CMB International Global Markets | Equity Research | Sector Update

Semiconductor Sector

Thematic investing and megatrends: Al sales exposure reality check, by the number

Al exploded into mainstream in early 2023 and has dominated the tech landscape since then. Heading into 2024, we believe the pace of Al innovation and adoption will continue accelerating.

Our estimate is based on observations including:

1) Besides hyperscalers' commitment to building AI infrastructure (<u>link</u>), strong demands for AI chips, HBMs, and network capacity from enterprises (<u>link/link</u>) represent expanded investment in AI.

2) The promising adoption of AI applications provide confidence that companies can turn the AI promise into AI profits. OpenAI's annualized revenue is reported to top US\$1.6bn in 2024 (link). The OpenAI rival, Anthropic, projected it will achieve US\$850mn in annualized revenue in 2024 (vs. current US\$100mn and previous projection of US\$500mn three months ago) (link).

3) Moreover, at the recent CES2024, AI dominated the event. Companies are busy unveiling their latest AI offerings for consumers. Everything has AI now. AI has enabled PCs, TVs, cars, health care, and robots. (link).

We anticipate an increase in Al-related service/product deployment. There will likely be great use cases of Al products. Some of them will have the potential to reshape business operations and customer engagements.

The key questions concerning the investors are: what are the best names positioned to ride the AI boom? Among those, who are the indispensables? And what are their AI sales exposures?

In this report, we found Nvidia in leading position in AI sales exposure with regards to both absolute dollar value as well as percentage of revenue generated from AI activities. We also see Arista (40%), Fabrinet (19%), Broadcom (16%), Marvell (13%), SK Hynix (11%), AMD (8%) and TSMC (6%) as indispensable names in this AI boom.

	Mkt Cap	Price	P/E (x)		ROE (%)	Al exposure
Company	US\$(mn)	(LC)	FY24E	FY25E	FY24E	FY25E	% sales
Nvidia	1,354,103	543.50	44.5	26.8	82.3	72.8	84%
Arista	78,316	249.23	34.6	31.0	27.3	24.7	40%
Fabrinet	6,849	185.56	22.6	19.6	18.6	18.9	19%
Broadcom	514,945	1080.57	23.5	19.7	70.4	71.2	16%
Marvell	56,945	63.43	43.6	32.5	6.5	7.2	13%
SK Hynix	74,649	133500.00	14.5	8.1	11.6	17.7	11%
AMD	239,126	148.54	38.8	29.2	8.3	11.0	8%
TSMC	524,969	100.80	16.8	13.7	25.2	25.8	6%
		Peers Avg.	29.9	22.6	31.3	31.2	25%
		Peers Media	29.0	23.2	21.9	21.8	15%

Source: Bloomberg, CMBIGM

Note: *AI sales exposure is based on 2024 Bloomberg consensus, except TSMC and Fabrinet (on CY3Q23 revenue)



OUTPERFORM (Maintain)

Semiconductor sector

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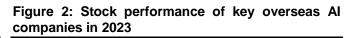
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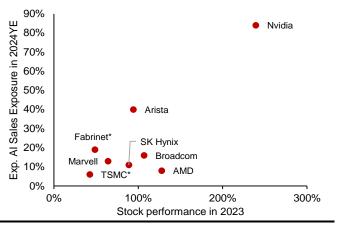
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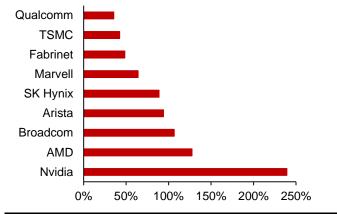
Focus Charts

Figure 1: Percentage of revenue from AI sales exposure vs. stock performance in 2023





Source: Company data, Bloomberg, CMBIGM estimates Note: * AI sales exposure is based on 2024 Bloomberg consensus, except TSMC and Fabrinet (on CY3Q23 revenue)



Source: Bloomberg, CMBIGM



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AI GPUs/accelerators

Nvidia: The dominant force will collect the lion's share of the Al chip market

Nvidia has emerged as the standout winner in 2023's AI race, with its shares surging by nearly 246% in 2023. The company enjoyed staller financial results, with revenue growth of 101.5% and 205.5% YoY or 87.8% and 34.2% QoQ during CY2Q23 and CY3Q23, respectively. The company guided CY4Q's revenue to grow 230.5% YoY or 10.4% QoQ, with GPM of 74.5% (vs. 64.6% in CY1Q23).

