75.7%	-3.7%
AMD	17.6%	18.0%	18.6%	23.3%	23.1%	-0.2%	5.4%	9.9%	14.9%	20.6%	5.6%	24.3%	3.7%
Revenue share													
INTC	72.9%	72.8%	74.9%	70.0%	68.9%	-1.1%	-4.0%	87.1%	76.8%	71.5%	-5.3%	68.0%	-3.5%
AMD	27.1%	27.2%	25.1%	30.0%	31.1%	1.1%	4.0%	12.9%	23.2%	28.5%	5.3%	32.0%	3.5%

Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 11: Server MPU Units

AMD is on track to take nearly 25% unit share in a few years

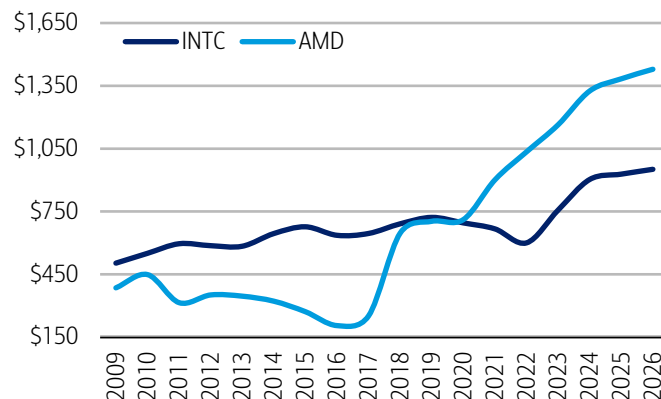


Source: Mercury Research, BofA Global Research estimates, company reports

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Exhibit 12: Server MPU ASPs

AMD server ASPs are well above INTC



Source: Mercury Research, BofA Global Research estimates, company reports

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3rd party CPU market unit estimates

Exhibit 13: Mercury Research estimate and forecast for Arm MPU share vs. INTC and AMD

Per Mercury, Arm PC unit share should remain near 10% long-term, servers closer to 5-8%

