ANALOG ALCHEMY - Volume XVIII, Issue 10 -- August 2017 SIA Data Analysis

Summary

WSTS August 2017 Results up +2.3% m/m, *above typical seasonal decline of -0.4% m/m (up +10.4% y/y).*

Raising 2017 growth outlook to +7%-10% y/y (from +5%-8% y/y previously). *August results appeared to be tracking well and even slightly ahead of 3CQ17 analog company guidance, with two consecutive months of above-seasonal performance. Coupled with YTD results for the analog semiconductor markets of +12.4% y/y, and with stronger-than-expected September manufacturing data from both the US (60.8% vs. 58.0% expectations) and China (52.4% vs. 51.6%), we are raising our 2017 growth outlook to +7%-10% y/y.*

Key end markets remain Industrial and Automotive, *with Industrial exhibiting solid C2Q17 results (up ~mid-single digits q/q), with commentary suggesting positive y/y trends continuing for the remainder of 2017 (with typical 1H>2H seasonality).*

Key Points

WSTS August 2017 Results: August's analog & mixed-signal (AMS) IC billings came in at $4.45 billion, a +2.3% month-over-month (m/m) increase, which compares with the month's normal seasonality of -0.4% m/m, and a +10.4% increase from the year-ago period. On a 3-month rolling basis, billings were up +2.7% m/m, versus +1.1% historical average, and up +9.9% y/y from August 2016.

Pricing & Unit Shipments: August's aggregate average selling price (ASP) of $0.33 decreased -3.3% m/m, versus the month's average historical -2.2% m/m decrease. Total monthly unit shipments of 13.46 billion units represented a +5.9% m/m increase versus seasonal +1.9% m/m, and a +20.9% increase from the year-ago period (August 2017).

The analog, mixed-signal semiconductor industry's August billings increased +2.3% m/m on a -3.3% decrease in average selling price, offset by a +5.9% m/m increase in unit shipments. The month-to-month increase in August billings was attributable to unit shipments of 13.46bn, up +5.9% m/m (vs. seasonal of +1.9% m/m), which was partially offset by the month's -3.3% m/m decrease in ASP to $0.33 (vs. seasonal of -2.2% m/m). As a reminder, this follows July quarter performance that came in above normal seasonality (-6.2% q/q vs. seasonality of -8.5%). Thus, year-to-date (YTD), AMS billings were up +12.4% y/y on higher unit shipments (+18.8% y/y), partially offset by lower ASPs (-5.5% y/y).

August's better-than-seasonal performance of -6.2% m/m vs. seasonal of -8.5% m/m follows the month of July's performance of -6.2% m/m vs. seasonal of -8.5% m/m, June's performance of +13.0% vs. seasonal of +14.0% , and May's essentially in-line seasonal performance. We weigh these results in conjunction with continued encouraging data from the U.S. manufacturing sector. Specifically, the ISM reported a September PMI of 60.8%, ahead of consensus expectations of 58.0% and representing a 930bps improvement from the year-ago period. We also highlight that September's 60.8% reading is above the 7-year average of 53.4% and represented a 7-year high for the month of September. In addition, we note that China PMI data was also above expectations, coming in at 52.4% (vs. consensus of 51.6%). We are encouraged by the ISM data as it suggests that we are in an environment that suggests a more positive bias, and highlights an environment that remains robust, with business trends and demand remaining at healthy levels (not too excessive).

September quarter outlook by our coverage companies (with all companies in our coverage having reported June/July quarter results and given September/October quarter outlooks) is for an average revenue growth of +4.8% q/q (+3.7%q/q median); in aggregate dollar terms, companies guided for September quarter growth of +4.5% q/q. Broken down by market cap, large-cap guidance is +2.0% with a median +3.4% (on an apples-to-apples basis, excluding one-time accounting adjustments that boosted 2CQ17 comps for ADI and MXIM, average large guidance would have been +3.2% q/q with a median of +4.3%). Outlook from mid-caps are a more robust +5.3% (median +3.2% q/q with results somewhat skewed by CRUS' ~28% q/q increase in the September quarter ahead of seasonal ramps at its largest customer) and small-caps names target an average of +4.3% q/q (median +5.0% q/q).

We view August's better-than-seasonal +2.3% m/m billings increase as positive (vs. seasonal of -0.4% m/m), suggesting that the industry remained in healthy condition moving through the third calendar quarter. As a result, with two consecutive months of above-seasonal performance (cumulative outperformance of +5.0%) and coupled with the current range of analog company guidance, we are raising our September quarter forecast for the analog semiconductor market, from +3.0% q/q growth to +6.0% q/q growth. In addition, with YTD results for the analog semiconductor markets of +12.4% y/y, and with stronger-than-expected September manufacturing data from both the US (60.8% vs. 58.0% expectations) and China (52.4% vs. 51.6%), we are raising our 2017 growth outlook to +7%-10% y/y.

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Raising 2017 growth outlook to +7%-10% y/y (from +5%-8% y/y previously). August results appeared to be tracking well and even slightly ahead of 3CQ17 analog company guidance, with two consecutive months of above-seasonal performance. Coupled with YTD results for the analog semiconductor markets of +12.4% y/y, and with stronger-than-expected September manufacturing data from both the US (60.8% vs. 58.0% expectations) and China (52.4% vs. 51.6%), we are raising our 2017 growth outlook to +7%-10% y/y.

Key end markets remain Industrial and Automotive, with Industrial exhibiting solid C2Q17 results (up ~mid-single digits q/q), with commentary suggesting positive y/y trends continuing for the remainder of 2017 (with typical 1H>2H seasonality). In Automotive, while vehicle unit shipments may be slowing (especially US and China), it does not change our view on the strong, secular LT content growth story in Auto Semis over the coming years (vs. simply unit growth). We note that while the US auto market will also likely be negatively impacted in the immediate/near-term from recent Hurricane activity, we believe vehicle sales in those affected regions will quickly recover and even be a net positive due to replacement of destroyed/damaged vehicles.

Looking ahead, we anticipate growth drivers for AMS will continue to be:

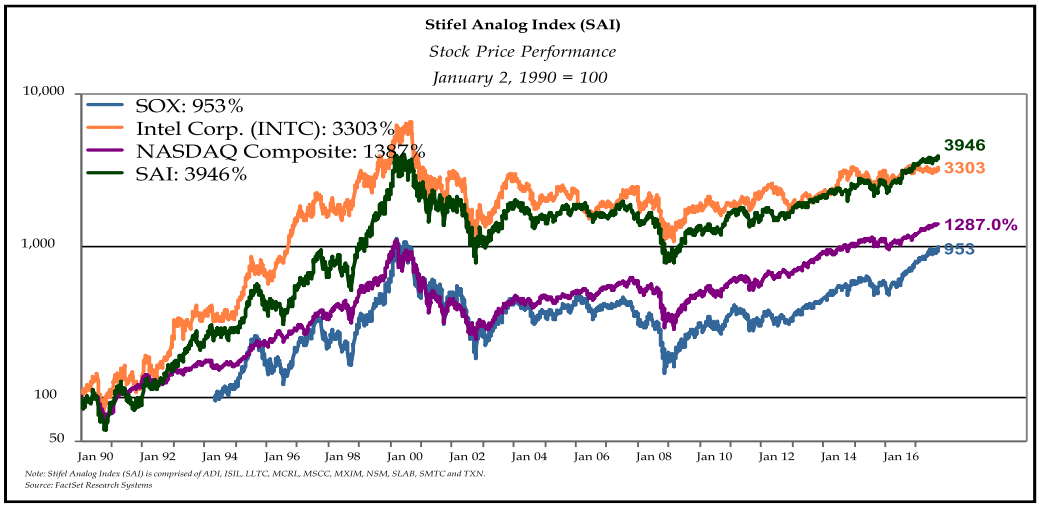
(1) Automotive on increasing silicon content/electrification, particularly in ADAS and alternative-energy vehicles;
(2) Communications, on 100Gbps optics/buildout and wireless infrastructure;
(3) Consumer, on continuing acceptance of IoT and adoption of new interface technologies (e.g., USB-C/USB-PD); and
(4) Industrial, on factory automation and increased focus on infrastructure spending.

