

Global Semiconductors

Dec'23 SIA: Strong semis growth rounds out a down year

Industry Overview

December semi & core semis sales up +19%/13% YoY

December semis sales finished **up 19.4% YoY**, making it the fourth consecutive month of positive semis growth since June of CY22. Core-semis (ex-memory) sales were **up 12.7% YoY**, showing positive YoY growth in core-semis for the fifth consecutive month. Key takeaways from the December data on a one-month basis: **1) Semis/core-semis were positive sequentially**, at **+8.2%/+0.5% MoM**, finishing 75bps above and 24bps below seasonal, **2) MoM core-semis performance was driven by Discretes**, the strongest core segment growing +20.2% MoM, offset by Logic, the only negative core segment down -2.3% MoM, **3) Memory sales grew in December**, up 36.3% MoM, with DRAM +53.8% MoM and NAND +13.7% MoM, **4) All regions except Japan grew MoM**, with Japan down -2.5% MoM, and China strongest (+12.5% MoM) followed by Europe +10.7% MoM.

Full-year 2023 Summary: the downcycle appears

2023 semis/core-semis fell -8.2%/-2.4% YoY, with strongest growth in Std Cells, PLDs (+16.8% YoY) and weakest performance in MPUs (-10.9% YoY). Memory sales fell -28.9% YoY, with DRAM down -33.2% YoY and NAND down -23.3% YoY. This marks the first year of negative semis growth since 2019's downcycle, and marks a steep drop-off from 2021's high growth of +26.2%/+26.8% YoY semis/core-semis. In 2023 China was the weakest geo, declining -14.0% YoY. Americas falls -5.2% YoY, while Europe was the only region to grow during the year, +4.1% YoY.

3mma semis/core semis YoY sales grow double-digits

On a 3mma basis: 1) December semi sales grew +1.5% MoM, down slightly from +2.9% MoM growth in Nov, yet boosted by Logic (+1.3% MoM), 2) Core-semis sales (ex-memory) grew +0.3% MoM (vs +2.0% MoM in Nov), while core-semis units fell -1.0% MoM, 3) 3mma semis/core semis sales at +11.9%/+10.5% YoY were positive, 4) 3mma semis/core-semi ASPs remained positive MoM (+3.0%/+1.3%), driven by strong Std Cell, PLDs ASPs (up +2.3% MoM) and Logic (up 2.1% MoM).

December Logic strongest, MCUs weakest (3mma)

On a 3mma basis: Logic sales finished up 1.3% MoM in December (161bps above seasonal), while MCUs were down -4.4% MoM, (-192bps seasonally) on weak units (-134bps seasonally). On the memory side, DRAM/NAND sales finished up +8.6%/7.3% MoM, (1380bps/1177bps above seasonal).

China strongest seasonally, Europe weakest (3mma)

On a 3mma basis: China region was strongest seasonally (873bps vs seasonally) growing 4.9% MoM, while Europe (167bps below seasonal) and Japan (128bps below seasonal) were the weakest seasonally, falling -3.6%/-2.2% MoM. Americas were 501bps above seasonality, with +2.0% MoM growth.

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Exhibit 1: 3mma revenue data

Semis sales down -10.6% YTD

3mma revs	MoM	YoY	YTD
Semiconductors	1.5%	11.9%	-8.2%
Discretes	-2.0%	-1.2%	4.2%
Analog	-0.8%	-6.3%	-8.8%
Microprocessors	0.9%	19.5%	-10.9%
Microcontrollers	-4.4%	-1.6%	11.3%
Std Cells, PLDs	-4.0%	-4.8%	16.8%
Logic	1.3%	19.1%	1.4%
Memory	7.7%	31.4%	-28.9%
DRAM	8.6%	36.5%	-33.2%
NAND	7.3%	29.8%	-23.3%
Total IC's	2.0%	14.9%	-9.6%
IC's ex-memory	0.3%	10.5%	-2.4%

Source: SIA, BofA Global Research

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See page 13 for abbreviations

December SIA review

Seasonality

- **3mma.** Total semiconductor sales were up 1.5% MoM, roughly 366bps above seasonal trends, with unit weakness weighing on growth (109bps below seasonal).

Exhibit 2: December revenues, units, ASP vs seasonality

Total semiconductor sales were up 1.5% MoM, 366bps above seasonal trends.

	Seasonal delta			Seasonal			Dec-23		
	Units	ASPs	Revenue	Units	ASPs	Revenue	Units	ASPs	Revenue
Semiconductors	109	261	366	-2.5%	0.4%	-2.1%	-1.4%	3.0%	1.5%
Discretes	79	-30	53	-3.4%	0.9%	-2.6%	-2.6%	0.6%	-2.0%
Analog	126	-66	63	-1.9%	0.5%	-1.5%	-0.6%	-0.2%	-0.8%
Microprocessors	6	46	59	-0.2%	0.6%	0.3%	-0.2%	1.0%	0.9%
Microcontrollers	-134	-70	-192	-3.1%	0.7%	-2.5%	-4.4%	0.0%	-4.4%
Std Cells, PLDs	-556	283	-247	-0.6%	-0.5%	-1.6%	-6.2%	2.3%	-4.0%
Logic	172	-18	161	-2.5%	2.3%	-0.3%	-0.7%	2.1%	1.3%
Memory	384	887	1267	-3.0%	-2.1%	-5.0%	0.9%	6.7%	7.7%
DRAM	200	1197	1380	-3.2%	-2.0%	-5.2%	-1.2%	9.9%	8.6%
NAND	465	711	1177	-3.0%	-1.6%	-4.5%	1.7%	5.5%	7.3%
Total IC's	154	249	402	-2.3%	0.3%	-2.0%	-0.7%	2.8%	2.0%
IC's ex-memory	115	-25	93	-2.2%	1.6%	-0.6%	-1.0%	1.3%	0.3%

Source: SIA, BofA Global Research

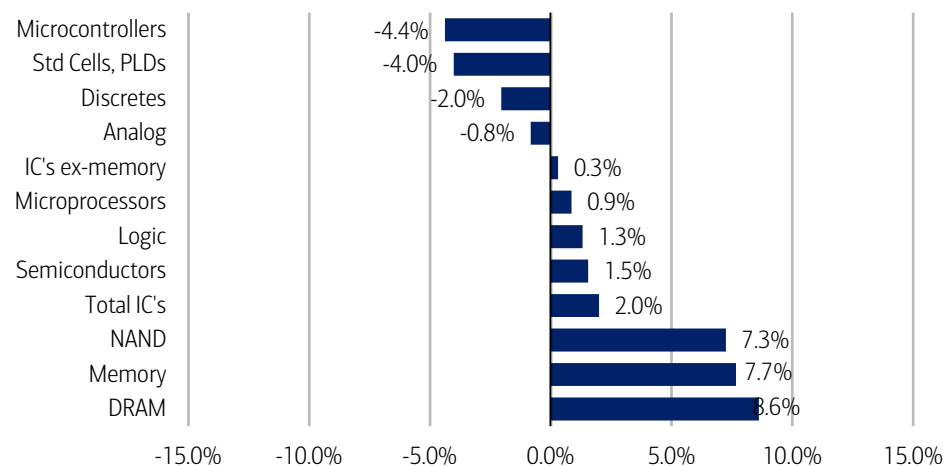
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Industry revenue trends

- **3mma.** DRAM revenue grew the most MoM (up 8.6%) while MCUs sales declined the most (down 4.4% MoM).

