

Global Memory Tech

Weekly theme: 1Q ASP hike, HBM3e kick-off, Nanya Tech upturn, NAND spot rally

Industry Overview

Upbeat 1Q24 blended ASP for both DRAM and NAND

Our channel check indicates upbeat blended ASP for 1Q24 – up 15%+/- QoQ for most DRAM and NAND chips vs our estimate/consensus of 10% range or low-teens%. This is consistent with memory chipmakers' commitment to price-/profit-focused strategies. True, sell-through of smartphone/PC/server is still weak. However, we see OEMs buying memory chips actively at 10-20% higher contract prices vs 4Q23. Two reasons: (1) per-box memory content increase (up 15%+ YoY), and (2) chip supply shortage concern (bigger impact of HBM, which eats up 2x larger wafer capacity vs regular DRAM). We also see slightly better NAND pricing momentum vs DRAM given chipmakers' slow migration to 200+ layers (low yield) and low utilization for old fabs (128 layers or below). Hynix's 1Q DRAM shipment mix improvement also appears outstanding given significant commodity chip supply cut (-20% QoQ bit growth possible led by DDR4 and even some low-end DDR5) vs 10%+ HBM3 bit growth (vs 4Q23). Hynix's HBM (mostly HBM3 for now) price should remain high at near-400% vs commodity DDR4/DDR5.

Hynix's HBM3e seems to be ready for NVIDIA's H200

We believe SK Hynix has completed 1b node DRAM die fabrication for HBM3e as of early March. MR-MUF packaging for 8-12 dies is also mostly done for late-March shipments (mostly for NVIDIA's new GPU called H200), in our view. Since the mainstream model of H200 uses 141GB vs a year ago 80GB/H100, per-GPU memory content increase should be immediately up 76% YoY. Thus Hynix's HBM bit growth can easily exceed 100% in 2024 if we reflect NVIDIA's double-digit GPU shipment growth. We also believe Hynix's cross-over target (HBM3e exceeds HBM3 volume in 2H24) will be achieved, thanks to 1b capacity expansion. Micron's progress (HBM3e) appears relatively outstanding (vs Samsung Electronics), according to a recent press release (see our report), but AI server supply chain companies seem to be expecting only small volume in 2Q24. Since Hynix's HBM production capacity is already fully booked for 2024 (mostly for NVIDIA), other chipmakers could gain market shares (2H-centric) without hurting Hynix. This suggests US\$1-2bn incremental market size vs our current 2024 estimate (US\$10bn).

Nanya Tech's Feb sales +51% YoY even with legacy DRAM

Nanya Tech does not fabricate HBM. Also, its DDR5 production is almost nil YTD. That said, Nanya Tech's Feb sales posted 51% increase YoY. We believe this is mostly driven commodity/legacy DRAM (DDR3/4) driven price hike. Nanya Tech should benefit continuously from the big-3 players' capacity shift from DDR to HBM.

NAND spot-price rally notable this week vs stable DRAM

NAND spot price firmly rebounded this week (+4% for 512Gb). This was mostly driven by module makers' rising concern on 2H supply shortage (chipmakers' low yield at 200+ layers NAND). Commodity DRAM spot price remained flat this week, but we still see 5%+ upside in Mar-Apr due to low utilization among old DDR4 fabs.

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Timestamp: 07 March 2024 06:45AM EST

07 March 2024

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Exhibit 1: Spot-market prices

NAND spot rally notable vs stable DRAM

US\$	Current	WoW	QoQ	YoY
DRAM spot				
16Gb DDR5	4.7	0%	11%	10%
16Gb DDR4	3.7	0%	11%	3%
8Gb DDR4	1.9	0%	12%	12%
NAND spot				
512Gb wafer	3.6	4%	25%	109%
256Gb wafer	1.8	4%	28%	82%
LCD street				
65" LCD	168	1%	2%	47%
55" LCD	125	1%	2%	47%
14" LCD	27	0%	0%	1%