Based on a slightly above-seasonal August (following a slightly better than seasonal July, a below-seasonal June, and an in-line May) – and coupled with solid YTD performance thus far over the first seven months of the year, **we are raising our 2017 growth outlook of +7% to +10% (from +5%-8% previously).**

Market Update – Analog, Mixed-Signal Semiconductors

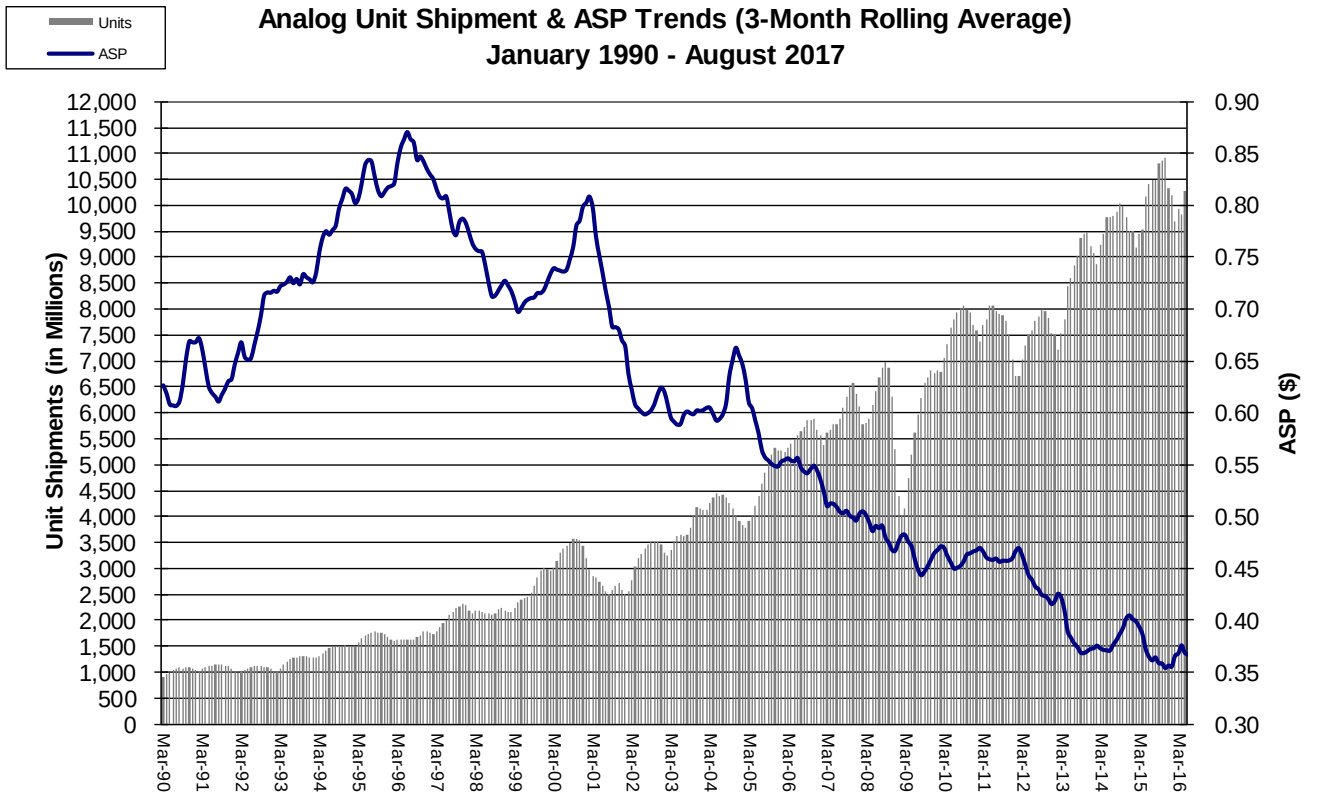
In our analysis of the analog and mixed-signal semiconductor markets, we discussed industry pricing trends, channel inventories, and seasonality in previous issues of the *Analog Alchemy*. The Semiconductor Industry Association (SIA) World Semiconductor Trade Statistics (WSTS) recently released sales, unit shipments, and pricing data for the month of August 2017. We would like to use this opportunity to present those results and our key takeaways with respect to the pricing trends in the analog and mixed-signal semiconductor markets.

Exhibit: Stifel Analog Index



Analysis

Exhibit: Rolling 3-Month Analog Semiconductor Unit Shipment & ASP Trends, Jan. 1990 - Aug. 2017



Source: WSTS

August billings of $4.45bn represent an increase of +2.3% m/m, vs. the month's 27-year historical average of -0.4% m/m. This slightly-above seasonal performance for the month of August follows an above-seasonal performance for the month of July, where billings came in at -6.2% m/m vs. seasonal of -8.5%, a slightly below seasonal performance for the month of June, where billings came in at +13.0% m/m vs. seasonal of +14.0; and an in-line seasonal performance in May at -0.5% m/m vs. seasonal of -0.5%. Year-over-year comparisons continue to be volatile, but remain solidly positive since May 2016 (up 1.2% y/y) to a peak in February 2017 (+18.9% y/y), with the recent August 2017 month growing +10.4% y/y.

Looking ahead, the September quarter is characterized as the second strongest quarter with a 27-year average of +4.4% q/q. As it relates to our coverage universe and, specifically, to guidance given by AMS companies for the September quarter, we see an average of +4.8% q/q (+4.3% ex Max & Min), and in total dollar terms up +4.5% q/q. We note that the two major bellwethers for the analog industry, Texas Instruments and Analog Devices, have guided for September quarter revenue midpoints of +5.6% q/q and +4.6% q/q (excluding $24.6mn acquisition-related deferred revenue from ADI's 2CQ17 revenue number), respectively. We note the third bellwether, Maxim Integrated, guided for a slightly down sequential quarter (down -1.9% q/q, excluding ~$19mn sell-in transition revenue in 2CQ17) due in part to slightly softer Automotive and Communications Infrastructure product sales.

As a result overall, given August's better-than-seasonal performance and coupled with the current range of analog company guidance and recent positive manufacturing data, we are again (and more materially) raising our September quarter forecast for the analog semiconductor market, from +3.0% q/q growth to +6.0% q/q growth. We would further note that this +6.0% q/q growth estimate would assume a conservative m/m growth forecast for the month of September of

~8%-9% m/m vs. its 27-year historical average of +16.4% m/m growth. We would further note that over the last 27 years for which we have data, September has grown by double-digits m/m with the exception of two years: (a) 1995 (+5.3% m/m) and (b) 2010 (+7.8% m/m). Thus, we believe our revised +6.0% q/q forecast for September to be relatively conservative.

