

Asia Passive Components, PCB/CCL, Substrate, and Testing

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Jerry Tsai's coverage

Name	Ticker	Rating	Price (LCY)	M-Cap (USD mn)	PT	PER			PBR			NI growth (%)				ROE (%)				Div yield (%)				
						2025	2026e	2027e	2025	2026e	2027e	2024	2025	2026e	2027e	2024	2025	2026e	2027e	2024	2025	2026e	2027e	
Chicony Power	6412	TT	OW	93	1,182	111	18	16	12	3	2	2	1%	-38%	15%	33%	23%	14%	16%	20%	6%	6%	4%	5%
CHPT	6510	TT	OW	3,455	3,581	4,800	114	48	26	13	11	9	1463%	96%	135%	84%	7%	13%	27%	40%	0%	0%	0%	1%
Chroma	2360	TT	OW	2,260	30,382	3,000	82	59	34	31	26	19	32%	122%	39%	73%	22%	42%	47%	63%	0%	0%	1%	1%
Elite Material	2383	TT	OW	5,005	56,696	5,850	120	54	28	37	27	16	75%	53%	129%	88%	31%	34%	57%	71%	0%	0%	0%	1%
Flexium	6269	TT	N	69	704	70	14	8	N.A.	1	1	N.A.	-85%	409%	79%	N.A.	1%	6%	11%	N.A.	4%	1%	3%	N.A.
Radiant	6176	TT	N	92	1,358	174	7	N.A.	N.A.	1	N.A.	N.A.	38%	-15%	N.A.	N.A.	19%	15%	N.A.	N.A.	11%	12%	N.A.	N.A.
Sunonwealth	2421	TT	OW	146	1,324	214	18	13	12	4	4	3	12%	49%	37%	12%	20%	26%	30%	30%	2%	2%	4%	4%
Tripod	3044	TT	OW	500	8,308	610	26	18	13	5	4	4	39%	22%	46%	32%	18%	19%	25%	29%	1%	2%	2%	4%
TSMT	6278	TT	OW	208	1,918	167	22	20	11	3	2	2	16%	-6%	12%	N.A.	14%	12%	13%	21%	2%	2%	2%	2%
Unimicron	3037	TT	OW	912	45,810	734	209	61	34	14	12	9	-58%	31%	244%	78%	6%	7%	21%	30%	0%	0%	0%	1%
Win Semi	3105	TT	OW	506	6,782	336	127	76	52	5	5	5	N.A.	121%	66%	47%	2%	4%	7%	9%	0%	0%	0%	1%
Yageo	2327	TT	OW	882	57,759	1,000	77	29	19	11	8	6	11%	22%	165%	55%	13%	14%	30%	36%	2%	2%	1%	1%
E Ink	8069	TT	OW	197	7,177	325	22	15	11	3	3	3	13%	19%	46%	32%	17%	17%	22%	26%	2%	2%	3%	4%

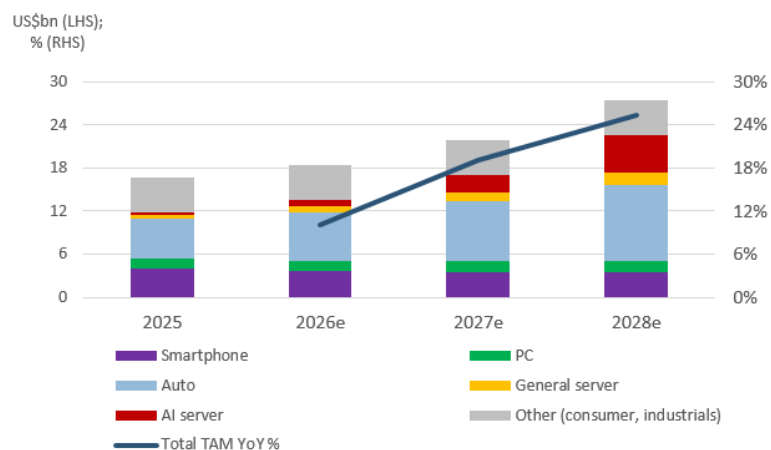
Note: Share price and market cap data is as of June 11.

Source: Company data, J.P. Morgan estimates.

Passive components

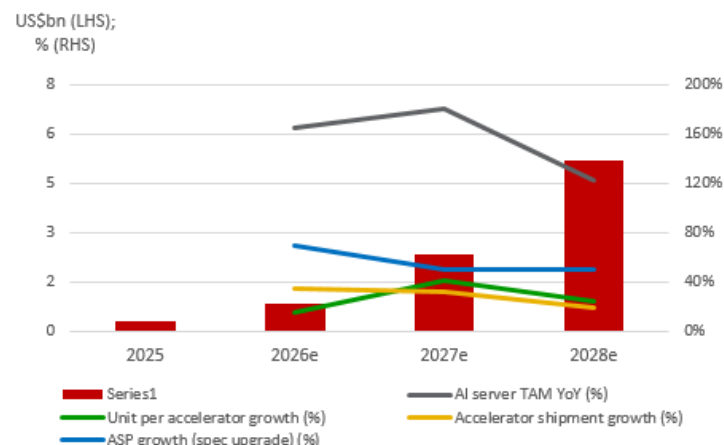
MLCC: AI server growing at 150%+ CAGR

Global MLCC TAM by application



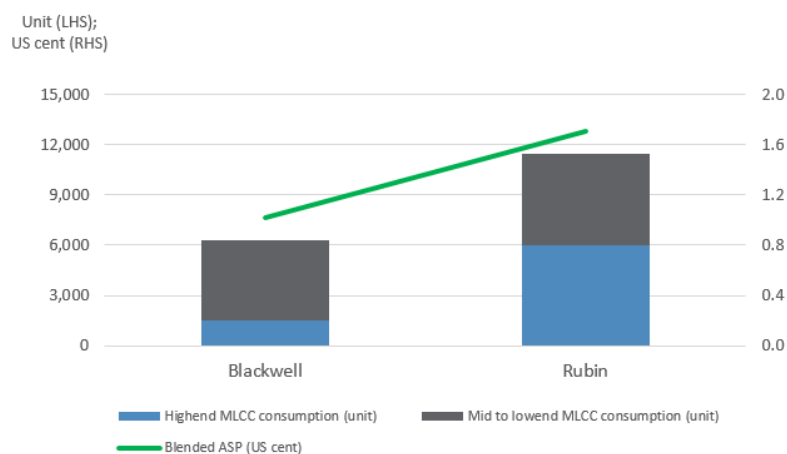
Source: All data is based on J.P. Morgan estimates.

AI server MLCC TAM



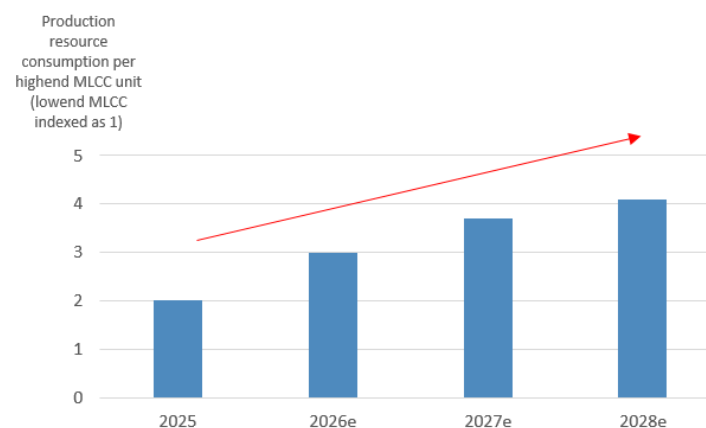
Source: All data is based on J.P. Morgan estimates.

Blackwell vs Rubin compute tray MLCC



Source: J.P. Morgan estimates.

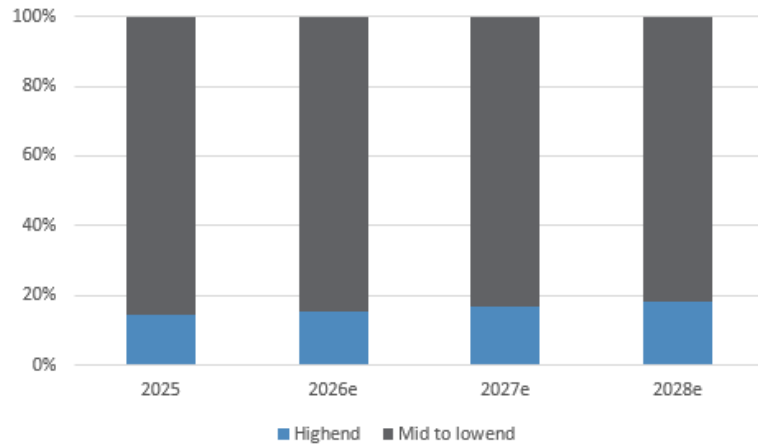
Highend MLCC capacity consumption



Source: All data is based on J.P. Morgan estimates.

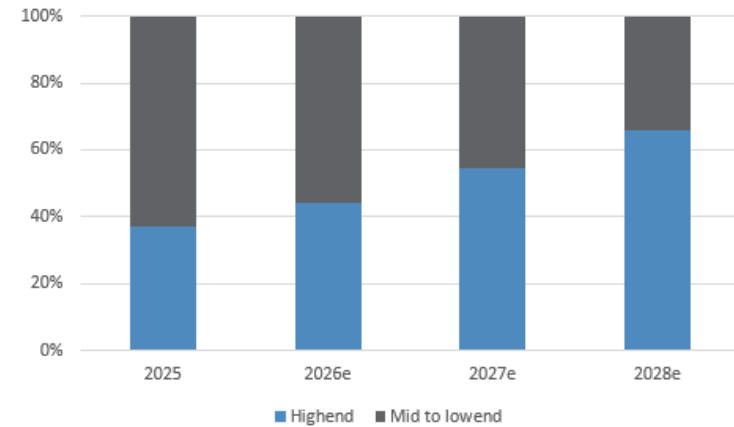
YAGEO: Low-end MLCC pricing benefits from AI server tailwind

MLCC demand by grade



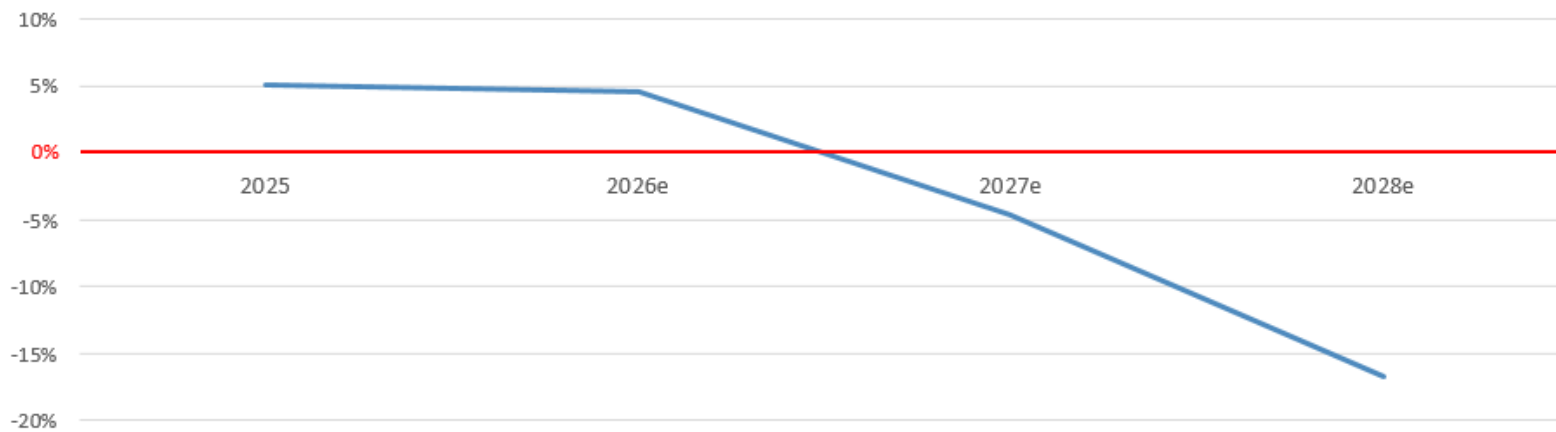
Source: All data is based on J.P. Morgan estimates.

MLCC production resource consumption by grade



Source: All data is based on J.P. Morgan estimates.

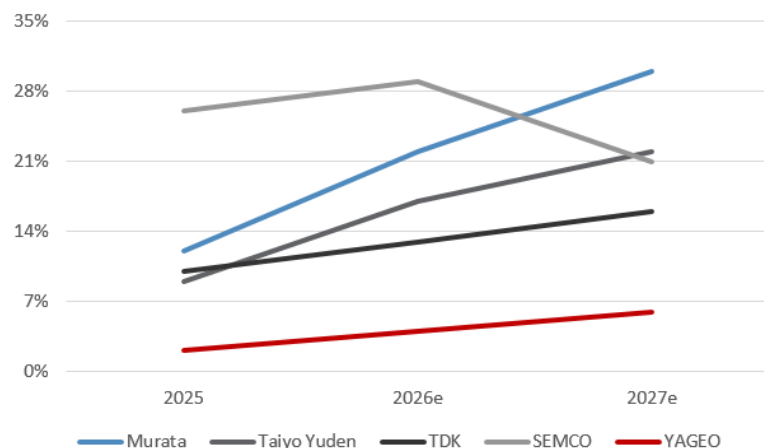
Low-end MLCC S/D balance %



Source: All data is based on J.P. Morgan estimates.

