ADVANTEST

Advantest IR Technical Briefing

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

December 7th , 2022

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NOTE

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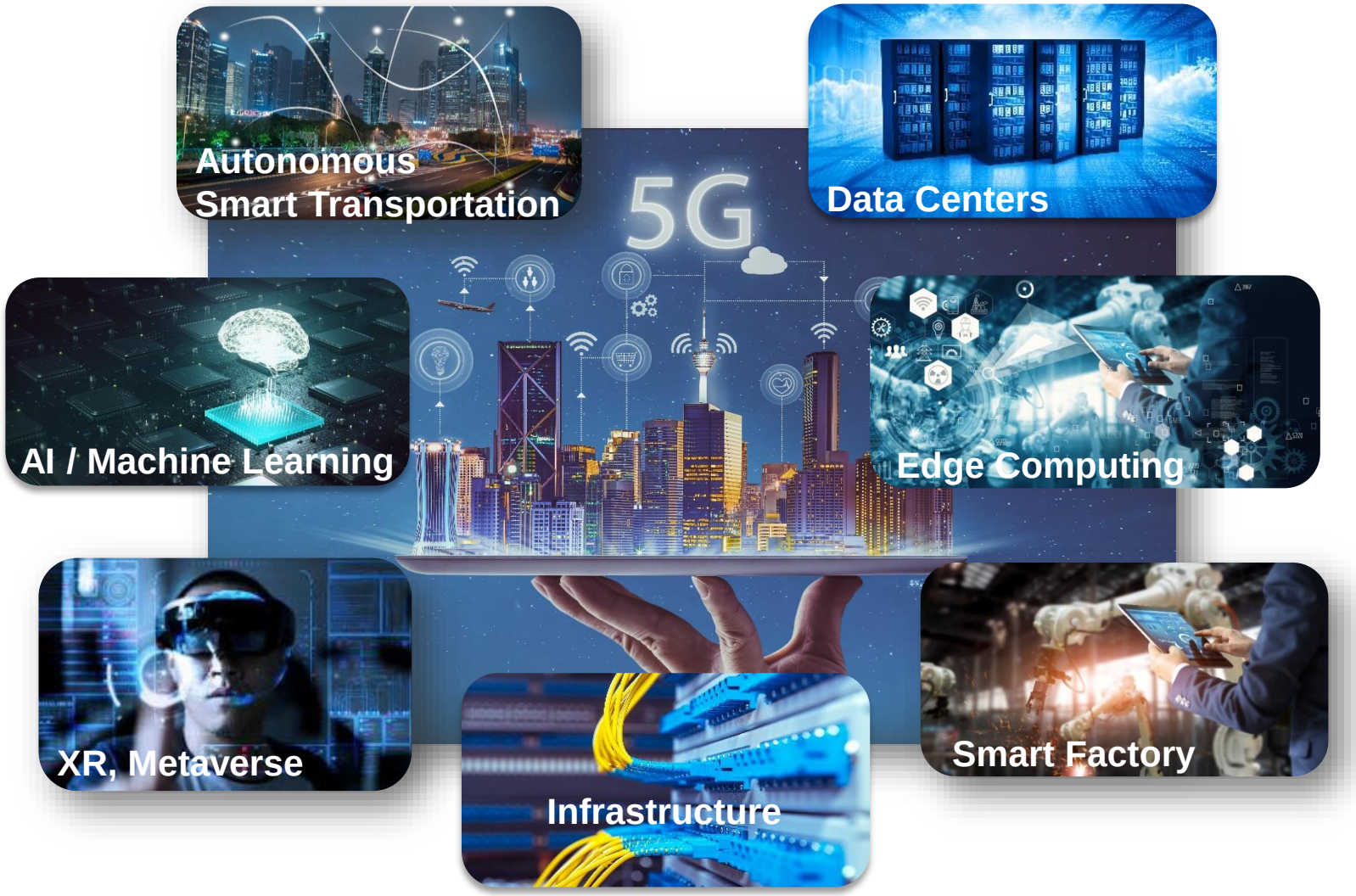
Agenda

- ✓ 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

	1st Mid-Term Management Plan (FY2018-2020) Results Total cumulative investment	2nd Mid-Term Management Plan* (FY2021-2023) Total cumulative investment
R&D investment	Approx. ¥120B	Approx. ¥170B

