IMS Overview &
Advanced Analog & Smart Power

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General Manager, Industrial & Multisegment Sector

IMS at a Glance

Innovation Results:
• 5 new products per day
• ~20% of sales with products less than 2 years old
• 2 new system solutions (boards) per week

Technical Resources:
(desiners, application engineers, technical marketing)
ANALOG & MEMS
45%
DIGITAL
35%
POWER DISCRETE
20%

2009 IMS key facts
TAM = $42B
Billing = $2.66B
Market Share = 6.3%

World Wide Competence Centers

Technical support located near customers in all sales regions

Source: WSTS, ST
IMS Results & TAM Evolution

2009

By Customer Type
- EMS
- OEM

By Market Segment
- Telecom
- Automotive
- Computer
- Consumer
- Industrial

By Region
- Americas
- Japan & Korea
- Greater China & South Asia
- EMEA

2015 TAM Split

<table>
<thead>
<tr>
<th>Segment</th>
<th>2015 (US$B)</th>
<th>CAGR (2010 ~2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital</td>
<td>19</td>
<td>5.8%</td>
</tr>
<tr>
<td>Analog &amp; MEMS</td>
<td>32</td>
<td>6.4%</td>
</tr>
<tr>
<td>Power Discrete</td>
<td>20</td>
<td>5.7%</td>
</tr>
<tr>
<td>Total IMS</td>
<td>71</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

Source: WSTS, STMicroelectronics

IMS Billing Split & Evolution

IMS Sales weight

2009 Sales Split

Power
Analog & MEMS
Digital

Source: STMicroelectronics
**IMS: Analog**

### Analog Ranking 2009

**Analog ICs* # 2**

<table>
<thead>
<tr>
<th>Key product family</th>
<th>Key target applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power management ICs</td>
<td>Power supply, solar, lighting</td>
</tr>
<tr>
<td>Mixed signal ICs</td>
<td>Mobiles, peripherals, portable medical</td>
</tr>
<tr>
<td>Battery management ICs</td>
<td>Mobiles, PDAs, e-Books</td>
</tr>
<tr>
<td>LED driver ICs</td>
<td>Street lighting, building, panel arrays</td>
</tr>
</tbody>
</table>

*Ranking refers to total ST Analog ICs sales*

**Competitive Advantages:**

- Ability to integrate analog and power in a single chip or in a single package in power conversion and power management applications
- System know-how enabling the design of dedicated ICs for complex applications and a variety of reference designs for medium and small customers
- Ability to deliver system solutions including sensors, analog ICs, microcontrollers and power discrete
- The world’s largest and most cost effective 6” front-end fab in Singapore

Source: iSuppli, ST

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**IMS: MEMS**

### MEMS Ranking 2009

**All Segments # 1**

*except Automotive*

<table>
<thead>
<tr>
<th>Key product family</th>
<th>Key target applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or 3-axis Accelerometers</td>
<td>PDAs, mobiles, toys, notebooks, multimedia devices</td>
</tr>
<tr>
<td>Gyroscopes</td>
<td>Games, camcorders, camera stabilization, GPS</td>
</tr>
<tr>
<td>Microphones</td>
<td>Games, mobile phones, laptops</td>
</tr>
</tbody>
</table>

*MEMS accelerometers & gyroscopes

**Competitive Advantages:**

- Integration in a single package of MEMS, data converters and RF transceivers for smart sensor networks
- Proprietary innovative silicon and packaging technologies for miniaturization and ultra-low-power fitting medical and portable applications
- First in the world to adopt an advanced 8” inch wafer fab (Agrate)

Source: iSuppli, ST
IMS: Power Discrete

Power Discrete Ranking 2009
- Power MOSFET (High Voltage) # 1
- Protection & IPAD # 1
- Thyristors # 1
- Rectifiers & power diodes # 3

Key product family | Key target applications
--- | ---
HV Power MOSFETs | Power supply, lighting, solar
Rectifiers | Power management
ACS switches | Home appliances
Protections & IPAD | Mobiles, USB/HDMI interfaces, wired data transfer

