2025 DRAM Market – Tight Supply Persists

Supply, Demand and ASP
Based on July MI Update

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FMS the Future of Memory and Storage

Capex Increases with Profit Improvement (HBM/Green Field)

Supplier	2024 CAPEX (M USD)	2024 CAPEX YoY	2023 CAPEX (M USD)	Notes
SAMSUNG	$13,500	↑% 35%	$10,000	*As AI-related demand gains momentum, Samsung is ramping up investments in HBM and 1beta nm migration so as to expand its market share.*
SK hynix	$6,400	↑% 60%	$4,000	*SK hynix has revised up its capex plan mainly to build up production capacity for the more advanced processes. This, in turn, will allow the supplier to raise the output of HBM products. Besides HBM products, the supplier also intends to increase the supply of DDR5 and LPDDR5(X) products.*
Micron	$5,000	↑% 67%	$3,000	*The upward revision of Micron's capex for 2024 has been mostly allocated to build up production capacity for HBM as the company wants to gain a larger market share for this product category. Furthermore, the share of 1beta nm products in Micron's output is expected to keep growing as its DDR5 products enter mass production.*
NANYA	$827	↑% 95%	$424	*A part of the increase in capital expenditure comes from the deferral of expenses from last year. The increase is still mainly related to the R&D of new products and 1B nm and more advanced processes.*
CXMT	$3,450	↑% 66%	$2,083	*CXMT is aggressively procuring new equipment due to geopolitical concerns. Its top priority is to have the Phase 2 of the Hefei base reach its maximum capacity.*

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Source: TrendForce, Aug., 2024

Driven by AI Demand, The 2025 New Fabs Planning Is Expected to Prioritize HBM Supply

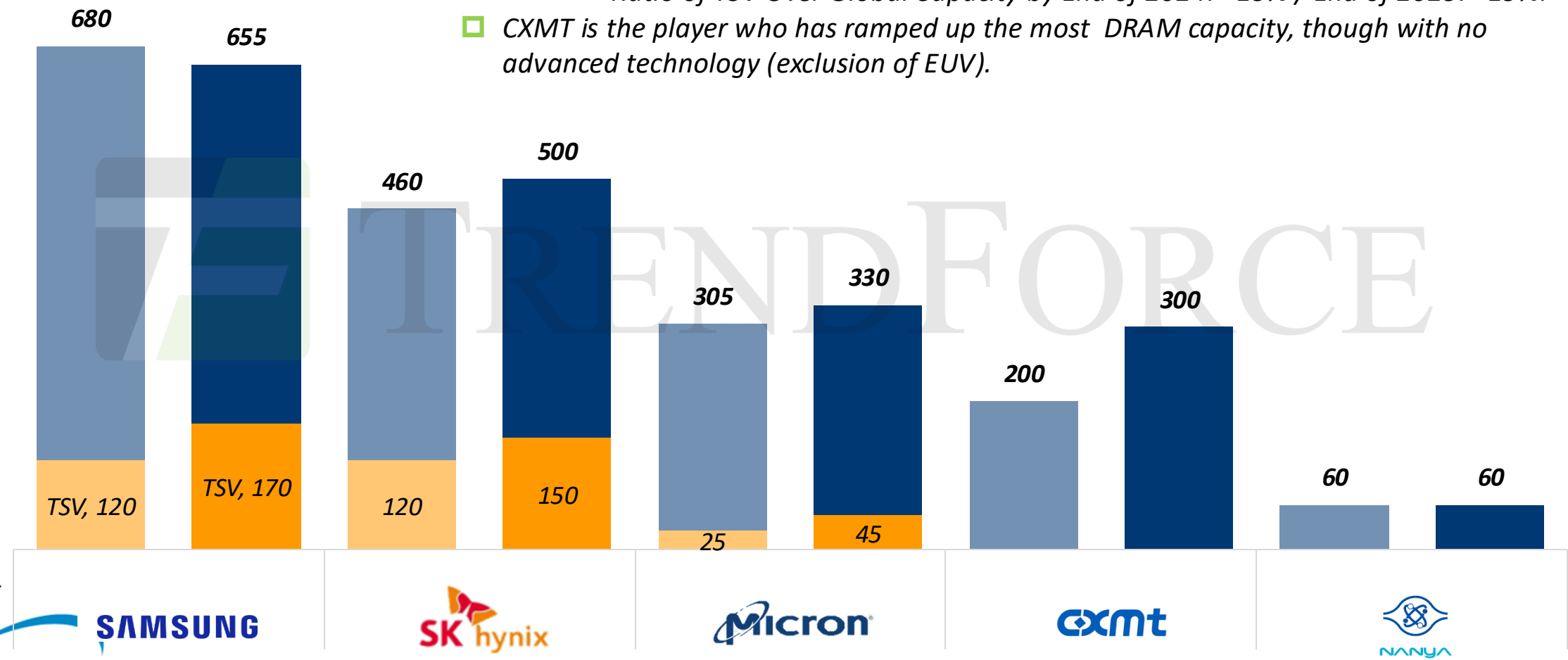
Company	New Fab	Location	Status
SAMSUNG	P4L	Korea	Groundwork has already started, the construction of the new fab is expected to finish in 2025.
SK hynix	M15X	Korea	The M15X is located next to the M15 where some TSV equipment is placed, which will be more conducive to HBM production. The fab is planned to mass-produce by the end of 2025.
	Yongin	Korea	The land is being prepared and fab construction is expected to begin next year and mass production will begin in Jun. 2027.
Micron	A3	Taiwan	The clean room is ready and will be used to maintain the wafer capacity next year, with a maximum scale of about 45K.
	A5	Taiwan	A piece of land in Taichung has been acquired, but there are no further plans related to this new fab.
	Boise Fab	U.S.	The new fab is located adjacent to Micron's R&D center. Groundbreaking has taken place last year, and the new fab is expected to initiate wafer starts in 2026.
	N.Y. Fab	U.S.	The site is still in the preparation stage, and the first fab will start construction in 2025 and mass production in 2028.
	Hiroshima New Fab	Japan	The construction is scheduled to start in 2026, with completion of the fab by the end of 2027 and will primarily be used for HBM-related production.
	Singapore Fab	Singapore	The expansion plan is still in the discussion phase, and the earliest production time will be after 2028.
NANYA	5A	Taiwan	Its groundbreaking took placed last year, and the construction of this new fab is scheduled for completion in 2026. The capacity of the entire fab is planned to be 45K.
PSMC	Tongluo	Taiwan	Future plans to centralize logic equipment at the fab will free up more space for DRAM production in other existing fabs.

