Emerging Non-Volatile Memory (NVM) Technologies & Markets 2015
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- **General Conclusions**
Key features of the report

• Presents an overview of the semiconductor memory market
  – NAND, DRAM, embedded MCU and mobile CPU main markets, market forecast, and main trends
  – Current technological status and roadmap for the coming years
  – Market landscape

• Provides understanding of emerging NVM applications:
  – For six application fields (industrial & transportation, enterprise storage, wearables, smart cards, mobile phones, mass storage): total addressable market, market drivers and challenges, technology roadmap, players, main trends.
  – Roadmap with time to market by application

• Presents market forecasts on emerging NVM business:
  – 2014-2020 market forecast in units, in Gbit, US$/Gbit, and number of wafers
  – Price evolution by application and technology
  – Forecast for six applications and two technologies (MRAM/STTMRAM, RRAM)

• Describes emerging NVM technologies
  – Working principle, manufacturing methods, advantages/limitations, status of development, price, time to market
  – Roadmap with technological nodes, and chip density evolution with main players
  – Latest product development status for each key market player

• Describes and analyzes the competitive landscape
  – Recent acquisitions and funding
  – Latest company news
  – Who the key players are by technologies and applications
Some definitions

- **Solid State Semiconductor Memory**
  - An electronic data storage device, often used as computer memory but also for many other applications: consumer (camera..), telecom, industrial applications...

- **Volatile memories**:
  - Requires power to maintain the stored information. Examples: DRAM, SRAM

- **Non volatile memories**:
  - Can retain the stored information even when not powered.
  - Most dominant NVM technology are based on electron retention principle: Flash NAND and NOR...

- **Emerging Non Volatile Technology**
  - Emerging NVM are based on another principle than electron retention and have emerged since 10 years or are still under development
Emerging Non-Volatile Memory Technologies summary

Year of commercial sample availability

2015
2016
2017
2018
2019
2020

Technological Choices By Application

Enterprise storage SCM memory

Embedded MCU : Smart card, wearable, other markets

Enterprise storage DRAM substitute

Mass storage NAND substitute

RRAM

STTMRAM

Market forecast in $

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Emerging NVM Time to market by Application

- **Mass Storage**
- **Mobile devices**
- **MCU Smart Card & other markets**
- **Wearable**
- **Cache Memory Enterprise storage**
- **Industrial & transport**

Year of commercial sample availability:
- **MRAM**
- **PCM**
- **RRAM**
The emerging NVM market will grow at a CAGR of +118%, with Enterprise Storage as the largest market by far in 2020 due to fast adoption of both STTMRAM and RRAM. Wearable is the second market thanks to strong demand for low power memory.
Emerging memory has distinctive technical features (endurance, speed, non-volatility), but price and scalability are obstacles to competing with dominant DRAM, NAND or SRAM memory.
Emerging NVM Applications

Emerging Non Volatile Memory applications

Industry & transportation

Enterprise storage

MCU Smart Card & other markets

Wearable

Mobiles applications

Mass storage Memory

Industrial Automation

Journal Memory

NFC Sim Card

Smart phones & tablets

NAND Memory

Smart Meter

Storage class Memory

ID Card

Automotive

Volatile DRAM

General purpose
First players (Panasonic, Adesto) entered on the market on industrial and wearable applications. Then Micron will enter in 2015 by targeting SCM enterprise storage and SK Hynix will follow after. Main memory leaders (Samsung, SK Hynix, Toshiba/ Sandisk) are expected to introduce RRAM chips for mass storage applications for 2020.
**Enterprise Storage** will represent the largest MRAM/STTMRAM production in 2020, thanks to high-density chip introduction (8 to 16 Gb). This is however, still very small compared to current DRAM production which is more than 10 B wafers in 2014.
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