

Emerging MEMS

Technologies & Markets - 2010 Report

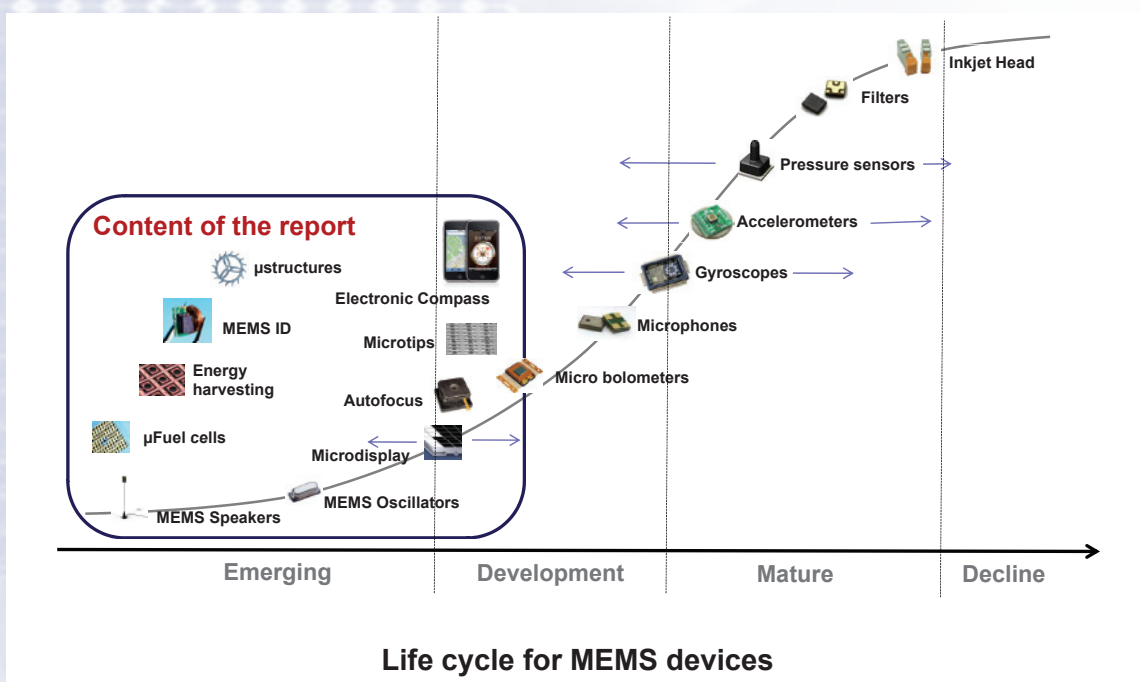
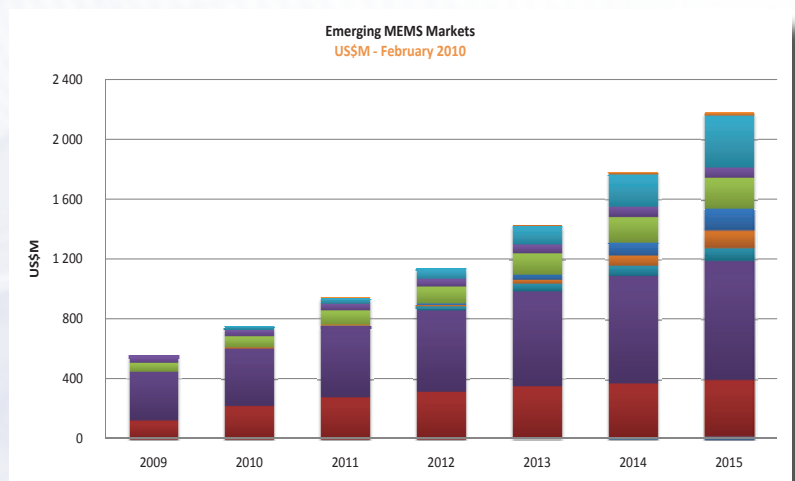
What are the next MEMS killer applications?

WHY ANOTHER MEMS MARKET REPORT ?

MEMS markets have been and will always be driven by innovation. It means that, every year, new MEMS developments are coming out. Not all of them find commercial success, but the constant stream shows there are plenty of applications where MEMS devices could be used. For a long time, the MEMS market has been composed of "mature" MEMS devices: IJ heads, pressure sensors, accelerometers and DMD. Then came microfluidics, gyroscopes, micro phones, RF MEMS (the latter still struggling to shift to large volume). In addition to these devices, there are a lot of new MEMS that have crossed the gap

from R&D to commercialization, or are close to doing so. This report presents these new "Emerging MEMS" devices that could be the next killer application of tomorrow.

