



2009 Kicks Off with NAND Production Cuts – Where is the Killer App?

For the past four or five years the NAND market has crashed during the first week of December, only to be resurrected late in Q1 with a killer application that comes into save the day. Almost always, the savior (this time, SSD's) is not the one who generated industry excitement during the second half of the previous year. In December, production was cut dramatically. Maybe this time the industry has it right—SSDs are not going to save the day in 2009.

Market Highlights

NAND Market

DRAM exchange expects 81% NAND flash bit growth in 2009 [more](#)

Toshiba

Delays NAND plant construction in western Japan [more](#)

Numonyx

Rolls out 41 nm MLC and 48 nm SLC NAND processes [more](#)

Toshiba

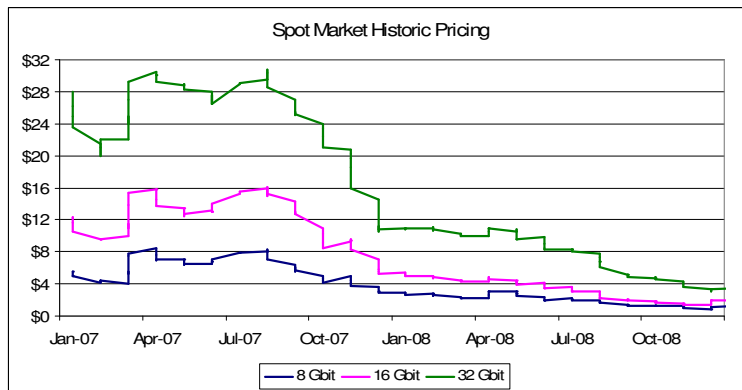
Reduces NAND flash output by 30% [more](#)

Financial Market

SanDisk shares increased 9.48% or \$1.05 on Monday January 5, while Micron saw 16.9% in gains to \$3.32.

"Those that fail to learn from history are doomed to repeat it." - Winston Churchill

In 2005 NAND manufacturers lead us to believe that embedded NAND flash used in mobile applications would increase by a factor and soak up oversupply. That demand never materialized (has it yet?), and it took Q2 2005 rumors of a flash based iPod, and Apple's Nano introduction in September 2005 to control NAND price erosion. A nearly identical situation occurred in late 2006, when industry leader SanDisk set high unit sales expectations for their MicroSD products. MicroSD sales suffered from slower than anticipated adoption in mobile phones, due to capacity mix issues and pricing. Industry expectations soon were re-set by Apple's iPhone introduction.



Historic Industry Behaviors

- Q1 – Slowest bit growth occurs this quarter and prices typically suffer their greatest erosion
- Q2 – Typically see stabilization of erosion to more manageable levels – generally due to new product rumors and announcements
- Q3 – Sees increased demand as Asian manufacturers stock NAND and begin volume production of consumer products for the coming holiday season.
- Q4 – Balloon bursts when consumer product inventories fail to sell through and NAND buyers reduce orders – all in light of increased production

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Is the Industry in a Tailspin or Transitioning to a Rational Business Model?

We believe that the flash industry, lead by Toshiba who was the first to announce production cuts, is moving away from a less reliable business model to a more rational one, well cognizant of the many and varied factors that influence supply and pricing.

Throughout 2008, we were lead to believe that SSD's would consume high volumes of NAND flash and in turn will moderate price erosion in 2009. We now only expect to see significant SSD adoption in enterprise application areas, and we do not expect this segment to positively influence NAND pricing throughout the year.

Next Month: New Applications and Technologies and their influence on the industry

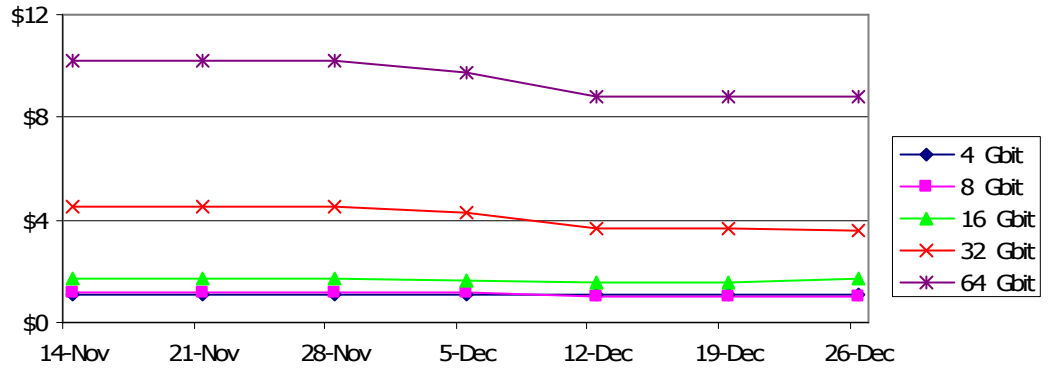


Flash Memory Components: Contract Pricing

MLC

Contract prices for MLC began a decline in the middle of December.

Most significantly, 32 Gbit MLC prices dropped 20% over the period.