Competitive Advantages:
- The widest range of power technologies and packages from low to very high voltage (MOSFET, IGBT, Bipolar, IPAD, Rectifiers) offering the highest efficiency in the most demanding applications
- Expertise in composite materials (SiC, GaN) for high frequency and very high temperature applications (electric cars, photovoltaic converters, wind generators)
- Extremely competitive manufacturing machine (Singapore, Longgang, Shenzhen)

Source: iSuppli, ST

IMS: Digital

Digital Ranking 2009
- EEPROM, EPROM # 1
- Smart Card # 3

Key product family | Key target applications
--- | ---
RFID & RF EEPROMs | Access control, tracking systems
Microcontrollers | Low-power medical and portable equipment
32-bit smartcard ICs | Mobile phones, data security

Competitive Advantages:
- Common technology and high-performance core (ARM® Cortex™) platforms for smartcards and microcontrollers
- Ultra-low-power technology suitable for battery operated and medical applications
- Complete hardware and software solutions for secure applications (STB, banking, access control, NFC)
- Special set of peripherals for connectivity (RF, ethernet), human machine interface (touch sensing) and real time control (motor control timers)

Source: iSuppli, ST
IMS: Key Strengths

- Analog drivers
- High voltage power MOSFET
- Rectifiers

- Consolidated IMS Key Areas
  - Lighting
  - Motor control
  - Secure transaction
  - Mobile

- Smart power ICs
- Power transistors
- Microcontrollers

- Analog ASSP ICs
- Microcontrollers
- Power transistors

- IPAD
- MEMS and sensors
- Audio amplifiers

Expanding into New Focus Areas

**Automation**
- 2013 TAM: $2.6B
- Revenue CAGR (2010-2013) 8.0%

**Energy**
- 2013 TAM: $5.1B
- Revenue CAGR (2010-2013) 7.0%

**Healthcare**
- 2013 TAM: $5.8B
- Revenue CAGR (2010-2013) 8.6%

Source: iSuppli, Semicast
Innovation is Still IMS Key Driver

System Innovation

Product Innovation

Technology Innovation

System Innovation

STMicroelectronics

System Innovation

STMicroelectronics
Our System Approach

- Complete reference designs (Hardware & Software) for medium and small accounts
- More than 550 reference designs available to support our worldwide design-in activity
- Innovative new product definition thanks to feedback from customer system know-how

System Innovation in Energy

- Hybrid Electric Traction
  - Motor drivers
  - Power conversion
  - Battery-cell management
  - Fast battery charger
- Photovoltaic panel converters
- SmartGrid
  - Smart energy metering
  - Smart appliance plug
  - Power-line modem
System Innovation in Automation

- Home automation through advanced wired (200 Mbit/s) and wireless connectivity
- Application Specific Integrated Modules (ASIMs) for robotics and industrial automation
- Sensor networks for building automation
- Low-power energy harvesting and storage

System Innovation in Healthcare

- Remote patient monitoring
  - Blood pressure
  - Heart beat
  - Electrocardiograph
  - Eye pressure sensor
- Movement reconstruction
  - Rehabilitation
  - Fitness
- Patient treatment (i.e. insulin pump)
Technology Innovation

Emerging Applications Require Smart Integration:
Moore’s Law and More than Moore

“More than Moore”: Diversification

SoC and SiP mix for Higher Value Systems

Beyond CMOS: Quantum Computing, Molecular Electronics Spintronics
ST Enabling Technologies: “More than Moore”

- MEMS & smart sensors
- Flexible ICs
- Harvesting & thin film batteries
- New materials: SiC & GaN
- Advanced BCD, BCD-SOI
- Ultra-low-power technologies
- 3D heterogeneous integration / TSV
- Advanced packaging & system-in-package
- Microfluidics

Product Innovation
More than 40M smart meters with ST’s power-line modem connectivity already installed in the field.