Exhibit 3: December (3mma) MoM% revenue growth by product

DRAM was the strongest performer on a 3mma basis

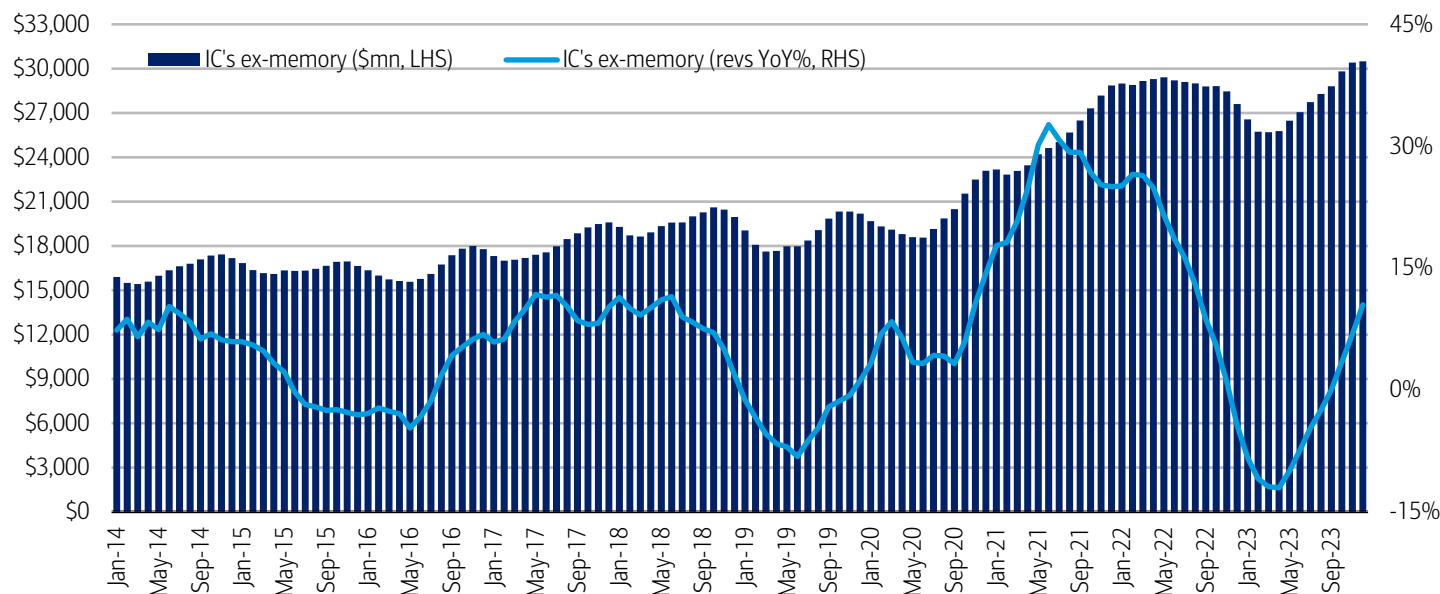


Source: SIA, BofA Global Research

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Exhibit 4: ICs ex-memory single-month revenue trends over the past 10 years

IC ex-memory sales were up 10.5% YoY (3mma)



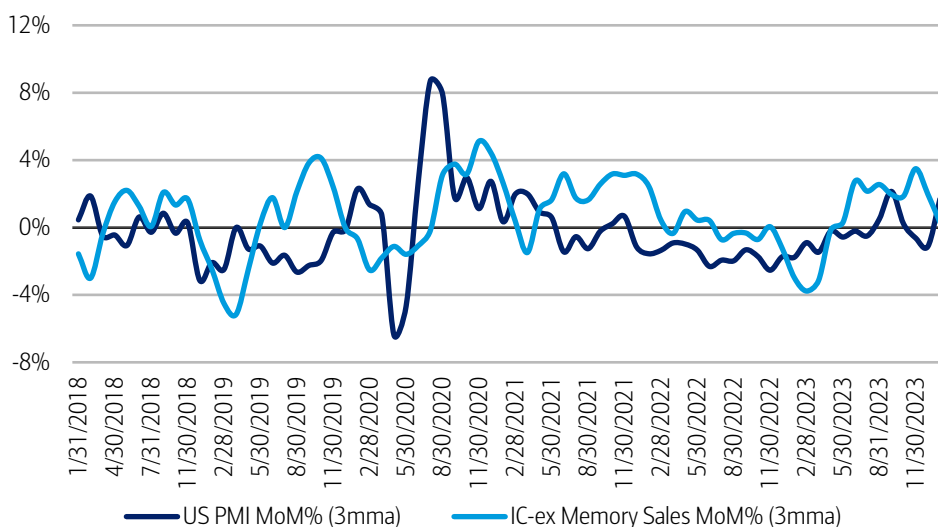
Source: SIA, BofA Global Research

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- The US ISM index has been a consistent indicator of global IC demand momentum. Since mid-2015, turns in the US PMI index have preceded accelerations/decelerations in IC ex-memory MoM growth by two to three months.

Exhibit 5: US ISM's PMI index MoM% vs. IC ex-memory sales MoM% (3mma)

Typically, turns in the US PMI index have preceded accelerations/decelerations in IC ex-memory MoM growth by 2-3 months



Source: BofA Global Research, ISM

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Exhibit 6: 3mma revenue summary (LTM)

Semis/core semis sales grew 11.9%/10.5% YoY on a 3mma basis

3mma Revs (\$mn)	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Semiconductors	\$43,472	\$41,290	\$39,660	\$39,832	\$40,098	\$41,182	\$42,233	\$43,224	\$44,041	\$44,886	\$46,590	\$47,918	\$48,659
Discretes	\$2,846	\$2,812	\$2,874	\$2,973	\$3,018	\$2,999	\$2,994	\$2,997	\$3,009	\$3,043	\$2,970	\$2,870	\$2,811
Analog	\$7,342	\$6,992	\$6,808	\$6,753	\$6,769	\$6,754	\$6,600	\$6,660	\$6,735	\$6,817	\$6,890	\$6,937	\$6,880
Microprocessors	\$3,847	\$3,468	\$3,153	\$3,031	\$3,067	\$3,236	\$3,417	\$3,661	\$3,817	\$4,115	\$4,359	\$4,558	\$4,597
Microcontrollers	\$2,168	\$2,245	\$2,298	\$2,355	\$2,358	\$2,331	\$2,378	\$2,364	\$2,444	\$2,419	\$2,368	\$2,233	\$2,135
Std Cells, PLDs	\$2,100	\$2,137	\$2,184	\$2,240	\$2,258	\$2,322	\$2,385	\$2,350	\$2,296	\$2,223	\$2,169	\$2,084	\$2,000
Logic	\$13,976	\$13,603	\$13,220	\$13,295	\$13,316	\$13,889	\$14,370	\$14,751	\$14,999	\$15,189	\$15,950	\$16,427	\$16,643
Memory	\$7,448	\$6,549	\$5,792	\$5,869	\$6,138	\$6,655	\$7,281	\$7,529	\$7,608	\$7,830	\$8,339	\$9,093	\$9,790
DRAM	\$4,243	\$3,780	\$3,374	\$3,337	\$3,327	\$3,476	\$3,764	\$3,938	\$3,957	\$4,420	\$4,746	\$5,335	\$5,794
NAND	\$2,809	\$2,402	\$2,072	\$2,176	\$2,455	\$2,825	\$3,173	\$3,252	\$3,291	\$3,037	\$3,216	\$3,401	\$3,647
Total IC's	\$35,055	\$33,115	\$31,526	\$31,562	\$31,908	\$33,133	\$34,329	\$35,268	\$35,892	\$36,640	\$38,155	\$39,499	\$40,288
IC's ex-memory	\$27,607	\$26,566	\$25,734	\$25,693	\$25,769	\$26,479	\$27,049	\$27,739	\$28,284	\$28,811	\$29,816	\$30,405	\$30,498
3mma MoM%													
Semiconductors	-4.4%	-5.0%	-3.9%	0.4%	0.7%	2.7%	2.6%	2.3%	1.9%	1.9%	3.8%	2.9%	1.5%
Discretes	-0.8%	-1.2%	2.2%	3.4%	1.5%	-0.6%	-0.2%	0.1%	0.4%	1.1%	-2.4%	-3.4%	-2.0%
Analog	-2.1%	-4.8%	-2.6%	-0.8%	0.2%	-0.2%	-2.3%	0.9%	1.1%	1.2%	1.1%	0.7%	-0.8%
Microprocessors	-5.9%	-9.8%	-9.1%	-3.9%	1.2%	5.5%	5.6%	7.1%	4.3%	7.8%	5.9%	4.6%	0.9%
Microcontrollers	0.8%	3.5%	2.4%	2.5%	0.1%	-1.1%	2.0%	-0.6%	3.4%	-1.0%	-2.1%	-5.7%	-4.4%
Std Cells, PLDs	-0.7%	1.7%	2.2%	2.5%	0.8%	2.9%	2.7%	-1.5%	-2.3%	-3.2%	-2.4%	-4.0%	-4.0%
Logic	-3.3%	-2.7%	-2.8%	0.6%	0.2%	4.3%	3.5%	2.7%	1.7%	1.3%	5.0%	3.0%	1.3%
Memory	-11.6%	-12.1%	-11.6%	1.3%	4.6%	8.4%	9.4%	3.4%	1.0%	2.9%	6.5%	9.0%	7.7%
DRAM	-13.0%	-10.9%	-10.8%	-1.1%	-0.3%	4.5%	8.3%	4.6%	0.5%	11.7%	7.4%	12.4%	8.6%
NAND	-10.4%	-14.5%	-13.8%	5.1%	12.8%	15.1%	12.3%	2.5%	1.2%	-7.7%	5.9%	5.8%	7.3%
Total IC's	-5.0%	-5.5%	-4.8%	0.1%	1.1%	3.8%	3.6%	2.7%	1.8%	2.1%	4.1%	3.5%	2.0%
IC's ex-memory	-3.0%	-3.8%	-3.1%	-0.2%	0.3%	2.8%	2.2%	2.6%	2.0%	1.9%	3.5%	2.0%	0.3%
3mma YoY%													
Semiconductors	-14.5%	-18.6%	-20.7%	-21.3%	-21.3%	-20.3%	-15.8%	-11.8%	-6.8%	-4.5%	-0.6%	5.4%	11.9%
Discretes	7.5%	3.3%	6.9%	8.9%	15.1%	11.7%	7.5%	0.2%	-1.5%	2.2%	1.6%	0.0%	-1.2%
Analog	7.5%	1.2%	-2.1%	-5.3%	-6.0%	-7.7%	-11.5%	-12.9%	-13.5%	-11.9%	-10.6%	-7.5%	-6.3%
Microprocessors	-27.0%	-32.7%	-37.6%	-39.0%	-35.2%	-27.2%	-17.2%	-11.0%	-6.4%	1.1%	6.5%	11.5%	19.5%
Microcontrollers	17.6%	18.6%	18.9%	17.9%	17.3%	15.4%	13.4%	12.1%	14.0%	16.3%	11.7%	3.8%	-1.6%
Std Cells, PLDs	34.2%	36.0%	38.6%	40.7%	36.3%	30.3%	29.9%	23.5%	17.3%	8.5%	3.6%	-1.5%	-4.8%
Logic	-4.8%	-8.0%	-10.1%	-10.2%	-11.7%	-9.6%	-5.8%	-1.4%	1.9%	3.7%	9.0%	13.7%	19.1%
Memory	-45.8%	-51.4%	-56.1%	-56.3%	-55.4%	-53.2%	-43.5%	-34.8%	-21.2%	-17.6%	-10.2%	7.9%	31.4%
DRAM	-48.2%	-52.3%	-56.9%	-58.7%	-59.9%	-59.8%	-51.1%	-43.8%	-32.1%	-25.0%	-14.9%	9.4%	36.5%
NAND	-45.0%	-53.2%	-58.0%	-55.7%	-51.3%	-45.1%	-33.7%	-21.2%	-3.1%	-4.6%	-2.0%	8.5%	29.8%
Total IC's	-17.7%	-22.0%	-25.1%	-25.9%	-25.9%	-24.1%	-18.4%	-13.2%	-7.2%	-4.3%	0.1%	7.1%	14.9%
IC's ex-memory	-4.4%	-8.4%	-10.9%	-11.9%	-12.0%	-10.0%	-7.4%	-4.7%	-2.5%	0.0%	3.5%	6.9%	10.5%

