LYON, France – April 5, 2016: Against a particularly difficult international setting, 2015 saw some MEMS companies like Texas Instruments, Hewlett Packard, Panasonic and Canon suffer from competition and pressure from strong markets. However, others stood out and are ranked in Yole Développement’s annual MEMS manufacturers list with impressive market growth in 2015 compared to 2014. These include Avago Technologies, Qorvo and some MEMS microphone companies. MEMS players depend heavily on their markets (consumer, automotive, medical industry) as well as on other factors and are developing their own strategies by combining market needs, economic constraints and innovative business models and technologies. Yole Développement (Yole), the “More than Moore” market research and strategy consulting company, presents its annual MEMS manufacturer ranking.

A continuing trend in the consumer industry

RF players stood out among the MEMS companies and showed impressive growth in 2015. Yole’s analysts estimate that Avago Technologies\(^1\) had an increase of approximately 41% in BAW\(^2\) filters

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\(^1\) Avago AFE28030 in iPhone 6s Plus FBAR-BAW Mid-Band Filter report – System Plus Consulting, 2016

\(^2\) BAW: Bulk Acoustic Wave
compared to 2014, as its FBAR\(^3\) technology was gradually adopted more widely by smartphone manufacturers. With its US$650 million in revenues in 2015, the company climbed one place\(^4\) to take the #4 spot in Yole’s ranking.

In the same market segment, Qorvo, a US-based company, also grew nicely in 2015. Yole estimated a 29% increase in revenue compared to 2014, thanks to Qorvo’s SMR technology.

In parallel, microphone applications were the second most successful market segment in the 2015 consumer, announced Yole. Several companies clearly bear out this finding. While the leader in the MEMS microphone market, Knowles Electronics, had medium growth in 2015 compared to 2014 (5.9% increase in revenues), AAC and Goertek recorded higher growth with 21.7% and 11.5%, respectively. “Such results are mainly due to good Infineon’s microphone performances and the trend of adding more and more value to smartphone audio,” comments Dr. Eric Mounier, Principal Analyst, MEMS & Sensors at Yole.

“Both companies chose to use Infineon Technologies’ products to develop their microphone solutions. At Yole, we expect a lot of innovations in the world of audio. MEMS technology is clearly a way to improve microphone quality and performance.”

The analysis of the consumer industry would not be complete without a comment on fabless company InvenSense. The US-based company showed the largest growth in 2015 revenue, 33.2% higher compared to 2014, reaching approximately US$438 million in revenue in 2015, ranking just below Avago Technologies and above Qorvo. “InvenSense has not achieved such results without making compromises, such as lower prices and loss of profitability,” asserts Jean-Christophe Eloy, Yole’s President & CEO. And he adds: “Nevertheless, InvenSense is the only inertial sensor company which was able to grow that much in 2015; more than 33% growth. Compared to its main competitors in the consumer inertial sensor market, such growth is very significant. InvenSense is now almost the same size in the consumer markets as STMicroelectronics (STM) and Robert Bosch (Bosch). This certainly paves the way for further business increases in 2016.”

TSMC’s 2015 foundry results are, of course, linked to the growth of its partner InvenSense. The Taiwanese foundry confirmed its expansion with a 29.2% growth in revenue.

And what about Bosch and STM, both 2014 winners?

Only one year has passed, but much has changed. 2014 was a successful year for Bosch. “Driven by consumer sales, its MEMS revenue

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\(^3\) FBAR : Film Bulk Acoustic Resonator

\(^4\) Compared to 2015 MEMS manufacturers ranking, Yole Développement – Update: April 2016
increased by 0.2% to top US$1.2 billion,” Yole announced in its 2014 MEMS manufacturer ranking. Today, despite its five billion MEMS sensors and its ten years of innovation—both pieces of news announced in 2015—Bosch’s growth was minute in 2015. Its volumes increased but cost pressures forced the German company to lower its prices. “From a market segment point of view, the consumer industry is slowing down from the unsustainable growth rates observed in the last few years,” announced Guillaume Girardin, Technology and Market Analyst at Yole. “Fourth quarter 2015 market figures confirm the trend. This slowdown directly impacts MEMS companies, including Bosch. In 2015, Bosch’s revenue stabilized mainly due to the expansion of its business into the automotive sector. Its automotive business unit brings in US$800 million revenue, twice as big as its consumer business unit.”