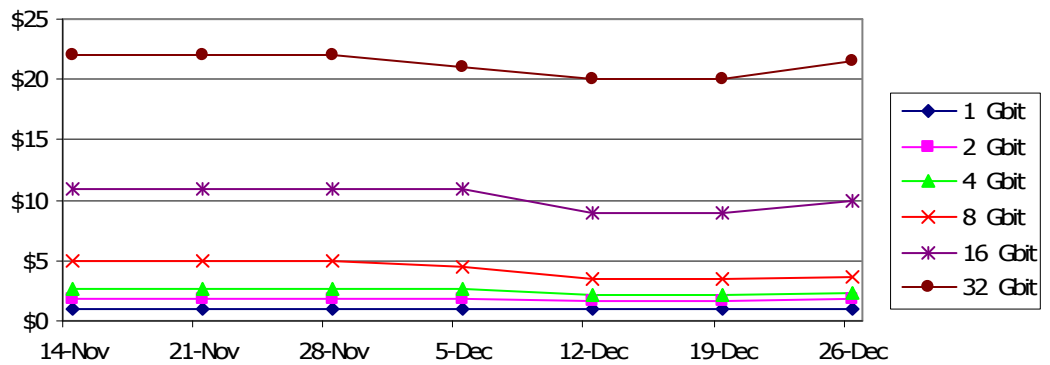


	14-Nov	21-Nov	28-Nov	5-Dec	12-Dec	19-Dec	26-Dec	% change last period	% change all periods
4 Gbit	\$1.10	\$1.10	\$1.10	\$1.10	\$1.10	\$1.10	\$1.10	0%	0%
8 Gbit	\$1.20	\$1.20	\$1.20	\$1.15	\$1.05	\$1.05	\$1.05	0%	-13%
16 Gbit	\$1.75	\$1.75	\$1.75	\$1.65	\$1.55	\$1.55	\$1.70	10%	-3%
32 Gbit	\$4.50	\$4.50	\$4.50	\$4.25	\$3.70	\$3.70	\$3.60	-3%	-20%
64 Gbit	\$10.20	\$10.20	\$10.20	\$9.75	\$8.80	\$8.80	\$8.80	0%	-14%

SLC

SLC pricing fell slightly in the middle of December, with prices creeping back up at the end of the month.

Again 8 Gbit component prices fell the most; 26% over the latest period.



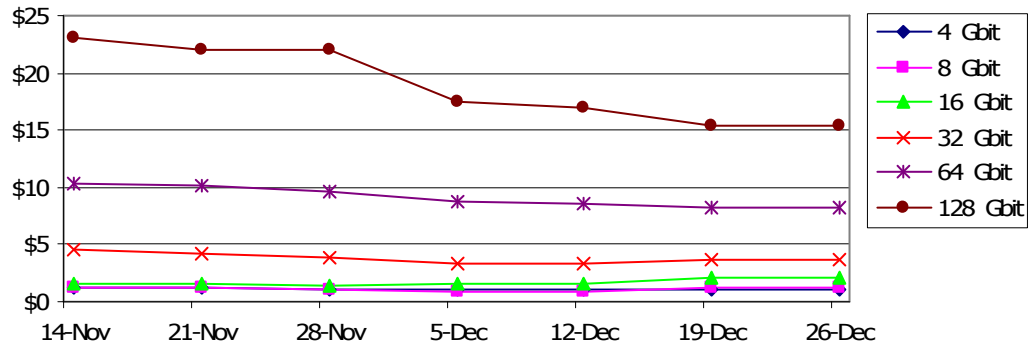
	14-Nov	21-Nov	28-Nov	5-Dec	12-Dec	19-Dec	26-Dec	% change last period	% change all periods
1 Gbit	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	0%	0%
2 Gbit	\$1.75	\$1.75	\$1.75	\$1.75	\$1.65	\$1.65	\$1.75	6%	0%
4 Gbit	\$2.65	\$2.65	\$2.65	\$2.65	\$2.20	\$2.20	\$2.30	5%	-13%
8 Gbit	\$5.00	\$5.00	\$5.00	\$4.50	\$3.55	\$3.55	\$3.70	4%	-26%
16 Gbit	\$11.00	\$11.00	\$11.00	\$11.00	\$9.00	\$9.00	\$10.00	11%	-9%
32 Gbit	\$22.00	\$22.00	\$22.00	\$21.00	\$20.00	\$20.00	\$21.50	8%	-2%



Flash Memory Components: Spot Market Pricing

MLC

Spot market pricing erosion continued over the period with high-volume 128 Gbit components falling 30% during the past seven weeks.

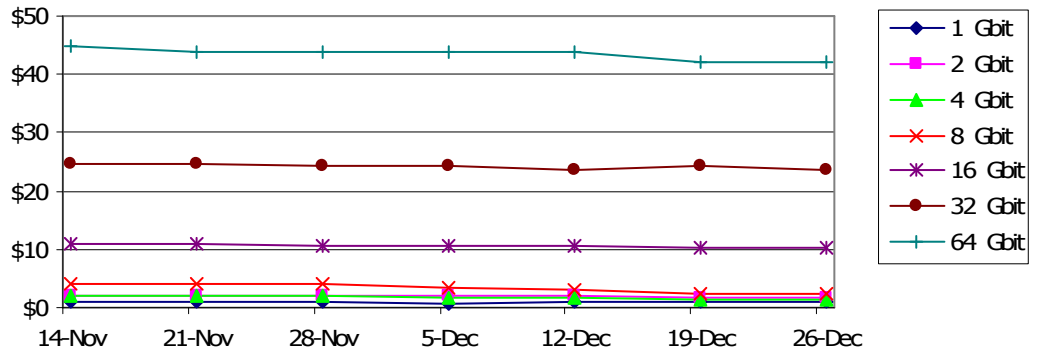


Spot prices for 8 Gbit and 16 Gbit components are sitting above Contract, while other capacities are within a dollar of each other.