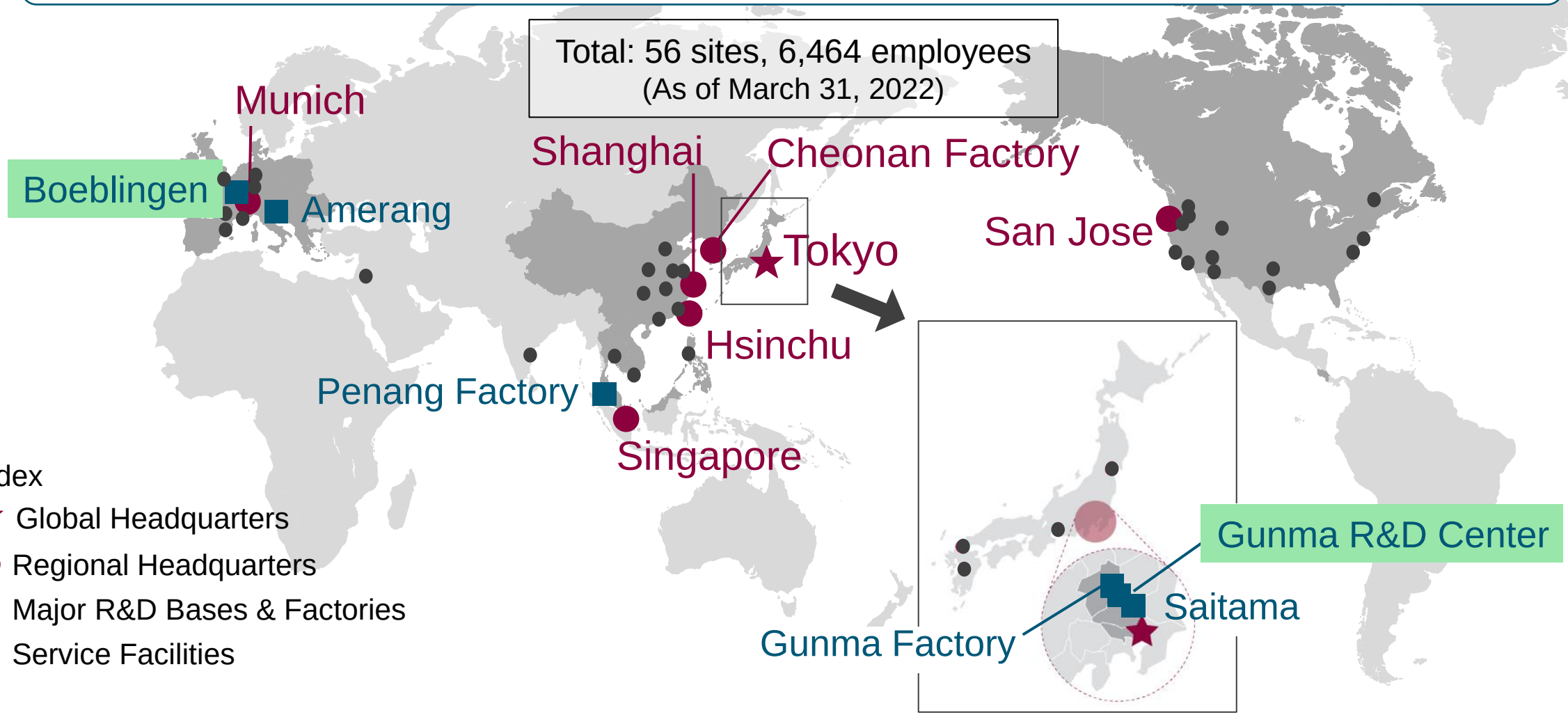
*Revised July 28th, 2022

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



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

Pin scale 5000

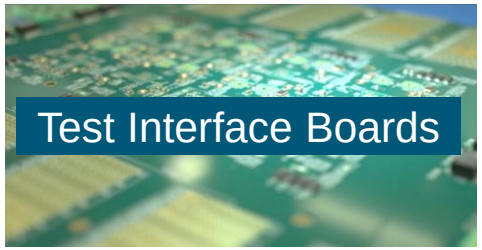
XPS256