Source: BofA Global Research, SIA

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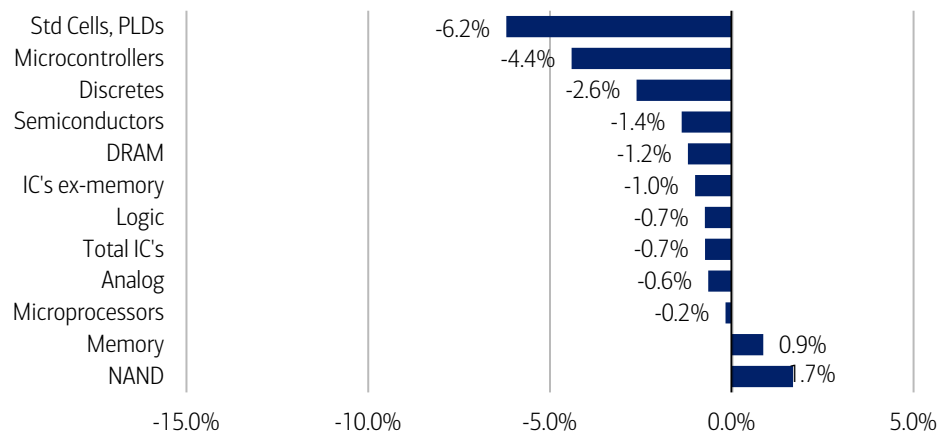


Industry unit trends

- **3mma.** Std Cells, PLDs saw the weakest MoM unit trends (-6.2% MoM), while NAND units were up the most (+1.7% MoM).

Exhibit 7: December (3mma) MoM% unit growth by product

Std Cells, PLDs saw the weakest unit growth on a 3mma basis

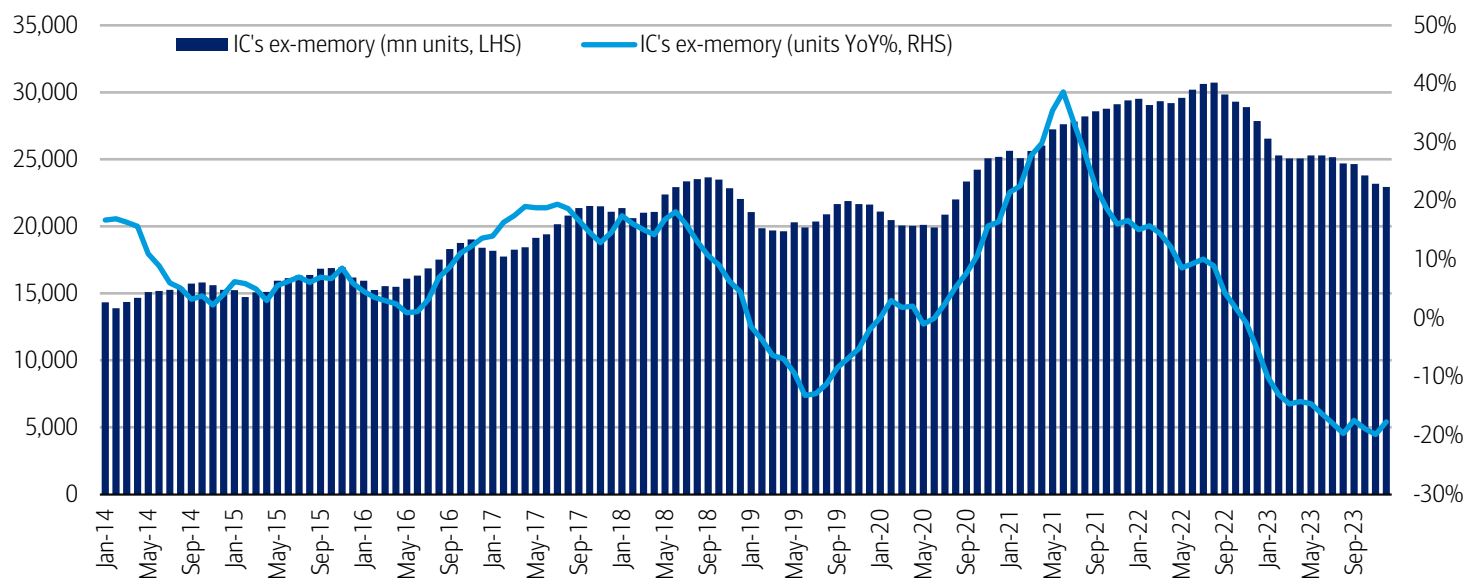


Source: SIA, BofA Global Research

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Exhibit 8: IC ex-memory unit trends over the last 10 years (3mma)

IC ex-memory unit growth -17.6% YoY



Source: SIA, BofA Global Research

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Exhibit 9: 3mma unit summary (LTM)