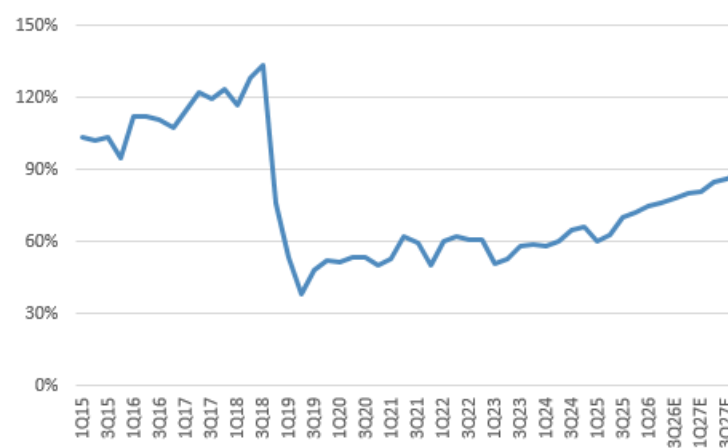
YAGEO: Low-end MLCC pricing benefits from AI server tailwind

Server/HPC MLCC mix of each MLCC vendors



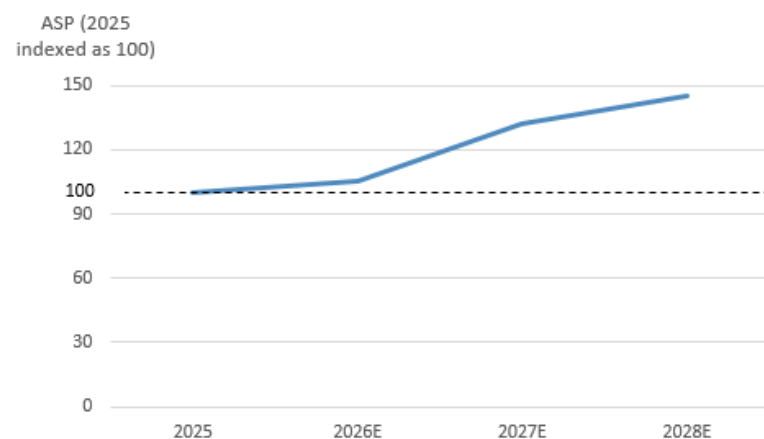
Source: J.P. Morgan estimates, company data.

YAGEO low-end MLCC UTR trend



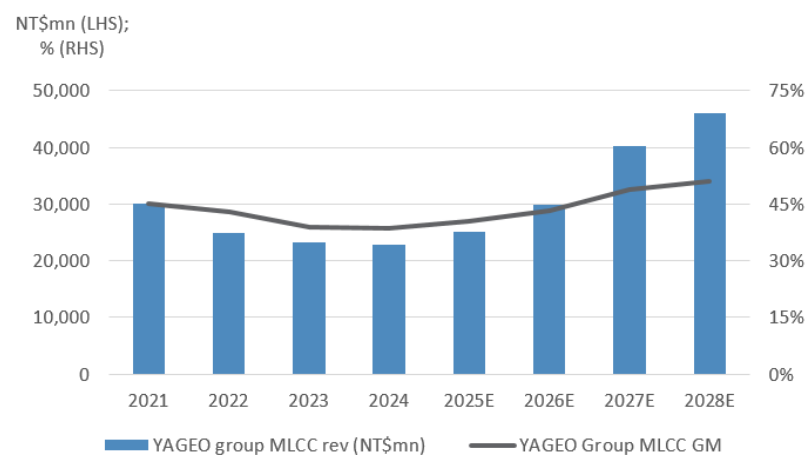
Source: J.P. Morgan estimates, company data.

Low-end MLCC pricing forecast



Source: All data is based on J.P. Morgan estimates.

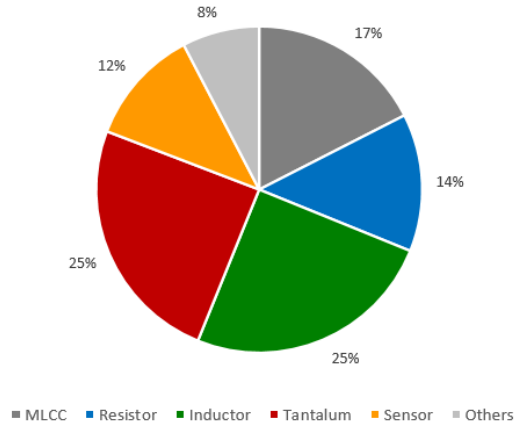
YAGEO MLCC rev & GM forecast



Source: J.P. Morgan estimates, company data.

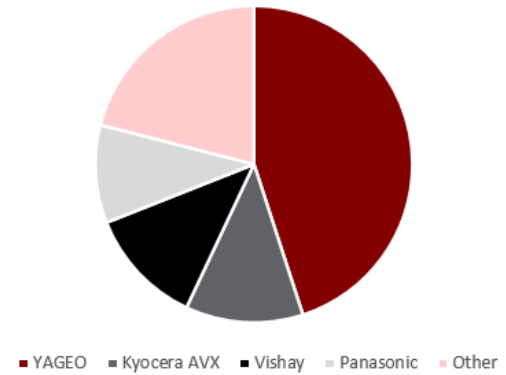
YAGEO: Pricing power in Tantalum and resistor

YAGEO rev mix (2026e)



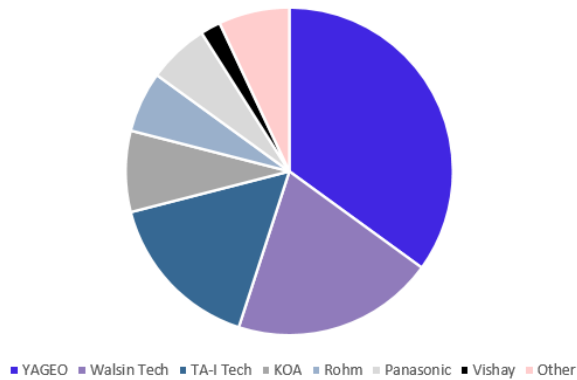
Source: J.P. Morgan estimates, company data.

YAGEO Tantalum market share



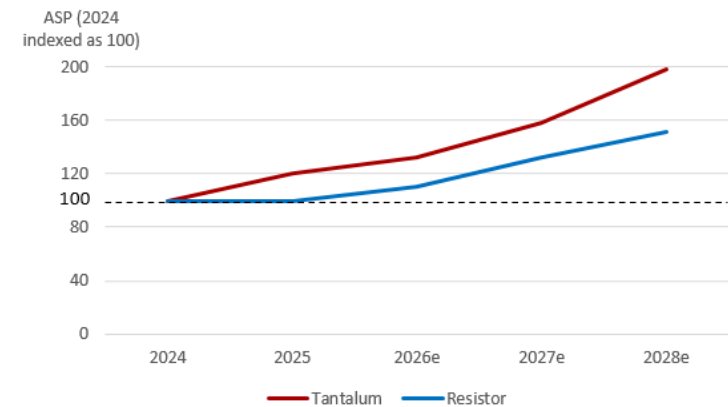
Source: J.P. Morgan estimates..

YAGEO resistor market share



Source: J.P. Morgan estimates.

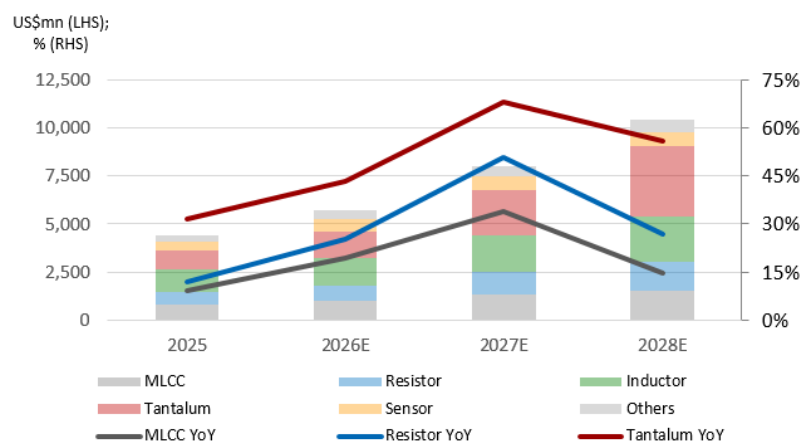
YAGEO Tantalum and resistor pricing forecast



Source: All data is based on J.P. Morgan estimates.

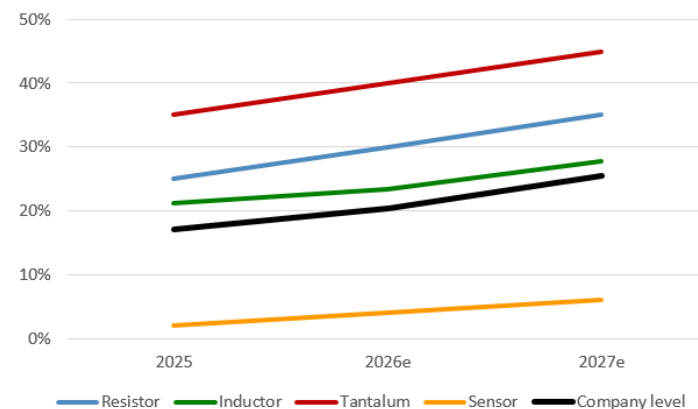
YAGEO: Different AI story, but just as good

YAGEO rev & GM forecast



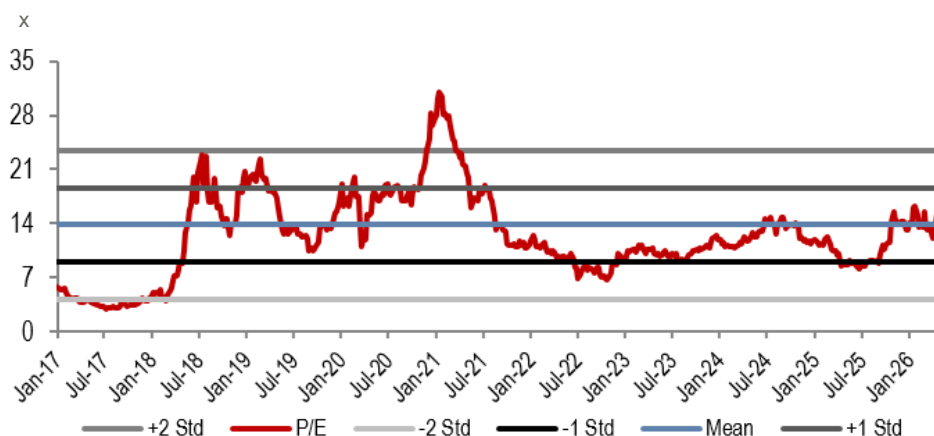
Source: J.P. Morgan estimates, company data.

YAGEO server/HPC rev mix forecast



Source: All data is based on J.P. Morgan estimates.

YAGEO P/E trend



Source: J.P. Morgan estimates, company data.

CCL/PCB

AI driving HPC CCL/PCB TAM growth

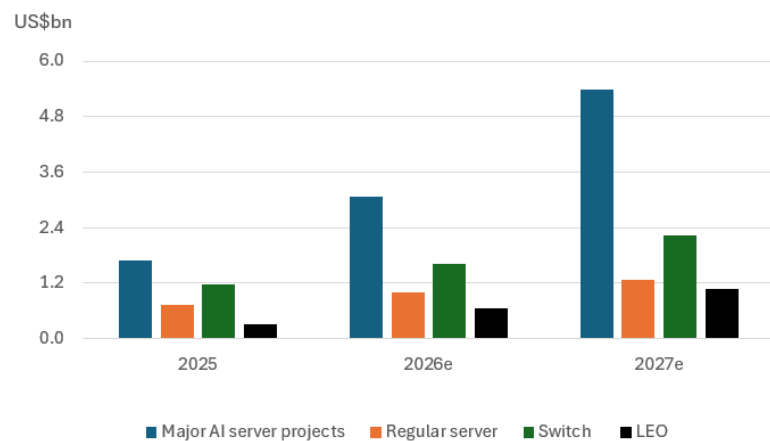
HPC CCL TAM

(US\$bn)	2025	2026e	2027e	YoY growth %	2025-27			Mix %	2025	2026e	2027e
					2026e	2027e	CAGR				
Major AI server projects	1.69	3.07	5.39	Major AI server projects	82%	75%	79%	Major AI server projects	43%	49%	54%
Regular server	0.73	0.99	1.28	Regular server	36%	29%	32%	Regular server	19%	16%	13%
Switch	1.17	1.62	2.24	Switch	39%	39%	39%	Switch	30%	26%	22%
LEO	0.30	0.65	1.07	LEO	116%	65%	89%	LEO	8%	10%	11%
Total	3.89	6.33	9.98	Total	63%	58%	60%	Total	100%	100%	100%

(US\$bn)	2025	2026e	2027e	YoY growth %	2025-27			Mix %	2025	2026e	2027e
					2026e	2027e	CAGR				
M9	-	0.24	0.77	M9		214%		M9	0%	4%	8%
M8	1.59	3.66	6.49	M8	130%	77%	102%	M8	41%	58%	65%
M7 and below	2.30	2.43	2.72	M7 and below	6%	12%	9%	M7 and below	59%	38%	27%
Total	3.89	6.33	9.98	Total	63%	58%	60%	Total	100%	100%	100%

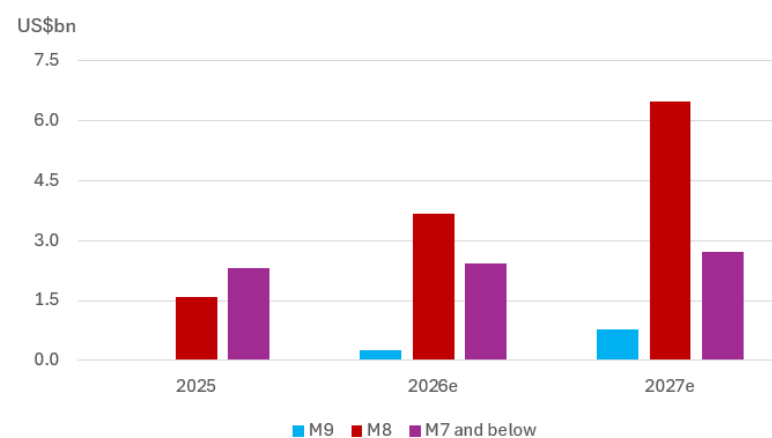
Source: J.P. Morgan estimates

HPC CCL TAM by application



Source: All data is based on J.P. Morgan estimates.

TAM by CCL grade

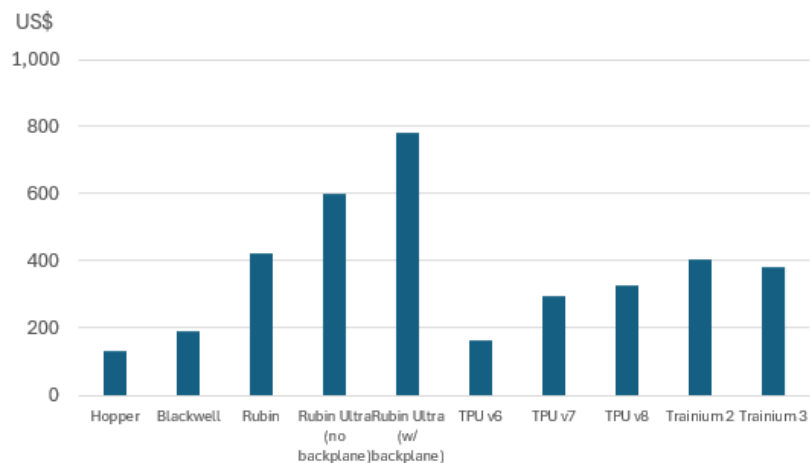


Source: All data is based on J.P. Morgan estimates.

