

## Memory sector

### Tightening consumer DRAM supply

#### Overweight • Maintained

##### Key message

1. We project further price hikes of a respective 10%, 10% and 15% in 2Q-4Q24F for 4Gb DDR3, driven by the seven catalysts outlined below.
2. We forecast 2024F global consumer DRAM capacity to reach 183k pieces/month, up by only 3% from 2023, indicating tightening supply.
3. We are upbeat on the earnings outlook and share valuations of Taiwanese DRAM makers, which will be boosted by tightening consumer DRAM supply.

##### Event

The 4Gb DDR3 contract price rose 7% in 4Q23 and is up 10% in 1Q24F. We project further price hikes of a respective 10%, 10% and 15% in 2Q-4Q24F, driven by the seven catalysts outlined below. We forecast 2024F global consumer DRAM capacity to reach 183k pieces/month, up by only 3% from 2023, indicating tightening supply.

##### Impact

**1. China spurs demand with networking tender projects.** To stimulate the economy, the Chinese government has released smart home network equipment procurement tenders at a faster pace starting January, driving up demand for DRAM equipped with passive optical networks (PON).

**2. Global TV demand to recover in 2H24F.** Global TV manufacturers have kicked off a second round of production cuts in 4Q23-1Q24F as prices have dipped below cash cost, capping DRAM demand for TV set-top box (STB). We believe TV manufacturers will increase capacity utilization starting 2H24F as price hikes resume, boosting STB demand recovery.

**3. Destocking by Taiwanese DRAM makers.** Nanya Technology (2408 TT, NT\$65.9, OP) and ESMT (3006 TT, NT\$93.0, NR) have raised DRAM prices by just around 5% in 4Q23-1Q24F, while Winbond (2344 TT, NT\$27.15, OP) has implemented a price-freeze measure. Hence, Taiwanese manufacturers are lagging behind global DRAM leaders in terms of price hikes, resulting in destocking.

**4. Capacity shift at Winbond's Taichung fab.** Winbond's 25S node DRAM capacity at the Kaohsiung fab reached 10k pieces per month in 2Q23 after ramping up in 3Q22, resulting in supply pressure for the sector. Since 4Q23, the Taichung fab has shifted some DRAM production capacity to NOR Flash, offsetting capacity growth at the Kaohsiung fab. Winbond's overall DRAM capacity reached 24k pieces/month in 4Q23 after peaking in 3Q23 (27k pieces/month). Therefore, the company's bit supply can be expanded only by raising 20nm capacity to 10k pieces/month.

**5. SK Hynix (KR) focused on high-density DRAM market.** SK Hynix's Wuxi (China) fab has been unable to purchase EUV equipment under US curbs, hindering production of 1alpha node. Therefore, in 2Q23, the company deferred the end of life (EOL) of 21nm node-manufactured 4Gb DDR3 and DDR4 products in order to destock capacity at the Wuxi fab. We note that the Wuxi fab now plans to develop 1alpha node design and can therefore aggressively migrate to 1alpha node and focus on the high-density DRAM consumer market (above 8Gb), easing supply pressure in the mid- to low-density consumer market (below 8Gb).

**6. Spillover effect from tightening supply of bulk DRAM.** To produce leading-edge products such as DDR5 and HBM, leading DRAM manufacturers are accelerating node migration from mature nodes such as 20nm, 1x and 1y to advanced nodes including 1z, 1alpha and 1beta, lowering the production of consumer DRAM adopting mature nodes.

**7. DDR4 price hikes exceed those of DDR5.** As the gross margin of DDR5 is higher than those of DDR4 and DDR3, starting 1Q24F leading manufacturers have increased price hikes on DDR4 contract prices to above those on DDR5, and narrowed the price premium of PC DDR5 from 26% (versus DDR4) in an effort to boost the PC DDR5 penetration rate (only 23% in 4Q23). We believe DDR4 price hikes bode well for the overall pricing of consumer DRAM.

##### Stocks for Action

We are upbeat on the earnings outlook and share valuations of Taiwanese DRAM makers, which will be boosted by tightening consumer DRAM supply. Our top pick is Winbond, which will commence price hikes in 2Q24F.

##### Risks

Slower-than-expected production node migration; weakening market demand.

Figure 1: Peer comparison – Valuations

Ticker	Company	Revenue contribution of related products(%)	Market cap (US\$m)	Price (NT\$)	Rating	Target price (NT\$)	Upside/downside(%)	EPS (NT\$)			
								2022	2023	2024F	2025F
2408 TT	Nanya Technology	DRAM(100)	6,510	65.90	OP	85	29	4.72	(2.40)	2.68	6.65
2344 TT	Winbond	DRAM(19)	3,619	27.15	OP	33	22	3.25	(0.29)	1.25	2.41
3006 TT	ESMT	DRAM(55)	849	93.00	NR	N.A.	N.A.	0.13	(0.09)	0.07	0.27