	14-Nov	21-Nov	28-Nov	5-Dec	12-Dec	19-Dec	26-Dec	% change last period	% change all periods
4 Gbit	\$1.25	\$1.15	\$1.11	\$1.01	\$1.03	\$1.00	\$1.02	2%	-11%
8 Gbit	\$1.28	\$1.20	\$1.13	\$0.95	\$0.95	\$1.30	\$1.28	-2%	6%
16 Gbit	\$1.61	\$1.57	\$1.46	\$1.52	\$1.59	\$2.03	\$2.03	0%	29%
32 Gbit	\$4.49	\$4.17	\$3.93	\$3.37	\$3.40	\$3.71	\$3.64	-2%	-13%
64 Gbit	\$10.32	\$10.08	\$9.70	\$8.82	\$8.53	\$8.23	\$8.24	0%	-18%
128 Gbit	\$23.00	\$22.00	\$22.00	\$17.50	\$17.00	\$15.40	\$15.40	0%	-30%

SLC

Significant erosion continued over the past 7-weeks with 4 Gbit prices falling 29%, 8 Gbit prices falling nearly 45%.



In further contrast from our last report, regarding the 4 Gbit price—the Spot sits \$1.15 below the Contract and the 8 Gbit Spot is \$2.25, 61%, below the contract

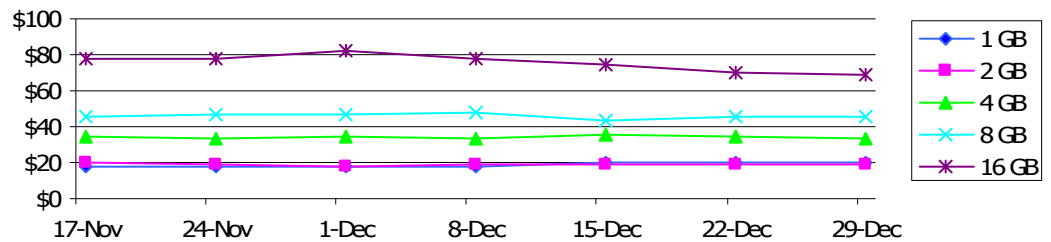
	14-Nov	21-Nov	28-Nov	5-Dec	12-Dec	19-Dec	26-Dec	% change last period	% change all periods
1 Gbit	\$0.92	\$0.91	\$0.90	\$0.84	\$0.89	\$0.86	\$0.86	0.0%	-5.0%
2 Gbit	\$2.02	\$2.01	\$2.00	\$1.98	\$1.92	\$1.88	\$1.88	0.0%	-7.0%
4 Gbit	\$2.07	\$2.01	\$1.97	\$1.57	\$1.77	\$1.43	\$1.43	0.0%	-29.0%
8 Gbit	\$4.13	\$4.13	\$4.13	\$3.39	\$3.10	\$2.28	\$2.28	0.0%	-45.0%
16 Gbit	\$10.99	\$10.89	\$10.75	\$10.51	\$10.58	\$10.25	\$10.32	1.0%	-5.0%
32 Gbit	\$24.75	\$24.65	\$24.38	\$24.42	\$23.67	\$24.17	\$23.50	-3.0%	-5.0%
64 Gbit	\$45.00	\$44.00	\$44.00	\$44.00	\$44.00	\$42.00	\$42.00	0.0%	-5.0%



USB Flash Drives

North America USB Flash Drive ASP

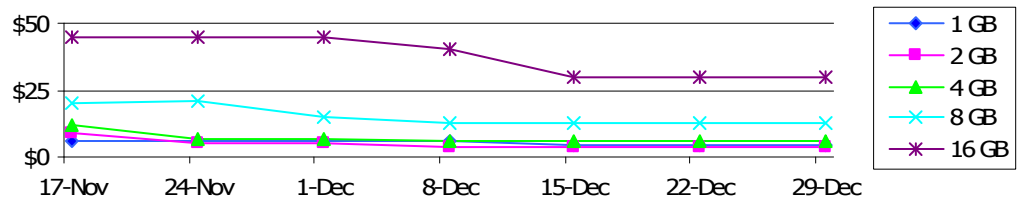
USB ASP's declined modestly over the period, with 16 GByte products seeing the highest discount of 12%.