Note: CCL TAM * 2.5~3 is a good approximation of PCB TAM.

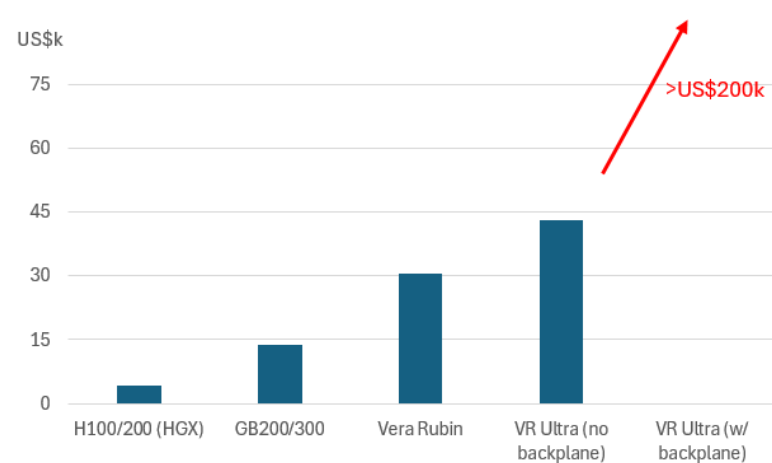
HPC CCL/PCB: Massive content growth in foreseeable future

CCL content per AI chip



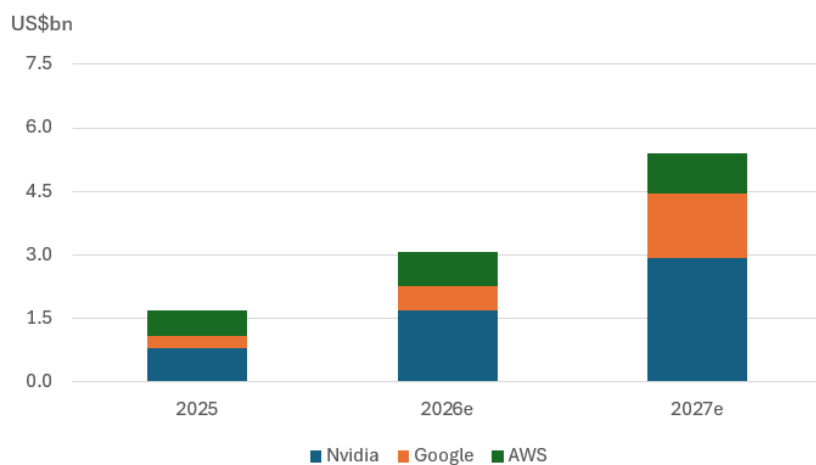
Source: J.P. Morgan estimates.

CCL content per AI rack



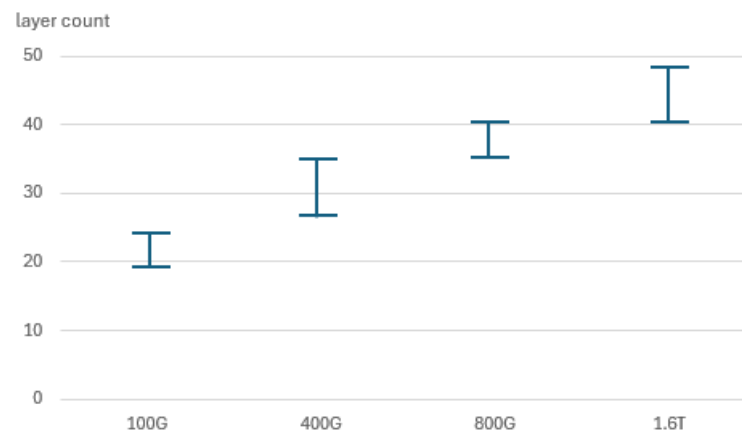
Source: J.P. Morgan estimates.

CCL TAM for Nvidia/Google/AWS



Source: All data is based on J.P. Morgan estimates.

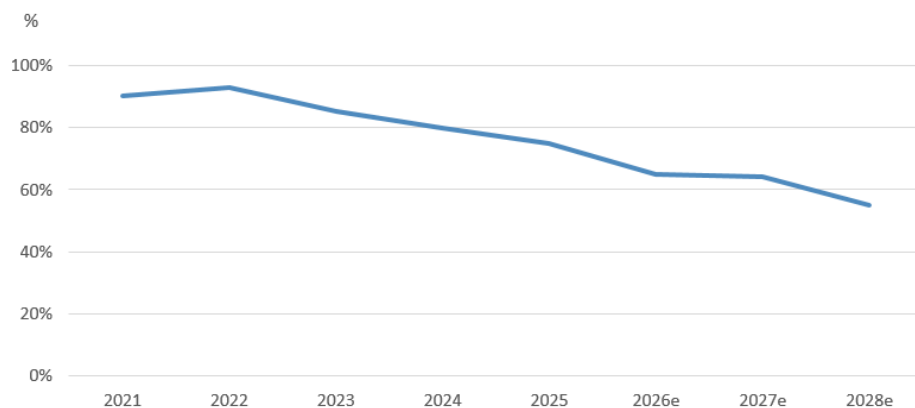
PCB layer count comparison (switch as illustration)



Source: J.P. Morgan estimates.

HPC CCL/PCB: Supply could undershoot demand

PCB/HDI fabrication yield



Source: All data is based on J.P. Morgan estimates.

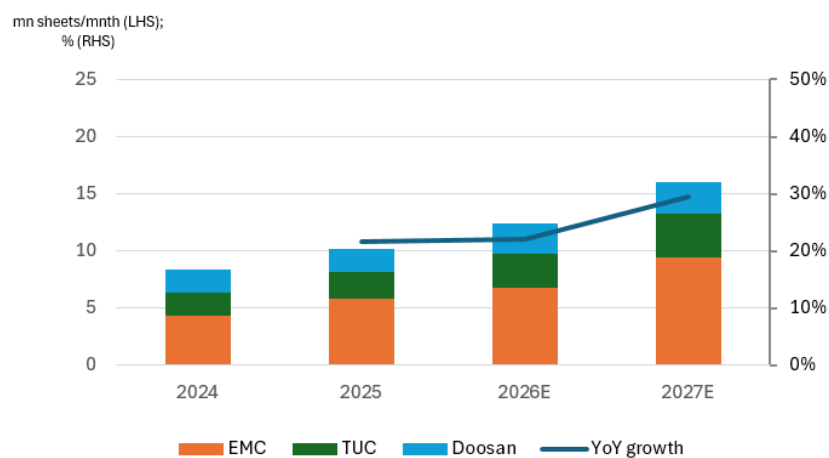
M9 projects

M9 projects

Vera Rubin generation	HGX structure UBB LPU/LPX	
Vera Rubin Ultra generation	Midplane LPU/LPX Backplane	Potential to go to M10 Potential to go to M10

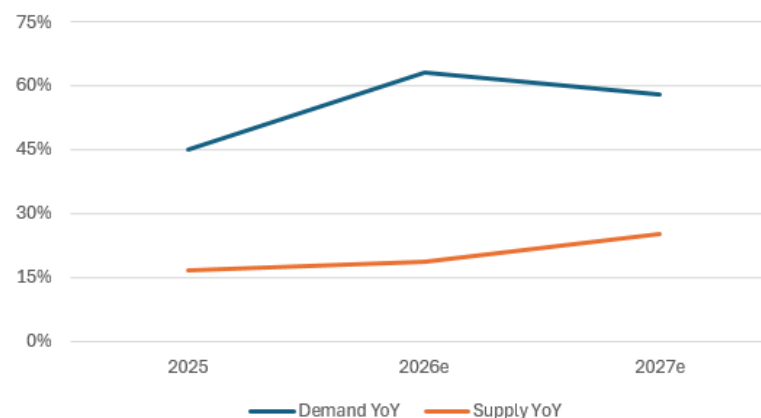
Source: J.P. Morgan estimates.

CCL capacity growth



Source: J.P. Morgan estimates, company data.

CCL S/D growth



Source: All data is based on J.P. Morgan estimates.

HPC CCL/PCB: Regular server and LEO under strong growth

Regular server CCL/PCB TAM

Server CPU Shipment (K)	2020	2021	2022	2023	2024	2025	2026e	2027e
AMD	2,022	3,837	5,761	5,256	5,820	6,219	7,125	7,512
Intel	22,026	20,066	19,181	14,375	14,783	13,492	12,959	12,509
PCB ASP (US\$)	2020	2021	2022	2023	2024	2025	2026e	2027e
Intel	40	59	96	148	187	227	285	322
AMD	42	69	112	157	218	253	360	400
Blended ASP	37	50	75	111	140	166	202	224
Blended ASP YoY %		36%	49%	49%	26%	18%	22%	11%
Server PCB TAM (US\$bn)	2020	2021	2022	2023	2024	2025	2026e	2027e
	0.46	0.65	1.03	1.26	1.69	1.98	2.68	3.46
TAM YoY %		39%	60%	22%	34%	17%	36%	29%
Server CCL TAM (US\$bn)	2020	2021	2022	2023	2024	2025	2026e	2027e
Before yield	0.15	0.22	0.34	0.42	0.56	0.66	0.89	1.15
Yield	90%	90%	90%	90%	90%	90%	90%	90%
After yield	0.17	0.24	0.38	0.47	0.63	0.73	0.99	1.28

Source: All data is based on J.P. Morgan estimates.

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HPC CCL/PCB: regular server and LEO under strong growth

LEO CCL/PCB TAM

Terminal					
	2023	2024	2025	2026e	2027e
User terminal PCB TAM (NT\$m)	4.09	9.41	20.25	45.80	82.94
User terminal PCB TAM (US\$m)	0.14	0.31	0.68	1.53	2.76
YoY		130%	115%	126%	81%

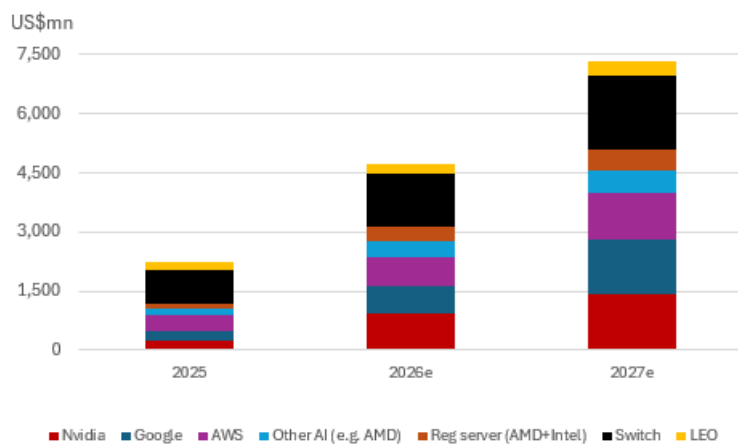
Satellite					
	2023	2024	2025	2026e	2027e
Satellite PCB TAM (NT\$m)	3.88	4.13	6.79	12.55	13.24
Satellite PCB TAM (US\$m)	0.13	0.14	0.23	0.42	0.44

UT + satellite					
	2023	2024	2025	2026e	2027e
PCB TAM (US\$bn)	0.27	0.45	0.90	1.95	3.21
YoY		70%	100%	116%	65%
CCL TAM (US\$bn)	0.09	0.15	0.30	0.65	1.07
YoY		70%	100%	116%	65%

Source: All data is based on J.P. Morgan estimates.

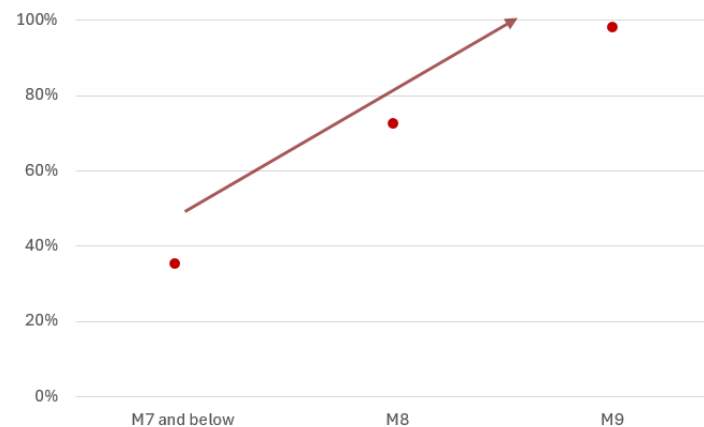
EMC: Major beneficiary from accelerated CCL upgrade

EMC infra rev breakdown by client/project



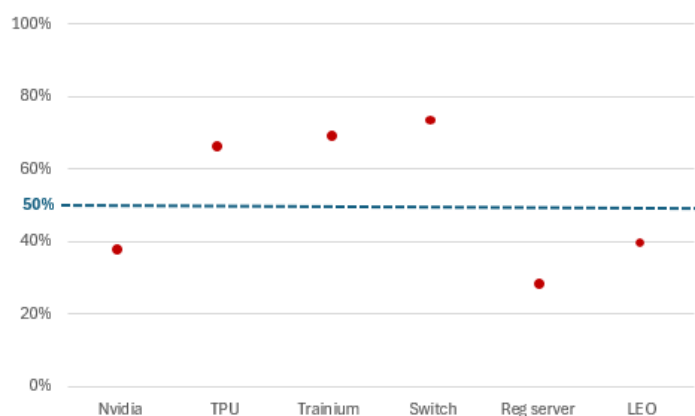
Source: All data is based on J.P. Morgan estimates.

EMC's m/s in HPC CCL by material grade



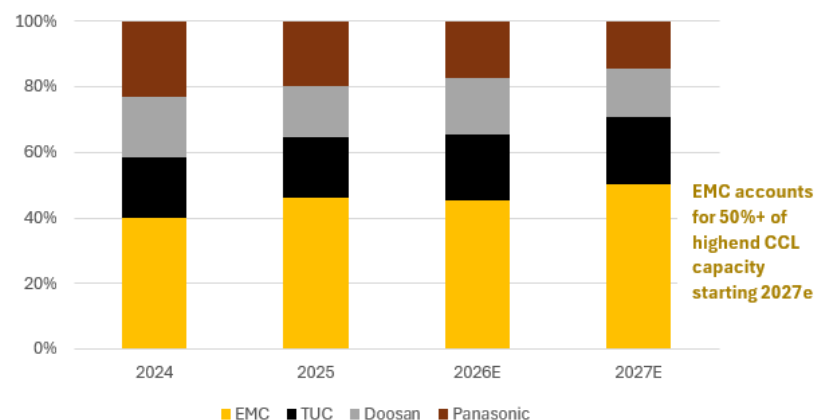
Source: J.P. Morgan estimates.