Source: DRAMeXchange, WitsView, BofA Global Research

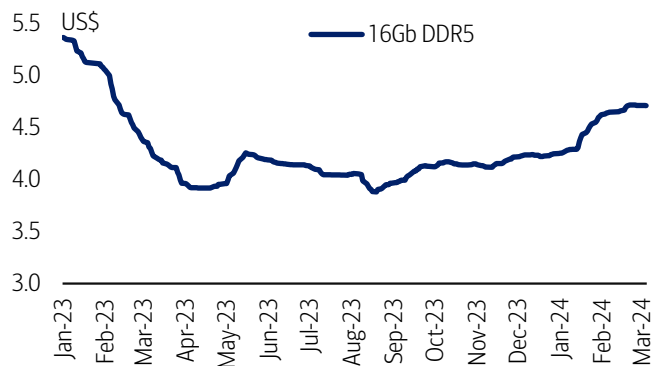
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DRAM: Dynamic random-access memory
DDR4/5: 4th/5th gen double-data rate DRAM
HBM: High bandwidth memory using DRAM
HBM3/3e: 4th/5th gen HBM
GPU: Graphics processing unit
H200: Hopper 200
GH200: Grace hopper 200
MR-MUF: Mass reflow molded underfill
NAND: Not-AND memory

Charts that we use for our Weekly

Exhibit 2: 16Gb DDR5 spot price - daily

Broadly stable as of early Mar vs Jan/Feb rebound; 5%+ upside still seen for the rest of March and April (supply cut driven likely)

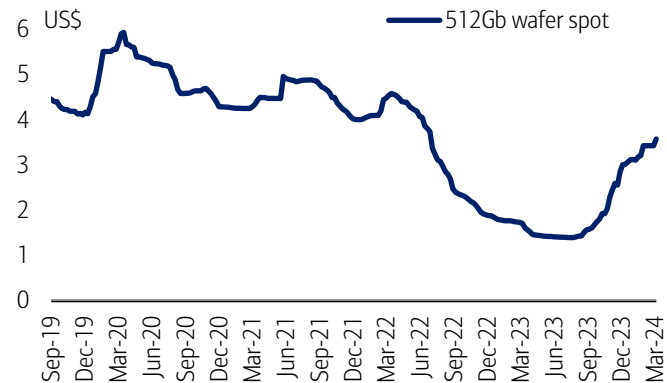


Source: DRAMeXchange, BofA Global Research

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Exhibit 3: 512Gb NAND wafer spot price - weekly

NAND spot rally continued into early March – also supply cut driven

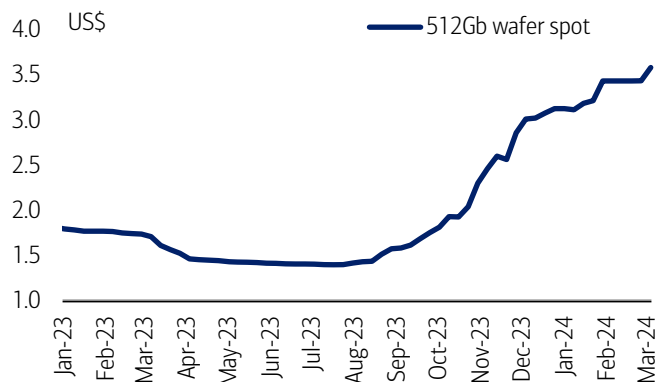


Source: DRAMeXchange, BofA Global Research

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Exhibit 4: NAND wafer spot from Jan 2023 to Feb 2024

NAND spot rally more notable in early March vs Feb

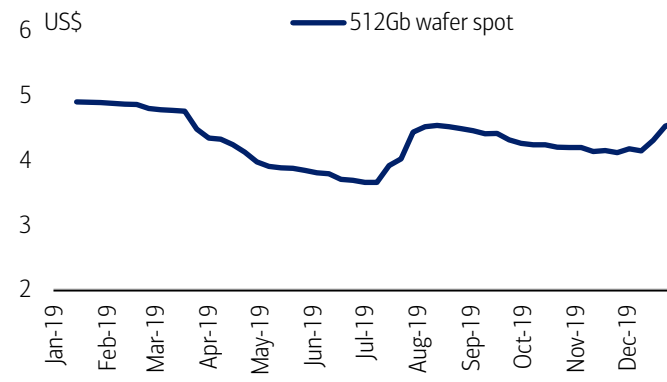


Source: DRAMeXchange, BofA Global Research

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Exhibit 5: NAND spot price comparison with 2019 turnaround period