(US\$mn)	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23E
Revenue	8,288	6,704	5,931	6,051	7,192	13,507	18,120	20,107
YoY	46.4%	3.0%	-16.5%	-20.8%	-13.2%	101.5%	205.5%	232.3%
QoQ	8.4%	-19.1%	-11.5%	2.0%	18.9%	87.8%	34.2%	11.0%
Gross profit	5,431	2,915	3,177	3,833	4,648	9,462	13,400	16,800
GPM (%)	65.5%	43.5%	53.6%	63.3%	64.6%	70.1%	74.0%	75.5%
Net profit	1,618	656	680	1,414	2,043	6,188	9,243	10,334
YoY	-15.4%	-72.4%	-72.4%	-52.9%	26.3%	843.3%	1259.3%	630.8%
QoQ	-46.1%	-59.5%	3.7%	107.9%	44.5%	202.9%	49.4%	11.8%
NPM (%)	19.5%	9.8%	11.5%	23.4%	28.4%	45.8%	51.0%	51.4%
EPS (US\$)	0.64	0.26	0.27	0.57	0.82	2.48	3.71	4.16
YoY	-15.8%	-72.3%	-72.2%	-51.7%	28.1%	853.8%	1274.1%	630.0%
QoQ	-45.8%	-59.4%	3.8%	111.1%	43.9%	202.4%	49.6%	12.1%

Source: Company data, Bloomberg consensus, CMBIGM

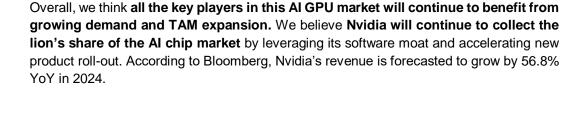
The significant sales growth and strengthened profitability was due to increasing revenue contribution from AI. We use Data Center segment revenue as a proxy for AI revenue. In CY3Q23, a staggering **80.1% of Nvidia's revenue stemmed from its data center, largely driven by AI.**

Figure 4: Nvidia's Data Center quarterly revenue

(US\$mn)	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23E
Data Center sales	3,750	3,806	3,833	3,616	4,284	10,323	14,514	16,611
YoY	83.1%	60.9%	30.6%	10.8%	14.2%	171.2%	278.7%	359.4%
QoQ	14.9%	1.5%	0.7%	-5.7%	18.5%	141.0%	40.6%	14.4%
% total sales	45.2%	56.8%	64.6%	59.8%	59.6%	76.4%	80.1%	82.6%

Source: Company data, Bloomberg consensus, CMBIGM

Nvidia's significant AI sales exposure positions it strongly for 2024. Bloomberg forecasts this trend to continue, projecting 84% of Nvidia's total revenue (US\$59bn) from its data center in 2024.



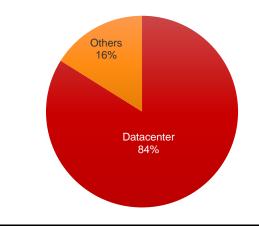
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CY4Q24) (US\$ mn) 30,000 25,000 20,000 15,000 10,000 5,000 0 3Q24E 2Q24E 4Q24E 1Q24E 4Q23 202 302 g ĝ 8 gg

Quarterly revenue

Nvidia's quarterly revenue (CY1Q20- Figure 6: Nvidia's Al accelerator/data center revenue contribution (% of CY2024E revenue)



Source: Company data, Bloomberg consensus, CMBIGM Sou

Al chips to improve their cost-efficiency and reduce their dependence on Nvidia.

Noticeably, considering how lucrative the AI GPU business is (significant revenue growth and high margins), we believe **competition in this market will get intensified.** It is important to recognize competitors like AMD and Intel, who are vying for a share of the AI chip market. In the longer term, Hyperscalers are all developing and deploying their custom

Source: Company data, Bloomberg consensus, CMBIGM

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AMD: Most likely to challenge Nvidia's monopoly

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AMD was trailing behind Nvidia in share price gain in 2023 (130% in 2023). AMD's revenue growth was -9%/-18%/4% YoY respectively during CY1Q23/2Q23/3Q23. Sequential growth was -4%/0%/8% respectively during the same period. The company guided CY4Q23's revenue to grow 8.9% YoY or 5.2% QoQ.

