

MEMS industry: the headwinds from COVID-19 and the way forward.¹

OUTLINES:

- Between 2019 and 2025 global MEMS² revenue should grow from US\$11.5 billion to US\$17.7 billion at a 7.4% CAGR³.
- The consumer market is and will continue to be the biggest market for MEMS.
- Competitive landscape:
The top MEMS players grew slightly in 2019, even if the associated main end-markets/end-products including smartphones, automotive was not so strong.
- COVID-19 outbreak:
Production systems and supply chains could change significantly after the crisis.
In automotive, the negative effects of COVID-19 will be prominent with a -27.5% YoY⁴ decline in 2020.
Industrial MEMS will profit from the COVID-19 pandemic, since thermal imagers and detectors for elevated body temperature detection are included. Medical MEMS are following the same growth trend with pressure, flowmeter and microfluidics devices boosted by the covid-19 demand for ventilators and PCR diagnostic tests.
Defense & aerospace market will slump in 2020, due to civil aviation paralysis...

*“2020 is the year that COVID-19 has changed our view about the world, from finance to ecology to us, humans” asserts **Dimitrios Damianos, PhD, Technology & Market Analyst, Photonics & Sensing at Yole Développement (Yole)**. “Naturally, Yole expects that there will be an effect on MEMS markets. Indeed, we have accounted for a combination of positive and negative scenarios regarding the main markets, applications and devices concerned”.*

Not all MEMS markets will be affected in the same way by the pandemic, for sure. What will be the status of the MEMS industry?

This is a chance for MEMS to be used in very different applications. While working from home will favor the market for data centers and accelerate the deployment of 5G, the lockdown has slammed the brake in markets such as automotive and, in a lesser extent, consumer devices due to a dramatic drop in demand.

¹ Extracted from: [Status of the MEMS Industry 2020](#), Yole Développement, 2020

² MEMS: Microelectromechanical systems

³ CAGR: Compound Annual Growth Rate

⁴ YoY: Year-over-Year

In this context, Yole and its partner [System Plus Consulting](#) investigate disruptive MEMS technologies and related markets in depth, in order to point out the latest innovations and to underline the overall business opportunities.

In this regard and in addition to numerous [teardown tracks](#) published by System Plus Consulting, Yole's Photonic & Sensing team releases today its annual report, [Status of the MEMS Industry 2020](#). This analysis is an update of Yole's best-selling "Status of the MEMS Industry" report, which was first released in 2004. Analysis, market consolidation and forecasts were done during May 2020 using Yole's database, with the effect and hypotheses regarding COVID-19, dating end of April 2020.

This study provides the latest major information and key facts of the MEMS industry. Considering the COVID-19 impacts, the analysts examine the MEMS market and propose a complete review of the industry and future trends. Including market forecasts, main player market shares, ecosystem, supply chain and market and technology trends, the report provides a detailed description of this industry.

This report also proposes an up-to-date analysis of more than 15 different devices, including inertial, microphones and pressure in six different markets, consumer, automotive, industrial, medical, telecom, defense and aerospace.

What are the economic and technological challenges? What are the impacts of COVID-19 on the MEMS industry in both the short and long term? What are the key drivers? Who are the suppliers to watch, and what innovative technologies are they working on? Yole's analysts present today its vision of the MEMS industry.

According to the new [Status of the MEMS Industry 2020 report](#), MEMS for consumer devices will be mainly supported by RF⁵ MEMS. It will continue to grow in 2020 and beyond due to the expanding 5G and sub 6 GHz band rollout that precipitates the need for BAW⁶ filters. Including RF MEMS the consumer market contracts only by 2.6%, but without RF MEMS it is poised to slump by 16% in 2020. A recovery to pre-COVID levels is expected in 2021, and growth will resume.

*"In the automotive field, negative effects of COVID-19 will be prominent with a -27.5% YoY decline in 2020," asserts **Eric Mounier, PhD. Fellow Analyst at Yole**. And he adds: "Most devices related to automotive will suffer because of the drop in the market, including sensing, lighting and power. Pressure and inertial MEMS will continue to lead this market, since they are indispensable in safety systems such as TPMS⁷, airbags, ESC⁸ and roll-over detection."*

Industrial MEMS will profit from the COVID-19 pandemic, as thermal imaging and sensing systems, both thermopile and microbolometer based, surge due to the need for contactless body temperature measurement.