EMC's m/s in key HPC projects (2026e)



Source: J.P. Morgan estimates.

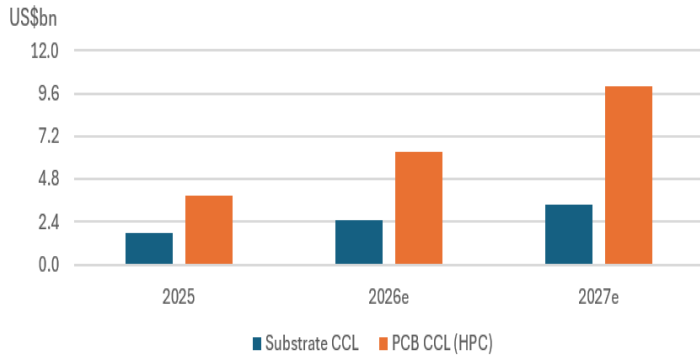
High-end CCL capacity mix



Source: J.P. Morgan estimates, company data.

EMC: Substrate CCL the new TAM

CCL TAM: substrate vs PCB



Source: All data is based on J.P. Morgan estimates.

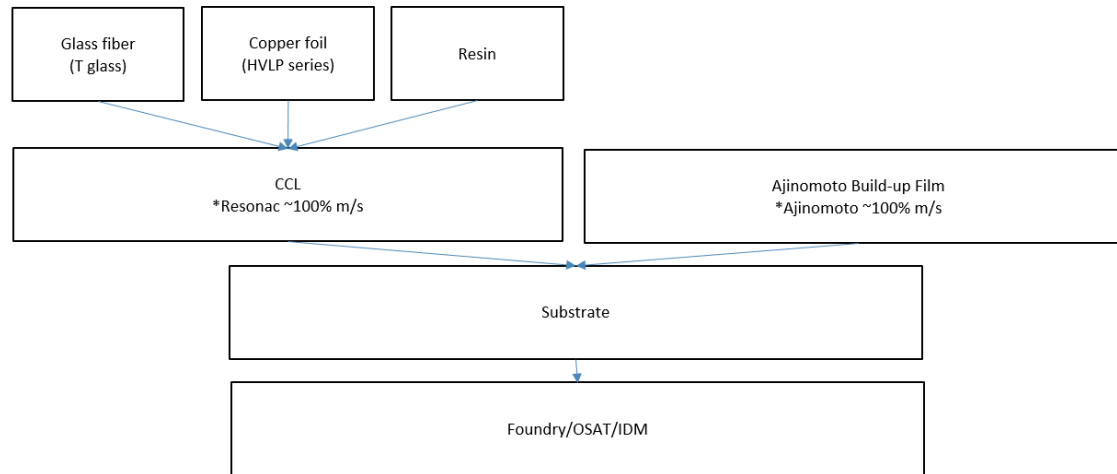
NE/NER glass vs Q glass

	NE/NER glass	Q glass
Data loss	Higher	Lower
Thermal expansion	Higher	Lower
Processibility	Higher	Lower
Price	Lower	Higher

More emphasized in AI era

Source: J.P. Morgan.

Substrate supply chain



Source: J.P. Morgan.

PCB/CCL: peer valuation

Valuations

Company	Ticker	PE (x)			PB (x)			NI yoy (%)					ROE (%)					
		2025	2026E	2027E	2025	2026E	2027E	2023	2024	2025	2026E	2027E	2023	2024	2025	2026E	2027E	
CCL																		
	Elite Material	2383 TT	122	54	29	36	27	16	8%	75%	53%	129%	88%	22%	31%	34%	57%	71%
	Taiwan Union	6274 TT	122	46	24	23	17	12	-35%	216%	31%	181%	76%	7%	20%	21%	45%	55%
	Iteq	6213 TT	60	33	20	4	4	4	-64%	21%	84%	86%	59%	3%	4%	7%	13%	20%
	Doosan Co Ltd	000150 KS	382	53	33	14	14	10	N.A.	N.A.	N.A.	588%	59%	-18%	-11%	4%	24%	29%
	Shengyi Tech C-A	600183 CH	104	65	47	21	18	14	-24%	49%	103%	59%	40%	8%	12%	21%	27%	33%
PCB																		
	Victory Giant -A	300476 CH	65	35	19	18	7	5	-15%	72%	274%	110%	91%	9%	14%	34%	30%	33%
	Gold Circuit	2368 TT	69	35	22	20	15	11	-23%	59%	71%	104%	62%	23%	29%	35%	51%	59%
	Isupetasy Co	007660 KS	54	32	19	12	9	6	-53%	55%	117%	77%	64%	20%	25%	30%	32%	38%
	Wus Printed-A	002463 CH	64	44	29	16	13	10	11%	71%	48%	53%	48%	17%	24%	28%	29%	31%
AI play	Ttm Technologies	TTMI US	99	42	32	10	9	8	N.A.	N.A.	215%	145%	33%	-1%	4%	11%	22%	22%
	Shennan Circui-A	002916 CH	77	50	34	15	12	9	-15%	34%	74%	59%	43%	11%	14%	21%	26%	29%
	Shengyi Electr-A	688183 CH	65	40	29	17	12	9	N.A.	N.A.	390%	68%	39%	-1%	8%	30%	37%	38%
	Shenzhen Kinwo-A	603228 CH	58	35	25	6	5	4	-12%	25%	5%	74%	37%	11%	12%	10%	15%	18%
	Dynamic Holding	3715 TT	61	38	9	4	4	4	83%	5%	-29%	67%	304%	16%	14%	8%	11%	34%
	Tripod Tech Corp	3044 TT	25	17	13	5	4	4	-2%	38%	22%	46%	32%	14%	18%	20%	25%	29%
Server play	Delton Technol-A	001389 CH	74	45	28	19	11	7	48%	63%	50%	81%	58%	26%	28%	29%	33%	33%
	Taiwan Pcb	8213 TT	16	N.A.	N.A.	1	N.A.	N.A.	-26%	-32%	-18%	N.A.	N.A.	7%	5%	4%	N.A.	N.A.
	Hannstar Board	5469 TT	13	N.A.	N.A.	1	N.A.	N.A.	-16%	12%	-3%	N.A.	N.A.	9%	10%	9%	N.A.	N.A.
	Compeq Mfg	2313 TT	50	35	21	7	6	5	-48%	34%	17%	43%	64%	11%	13%	14%	18%	23%
LEO play	Unitech Print	2367 TT	95	58	33	4	N.A.	N.A.	N.A.	N.A.	-69%	62%	76%	-3%	14%	4%	N.A.	N.A.
	Meiko Electronic	6787 JT	37	29	21	6	5	4	28%	32%	36%	27%	36%	13%	14%	18%	18%	22%
	Zhen Ding Tech	4958 TT	77	39	24	5	4	4	-56%	48%	-26%	122%	73%	6%	9%	6%	11%	18%
Smartphone play	Suzhou Dongsha-A	002384 CH	181	60	31	18	14	10	-17%	-45%	73%	253%	99%	11%	6%	9%	25%	34%
	Cmk Corp	6958 JT	17	29	20	1	1	1	143%	-2%	-18%	-42%	47%	6%	5%	4%	2%	3%
	Flexium Intercon	6269 TT	N.A.	N.A.	N.A.	1	N.A.	N.A.	-41%	N.A.	N.A.	N.A.	N.A.	8%	-3%	-10%	N.A.	N.A.
Auto play	Chin-Poon Ind	2355 TT	37	35	27	1	1	1	54%	48%	-44%	5%	28%	5%	7%	4%	5%	5%

Note: 1) Share prices as of June 11 (except for TTM, whose share price is as of June 10); 2) J.P. Morgan covers Elite Material (covered by Jerry Tsai), Victory Giant (by Cherry Liu), Isu Petasys (by Sangsik Lee), Tripod Tech (by Jerry Tsai), and Flexium (by Jerry Tsai), whose financial forecasts are based on J.P. Morgan estimates. Others are based on Bloomberg Finance L.P. estimates.

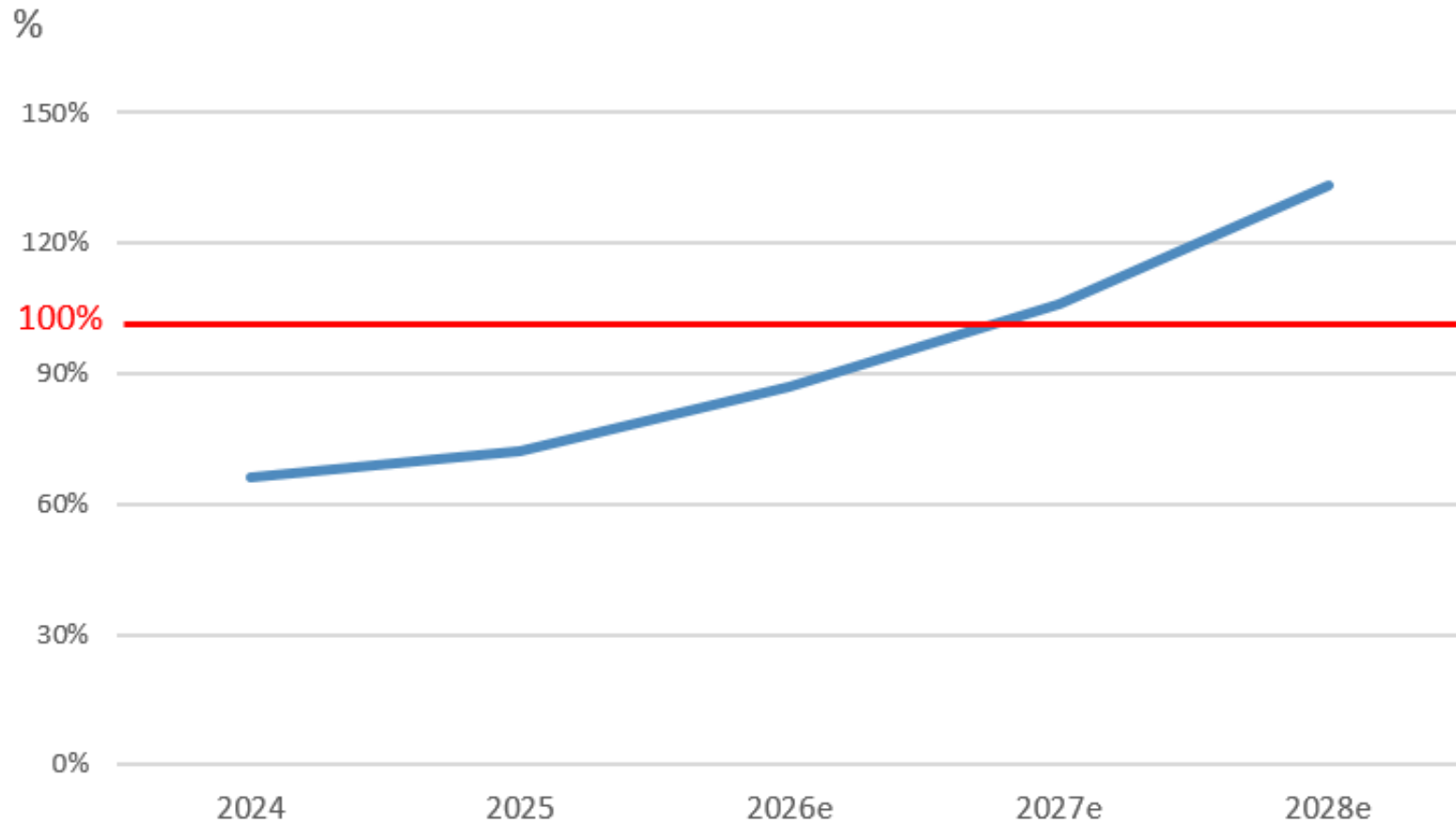
Source: J.P. Morgan estimates, company data, Bloomberg Finance L.P.



Substrate

Substrate: Entering unprecedented supply tightness

Industry UTR trend



Source: All data is based on J.P. Morgan estimates.

J.P.Morgan

Substrate: Entering unprecedented supply tightness

Global substrate demand breakdown

Demand Summary

(bn mm ²)	2024	2025	2026e	2027e	2028e
AI server & switch	2,448	4,634	8,301	13,638	21,522
Regular server	3,210	3,243	3,682	3,911	4,183
Consumer	3,812	3,431	2,941	3,006	3,055
Total	9,470	11,308	14,924	20,555	28,759

YoY %

	2025	2026e	2027e	2028e	2025-28 CAGR
AI server & switch	89%	79%	64%	58%	67%
Regular server	1%	14%	6%	7%	9%
Consumer	-10%	-14%	2%	2%	-4%
Total	19%	32%	38%	40%	36%

Demand Mix

%	2024	2025	2026e	2027e	2028e
AI server & switch	26%	41%	56%	66%	75%
Regular server	34%	29%	25%	19%	15%
Consumer	40%	30%	20%	15%	11%
Total	100%	100%	100%	100%	100%

Source: All data is based on J.P. Morgan estimates.