Source: TrendForce, Aug., 2024

2025 DRAM Capacity Grows Marginally while TSV Takes Higher Share

- *Looking into 2025, HBM market share competition will only further intensified.*
  - *Global DRAM Capacity by End of 2024: ~1,800K / End of 2025: ~1920K.*
  - *Ratio of TSV Over Global Capacity by End of 2024: ~15% / End of 2025: ~19%.*
- *CXMT is the player who has ramped up the most DRAM capacity, though with no advanced technology (exclusion of EUV).*

Unit: K units / monthly average



Note: The timeline for data statistics is the end of the year

Source: TrendForce, Aug., 2024

DRAM Technology Transitions on DDR5

- *Samsung and Micron have started to ship DDR5 using its advanced technology (Samsung: 1alpha nm/Micron: 1beta nm) since 4Q23.*
- *SK hynix removed 1beta nm PC/server DRAM from schedule due to prioritizing its capacity on HBM3e in particular.*
- *DDR5 32Gb: both Samsung and Micron are expected to provide CS by the end of 1Q24, and there will be a significant increase in output starting from 2Q24 to facilitate the shipment of 128GB RDIMMs.*

Density	Nodes (nm)	3Q23	4Q23	1Q24	2Q24	3Q24	4Q24	1Q25
16Gb	1Y	SAMSUNG						4800-5600MT/s
		SK hynix						4800MT/s
	1Z	Micron			4800-5600MT/s	EOL		
	1alpha	C/S	SAMSUNG ★					5600-6400MT/s
						C/S	SAMSUNG ★	6400MT/s (PC)
		SK hynix ★						4800-5600MT/s
					C/S	SK hynix ★		6400MT/s
	1beta	C/S			C/S	SAMSUNG ★		5600-6400MT/s (SV)
			Micron					5600MT/s
				C/S	Micron			6400MT/s
24Gb	1alpha	SAMSUNG ★						4800MT/s
			C/S	SAMSUNG ★				5600-6400MT/s (SV)
					C/S	SAMSUNG ★		5600-6400MT/s (PC)
		SK hynix ★						4800-5600MT/s
					C/S	SK hynix ★		6400MT/s
		Micron						4800-5600MT/s
				C/S	Micron			6400MT/s
	1beta						C/S	Micron 6400MT/s
32Gb	1beta			C/S	SAMSUNG ★			5600-6400MT/s
						C/S	SK hynix ★	5600-6400MT/s
				C/S	Micron			5600-6400MT/s

