More Than Moore (MTM) Market Trends and Opportunities

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World’s #1 semiconductor and display equipment company

- **$9.7 billion** revenue
- **$1.5 billion** R&D spending
- **>10,200** patents
- **AMAT stock listing on NASDAQ**
- **Headquartered in California’s Silicon Valley**
- **>14,000** employees
  - **81** locations
  - **18** countries

**World’s #1** semiconductor and display equipment company
Applied’s Businesses

Silicon Systems

Global Services

Display

Energy and Environmental Solutions
Global Scale and Reach

Principal Locations

Data as of fiscal year end, October 25, 2015
Applied Materials Global R&D Infrastructure

**Maydan Technology Center**

LOCATED IN SANTA CLARA, CA:
HQ dedicated to product development transistors, interconnects, memory applications.

39K SQFT CLASS 1 cleanroom with 120 tools

**Asia Product Development Center (APDC)**

LOCATED IN SINGAPORE:
Dedicated advanced packaging center since April 2012

14K SQFT CLASS 10 CLEANROOM:
11 Applied platforms & over 40 supporting tools

**Xi’an Technology Center**

LOCATED IN Xi’an China:
Dedicated 200mm demo and development facility
Applied Global Services: Optimizing Efficiency Through—
COMPREHENSIVE SERVICES, CONSULTING, EQUIPMENT, AUTOMATION SOFTWARE

**Fab Services**
- Supporting > 34,000 tools
- 3,000 field engineers
- Innovative, flexible & technology-based service solutions

**FabVantage™**
- Benchmarking
- Tool output & cost
- Yield & predictability
- Fab productivity

**Equipment**
- < 200mm semi
- Subfab solutions
- Dedicated R&D for emerging technology
- Technology and productivity upgrades

**Components**
- Certified Applied parts
- Flexible spares delivery programs
- High performance parts options
- Advanced cleaning and coatings

**Software**
- Product quality
- Equipment control
- Factory productivity
- Supply chain
Equipment Product Group:
ENABLING EMERGING TECHNOLOGIES & HIGHER PERFORMANCE

Enabling New Technologies

Extending Tool Lifetimes

Enabling Green Compliance

From technology inflections to productivity enhancements
Evolution of More-Than-Moore (MTM) in the Marketplace

- **MTM technology segments:** MEMS, Power, Analog, Image Sensors, LP-MCU and Packaging technologies
- **MTM device segments:** Consumer, Automotive, Industrial, Medical, …

≤200mm represents >70% of all IC content in Automobiles, Mobile Devices and Wearables
Healthy growth expected for all key segments

>70% of chip content produced on ≤ 200mm wafer technology
200mm Capacity Growth

80% of chips on 3 fastest growing segments made on 200mm

Source: Gartner Forecast; Dec 2015

+304K wspm 2015 to 2018

Source: Global 200mm Fab Outlook, preliminary Feb 2016, SEMI
Smartphone Teardown Analysis – 200mm Si

**Global Smartphone Units Sold (M)**

- **Samsung**: 1,433 (23%)
- **Apple**: 325 (16%)
- **Huawei**: 232 (16%)
- **Lenovo**: 74 (7%)
- **Xiaomi**: 71 (5%)
- **Others**: 107 (7%)

**200mm Si Area by device**

- **Analog**: 26%
- **CIS**: 8%
- **CMOS**: 9%
- **Memory**: 15%
- **MEMS**: 1%
- **Power / Power Management**: 41%

**Total 200mm Wafers Driven by Smartphones (M)**

- **Samsung**: 2.4M
- **Apple**: 1.0M
- **Huawei**: 0.6M
- **Lenovo**: 0.6M
- **Xiaomi**: 0.2M
- **Others**: 0.9M
- **Others**: 1.9M

**Calculations**

- Smartphones 25% of total 200mm wafers (2015)
- Power 26% of total Si area
- Chinese Smartphone makers growing fastest
BMW i3 Teardown Analysis – 200/300mm Si

Analysis Based on Silicon Area

- 200mm Die Count: 484
- 300mm Die Count: 360
- 200mm Si Area: 3189 mm²
- 300mm Si Area: 4077 mm²

Analysis Based on Number of Dies

- 200mm Die Count: 484
- 300mm Die Count: 360
- 200mm Si Area: 3189 mm²
- 300mm Si Area: 4077 mm²

200mm dominating semiconductor market for Automotive
Enabling the Mobility Evolution
COMPREHENSIVE PORTFOLIO OF ≤ 200MM APPLIED MATERIALS EQUIPMENT & UPGRADES

<table>
<thead>
<tr>
<th>Analog</th>
<th>Power</th>
<th>MEMS</th>
<th>Packaging</th>
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<tbody>
<tr>
<td>• Chamber and system upgrades that enable installed base tools to meet tighter performance requirements</td>
<td>• Improving processes like aluminium PVD, epitaxial silicon deposition, and deep reactive ion etch</td>
<td>• Supporting time to market and cost challenges by developing new 200mm capabilities on our production proven platforms</td>
<td>• Supporting today’s state-of-the-art IDM and foundry capabilities</td>
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<tr>
<td>• Upgrades include remote clean for CVD chambers and pumping improvements for metal etch</td>
<td>• Addressing emerging trends such as thin wafer handling to &lt;150µm and thermal management</td>
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<td>• Meeting the needs of reduced form-factor electronics and ever-shrinking die footprint</td>
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Enabling MTM Technologies on 200mm

- Smartphone / Tablet, Automotive and Wearables will drive 200mm device unit growth and new technology requirement for the next 5+ years.

**End Use Application(s)**

Segments with >70% 200mm Content

- Smartphones & Tablets
- Automotive (Body, Engine, Infotainment, ADAS)
- Wearables (Fitness, Garments)

Key inflections in high growth application segments drive requirements for new materials, packaging and CMOS integration.

- Ultra Uniform AlN Films (MEMS RF Filters)
- Adv. CMOS Compatible Films (PECVD SiGe for MEMS)
- Adv. Epi Technologies (Power Switching)
- Adv. Etch Solutions (Packaging, Power)
- Adv. Metal Deposition (Power Technologies)

**Endura**

**Centura / Producer CVD**

**Centura Epi**

**Centura DPS DTM**

**Endura**
Transition to 300mm Technologies

- Will occur in MTM on an opportunistic basis. Key drivers:
  - Available capacity on depreciated 300mm line
  - Volume / ASP pressure
  - Opportunity for disruption (ASP/ Technology)
  - Technology existing or easily ported to 300mm

- Examples from the MEMS segment may include:

Gyro – ASIC / WLCSP
AIN Based Devices
Disruptive Technologies
Manufacturing Capability

- **Ability to build new 200mm tools**
- **Upgrades** to latest technology and safety standards
  - Proactive obsolescence solutions
- **200mm and 300mm** refurbishment capability
  - 92,000 sq ft. with 17 test bays
  - Capacity of >70 tools/quarter
- **Dedicated team**
  - Average experience >15 years
- **Continuously driving manufacturing efficiency**
  - Enabling high quality, cost competitive solutions
Conclusions

More Than Moore technologies is a large and growing market

MTM customers require technology development – new films, new structures, improved productivity

Applied Materials is committed to the success of our customers

Applied continues to invest in enabling technology (materials engineering, productivity, fab life)

Comprehensive manufacturing capability, upgrades; Technology-based service and support