Figure 7: AMD's	quarterly resu	lts						
(US\$mn)	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23E
Revenue	5,887	6,550	5,565	5,599	5,353	5,359	5,800	6,132
YoY	70.9%	70.1%	29.0%	16.0%	-9.1%	-18.2%	4.2%	9.5%
QoQ	22.0%	11.3%	-15.0%	0.6%	-4.4%	0.1%	8.2%	5.7%
Gross profit	2,818	3,028	2,354	2,403	2,359	2,443	2,747	3,004
GPM (%)	47.9%	46.2%	42.3%	42.9%	44.1%	45.6%	47.4%	51.8%
Net profit	786	447	66	21	-139	27	299	538.3
YoY	41.6%	-37.0%	-92.8%	-97.8%	-117.7%	-94.0%	353.0%	2,463.3%
QoQ	-19.3%	-43.1%	-85.2%	-68.2%	-761.9%	-119.4%	1007.4%	80.0%
NPM (%)	13.4%	6.8%	1.2%	0.4%	-2.6%	0.5%	5.2%	8.8%
EPS (US\$)	0.54	0.28	0.04	-0.01	-0.09	0.02	0.18	0.37
YoY	17.4%	-51.7%	-94.7%	-101.2%	-116.7%	-92.9%	350.0%	NA
QoQ	-33.3%	-48.1%	-85.7%	-125.0%	800.0%	-122.2%	800.0%	105.6%

Source: Company data, Bloomberg consensus, CMBIGM

With its recent launch of the MI300 series, AMD has become a noteworthy contender in the AI battleground and is poised to challenge Nvidia's current share in AI arena. The MI300 series, which has shown strong performance compared to Nvidia's offerings in several tests, signals AMD's growing AI presence. CEO Lisa Su told reporters that AMD's chip would cost less to purchase and operate than Nvidia's. We think AMD is well positioned to take advantage of the strong AI expansion tailwind. Per Bloomberg, AMD's revenue is forecasted to grow by 17.3% YoY in CY2024.

The company guided their Al-related revenue to be US\$400mn in CY4Q23 (raised from previous guidance of US\$300mn); and will reach US\$2bn in CY2024, representing 6.5% and 7.5% AI GPU revenue contribution, respectively.

Figure 8: AMD's Data Center and AI GPU quarterly revenue

(US\$mn)	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23E
Data Center sales	610	813	1,108	1,163	1,295	1,321	1,598	2,298
YoY					112%	62%	44%	97.6%
QoQ		33.3%	36.3%	5.0%	11.3%	2.0%	21.0%	43.8%
% total sales	22.0%	22.7%	28.9%	29.6%	24.2%	24.7%	27.6%	37.5%

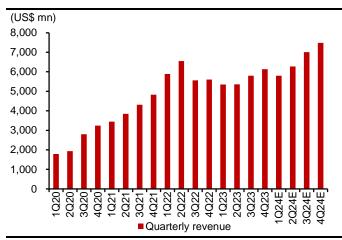
Source: Company data, Bloomberg consensus, CMBIGM

AMD's shipments for the MI300 series are expected to reach 300k-400k units in 2024,

with Microsoft and Google as the biggest customers for the new AI GPU accelerators, according to <u>Digitimes</u>. Shipment could be greater if without capacity constraints.

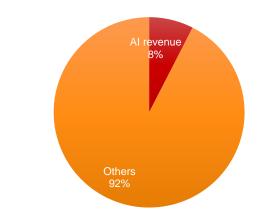


Figure 9: AMD's quarterly revenue (CY1Q20-CY4Q24)



Source: Company data, Bloomberg consensus, CMBIGM

Figure 10: AMD's AI accelerator/Data center revenue contribution (% of 2024E revenue)



Source: Company data, Bloomberg consensus, CMBIGM



3Q23

9,295

4.1%

2Q23

8,876

4.9%

4Q23E*

11,522

29.2%

Networking suppliers

Broadcom: Hidden Al winner with broad and growing Al product portfolio

Broadcom's share price has also seen quite a ride in 2023, surging by 109% in 2023. The company's revenue growth was 8%/5%/4% YoY respectively during CY1Q23/ 2Q23/3Q23. Sequential growth was -2%/2%/5% respectively during the same period. Bloomberg consensus estimated CY4Q23's revenue to grow 24% QoQ. The company guided NTM revenue to be US\$50bn, a ~40% YoY increase.