Semis/core semis unit sales finished -11.4%/-17.6% YoY on a 3mma basis

3mma Units (mn)	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Semiconductors	84,081	78,495	74,454	74,399	75,271	76,388	76,996	77,678	78,302	79,024	77,463	75,517	74,476
Discretes	35,438	33,088	31,929	32,668	33,162	33,564	34,217	34,800	35,649	36,326	35,605	34,564	33,658
Analog	18,626	17,808	17,202	17,238	17,242	17,433	17,563	17,571	17,113	17,017	16,229	15,800	15,698
Microprocessors	36	32	29	27	27	27	27	28	30	33	36	38	38
Microcontrollers	2,493	2,336	2,174	2,186	2,287	2,361	2,355	2,330	2,375	2,391	2,291	2,097	2,005
Std Cells, PLDs	362	354	313	275	263	276	279	279	281	286	276	262	245
Logic	6,659	6,337	5,845	5,568	5,470	5,429	5,311	5,183	5,134	5,168	5,214	5,204	5,166
Memory	3,401	3,087	2,907	3,153	3,330	3,527	3,666	3,712	3,716	3,753	3,852	3,956	3,990
DRAM	1,506	1,406	1,339	1,423	1,465	1,531	1,600	1,590	1,529	1,634	1,696	1,826	1,804
NAND	868	733	663	813	924	1,059	1,130	1,152	1,163	1,086	1,135	1,134	1,153
Total IC's	31,253	29,636	28,193	28,210	28,393	28,814	28,961	28,864	28,407	28,399	27,655	27,128	26,928
IC's ex-memory	27,852	26,548	25,286	25,057	25,063	25,287	25,295	25,153	24,691	24,647	23,803	23,172	22,938
MoM%													
Semiconductors	-4.2%	-6.6%	-5.1%	-0.1%	1.2%	1.5%	0.8%	0.9%	0.8%	0.9%	-2.0%	-2.5%	-1.4%
Discretes	-5.8%	-6.6%	-3.5%	2.3%	1.5%	1.2%	1.9%	1.7%	2.4%	1.9%	-2.0%	-2.9%	-2.6%
Analog	-3.2%	-4.4%	-3.4%	0.2%	0.0%	1.1%	0.7%	0.0%	-2.6%	-0.6%	-4.6%	-2.6%	-0.6%
Microprocessors	-2.8%	-11.6%	-9.9%	-7.2%	0.0%	-0.5%	0.3%	4.1%	7.7%	10.4%	8.1%	4.5%	-0.2%
Microcontrollers	-0.7%	-6.3%	-6.9%	0.6%	4.6%	3.3%	-0.2%	-1.1%	1.9%	0.7%	-4.2%	-8.5%	-4.4%
Std Cells, PLDs	3.5%	-2.2%	-11.7%	-12.2%	-4.0%	4.6%	1.2%	-0.1%	0.9%	1.7%	-3.5%	-5.2%	-6.2%
Logic	-5.7%	-4.8%	-7.8%	-4.7%	-1.8%	-0.7%	-2.2%	-2.4%	-0.9%	0.7%	0.9%	-0.2%	-0.7%
Memory	-2.1%	-9.2%	-5.9%	8.5%	5.6%	5.9%	4.0%	1.3%	0.1%	1.0%	2.6%	2.7%	0.9%
DRAM	0.2%	-6.6%	-4.8%	6.3%	3.0%	4.5%	4.5%	-0.6%	-3.8%	6.9%	3.8%	7.7%	-1.2%
NAND	-5.0%	-15.6%	-9.5%	22.7%	13.6%	14.7%	6.7%	1.9%	0.9%	-6.6%	4.5%	0.0%	1.7%
Total IC's	-3.4%	-5.2%	-4.9%	0.1%	0.6%	1.5%	0.5%	-0.3%	-1.6%	0.0%	-2.6%	-1.9%	-0.7%
IC's ex-memory	-3.6%	-4.7%	-4.8%	-0.9%	0.0%	0.9%	0.0%	-0.6%	-1.8%	-0.2%	-3.4%	-2.6%	-1.0%
YoY%													
Semiconductors	-12.6%	-18.2%	-20.3%	-21.0%	-18.8%	-18.6%	-18.8%	-19.5%	-18.3%	-14.4%	-14.0%	-14.0%	-11.4%
Discretes	-15.4%	-21.8%	-22.0%	-20.6%	-16.3%	-16.7%	-17.3%	-19.0%	-16.5%	-10.1%	-8.7%	-8.1%	-5.0%
Analog	-1.7%	-6.5%	-8.0%	-8.8%	-8.3%	-9.5%	-11.1%	-13.5%	-16.4%	-14.7%	-17.1%	-17.9%	-15.7%
Microprocessors	-21.8%	-27.6%	-31.8%	-34.2%	-31.4%	-27.4%	-22.3%	-18.8%	-12.3%	-4.0%	-1.5%	0.2%	2.9%
Microcontrollers	-1.8%	-6.3%	-9.1%	-7.8%	-0.1%	4.4%	4.4%	2.8%	3.1%	4.5%	-4.6%	-16.5%	-19.6%
Std Cells, PLDs	10.5%	9.0%	2.2%	-1.1%	-4.0%	-5.3%	-3.5%	-5.1%	-7.0%	-12.6%	-18.4%	-25.2%	-32.2%
Logic	-15.0%	-19.7%	-25.9%	-30.3%	-31.8%	-32.1%	-34.6%	-35.0%	-34.7%	-31.4%	-28.1%	-26.3%	-22.4%
Memory	-16.1%	-22.5%	-25.6%	-20.7%	-17.2%	-13.9%	-4.6%	4.4%	13.9%	13.4%	10.1%	13.8%	17.3%
DRAM	-15.0%	-18.9%	-21.8%	-19.5%	-19.6%	-18.5%	-10.0%	-1.6%	4.5%	9.3%	8.7%	21.6%	19.8%
NAND	-20.2%	-32.6%	-37.0%	-23.9%	-14.2%	-1.0%	17.8%	37.3%	59.9%	41.5%	28.9%	24.1%	32.9%
Total IC's	-6.6%	-11.5%	-14.5%	-15.3%	-14.5%	-14.5%	-14.9%	-15.6%	-16.4%	-14.3%	-15.7%	-16.2%	-13.8%
IC's ex-memory	-5.2%	-10.0%	-13.0%	-14.6%	-14.2%	-14.5%	-16.2%	-17.9%	-19.6%	-17.4%	-18.8%	-19.8%	-17.6%

Source: SIA, BofA Global Research

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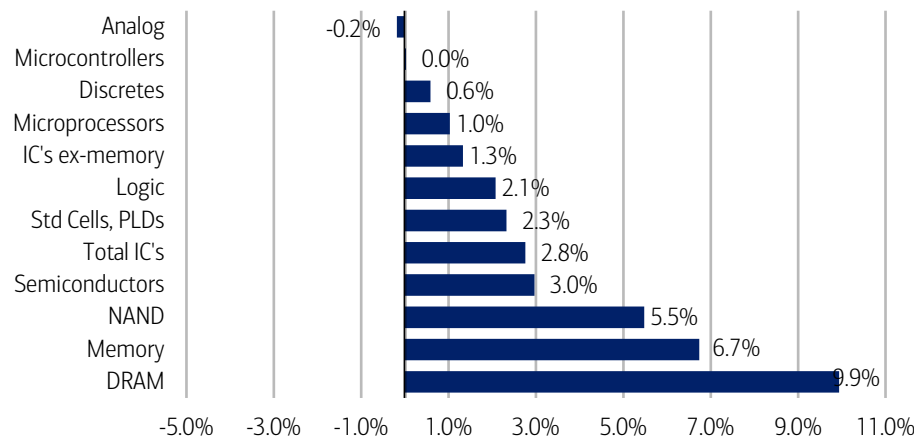


Industry ASP trends

- **3mma.** DRAM ASPs grew the most (+9.9% MoM) while Analog ASPs saw the greatest declines (-0.2% MoM)

Exhibit 10: December (3mma) MoM% ASP growth by product type

DRAM saw the strongest industry ASP trends

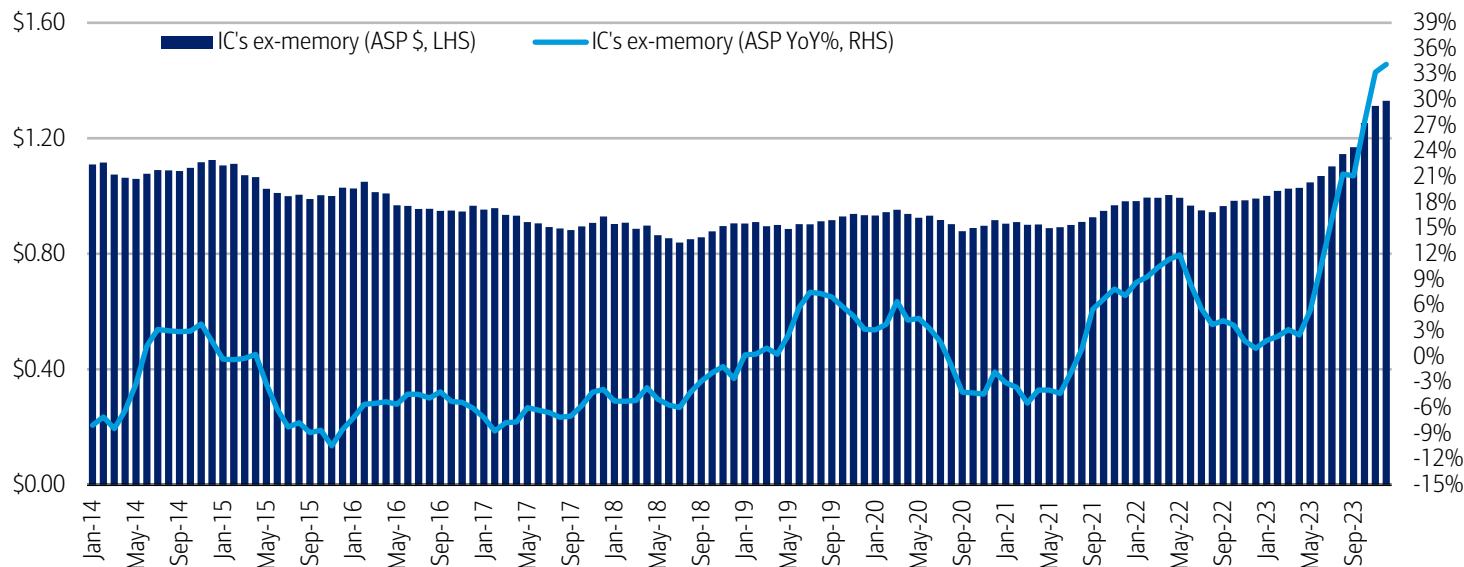


Source: SIA, BofA Global Research

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Exhibit 11: IC ex-memory ASP trends over the last 10 years (3mma)

IC ex-memory ASPs now up 34.1% YoY



Source: SIA, BofA Global Research

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Exhibit 12: 3mma ASP summary (LTM)

