

Very Anemic Semiconductor Growth for July But 3Q Guidance for Growth is Solid, and DRAMs Really are Different

Recently released semiconductor industry statistics for July reflected surprisingly weak growth given strength over the previous three months, expected and demonstrated strength from memory products this year, and solid guidance for 3Q growth. While the overall semiconductor business environment remains quite healthy, this could change if negatives cumulate over the next few weeks. While some caution is warranted, I think current strength will persist.

Both industry statistics and company reports resulted in very solid, better-than-expected 2Q growth as memory products continue to drive the industry. Guidance for the 3Q after the recently completed 2Q earnings season is also very solid as we enter the seasonally strongest period of the year. In the meantime, chip sector shares have gained but the performance of my Universe has diverged from that of the SOX, with a mix of under- and over-performance compared to each other as well as broader market indices, depending on the timeframe. The bad news is that things are getting complicated, but the good news is that potential investment opportunities are surfacing.

I am also taking the opportunity in this publication to highlight the difference between DRAM and NAND memory markets. While they are both driving disproportionate growth across the semiconductor industry this year, the two products operate in vastly different environments. The really short version is that DRAMs are an oligopoly that is likely to remain highly profitable for the foreseeable future, while NAND is much more commodity oriented whose pronounced expansion is likely to be volatile as the ebbs and flows of short-term industry supply affect market pricing and overall product revenues.

Memories Still Drive Growth: DRAM and NAND memories continue to drive semiconductor industry growth. In June the SIA/WSTS industry organization updated its semi-annual forecast, revising expected revenue growth this year to +12.4% from +7% with memories contributing +26.5%—and no other major product group exceeding the +12.4% average. In this case, memories include DRAM, SRAM, NOR Flash, NAND Flash and others.

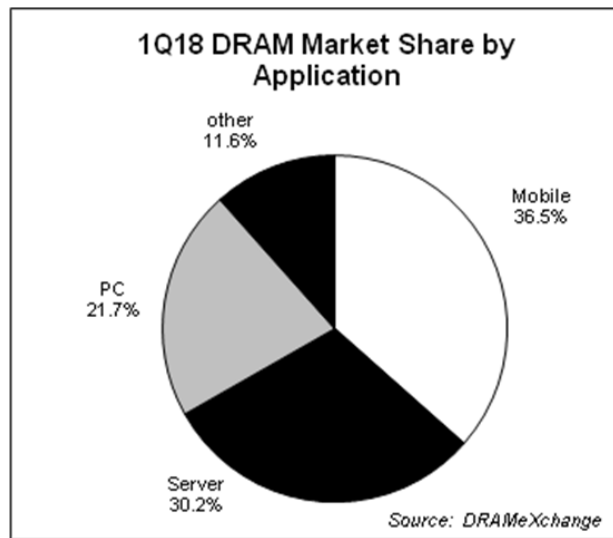
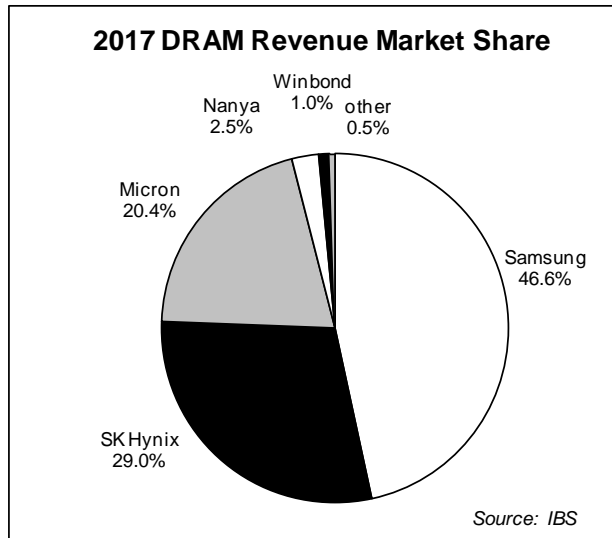
Recall market researcher IC Insights expects 2018 revenue growth for the overall industry of +15% primarily driven by DRAM gains of +39% (up by 200 basis points last month) and NAND growth of +17%. The rest of the semiconductor industry *excluding* DRAMs (but including NAND) is expected to grow by +10%, according to IC Insights.