✓ Signal integrity

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

Test Systems

+



Test Interface Boards

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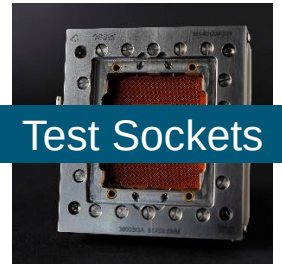
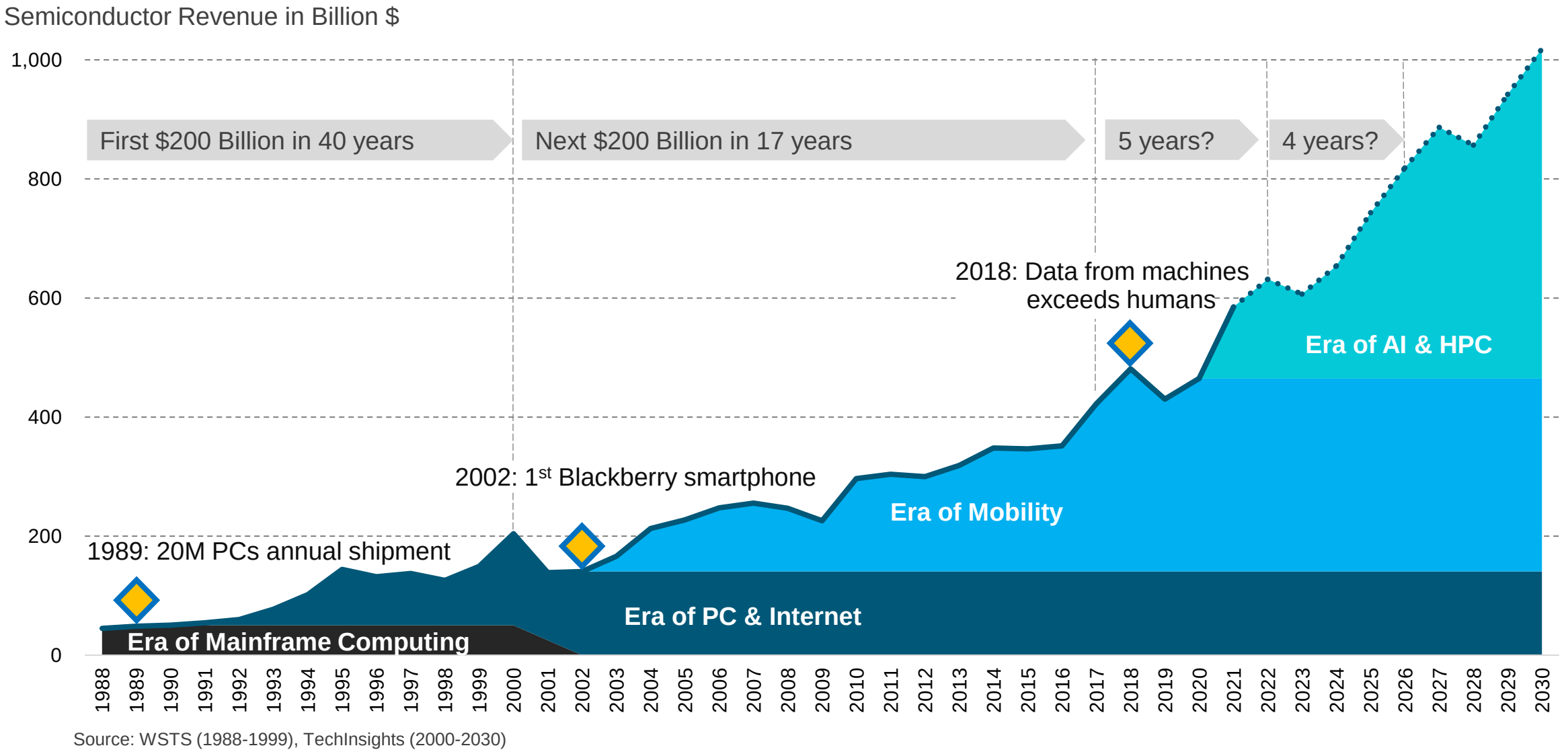