2015 remains a good year for Bosch. Thanks to its BMP280 pressure sensor “design win”, Bosch’s production took off shipping more than one billion components in 2015, with its subsidiary Bosch Sensortec.

STM’s story is slightly different. STM eked out US$755 million in revenue in 2015, versus US$810 million the year before. With a 6.8% decrease, the company felt the effects of the fierce competition in the inertial MEMS market. To counter this harsh environment, STM came up with various strategies: a focus on MEMS-based actuators such as micro-mirrors and autofocus, and a penetration into new market segments, such as wearable electronics and automotive. It collaborated with Chinese firms to increase its volume and fill its production capacity. STM is also considering selling its CIS5 business. All of these strategies indicate hesitation on the part of STM and do not reveal what the future holds.

Texas Instruments (TI) held onto third place on the list with US$735 million in revenue, a 5.5% decrease compared to 2014. Working in a low-volume market, the company still struggles with its DLP6 sales. However, the trend could reverse in the near future. Yole’s analysts stress the appeal of using MEMS micro-mirrors in various applications, for example gesture control, auto-focus and smart lighting applications for cars. Today, TI has a full range of micro-mirrors for a diverse array of industries (consumer, automotive, industrial) and may be able to offer them valuable solutions. Only time will tell.

2016 might be a challenging year for MEMS companies. According to Yole’s analysts, market segments that could be great opportunities for MEMS firms are not yet mature and may not ensure significant volume or revenue as high as in the smartphone industry. These include:

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5 CIS: CMOS Image Sensor
6 DLP: Digital Light Processing
The IoT\(^7\) bubble is still a niche market today. The main applications are industrial, which do not look for low cost or large volume.

Wearable electronics applications look very promising as part of the consumer industry. However, the high volumes that will come with it have not yet taken off.

Self-driving vehicles might be the most attractive market segment, but its primary products are image sensors, radars and LIDARs\(^8\).

The medical industry is growing, but its volumes are still very low compared to the total MEMS market. Nevertheless, Yole still sees some wonderful opportunities in the emerging but growing demand for pressure and gas sensors, fingerprinting and dual cameras shaping the consumer market.

Yole believes the future growth of the MEMS market will be a combination of applications, from smartphones and wearables to automotive and medical. In addition to putting together the annual MEMS manufacturer ranking and crunching MEMS market data, Yole’s experts identify disruptive technologies and analyze changes in MEMS solutions and their applications to pinpoint major trends and business opportunities. In one of their latest presentations (Claire Troadec, MEMS Executive Congress, Munich, 2016), they stated that MEMS solutions should increase added value first and foremost and address cost pressures and process optimization secondly to avoid shrinking margins. Further analysis and results are available in Yole’s reports all year long. Read more information at i-micronews.com.

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\(^7\) IoT: Internet of Things  
\(^8\) LIDAR: Laser Imaging Detection and Ranging (system)
About **Status of the MEMS Industry** report
- New MEMS sensors, dramatic cost reductions, growing importance of software, new technologies, the rise of industry titans and Chinese foundries: The MEMS industry is preparing to exceed $20B by 2020.
- Claire Troadecc’s presentation at the MIG Technical Congress: **MEMS & Sensors challenges & opportunities for the next decade**. This presentation is an introduction to the report *Status of the MEMS Industry (2016 edition)*.

Status of the MEMS Industry report, 2016 edition will be available in May 2016.

**About Gas Sensors report**
Disruptive technologies and emerging applications will make the gas sensor market skyrocket!

**About Status of the CMOS Image Sensor Industry report**
Reaching $10B for the first time, the CMOS Image Sensor Industry (CIS) is undergoing massive technology and market shifts, while growing at a 10% CAGR.

For more information about each report, please contact [David Jourdan](mailto:jourdan@yole.fr) - Phone: +33 472 83 01 90

**About Yole Développement – [www.yole.fr](http://www.yole.fr)**
Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Développement group has expanded to include more than 50 collaborators worldwide covering MEMS, Compound Semiconductors, LED, Image Sensors, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” company Yole and its partners System Plus Consulting, Blumorpho and KnowMade support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to develop their business.

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