Semis/Core semis ASPs grew 26.4%/34.1% YoY on a 3mma basis

3mma ASPs (\$)	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Semiconductors	\$0.52	\$0.53	\$0.53	\$0.54	\$0.53	\$0.54	\$0.55	\$0.56	\$0.56	\$0.57	\$0.60	\$0.63	\$0.65
Discretes	\$0.08	\$0.08	\$0.09	\$0.09	\$0.09	\$0.09	\$0.09	\$0.09	\$0.08	\$0.08	\$0.08	\$0.08	\$0.08
Analog	\$0.39	\$0.39	\$0.40	\$0.39	\$0.39	\$0.39	\$0.38	\$0.38	\$0.39	\$0.40	\$0.42	\$0.44	\$0.44
Microprocessors	\$105.51	\$107.56	\$108.46	\$112.33	\$113.68	\$120.61	\$127.03	\$130.78	\$126.61	\$123.66	\$121.20	\$121.32	\$122.57
Microcontrollers	\$0.87	\$0.96	\$1.06	\$1.08	\$1.03	\$0.99	\$1.01	\$1.01	\$1.03	\$1.01	\$1.03	\$1.06	\$1.06
Std Cells, PLDs	\$5.80	\$6.03	\$6.98	\$8.16	\$8.57	\$8.43	\$8.55	\$8.43	\$8.16	\$7.77	\$7.86	\$7.96	\$8.15
Logic	\$2.10	\$2.15	\$2.26	\$2.39	\$2.43	\$2.56	\$2.71	\$2.85	\$2.92	\$2.94	\$3.06	\$3.16	\$3.22
Memory	\$2.19	\$2.12	\$1.99	\$1.86	\$1.84	\$1.89	\$1.99	\$2.03	\$2.05	\$2.09	\$2.16	\$2.30	\$2.45
DRAM	\$2.82	\$2.69	\$2.52	\$2.35	\$2.27	\$2.27	\$2.35	\$2.48	\$2.59	\$2.70	\$2.80	\$2.92	\$3.21
NAND	\$3.24	\$3.28	\$3.12	\$2.68	\$2.66	\$2.67	\$2.81	\$2.82	\$2.83	\$2.80	\$2.83	\$3.00	\$3.16
Total IC's	\$1.12	\$1.12	\$1.12	\$1.12	\$1.12	\$1.15	\$1.19	\$1.22	\$1.26	\$1.29	\$1.38	\$1.46	\$1.50
IC's ex-memory	\$0.99	\$1.00	\$1.02	\$1.03	\$1.03	\$1.05	\$1.07	\$1.10	\$1.15	\$1.17	\$1.25	\$1.31	\$1.33
MoM%													
Semiconductors	-0.2%	1.7%	1.3%	0.5%	-0.5%	1.2%	1.7%	1.4%	1.1%	1.0%	5.9%	5.5%	3.0%
Discretes	5.3%	5.8%	5.9%	1.1%	0.0%	-1.8%	-2.1%	-1.6%	-2.0%	-0.8%	-0.4%	-0.4%	0.6%
Analog	1.2%	-0.4%	0.8%	-1.0%	0.2%	-1.3%	-3.0%	0.9%	3.8%	1.8%	6.0%	3.4%	-0.2%
Microprocessors	-3.2%	1.9%	0.8%	3.6%	1.2%	6.1%	5.3%	3.0%	-3.2%	-2.3%	-2.0%	0.1%	1.0%
Microcontrollers	1.5%	10.5%	10.0%	1.9%	-4.3%	-4.3%	2.3%	0.5%	1.4%	-1.7%	2.2%	3.0%	0.0%
Std Cells, PLDs	-4.1%	4.0%	15.8%	16.8%	5.0%	-1.6%	1.5%	-1.4%	-3.2%	-4.8%	1.1%	1.3%	2.3%
Logic	2.5%	2.3%	5.4%	5.6%	2.0%	5.1%	5.8%	5.2%	2.7%	0.6%	4.1%	3.2%	2.1%
Memory	-9.7%	-3.1%	-6.1%	-6.6%	-1.0%	2.4%	5.2%	2.1%	0.9%	1.9%	3.8%	6.2%	6.7%
DRAM	-13.2%	-4.6%	-6.3%	-6.9%	-3.2%	0.0%	3.6%	5.3%	4.5%	4.5%	3.5%	4.4%	9.9%
NAND	-5.6%	1.3%	-4.7%	-14.3%	-0.7%	0.4%	5.3%	0.5%	0.3%	-1.2%	1.4%	5.8%	5.5%
Total IC's	-1.6%	-0.4%	0.1%	0.1%	0.4%	2.3%	3.1%	3.1%	3.4%	2.1%	6.9%	5.5%	2.8%
IC's ex-memory	0.6%	1.0%	1.7%	0.8%	0.3%	1.8%	2.1%	3.1%	3.9%	2.0%	7.2%	4.8%	1.3%
YoY%													
Semiconductors	-2.2%	-0.5%	-0.5%	-0.3%	-3.1%	-2.1%	3.7%	9.5%	14.1%	11.6%	15.7%	22.5%	26.4%
Discretes	27.1%	32.0%	36.9%	37.1%	37.5%	34.1%	29.9%	23.6%	18.0%	13.7%	11.3%	8.9%	4.0%
Analog	9.3%	8.2%	6.4%	3.8%	2.5%	1.9%	-0.4%	0.6%	3.6%	3.2%	7.9%	12.7%	11.2%
Microprocessors	-6.7%	-7.1%	-8.6%	-7.3%	-5.5%	0.4%	6.5%	9.5%	6.7%	5.3%	8.1%	11.3%	16.2%
Microcontrollers	19.7%	26.5%	30.8%	27.8%	17.4%	10.5%	8.7%	9.1%	10.6%	11.3%	17.0%	24.2%	22.4%
Std Cells, PLDs	21.5%	24.8%	35.6%	42.3%	42.0%	37.6%	34.6%	30.1%	26.1%	24.1%	26.9%	31.6%	40.4%
Logic	11.9%	14.5%	21.4%	28.9%	29.5%	33.1%	43.9%	51.8%	56.0%	51.3%	51.7%	54.2%	53.5%
Memory	-35.4%	-37.4%	-40.9%	-44.8%	-46.1%	-45.6%	-40.8%	-37.5%	-30.8%	-27.3%	-18.5%	-5.2%	12.0%
DRAM	-39.1%	-41.2%	-44.9%	-48.7%	-50.1%	-50.7%	-45.7%	-42.9%	-35.0%	-31.4%	-21.7%	-10.0%	14.0%
NAND	-31.1%	-30.5%	-33.3%	-41.8%	-43.3%	-44.6%	-43.7%	-42.6%	-39.4%	-32.6%	-24.0%	-12.6%	-2.3%
Total IC's	-12.0%	-11.9%	-12.4%	-12.5%	-13.3%	-11.2%	-4.1%	2.8%	11.1%	11.7%	18.8%	27.8%	33.4%
IC's ex-memory	0.9%	1.9%	2.3%	3.1%	2.5%	5.3%	10.6%	16.1%	21.3%	21.1%	27.4%	33.2%	34.1%

Source: BofA Global Research, SIA

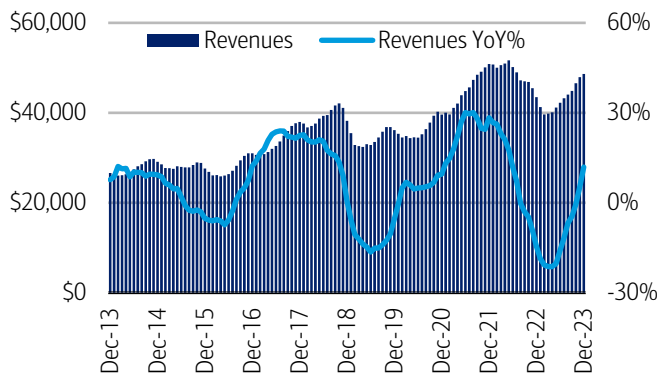
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Appendix

Exhibit 13: Total semiconductor revenue trends (3mma)

Semis sales grew 11.9% YoY on a 3mma basis

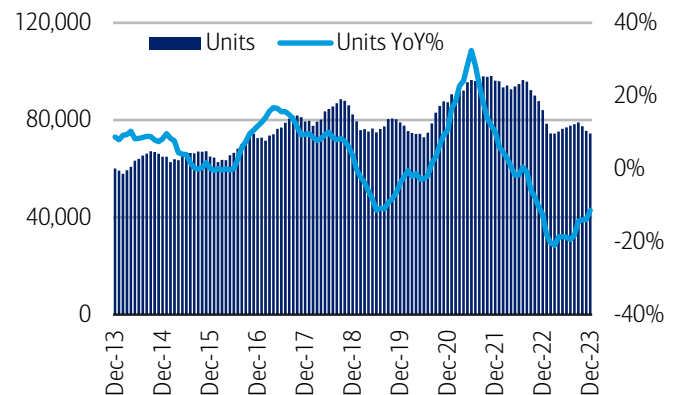


Source: SIA, BofA Global Research estimates

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Exhibit 14: Total semiconductor unit trends (3mma)