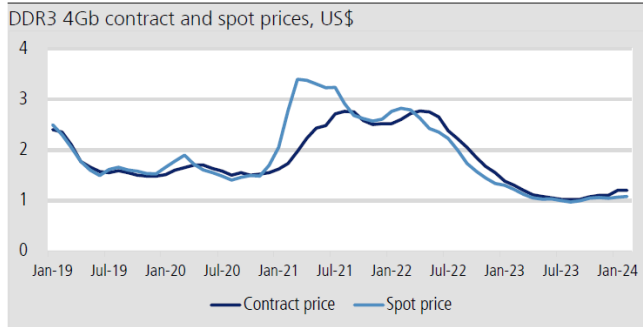
Source: Bloomberg ; KGI Research

Figure 2: Breakdown of DRAM supply, demand, &amp; pricing outlooks

%	2023				2024				2022	2023	2024
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q			
DRAM											
Bit supply growth									19	(4)	17
Wafer output YoY growth									7	(14)	16
Wafer output QoQ/YoY growth (kwpm)	(84)	(201)	(20)	65	86	86	119	88	98	(230)	221
Bit demand growth									12	8	15
Sufficiency rate	113	104	88	83	92	94	100	104	108	96	98
DDR4 8Gb contract price QoQ growth	(18)	(22)	(6)	19	17	5	10	15			

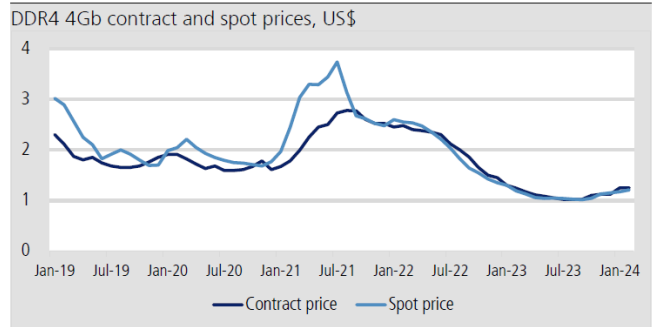
Source: TrendForce; KGI Research

Figure 3: Consumer DRAM price hikes sustained



Source: TrendForce; KGI Research

Figure 4: Consumer DRAM price hikes sustained



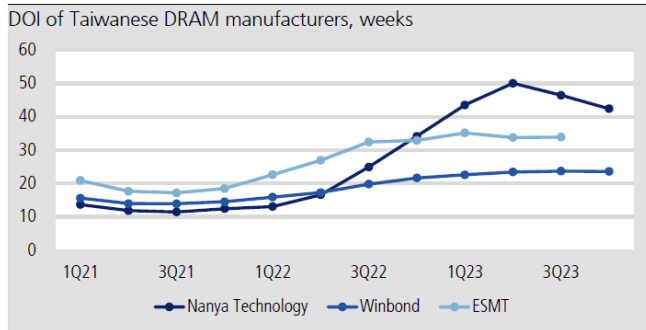
Source: TrendForce; KGI Research

Figure 5: 2019-25F consumer DRAM supply outlook

Company	Fab	Location	Consumer DRAM wafer start (k wafer/month)						
			2019	2020	2021	2022	2023	2024	2025
Samsung	Line13	Hwaseong, Gyeonggi-do, South Korea	99	78	68	63	39	26	15
SK Hynix	M10	Icheon, Gyeonggi-do, South Korea	63	28	15	8	3	3	0
	C2	Wuxi, Jiangsu, China	14	15	17	19	15	20	25
Micron	Dominion Fab6	Manassas, Virginia, U.S	18	18	18	18	18	18	18
Nanya	Fab 3A	Linko, Tao Yuan, Taiwan	43	42	50	48	38	40	42
PSMC	Fab P3	Hsinchu, Taiwan	49	44	47	43	27	38	35
Winbond	Fab6	Taichung, Taiwan	27	27	26	21	24	24	30
CXMT	Fab 1	Hefei, Anhui, China	0	0	0	0	15	15	15
<b>Worldwide supply</b>			<b>310</b>	<b>251</b>	<b>240</b>	<b>218</b>	<b>178</b>	<b>183</b>	<b>180</b>
<b>YoY growth (%)</b>				<b>(19)</b>	<b>(4)</b>	<b>(9)</b>	<b>(18)</b>	<b>3</b>	<b>(2)</b>

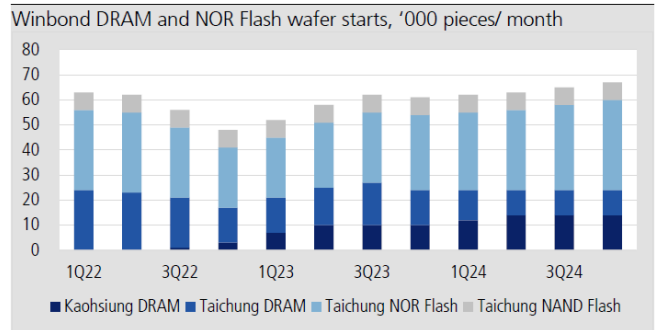
Source: TrendForce; KGI Research

**Figure 6: Inventory level of Taiwanese DRAM manufacturers was high in 3Q-4Q23, but will be largely destocked starting 2Q24F**