DRAMs are Different, NAND Not-So-Much: Over the last two decades DRAMs have transformed from a Moore's Law-driven commodity to an oligopoly of specialists serving fragmented end-markets that are likely to support current levels of profitability for at least the next couple of years—if not longer. NAND flash, on the other hand, continues to embody relatively greater commodity-like characteristics offering greater growth potential than DRAMs, albeit commensurate with enhanced volatility of more pronounced market price erosion thanks to a larger supplier base.

DRAM product profitability is likely to persist for the foreseeable future due to: Supplier consolidation with three manufacturers currently accounting for some 96% of industry output; fragmented end-markets of PCs, smartphones, servers and automotive each requiring different product performance optimizations (density, low-power, high-speed and high-reliability, respectively); and technological complications impeding line-width shrinkage below 20nm significantly raising the capital intensity of investment and severely encumbering potential new entrants. This is why I am *NOT* concerned that the rich and motivated Chinese will spoil the DRAM market by crashing prices with oversupply anytime in the foreseeable future. There are currently two DRAM wafer fabs in China attempting to manufacture devices, and I predict both will struggle: Fujian Jin Hua IC, and Innotron Memory (formerly Hefei ChangXin or Hefei RuiLi and owned by the Hefei Industrial Investment Group, or HIIG). Also, unit growth of primary end-markets for DRAMs has largely plateaued (PCs and smartphones), although servers are growing and content expansion on a per-unit basis continues to support annual bit growth around +20%.

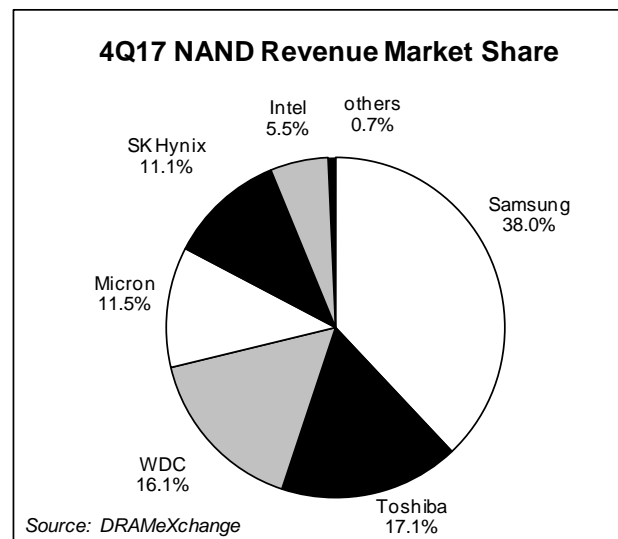
NAND flash has very different market characteristics: there are twice as many suppliers supporting a smaller market that is less fragmented with twice the expected growth compared to DRAMs. Six suppliers instead of three account for virtually the entire supplier base. IC Insights estimates that DRAMs will account for 24% of the total semiconductor industry this year, while NAND will total 14%—or somewhat more than half of DRAMs. NAND market applications are split amongst PC, consumer, smartphones, and client and enterprise SSDs (solid state drives), but I argue the relative performance differences are less pronounced than for DRAMs—NAND is predominantly a density and cost game between smartphones and SSDs (high-reliability has been ceded to NOR flash products). And while the technological challenges are significant and expanding, they appear to be less challenging than those for DRAM at this time. Finally, the expected growth of SSDs as they replace conventional

HDDs (hard disk drives) over the next several years turbo-charges expected annual bit growth of +40%, twice that of DRAMs. However, the greater commoditization of NAND results in significant market price erosion which tempers expected revenue growth: DRAM revenue is expected to grow by +39% this year as market price strength adds to bit growth, while NAND will only grow by +17% as market price erosion more than offsets bit growth.