Semis unit sales were down 11.4% YoY on a 3mma basis

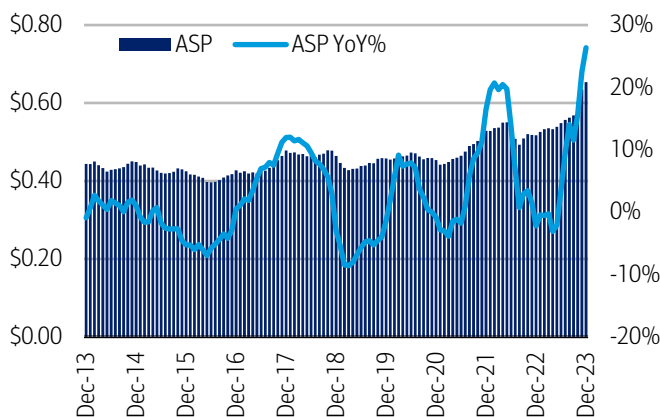


Source: SIA, BofA Global Research estimates

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Exhibit 15: Total semiconductor ASP trends (3mma)

Semis ASPs grew 26.4% YoY on a 3mma basis

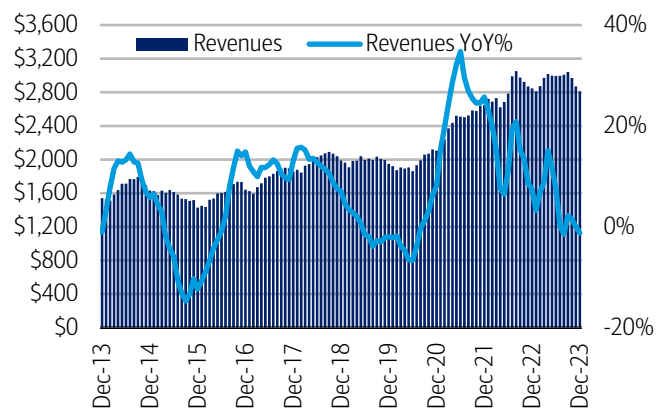


Source: SIA, BofA Global Research estimates

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Exhibit 16: Discretes revenue trends (3mma)

Discrete sales were down 1.2% YoY on a 3mma basis

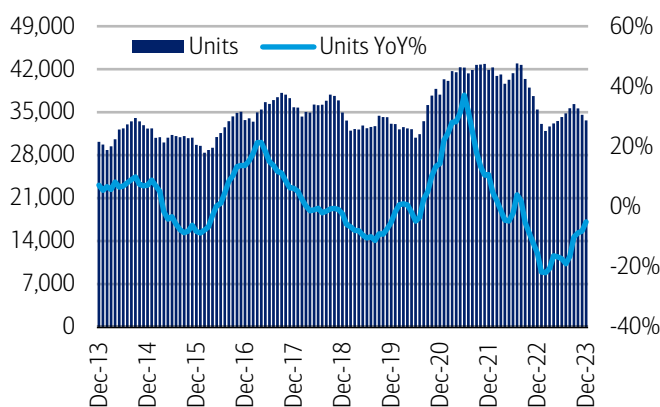


Source: SIA, BofA Global Research estimates

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Exhibit 17: Discretes unit trends (3mma)

Discrete unit sales fell 5.0% YoY on a 3mma basis

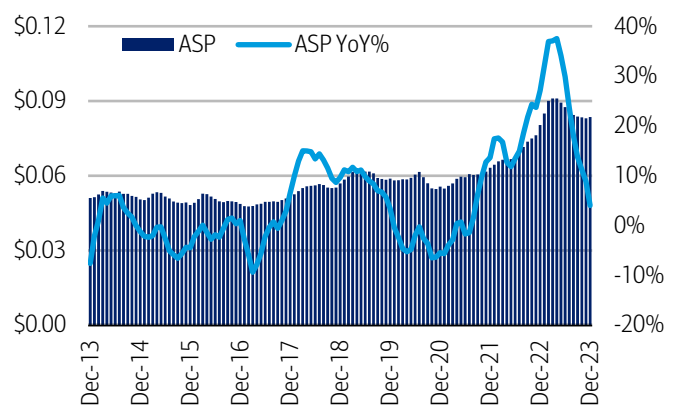


Source: SIA, BofA Global Research estimates

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Exhibit 18: Discretes ASP trends (3mma)

Discrete ASPs grew 4.0% YoY on a 3mma basis



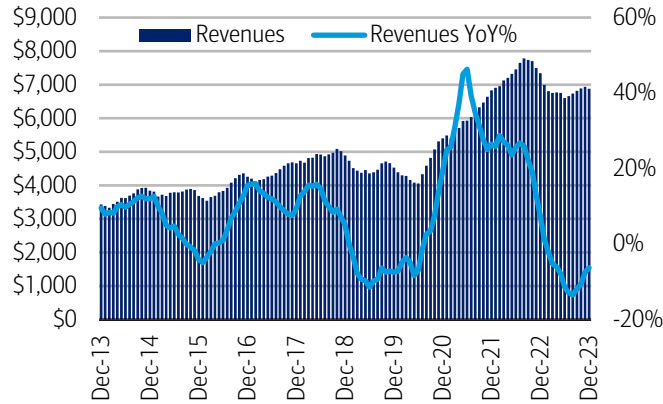
Source: SIA, BofA Global Research estimates

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Exhibit 19: Analog revenue trends (3mma)

Analog sales fell 6.3% YoY on a 3mma basis

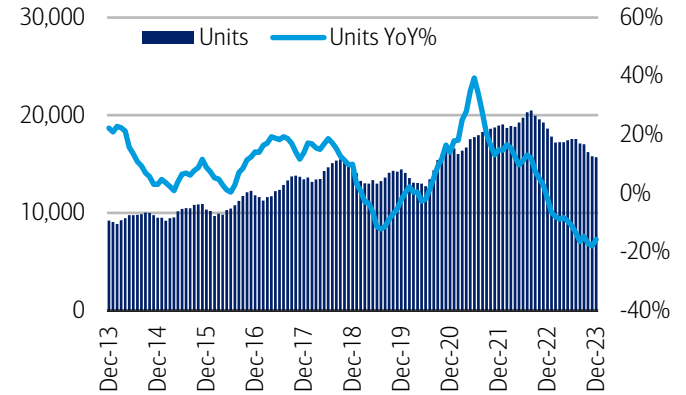


Source: SIA, BofA Global Research estimates

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Exhibit 20: Analog units trends (3mma)

Analog unit sales fell 15.7% YoY on a 3mma basis

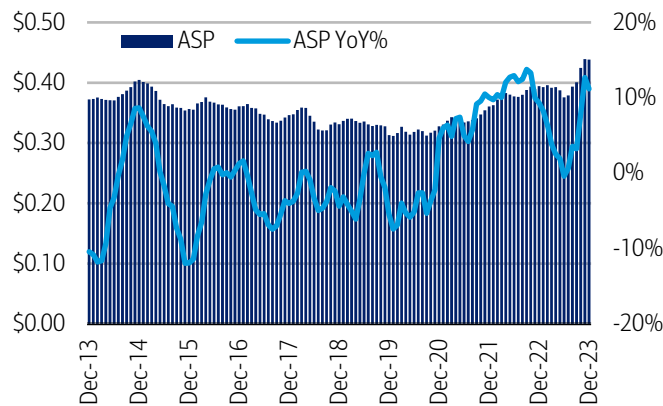


Source: SIA, BofA Global Research estimates

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Exhibit 21: Analog ASP trends (3mma)

Analog ASPs grew 11.2% YoY on a 3mma basis

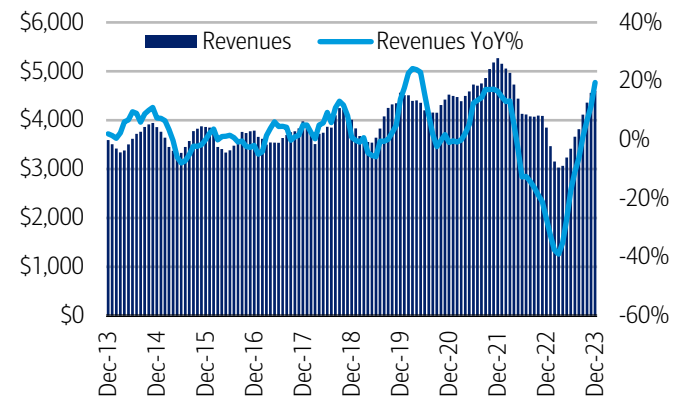


Source: SIA, BofA Global Research estimates

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Exhibit 22: Microprocessor revenue trends (3mma)