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
1 GB	\$18.14	\$18.19	\$17.74	\$17.45	\$20.46	\$19.79	\$19.74	0.0%	9.0%
2 GB	\$20.06	\$19.32	\$18.21	\$18.80	\$19.17	\$18.56	\$19.26	4.0%	-4.0%
4 GB	\$34.17	\$33.68	\$33.97	\$33.33	\$35.14	\$34.31	\$32.83	-4.0%	-4.0%
8 GB	\$45.78	\$46.33	\$46.91	\$47.85	\$43.84	\$45.61	\$45.35	-1.0%	-1.0%
16 GB	\$77.74	\$77.74	\$81.77	\$77.60	\$74.38	\$69.89	\$68.55	-2.0%	-12.0%

North America USB Flash Drive MSP

MSP's dropped significantly across the board with discounts between 30 and 56%



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
1 GB	\$5.99	\$5.99	\$5.99	\$5.99	\$4.18	\$4.18	\$4.18	0.0%	-30.0%
2 GB	\$8.99	\$4.99	\$4.99	\$3.99	\$3.99	\$3.99	\$3.99	0.0%	-56.0%
4 GB	\$11.99	\$6.99	\$6.99	\$5.99	\$5.99	\$5.99	\$5.99	0.0%	-50.0%
8 GB	\$19.99	\$20.99	\$14.99	\$12.99	\$12.99	\$12.99	\$12.99	0.0%	-35.0%
16 GB	\$44.99	\$44.99	\$44.99	\$39.99	\$29.99	\$29.95	\$29.95	0.0%	-33.0%



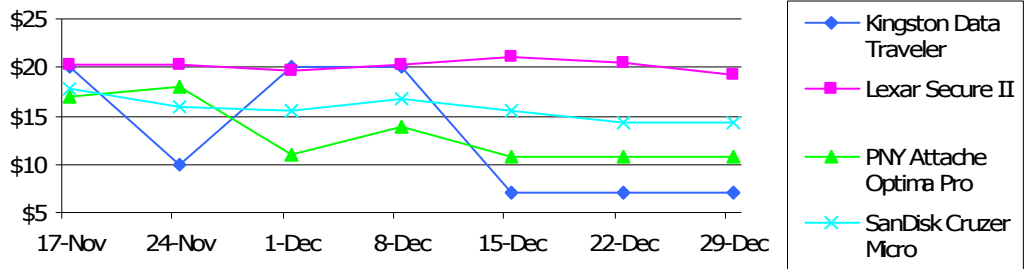
USB Flash Drives

North America Leading Brands USB Flash Drive Consumer Price Trend

With sales occurring earlier in the quarter, few price reductions were offered on any USB Flash Drives for Black Friday Shoppers.

As the Christmas holiday approached, manufacturers offered significant reductions on its Data Travelers. This behavior was anticipated, as many shoppers would forego Black Friday offers in hopes of later discounts closer to the holidays.

2 GB



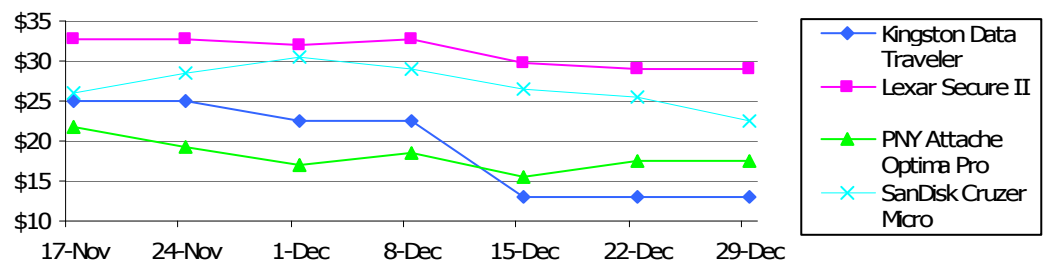
End of December Shenzhen broker pricing for 500 piece minimum order quantity of USB Flash Drives:

2 Gbyte - \$2.40
(was \$2.25 on 12/1)

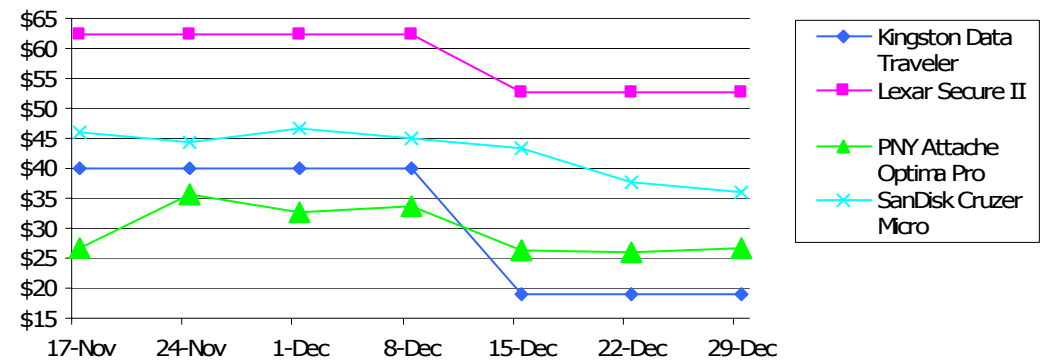
4 Gbyte - \$3.10
(was \$3.95 on 12/1)

The products are individually packed and include screen printing of logos and a software application:

4 GB



8 GB



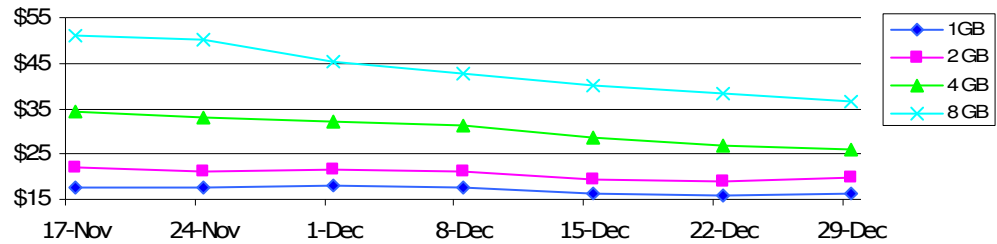


Standard Flash Cards

North America Standard Flash Card ASP

Significant Standard Flash Card ASP price erosion occurred most noticeably in the higher capacity cards.

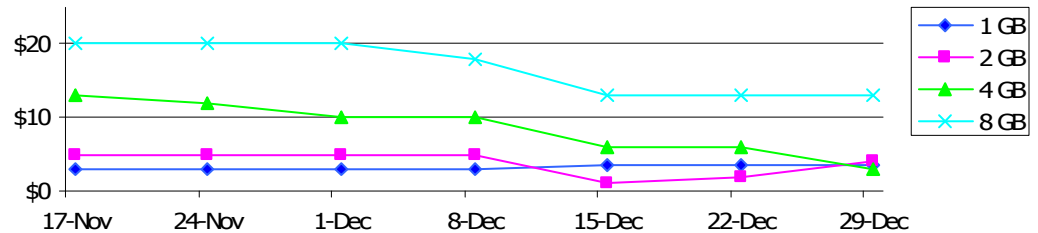
ASP price erosion was most significant in 4 Gbyte and 8 Gbyte products, falling 24% and 29% respectively.



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
1 GB	\$17.54	\$17.50	\$18.05	\$17.80	\$16.20	\$15.97	\$16.49	3.0%	-6%
2 GB	\$21.88	\$21.20	\$21.49	\$21.34	\$19.38	\$18.98	\$19.70	4.0%	-10%
4 GB	\$34.14	\$32.93	\$32.31	\$31.47	\$28.49	\$26.70	\$25.94	-3.0%	-24%
8 GB	\$51.18	\$50.09	\$45.20	\$42.76	\$40.20	\$38.37	\$36.52	-5.0%	-29%

North America. Standard Flash Card MSP

1 GB cards continue to increase in price, while higher capacity cards fell in price—most noticeably 4 GB SDHC cards fell 77% over the latest reporting period.



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
1 GB	\$2.95	\$2.95	\$2.95	\$2.95	\$3.49	\$3.49	\$3.49	0.0%	18%
2 GB	\$4.99	\$4.99	\$4.99	\$4.95	\$0.99	\$1.99	\$3.99	101.0%	-20%
4 GB	\$12.99	\$11.99	\$9.99	\$9.99	\$5.99	\$5.99	\$2.99	-50.0%	-77%
8 GB	\$19.99	\$19.99	\$19.99	\$17.99	\$12.99	\$12.99	\$12.99	0.0%	-35%



Standard Flash Cards

North America Leading Brands Standard Flash Card Consumer Price Trend

SD Cards remained tightly competitive, with Kingston and Toshiba dropping prices, while Lexar, PNY and Dane Elec brought prices back to their average to match other manufacturers at the end of the quarter.

As expected, 1 GByte products are nearing EOL, and is noted by Toshiba products disappearing from shelves at the end of November.

End of December
Shenzhen broker
pricing for 500 piece
minimum order
quantity of SD Flash
Cards:

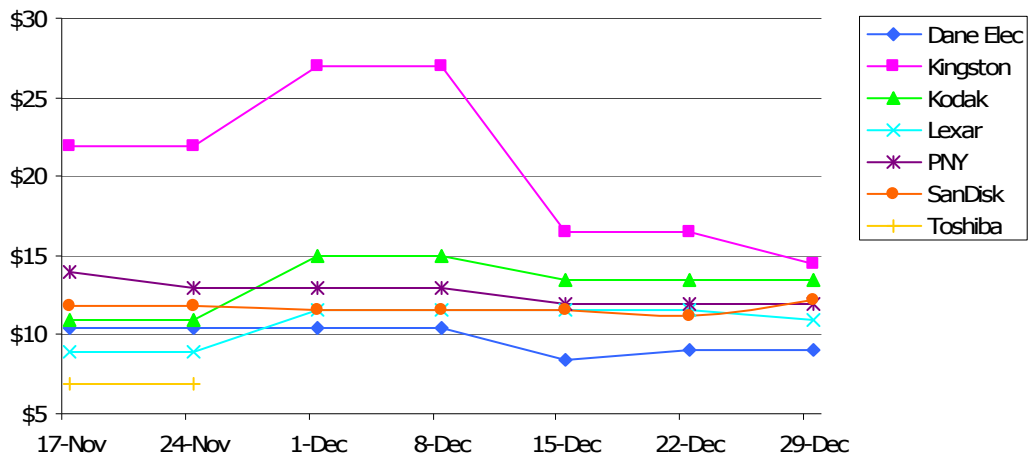
1 Gbyte - \$1.98

2 Gbyte - \$2.85

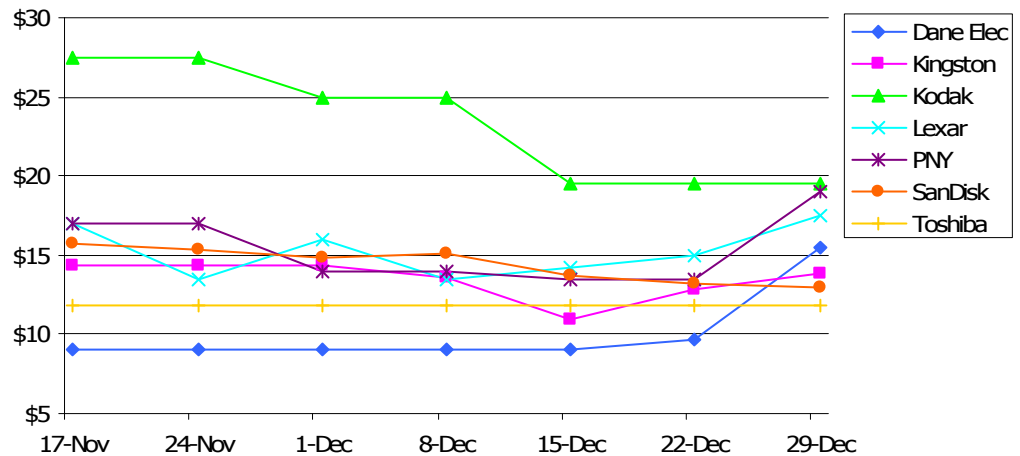
4 Gbyte - \$4.78

The products are
individually packed.

1 GB



2 GB

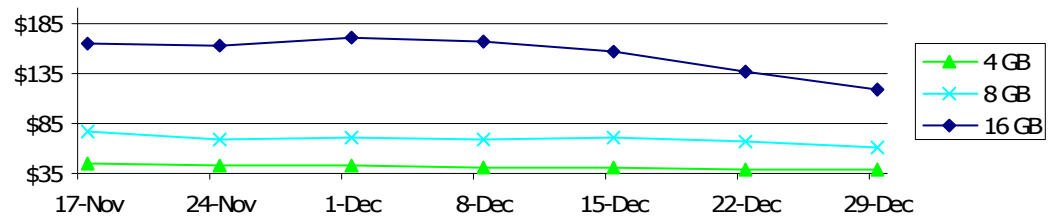




High Performance Flash Cards

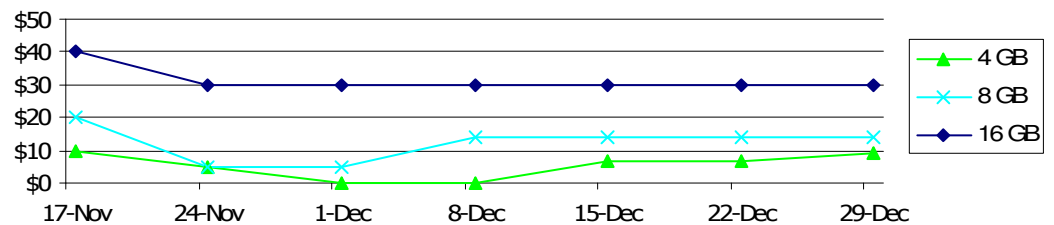
North America High Performance Flash Card ASP

Modest shelf price erosion is seen on High Performance Flash Cards towards the end of the quarter, with higher capacity 8 Gbyte and 16Gbyte ASPs and MSPs seeing between 20 and 30% reductions.



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
4 GB	\$44.48	\$42.23	\$42.28	\$40.57	\$41.03	\$39.48	\$39.80	1%	-11%
8 GB	\$76.65	\$69.04	\$70.06	\$68.55	\$71.66	\$66.01	\$61.54	-7%	-20%
16 GB	\$164.31	\$161.77	\$169.48	\$166.37	\$155.96	\$136.44	\$118.56	-13%	-28%

North America High Performance Flash Card MSP



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
4 GB	\$9.99	\$4.95	\$0.00	\$0.00	\$6.99	\$6.99	\$8.95	28%	-10%
8 GB	\$19.95	\$4.99	\$4.99	\$13.95	\$13.95	\$13.95	\$13.95	0%	-30%
16 GB	\$39.95	\$29.99	\$29.99	\$29.99	\$29.99	\$29.99	\$29.99	0%	-25%