2019 NAND spot rally was relatively limited versus 2H23/1Q24 upturn

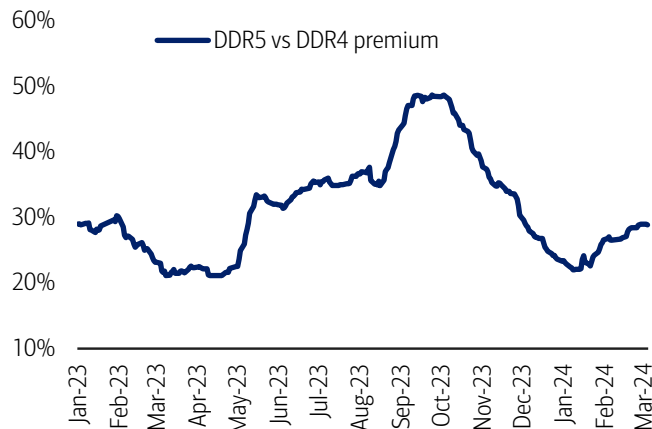


Source: DRAMeXchange, BofA Global Research

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Exhibit 6: DDR5 spot-price premium versus DDR4

Back to 30% price premium but downside seen due to DDR4 shortage

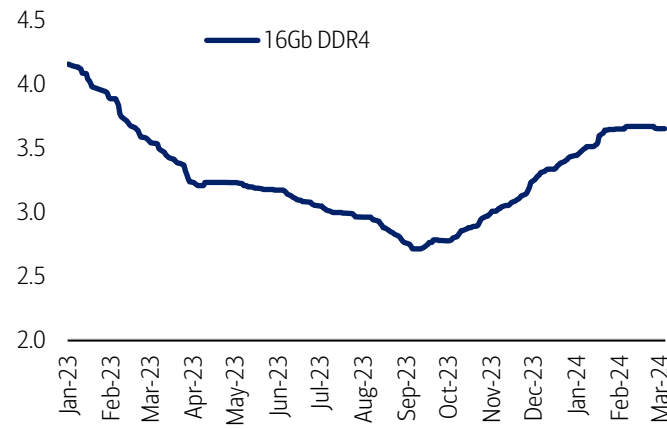


Source: DRAMeXchange, BofA Global Research

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Exhibit 7: 16Gb DDR4 spot price trend

Legacy DDR4 price remained flat in Mar but upside still seen

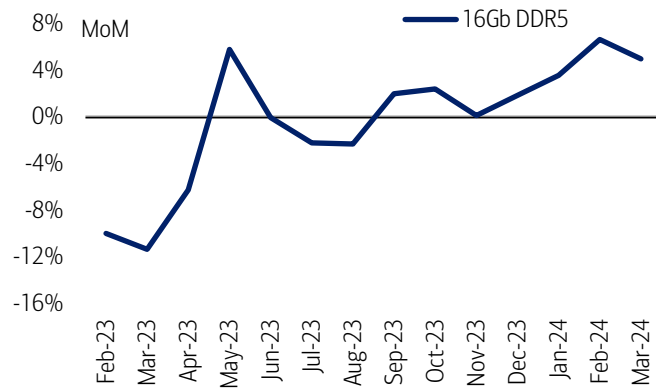


Source: DRAMeXchange, BofA Global Research

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Exhibit 8: 16Gb DDR5 spot month-average price – MoM change

March spot price likely up 5% MoM – similar to Jan-Feb (4-7%) or better compared to 2H23 average