Total PC MPU summary	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
PC units (mn)	50.4	60.0	68.9	76.5	65.3	67.4	73.5	75.1	68.9	71.9	79.2	84.3	255.8	281.3	304.3
INTC	36.3	44.1	49.7	54.9	46.3	47.8	52.1	52.7	47.7	50.6	57.1	61.7	184.9	198.9	217.2
AMD	7.5	9.2	11.9	13.9	12.3	12.7	14.6	15.1	13.8	13.7	14.5	14.9	42.4	54.6	56.9
ARM	6.7	6.6	7.3	7.8	6.7	7.0	6.8	7.3	7.4	7.6	7.6	7.6	28.5	27.8	30.3
Unit share															
INTC	71.9%	73.5%	72.0%	71.7%	71.0%	70.9%	70.9%	70.1%	69.2%	70.4%	72.1%	73.3%	72.3%	70.7%	71.4%
AMD	14.8%	15.4%	17.3%	18.1%	18.8%	18.8%	19.9%	20.1%	20.0%	19.1%	18.3%	17.7%	16.6%	19.4%	18.7%
ARM	13.3%	11.1%	10.7%	10.2%	10.2%	10.4%	9.2%	9.8%	10.8%	10.5%	9.6%	9.0%	11.1%	9.9%	9.9%
Notebook MPU summary	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Notebook units (mn)	37.2	44.2	48.8	54.2	47.5	49.4	52.7	52.3	48.1	51.2	57.0	60.2	184.4	201.8	216.5
INTC	26.4	32.2	34.3	37.9	33.2	34.3	36.5	35.6	32.1	34.9	40.1	43.0	130.8	139.6	150.1
AMD	5.1	6.4	8.3	9.7	8.7	9.2	10.5	10.6	9.7	9.9	10.4	10.7	29.4	38.9	40.6
ARM	5.7	5.6	6.2	6.6	5.6	5.9	5.7	6.2	6.3	6.4	6.5	6.5	24.1	23.3	25.8
Unit share															
INTC	71.0%	72.9%	70.3%	70.0%	69.9%	69.5%	69.4%	67.9%	66.7%	68.1%	70.4%	71.5%	71.0%	69.2%	69.3%
AMD	13.7%	14.4%	17.0%	17.9%	18.4%	18.6%	19.9%	20.2%	20.2%	19.3%	18.2%	17.7%	16.0%	19.3%	18.8%
ARM	15.2%	12.7%	12.7%	12.2%	11.7%	11.9%	10.7%	11.9%	13.2%	12.6%	11.4%	10.8%	13.1%	11.5%	11.9%
Desktop MPU summary	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Desktop units (mn)	13.2	15.7	20.1	22.3	17.8	18.1	20.8	22.8	20.9	20.7	22.2	24.1	71.4	79.5	87.9
INTC	9.8	11.8	15.4	17.0	13.1	13.5	15.6	17.1	15.7	15.7	17.0	18.7	54.0	59.3	67.1
AMD	2.3	2.8	3.6	4.2	3.5	3.5	4.1	4.6	4.1	3.8	4.1	4.2	13.0	15.7	16.3
ARM	1.0	1.0	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	4.4	4.5	4.5
Unit share															
INTC	74.4%	75.3%	76.2%	76.0%	73.9%	74.5%	74.7%	75.1%	75.1%	76.0%	76.4%	77.7%	75.6%	74.6%	76.4%
AMD	17.7%	18.1%	18.1%	18.7%	19.9%	19.3%	19.8%	20.0%	19.5%	18.5%	18.5%	17.6%	18.2%	19.8%	18.5%
ARM	7.9%	6.6%	5.7%	5.3%	6.2%	6.2%	5.4%	5.0%	5.4%	5.4%	5.1%	4.7%	6.2%	5.6%	5.1%
Server MPU summary	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Server units (mn)	6.4	6.4	5.6	6.1	5.5	5.8	6.6	6.9	6.4	6.5	6.6	6.8	24.5	24.7	26.3
INTC	5.1	5.0	4.0	4.4	3.9	4.1	4.6	4.9	4.4	4.5	4.6	4.8	18.5	17.6	18.3
AMD	1.1	1.1	1.2	1.3	1.2	1.3	1.5	1.6	1.5	1.5	1.5	1.6	4.8	5.6	6.2
ARM	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	1.2	1.6	1.9
Unit share															
INTC	79.3%	77.9%	72.2%	72.2%	71.9%	71.1%	70.5%	70.4%	69.1%	69.3%	69.4%	69.9%	75.5%	70.9%	69.4%
AMD	17.4%	17.7%	21.9%	21.6%	21.7%	22.4%	23.4%	23.4%	23.9%	23.5%	23.3%	22.8%	19.6%	22.8%	23.4%
ARM	3.3%	4.4%	6.0%	6.2%	6.4%	6.5%	6.1%	6.2%	7.0%	7.2%	7.3%	7.3%	4.9%	6.3%	7.2%
Total MPU summary	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
PC + Server units (mn)	56.8	66.3	74.5	82.6	70.7	73.3	80.0	82.0	75.3	78.4	85.8	91.1	280.3	306.0	330.6
INTC	41.4	49.0	53.7	59.3	50.3	51.9	56.7	57.5	52.1	55.1	61.7	66.5	203.4	216.4	235.4
AMD	8.6	10.4	13.1	15.2	13.4	14.0	16.1	16.7	15.3	15.3	16.0	16.5	47.2	60.3	63.1
ARM	6.9	6.9	7.7	8.1	7.0	7.4	7.2	7.8	7.9	8.0	8.1	8.1	29.7	29.3	32.2
Unit share															
INTC	72.8%	74.0%	72.0%	71.8%	71.1%	70.9%	70.8%	70.1%	69.2%	70.3%	71.9%	73.0%	72.6%	70.7%	71.2%
AMD	15.1%	15.6%	17.6%	18.4%	19.0%	19.1%	20.2%	20.4%	20.3%	19.5%	18.7%	18.1%	16.9%	19.7%	19.1%
ARM	12.2%	10.4%	10.3%	9.9%	9.9%	10.1%	9.0%	9.5%	10.5%	10.2%	9.4%	8.9%	10.6%	9.6%	9.7%

Source: Mercury Research

BofA GLOBAL RESEARCH

BofA CPU market value estimates

Exhibit 14: CPU Market TAM and Market Share by Sales

We believe AMD's share in PC/server CPU market should rise to ~22% level by CY25E