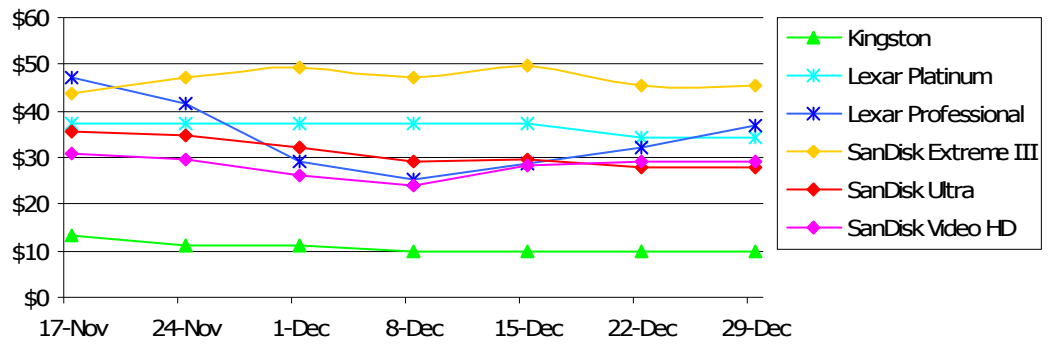
High Performance Flash Cards

North America Leading High Performance Flash Card Consumer Price Trend

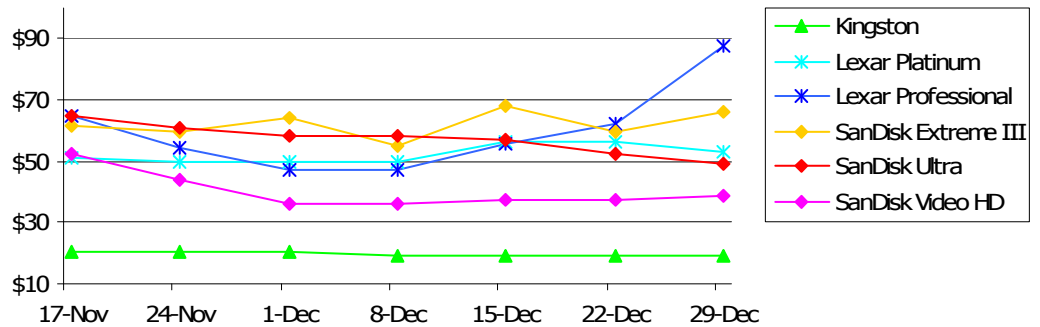
Product pricing remained in line over the period.

Lexar continues to hold the highest price point on 16 GB Cards, with others manufacturers offering products at less than half the price of Lexar SD Cards.

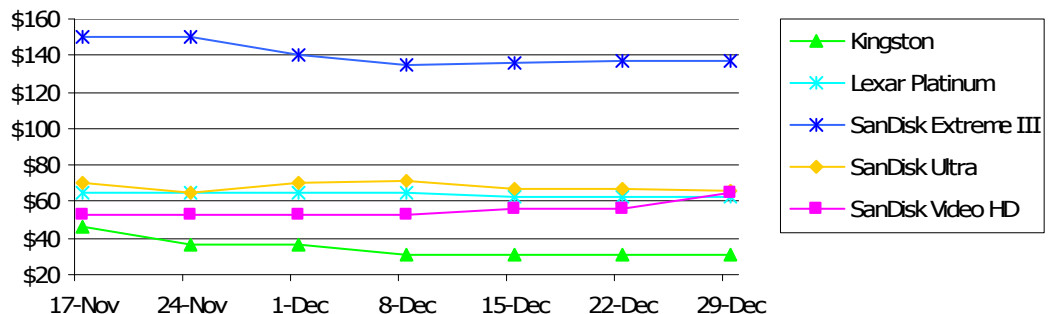
4 GB



8 GB



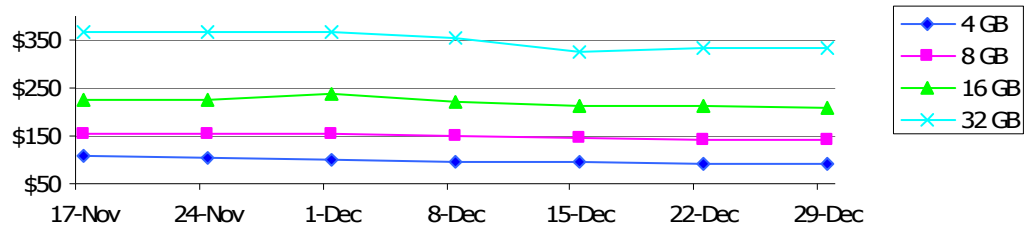
16 GB





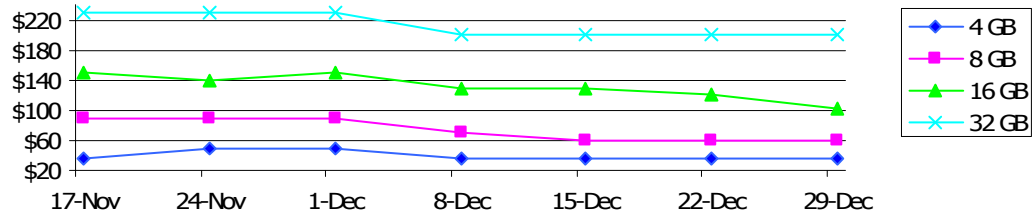
Personal Media Players

North America Media Player ASP



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
4 GB	\$106.79	\$105.90	\$100.30	\$96.89	\$95.83	\$92.40	\$91.91	-1.0%	-14.0%
8 GB	\$154.27	\$154.39	\$153.27	\$151.11	\$146.36	\$143.30	\$143.30	0.0%	-7.0%
16 GB	\$227.03	\$225.57	\$238.47	\$221.81	\$212.13	\$210.77	\$208.93	-1.0%	-8.0%
32 GB	\$367.28	\$367.28	\$364.84	\$353.31	\$326.58	\$331.75	\$331.75	0.0%	-10.0%