Figure 11: Broadcom's quarterly results 3Q22 4Q22 1Q23 (US\$mn) 1Q22 2Q22 8,915 8,103 8,930 8,733 Revenue 8.464YoY 22.6% 24.9% 20.6% 15.7% 7.8%

QoQ	5.2%	4.5%	5.5%	-0.2%	-2.0%	1.6%	4.7%	24.0%
Gross profit	6,147	6,387	6,632	6,541	6,556	6,604	6,846	8,734
GPM (%)	75.9%	75.5%	74.3%	73.4%	75.1%	74.4%	73.7%	75.8%
Net profit	2,590	3,074	3,359	3,774	3,481	3,303	3,524	3,459
YoY	73.5%	63.9%	68.9%	52.7%	34.4%	7.4%	4.9%	-8.3%
QoQ	4.8%	18.7%	9.3%	12.4%	-7.8%	-5.1%	6.7%	-1.8%
NPM (%)	32.0%	36.3%	37.6%	42.3%	39.9%	37.2%	37.9%	30.0%
EPS (US\$)	6.16	7.40	8.06	9.03	8.39	8.00	8.25	7.50
YoY	78.0%	68.9%	73.0%	55.2%	36.2%	8.1%	2.4%	-16.9%
QoQ	5.8%	20.1%	8.9%	12.0%	-7.1%	-4.6%	3.1%	-9.1%

Source: Company data, Bloomberg consensus (*as of 10 Jan 2024), CMBIGM

The brightest spot in Q3 results was its networking revenue, which grew significantly (24% YoY) due to strong demand from hyperscalers for its custom AI accelerators and other related products that are dedicated toward scaling out AI data centers.

The mgmt. made bold guidance for growth in this segment in the coming year again on heightened demand from hyperscalers. According to mgmt., the company's networking revenue will grow 30% for FY2024 (NTM), growing on AI networking connectivity demand.

(US\$mn)	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	LTM	NTM*
Networking sales	\$2,200	\$2,300	\$2,500	\$2,300	\$2,600	\$2,800	\$3,100		
YoY	44.0%	27.8%	31.6%	21.1%	18.2%	21.7%	24.0%		
QoQ	15.8%	4.5%	8.7%	-8.0%	13.0%	7.7%	10.7%		
% total sales	27.2%	27.2%	28.0%	25.8%	29.8%	31.5%	33.4%		
Semi sales	\$6,229	\$6,624	\$7,092	\$7,107	\$6,808	\$6,941	\$7,326		\$31,576
YoY	29.2%	31.9%	25.9%	21.0%	9.3%	4.8%	3.3%		
QoQ	6.1%	6.3%	7.1%	0.2%	-4.2%	2.0%	5.5%		
% total sales	76.9%	78.3%	79.4%	79.7%	78.0%	78.2%	78.8%		63.1%
Al-related sales								\$4,227	
% semi sales								15.0%	25.0%
% total sales								11.8%	

Source: Company data, Bloomberg consensus (*as of 10 Jan 2024), CMBIGM



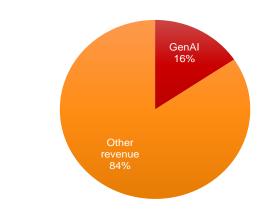
As for Generative AI revenue, "driven by Ethernet solutions and custom AI accelerators, represented close to US\$1.5bn in CY4Q23, or 20% of semiconductor revenue" (link). The Generative AI revenue is expected to reach more than 25% of semi revenue (or 16% of its total revenue) in FY2024 (NTM). (link)

Figure 13: Broadcom's quarterly revenue (CY1Q20-CY4Q24)



Source: Company data, Bloomberg consensus, CMBIGM

Figure 14: Broadcom's AI revenue contribution (% of 2024E revenue)