Substrate: Massive size migration ahead

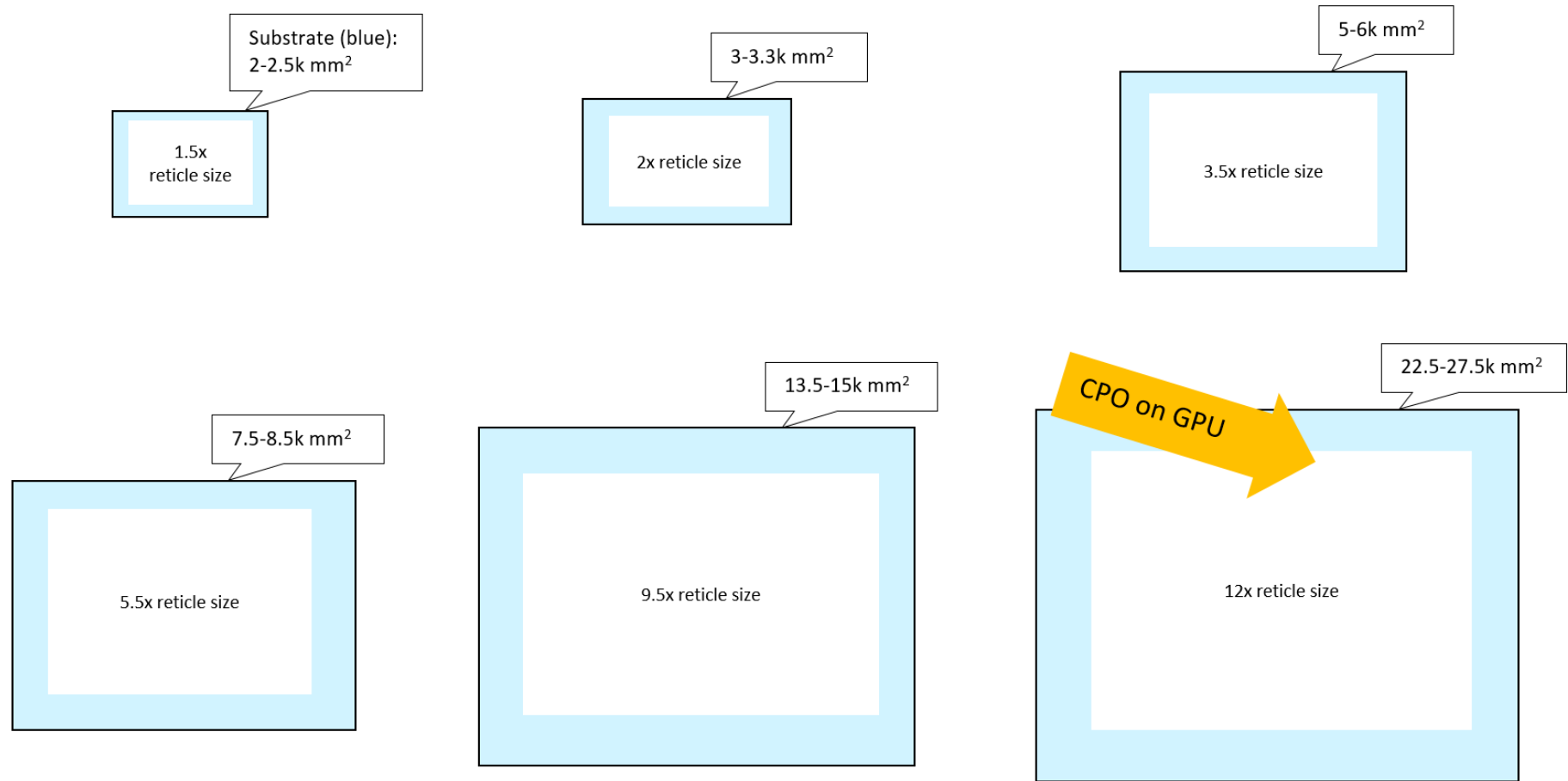
Major AI chip body size & layer count

Vendor	AI chip	Body size (mm ²)	Layer count	Total size (mm ²)
Nvidia	Hopper	3,190	12	38,280
	Grace	4,964	12	59,568
	Blackwell	5,913	14	82,782
	Rubin	8,051	18	144,918
	Rubin Ultra	16,102	20	322,040
	Feynman	18,000	24	432,000
	NVLink 5	3,969	16	63,504
	NVLink 6	4,500	18	81,000
	NVLink 7	5,500	20	110,000
	NVLink 8 (CPO)	8,000	22	176,000
Google (TPU)	Trillium (v6)	3,100	12	37,200
	Hellcat (v7) (BRCM)	3,460	12	41,520
	Sunfish (v8) (BRCM)	7,037	18	126,666
	Pumafish (v9) (BRCM)	18,000	24	432,000
AWS	Trainium 2	5,514	14	77,200
	Trainium 3	6,344	18	114,188
	Trainium 4	14,400	24	345,600

Source: J.P. Morgan estimates.

Substrate: Massive size migration ahead

CoWoS interposer size vs substrate



Source: J.P. Morgan estimates.

Substrate: Entering unprecedented supply tightness

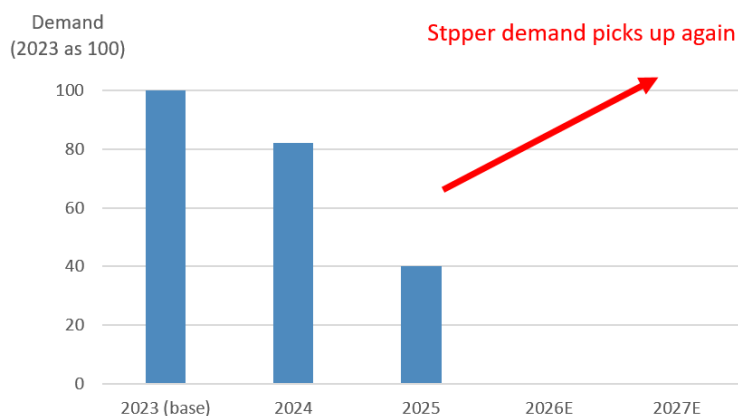
Global substrate supply

(equivalent to 30x30mm, 6 layers)

Capacity	2018	2019	2020	2021	2022	2023	2024	2025	2026e	2027e	2028e
Unimicron	43	51	55	58	67	69	73	79	92	102	117
Ibiden	32	34	44	55	60	63	65	72	82	95	107
Nanya	28	29	31	36	42	45	47	48	50	54	57
SEMCO	17	18	19	20	22	24	30	32	33	36	40
Shinko	24	24	30	35	41	44	46	49	50	53	55
Kinsus	6	8	12	16	21	26	26	27	28	31	37
AT&S	10	11	14	21	32	35	38	40	42	45	49
Others	10	11	13	13	15	20	23	26	30	34	41
Total	170	186	218	254	300	326	348	373	407	449	503
Growth		9.1%	17.3%	16.5%	18.3%	8.7%	6.8%	7.0%	9.3%	10.2%	12.1%
Absolute growth		16	32	36	46	26	22	24	35	42	54

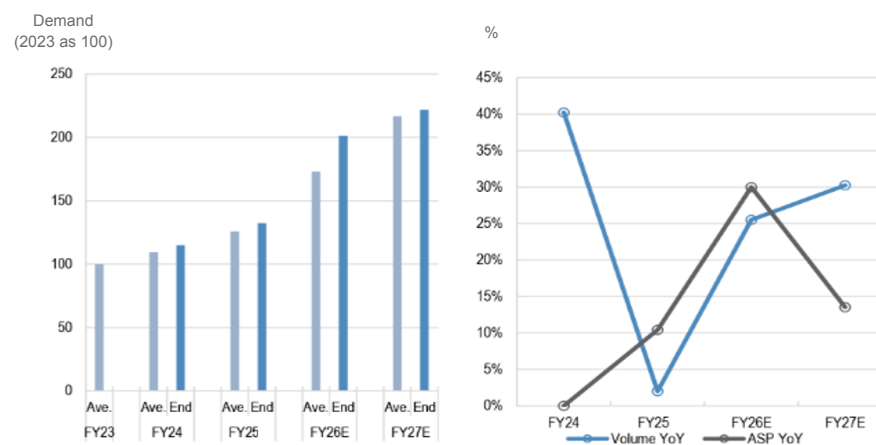
Source: Company data, J.P. Morgan estimates.

Global stepper demand forecast



Source: Unimicron for NC stocks, J.P. Morgan estimates for the rest.

Nittobo T-glass capacity expansion (left) and vol/pricing trend (right)

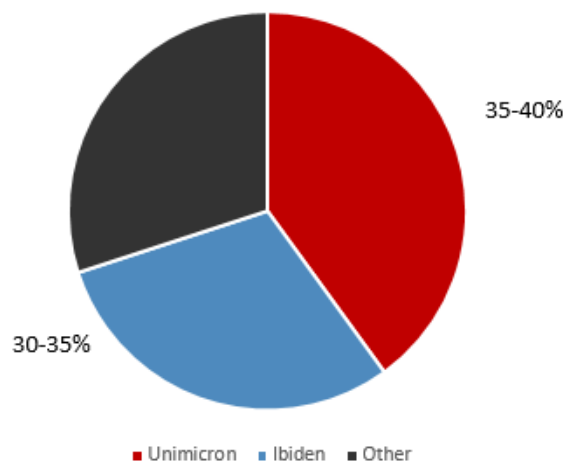


Source: J.P. Morgan estimates, company data.

J.P. Morgan

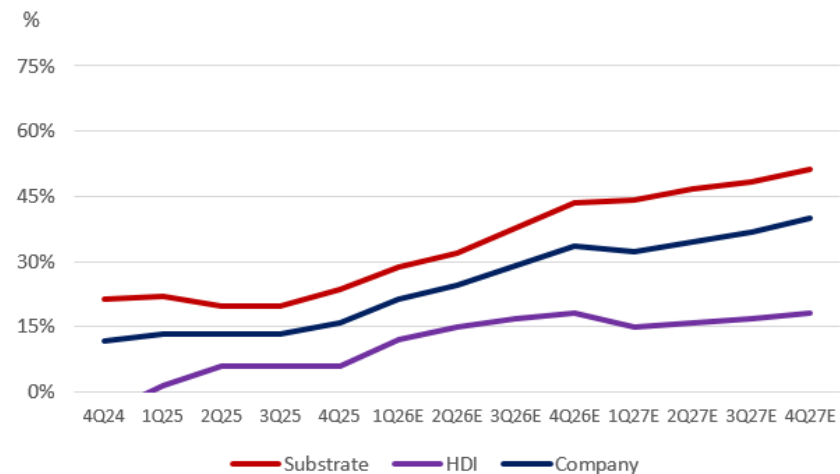
Substrate: Positive implication from T-glass shortage; LTA emerging

T-glass allocation



Source: J.P. Morgan estimates

Unimicron margin forecasts



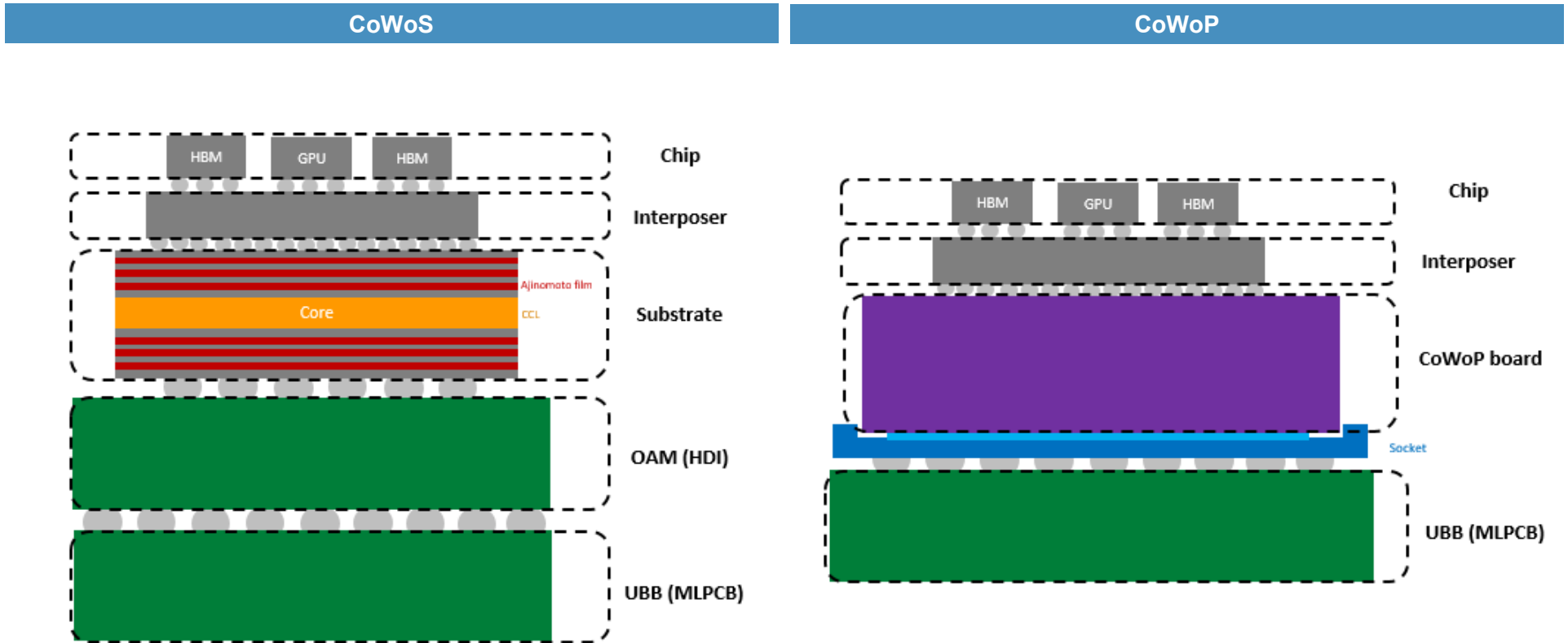
Source: J.P. Morgan estimates, company data.

LTA comparison by type

LTA types	Financial benefits	Flexibility	Irrevocability
Pre-paid sales	*	**	****
Customer-purchased equipment	**	**	****
Customer-financed capacity	***	*	*****
Capacity reservation fees	*****	****	****
Super hot runs	****	****	****

Source: J.P. Morgan.

Substrate structure: CoWoS vs CoWoP



Source: J.P. Morgan.