In addition, while we had previously believed the industry to be tracking toward the high end of our prior 2017 outlook of +5%-8% y/y, we believe it appropriate to now **raise the range for our 2017 outlook to +7%-10% y/y growth**, given our upwardly-revised September quarter outlook, coupled with positive manufacturing data (Industrial representing the largest end market for analog semis) from both the US (ISM PMI of 60.8% vs. 58.0% consensus expectations; August was 58.8%) and China (PMI of 52.4% vs. 51.6% consensus expectations; August was 51.7%). We note the midpoint of this range assumes our revised +6.0% q/q September quarter forecast, coupled with typical m/m seasonality for the remainder of the year (which in turn, implies a below-seasonal December quarter performance of -3.5% q/q vs. average seasonality of -0.4% q/q), while the high end of this range is based on our conservative +6.0% q/q September quarter forecast coupled with average December quarter seasonality of ~-0.4% q/q.

Monthly ASPs continues to be volatile due to wider swings in unit shipments. ASP in the month of August decreased 3.3% m/m vs. seasonal -2.2% m/m, to $0.33. Current ASP volatility is, in our view, both a function of mix, as well as the result of an uncertain macroeconomic and end demand environment and a stronger U.S. dollar. In such an environment, we believe the advantages of lower supply chain inventory win out over the benefits of volume pricing that come with higher inventory. Empirically, swings in monthly ASP in the mid-single digits is not unusual; swings in the high single digits (arbitrarily defined here as an increase greater than 7.5% or a decrease less than -7.5%) as registered the last three months and are becoming increasingly prevalent. We counted 15 such incidences in the 23 years (5.4% rate over 276 months) spanning 1990-2012, while there were 12 such occurrences just in the last 4 years (25.0% rate over 48 months), 2013-2016. But in just the first seven months of 2017, we have had 3 months that exhibited wide ASP swings and contrasts to seasonality—March with a 7.9% ASP downswing (vs. seasonality of +0.8%), April with a 8.8% upswing (vs seasonality of +0.2%), and May with an 8.0% downswing (vs seasonality of -3.5%). Going forward, we anticipate consolidation in the analog semiconductor industry to afford companies more pricing power, and with that we expect ASP to become more stable over time. Thus far, while August's -3.3% m/m decline was more volatile than typical, June and July 2017 have exhibited relatively less volatility at -1.0% m/m and +1.8% m/m, respectively.

Total unit shipments for the month of August at 13.46bn units represents a sequential increase of +5.9% m/m, which compares to its 27-year average historical increase of +1.9% m/m. With August's unit performance above seasonal, we note it follows the month of July, where the unit shipments outperformed (decreased -7.9% m/m vs. seasonal of -8.3% m/m), June, where unit shipments outperformed (increased +14.2% m/m vs. seasonal of +11.7% m/m), and the month of May, where unit shipments outperformed (increased +8.0% m/m vs. seasonal of +3.1% m/m).

Product Categories: Broadly, July's General Purpose Analog (GPA) billings increased +2.0% m/m, above the typical seasonal decrease of -3.3% m/m, while Analog ASIC billings increased +2.6% m/m vs. seasonal increase of +1.5% m/m. In the month of August, billings were generally mixed m/m, and results were also mixed relative to historical seasonality. More specifically, performances by product category were: Signal Conditioning, down -5.4 m/m vs. -4.8% historical average; Interface, down -5.4% m/m vs. +0.6% historical average; Power Management, up +10.6% m/m vs. +4.7% historical average; and, Signal Conversion, -12.9% m/m vs. -20.4% m/m.

End Markets: Using analog ASIC data as a proxy for all analog semis, we observe that during the month of August, results were generally above seasonal, as Consumer, Computer, Automotive and Industrial were all above seasonality, whereas Communications was weaker than seasonal. More specifically, Consumer increased +2.5% m/m, vs. historical seasonality of +1.6% m/m. Computer increased +16.6% m/m vs. historical seasonality of +6.5% m/m. Communications decreased -1.0% m/m vs. historical seasonality of +6.5% m/m. Automotive increased +4.2% m/m, vs. seasonal -1.6% m/m. And, Industrial/Other increased +8.9% m/m, vs. seasonal +0.5% m/m.

Following are a few key thoughts relating to each end market and the major themes we are tracking.

Consumer was up +2.5% m/m, vs. seasonal +1.6% m/m, but was down -1.3% y/y in August and for the June quarter, was up +5.3% q/q vs. seasonal of -9.2% q/q; **YTD, Consumer is up +6.7% (2017 vs. 2016).** Recapping, 2016 was a stellar year with Consumer up nearly 20% in year-over-year comparison, vs. low single-digit decline in 2015, and low single-digit increase in 2014. Consumer was the best performing end market in 2016, beating Automotive and Industrial/Other that year, as it delivered the best annual y/y performance since 2010. As the Consumer market continues to evolve, especially as emerging trends especially in the areas of consumer IoT take root, many market observers could be pleasantly surprised and reset their perceptions of this market going forward.

Computer was up +16.6% m/m in the month of August, vs. seasonal +6.5% m/m, and was up +18.2% from August 2016 and for the June quarter, was up +17.4% vs. seasonal of +5.0% q/q; **YTD, Computer is up +17.3% (2017 vs. 2016).** For 2016, billings were down -9.6% y/y, which, while not growing, is a meaningful improvement from a negative 20%-plus y/y comparison at the start of the 2016. Computer remains in a secular down trend, as the PC market adjusts to cannibalization by smartphones, tablets, 2-in-1s, and other mobile form factors. In fact, Computer ASIC billings declined 4 out of the last 5 years with an average annual rate of decline of 9.3%. The latest forecast from SIA/WSTS predicts a stable Computer end market for the next 3 years, which compared to roughly 10% per year decline for the last two years (2015-2016) would be a nice change. We anticipate the many advances in PCs that, taken together, might be the motivating factor behind some recent strength and spurring users to upgrade, including: higher resolution displays (e.g., OLED (Apple), UHD, 4K), improved color dynamics, greater power efficiency leading to longer battery life, new storage technologies (solid state drives (SSD) and hybrid SSD-HDD drives, vs. traditional HDD), faster battery charging, new power architecture (USB-C/PD), and shorter system boot and response times, coupled with innovative form factors such as convertibles, detachables, ultrabooks, and 2-in-1's.

Communications experienced a decrease of -1.0% m/m in the month of August, vs. seasonal +6.5% m/m, and was up +8.2% y/y and for the June quarter, was up +0.5%, vs. seasonal of +6.2% q/q; **YTD, Communications is up +9.1% (2017 vs. 2016).** For 2016, Communications was up just +1.1% y/y (vs. +8.9% y/y in 2015 where it was the best performing end market). For the years ahead, Communications is expected to achieve modest growth with slight improvements year-after-year through 2018, with a projected 3-year CAGR of +2.3%, 2017-2019 (WSTS). Some of the key factors driving growth expectations are the growing number of connected devices, increasingly powerful handheld consumer electronics (smartphones, tablets, phablets), consumers' growing appetite for streamed content, and sustained presence of portable computing devices (laptops, notebooks, convertibles, detachables, ultrabooks). Jointly, these catalysts continue to drive down demand for bandwidth and have been a major motivation behind global 4G/LTE infrastructure build-outs in the past few years; and there is momentum building for 5G, which will likely be a 2019/2020 event. With IoT continuously gaining traction and consumption of Internet content continuing to increase, demand for data/communication bandwidth will only accelerate in the forthcoming years, forcing network providers/cell phone carriers to undertake additional large scale infrastructure expansions, equipment downgrade, and adoptions of new technologies (e.g., 5G).