Source: Company data, Bloomberg consensus, CMBIGM

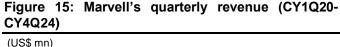


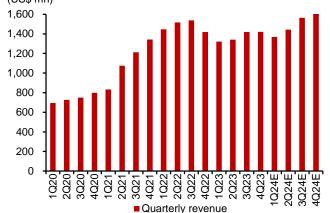
Marvell: Strong AI revenue to drive growth

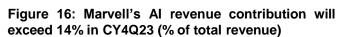
Marvell stands out with its diverse product range, ranging from accelerated computing to optical connectivity. In CY3Q23, Marvell's revenue declined by 7.7% YoY, due to macro headwinds and high inventory levels amid downstream customers. But the company sees strong revenue growth in data center thanks to the resilient AI momentum. **Data center revenue contributed 39% to total revenue in CY3Q23 while cloud service grew by more than 30%.**

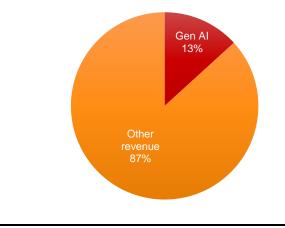
While demand for data center storage remains suppressed, demand for cloud service is accelerating on heightened AI enthusiasm. According to Marvell in its latest earnings call, the growth was broad-based, led by our PAM4 optical products, Teralynx, Ethernet switches as well as its Data Center Interconnect or DCI products.

According to the company, mgmt. forecasts CY4Q23's data center revenue to grow in mid-30% range on a sequential basis, more optimistic than its previous forecast. Mgmt. also forecasts data center revenue to contribute more than 50% of total revenue in CY4Q23, significantly higher than 39% in CY3Q23.



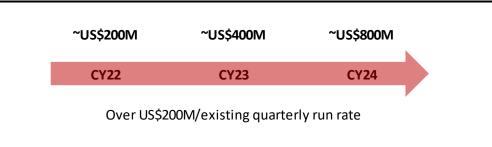






In terms of AI revenue, the company originally provided a forecast for AI revenue to cross the US\$200mn existing quarterly run rate this year. However, Marvell saw demand continuing to grow since then. The company guided CY4Q23 revenue to be US\$1.42bn and expected their AI revenue in CY4Q23 to come in significantly above the prior projection, which means more than 14% of revenue contribution will be AI driven (mostly by Electro-Optics platform, the DSP, TAs drivers at 800G). AI revenue contribution could be much greater in CY24, as the company gave a bullish outlook.





Source: Company data, CMBIGM estimates

Source: Company data, Bloomberg consensus, CMBIGM

Source: Company data, Bloomberg consensus, CMBIGM



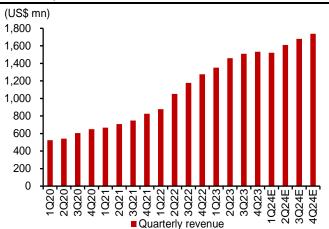
Arista: Seeing secular growth as demand for network capacity remains strong

Arista provides software-driven cloud networking solutions for data center storage and computing environment. The company has seen its share price thriving along the growing demand for cloud service due to AI needs. With increasing reliance on cloud-based solutions and the rise of AI tech across all industries, Arista is well-positioned for continued growth, in our view. In the near future, mgmt. will categorize a new revenue segment to specifically address customers with spend that exceeds a certain amount. Mgmt. currently forecasts 40% of its revenue to be generated by major cloud hyperscalers in the coming years.

Arista's revenue grew by 28.3% YoY and 3.5% QoQ in CY3Q23. Arista did not specifically state its AI-related revenue in earnings call, but there are several references to AI and cloud networking's growing importance in Arista's business strategy and product development.

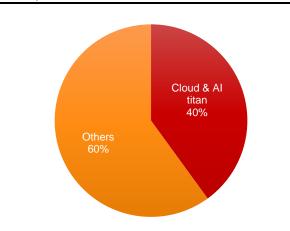
Mgmt. announced a new classification of customer spend, combing cloud and Al customer spend into one category called "Cloud and Al titan sector," which is projected to represent more than 40% of Arista's total revenue mix due to favorable Al investments expected in the future.