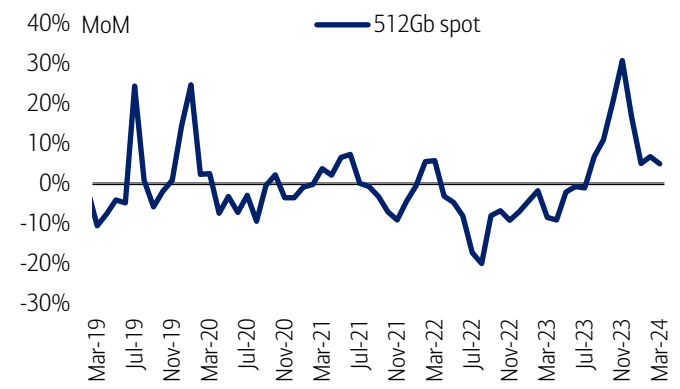


Source: DRAmExchange, BofA Global Research

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Exhibit 9: 512Gb NAND wafer spot month-average – MoM change

NAND spot rally continues into Jan/Feb/Mar (+5% MoM) even after Nov-Dec upturn (15-30% MoM)

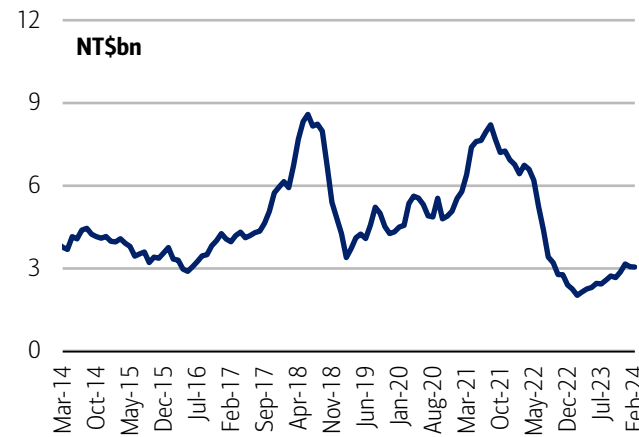


Source: DRAmExchange, BofA Global Research

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Exhibit 10: Nanya Tech – Monthly sales

Feb-24 monthly sales were NT\$3bn vs a year ago NT\$2bn

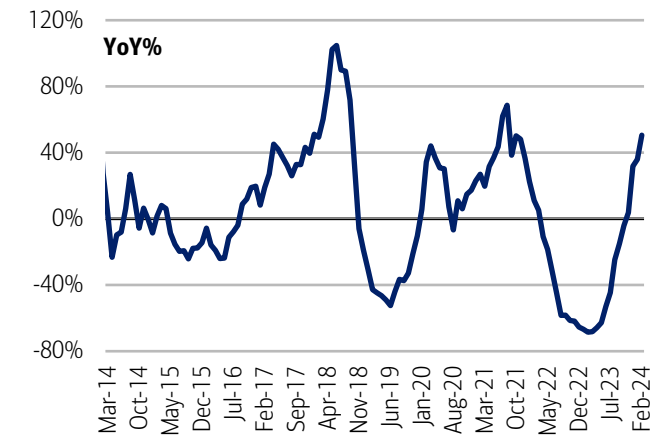


Source: Company, BofA Global Research

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Exhibit 11: Nanya Tech – Monthly sales YoY

YoY growth accelerated to 51% in Feb – close to upcycle growth

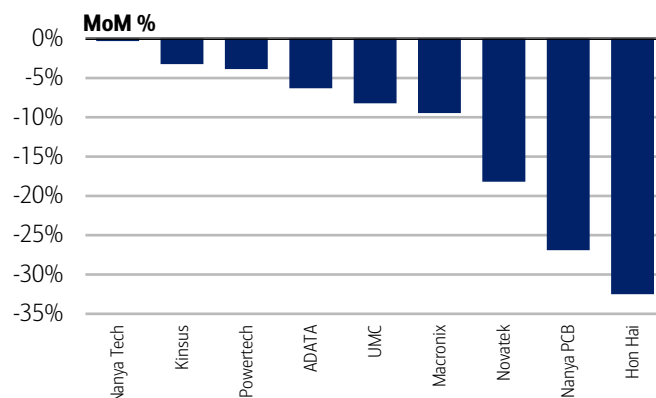


Source: Company, BofA Global Research

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Exhibit 12: Taiwan tech companies – Feb sales MoM