CPU TAM (\$mn)	2017	2018	2019	2020	2021	2022	2023	2024E	2025E	2026E	CAGR	CAGR (5yr)	CAGR (10y)
											CY22-25E	CY17-22	CY12-22
PC + Server CPU TAM (\$mn)	\$47,497	\$53,991	\$55,985	\$63,339	\$69,995	\$60,241	\$52,828	\$60,933	\$67,403	\$71,993	3.8%	4.9%	3.9%
x86	\$47,497	\$53,991	\$55,648	\$62,705	\$67,484	\$56,889	\$48,921	\$56,369	\$62,205	\$66,068	3.0%	3.7%	3.3%
INTC	\$46,055	\$51,661	\$51,697	\$56,361	\$57,480	\$45,344	\$38,949	\$43,380	\$47,741	\$50,580	1.7%	-0.3%	1.8%
AMD	\$1,442	\$2,330	\$3,951	\$6,344	\$10,004	\$11,545	\$9,972	\$12,989	\$14,464	\$15,488	7.8%	51.6%	13.8%
Arm	\$0	\$0	\$337	\$634	\$2,511	\$3,352	\$3,907	\$4,564	\$5,197	\$5,925	15.7%	NA	NA
PC + Server Revenue Share (%)													
x86 Share	100.0%	100.0%	99.4%	99.0%	96.4%	94.4%	92.6%	92.5%	92.3%	91.8%	-0.8%	-1.1%	-0.6%
INTC Share	97.0%	95.7%	92.3%	89.0%	82.1%	75.3%	73.7%	71.2%	70.8%	70.3%	-2.0%	-4.9%	-2.0%
AMD Share	3.0%	4.3%	7.1%	10.0%	14.3%	19.2%	18.9%	21.3%	21.5%	21.5%	3.8%	44.6%	9.5%
Arm Share	0.0%	0.0%	0.6%	1.0%	3.6%	5.6%	7.4%	7.5%	7.7%	8.2%	11.5%	NA	NA
PC CPU TAM (\$mn)	\$29,941	\$32,421	\$33,423	\$38,612	\$43,818	\$36,003	\$32,640	\$36,761	\$40,890	\$43,275	4.3%	3.8%	1.5%
x86	\$29,941	\$32,421	\$33,164	\$38,094	\$41,448	\$32,863	\$29,333	\$33,056	\$36,732	\$38,607	3.8%	1.9%	0.6%
INTC	\$28,540	\$30,461	\$30,059	\$33,298	\$34,813	\$26,898	\$24,942	\$27,534	\$30,779	\$32,390	4.6%	-1.2%	-0.5%
AMD	\$1,401	\$1,960	\$3,105	\$4,795	\$6,636	\$5,965	\$4,390	\$5,522	\$5,953	\$6,216	-0.1%	33.6%	7.7%
Arm	\$0	\$0	\$259	\$519	\$2,370	\$3,140	\$3,308	\$3,706	\$4,159	\$4,668	9.8%	NA	NA
PC Revenue Share (%)													
x86 Share	100.0%	100.0%	99.2%	98.7%	94.6%	91.3%	89.9%	89.9%	89.8%	89.2%	-0.5%	-1.8%	-0.9%
INTC Share	95.3%	94.0%	89.9%	86.2%	79.4%	74.7%	76.4%	74.9%	75.3%	74.8%	0.2%	-4.8%	-1.9%
AMD Share	4.7%	6.0%	9.3%	12.4%	15.1%	16.6%	13.4%	15.0%	14.6%	14.4%	-4.2%	28.8%	6.1%
Arm Share	0.0%	0.0%	0.8%	1.3%	5.4%	8.7%	10.1%	10.1%	10.2%	10.8%	5.3%	NA	NA
Server CPU TAM (\$mn)	\$17,556	\$21,570	\$22,562	\$24,727	\$26,177	\$24,239	\$20,188	\$24,171	\$26,512	\$28,718	3.0%	6.7%	9.1%
x86	\$17,556	\$21,570	\$22,484	\$24,611	\$26,036	\$24,026	\$19,589	\$23,313	\$25,474	\$27,462	2.0%	6.5%	9.0%
INTC	\$17,515	\$21,200	\$21,637	\$23,063	\$22,668	\$18,446	\$14,007	\$15,846	\$16,962	\$18,190	-2.8%	1.0%	6.5%
AMD	\$41	\$370	\$846	\$1,548	\$3,368	\$5,580	\$5,582	\$7,467	\$8,512	\$9,272	15.1%	167.5%	32.9%
Arm	\$0	\$0	\$78	\$115	\$141	\$212	\$599	\$858	\$1,038	\$1,256	69.7%	NA	NA
Server Revenue Share (%)													
x86 Share	100.0%	100.0%	99.7%	99.5%	99.5%	99.1%	97.0%	96.4%	96.1%	95.6%	-1.0%	-0.2%	-0.1%
INTC Share	99.8%	98.3%	95.9%	93.3%	86.6%	76.1%	69.4%	65.6%	64.0%	63.3%	-5.6%	-5.3%	-2.4%
AMD Share	0.2%	1.7%	3.8%	6.3%	12.9%	23.0%	27.6%	30.9%	32.1%	32.3%	11.7%	150.8%	21.9%
Arm Share	0.0%	0.0%	0.3%	0.5%	0.5%	0.9%	3.0%	3.6%	3.9%	4.4%	64.7%	NA	NA