Figure 18: Arista's quarterly revenue (CY1Q20-CY4Q24)



Source: Company data, Bloomberg consensus, CMBIGM

Figure 19: Arista's AI related revenue contribution (FY2024)



Source: Company data, Bloomberg consensus, CMBIGM

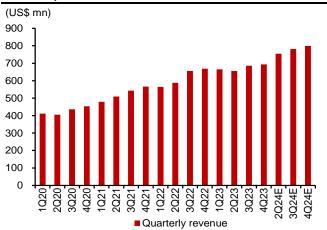


Fabrinet: Specutlar growth in high-data rate datacom transforming the company as an Al-era beneficiary

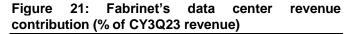
Fabrinet offers a wide range of optical products, including both passive and active optical components. The company has seen consistent quarterly revenue growth on elevated datacenter demand, **and datacenter revenue made up roughly 19% of total revenue in CY3Q23**. We believe a major portion of this revenue stems from AI-related demand.

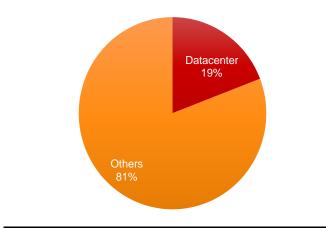
Fabrinet's revenue grew by 4.6% YoY and 4.5% QoQ in CY3Q23. Fabrinet's optical communications revenue grew by 7.2% YoY and 4.5% QoQ, making up 77.8% of total revenue in CY3Q23. Within the optical communications, telecom slipped sequentially, but was offset by growth in Datacom, which posted sequential growth of 26% and annual growth of 160% due to AI. The growth in Datacom is mainly driven by 800G and 400G demand, though the company believes there is excess inventory in the supply chain for the high-performance optical products. In CY3Q23, Fabrinet's datacenter revenue made up roughly 19% of its total revenue. Looking ahead to CY4Q23, mgmt. expects Datacom segment revenue to improve sequentially again and further offset the decline in telecom segment as inventory digestion continues.

Figure 20: Fabrinet's quarterly revenue (CY1Q20-CY4Q24)



Source: Company data, Bloomberg consensus, CMBIGM





Source: Company data, Bloomberg consensus, CMBIGM



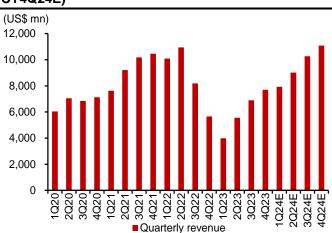
Memory/HBM

SK Hynix: Winner of AI era as demand for its memory chips soars

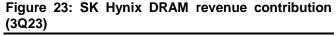
SK Hynix's sales growth rebounded in 1H23, in line with the broader recovery in the semi industry. This uptick is largely due to increasing demand for AI GPUs.

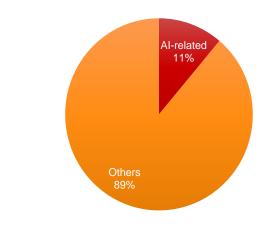
In 3Q23 the company's DRAM business posted a sequential growth of 38.1% while remaining flat on a yearly basis. The recovery in DRAM business was mainly attributed to heightened GPU demand that brought up the demand for High bandwidth Memory (HBM) chips. The company's DRAM segment made up roughly 67% of total revenue in 3Q23, and about 17-18% of that revenue came from HBM. In Aug 2023 the company also announced the successful development of HBM3E, and it plans to mass produce HBM3E in 1H24 to strengthen its current leadership in AI memory market (link). According to SK Hynix, the new product "comes with 10% improvement in heat dissipation by adopting a new technology." According to Trendforce, SK Hynix currently holds a lead in HBM3 production, serving as the primary supplier for Nvidia's GPUs. The company is also projected to take up 48% of a US\$8.9bn HBM market in 2024. (link)

Figure 22: SK Hynix quarterly revenue (CY1Q20-CY4Q24E) (3Q23)



Source: Company data, Bloomberg consensus, CMBIGM





Source: Company data, Bloomberg consensus, CMBIGM

Figure	21.		suppliers'	roadmaps	for	HRM	solutions
rigure	Z 4.	DRAW	Suppliers	ruaumaps	101		5010110115