Note: C/S=Customer Sample

★ *means applying EUV technology*

Source: TrendForce, Aug., 2024

2024/2025 Supply Output Comparison

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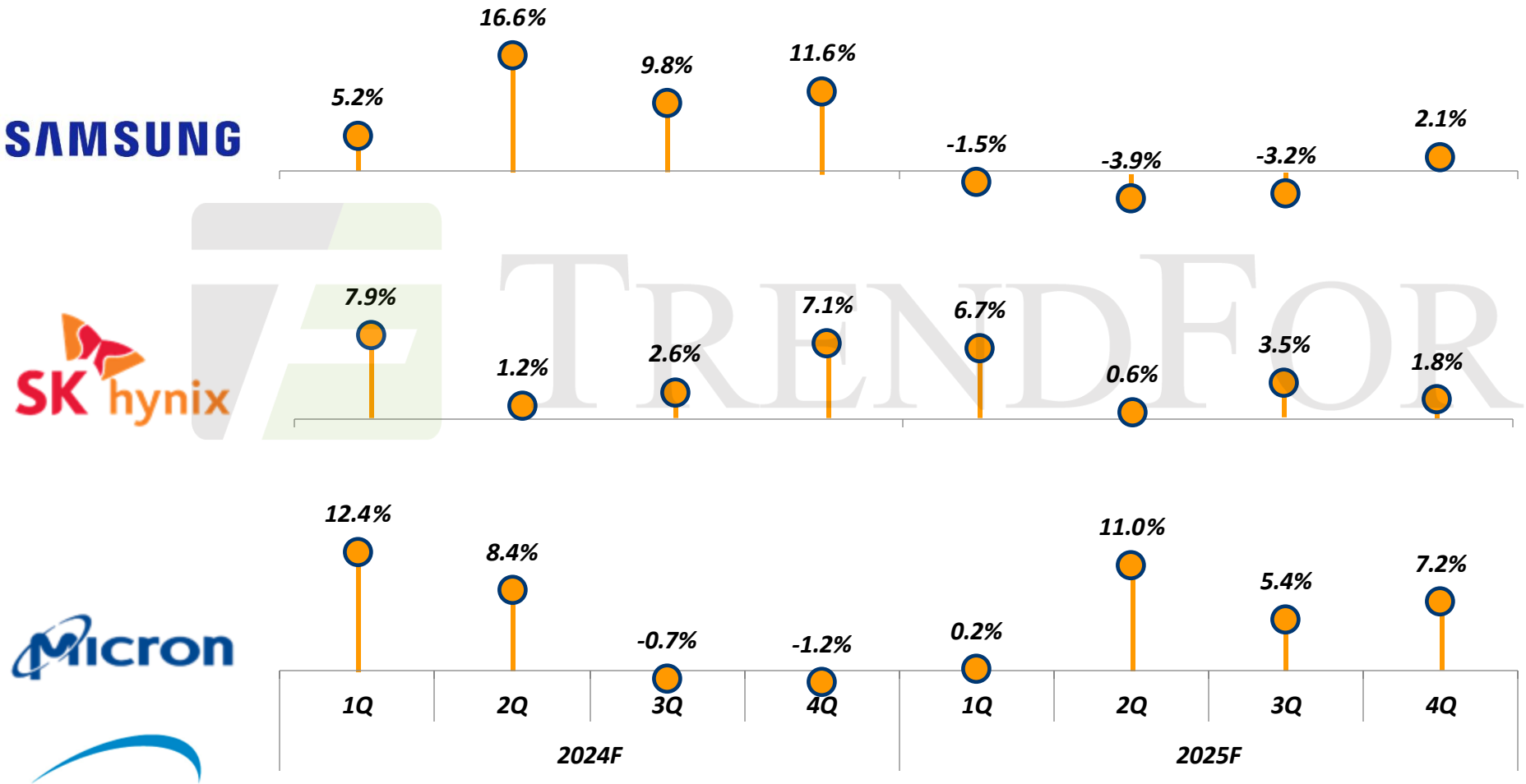
DRAM Production Bit Growth –

2025 Supply YoY: 18% (excluding China: 14%)
2024 Supply YoY: 16% (excluding China: 13%)



Annual Production Bit Growth	
2024(F)	2025(F)
9%	11%
12%	17%
24%	14%

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Source: TrendForce, Aug., 2024