Some words about semiconductor capital equipment expenditures. First of all, cap equipment expenditures are demand-pulled by memory maker end-market opportunities, and do not supply-push chip industry growth. Nevertheless, as a second-order effect I concede that a flood of supply can spoil markets (NAND revenue growth this year, for example). IC Insights expects DRAM (combined with SRAM) cap ex to account for 22% of semiconductor industry total cap ex this year, which, I argue, is roughly what it should be given the product accounts for 24% of sales. NAND (combined with NOR flash) is expected to account for 31% of total cap ex this year—which, I argue, is pretty rich for a sector that accounts for 14% of sales. And while DRAM/SRAM cap ex is growing by +41% (pretty close to revenue growth of +39%), NAND/NOR cap ex is only growing by +13%. I argue this +13% is artificially depressed to a significant degree after Samsung spiked a huge \$14B expenditure on NAND alone during 2017. Compare that \$14B from last year to total expected industry NAND/NOR cap ex this year of \$31B.

The bottom line is that DRAM and NAND are very different markets. I believe DRAM will continue to grow and largely maintain its impressive profitability (70% gross margins at Micron last quarter) for at least the next couple—if not the next few—years. NAND, on the other hand, will probably experience greater overall growth, but that growth will be highly volatile as short-term supply dynamics risk adverse market price erosion.



Structural Differences: Recall that my US-equity-based Tokeneke Universe does *not* include some three-quarters of industry DRAM and NAND business from Samsung, Hynix and Toshiba. While my Universe does include Micron, it will more closely track growth of +10% this year rather than +15% or +12.4%. Other structural differences in my Universe include the lack of very large international players (Samsung, Hynix, Toshiba, MediaTek, Infineon), although it does include wafer foundries (TSMC, UMC, SMIC, TowerJazz) and IP companies (Rambus, Xperi (Tessera), Ceva, and InterDigital) that, technically anyway, don't count as semiconductor industry revenues, but rather costs associated with manufacturing. I also normalize fiscal quarters to the best fitting two out of three months. Unreported stub-periods from acquisitions can also be a difference.

The bigger problem is that most US-based investors in the chip sector experience the industry from the Tokeneke Universe perspective. The Philadelphia Semiconductor Index Option (SOX) is similarly under-represented in memories, although this is mitigated by the inclusion of equipment companies supplying to memory manufacturers.

Very Anemic July: Worldwide semiconductor industry revenues for July grew by a very anemic +0.4% sequentially on a three-month rolling average basis, according to statistics released by the Semiconductor Industry Association (SIA) earlier this week. The SIA spun it as a positive noting year-to-year growth of +17.4%, although I am surprised at its pronounced relative weakness after three months of above-average gains, expected industry growth this year (especially from memories), and company guidance for 3Q strength. July has averaged a gain of +1.4% with a high of +5.4%, a low of -6.3%, and only six declines in the last 28 years—including three in the last seven years. China led once again with a gain of +1.7% followed by The Americas at +0.4%. Asia-Pacific was flat at +0.0%, Japan declined ever so slightly at -0.1%, and Europe continued to lag with a decline of -2.4%.

Next month’s release of August *better* make up for July weakness, given expected 3Q growth. August has averaged a gain of +1.9% with a high of +5.2%, a low of -3.5%, and only four declines in the last 28 years—including none in the last 16 years.

Very Strong 2Q: 2Q sequential growth was a very strong +6.0% according to industry statistics from last month, thanks to memories. The 2Q has averaged growth of +3.8% with a high of +20.0%, a low of -19.9% and only five declines in the last 28 years, including two of the last 11 years.