Tech companies' Feb sales mostly down MoM due to the holiday season

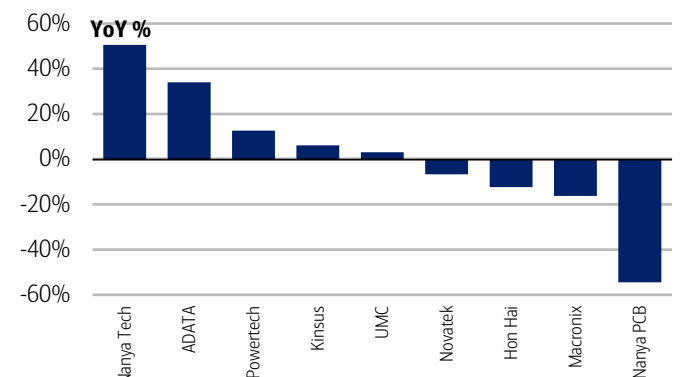


Source: Companies, BofA Global Research

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Exhibit 13: Taiwan tech companies – Feb sales YoY

Memory supply chain companies (Nanya Tech, ADATA, Powertech) reported YoY growth while Hon Hai, Macronix, Nanya PCB Feb sales down YoY

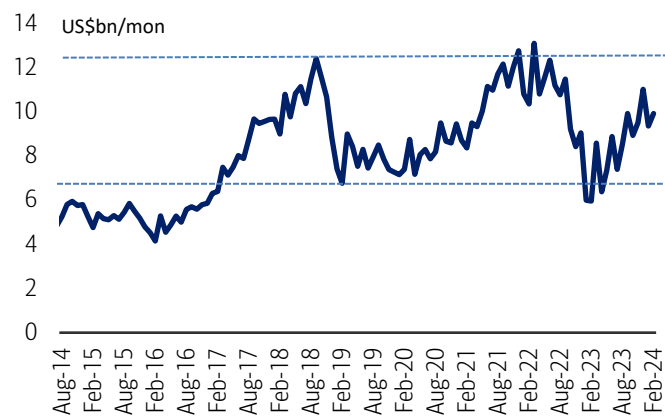


Source: Companies, BofA Global Research

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Exhibit 14: Korea semis exports – US\$bn monthly

Back to near US\$10bn in Feb-24 (US\$9.9bn; +6% MoM) vs a year ago bottom at US\$6bn; mostly driven HBM and DDR5

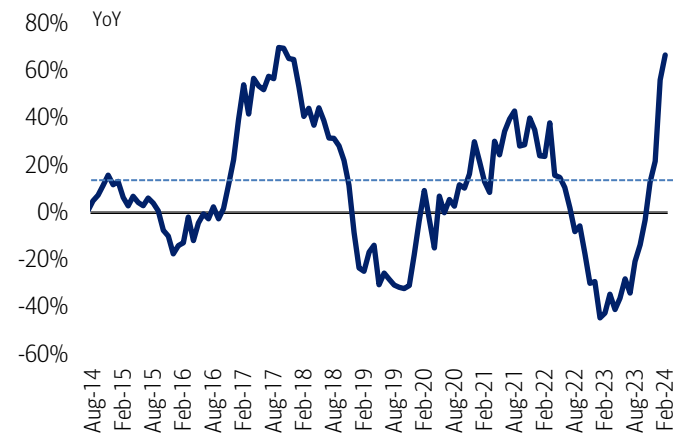


Source: MoTIE, BofA Global Research

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Exhibit 15: Korea semis exports – YoY change in monthly US\$bn

Even higher YoY recovery seen in Feb (+67%) vs 2017 peak (+65%)