North America Media Player MSP



	17-Nov	24-Nov	1-Dec	8-Dec	15-Dec	22-Dec	29-Dec	% change last period	% change all periods
4 GB	\$34.99	\$49.98	\$49.98	\$34.99	\$34.99	\$34.99	\$34.99	0.0%	0.0%
8 GB	\$89.99	\$89.99	\$89.99	\$69.99	\$59.99	\$59.99	\$59.99	0.0%	-33.0%
16 GB	\$149.99	\$139.99	\$149.99	\$129.87	\$129.87	\$119.99	\$102.00	-15.0%	-32.0%
32 GB	\$229.99	\$229.99	\$229.99	\$199.99	\$199.00	\$199.00	\$199.00	0.0%	-13.0%



Personal Media Players

North America Leading Brands Personal Media Player Consumer Price Trend

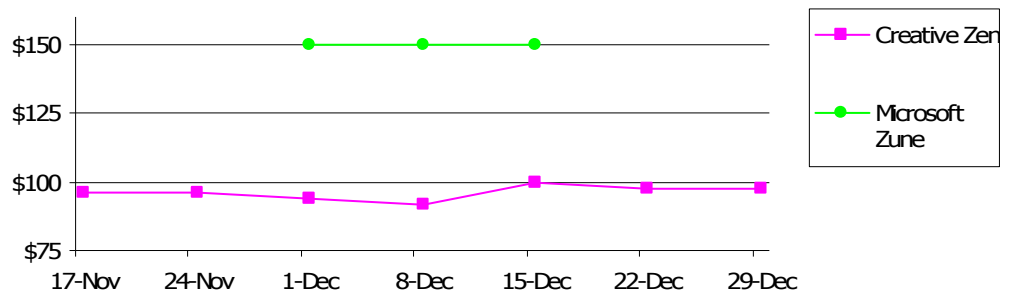
Non-iPod 8 GB players remain competitive as we enter Q1.

The spike in prices for the 16 Gbyte Creative Zen is likely due to a pricing error in which the player was listed at over \$400 at one of our online retailers.

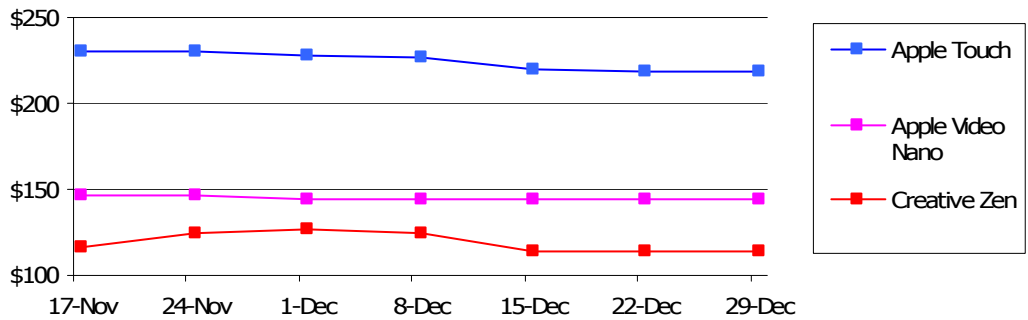
During the second half of 2008, we regularly received offers for iPod knock-offs. Those offers have dried up almost entirely, and we believe that Asian manufacturers have abandoned the US market for these products.

Major brand MP3 players like Phillips and RCA have likewise disappeared from store shelves.

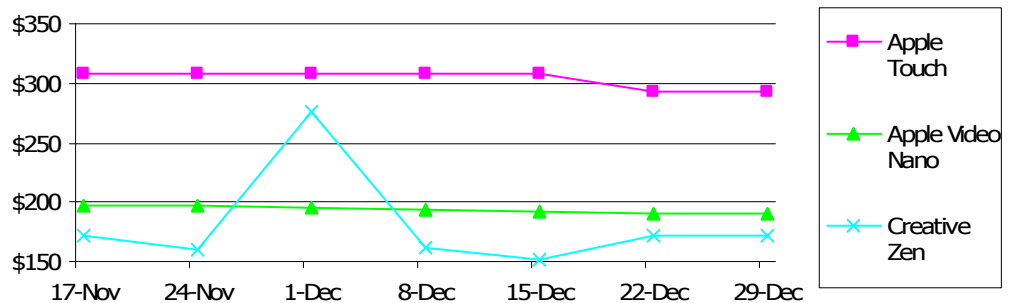
4 GB



8 GB



16 GB





Expert Consultations

Please contact us for information regarding expert consultations on the flash memory field including, memory, controller, and product manufacturers, storage brands, embedded flash memory applications, OEM's who integrate flash memory into their products, as well as retail and e-commerce sellers of flash memory products. Expert consultations are available directly from Westwood Marketing, LLC, and investment industry professionals can access us via:

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Appendix

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