⁵ RF: Radio Frequency

⁶ BAW: Bulk Acoustic Wave

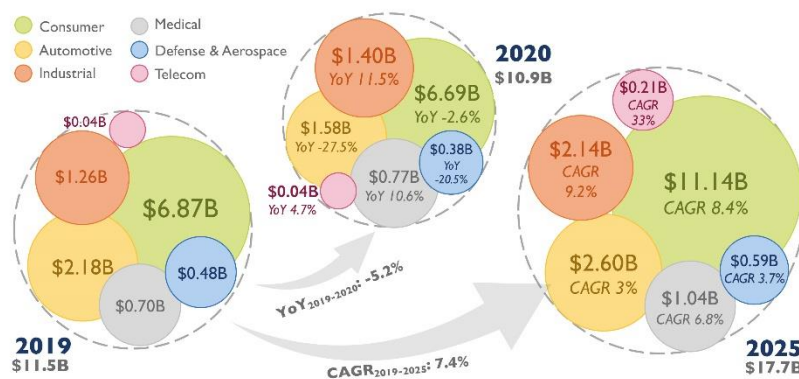
⁷ TPMS: Tire Pressure Monitoring Systems

⁸ ESC: Electronic Stability Control

Another market segment to follow, is the MEMS devices for medical applications. Therefore, the medical MEMS market is mostly dominated by pressure and microfluidics and will continue this way. Areas directly linked to COVID-19, including ventilators, respiratory diagnostics, research tools to study the virus and patient monitoring are positively impacted while other healthcare areas experience moderate to no impact. Furthermore, microfluidics diagnostic tests are of paramount importance for the diagnosis of COVID-19. In the transformation of healthcare organization, the COVID-19 pandemic will probably accelerate technology requirements towards a patient-centric approach. There will be more telehealth, more wearable, hearable and connected medical devices and more prevention and continuous monitoring.

2019-2025 MEMS market forecasts by end-market

(Source: Status of the MEMS Industry 2020 report, Yole Développement, 2020)



This analysis will not be complete without taking into account the telecommunications segment. According to **Dimitrios Damianos from Yole**: “It presents the highest growth potential up to 2025, as MEMS oscillators grow rapidly since more timing solutions will be needed for 5G and automotive V2X connectivity. Also, telecom operators are determined to continue to accelerate 5G deployment in 2020, thus growth will be here”.

At the end, the defense and aerospace market will slump in 2020, due to civil aviation paralysis, although defense will not feel any significant effect. Traditional MEMS sensors including pressure and inertial could be affected negatively, since new aircraft orders are being hindered. However, in the longer term, thermal imagers based on microbolometers present a good opportunity in defense applications as they keep replacing legacy thermal cameras using older cryo-cooler based technologies. In a general way, defense is not so much impacted by covid-19 as governmental programs will continue.

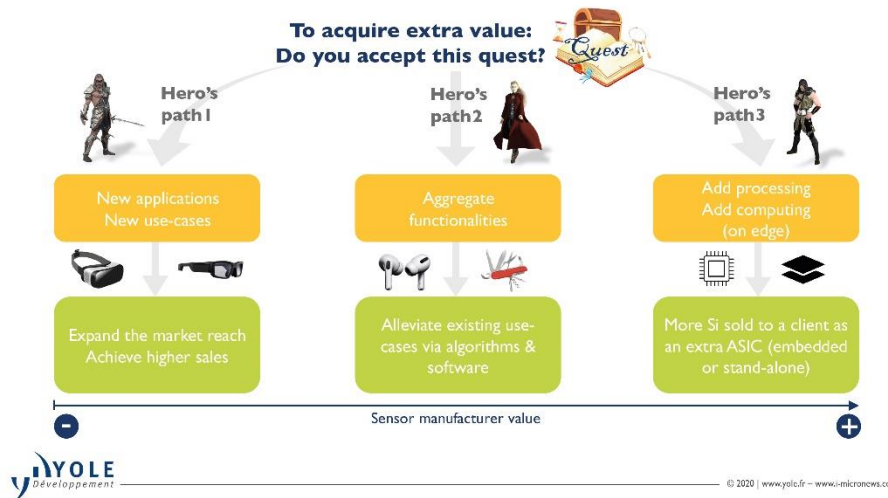
Regarding MEMS trends, at the application level and in the medium term, there will be a move to more wearable ultra-sensitive devices packing a lot of sensors but also a move to more consumer healthcare. Everything related to voice interfaces and VPA⁹s will continue to grow strongly, increasing demand for MEMS mics with better quality and high-fidelity voice capture. MEMS devices are shifting to higher accuracy, ultra-low power, embedded intelligence and possibly some biocompatibility for medical applications.

From their side, MEMS players are trying to escape the commoditization cycle and acquire more value from sensors. This can be achieved in three ways:

- By finding new applications and use-cases of sensors - one example could be AR/VR¹⁰.
- By aggregating functionalities and ameliorating the existing use-cases via algorithms and software. The value lies in the chip/ASIC running these algorithms/software.
- By adding processing and computing ‘at the edge’. It increases the value both because of more silicon area as an extra ASIC/MCU¹¹ is added, but also by adding more functionality – this could reverse the price decreasing curve of MEMS that we have seen for years.

2020 MEMS market: The quest for value acquisition

(Source: Status of the MEMS Industry 2020 report, Yole Développement, 2020)



“Each player has its own strategy. Knowles, for example, managed to increase its value from the Google Pixel 3 to the Google Pixel 4 smartphone by adding an extra audio processor for DSP¹²,” explains **Eric Mounier from Yole**. “The acquisition of Audience some years back was critical for reaching this step. While selling MEMS microphones as usual, by adding the processing function, Knowles increased the value of the silicon sold to Google.”