The 2Q earnings season is finally complete with all 60 companies in the Tokeneke Universe reporting. Revenue growth was much better than expected, although underperformed relative to industry statistics—thanks again to the lack of memories. The weighted average sequential sales growth across my memory-light Universe was +3.2%, which is near the high-end of company guidance centered at +2.0% ranging from +0.6% to +3.5% after 13 preannouncements (INTC, MCHP, MLNX, MU, PI and TSM raised their guidance; ACIA, INFN, IOTS, SIMO, TXN and UMC narrowed their ranges; and IDCC lowered). The average company gain was even better at +4.7%.

Solid 3Q Growth: I argue that guidance for 3Q looks pretty darn good despite numerical underperformance. Why? Two reasons: First, my Universe is light on high-growth memory; and second, guidance has proven to be conservative in recent quarters where actual results have skewed to the higher-end of the range. The weighted-average sequential revenue growth across my Universe is +5.7% ranging from +3.0% to +8.5%. 3Q is seasonally the strongest sequential growth quarter of the year: it has averaged a gain of +6.5% with a high of +19.9%, a low of -11.7%, and has declined only twice in the last 28 years—including none of the last 16. While the center-point of guidance underperforms to seasonal norms, the higher-end of the range would be quite respectable.

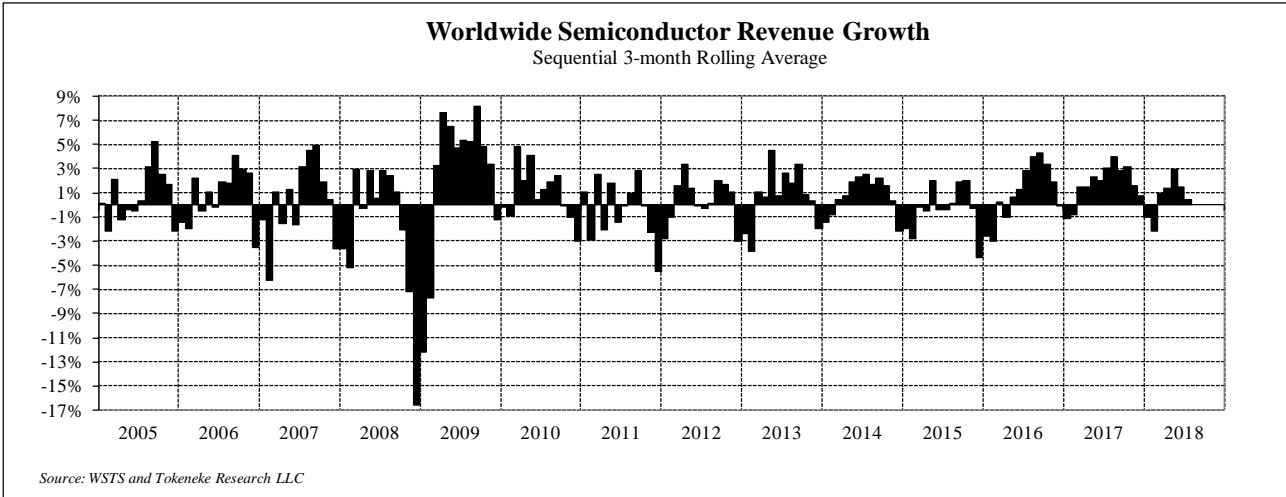
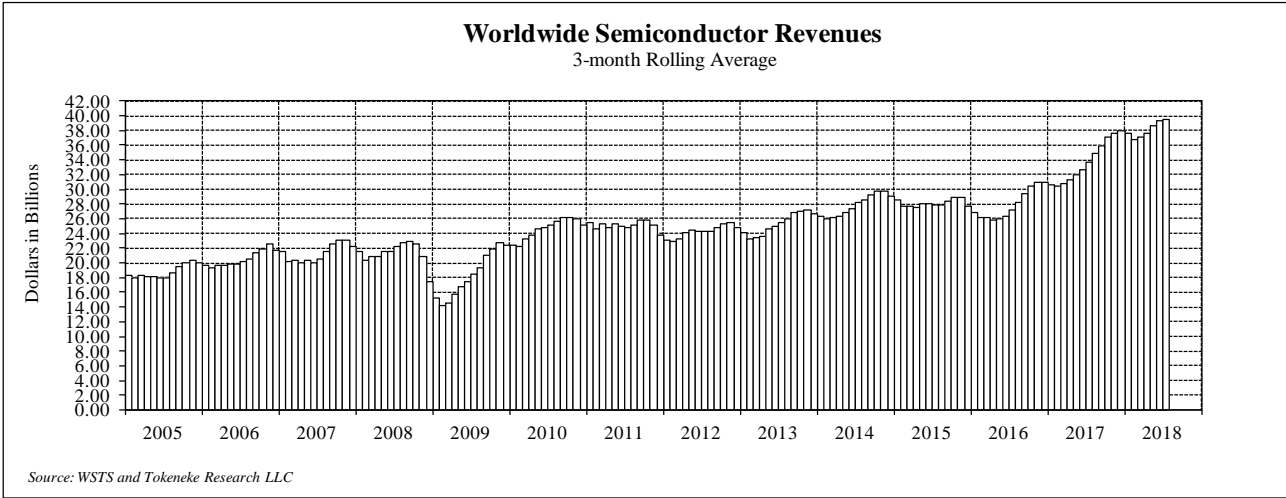
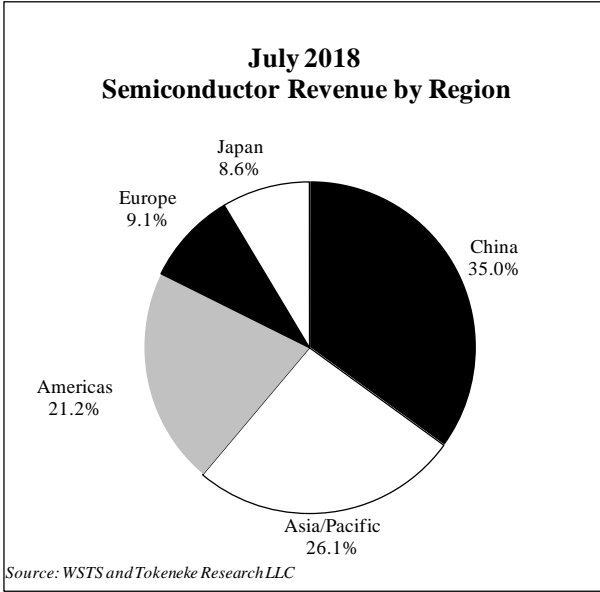
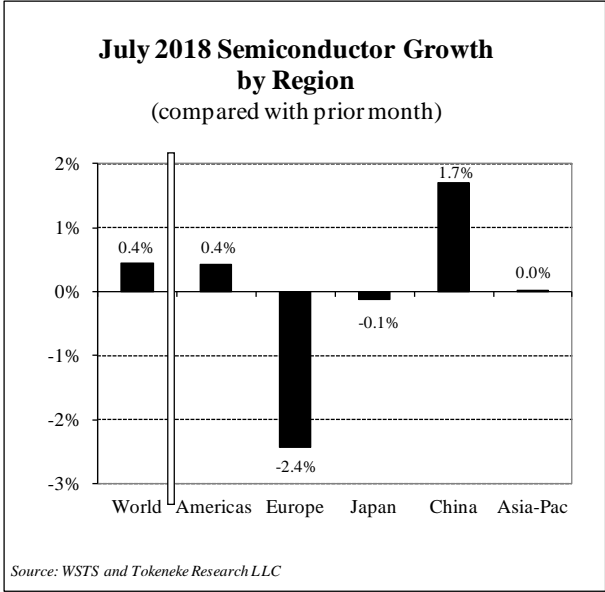
Chip Sector Divergence Continues in August: Chip sector share prices diverged again last month as my Universe gained over double that of the SOX. During August, the Philadelphia Semiconductor Index Option (SOX) gained +2.5% and mostly underperformed relative to broader equity markets, while 37 out of 60 stocks in my Universe advanced by an average of +5.5% compared to gains from the NASDAQ, S&P500 and DOW at +5.7%, +3.0%, and +2.2%, respectively. Both the SOX and my Universe are underperforming compared to the very strong NASDAQ on a year-to-date basis, per the tables below.

