Advantest IR Technical Briefing

Test needs and Solutions in the High-End SoC Semiconductor Market

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Agenda

✓ Our Dynamic SoC Test Business

✓ High Performance Computing (HPC) is the major driver of SoC Test

✓ Future Test Needs & Solutions

✓ Summary
Our Dynamic SoC Test Business
Semiconductors Support Changing Lifestyles

More applications, more technology

Evolution of Semiconductor Technology
- 2D Scaling
- 2.5D / 3D Scaling
- Higher speeds
- Lower power consumption

Higher demand for solutions to customer issues: “PPAC”
- Performance
- Power
- Area
- Cost
R&D Management Initiatives from FY2018

Maintain our high level of R&D investment to date as a driving force for value creation and social contribution

<table>
<thead>
<tr>
<th>1st Mid-Term Management Plan (FY2018-2020) Results</th>
<th>2nd Mid-Term Management Plan* (FY2021-2023)</th>
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<tbody>
<tr>
<td>R&amp;D investment</td>
<td>Total cumulative investment</td>
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<tr>
<td>Approx. ¥120B</td>
<td>Approx. ¥170B</td>
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*Revised July 28th, 2022

Initiatives from FY2018 “Converging to grow”

✓ Executing R&D based on a long-term roadmap aligned with semiconductor technology trends. At the same time, we are expanding our platform strategy for diverse customers and applications

✓ Providing comprehensive test solutions

  − Expanding our business domains from semiconductor mass production test to design/evaluation processes and new system level test

  − Offering end-to-end solution coverage, along with device handling, temperature control, and device contact

✓ Developing a new business domain that utilizes the cloud, software, and data analytics
More R&D Synergies

Sharing technologies and accelerating development efficiency
- Integration of V93000, T2000 and Memory tester development team in FY2018

Total: 56 sites, 6,464 employees
(As of March 31, 2022)

Index
★ Global Headquarters
● Regional Headquarters
■ Major R&D Bases & Factories
● Service Facilities
Today’s Focus : High-End SoC Test

Test Needs and Solutions

✓ More Complexity, More Power & Thermal Requirements

Advantest offers an industry-leading test module line-up

✓ Signal integrity

Advantest’s high-quality end-to-end solutions enable a comprehensive test environment

Test Systems + Test Interface Boards + Test Sockets

We are reinforcing our core technologies and platform strategy
High Performance Computing (HPC) is the major driver of SoC Test.
Era of High-Performance Compute - Exascale Computing

Semiconductor Revenue in Billion $

- First $200 Billion in 40 years
- Next $200 Billion in 17 years
- 5 years?
- 4 years?


- 1988: 20M PCs annual shipment
- 2002: 1st Blackberry smartphone
- 2018: Data from machines exceeds humans
- Era of Mainframe Computing
- Era of PC & Internet
- Era of Mobility
- Era of AI & HPC

2022: 1989: 20M PCs annual shipment

2002: 1st Blackberry smartphone
Advantest V93000 led the way towards EXA Scale Computing

Semiconductor Revenue in Billion $

1988 - 2030


Era of Mainframe Computing
Era of PC & Internet
Era of Mobility
Era of AI & HPC
Leader in Test of Android Phone APU
Leader in PC-GPU and PC-CPU Test
Installed base ~10,000 Systems

V93000 EXA Scale Generation
V93000 Smart Scale Generation
V93000 Pin Scale Generation

Advantest V93000 led the way towards EXA Scale Computing
Technology Leadership by continuous Innovation

- **First Integrated 1Gbps Channel**
- **First 160A Power Supply**
  - >1000A possible
- **First 1.6Gbps Universal Channel**
  - Fastest/Deepest Scan
  - 16Gbps High Speed IO
- **Fastest Universal ATE Pin – 5Gbps**
  - Deepest Scan Vector Memory
- **First 1..256A Power Supply**
  - >1000A

V93000 Pin Scale Generation

V93000 Smart Scale Generation

V93000 EXA Scale Generation

Compatible and Upgradeable

Year:
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
Major Segments and ATE Customers

Traditional Computation IC Market

- **PC/Server CPU (x86)**: Several Players
- **PC Graphics**: Several Players
- **Mobile APU/Modem**: Several Players

Future Computation IC Market

- **PC/Server CPU (x86)**: Several Players
- **PC/Server (ARM, RISC-V)**: Several Players + Many Startups in China
- **PC/Server (ARM, RISC-V)**: Many New Players Hyperscalers System Companies China
- **PC Graphics**: Several Players established Players + China Startups
- **Mobile APU/Modem**: Several Established Players New Players in China
- **Mobile APU/Modem**: Phone Makers System Providers
Major HPC Trends – Growing Complexity

**Chiplets Everywhere**
- CPU, GPU, cache, I/O, HBM

**ARM Server CPUs**
- New players, new architectures

**3D Packaging**
- Micro bump → hybrid bonding

**Power & Thermal**
- More power & thermal challenges

**Complexity Growth**
- New process nodes 5nm, 3nm, ..

**High-Speed Fabrics**
- Large and fast data center networks
Growing Complexity drives Market Size for ATE

Test Data Volume tracks Number of Transistors

Further Data Compression is hard to achieve

3D Integration and System Failures drive additional Test

Focus on Software and System Level Testing on ATE

Power becomes a major Challenge for Test

Source: Processor Quarterly Market Monitor, Q2 2022 - Yole Intelligence
Future Test Needs & Solutions
100x Complexity – Moore’s Law + 3D Integration

Test data will continue to explode

3D Integration with drive density by factors

- Industry’s only 5Gbps ATE
- Deepest ATE Memory
- Enabling Future High Speed IO Scan
Power and Thermal beyond 1000W

Power and Cooling become major Challenge

High Currents and Dynamics require new approaches for Power Supply and Cooling during test

- Industry’s highest Power Density
- 256A per Card, >2000A in System
- First full Digital Control loop
- Unique Probe Card Protection
Time To Market Challenge

Example: Software based functional Verification

- First ATE-integrated Compute System
- Native PCIe and USB
- Functional Test Coverage on Tester
Summary

Market

Semiconductor Market to grow to $1 Trillion by 2030

ATE will grow in line with Semiconductor market

ATE Volume driven by large Digital Integration

Challenges & Opportunities

100x Complexity Growth (incl. 3D)

Test coverage for Data Centers become critical

New system players require turn-key test solutions

Time to market becomes a major Challenge

Technical Leadership

V93000 EXA Scale was developed with and for the High-End SoC Leaders

Major Market Share in this Segment

V93000 EXA Scale Generation addresses increasing Test Complexity, Power/Thermal and TTM Challenges by Superior Test Solutions