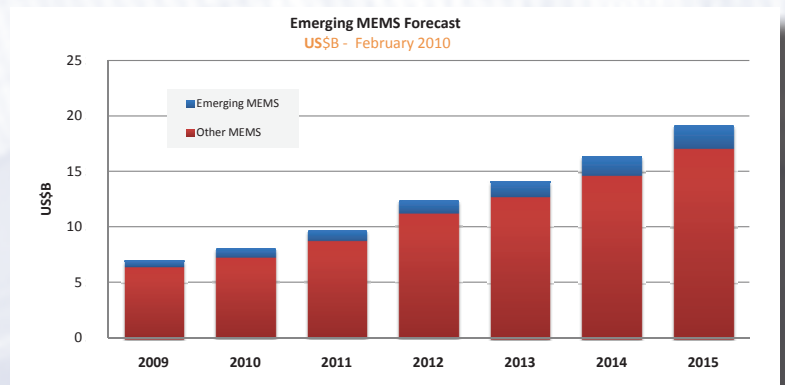
This report presents a market and technical overview for **MEMS-based Auto Focus, Electronic Compass, Energy Harvesting, Micro-bolometers, Micro displays, Micro fuel cells, Micro speakers, Micro structures, Microtips, Oscillators and RFID.**



INNOVATIVE DEVELOPMENTS, PROMISING MARKETS

Estimated to be \$550M in 2009 a few % of the total MEMS business, Emerging MEMS markets have the potential to add **\$2.2B** to the overall **MEMS market by 2015**.

An interesting fact is that most of the new MEMS developments are under the roof of startups. The situation is quite similar to what happened in the 1998-1999 period, when many new MEMS developments were on the edge of crossing the chasm - today these are mature MEMS products with large volume markets. We have identified **more than 30 startups** involved in new developments. These new companies will contribute a major part of the Emerging MEMS market devices by 2015 (10% of the total MEMS market)!



Among the MEMS devices analyzed in this report, **microbolometers, digital compasses & oscillators** will represent the most promising markets. Out of these 3, only microbolometers are mature technologies (while still subject to innovations to lower cost and increase integration). MEMS oscillators are now ready to take a significant share of the timing market. Digital compass is a soaring market in 2010 that started in earnest in 2007 thanks to the first monolithic 3-axis devices.

- **Micro displays** are a more risky technology as the technology is not mature yet. But CAGR will be very high.
- **Micro fuel** cells have large market expectation as MEMS based microfuel cell market is expected to take about 25% of the global microfuel cell market.
- Other emerging MEMS will still represent a major market value in 2015. They are **micro tips** and **micro probes**. **Auto focus** is today shifting from AF lens to an integrated OIS solution for camera modules with gyroscopes. This could boost the gyroscope market as soon as 2010.
- Finally, considered as Emerging MEMS technologies and covered in our report, other applications are really at the start of the learning curve or will stay niche applications. They are micro structures for watches, RFID, Energy harvesting and Micro speakers (with the latter showing promise for a volume market by 2015).

OBJECTIVES OF THE REPORT

The objectives of this report is to provide:

1. **Understanding** of the players and their new MEMS devices under development. For each Emerging MEMS device: overview, market dynamics, technologies, players, technical trends and market shares are described.
2. **Market data** on new MEMS developments. Each Emerging MEMS has been quantified in market value and units for 2009 through 2015.
3. An identification of **new MEMS companies** that could contribute to the MEMS market growth in the future.

WHO SHOULD BUY THIS REPORT ?

• MEMS companies:

To evaluate the potential for new MEMS applications
To monitor and benchmark potential competitors

• MEMS foundries:

To identify new MEMS companies that could be interested by a foundry partner

• Financial & Strategic investors:

To understand the potential of new MEMS devices.
To get a list of emerging startups of the MEMS industry

• R&D players:

To understand new technical challenges in MEMS

• Equipment & Material suppliers:

To understand the technical evolution of future MEMS devices.

To identify new business opportunities and prospects

• OEMs & Integrators:

To evaluate benefits of using these new MEMS in your systems

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One «Analysis by MEMS Type» can be bought separately. Indeed, you can buy the full report or the «General Market Data» part plus one «Analysis by MEMS Type» from the above list.

More details on the order form.