Automotive was up +4.2% m/m in August, vs. seasonal -1.6% m/m, but was up +9.6% y/y and for the June quarter, was up +0.1% vs. seasonal of +2.9% q/q; **YTD, Automotive is up +14.7% (2017 vs 2016).** For 2016, Automotive had seen steady improvements, finishing up 17.1% y/y, which put it in second place behind Consumer (+19.6% y/y). In 2015, Automotive was the second best performing end market next to Communications with billings decreasing -0.8% y/y (while Communications grew +8.9% y/y), which followed an impressive 12.6% growth in 2014. Longer term, automotive is anticipated to be the fastest growing end market with a forecasted 3-year CAGR (2017-2019) of +7.0%. Automotive remains an important growth driver for many analog semiconductor companies. While global vehicle unit growth is expected to remain flat/slightly down y/y (based on SAAR estimates), dollar sales of automotive semiconductors is anticipated to be more resilient with growth possible driven by increasing electronic content in new car features, including: safety (e.g., electronic stability control, tire pressure sensing); efficiency (e.g., LED lighting, electric/hybrid drive train, fuel economy

gauge); convenience (keyless entry, kick-activated tailgate); connectivity (WiFi/Internet connectivity); infotainment (GPS, audio/video, in-vehicle network); and advanced driver-assist functions (ADAS) (e.g., adaptive cruise control, lane keeping, collision avoidance, self-parking). Many of these features that started on luxury models are now making their way to mass volume models, providing a lift to semiconductor companies leveraged to the automotive end market. With the long-term goal being energy-efficient, safe, self-driving cars, we believe automotive semiconductor content growth will be a multi-year cycle.

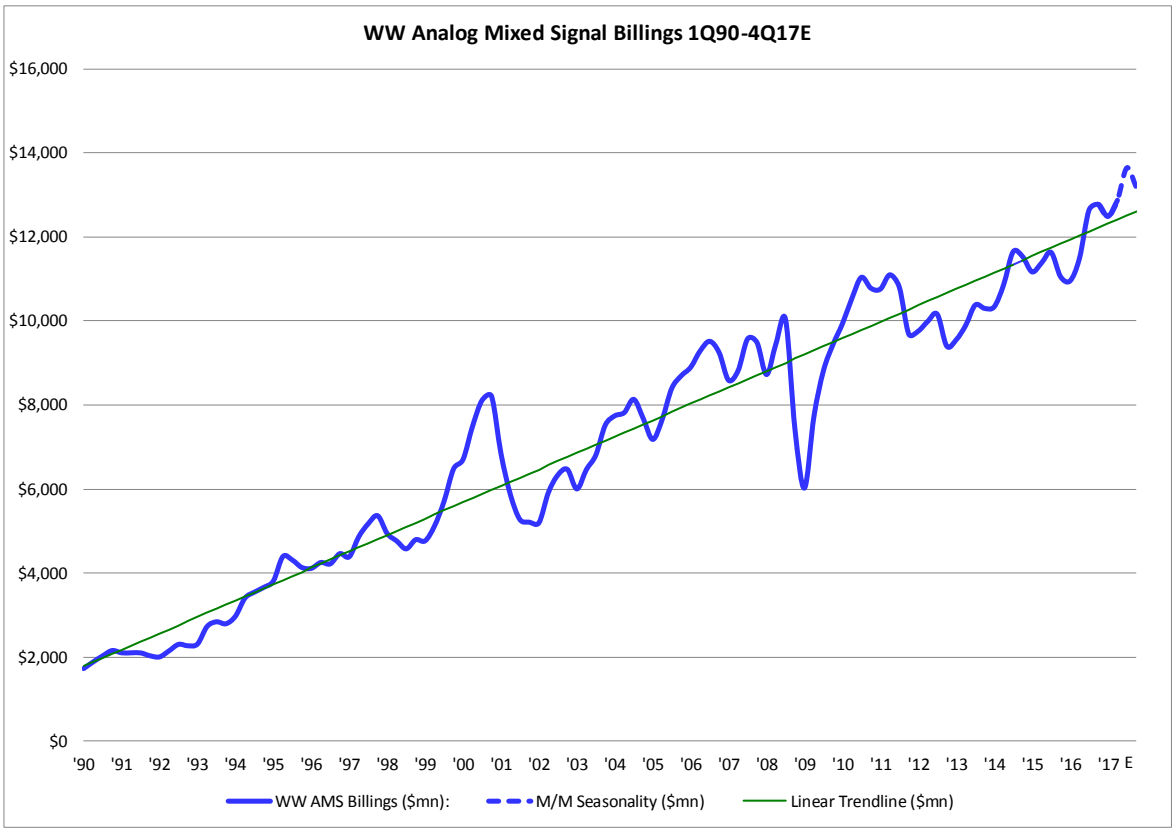
Industrial/Other was up +8.9% m/m in the month of August, vs. seasonal +0.5% m/m, but was up +11.8% y/y (August 2017 vs. 2016); for the June quarter, it was up +5.6%, vs. seasonal of +7.5% q/q; **YTD, Industrial/Other is up +9.6% (2017 vs 2016).** For 2016, Industrial/Other was up +15.7%, following 2015 where it was the weakest end market, declining -14.9% y/y that year. The sector's weakness in 2015 has most often been attributed to overseas infrastructure projects being paused or cancelled due to the appreciation in U.S. dollar, which made overseas projects more expensive to foreign governments and entities. Infrastructure investments continue to gain momentum, and while acknowledging that Industrial/Other analog ASIC is not an accurate proxy for the whole industrial analog market, given the high performance requirements of Industrial applications, we note directionally that the sector continues to improve (despite slightly below seasonal performance, the month of July nevertheless demonstrated healthy y/y growth trends).

Key 2017 drivers remain Automotive on increasing electronic content and Industrial on a multi-year innovation cycle (Industrial 4.0/factory automation), followed by Consumer on Internet of Things (IoT), and Communications. Automotive remains a key trend for the analog industry with a focus on increasing semiconductor content, which can drive growth even if we were to see weaker SAAR estimates. Consumer IoT continues to be one of the bright spots, especially considering the many IoT devices that have come to market, spurring consumer spending. With regards to PCs, traditional form factors continue to give way to new ones that are thinner, lighter, and more portable with longer battery life, including some high performance tablets that are being marketed as substitutes for traditional notebook PCs and are starting to see market acceptance. Finally, industrial has rebounded on resumed infrastructure spending and marginally less unfavorable currency exchange rates, coupled with the long-term secular trends toward factory automation/robotics.

In conclusion, given: (1) that two-thirds of the year have now been reported, with YTD results up +12.4% y/y (tempered by expectations for typical 1H>2H analog seasonality); (2) analog company guidance of +4.5% q/q on an absolute dollar basis; (3) better-than-seasonal performances for both July and August (by a cumulative outperformance of ~+5%) suggesting healthy trends for 3QC17; and (4) robust manufacturing data for September for both the US (PMI of 60.8% vs. 58.0% consensus expectations; 58.0% in August) and China (52.4% vs. 51.6% consensus expectations; 51.7% in August) underscoring the strength in the Industrial end market, we believe the industry is now tracking above even our previous 2017 growth expectations (for the high end of our prior +5%-8% range). **As a result, we are now raising our 2017 forecast for the analog semiconductor market to +7%-10% y/y; we are also raising our September quarter forecast, from +3.0% q/q growth to +6.0% q/q growth.**