	Brand	Speed	Tech		20	22			-	23				24				25			20		
	Brana	(Gps)	Nodes	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
	Samsung	3.2-3.6	1Y 16Gb	8/16	Gb																		
HBM2e	SK Hynix	3.6	1Y 16Gb	8/16	Gb																		
	Micron	3.2-3.6	1Z 16Gb	16G	b																		
	Samsung	5.6-6.4	1Z																				
HBM3	Samsung	5.0-0.4	16 Gb																				
TIDIVIS	SK Hynix	5.6-6.4	1Z																				
	SICTIVITA	5.0-0.4	16 Gb																				
	Computer	8-9.2	1 beta																				
	Samsung	0-9.2	24 Gb																				
LIDUG	SK Hynix	8-9.2	1 beta																				
HBM3e	SK HYHIX	0-9.2	24 Gb																				
	Manan	0.0.0	1 beta																				
	Micron	8-9.2	24 Gb																				
HBM4		TBD	TBD										Full	spec	mayb	e rele	ased	l in 2l	124-2	025;	C/S ir	2026	; ;

Source: Company data, Bloomberg consensus (*as of 10 Jan 2024), CMBIGM

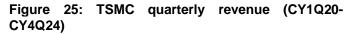


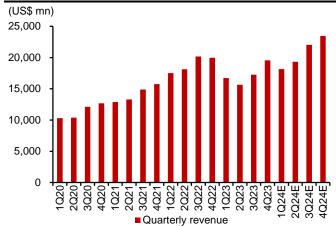
Foundries

TSMC: The goliath in AI chip manufacturing

TSMC's 3Q23 sequential sales growth of 14% was largely driven by the ramp-up of its 3nm tech as well as strong demand for 5nm tech. TSMC's 4Q23 revenue grew another 14% QoQ, outpacing market expectations due to the AI tailwind.

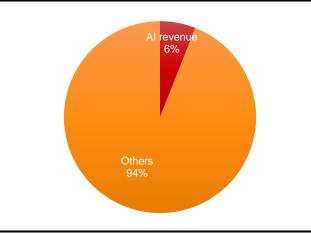
While breaking down revenue by platform, High Performance Computing (HPC) contributed 42% of total revenue, followed by smartphone at 39% in 3Q23. In terms of revenue contributed by AI, TSMC estimated 6% of the company's total revenue came from AI server processors in 3Q23. Looking forward, mgmt. expects AI-related contribution to grow at a ~50% CAGR in the next five years, driving total revenue growth at a "low teens" level (link)





Source: Company data, Bloomberg consensus, CMBIGM

Figure 26: TSMC Al-related revenue contribution (CY3Q23)



Source: Company data, Bloomberg consensus, CMBIGM



Al Mobile/PC chip provider

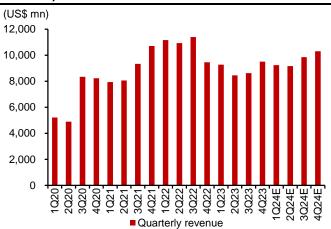
Qualcomm: Competing to be the top vendor behind "AI on the Edge"

Qualcomm has experienced a resurgence in sales growth, propelled by the recent uptick in the mobile handset market. While specific guidance on Al-related revenue was not provided, mgmt. emphasizes the importance of edge computing development. We consider Qualcomm well-positioned for future AI trends, especially as cloud computing trends towards on-device computing.

Qualcomm's revenue growth was flat in CY3Q23, while on a sequential basis, revenue grew by 10%. Qualcomm did not specifically state its AI-related revenue. But its CEO did highlight the evolution of on-device GenAl development in addition to cloud-based Al. Such innovation is projected to transform user experiences with devices, making interactions more natural and personalized.

Qualcomm has significantly increased the AI processing performance and power efficiency of its platforms, particularly for NPUs, CPUs, and GPUs. This enhancement positions Qualcomm's Snapdragon platforms as highly differentiated in the market.

Figure 27: Qualcomm's quarterly revenue (CY1Q20- Figure 28: Qualcomm's Snapdragon Digital Chassis CY4Q24)





Source: Company data, Bloomberg consensus, CMBIGM

Source: Qualcomm, CMBIGM



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