MPU sales were up 19.5% YoY on a 3mma basis

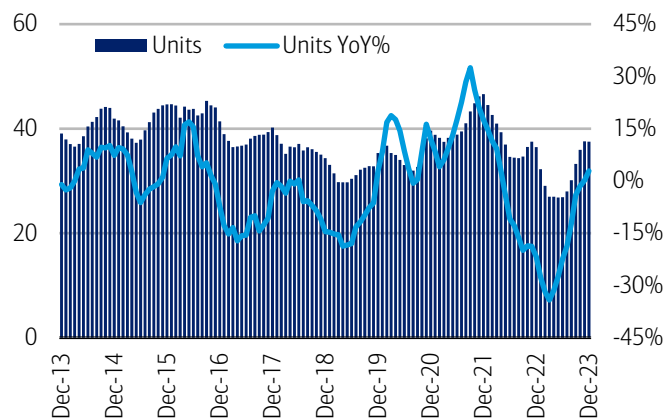


Source: SIA, BofA Global Research estimates

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Exhibit 23: Microprocessor units trends (3mma)

MPU units grew 2.9% YoY on a 3mma basis

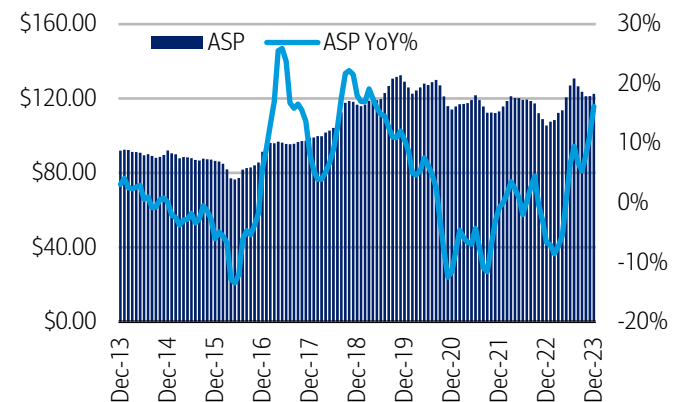


Source: SIA, BofA Global Research estimates

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Exhibit 24: Microprocessor ASP trends (3mma)

MPU ASPs grew 16.2% YoY on a 3mma basis

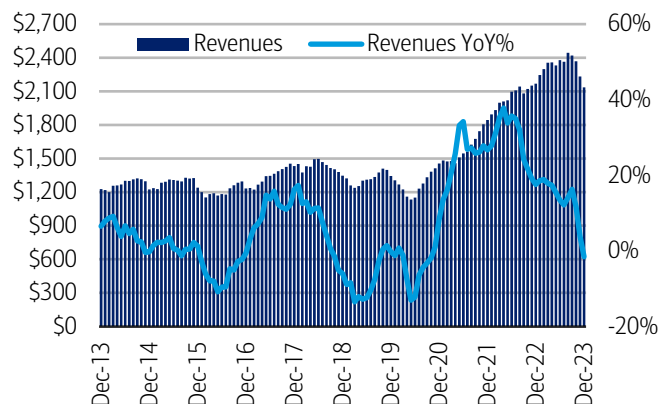


Source: SIA, BofA Global Research estimates

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Exhibit 25: Microcontroller revenue trends (3mma)

MCU sales fell 1.6% YoY on a 3mma basis

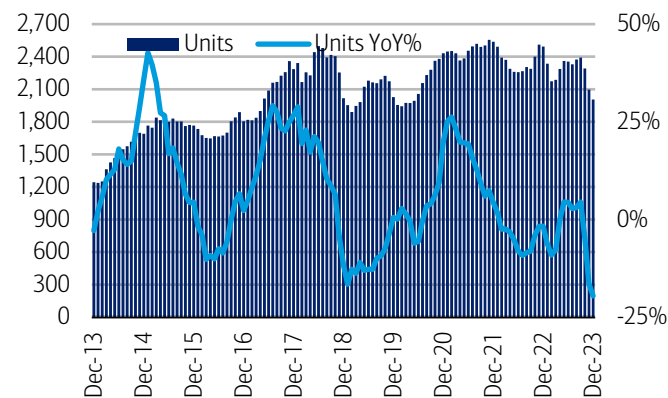


Source: SIA, BofA Global Research estimates

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Exhibit 26: Microcontroller unit trends (3mma)

MCU unit sales fell 19.6% YoY on a 3mma basis

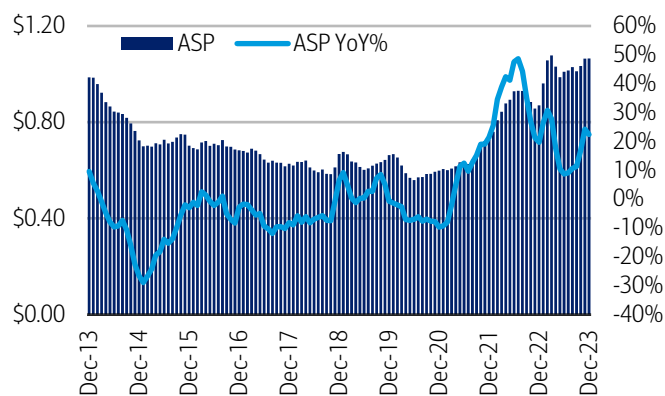


Source: SIA, BofA Global Research estimates

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Exhibit 27: Microcontroller ASP trends (3mma)

MCU ASPs grew 22.4% YoY on a 3mma basis

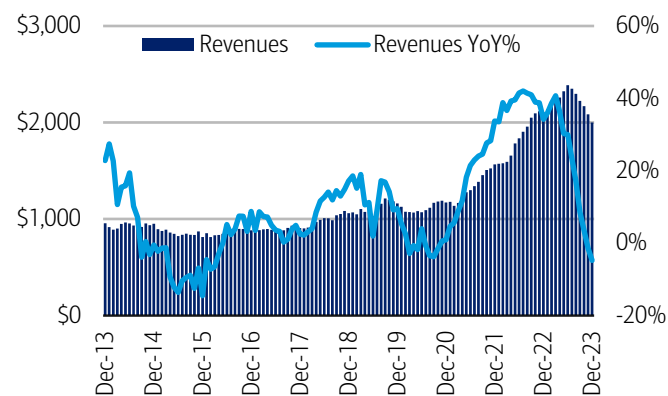


Source: SIA, BofA Global Research estimates

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Exhibit 28: PLD revenue trends (3mma)

PLD sales fell 4.8% YoY on a 3mma basis

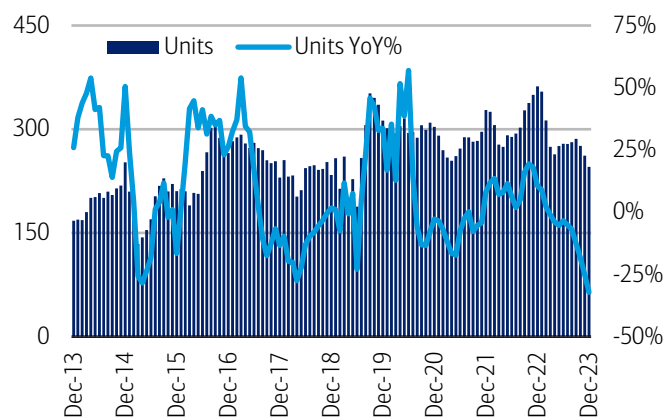


Source: SIA, BofA Global Research estimates

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Exhibit 29: PLD unit trends (3mma)

PLD unit sales were down 32.2% YoY on a 3mma basis

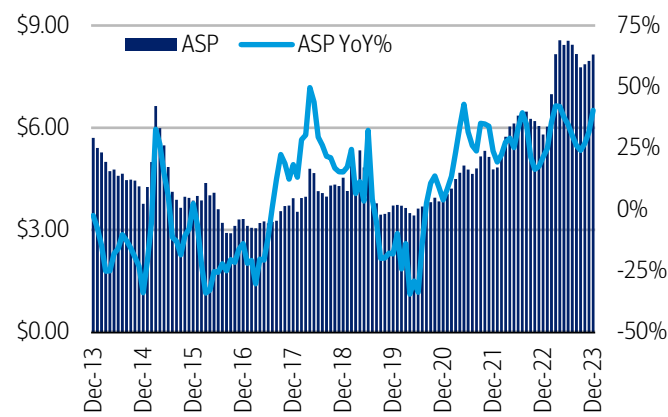


Source: SIA, BofA Global Research estimates

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Exhibit 30: PLD ASP trends (3mma)

PLD ASPs grew 40.4% YoY on a 3mma basis

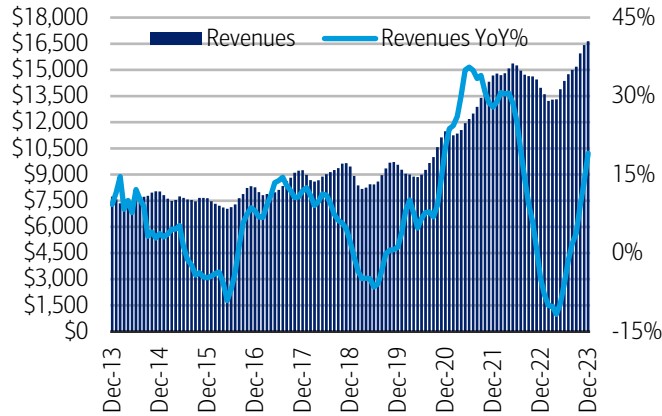


Source: SIA, BofA Global Research estimates

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Exhibit 31: Logic revenue trends (3mma)