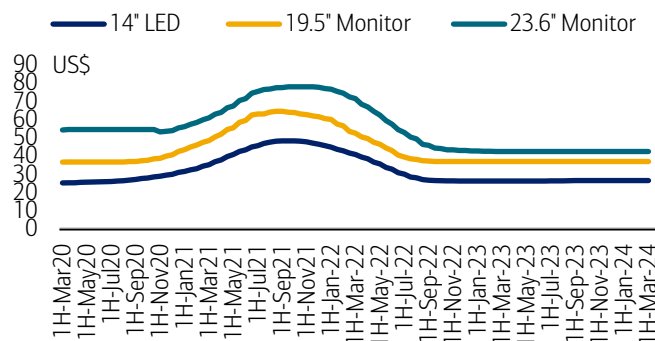


Source: MoTIE, BofA Global Research

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Exhibit 16: IT panel price trend – US\$/panel

IT panel prices remained flat; no recovery even as of early Mar-24



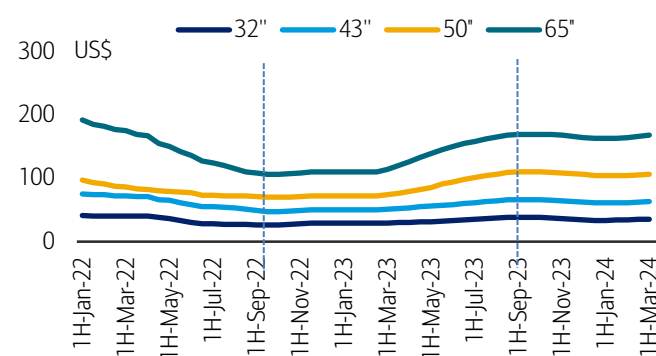
Panel price update from WitsView as of 5 Mar 2024

Source: WitsView, BofA Global Research

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Exhibit 17: TV panel price trend – US\$/panel

TV panel price slightly recovered in Feb/1H-Mar vs Jan (flat) and Oct-Dec (slightly down)



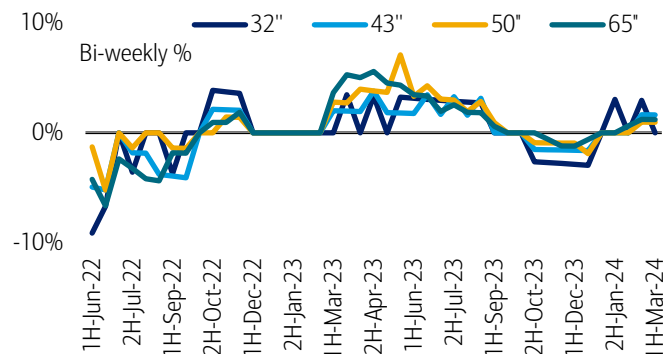
Panel price update from WitsView as of 5 Mar 2024

Source: WitsView, BofA Global Research

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Exhibit 18: LCD TV panel price trend (bi-weekly sequential)

Slightly recovered in 2H-Jan/Feb/1H-Mar vs correction period (4Q23, Jan-24); previous price rebound period was Mar-Sept 2023



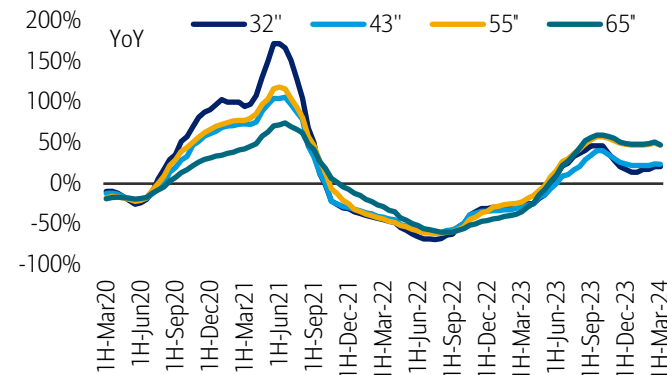
Panel price update from WitsView as of 5 Mar 2024