Source: Mercury Research, BofA Global Research estimates, company reports

BofA GLOBAL RESEARCH

x86 MPU market share & ASPs

Exhibit 15: INTC vs. AMD historical MPU sales/unit market share and ASPs

We see a path for AMD to reach 23.3% MPU (x86) value share by 2025E

Sales share	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Desktops (\$bn)	\$1.9	\$2.4	\$2.9	\$3.3	\$2.6	\$2.7	\$3.1	\$3.4	\$3.2	\$3.1	\$3.4	\$3.7	\$10.6	\$11.7	\$13.4
YoY (%)	-29.9%	-1.5%	-9.3%	32.7%	35.9%	10.2%	3.9%	1.6%	20.2%	17.8%	9.7%	10.5%	-3.2%	10.4%	14.1%
INTC share (%)	84.6%	84.2%	83.7%	84.1%	82.7%	83.1%	82.7%	82.7%	83.0%	83.8%	83.7%	84.8%	84.1%	82.8%	83.9%
AMD share (%)	15.4%	15.8%	16.3%	15.9%	17.3%	16.9%	17.3%	17.3%	17.0%	16.2%	16.3%	15.2%	15.9%	17.2%	16.1%
Notebooks (\$bn)	\$3.6	\$4.2	\$5.2	\$5.7	\$5.1	\$5.2	\$5.6	\$5.5	\$5.1	\$5.4	\$6.2	\$6.7	\$18.7	\$21.3	\$23.4
YoY (%)	-49.8%	-30.6%	9.8%	45.5%	40.7%	22.2%	8.7%	-4.1%	0.1%	4.0%	11.4%	21.3%	-14.5%	14.0%	9.5%
INTC share (%)	89.1%	86.8%	82.7%	85.0%	84.5%	84.0%	83.2%	82.7%	82.3%	82.9%	84.5%	84.9%	85.6%	83.6%	83.8%
AMD share (%)	10.9%	13.2%	17.3%	15.0%	15.5%	16.0%	16.8%	17.3%	17.7%	17.1%	15.5%	15.1%	14.4%	16.4%	16.2%
Total PCs (\$bn)	\$5.5	\$6.6	\$8.1	\$9.0	\$7.7	\$7.8	\$8.7	\$8.9	\$8.2	\$8.5	\$9.6	\$10.4	\$29.3	\$33.1	\$36.7
YoY (%)	-44.3%	-22.3%	2.0%	40.6%	39.0%	17.8%	6.9%	-2.0%	7.0%	8.7%	10.8%	17.2%	-10.7%	12.7%	11.1%
INTC share (%)	87.5%	85.9%	83.1%	84.6%	83.9%	83.7%	83.0%	82.7%	82.6%	83.3%	84.2%	84.8%	85.0%	83.3%	83.8%
AMD share (%)	12.5%	14.1%	16.9%	15.4%	16.1%	16.3%	17.0%	17.3%	17.4%	16.7%	15.8%	15.2%	15.0%	16.7%	16.2%
Servers (\$bn)	\$4.3	\$4.8	\$5.0	\$5.6	\$4.9	\$5.4	\$6.3	\$6.7	\$6.1	\$6.2	\$6.4	\$6.7	\$19.6	\$23.3	\$25.5
YoY (%)	-41.0%	-20.0%	-7.1%	1.8%	14.6%	12.4%	27.0%	20.9%	25.5%	16.2%	1.6%	-0.9%	-18.5%	19.0%	9.3%
INTC share (%)	72.8%	74.9%	70.0%	68.9%	68.9%	68.0%	67.5%	67.7%	66.1%	66.4%	66.6%	67.2%	71.5%	68.0%	66.6%
AMD share (%)	27.2%	25.1%	30.0%	31.1%	31.1%	32.0%	32.5%	32.3%	33.9%	33.6%	33.4%	32.8%	28.5%	32.0%	33.4%
Servers + PCs (\$bn)	\$9.8	\$11.4	\$13.1	\$14.6	\$12.6	\$13.2	\$15.0	\$15.6	\$14.4	\$14.7	\$16.0	\$17.1	\$48.9	\$56.4	\$62.2
YoY (%)	-42.9%	-21.4%	-1.7%	22.7%	28.4%	15.5%	14.5%	6.7%	14.2%	11.7%	6.9%	9.4%	-14.0%	15.2%	10.4%
INTC share (%)	81.1%	81.3%	78.1%	78.6%	78.1%	77.3%	76.5%	76.2%	75.6%	76.1%	77.1%	77.9%	79.6%	77.0%	76.7%
AMD share (%)	18.9%	18.7%	21.9%	21.4%	21.9%	22.7%	23.5%	23.8%	24.4%	23.9%	22.9%	22.1%	20.4%	23.0%	23.3%
Unit share	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Desktops (mn)	12	15	19	21	17	17	20	22	20	20	21	23	67	75	83
YoY (%)	-30.9%	-13.1%	-13.5%	41.8%	36.9%	15.5%	3.6%	2.5%	18.2%	15.4%	7.3%	5.9%	-6.2%	11.9%	11.1%
INTC share (%)	80.8%	80.6%	80.8%	80.2%	78.7%	79.4%	79.0%	79.0%	79.4%	80.4%	80.5%	81.5%	80.6%	79.0%	80.5%
AMD share (%)	19.2%	19.4%	19.2%	19.8%	21.3%	20.6%	21.0%	21.0%	20.6%	19.6%	19.5%	18.5%	19.4%	21.0%	19.5%
Notebooks (mn)	32	39	43	48	42	43	47	46	42	45	50	54	160	179	191
YoY (%)	-41.7%	-22.0%	13.6%	49.9%	32.9%	12.6%	10.4%	-3.1%	-0.4%	3.0%	7.4%	16.4%	-7.3%	11.4%	6.8%
INTC share (%)	83.8%	83.5%	80.5%	79.7%	79.2%	78.9%	77.7%	77.1%	76.8%	77.9%	79.4%	80.1%	81.6%	78.2%	78.7%