Trend Line Analysis

Exhibit: Worldwide Analog Mixed Signal Billings and Trendline



Source: WSTS, Stifel estimates

Analog Mixed Signal Billings and Trendline Data

DATA (Quarterly)	Mar-14	Jun-14	Sep-14	Dec-14	Mar-15	Jun-15	Sep-15	Dec-15	Mar-16	Jun-16	Sep-16	Dec-16	Mar-17	Jun-17	Sep-17E	Dec-17E
WW AMS Billings ($mn):	$10,333	$10,860	$11,644	$11,529	$11,166	$11,379	$11,631	$11,052	$10,950	$11,493	$12,633	$12,772	$12,485	$12,869	$13,642	$13,167
% q/q	0.4%	5.1%	7.2%	-1.0%	-3.1%	1.9%	2.2%	-5.0%	-0.9%	5.0%	9.9%	1.1%	-2.2%	3.1%	6.0%	-3.5%
Linear Trendline ($mn)	$11,149	$11,247	$11,344	$11,442	$11,539	$11,637	$11,735	$11,832	$11,930	$12,027	$12,125	$12,222	$12,320	$12,418	$12,515	$12,613
Delta	-$816	-$387	$299	$87	-$373	-$258	-$104	-$780	-$980	-$535	$509	$549	$165	$451	$1,127	$554

Source: WSTS/SIA, Stifel estimates
Note: Estimated bilings are based on normal m/m seasonality per historical data provided by SIA/WSTS

We have been reporting for a while now our trendline analysis, which looking at over 20 years of data appears to have been a good indicator of whether the analog, mixed-signal semiconductor industry is currently "over-shipping" or "under-shipping" long-term, steady-state demand. While we recognize that this analysis is imperfect, we believe it is a good proxy for understanding the semiconductor cycle.

According to our analysis, the industry has been "under-shipping" to the trendline in the 11 quarters 4Q11-2Q14, which were preceded by seven quarters 1Q10-3Q11 of "over-shipping" the trendline. In the six quarters from 2Q14-3Q15, industry billings moved range bound to the long-term trend line. In 4Q16, demand appeared to have improved, driving further over shipment of ~576mn in the quarter. Thus, the industry exited 2016 having grown billings at a rate slightly above our forecasted range of 3%-5% growth (+5.8% y/y).

For 2017, the World Bank is forecasting the World real GDP to grow 2.7% (June 4, 2017 forecast), with the small y/y increase primarily driven by improved growth prospects in emerging markets and developing economies. Historically, there has been a roughly 2:1 relationship between semiconductor growth and GDP growth that holds, especially when GDP growth is above 2%. This general guide puts potential AMS industry growth in 2017 within the range of +5%-8%.

Furthermore, with billings noticeably above the long-term trendline, we believe the AMS industry could see further growth in the June quarter of 2017. Given this and the current macro backdrop, we are modeling for the industry to perform just below seasonal in the second half of the year, with 3Q operating well above the trendline before correcting again and then closing the gap and returning closer to the trendline. Our estimated quarterly growth rates for the remainder of 2017 are thus +6.0%, and -3.5% q/q for the September, and December quarters in 2017, driving our upwardly-revised ***2017 growth forecast for the AMS semiconductor industry of +7.0% to +10.0%.***

Summary of Data

Billings

Total analog mixed-signal (AMS) semiconductor billings for August increased +2.3% m/m to $4.45bn, following a decrease of 6.2% m/m in the month of July, an increase of +13.0% m/m in the month of June, and a decrease of -0.6% m/m in the month of May. August billings' increase of +2.3% m/m was better than the month's historical average of -0.4% m/m over the last 27 years (1990-2016). Compared to the same period last year (August 2016), the month's $4.45bn billings represented a +10.4% y/y increase.

On a 3-month rolling basis, smoothing out more volatile monthly fluctuations, August billings were up +2.7% m/m, vs. average historical increase of +1.1% m/m for the month. Also on a three-month rolling basis, August is up +9.9% y/y, which is the seventeenth consecutive month of positive y/y comparison, which were preceded by a run of seven consecutive negative y/y comparisons, and prior to that, a positive y/y comparisons that lasted twenty-five consecutive months.

Within AMS, August's General Purpose Analog (GPA) billings increased +2.2% m/m to $1.87bn, vs. the 27-year historical average of -3.3% m/m. At $1.87bn, August GPA billings represented +12.7% y/y increase from August 2016. Analog ASIC billings in the month increased +2.6% m/m to $2.58bn, vs. its historical average of +1.5% m/m, and increased +8.7% compared to the year ago period (August 2016). Within GPA, Signal Conditioning IC billings were down -5.4% m/m vs. its historical average of -4.8% m/m. Interface IC billings decreased -5.4% m/m, vs. its historical average of +0.6% m/m. Power Management IC billings were up +10.6% m/m, vs. its historical average of +4.7% m/m. Lastly, Signal Conversion IC billings decreased -12.9% m/m, vs. its historical average of -20.4% m/m.

Using Analog ASIC as proxy for all analog to gain some insights into major markets, we observe that results were mixed. Specifically, Consumer billings increased +2.5% m/m, which compares with its seasonal +1.6% m/m increase for the month. Computer billings increased +16.6% m/m, above its average seasonal increase of +6.5% m/m. Communications was down slightly at -1.0% m/m, which came in below normal seasonality of +6.5% m/m. Automotive billings increased +4.2% m/m, which compares with its seasonality of -1.6% m/m. Lastly, Industrial/Other billings increased +8.9% m/m, which compares to its historical average of +0.5% m/m.

Unit Shipments

August's unit shipments increased +5.9% m/m to 13.47bn, following a decrease of 7.9% m/m in the month of July, an increase of +14.2% m/m in the month of June, and an increase of +8.0% m/m in the month of May. August's +5.9% m/m increase in shipments compared with its 27-year historical average of +1.9% m/m. On a y/y basis, unit shipments of 13.47bn increased +20.9% from August 2017. The month's +20.9% y/y increase in unit shipments compares to July, which was up 23.1% y/y, June, which was up +13.1%; and May, which was up 23.2%.

On a 3-month rolling basis, August's unit shipments of 13.32bu was a +3.6% m/m increase, versus a 27-year historical average increase +1.3% m/m. In y/y comparison (on a 3-month rolling basis), August's unit shipments increased +18.7% y/y compared with August 2016, making it the 60th consecutive month of positive y/y comparisons from September 2012 to

present. The last run of consecutive, monthly, positive y/y comparisons lasted 41 consecutive months from June 2004 through October 2008.

Within AMS, General Purpose Analog (GPA) unit shipments increased +10.3% m/m, compared with the month's 27-year historical average increase of +3.1% m/m. At 8.22bu, August's GPA unit shipments represented a +17.5% y/y increase from August 2016. Analog ASIC shipments decreased -0.4% m/m, vs. the historical average increase of +0.5% m/m. ASIC's 5.24bu in August represented a +26.6% y/y increase from August 2016. Within GPA by segment, Signal Conditioning IC unit shipments increased +6.4% m/m, vs. its 27-year historical average of +0.8% m/m. Interface IC unit shipments increased +5.3% m/m, vs. its historical average of +1.8% m/m. Power Management IC unit shipments were up +12.1% m/m, vs. its historical average of +5.4% m/m. And, Signal Conversion IC unit shipments increased +5.1% m/m, vs. its historical average of -7.6% m/m.

Using Analog ASIC as a proxy for all analog to provide some insights into end market performances, changes in shipments in the month were: Consumer, up 11.5% m/m vs. average historical +1.2% m/m; Computer, up +11.5% m/m vs. average historical +4.9% m/m; Communications, down -2.8% m/m vs. average historical +3.2% m/m; Automotive, up +3.6% m/m vs. average historical -2.5% m/m; and, Industrial/Other, down -6.7% m/m vs. average historical +1.7% m/m.