2025 Demand Bit Contribution by Applications

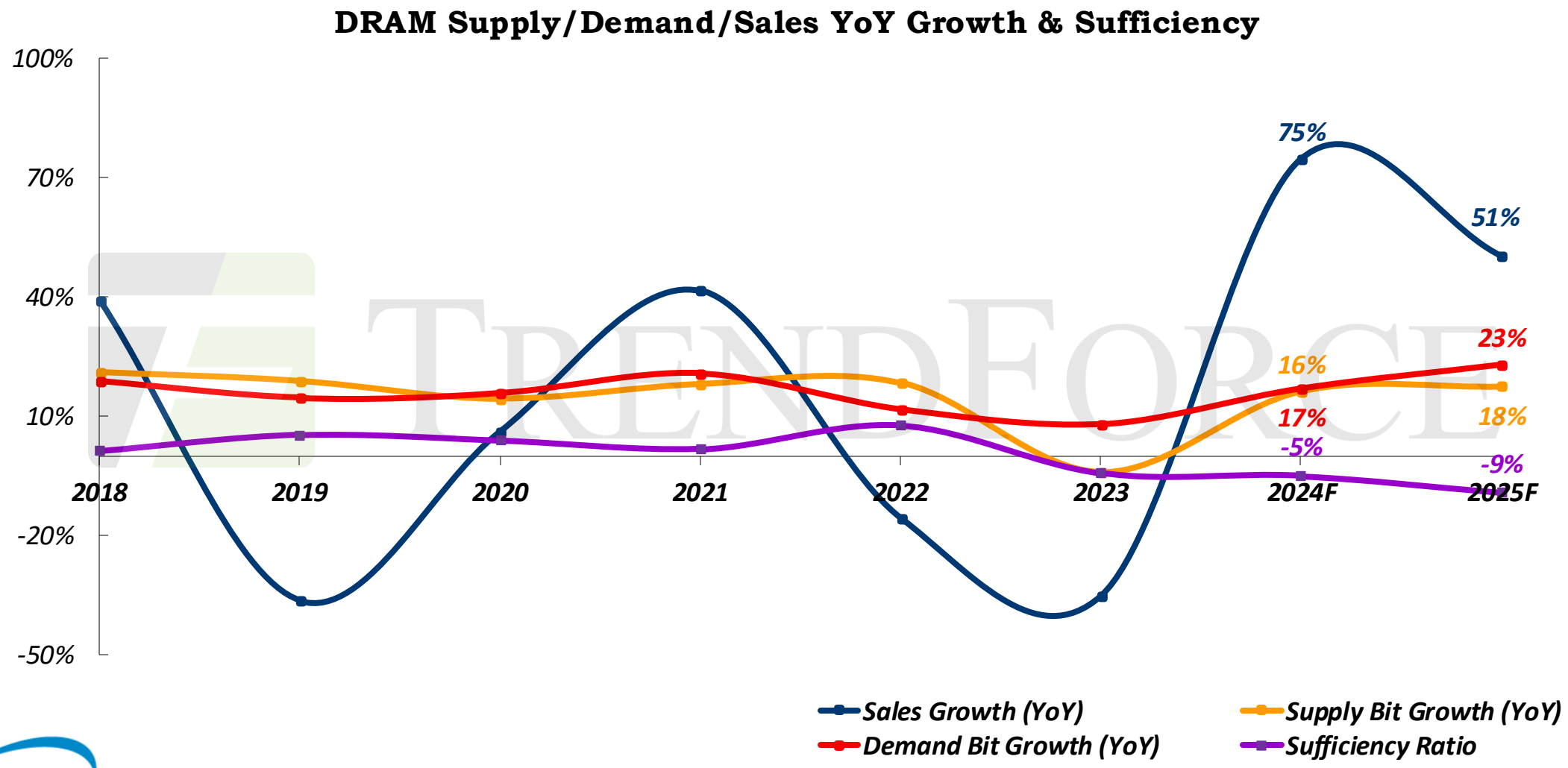
DRAM Demand Bit Growth –

2025 Demand YoY: 23%
2024 Demand YoY: 17%

	NB	Server	AI Server	Smartphone
2025 YoY				
Shipment	5%	6%	28%	3%
DRAM Content	14%	19%	LPDDR 41% RDIMM 27%	8%
NAND Flash Content	4%	20%	53%	16%

Source: TrendForce, Aug., 2024

DRAM Industry Outlook – HBM Cannibalization Reshapes DRAM Industry since 2024



Source: TrendForce, Aug., 2024

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