AMD share (%)	16.2%	16.5%	19.5%	20.3%	20.8%	21.1%	22.3%	22.9%	23.2%	22.1%	20.6%	19.9%	18.4%	21.8%	21.3%
Total PCs (mn)	44	53	62	69	59	60	67	68	61	64	72	77	227	254	274
YoY (%)	-39.1%	-19.7%	3.6%	47.3%	34.1%	13.4%	8.3%	-1.3%	4.9%	6.5%	7.4%	13.0%	-6.9%	11.5%	8.1%
INTC share (%)	83.0%	82.7%	80.6%	79.8%	79.1%	79.1%	78.1%	77.7%	77.6%	78.6%	79.8%	80.5%	81.3%	78.4%	79.2%
AMD share (%)	17.0%	17.3%	19.4%	20.2%	20.9%	20.9%	21.9%	22.3%	22.4%	21.4%	20.2%	19.5%	18.7%	21.6%	20.8%
Servers (mn)	6	6	5	6	5	5	6	6	6	6	6	6	23	23	24
YoY (%)	-40.2%	-33.9%	-35.9%	-31.0%	-17.8%	-10.6%	18.0%	12.0%	16.1%	10.4%	-0.3%	-2.1%	-35.5%	-0.5%	5.3%
INTC share (%)	82.0%	81.4%	76.7%	76.9%	76.8%	76.1%	75.1%	75.1%	74.3%	74.7%	74.9%	75.4%	79.4%	75.7%	74.8%
AMD share (%)	18.0%	18.6%	23.3%	23.1%	23.2%	23.9%	24.9%	24.9%	25.7%	25.3%	25.1%	24.6%	20.6%	24.3%	25.2%
Servers + PCs (mn)	50	59	67	74	64	66	73	74	67	70	78	83	251	277	298
YoY (%)	-39.2%	-21.5%	-1.2%	35.4%	27.6%	10.9%	9.0%	-0.3%	5.8%	6.8%	6.7%	11.7%	-10.6%	10.4%	7.9%
INTC share (%)	82.8%	82.6%	80.3%	79.6%	78.9%	78.8%	77.8%	77.5%	77.3%	78.3%	79.4%	80.1%	81.1%	78.2%	78.9%
AMD share (%)	17.2%	17.4%	19.7%	20.4%	21.1%	21.2%	22.2%	22.5%	22.7%	21.7%	20.6%	19.9%	18.9%	21.8%	21.1%
Blended ASPs	1Q23	2Q23	3Q23	4Q23	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	3Q25E	4Q25E	2023	2024E	2025E
Desktops (\$)	\$158	\$164	\$155	\$157	\$157	\$156	\$156	\$156	\$160	\$160	\$159	\$162	\$158	\$156	\$160
INTC (\$)	\$166	\$171	\$161	\$164	\$165	\$164	\$163	\$163	\$167	\$166	\$166	\$169	\$165	\$164	\$167
AMD (\$)	\$127	\$133	\$132	\$126	\$128	\$128	\$128	\$128	\$132	\$132	\$133	\$134	\$130	\$128	\$133
AMD vs INTC (%)	-23.7%	-22.1%	-17.8%	-23.2%	-22.7%	-21.6%	-21.2%	-21.2%	-21.2%	-20.8%	-19.8%	-20.8%	-21.6%	-21.6%	-20.7%
Notebooks (\$)	\$114	\$110	\$121	\$120	\$121	\$119	\$119	\$119	\$122	\$120	\$124	\$124	\$117	\$120	\$123
INTC (\$)	\$122	\$114	\$125	\$128	\$129	\$127	\$128	\$128	\$130	\$128	\$132	\$132	\$122	\$128	\$130
AMD (\$)	\$77	\$88	\$108	\$89	\$90	\$90	\$90	\$90	\$93	\$93	\$94	\$95	\$92	\$90	\$93
AMD vs INTC (%)	-36.8%	-23.2%	-13.4%	-30.6%	-30.2%	-28.8%	-29.5%	-29.5%	-28.9%	-27.5%	-28.8%	-28.1%	-25.0%	-29.5%	-28.4%
Total PCs (\$)	\$127	\$125	\$132	\$132	\$131	\$129	\$130	\$131	\$134	\$132	\$134	\$136	\$129	\$130	\$134
INTC (\$)	\$134	\$129	\$136	\$140	\$139	\$137	\$138	\$139	\$142	\$140	\$142	\$143	\$135	\$138	\$142
AMD (\$)	\$93	\$102	\$115	\$100	\$101	\$101	\$101	\$102	\$104	\$104	\$105	\$106	\$103	\$101	\$105
AMD vs INTC (%)	-30.7%	-21.4%	-15.1%	-28.1%	-27.5%	-26.5%	-27.0%	-27.0%	-26.8%	-25.9%	-26.1%	-26.0%	-23.3%	-27.0%	-26.2%
Servers (\$)	\$685	\$783	\$954	\$967	\$955	\$985	\$1,026	\$1,043	\$1,032	\$1,037	\$1,046	\$1,056	\$840	\$1,006	\$1,043
INTC (\$)	\$608	\$720	\$870	\$866	\$856	\$881	\$923	\$940	\$919	\$922	\$930	\$941	\$757	\$903	\$928
AMD (\$)	\$1,037	\$1,058	\$1,228	\$1,303	\$1,282	\$1,316	\$1,338	\$1,353	\$1,359	\$1,375	\$1,392	\$1,408	\$1,164	\$1,325	\$1,384
AMD vs INTC (%)	70.5%	46.8%	41.1%	50.5%	49.8%	49.4%	45.0%	43.8%	47.9%	49.1%	49.7%	49.6%	53.8%	46.8%	49.0%