⁹ VPA: Voice/Virtual-Personal Assistants

¹⁰ AR/VR: Augmented Reality/ Virtual Reality

¹¹ ASIC/MCU: Application Specific Integrated Circuit/Microcontroller Unit

¹² DSP : Digital Signal Processing

On the other hand, other players are boosting the use-cases in the applications of their clients with extra functionality achieved with better algorithms and software. Bosch is collaborating with Qualcomm, while ST has added a machine learning core in its inertial sensors.

Finally, AI on the edge seems very alluring for even more extra value acquisition, by climbing the value chain even higher. Startups are already working on it, such as Imerai, Aspinity, Syntiant and Cartesiam, and for sure, this will be the next step for MEMS.

For sure, the MEMS market challenges are evolving. Today, Yole's analysts point out the importance of use case (starting with the definition of an application), the fusion of different sensors with software and power decrease, especially for always-on applications (voice HMI). Now the time is ripe to scale up MEMS, but this will only be possible if companies follow some golden rules such as higher accuracy, lower power consumption, compactness. Finally, the story is about value. Where is this value? In the data. Who can handle that? There is a growing movement toward a mix of competencies either across the supply chain, from front-end manufacturing to the packaging, the modules and the integration of systems.



All year long, Yole Développement and System Plus Consulting publish numerous reports. In addition, our experts realize various key presentations and organize key conferences. In this regard, don't miss the Sensors Expo & Conference 2020 from Monday 16, November to Wednesday 18, November 2020 at San Jose, USA. Register here.

Throughout the year, discover the numerous MEMS-related reports including the Status of the MEMS Industry one. Make sure to be aware of the latest news coming from the industry and get an overview of our activities, including interviews with leading companies and more on i-Micronews. Stay tuned!

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About our analysts

With more than 25+ years of experience within the semiconductor industry, **Eric Mounier, PhD.** is Fellow Analyst at Yole Développement (Yole). Eric is daily providing deep insights into current and future semiconductor markets and innovative technologies such as Si photonics, MEMS, quantum computing and new type of sensors. Based on a relevant methodology expertise and strong technological background, he is closely working with the overall teams at Yole to point out disruptive technologies and analyze business opportunities. Eric Mounier has a Semiconductor Engineering Degree and a Ph.-D in Optoelectronics from the National Polytechnic Institute of Grenoble (France).

Dimitrios Damianos, PhD joined Yole Développement (Yole) as a Technology and Market Analyst and is working within the Photonics & Sensing division. Dimitrios is daily working with his team to deliver valuable technology & market reports regarding the imaging industry including photonics & sensors. After his research on theoretical and experimental quantum optics and laser light generation, Dimitrios pursued a Ph.D. in optical and electrical characterization of dielectric materials on silicon with applications in photovoltaics and image sensors, as well as SOI for microelectronics at Grenoble's university (France). In addition, Dimitrios holds a MSc degree in Photonics from the University of Patras (Greece). He has also authored and co-authored several scientific papers in international peer-reviewed journals.

About the reports

Status of the MEMS Industry 2020

Edge processing and subsequently computing will boost the MEMS market. Will manufacturers have access to the new MEMS added value? – Performed by Yole Développement

Companies cited:

AAC, AKM, Alps Electric, Amphenol, ams, Analog Devices, Apple, Arioso, Asia Pacific Microsystems, Aspinity, Audiopixels, Boehringer Ingelheim Microparts, Bosch, Broadcom, Butterfly Network, Canon, Cartesiam, Colibrys, Collins Aerospace (Ex Utc), Cirrus Logic, Csem, Denso, DRS, Epcos, Epson, Esiee, First Sensor Technology, Flir Systems, Formfactor, Fraunhofer Ipms, Fujifilm Dimatix, Gettop, Goertek, Google, Hanking Electronics, Hewlett Packard, Honeywell, imec, Imerai, IMT, Infineon Technologies, Knowles Electronics, Lynred, Maxim, Melexis, MEMSCAP, MEMSensing, MEMSIC, Micralyne, Murata, Nxp, Omron, ON Semiconductor, Panasonic, Qorvo, Qualcomm, Raytheon, Rf360, Rohm, Samsung, Sensata, Sensirion, Si Time, Silex Microsystems, Silicon Sensing Systems, SINTEF, SMI, Sony, STMicroelectronics, Syntiant, Taiyo Yuden, TDK, TE Connectivity, Teledyne Dalsa, Texas Instruments, Tower Jazz, Vis (Vanguard International Semiconductor – Ex Globalfoundries), VTT, TSMC, UMC, Usound, X-Fab, xMEMS ... and many more

Related reports:

- [Thermal Imagers and Detectors 2020 – COVID-19 Outbreak Impact – Preliminary Report](#)
- [BioMEMS Market and Technology 2020](#)
- [High-End Inertial Sensors for Defense. Aerospace and Industrial Applications 2020](#)
- [Point-of-Need 2020 – Including PCR-Based Testing](#)
- [Consumer MEMS Microphones Comparison 2020](#)

About System Plus Consulting

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product... [More](#)

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Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or



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micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide... [More](#)

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