Logic sales grew 19.1% YoY on a 3mma basis

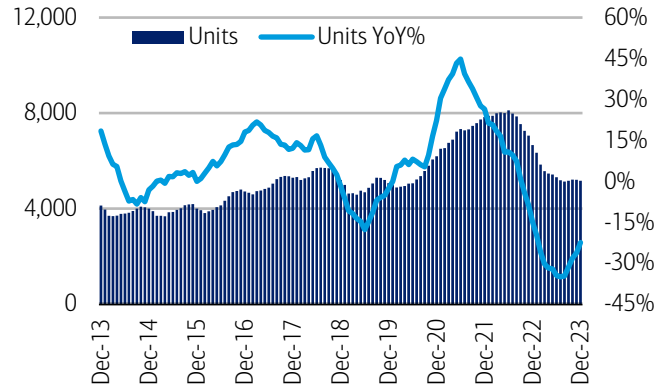


Source: SIA, BofA Global Research estimates

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Exhibit 32: Logic unit trends (3mma)

Logic unit sales fell 22.4% YoY on a 3mma basis

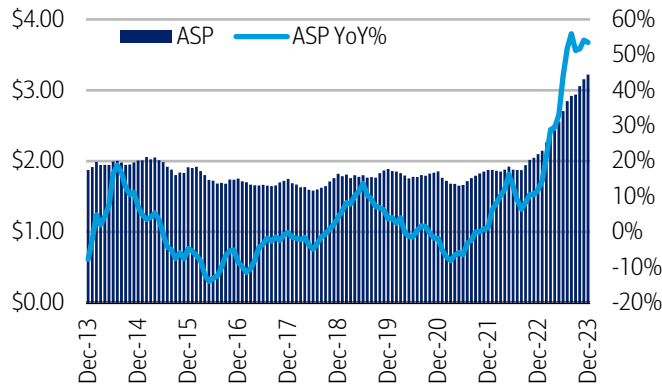


Source: SIA, BofA Global Research estimates

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Exhibit 33: Logic ASP trends (3mma)

Logic ASPs grew 53.5% YoY on a 3mma basis

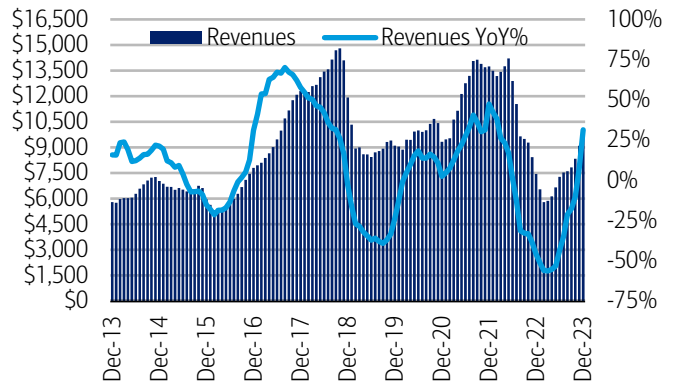


Source: SIA, BofA Global Research estimates

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Exhibit 34: Memory revenue trends (3mma)

Memory sales grew 31.4% YoY on a 3mma basis

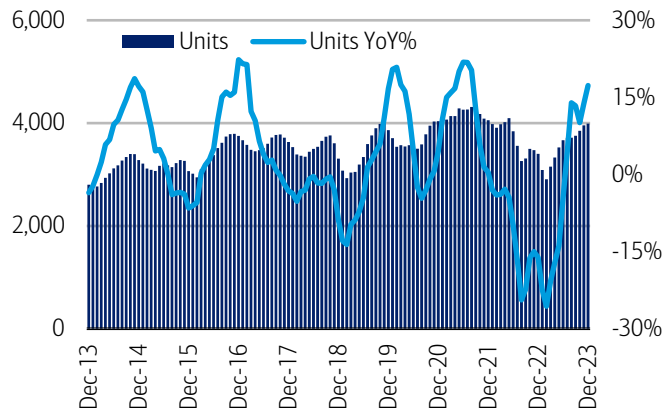


Source: SIA, BofA Global Research estimates

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Exhibit 35: Memory unit trends (3mma)

Memory unit sales grew 17.3% YoY on a 3mma basis

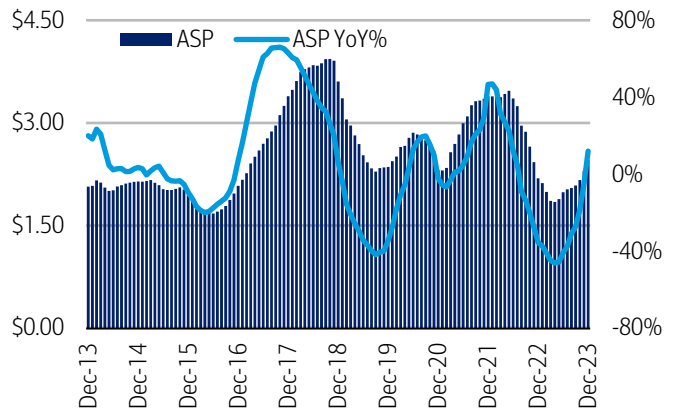


Source: SIA, BofA Global Research estimates

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Exhibit 36: Memory ASP trends (3mma)

Memory ASPs grew 12.0% YoY on a 3mma basis

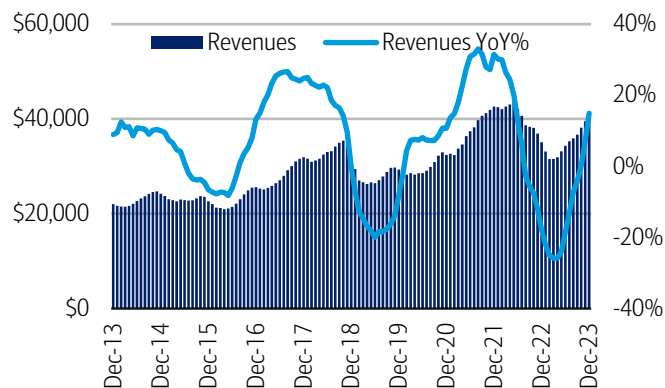


Source: SIA, BofA Global Research estimates

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Exhibit 37: Total IC revenue trends (3mma)

Total IC sales grew 14.9% YoY on a 3mma basis

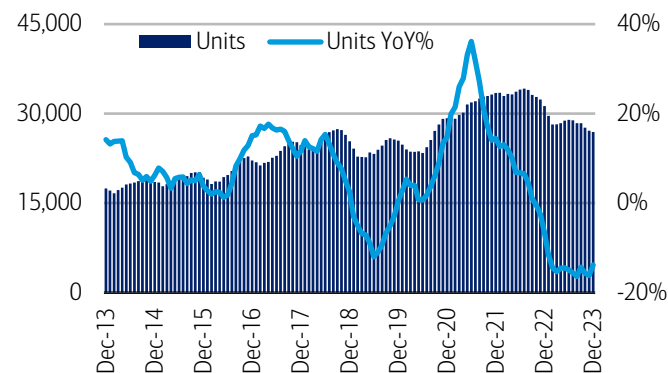


Source: SIA, BofA Global Research estimates

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Exhibit 38: Total IC unit trends (3mma)

Total IC unit sales fell 13.8% YoY on a 3mma basis

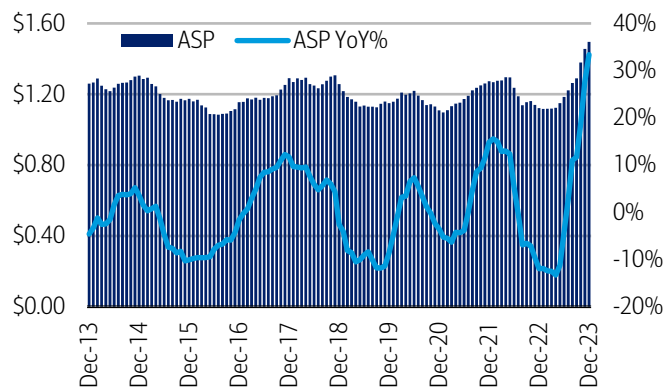


Source: SIA, BofA Global Research estimates

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Exhibit 39: Total IC ASP trends (3mma)

Total IC ASPs grew 33.4% YoY on a 3mma basis



Source: SIA, BofA Global Research estimates

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Glossary

DRAM: dynamic random-access memory

IC: integrated circuit

MCU: Microcontroller

MPU: Microprocessor

n-t: near term

l-t: long term

ASP: average selling price

PLD: Programmable Logic Device

mma: monthly moving average

NAND: "NOT AND" memory

Disclosures

Important Disclosures

FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. **VOLATILITY RISK RATINGS**, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. **INVESTMENT RATINGS** reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its Coverage Cluster (defined below). Our investment ratings are: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. An investment rating of 6 (No Rating) indicates that a stock is no longer trading on the basis of fundamentals. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster ^{R1}
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

^{R1} Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

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