Source: Mercury Research, BofA Global Research estimates, company reports

PC builds vs. sell-through units

Exhibit 16: PC MPU units vs. sell-through PCs – i.e., builds vs. consumption

Client PC MPU units of 68.7mn were above PC (excl. workstations) units of 61.4mn in Q4 suggesting building of MPU inventory

PC builds vs consumption	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
Client PC MPU units																
Units (mn)																
INTC excl IoT (3rd party)	58.9	57.3	66.8	82.0	81.1	76.3	62.5	67.2	56.3	50.7	50.5	38.7	36.3	44.1	49.7	54.9
AMD (3rd party research)	12.5	14.1	16.9	19.3	18.2	18.3	16.2	16.7	15.4	15.7	8.9	8.0	7.5	9.2	11.9	13.9
Other (3rd party research)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	71.4	71.3	83.8	101.4	99.3	94.6	78.7	83.9	71.7	66.4	59.4	46.6	43.7	53.3	61.6	68.7
Share (%)																
INTC excl IoT (3rd party)	82.5%	80.3%	79.8%	80.9%	81.7%	80.6%	79.4%	80.1%	78.5%	76.3%	85.0%	82.9%	83.0%	82.7%	80.6%	79.8%
AMD (3rd party research)	17.5%	19.7%	20.2%	19.1%	18.3%	19.4%	20.6%	19.9%	21.5%	23.7%	15.0%	17.1%	17.0%	17.3%	19.4%	20.2%
Other (3rd party research)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
vs 3rd party PC estimates																
Units (mn)																
Client PC MPUs	71.4	71.3	83.8	101.4	99.3	94.6	78.7	83.9	71.7	66.4	59.4	46.6	43.7	53.3	61.6	68.7
Client PC units (IDC)	53.2	73.1	82.3	90.3	83.3	82.6	85.3	91.3	78.1	69.1	71.9	65.3	55.4	59.5	66.7	61.4
Delta	18.2	-1.8	1.5	11.1	15.9	12.0	-6.5	-7.4	-6.3	-2.7	-12.4	-18.7	-11.7	-6.2	-5.1	7.3
Historic median	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Trailing 4 qtr sum	26.3	21.9	21.3	29.0	26.7	40.5	32.5	14.0	-8.3	-23.0	-28.9	-40.1	-45.4	-49.0	-41.6	-15.7
QoQ (%)																
Client PC MPUs	-4.1%	-0.2%	17.4%	21.0%	-2.1%	-4.7%	-16.8%	6.6%	-14.5%	-7.4%	-10.5%	-21.5%	-6.3%	22.0%	15.5%	11.6%
Client PC units (IDC)	-25.2%	37.4%	12.6%	9.7%	-7.7%	-0.8%	3.2%	7.1%	-14.5%	-11.5%	4.1%	-9.2%	-15.2%	7.4%	12.0%	-7.8%
Delta	21.1%	-37.5%	4.9%	11.3%	5.6%	-3.8%	-20.0%	-0.5%	0.0%	4.1%	-14.6%	-12.4%	8.9%	14.6%	3.5%	19.4%
Historic median	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
Trailing 4 qtr sum	20.2%	-16.0%	-9.8%	-0.3%	-15.8%	18.0%	-6.9%	-18.7%	-24.3%	-16.4%	-11.0%	-22.8%	-14.0%	-3.5%	14.5%	46.4%
YoY (%)																
Client PC MPUs	16.9%	7.5%	17.1%	36.1%	39.0%	32.7%	-6.0%	-17.2%	-27.7%	-29.8%	-24.5%	-44.4%	-39.1%	-19.7%	3.6%	47.3%
Client PC units (IDC)	-8.1%	14.8%	18.4%	27.0%	56.7%	13.1%	3.7%	1.2%	-6.3%	-16.4%	-15.7%	-28.5%	-29.1%	-13.9%	-7.3%	-5.9%
Delta	25.0%	-7.3%	-1.3%	9.1%	-17.7%	19.6%	-9.6%	-18.4%	-21.4%	-13.4%	-8.8%	-15.9%	-10.0%	-5.9%	10.8%	53.2%
Historic median	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%
Trailing 4 qtr sum	11.2%	7.9%	16.1%	25.6%	-17.2%	9.8%	1.4%	-26.1%	-29.8%	-62.9%	-62.0%	-59.5%	-48.1%	-40.6%	-20.9%	48.2%
HoH, YoY (%)																
Client PC MPUs	10.8%	12.0%	12.5%	26.8%	37.5%	35.8%	11.8%	-12.1%	-22.4%	-28.8%	-27.4%	-34.8%	-42.0%	-29.8%	-8.7%	22.8%
Client PC units (IDC)	-0.7%	3.9%	16.7%	22.7%	39.7%	31.4%	8.1%	2.3%	-2.4%	-11.3%	-16.1%	-22.3%	-28.8%	-21.9%	-10.5%	-6.6%
Delta	11.4%	8.1%	-4.2%	4.1%	-2.2%	4.4%	3.7%	-14.5%	-20.0%	-17.4%	-11.3%	-12.4%	-13.2%	-7.9%	1.8%	29.4%
Historic median	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%
Trailing 4 qtr sum	11.4%	3.0%	7.2%	12.2%	-6.4%	8.5%	1.5%	-10.1%	-16.3%	-31.9%	-31.3%	-29.9%	-24.5%	-20.3%	-11.4%	21.6%