COMPANIES CITED IN THE REPORT

Agiltron, Aichi Steel, AKM, Akustica, ALPS, Audiopixels, BAE Systems, Bluechiip, Bosch, Cambridge Mechatronics, Ceradyne, Diamaze, Discera, DRS, Epson Toyocom, Faun Infrared, Focalplane, FLIR, Fluke, Frederique Constant, GP, Honeywell, Jaeger-Lecoultrre, L3 Communications, Lensvector, MB&F, MEMSiC, MicroGen, Mikrosistemler, Mimotec, Mitsubishi, NEC Avio, Nivarox, NoblePeak Vision, NXP, Omega, ON Semiconductor, Optotune, Panasonic, Patek Philippe, Pixtronix, PNI, Polight, QinetiQ, Qualcomm, Rhevision, Samsung, Sand9, Sarnoff, SCD, Sensitec, Sensoror, Sigatec, Siimpel, Silicon Clocks, SiTime, Sonion, Temicon, Ulis, Unipixel, Varioptic, Verateg, VTI Technologies, Xenics, Yamaha.

BIOs



Laurent Robin is in charge of the MEMS & Sensors market research at Yole Developpement. He previously worked at

e2v Technologies and at EM Microelectronics. He holds a Physics Engineering degree from the National Institute of Applied Sciences in Toulouse and was also granted a Master Degree in Technology & Innovation Management from EM Lyon Business School.



Dr. Eric Mounier has a PhD in microelectronics from the INPG in Grenoble. Since 1998 he is a co-founder of Yole Developpement,

a market research company based in France. At Yole, Dr. Eric Mounier is in charge of market analysis for MEMS, equipment & material. He is Chief Editor of Micronews, a monthly magazine dedicated to micro and nano technologies.



Jérôme Mouly was granted a Master degree in Physics in Lyon. He is analyst at Yole for 10 years, specialized in MEMS & IC

manufacturing. He is in charge of MEMS players and supply chain analysis. Since 2000, Jérôme Mouly has contributed to more than 50 marketing and technological analysis. He is also the editor of the MEMS column for Micronews magazine.

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General Market Data + 1 Analysis by MEMS Type

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Fax: +34 93 4011989

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ABOUT YOLE DÉVELOPPEMENT

Created in 1998, Yole Développement is a market research and strategy consulting firm analyzing emerging applications using silicon and micro manufacturing. With 20 full time analysts tracking MEMS, Microfluidics, Compound Semiconductor, Power Electronics, Photovoltaic, Advanced Packaging and Nanomaterials, Yole Développement supports companies and investors worldwide to help them understand markets and follow technology trends.

SERVICES

- Market research and market data
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- Players & technology databases and market data
- Manufacturing cost simulation tools
- Component reverse costing analysis
- More information on Yole.fr in reports section

MEDIA

- Critical news, bi-weekly: Micronews
- In-depth analysis & Quarterly Technology Magazines: MEMS Trends - 3D Packaging PV Manufacturing
- Online disruptive technologies website: www.i-micronews.com
- Exclusive webcasts
- Live event with Market Briefings

TERMS AND CONDITIONS OF SALE

Definitions: "Acceptance": Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions "I hereby accept Yole's Terms and Conditions of Sale".

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"Products": Depending on the purchase order, reports or database on MEMS, CSC, Optics/MOEMS, Nano, bio... to be bought either on a unit basis or as an annual subscription. (i.e. subscription for a period of 12 calendar months). The annual subscription to a package (i.e. a global discount based on the number of reports that the Buyer orders or accesses via the service, a global search service on line on I-micronews and a consulting approach), is defined in the order. Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

"Seller": Based in Lyon (France headquarters), Yole Développement is a market research and business development consultancy company, facilitating market access for advanced technology industrial projects. With more than 20 market analysts, Yole works worldwide with the key industrial companies, R&D institutes and investors to help them understand the markets and technology trends.

1. Scope

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. ANY ADDITIONAL, DIFFERENT, OR CONFLICTING TERMS AND CONDITIONS IN ANY OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTED TO BY THE SELLER, SHALL BE WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER AND SHALL NOT BE BINDING IN ANY WAY ON THE SELLER.

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1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within [7 days] from the date of order, to be sent either by email or to the Buyer's address. In the absence of any confirmation in writing, orders shall be deemed to have been accepted.

2. Mailing of the Products

2.1 Products are sent by email to the Buyer:

- within [1] month from the order for Products already released; or
- within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including incases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

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2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to produce sufficient evidence of such defects. .

2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed delivery. Any Product returned to the Seller without providing prior information to the Seller as required under article 2.5 shall remain at the Buyer's risk.

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Bank code: 30056

Branch code: 00170

Account n°: 0170 200 1565 87

BIC or SWIFT code: CCFRFRPP

IBAN: FR76 3005 6001 7001 7020 0156 587

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.4 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

3.5 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

4. Liabilities

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

- a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller's website or the Products, or any information provided on the website, or in the Products;
- b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

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4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot guarantee that any Product will be free from infection.

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The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not the fault of the Seller.

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6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

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7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be borne by the Seller, following this decision.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

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All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

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