Source: WitsView, BofA Global Research

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Exhibit 19: LCD TV panel price trend (YoY)

Current prices still slightly higher than year ago but upside still low



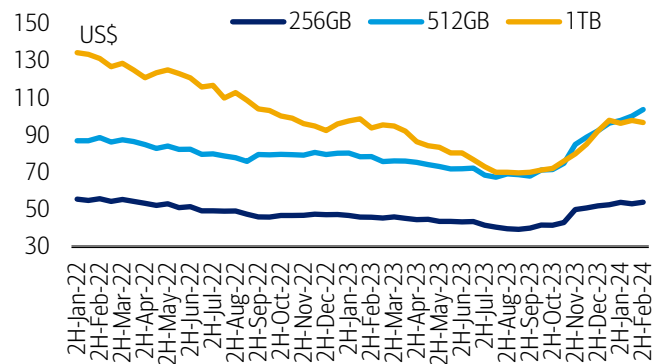
Panel price update from WitsView as of 5 Mar 2024

Source: WitsView, BofA Global Research

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Exhibit 20: Solid-state drive (SSD) price trend

SSD price recovery continued through 4Q23 and Jan-Feb



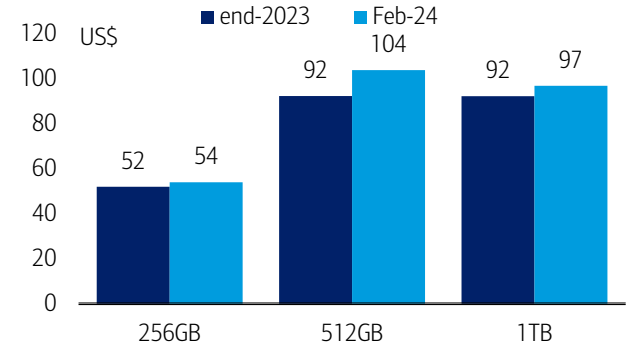
Note: SSD prices are as of 28 Feb 2024, reported by DRAMeXchange. TB = terabyte.

Source: DRAMeXchange, BofA Global Research

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Exhibit 21: SSD price comparison – current versus end-2023

SSD product price also shows gradual recovery YTD



Note: SSD prices are as of 28 Feb 2024, reported by DRAMeXchange

Source: DRAMeXchange, BofA Global Research

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Exhibit 22: Valuation comparison among memory stocks

SK Hynix resumed its rally; mostly HBM3e (for NVIDIA's new GPUs) driven – re-rating at 2x P/B possible

