"By 2018, MRAM/STTMRAM and PCM will represent a $1.6B business," announces Yole Développement

"Emerging Non-Volatile Memories", a report from Yole Développement

Lyon, France – February 19, 2013: Yole Développement announces its Emerging Non-Volatile Memories report. Yole Développement’s report provides an analysis of the emerging Non-Volatile Memories (NVM) five applications fields that will fuel market growth and a description and forecasts of the four emerging NVM (MRAM, PCM, RRAM, FeRAM) technologies. It also analyzes the competitive landscape for both standard memories (DRAM and NAND) and emerging NVM with expected dynamic for the future.

Higher-density NVM chips will spawn many new applications and increase the business ten-fold in just five years

This Yole Développement report describes why and how emerging NVM (FRAM, MRAM/STTMRAM, PCM, RRAM) will be increasingly used in various markets: industrial & transportation, enterprise storage, smart card, mobiles phones and mass storage.

Until recently, only FRAM, PCM and MRAM were industrially produced and available in low-density chips to only a few players. Thus the market was quite limited and considerably smaller than the volatile DRAM and non-volatile Flash NAND dominant memory markets (which enjoyed combined revenues of $50B +in 2012).
However, in the next five years the scalability and chip density of those memories will be greatly improved and will spark many new applications, with the following NVM market drivers explained in detail in this report:

- With the adoption of STT MRAM and PCM Cache memory, enterprise storage will be the largest NVM market. NVM will greatly improve the input/output performance of enterprise storage systems whose requirements will intensify with the growing need for web-based data supported by cloud servers.

- Mobile phones will increase its adoption of PCM as a substitute to flash NOR memory in MCP packages thanks to 1GB chips made available by Micron in 2012. Higher-density chips, expected in 2015, will allow access to smart phone applications that are quickly replacing entry-level phones. STTMRAM is expected to replace SRAM in SoC applications thanks to lower power consumption and better scalability.

- Smart card MCU (microcontrollers) will likely adopt MRAM/STTMRAM and PCM as a substitute to embedded flash. Indeed, flash memory cell-size reduction is limited for the future. NVM could reduce the cell size by 50% and thus be more cost-competitive. Additional features like increased security, lower power consumption and higher endurance are also appealing NVM attributes.

- Mass storage markets served by flash NAND could begin using 3D RRAM in 2017-2018, when 3D NAND will slow down its scalability as predicted by all of the main memory players. When this happens, a massive RRAM ramp-up will commence in the next decade that will replace NAND, if sufficient 3D RRAM cost-competitiveness and chip density are available. Overall, the global emerging non-volatile memory market will grow from $209M in 2012 to $2B in 2018, equating to an impressive growth of + 46%/year. Nevertheless, this is a forecast based on a conservative scenario, and the report also provides a best-case scenario for an even broader adoption of NVM.

**MRAM/STTMRAM and PCM will lead the NVM market, reaching a combined $1.6B by 2018**

Market adoption of memory is strongly dependent on its scalability. This Yole Développement report provides a precise memory roadmap in terms of technological nodes, cell size and chip density for each NVM (FRAM, MRAM/STTMRAM, PCM, RRAM). A market forecast is provided for each technology by application, units, revenues and also # of wafers. A comprehensive review of the latest technical developments of every main player is presented in order to understand the technology’s status and the main technical challenges.

“By 2018, MRAM/STTMRAM and PCM will surely be the top two NVM on the market. Combined, they will represent a $1.6B business by 2018, and their sales will almost double each year, with double-density chips launched every two years,” explains Yann de Charentenay, Senior Technology and Market Analyst at Yole Développement.

FeRAM will grow at a steadier growth rate (+10%/year) and will focus on industrial & transportation applications because of the low-density available. RRAM revenues won’t really surge until 2018, with the availability of high-density chips of several 10’s of Gb that could replace NAND technology.

**Giant memory manufacturers and start-up companies compete on technology development**

The memory supply chain has been highly concentrated in the last 10 years, supporting a huge price/Gb decrease (-20 to 40%/year for NAND and DRAM). Five players (Samsung, Micron, SK Hynix, Toshiba and SanDisk) hold 90% of DRAM and NAND sales. These leading players will have a key role in the competitive landscape of emerging NVM. This report identifies and positions the key emerging NVM players based on the technology developed, market presence (new entrant or established
memory player), and targeted markets. The supply chain dynamic is analyzed in order to understand who today’s key market players are in each application and technology, and to illustrate how the competitive landscape will evolve.

**About Emerging Non Volatile Memories report:**

- **Author:**

  **Yann de Charentenay** has worked for Yole Développement in the field of MEMS, materials and compound semiconductors since 2003. He has contributed to more than 60 marketing & technological analysis.

- **Catalogue price:**

  Euros 5,990.00 (Multi user license) - Publication date: February 2013. For special offers and the price in dollars, please contact David Jourdan (jourdan@yole.fr or +33 472 83 01 90).

- **Companies cited in the report:**


**About Yole Développement – [www.yole.fr](http://www.yole.fr)**

Beginning in 1998 with Yole Développement, we have grown to become a group of companies providing market research, technology analysis, strategy consulting, media in addition to finance services. With a solid focus on emerging applications using silicon and/or micro manufacturing, Yole Développement group has expanded to include more than 50 associates worldwide covering MEMS, Microfluidics & Medical, Advanced Packaging, Compound Semiconductors, Power Electronics, LED, Image Sensors and Photovoltaics. The group supports companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to develop their business.

**CUSTOM STUDIES**

- Market data, market research and market analysis
- Technology analysis
- Reverse engineering and reverse costing
- Strategy consulting
- Corporate Finance Advisory (M&A and fund raising)

**MEDIA**

- Critical news, Bi-weekly: Micronews, the magazine
- Online disruptive technologies website: [www.i-micronews.com](http://www.i-micronews.com)
- Exclusive Webcasts
- Live event with Market Briefings

**TECHNOLOGY & MARKET REPORTS**

- Collection of reports
- Players & market databases
- Manufacturing cost simulation tools
- Component reverse engineering & costing analysis
  More information on [www.yole.fr](http://www.yole.fr)

**CONTACTS**

For more information about:

- Services : Jean-Christophe Eloy ([eloy@yole.fr](mailto:eloy@yole.fr))
- Reports: David Jourdan ([jourdan@yole.fr](mailto:jourdan@yole.fr))
- Media : Sandrine Leroy ([leroy@yole.fr](mailto:leroy@yole.fr))

###