Average Selling Price (ASP)

August's aggregate average selling price (ASP) of $0.33 for the analog semiconductor industry represented a -3.3% m/m decrease, and compares to the month's 27-year historical average of -2.2% m/m. Within analog, General Purpose Analog (GPA) ASP decreased -7.5% m/m to $0.23 in August vs. its historical average of -6.1% m/m for the month, following an increase of 4.4% m/m in the month of July, a decrease of -2.6% m/m in the month of June, and a decrease of -7.7% m/m in the month of May. Analog ASIC ASP was up +3.0% m/m to $0.49, compared with its historical average of +1.0% m/m.

Within General Purpose Analog by product category, Signal Conditioning IC ASP decreased -11.1% m/m, vs. its average 27-year average historical -5.5% m/m; Interface IC ASP decreased -10.2% m/m, vs. its average historical -1.0% m/m; Power Management IC ASP was down -1.4% m/m, vs. average historical -0.6% m/m; and Signal Conversion IC ASP was down -17.2% m/m, vs. average historical -14.1% m/m.

On a 3-month rolling basis, August's ASP was $0.34, or down -0.9% m/m, which compares to its historical average of -0.1% m/m for the month. By segment, GPA ASP of $0.24 was down -1.7% m/m (vs. its historical average of -0.4% m/m), while Analog ASIC ASP of $0.49 was up +1.1% (vs. historical average of +0.1% m/m).

A Note on Seasonality

The September quarter is seasonally the second strongest performing quarter in the year, increasing on average +4.4% (vs. an average decrease of 2.1% q/q in the March quarter, an average increase of 6.7% q/q in the June quarter, and average decrease of 0.4% q/q in the December quarter) over the last 27 years. Historically, the September quarter has benefitted from an inventory build for the year-end holiday shopping season, although Europe in August tends to have lower levels of business activities as this region enters the vacation season. The heavily-focused manufacturing arm of Asia remains busy throughout the September quarter. By end market, Consumer, Computer and Communications are the stronger performing sectors, as compared with seasonally softer Automotive and Industrial. We also note that top tier consumer electronics firms (makers of smartphones, tablets, gaming consoles and notebooks/PCs) often introduce next-generation products in the fall time frame, which helps sustain momentum built-up during the June quarter, while Automotive and Industrial tend to be seasonally stronger in the 1H than the 2H of the calendar year.

Average September quarter growth rate in the last 3 years has been +6.5% q/q, but analog and IoT semiconductor companies have guided for +4.5% q/q growth on an absolute dollar basis for C3Q17 (September quarter), with average q/q percentage guidance of +4.8% q/q (+4.3% ex max/min), and with all of our companies having reported their June/July 2017 quarters. As a result, and with August's better-than-seasonal performance and coupled with the current range of analog company guidance and recent positive manufacturing data, we are raising our September quarter forecast for the analog semiconductor market, from +3.0% q/q growth to +6.0% q/q growth. Coupled with industry performance through the first eight months of the year (YTD +12.4% y/y), and recent positive manufacturing data from both the US (ISM PMI of 60.8% vs. 58.0% consensus expectations) and China (PMI of 52.4% vs. 51.6% consensus expectations), we are also raising our 2017 outlook to +7%-10% y/y growth (from +5%-8% y/y previously).

Exhibit: Month/Month Sequential Revenue Performance for the Analog Industry

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	'90-'16 Avg
January	NA	-6.4%	-4.6%	-6.2%	0.7%	-5.1%	-2.6%	-8.1%	-9.6%	-9.9%	-12.2%	-23.3%	-16.5%	-21.8%	-9.8%	-13.3%	-7.2%	-15.1%	-9.9%	-15.5%	0.5%	0.2%	-7.3%	4.4%	-5.1%	-4.3%	-7.7%	-7.3%	-8.3%
February	8.2%	7.0%	-0.4%	5.7%	0.1%	2.6%	-0.1%	-5.1%	-4.7%	0.3%	5.4%	-1.9%	4.6%	5.7%	5.3%	-5.2%	-2.5%	-4.8%	-8.8%	3.5%	-5.1%	-9.8%	3.3%	-13.5%	-6.4%	-14.3%	-7.5%	-4.3%	-1.4%
March	8.8%	7.3%	15.0%	16.5%	16.5%	18.5%	14.5%	21.2%	18.0%	18.1%	17.4%	15.7%	32.8%	25.6%	15.4%	21.8%	16.8%	28.1%	19.9%	25.1%	15.9%	22.4%	13.5%	22.4%	23.4%	27.0%	27.3%	17.1%	19.4%
April	-5.8%	-9.9%	-10.9%	-1.0%	0.7%	0.4%	-6.8%	-5.2%	-11.2%	-8.7%	-8.2%	-24.6%	-12.8%	-15.5%	-13.4%	-8.4%	-9.2%	-13.6%	-9.0%	8.8%	-3.4%	-8.4%	-10.2%	-4.7%	-8.2%	-10.8%	-12.4%	-9.2%	-8.2%
May	4.2%	1.9%	8.2%	2.0%	-0.8%	-2.5%	-4.1%	1.2%	-6.2%	1.1%	5.6%	-2.7%	2.5%	3.7%	1.5%	-3.2%	-2.1%	-3.8%	-0.1%	-3.6%	-1.6%	-1.9%	0.2%	-6.1%	-2.1%	-4.0%	-1.8%	-0.5%	-0.5%
June	12.3%	7.3%	12.3%	13.7%	10.2%	11.3%	13.5%	12.2%	9.9%	14.6%	12.0%	17.5%	17.7%	16.9%	10.4%	19.8%	18.9%	17.4%	28.0%	11.0%	7.4%	10.8%	11.0%	13.1%	10.8%	17.9%	19.5%	13.0%	14.0%
July	-6.0%	-7.9%	-6.3%	-7.2%	-4.6%	-5.3%	-10.6%	-3.6%	-12.0%	-9.4%	-10.9%	-29.0%	-10.1%	-15.6%	-7.2%	-7.9%	-15.3%	-9.2%	-13.1%	4.9%	-0.4%	-10.9%	-7.0%	-2.3%	-2.2%	-12.1%	-8.1%	-6.2%	-8.5%
August	0.3%	-1.4%	-0.9%	-2.0%	-2.0%	-6.4%	-4.7%	-6.6%	-4.6%	6.0%	9.0%	5.0%	1.7%	4.9%	-0.6%	0.3%	2.2%	5.0%	0.8%	-2.8%	-2.5%	-2.9%	-2.4%	-6.3%	-2.4%	-1.2%	2.7%	2.3%	-0.4%
September	13.2%	11.9%	12.4%	12.1%	12.5%	5.3%	21.2%	20.4%	24.7%	23.0%	13.4%	33.9%	15.3%	23.5%	15.1%	20.3%	21.6%	16.5%	11.2%	14.1%	7.8%	14.7%	11.3%	16.8%	14.8%	20.2%	15.8%		16.4%
October	-0.1%	-7.7%	-5.6%	-7.3%	-3.4%	-1.9%	-4.0%	-1.7%	-6.7%	-8.3%	-10.6%	-20.3%	-10.5%	-7.0%	-13.5%	-10.7%	-17.4%	-12.2%	-18.3%	-1.7%	-3.4%	-14.1%	-9.5%	-6.8%	-7.7%	-14.6%	-9.3%		-8.7%
November	-1.3%	-3.5%	-5.2%	-1.7%	-2.4%	-4.5%	-5.7%	-8.2%	-6.1%	5.0%	-1.5%	-1.1%	1.4%	-0.3%	-4.9%	-0.7%	2.3%	-0.7%	-20.5%	-1.4%	-5.4%	-8.8%	-7.7%	-6.0%	-5.3%	-5.3%	-1.9%		-3.8%
December	-3.7%	0.1%	1.4%	1.1%	3.6%	-1.3%	8.6%	3.5%	9.4%	8.9%	7.7%	7.1%	7.2%	7.4%	9.4%	9.9%	4.1%	3.3%	-8.3%	5.5%	2.0%	7.4%	4.0%	7.3%	7.5%	8.8%	5.3%		4.7%