Source: ABI Research, ST

Target Applications:
- Electricity meters
- Water meters
- Gas meters

Smart electricity meters TAM 2009: 76M units
CAGR 2010-2013: ~18%
Micro Inverter Modules

- Maximizing energy output (MPPT)
- Energy monitoring (daily, monthly, yearly, etc.)
- Diagnostic and anti-theft & anti-tearing protection
- Reducing operation cost due to modularity

Target applications:
- Photovoltaic panels

Electronics on panel value from $1.50 to $15

PV energy production growth
- 2010 → about 7 GW
  (~35 million single photovoltaic panels)
- 2020 → about 56 GW

Source: European Photovoltaic Industry Association, ST
LED Lighting Driver ICs

Luminous efficacy

LED >100 lm/W

... more light with less energy

TL  70 lm/W

CFL 50 lm/W

Filament 15 lm/W

Driving LEDs using AC-DC solutions

Driving LEDs using DC-DC solutions

LED Array Drivers

Target applications:
- Display & signs
- General illumination
- Backlight
- Signal lighting

LED TAM 2009: 63B units
CAGR 2010-2013: 30%

Source: iSuppli
Motherboard Power Management ICs

- Enabling next generation motherboard power management solutions

<table>
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<th>Multi Segment ICs</th>
<th>Motherboard Dedicated ICs</th>
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<tr>
<td>Low power consumption switching regulators</td>
<td>CPU power management controllers</td>
</tr>
<tr>
<td>Single and multi phase DC-DC controllers</td>
<td>Multi output controllers</td>
</tr>
<tr>
<td>High density DC-DC controllers</td>
<td>Multi output regulators</td>
</tr>
<tr>
<td>High efficiency switching regulators</td>
<td>LED backlight drivers</td>
</tr>
</tbody>
</table>

**Target applications:**
- Desktop
- Laptop
- Server

TAM 2009: $2.6B
CAGR 2010-2013: ~12%

Source: iSuppli

MEMS Gyrosopes

- Driving direction
- Sensing direction
- No Angular rate (Pitch axis)
- Angular rate (Pitch axis)

**Target applications:**
- Smart phones
- Robotics
- Navigation
- Cameras
- Gaming

TAM 2009: ~$526M
CAGR 2010-2013: ~13%

Source: iSuppli
Microcontroller “STM32W”

- IEEE 802.15.4 open flexible reconfigurable platform

Target Applications:
- Smart meters
- Home & building automation
- Wireless sensor networks
- Healthcare
- Consumer
- Remote control
- Home automation

System-on-Chip solution
Microcontroller, radio and firmware

Low power microcontroller product family, ...

32-Bit MCU* TAM 2009: $3.8B
CAGR 2010-2012: >10%

Source: WSTS
Includes Automotive

Flexible Eye Lens for Glaucoma

Flexible Lens IC for wireless sensor for Continuous eye pressure monitor
- Contact lens (30m thickness)
- Pressure sensor
- Continuous remote monitoring
- Very low-power RF data transfer

Target applications:
- Remote patient monitoring

Population and aging increase
Over 7.5 million suffer from age-related macular degeneration
Therapeutic sales for ophthalmology disorders exceeded $12B in 2009

Source: World Health Organization
3D Ultrasound Scanner ICs

- Miniaturization and low-power ICs allow electronics migration from centralized computer to ultrasound beamer

Old System  
New System

Solution Integrating:
- Power management IC array
- Microcontroller
- Analog front-end and data converter

Target application:
- Echographs with color and 3D integration

Source: Semicast

TAM 2010: 83M units
CAGR 2010-2013: 11%

IMS Strategy

- Focus on high-margin segments (energy, automation, healthcare)
- System approach to deliver complete solutions to the market
- Boost high-performance, high-margin analog products leveraging on our strong position in MEMS and power management
- Pervade the market with microcontrollers and secure access products based on ARM core leveraging on:
  - Ultra-low-power technologies for portable and healthcare applications
  - Complete set of analog peripherals including wireless connectivity
- Maintain our leadership in power discrete supporting:
  - High-volume and cash-generating products
  - New high-margin products utilizing new materials (SiC and GaN)
- Improve profitability towards high teens operating margin by the end of 2010 and above 20% in the mid-term