August		QTD (3Q)		YTD		Indices		
Winners (37/60)	Losers	Winners (33/60)	Losers	Winners (34/60)	Losers	Aug	QTD	YTD
PXLW 69.0%	MOSY -20.8%	AMD 67.9%	MOSY -52.0%	AMD 144.8%	NLST -62.0%	SOX 2.5%	6.7%	11.8%
NPTN 38.0%	NLST -16.6%	PXLW 52.6%	NLST -33.8%	SMTC 74.7%	HIMX -38.3%	SMH 2.4%	6.3%	11.4%
AMD 37.3%	MCHP -7.9%	NPTN 41.1%	IOTS -28.0%	QTNA 49.8%	QUIK -37.4%	NASDAQ 5.7%	8.0%	17.5%
ACIA 26.9%	XPER -5.7%	IDTI 33.3%	SQNS -18.6%	NVDA 45.1%	TSEM -36.0%	S&P500 3.0%	6.7%	8.5%
SMTC 25.9%	MX -5.2%	SMTC 27.0%	NXP1 -14.8%	IDTI 42.9%	XPER -35.7%	DOW 2.2%	7.0%	5.0%
average stock +5.5%	SOX +2.5%	average stock +4.6%	SOX +6.7%	average stock +5.6%	SOX +11.8%			

Sector Volatility Tempers: The SOX returned to relatively subdued volatility during August after its roller-coaster profile during July. It cycled up the first several days of the month by +2.7% before retreating by -5.8% over the next couple of weeks, and then rallied by +6.0% after the 20th of the month to finish the period at a value of 1,401.2.

Opportunities Knock: While the longer-term outperformance of the SOX index (see the chart on Page 5) and the significant difference between winning and losing sectors continues to concern me from a top-down perspective, I am actually encouraged by the divergence between the SOX index and my Universe. See my latest Semiconductor Investment Ideas publication for specific potential opportunities.

—Dan K. Scovel
Semiconductor Analyst



Weekly Philadelphia Semiconductor Index Option (SOX) vs. S&P 500



Source: Tokeneke Research LLC

*S&P 500 normalized to the SOX

The Company

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My Background

I have an electrical engineering background, nearly 12 years of semiconductor industry experience, and was on Wall Street for nearly eight years where I was selected as the Best On The Street semiconductor analyst for 2002 by The Wall Street Journal, and third-rated Best of the Best across all sectors.

I obtained my undergraduate BS degree in electrical engineering from the University of Washington, and my MBA from Santa Clara University. My industry experience consists of nearly 12 years in various technical sales and marketing roles at four different semiconductor firms located in Silicon Valley beginning with Advanced Micro Devices in 1984, followed by two small start-up companies, and ending at Cirrus Logic where I supported the firm's Japanese market development. I joined Fahnstock & Co. as a senior semiconductor analyst in 1996 and was recruited by Needham & Co. in April 2000.

My formal coverage list as a sell-side analyst included the following equities: AMD, ALSC, ALTR, ARTI, ATML, CUBE, CY, ESST, GNSS, INTC, ISSI, LSI, MOSY, MU, OIIM, OVTI, RMTR, SIII, SMSC, STEC, SVTG, TDFX, TSRA, TXN, and ZRAN.

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