Source: Stifel, based on WSTS data

Exhibit: Quarter/Quarter Sequential Revenue Performance for the Analog Industry

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	'90-'16 Avg
March	NA	-2.5%	-1.3%	1.9%	6.5%	4.1%	-0.5%	-1.7%	-7.9%	-0.5%	3.5%	-16.7%	-0.3%	-7.2%	2.9%	-6.5%	2.3%	-7.1%	-8.0%	-18.7%	5.3%	-0.2%	0.7%	1.6%	0.4%	-3.1%	-0.9%	-2.2%	-2.1%
June	9.2%	-0.0%	7.2%	17.9%	14.4%	15.2%	3.4%	10.8%	-3.6%	7.5%	11.8%	-14.3%	13.9%	7.7%	1.0%	6.7%	4.4%	2.7%	8.5%	28.3%	6.0%	3.2%	2.4%	3.6%	5.1%	1.9%	5.0%	3.1%	6.7%
September	7.6%	-0.1%	7.2%	4.2%	4.2%	-1.9%	-0.8%	6.4%	-3.9%	11.4%	8.2%	-10.0%	7.0%	5.4%	4.0%	9.6%	2.5%	8.6%	6.1%	14.0%	4.8%	-2.7%	1.7%	4.9%	7.2%	2.2%	9.9%		4.4%
December	6.2%	-3.3%	-1.5%	-1.6%	3.2%	-4.1%	5.8%	3.6%	4.7%	13.5%	1.2%	-1.2%	2.1%	10.5%	-5.6%	3.6%	-2.8%	-0.9%	-26.2%	7.0%	-2.3%	-10.3%	-7.5%	-0.8%	-1.0%	-5.0%	1.1%		-0.4%

Source: Stifel, based on WSTS data

Exhibit: Year/Year Performance for the Analog Industry

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	YTD 2017	'90-'16 Avg
Billings y/y growth	NA	6.9%	4.7%	22.3%	27.3%	22.5%	2.4%	16.1%	-3.6%	15.8%	38.2%	-24.0%	3.2%	12.0%	17.1%	1.8%	15.7%	-1.3%	-2.2%	-10.2%	32.1%	0.1%	-7.2%	2.1%	10.6%	1.9%	5.8%	13.0%	8.1%
Unit y/y growth	NA	7.0%	-3.0%	14.9%	17.7%	17.2%	-0.8%	24.1%	4.0%	19.6%	29.5%	-20.3%	22.0%	14.9%	12.4%	10.9%	20.1%	7.4%	1.8%	-5.6%	32.4%	0.1%	-1.7%	15.3%	10.9%	6.4%	7.0%	17.8%	10.2%
ASP y/y change	NA	-0.1%	8.0%	6.4%	8.1%	4.5%	3.2%	-6.4%	-7.3%	-3.2%	6.7%	-4.7%	-15.4%	-2.5%	4.1%	-8.2%	-3.7%	-8.1%	-3.9%	-4.9%	-0.2%	-0.0%	-5.5%	-11.5%	-0.3%	-4.2%	-1.2%	-4.1%	-1.9%

Source: Stifel, based on WSTS data

STIFEL

Exhibit: Analog Mixed-Signal Table of Comparables

Analog & Internet-of-Things (IoT) Semiconductor Table of Comparables

Tore Svanberg, 415-364-7461
Erik Rasmussen, 212-271-3461
Jeremy Kwan, 949-252-5667

Large Cap Analog & IoT Semiconductor Companies Comparable Valuation Table

			12-month	10/2/17	Mkt Cap	EV	GAAP P/E				Pro Forma P/E				EV / Sales					GP P/E	NG P/E		FCF	Last Reported Quarter			% Off
Company	Ticker	Rating	Target	Intraday	($mn)	($mn)	2015	2016	2017E	2018E	2015	2016	2017E	2018E	2015	2016	2017E	2018E	P/TBV	Ex-Cash	Ex-Cash	P/FCF	Yield	Rev	GM	OM	52WK HI
Analog Devices *	ADI	Buy	$97.00	$85.79	$31,840	$39,131	37.1x	29.3x	42.4x	26.4x	34.5x	23.5x	17.2x	16.9x	11.4x	10.8x	7.0x	6.7x	3.2x	47.2x	20.3x	16.8x	6.0%	+20.7%	70.5%	40.5%	(5.2%)
Broadcom Limited	AVGO	NC	NA	$240.62	$107,076	$115,199	49.7x	NM	42.7x	31.8x	28.5x	22.5x	16.5x	15.4x	16.5x	7.4x	6.3x	6.0x	(34.8x)	44.4x	17.6x	21.8x	4.6%	+6.3%	63.3%	46.1%	(7.2%)
Maxim Integrated *	MXIM	Buy	$54.00	$47.81	$13,745	$12,488	100.2x	27.9x	22.8x	21.5x	25.6x	23.9x	20.5x	19.9x	5.6x	5.6x	5.3x	5.2x	8.5x	21.2x	19.0x	18.8x	5.3%	+3.6%	65.4%	33.1%	(3.8%)
Microchip †	MCHP	Buy	$94.00	$90.31	$21,936	$23,701	55.4x	231.6x	31.6x	25.4x	37.1x	28.8x	18.8x	17.5x	10.8x	7.5x	6.1x	5.8x	6.6x	33.3x	20.0x	20.1x	5.0%	+7.7%	60.1%	37.5%	(1.7%)
NXP Semiconductor *	NXPI	Hold	$110.00	$113.23	$39,062	$42,968	19.4x	NM	20.2x	33.8x	20.2x	19.1x	17.9x	16.1x	7.0x	4.5x	4.8x	4.6x	3.0x	21.7x	19.3x	19.2x	5.2%	-0.4%	53.0%	28.4%	(0.1%)
STMicroelectronics	STM	NC	NA	$19.70	$17,949	$17,400	176.5x	104.2x	25.1x	18.7x	NA	NA	NA	NA	2.5x	2.5x	2.2x	2.0x	NA	24.2x	NA	38.8x	2.6%	+5.6%	38.3%	9.3%	(1.0%)
Texas Instruments *	TXN	Hold	$85.00	$89.39	$90,731	$91,281	31.7x	26.5x	21.6x	20.6x	29.6x	24.8x	20.5x	19.6x	7.0x	6.8x	6.2x	6.0x	NA	21.7x	20.6x	22.8x	4.4%	+8.6%	64.3%	40.1%	(0.6%)
AVERAGE					$46,049	$48,881	58.8x	83.9x	29.5x	25.4x	29.2x	23.8x	18.6x	17.6x	8.7x	6.4x	5.4x	5.2x	(2.7x)	30.5x	19.4x	22.6x	4.7%	7.4%	59.3%	33.6%	(2.8%)

Source: Reuters, company reports, FactSet, and (*) Stifel estimates
† Covered by Stifel analyst Kevin Cassidy*