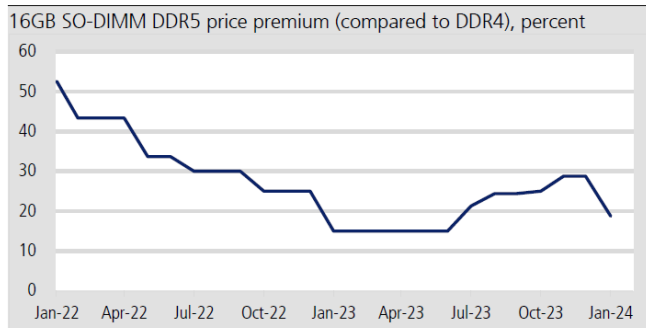
Source: KGI Research

**Figure 7: Winbond's Taichung plant shifted some DRAM capacity to NOR Flash starting 4Q23, easing consumer DRAM supply pressure**



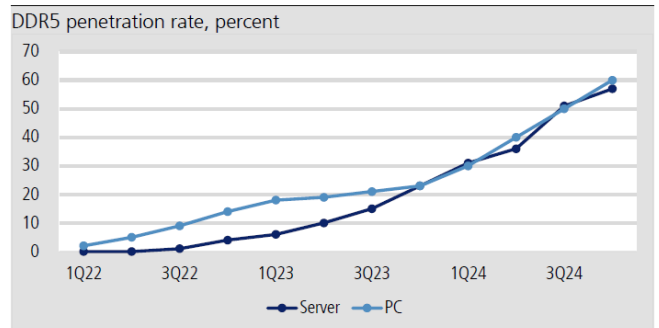
Source: TrendForce; KGI Research

**Figure 8: PC DDR5 price premium remains high**



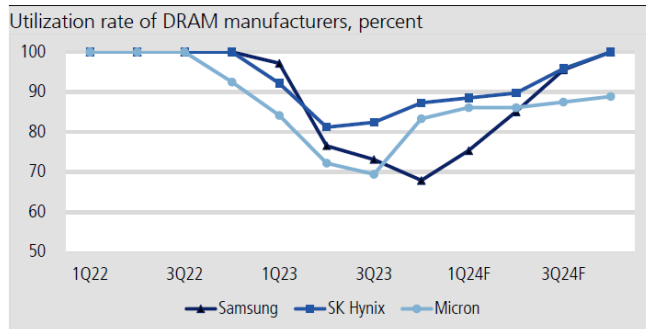
Source: TrendForce; KGI Research

**Figure 9: DDR5 penetration uptrend capped by PC DDR5 price premium**



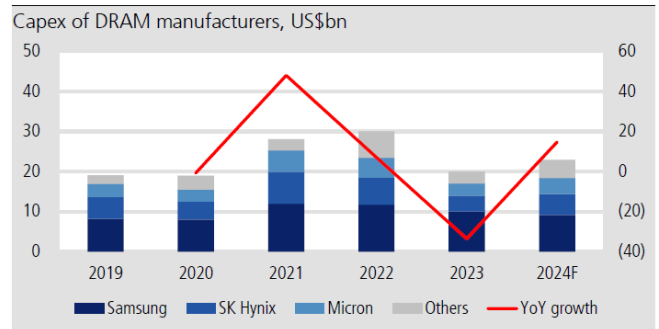
Source: TrendForce; KGI Research

**Figure 10: Micron, SK Hynix & Samsung reduced production cuts in 4Q23, 4Q23 & 1Q24F, respectively**

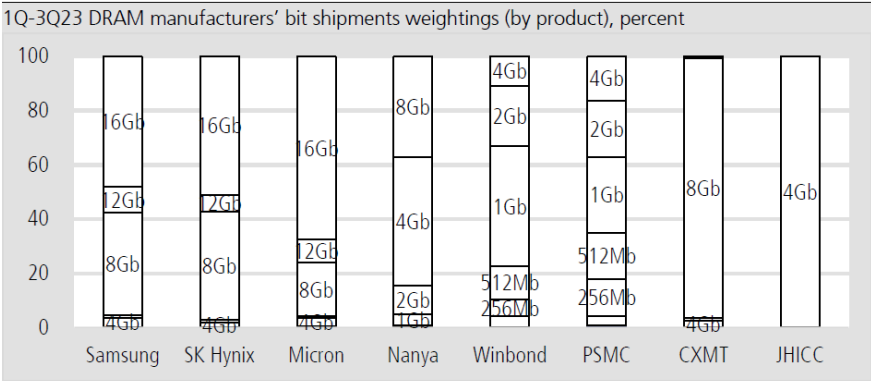


Source: TrendForce; KGI Research

**Figure 11: Micron & SK Hynix have revised up 2024F capex to 30% YoY increase**



Source: TrendForce; KGI Research

**Figure 12: Among Taiwanese manufacturers, Winbond focuses on products below 4Gb, while Nanya Technology concentrates on products above 4Gb**


Source: TrendForce; KGI Research

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