Substrate: peer valuations

Valuations

Company	Ticker	PE (x)			PB (x)			NI yoy (%)					ROE (%)						
		2025	2026E	2027E	2025	2026E	2027E	2023	2024	2025	2026E	2027E	2021	2022	2023	2024	2025	2026E	2027E
Unimicron Tech	3037 TT	196	57	32	13	11	9	-60%	-58%	31%	244%	78%	24%	40%	14%	6%	7%	21%	30%
Ibiden Co Ltd	4062 JP	67	91	79	9	8	7	-40%	7%	126%	-26%	21%	12%	13%	7%	7%	14%	9%	10%
Kinsus	3189 TT	185	65	31	9	8	6	-99%	3%	3020%	217%	109%	14%	22%	0%	0%	4%	12%	20%
Nan Ya Printed	8046 TT	308	63	28	11	10	8	-70%	-96%	753%	430%	123%	29%	41%	11%	0%	4%	18%	32%
Samsung Electro	009150 KS	192	92	44	15	13	11	-57%	61%	3%	109%	108%	14%	13%	5%	8%	8%	14%	25%
	Average		74	43		10	8												

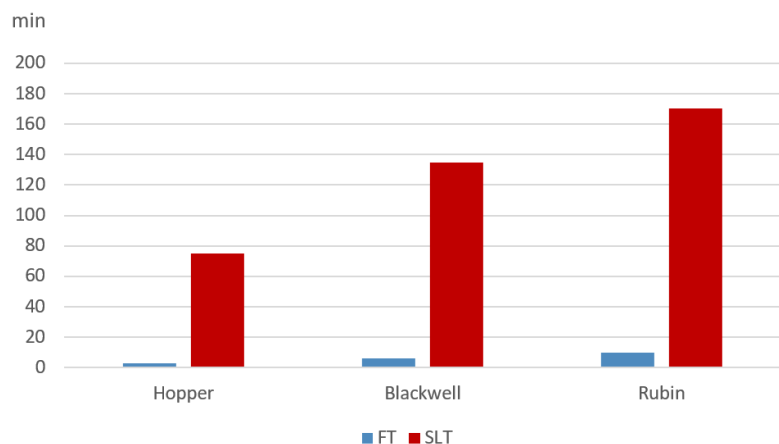
Note: 1) Share prices as of June 11; 2) J.P. Morgan covers Unimicron (covered by Jerry Tsai), Ibiden (by Akinori Kanemoto), and Samsung Electro (by Jay Kwon), whose financial forecasts are based on J.P. Morgan estimates. Others are based on Bloomberg Finance L.P. estimates.

Source: J.P. Morgan estimates, company data, Bloomberg Finance L.P.

Testing equipment

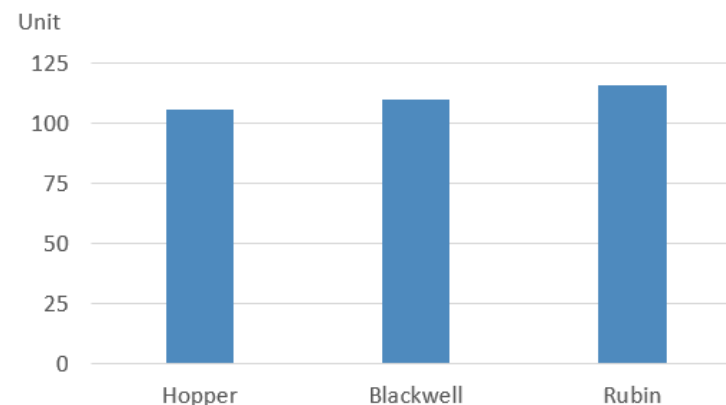
IC testing: 1) Longer testing time (unit growth); 2) higher TDP (ASP growth)

Nvidia GPU FT/SLT testing time



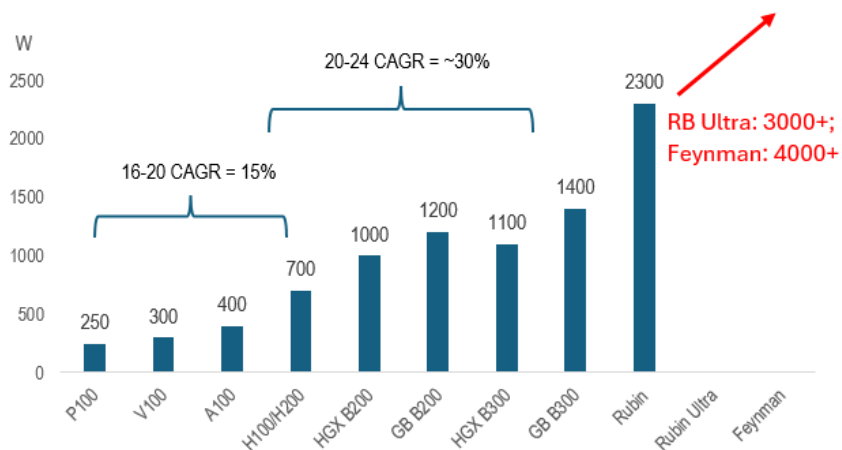
Source: J.P. Morgan estimates.

Nvidia GPU SLT equipment shipment (Chroma 100% share)



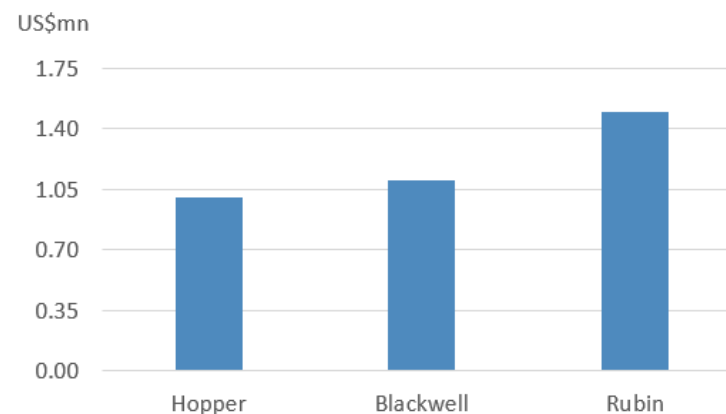
Source: J.P. Morgan estimates.

Nvidia GPU TDP per chip



Source: J.P. Morgan estimates.

Nvidia GPU SLT equipment ASP (Chroma 100% share)



Source: J.P. Morgan estimates.

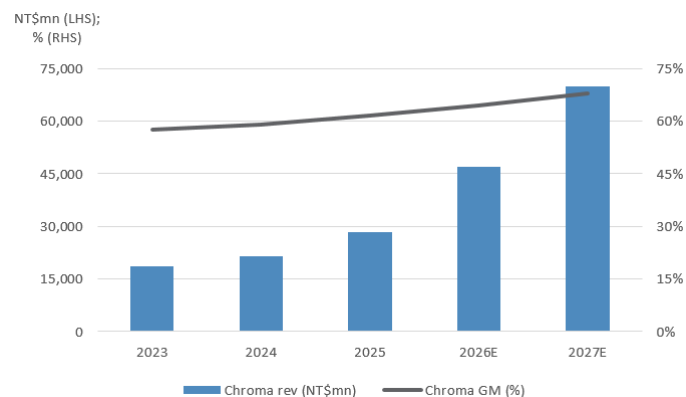
Chroma: SLT, Optical comm, and Datacenter Power Testing — each at 100%+ CAGR

Chroma segment overview

Rev weighting (%)		2023	2024	2025	2026E	2027E Notes
Testing rev (parent + overseas)		95%	95%	95%	97%	97%
Testing rev	Parent rev					
	ATS	43%	32%	33%	32%	33% Datacenter/AI power testing EV power testing Passive components, power adopters
	Semi/photon rev	16%	32%	33%	39%	41% SLT for GPU Metrology for CoWoS For laser emitters in fiber optical networks FT is final testers, for PMIC, MCU 3D sensing on iPhones; increase in 2022 and beyond from auto Lidar
	Turnkey	2%	3%	3%	7%	7% Turnkey is mostly for battery cell ; used to be Chinese battery makers, now more for non-Chinese
	Service & Others	6%	5%	5%	3%	3% Peripherals
Overseas	28%	22%	21%	15%	13% Include China battery formation business	
MAS	4%	4%	4%	3%	2% Automation	
New Material	0%	0%	0%	0%	0% Material trading (e.g., Copper, gold)	
Others	1%	1%	1%	1%	1%	

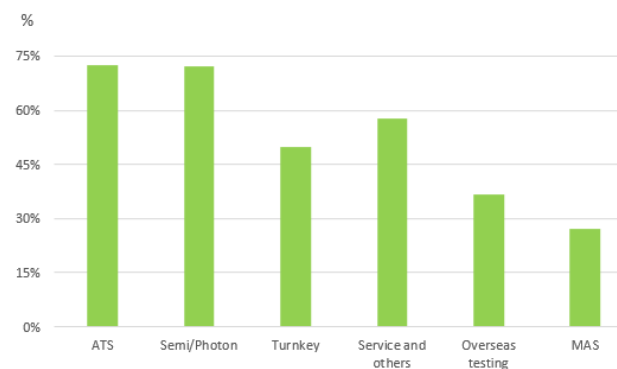
Source: J.P. Morgan estimates, company data.

Chroma rev. and GM



Source: J.P. Morgan estimates, company data.

Margin by segment (2026e)

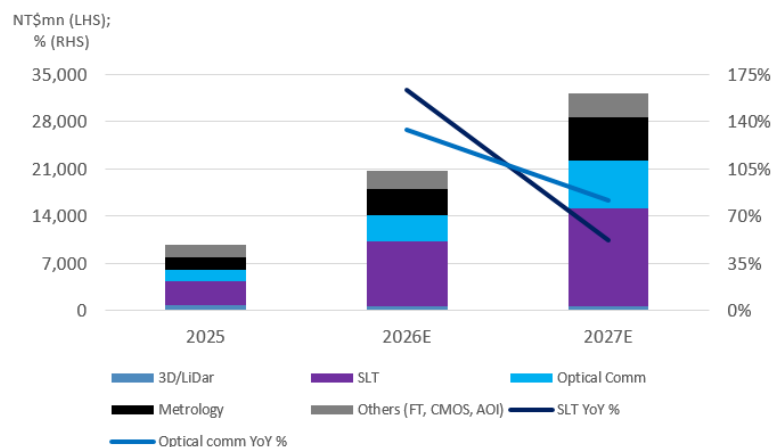


Source: J.P. Morgan estimates, company data.

J.P. Morgan

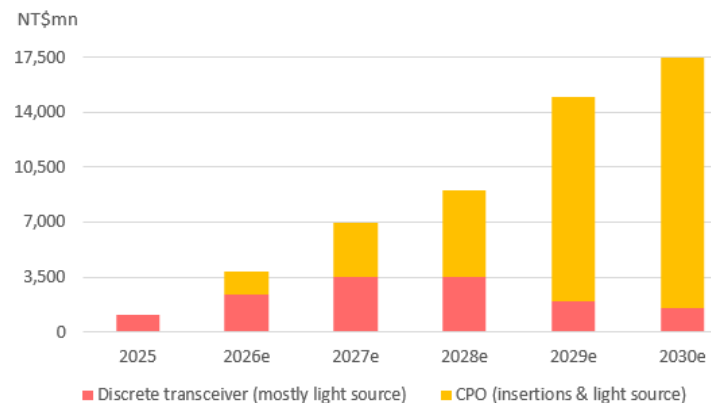
Chroma: SLT and optical comm (both at 100%+ CAGR)

Semi/photon rev. mix



Source: J.P. Morgan estimates, company data.

Optical comm rev. breakdown



Source: All data is based on J.P. Morgan estimates.

Chroma SLT equipment vs peer

Chroma model 3260 Hon Prec HT-3015CT



Capacity (# of chip per batch)	6	6
Power (kW)	1.8	1.6
Temperature control	-40°C to 150°C	-55~130°C
ASP	US\$1-1.5mn	US\$8-1.1mn

Source: Company data.

Chroma ATC vs peer

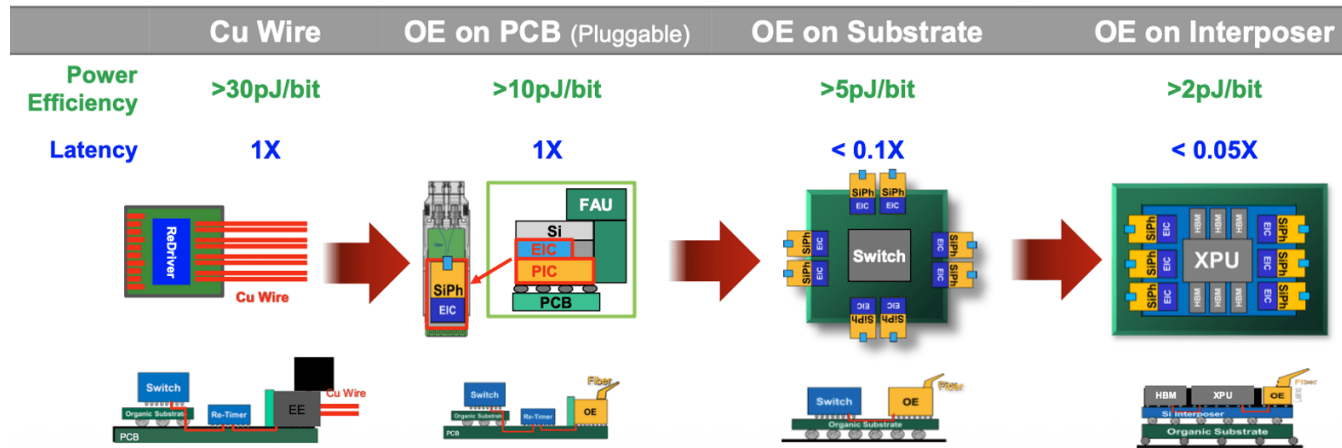
Chroma 3100R/3100K Hon Prec ATC 3.5



Power (kW)	2.9	2.0
Temperature control	-70°C to 150°C	25~125°C

Source: Company data.

CPO testing



Source: TSMC

CPO testing process overview

Insertion	1	2	3	4
Process context	PIC Wafer-Level	EIC-PIC Wafer-Level	Optical Engine Singulated Die/chip-Level	ASIC/CPO Packaged module
Notes	- single sided probing - electrical/optical direct current probing (power, loss, dark current etc)	- double sided probing - E/O, O/E, O/O	- full calibration (after RDL, DSP etc attached)	- full system functional validation (after co-packaged with ASIC)

Chroma



Source: J.P. Morgan, Advantest.

J.P.Morgan

Chroma model 587 XX: Insertion 3

Scale out tool calculation (Chroma 587 XX)

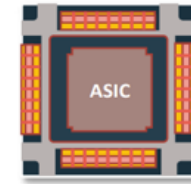
Number of racks	83,333	
Each rack contains		6 ToR switch ICs (Spectrum)
Each switch IC contains	32	OEs
Total OE per year	16,000,000	
Average daily testing volume	53,333	Assume 300 days
Average daily testing capacity required	96,000.0	Factor in 1.8x average

Chroma tool capacity calculation

Hourly throughput	150	
Daily output	3000	Assume 20 hours a day
Daily known-good-die	2400	Assume 80% yield

Tools needed **40**

Spectrum: 32 OEs



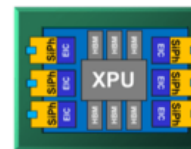
ASIC + Optical Engine

Quantum 5 (NVLink switch): 3 OEs



ASIC + Optical Engine

GPU with CPO: 6 OEs

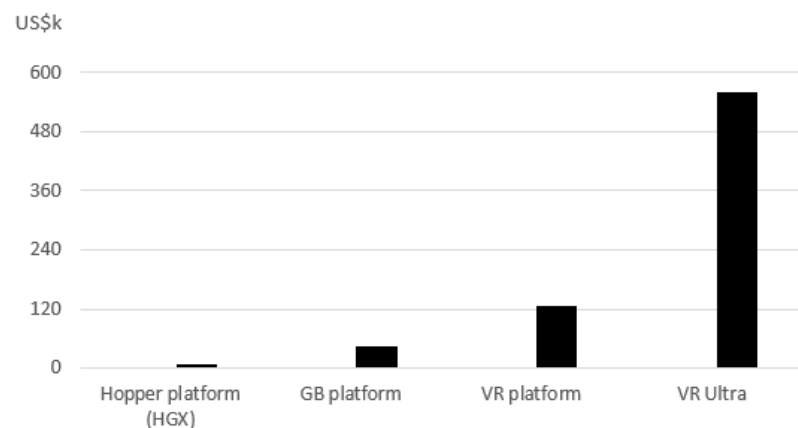


XPU + Optical Engine

Source: J.P. Morgan estimates.