Source: Mercury Research, IDC, BofA Global Research estimates, company reports

BofA GLOBAL RESEARCH

Exhibit 17: Stocks mentioned

Ratings and prices of stocks mentioned in report

Company Name	Ticker	Rating	Price
Advanced Micro Devices	AMD	C-1-9	\$167.88
Arm Holdings	ARM	C-1-9	\$72.98
Intel	INTC	B-2-8	\$42.74

Source: BofA Global Research

BofA GLOBAL RESEARCH



Price objective basis & risk

Advanced Micro Devices, Inc (AMD)

Our \$195 PO is based on 38x our 2025E non-GAAP EPS, which is towards the middle of AMD's historical 17x-64x range, justified by AI upside offset by slowdown in cyclical embedded/console markets.

Downside risks: 1) M&A integration risks, 2) Strong competition from larger names, 3) Lumpy nature of consumer and enterprise spending that could create delays in acceptance and success of new products, 4) High reliance on one outsourced manufacturing partner, 5) Maturity of current game console cycle.

Arm Holdings (ARM)

We assign a \$80 PO, which is based on 44x our CY25E non-GAAP EPS. This is at the high end of peers trading at 30x-36x and is justified, in our view, given Arm's superior growth profile.

Downside risks: 1) historically cyclical nature of semiconductor units, 2) high exposure to mature smartphone market, 3) competition against established x86 in the data center, 4) emerging competition from RISC-V in low-end consumer markets, 5) rising geopolitical tensions and deterioration of Arm China relationship, 6) ongoing Qualcomm/Nuvia litigation, 7) small trading float

Intel (INTC)

Our \$50 price objective is based on 26x our 2025E pf-EPS ex-stock comp expense, in the middle of compute peers (15x-40x), which we view as appropriate given manufacturing uncertainties and risks of new foundry strategy.

Upside risks to our price objective are 1) clarity or breakthrough on yields for 7nm process technology, 2) new products allowing Intel to limit share loss, 3) improving product mix which can drive upside to gross margins, 4) manufacturing slip up at key foundry competitors.

Downside risks to our price objective are 1) weaker-than-expected trends in a mature PC market, which is largest revenue generator for Intel, 2) further delays in 7nm process technology and roadmap, 3) accelerated share loss to AMD, 4) more competition in profitable data center market.

Analyst Certification

I, Vivek Arya, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

Special Disclosures

BofA Securities is currently acting as financial advisor to Intel Corp in connection with its sale of a minority stake in IMS Nanofabrication GmbH to Taiwan Semiconductor Manufacturing Co Ltd, which was announced on September 12, 2023.