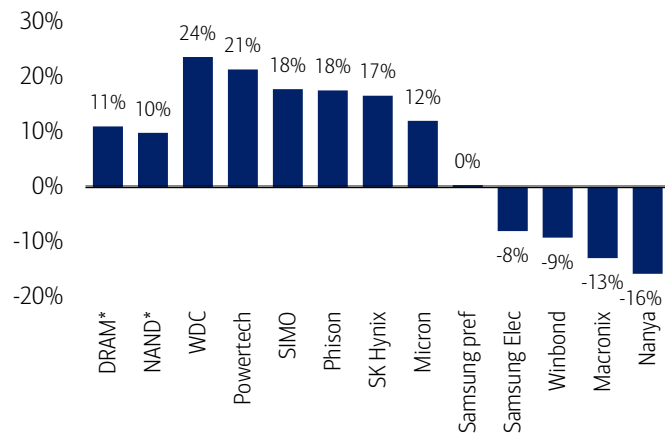
	Ticker	Rating	Price (Local)	Mcap (\$bn)	P/E FY23E	P/E FY24E	P/E FY25E	P/Book FY23E	P/Book FY24E	P/Book FY25E	EV/EBITDA FY23E	EV/EBITDA FY24E	EV/Sales FY23E	EV/Sales FY24E	ROE FY23E	ROE FY24E	ROE FY25E	Div. yield FY23E	Div. yield FY24E
Samsung Elec	SSNLF	A-1-7	72,200	323.0	33.9	18.2	10.4	1.4	1.3	1.2	9.4	5.9	1.6	1.5	4.1%	7.4%	11.9%	2.0%	2.0%
Samsung Pref	SSNNF	A-1-7	62,500	38.5	29.3	15.7	9.0	1.2	1.1	1.0	9.4	5.9	1.6	1.5	4.1%	7.4%	11.9%	2.3%	2.3%
SK Hynix	HXSCF	B-1-8	164,900	90.0	NM	15.7	8.8	2.2	2.0	1.7	25.9	6.2	4.3	2.7	-15.6%	13.1%	20.0%	0.7%	0.7%
Micron	MU	B-1-7	95.56	105.5	NM	NM	16.1	2.4	2.4	2.1	38.6	19.7	7.3	5.0	-10.3%	-1.3%	14.1%	0.5%	0.5%
Nanya	NNYAF	B-1-9	65.70	6.4	NM	132.6	16.2	1.2	1.2	1.1	165.8	9.6	5.0	2.8	-4.3%	0.9%	7.2%	0.0%	0.0%
Winbond	WBEKF	B-1-8	27.65	3.7	NM	29.3	8.6	1.3	1.2	1.1	14.7	8.4	2.0	1.6	-1.2%	4.0%	12.6%	0.0%	1.1%
Macronix	MXICF	B-2-8	27.30	1.6	NM	NM	17.8	1.0	1.1	1.0	35.0	28.7	2.3	2.2	-3.4%	-3.8%	6.0%	0.0%	0.7%
Powertech	XPPZF	B-2-8	171.00	4.1	16.0	16.7	14.7	2.4	2.2	2.0	6.4	5.5	2.0	1.8	14.9%	13.2%	13.8%	4.1%	4.1%
Silicon Motion	SIMO	B-1-7	72.12	2.4	45.8	23.6	21.7	3.2	3.1	2.9	33.8	15.0	3.3	2.5	7.2%	13.6%	14.1%	0.7%	2.8%
Phison	PISNF	B-3-8	611.00	4.0	46.6	34.1	27.0	2.9	2.8	2.7	24.2	19.9	2.4	2.0	6.7%	8.6%	10.4%	1.5%	1.6%
Western Digital	WDC	C-1-9	64.70	21.1	NM	NM	9.4	1.8	1.9	1.6	115.5	23.7	2.2	2.1	-9.5%	-3.1%	18.8%	0.0%	0.0%

Source: Company reports, BofA Global Research estimates; Mcap = market capitalization, ROE = return on equity, Div = dividend.

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Exhibit 23: Share-price performance – 2024 YTD (current vs end-2023)

Hynix and NAND stocks outperformed Samsung and legacy chip suppliers



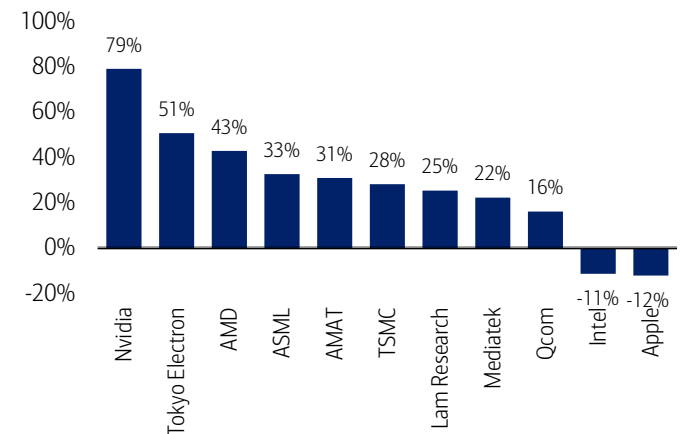
*DRAM: 16Gb DDR5; NAND: 512Gb wafer

Source: Bloomberg, DRAMeXchange

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Exhibit 24: Share-price performance – 2024 YTD (current vs end-2023)

AI thematic and semis equipment stock rally continued YTD



Source: Bloomberg, DRAMeXchange

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