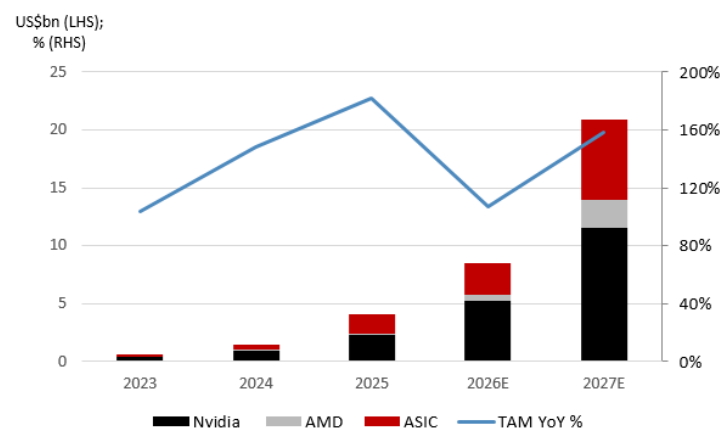
Chroma: Power testing segment driven by datacenter power testing (100%+ CAGR)

Nvidia server power content per rack (PSU, etc)



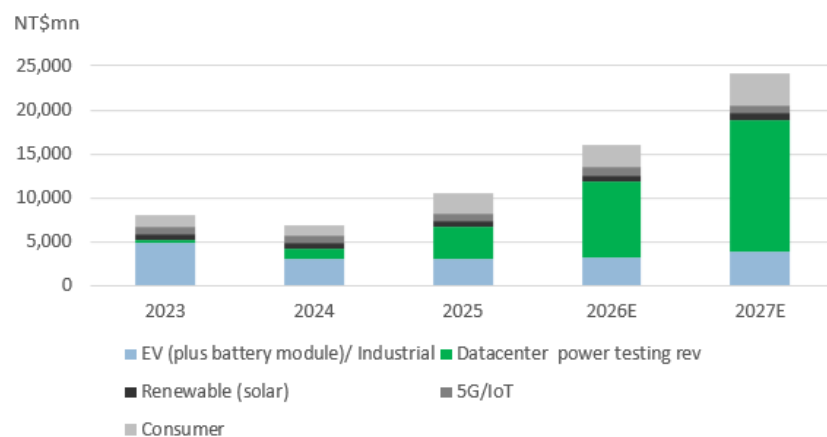
Source: J.P. Morgan estimates.

AI server power TAM (PSU, etc.)



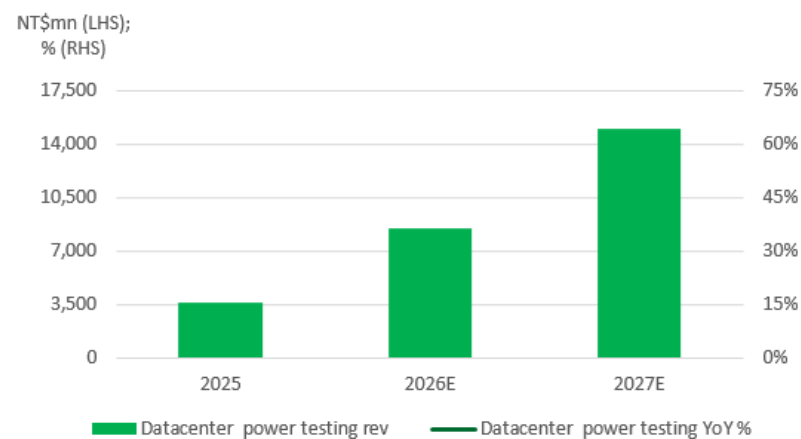
Source: Company data, J.P. Morgan estimates.

Chroma ATS/power testing rev. mix



Source: J.P. Morgan estimates, company data.

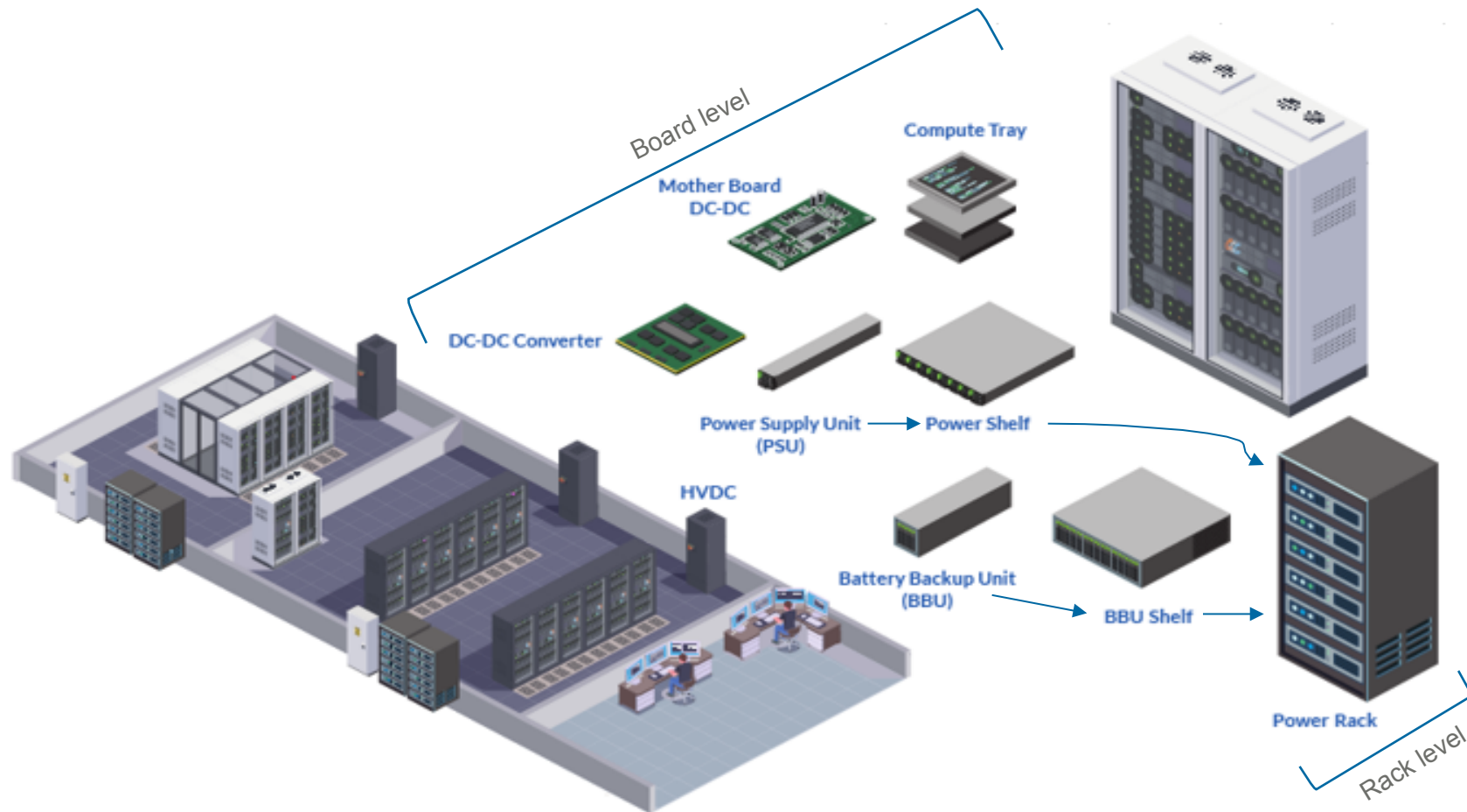
Chroma datacenter power testing rev. growth



Source: All data is based on J.P. Morgan estimates.

Overview of datacenter power structure

- Chroma is the leader in AI data center power testing.
- Chroma has a comprehensive product offering in the datacenter power equipment testing realm (offering in each product category see next page).

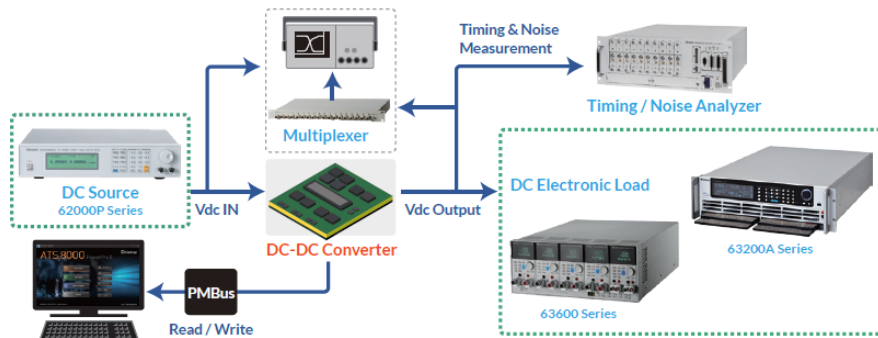


Source: Chroma.

J.P.Morgan

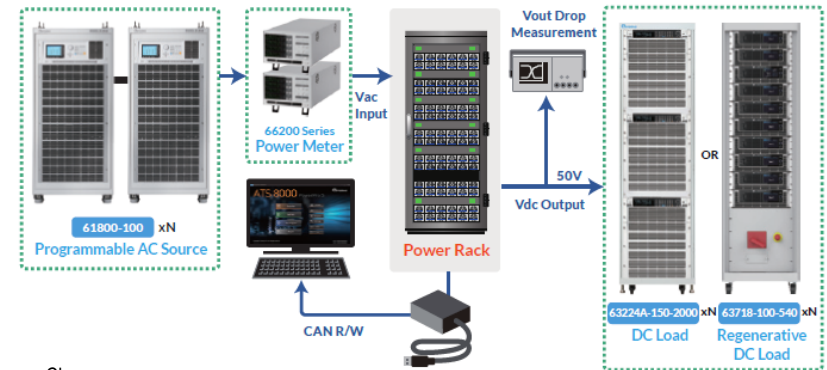
Chroma: Datacenter power testing (under ATS segment) – comprehensive offering

DC converter testing product offering



Source: Chroma.

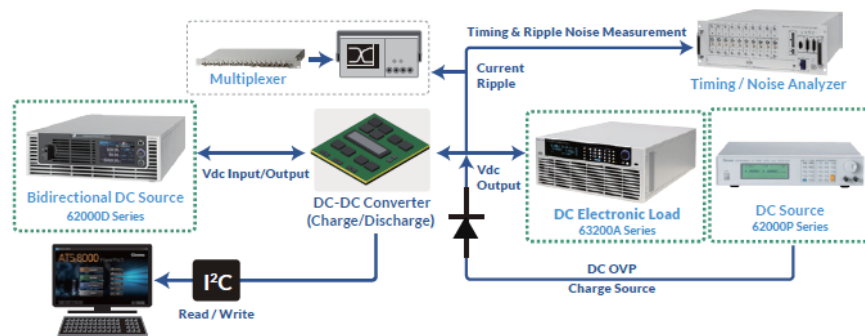
Rack level power testing product offering



Source: Chroma.

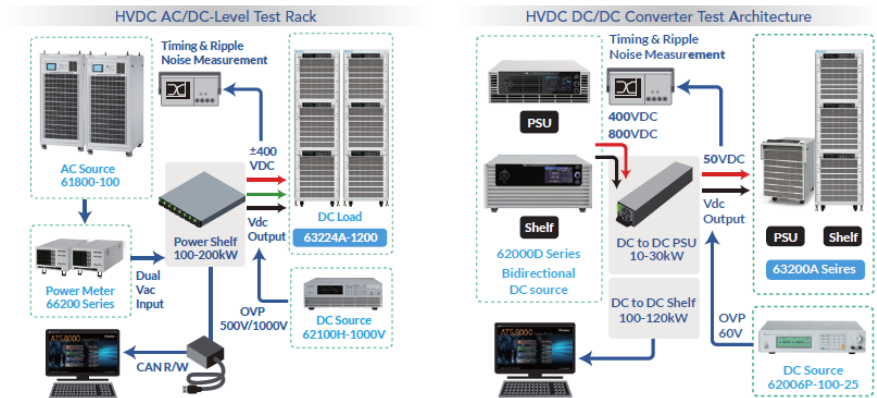
Future datacenter power supply technology

Back-up Battery Unit (BBU) testing product offering



Source: Chroma.

HVDC power testing product offering



Source: Chroma.

Testing equipment: Peer valuations

Valuations

Company	Ticker	PE (x)			PB (x)			NI yoy (%)					ROE (%)				
		2025	2026E	2027E	2025	2026E	2027E	2023	2024	2025	2026E	2027E	2023	2024	2025	2026E	2027E
Chroma Ate	2360 TT	80	57	33	30	25	18	-22%	32%	122%	39%	73%	18%	22%	42%	47%	63%
Hon Precision In	7769 TT	92	57	34	20	18	13	-30%	72%	134%	82%	69%	26%	41%	34%	34%	45%
Advantest Corp	6857 JP	52	34	29	26	18	14	-52%	159%	119%	52%	18%	16%	34%	58%	63%	54%
Teradyne Inc	TER US	88	49	35	N.A.	N.A.	N.A.	-37%	21%	17%	75%	39%	18%	20%	23%	36%	40%
Cohu Inc	COHU US	N.A.	93	37	3	3	3	-71%	N.A.	N.A.	N.A.	152%	3%	-8%	-4%	4%	27%
Keysight Tec	KEYS US	45	32	25	10	8	6	-6%	-42%	102%	43%	27%	24%	13%	23%	27%	28%
Hangzhou Chang-A	300604 CH	131	90	61	34	23	17	-90%	915%	172%	52%	41%	2%	15%	26%	28%	30%
Beijing Huaafen-A	688200 CH	81	92	72	11	14	12	-52%	33%	60%	30%	29%	8%	10%	14%	16%	17%
	Average		63	41		16	12				53%	56%				32%	38%

Note: 1) Share prices as of June 11 (except for Teradyne, Cohu, and Keysight, whose share prices are as of June 10); 2) J.P. Morgan covers Chroma ATE (covered by Jerry Tsai), Hon Precision (by Jimmy Huang and Jerry Tsai), Advantest (by Mio Shikanai), Teradyne (by Samik Chatterjee), Keysight (by Samik Chatterjee), Beijing Huaafen-A (by Billy Feng), whose financial forecasts are based on J.P. Morgan estimates. Others are based on Bloomberg Finance L.P. consensus.