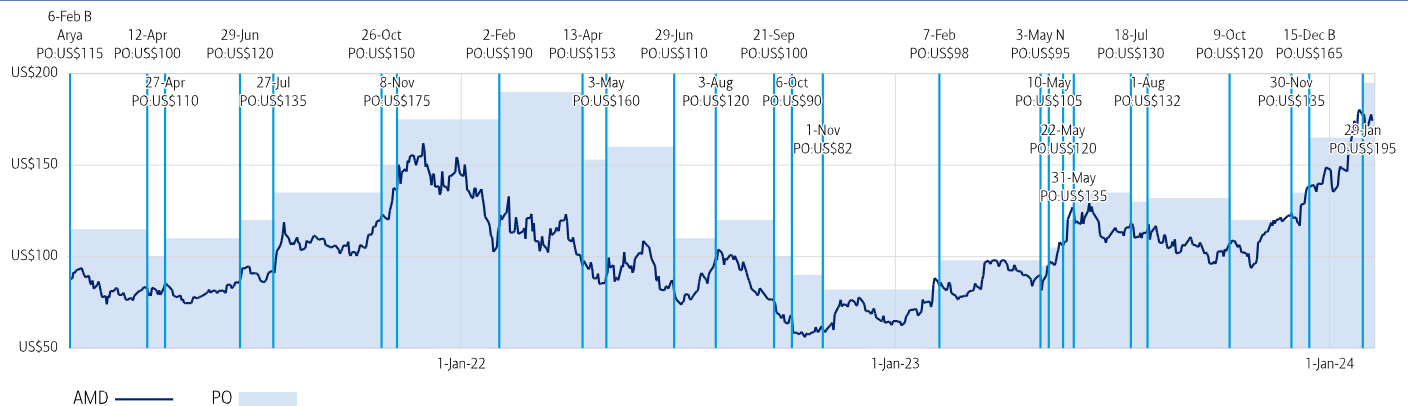
US - Semiconductors and Semiconductor Capital Equipment Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Advanced Micro Devices, Inc	AMD	AMD US	Vivek Arya
	Analog Devices Inc.	ADI	ADI US	Vivek Arya
	Applied Materials, Inc.	AMAT	AMAT US	Vivek Arya
	Arm Holdings	ARM	ARM US	Vivek Arya
	Broadcom Inc	AVGO	AVGO US	Vivek Arya
	Cadence	CDNS	CDNS US	Vivek Arya
	Camtek	CAMT	CAMT US	Vivek Arya
	KLA Corporation	KLAC	KLAC US	Vivek Arya
	Lam Research Corp.	LRCX	LRCX US	Vivek Arya
	M/A-Com	MTSI	MTSI US	Vivek Arya
	Marvell Technology Group Ltd.	MRVL	MRVL US	Vivek Arya
	Microchip	MCHP	MCHP US	Vivek Arya
	Micron Technology, Inc	MU	MU US	Vivek Arya
	Nova	NVMI	NVMI US	Vivek Arya
	NVIDIA Corporation	NVDA	NVDA US	Vivek Arya
	NXP Semiconductors NV	NXPI	NXPI US	Vivek Arya
	onsemi	ON	ON US	Vivek Arya
	Synopsys	SNPS	SNPS US	Vivek Arya
NEUTRAL				
	Advanced Energy Industries	AEIS	AEIS US	Duksan Jang
	Allegro MicroSystems	ALGM	ALGM US	Blake Friedman
	Axcelis Technologies	ACLS	ACLS US	Duksan Jang
	Coherent Corp	COHR	COHR US	Vivek Arya
	GlobalFoundries	GFS	GFS US	Vivek Arya
	Intel	INTC	INTC US	Vivek Arya
	Lattice Semiconductor	LSCC	LSCC US	Blake Friedman
	Texas Instruments Inc.	TXN	TXN US	Vivek Arya
UNDERPERFORM				
	Ambarella	AMBA	AMBA US	Vivek Arya
	Credo Technology	CRDO	CRDO US	Vivek Arya
	Lumentum Holdings	LITE	LITE US	Vivek Arya
	Qorvo Inc.	QRVO	QRVO US	Vivek Arya
	Skyworks Solutions, Inc.	SWKS	SWKS US	Vivek Arya
	Teradyne	TER	TER US	Vivek Arya
	Wolfspeed Inc	WOLF	WOLF US	Vivek Arya

Disclosures

Important Disclosures

Advanced Micro (AMD) Price Chart



The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

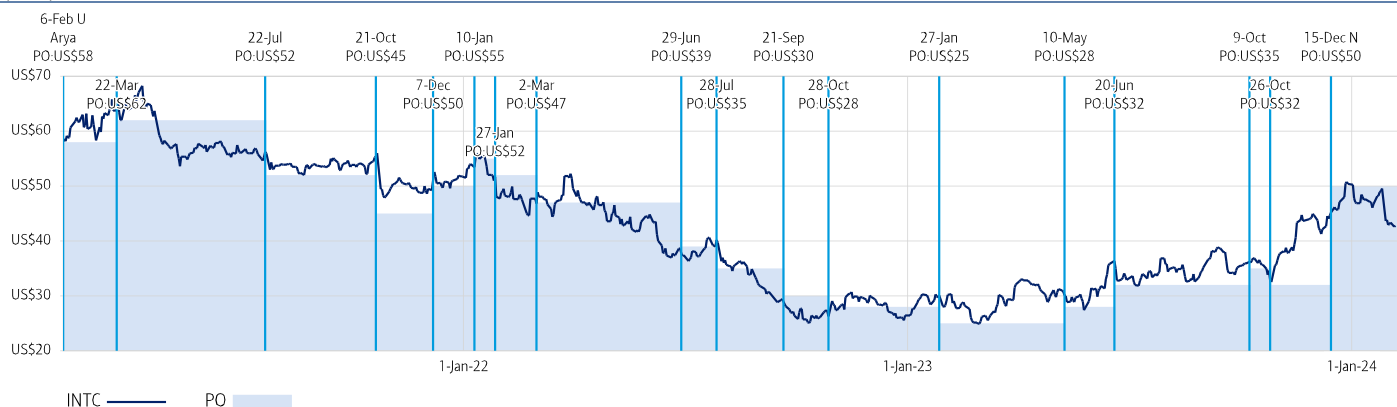
Arm Holdings (ARM) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

Intel (INTC) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

Equity Investment Rating Distribution: Technology Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships ^{R1}	Count	Percent
Buy	215	53.09%	Buy	111	51.63%
Hold	97	23.95%	Hold	45	46.39%
Sell	93	22.96%	Sell	24	25.81%

Equity Investment Rating Distribution: Global Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships ^{R1}	Count	Percent
Buy	1895	53.62%	Buy	1083	57.15%
Hold	832	23.54%	Hold	454	54.57%
Sell	807	22.84%	Sell	383	47.46%

^{R1} Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. **VOLATILITY RISK RATINGS**, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. **INVESTMENT RATINGS** reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its Coverage Cluster (defined below). Our investment ratings are: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. An investment rating of 6 (No Rating) indicates that a stock is no longer trading on the basis of fundamentals. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster ^{R2}
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

^{R2}Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

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