0.04976

Mid Cap Analog & IoT Semiconductor Companies Comparable Valuation Table

			12-month	10/2/17	Mkt Cap	EV	GAAP P/E				Pro Forma P/E				EV / Sales					GP P/E	NG P/E		FCF	Last Reported Quarter			% Off
Company	Ticker	Rating	Target	Intraday	($mn)	($mn)	2015	2016	2017E	2018E	2015	2016	2017E	2018E	2015	2016	2017E	2018E	P/TBV	Ex-Cash	Ex-Cash	P/FCF	Yield	Rev	GM	OM	52WK HI
Cirrus Logic *	CRUS	Buy	$75.00	$53.60	$3,600	$3,350	27.0x	15.4x	15.3x	15.2x	20.0x	13.3x	11.6x	11.6x	2.8x	2.3x	2.1x	2.0x	4.9x	14.4x	10.9x	11.4x	8.8%	-2.2%	50.5%	20.7%	(25.5%)
M/A-COM *	MTSI	Buy	$57.00	$44.69	$2,947	$3,368	NM	154.3x	NM	29.8x	31.9x	21.4x	20.1x	12.9x	7.7x	5.8x	4.6x	3.8x	(19.2x)	(21.5x)	22.3x	41.2x	2.4%	+4.6%	58.5%	27.2%	(32.3%)
Microsemi *	MSCC	Buy	$65.00	$52.09	$6,104	$7,847	56.6x	NM	35.6x	24.2x	18.6x	16.4x	13.1x	11.9x	6.2x	4.5x	4.3x	4.1x	(4.2x)	41.2x	16.1x	19.6x	5.1%	+3.4%	63.9%	32.3%	(10.2%)
Monolithic Power Systems *	MPWR	Buy	$117.00	$106.34	$4,615	$4,337	123.5x	84.8x	63.5x	44.9x	56.2x	46.2x	36.7x	28.9x	13.0x	11.2x	9.4x	7.8x	9.7x	62.2x	35.3x	64.6x	1.5%	+11.8%	55.6%	27.8%	(1.4%)
ON Semiconductor †	ON	Buy	$20.00	$18.63	$7,935	$10,204	38.0x	43.3x	20.1x	15.7x	22.2x	20.7x	13.6x	11.7x	2.9x	2.6x	1.9x	1.9x	8.3x	24.4x	16.8x	11.4x	8.7%	+4.4%	36.8%	14.7%	0.8%
Power Integrations *	POWI	Buy	$85.00	$72.40	$2,205	$1,951	54.8x	43.8x	38.8x	33.3x	35.6x	28.6x	26.3x	23.1x	5.7x	5.0x	4.5x	4.1x	5.2x	36.1x	24.1x	40.9x	2.4%	+2.7%	50.9%	20.5%	(12.6%)
Semtech	SMTC	NC	NA	$37.45	$2,527	$2,482	208.0x	45.1x	43.3x	31.6x	69.5x	41.0x	36.6x	27.9x	5.1x	4.5x	4.0x	3.6x	9.0x	42.9x	36.2x	35.3x	2.8%	+4.8%	61.2%	27.4%	(9.0%)
Silicon Labs *	SLAB	Buy	$85.00	$80.20	$3,463	$3,137	117.9x	55.3x	51.7x	45.8x	35.8x	28.8x	26.1x	23.4x	4.9x	4.5x	4.1x	3.8x	6.6x	49.5x	24.3x	25.7x	3.9%	+6.2%	59.7%	20.5%	(2.1%)
AVERAGE					$4,174	$4,584	51.1x	63.1x	38.3x	30.1x	36.2x	27.1x	23.0x	18.9x	6.0x	5.0x	4.4x	3.9x	2.5x	31.1x	23.2x	31.3x	4.5%	4.5%	54.6%	23.9%	(11.5%)

Source: Reuters, company reports, FactSet, and (*) Stifel estimates
† Covered by Stifel analyst Kevin Cassidy*

Small Cap Analog & IoT Semiconductor Companies Comparable Valuation Table

			12-month	10/2/17	Mkt Cap	EV	GAAP P/E				Pro Forma P/E				EV / Sales					GP P/E	NG P/E		FCF	Last Reported Quarter			% Off
Company	Ticker	Rating	Target	Intraday	($mn)	($mn)	2015	2016	2017E	2018E	2015	2016	2017E	2018E	2015	2016	2017E	2018E	P/TBV	Ex-Cash	Ex-Cash	P/FCF	Yield	Rev	GM	OM	52WK HI
Alpha & Omega Semiconductor *	AOSL	Hold	$18.00	$16.64	$415	$299	NM	58.2x	24.8x	23.4x	NM	32.5x	16.8x	15.9x	0.9x	0.8x	0.8x	0.7x	1.4x	19.4x	12.7x	35.2x	2.8%	+5.1%	26.0%	5.7%	(30.5%)
Inphi *	IPHI	Buy	$44.00	$39.52	$1,665	$1,693	NM	63.7x	NM	NM	42.7x	26.2x	26.5x	18.8x	8.8x	6.4x	4.8x	4.1x	46.7x	(28.7x)	26.8x	56.5x	1.8%	-9.8%	70.3%	20.8%	(23.7%)
MaxLinear *	MXL	Buy	$33.00	$23.56	$1,641	$1,968	NM	26.6x	47.9x	30.9x	20.3x	13.3x	17.2x	13.9x	6.6x	5.1x	4.6x	3.7x	4.1x	52.1x	19.9x	29.4x	3.4%	+17.3%	64.4%	29.0%	(27.4%)
O2Micro *	OIIM	Buy	$5.00	$1.77	$46	($2)	NM	NM	NM	NM	NM	NM	NM	NM	(0.0x)	(0.0x)	(0.0x)	(0.0x)	0.6x	0.2x	0.3x	(84.5x)	(1.2%)	-2.9%	50.9%	(8.1%)	(36.8%)
AVERAGE					$942	$990	NM	49.5x	36.4x	NM	NM	24.0x	20.2x	16.2x	4.1x	3.1x	2.6x	2.1x	13.2x	10.7x	15.0x	9.2x	1.7%	2.4%	52.9%	11.9%	(29.6%)

Source: Reuters, company reports, FactSet, and (*) Stifel estimates
† Covered by Stifel analyst Kevin Cassidy*

ABOUT ANALOG ALCHEMY:

The purpose of this report is to monitor and update the investment and corporate communities on developments in the analog industry over the preceding fortnight. Close attention will also be paid to the performance of the Stifel Nicolaus Analog Index (SNAI) during this period. The SNAI is a market cap weighted index, beginning at 100 on January 2, 1990, comprising the following analog semiconductor companies: Analog Devices (ADI), Intersil (ISIL), Linear Technology (LLTC), Maxim Integrated Products (MXIM), Micrel Semiconductor (MCRL), Microsemi Corp. (MSCC), National Semiconductor (NSM), Semtech Corp., (SMTC), Silicon Labs (SLAB) and Texas Instruments (TXN).

The "science" of alchemy goes back to the medieval ages when ancient researchers sought to transform more abundantly available metals like iron into gold. Clearly, while the original alchemists were not successful in their endeavor, the theory and concept of alchemy has certainly been a source of human intrigue for the past several centuries. The title of this report, ANALOG ALCHEMY, stands testament to the many successes that semiconductor analog/mixed-signal companies have been able to achieve as a result of the modern day alchemist – the analog design engineer. Today, leading analog companies can boast amongst the best operating models in the semiconductor industry. They typically self-finance their own growth and are also known as "money machines" for the amount of cash that they generate from operations.

Al.che.my A medieval chemical philosophy having as its asserted aims the transmutation of base metals into gold, the discovery of panacea, the preparation of the elixir of longevity. (Source: *The American Heritage Dictionary*).

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