Source: J.P. Morgan estimates, company data, Bloomberg Finance L.P.

Appendix: Key financials of Jerry Tsai's key coverage

NT\$mm except EPS		1023	2023	2023	2023	1024	2024	2024	2024	1025	2025	2025	2025	1026	2026e	2026e	2026e	1027e	2027e	2027e	2027e	2021	2022	2023	2024	2025	2026e	2027e	
Chicony Power	Revenue	8,291	9,270	9,740	9,009	8,046	8,898	10,363	9,870	8,442	9,130	9,037	7,843	8,205	9,555	10,151	9,307	9,193	10,757	11,155	10,230	40,364	41,066	36,311	37,176	34,452	37,218	41,335	
	Q/Q	-12.7%	11.8%	5.1%	-7.5%	-10.7%	10.6%	16.5%	-4.8%	-14.5%	8.2%	-1.0%	-13.2%	4.6%	16.5%	6.2%	-8.3%	-1.2%	17.0%	3.7%	-8.3%	Y/Y	15.8%	1.7%	-11.6%	2.4%	-7.3%	8.0%	11.1%
	GM	18.7%	20.3%	22.4%	23.1%	20.8%	20.5%	21.0%	18.5%	17.3%	16.5%	17.4%	16.2%	16.6%	17.3%	17.4%	17.3%	17.5%	18.3%	18.5%	18.2%	17.7%	18.6%	21.2%	20.2%	16.9%	17.2%	18.1%	
	OPM	8.8%	9.6%	12.5%	12.5%	9.7%	10.3%	12.0%	8.7%	6.8%	6.1%	8.0%	5.0%	5.4%	7.8%	8.3%	7.6%	7.5%	9.2%	9.9%	9.0%	8.5%	9.5%	10.9%	10.2%	6.5%	7.3%	9.0%	
	EPS	1.46	1.98	2.36	2.46	1.71	2.28	2.21	2.15	1.01	1.17	1.85	1.18	1.00	1.63	1.82	1.53	1.51	2.13	2.35	1.98	7.23	8.23	8.26	8.35	5.20	5.99	7.96	
CHPT	Revenue	675	744	692	772	676	723	917	1,289	1,152	1,216	1,242	1,196	1,357	1,570	2,215	2,524	2,776	3,060	3,360	3,500	4,241	4,389	2,884	3,605	4,806	7,666	12,696	
	Q/Q	-41.1%	10.2%	-7.0%	11.6%	-12.5%	7.0%	26.9%	40.6%	-10.6%	5.5%	2.2%	-3.7%	13.5%	15.7%	41.1%	14.0%	10.0%	10.2%	9.8%	4.2%	Y/Y	0.8%	3.5%	-34.3%	25.0%	33.3%	59.5%	65.6%
	GM	46.0%	48.0%	48.8%	49.8%	50.9%	52.4%	53.0%	55.7%	53.8%	55.8%	56.3%	56.0%	56.8%	57.0%	58.8%	59.2%	59.4%	59.7%	60.3%	60.4%	54.0%	52.1%	48.2%	53.5%	55.5%	58.2%	60.0%	
	OPM	-9.5%	1.8%	-2.5%	2.0%	-1.8%	3.6%	13.2%	27.4%	21.7%	25.8%	24.7%	26.7%	29.3%	33.5%	38.3%	38.7%	39.4%	40.1%	41.2%	41.3%	25.5%	19.7%	-1.8%	13.6%	24.8%	35.9%	40.6%	
	EPS	(0.94)	1.07	0.33	0.53	0.43	2.04	3.25	9.82	6.75	6.58	8.41	8.69	10.43	14.02	21.96	25.05	28.01	31.22	35.35	36.65	27.20	23.50	0.99	15.55	30.41	71.45	131.22	
Chroma	Revenue	4,388	4,416	4,847	5,025	4,418	5,515	5,632	6,039	6,865	6,455	6,410	8,580	11,859	11,247	11,130	12,775	16,384	17,010	17,149	19,248	17,584	22,067	18,676	21,604	28,311	47,010	69,791	
	Q/Q	-27.7%	0.6%	9.8%	3.7%	-12.1%	24.8%	2.1%	7.2%	13.7%	-6.0%	-0.7%	33.9%	32.7%	26.2%	10.4%	5.9%	28.3%	3.8%	0.8%	12.2%	Y/Y	13.2%	25.5%	-15.4%	15.7%	31.0%	66.1%	48.5%
	GM	60.8%	62.3%	57.0%	51.3%	58.1%	59.2%	58.7%	59.7%	60.4%	65.4%	59.8%	60.8%	62.6%	64.7%	65.3%	65.2%	66.1%	68.1%	68.3%	69.1%	48.1%	51.5%	57.6%	59.0%	61.5%	64.5%	68.0%	
	OPM	27.1%	27.5%	25.5%	20.6%	20.4%	27.5%	26.8%	25.8%	31.5%	34.0%	28.8%	34.8%	40.5%	40.4%	40.6%	42.7%	45.6%	47.6%	48.3%	49.1%	17.5%	22.8%	25.0%	27.9%	32.5%	41.1%	47.7%	
	EPS	2.20	2.39	2.88	1.88	2.25	3.31	3.35	3.47	4.99	4.59	11.91	5.99	9.09	9.17	9.13	10.91	14.91	16.14	16.51	18.76	9.92	12.05	9.35	12.38	27.49	38.30	66.33	
Elite Material	Revenue	7,359	9,180	11,875	12,882	12,902	15,449	17,463	18,562	21,680	22,508	25,146	24,927	33,067	41,745	46,090	48,824	53,653	59,313	64,530	68,636	38,500	38,673	41,296	64,377	94,261	169,727	246,132	
	Q/Q	-17.2%	24.7%	29.3%	8.5%	0.2%	19.7%	13.0%	6.3%	16.8%	3.8%	11.7%	-0.9%	32.7%	26.2%	10.4%	5.9%	9.9%	10.6%	8.8%	6.4%	Y/Y	41.5%	0.4%	6.8%	55.9%	46.4%	80.1%	45.0%
	GM	21.4%	27.5%	30.2%	28.3%	29.0%	27.4%	27.0%	28.5%	30.4%	30.3%	30.1%	28.6%	30.4%	30.3%	30.1%	28.6%	29.4%	32.2%	34.5%	35.6%	26.2%	25.1%	27.4%	27.9%	29.8%	33.2%	40.0%	
	OPM	10.5%	17.6%	21.1%	19.0%	19.7%	18.9%	18.1%	19.0%	21.6%	24.9%	20.6%	19.8%	21.6%	24.3%	26.6%	27.7%	29.1%	32.0%	33.2%	35.0%	18.0%	16.1%	17.8%	19.9%	20.3%	25.4%	32.5%	
	EPS	1.44	3.00	6.10	5.79	5.76	7.08	7.30	7.69	10.01	10.02	11.19	10.45	14.90	22.21	26.86	29.57	34.31	41.72	47.28	52.94	16.50	15.24	16.38	27.83	41.68	93.54	176.25	
E Ink	Revenue	7,230	7,236	6,821	5,833	5,643	7,656	9,189	9,675	8,059	10,626	10,415	7,016	8,633	10,899	12,870	10,950	11,574	13,463	15,663	14,567	19,651	30,061	27,120	32,163	36,116	43,352	55,266	
	Q/Q	-15.4%	0.1%	-5.7%	-14.5%	-3.3%	35.7%	20.0%	6.3%	-16.7%	31.8%	-2.0%	-32.6%	23.1%	26.2%	18.1%	-14.9%	5.7%	16.3%	16.3%	-7.0%	Y/Y	27.9%	53.0%	-9.8%	18.6%	12.3%	20.0%	27.5%
	GM	49.2%	53.1%	55.4%	56.3%	47.4%	47.6%	48.4%	53.7%	52.2%	60.3%	56.0%	48.3%	59.7%	58.1%	58.6%	58.7%	59.5%	60.0%	61.0%	60.0%	43.7%	54.0%	53.3%	49.6%	54.9%	58.7%	60.2%	
	OPM	25.1%	28.1%	28.3%	25.9%	14.8%	20.6%	26.1%	29.0%	26.6%	39.5%	34.9%	9.8%	32.6%	36.8%	39.6%	35.7%	36.5%	41.0%	45.0%	42.2%	15.4%	30.6%	26.9%	23.7%	29.6%	36.5%	41.5%	
	EPS	1.54	2.12	2.10	1.09	1.16	1.76	1.75	3.07	1.91	2.58	3.67	0.97	2.42	3.43	4.22	3.28	3.28	4.29	5.38	4.63	4.52	8.69	6.85	7.75	9.15	13.35	17.58	
Sunonwealth	Revenue	3,075	3,280	3,294	3,266	3,060	3,677	4,031	3,856	4,162	4,663	4,934	5,080	5,026	5,382	5,769	5,893	5,821	6,144	6,484	6,592	13,562	14,063	12,915	14,624	18,840	22,068	25,041	
	Q/Q	-18.9%	6.6%	0.4%	-0.8%	-6.3%	20.2%	9.6%	-4.3%	7.9%	12.0%	5.8%	2.9%	-1.1%	7.1%	7.2%	2.1%	-1.2%	5.6%	5.5%	1.7%	Y/Y	13.6%	3.7%	5.8%	28.8%	17.1%	13.5%	
	GM	26.5%	28.1%	29.0%	27.9%	26.1%	28.3%	28.5%	30.3%	29.3%	30.5%	31.3%	31.4%	31.5%	32.0%	32.2%	32.2%	32.3%	31.3%	31.6%	31.9%	18.7%	22.5%	27.9%	28.4%	30.7%	32.0%	31.8%	
	OPM	11.3%	12.4%	12.3%	11.4%	9.0%	11.4%	12.9%	11.9%	12.4%	15.3%	15.6%	16.2%	16.3%	17.3%	17.7%	17.9%	17.3%	16.3%	17.3%	17.8%	3.4%	8.0%	11.8%	11.5%	15.0%	17.3%	17.2%	
	EPS	1.11	1.72	1.54	0.95	1.30	1.39	1.28	1.60	1.73	1.37	2.54	2.49	2.38	2.82	2.87	3.07	2.92	3.04	3.15	3.40	1.71	4.34	5.32	5.57	8.12	11.14	12.51	
Tripod	Revenue	14,229	13,443	16,239	14,951	15,285	15,799	17,674	17,045	17,128	17,903	19,389	18,979	20,964	24,416	26,266	25,644	25,897	27,971	29,609	30,237	63,000	65,784	58,862	65,804	73,399	97,290	113,714	
	Q/Q	-3.0%	-5.5%	20.8%	-7.9%	2.2%	3.4%	11.9%	-3.6%	0.5%	4.5%	8.3%	-2.1%	10.5%	16.5%	7.6%	-2.4%	1.0%	8.0%	5.9%	2.1%	Y/Y	13.4%	4.4%	-10.5%	11.8%	11.5%	32.5%	16.9%
	GM	15.3%	17.1%	22.1%	22.2%	22.0%	23.1%	23.5%	24.3%	25.0%	26.2%	26.8%	25.5%	26.5%	27.2%	28.3%	29.1%	30.0%	30.4%	31.0%	31.7%	18.9%	17.9%	19.3%	23.2%	25.9%	27.9%	30.8%	
	OPM	7.3%	9.0%	14.4%	13.5%	14.0%	13.8%	15.4%	15.8%	16.6%	18.1%	18.6%	16.9%	18.3%	19.1%	20.2%	21.0%	21.9%	22.3%	22.9%	23.6%	10.5%	10.2%	11.2%	14.8%	17.6%	19.7%	22.7%	
	EPS	2.12	1.84	4.10	3.44	3.50	3.78	4.44	4.24	4.48	4.68	5.66	4.64	5.61	6.97	7.93	7.98	8.30	9.13	9.92	10.33	11.18	11.67	11.50	15.96	19.45	28.49	37.68	
TSMC	Revenue	9,412	12,186	12,741	12,157	10,929	11,502	11,009	11,848	12,414	12,588	12,788	12,087	12,555	12,922	13,801	14,639	13,958	15,159	15,852	16,083	65,720	68,455	46,496	45,288	49,877	53,917	61,053	
	Q/Q	-46.5%	29.5%	4.6%	-4.6%	-10.1%	5.2%	-4.3%	7.6%	4.8%	1.4%	1.6%	-5.5%	3.9%	2.9%	6.8%	6.1%	-4.6%	8.6%	6.8%	1.5%	Y/Y	58.7%	4.2%	-32.1%	-2.6%	10.1%	8.1%	13.2%
	GM	9.4%	11.3%	13.1%	11.0%	11.8%	13.9%	12.9%	14.6%	13.4%	12.1%	12.7%	13.1%	11.8%	12.6%	13.5%	15.3%	15.3%	16.9%	17.7%	18.0%	12.3%	12.9%	11.3%	13.4%	12.8%	13.4%	17.0%	
	OPM	2.7%	5.6%	7.5%	4.8%	5.6%	6.9%	5.9%	8.1%	7.6%	6.7%	7.4%	6.5%	5.8%	6.8%	8.0%	10.1%	9.9%	12.0%	12.9%	13.3%	7.2%	8.5%	5.4%	6.6%	7.0%	7.8%	12.1%	
	EPS	0.97	2.16	3.12	2.32	2.33	2.94	2.27	2.41	2.88	1.64	2.38	2.49	1.80	2.21	2.79	3.69	3.59	4.72	5.33	5.31	12.70	13.82	8.57	9.94	9.39	10.48	19.16	
Unimicron	Revenue	26,566	25,235	26,546	25,689	26,403	27,877	31,712	29,381	30,090	32,766	33,994	34,691	37,104	40,043	42,444	41,969	45,289	48,3										

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