Test Sockets

We are reinforcing our core technologies and platform strategy

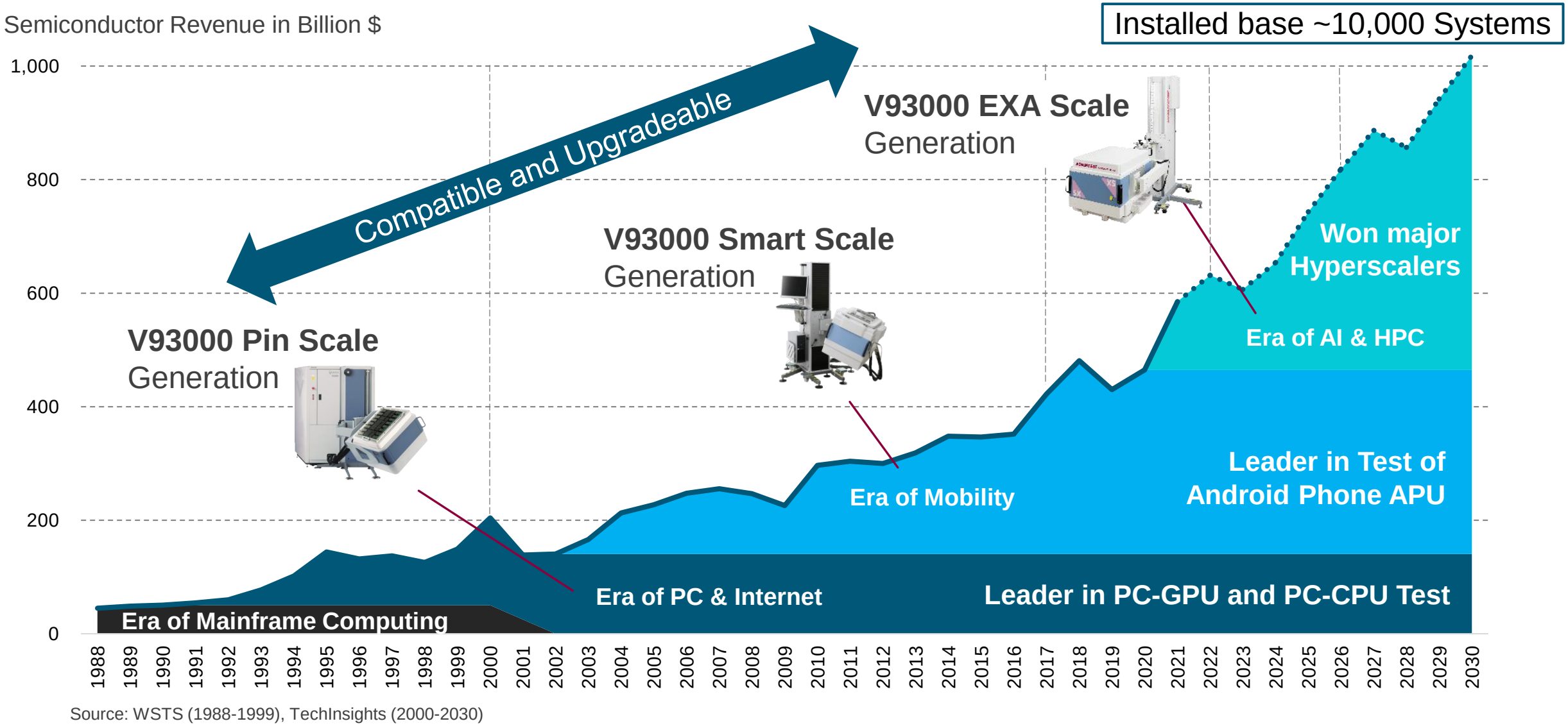
High Performance Computing (HPC) is the major driver of SoC Test

Era of High-Performance Compute - Exascale Computing



Source: WSTS (1988-1999), TechInsights (2000-2030)

Advantest V93000 led the way towards EXA Scale Computing



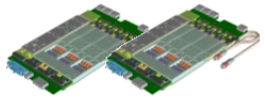
Source: WSTS (1988-1999), TechInsights (2000-2030)

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

Compatible and Upgradeable

V93000 Pin Scale
Generation

V93000 Smart Scale
Generation

V93000 EXA Scale
Generation

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

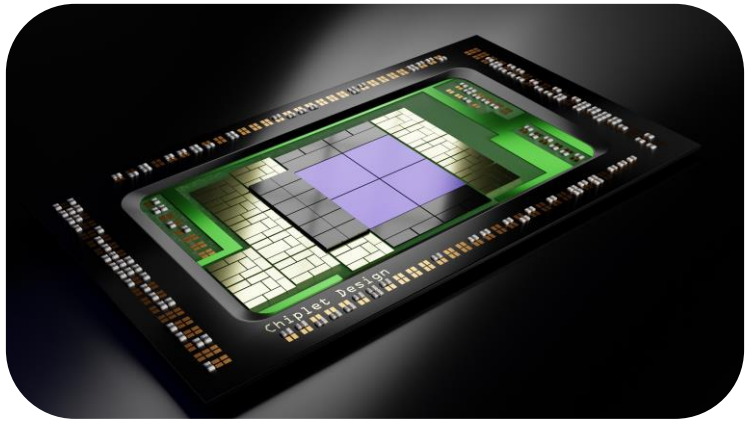
Several Established Players
New Players in China

Mobile APU/Modem

Phone Makers
System Providers

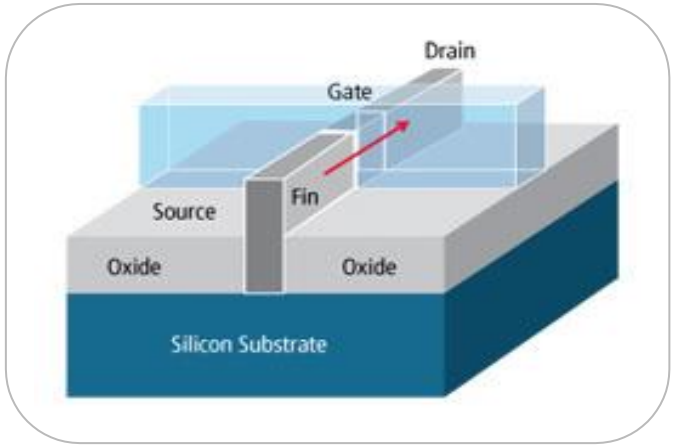
Major HPC Trends – Growing Complexity

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

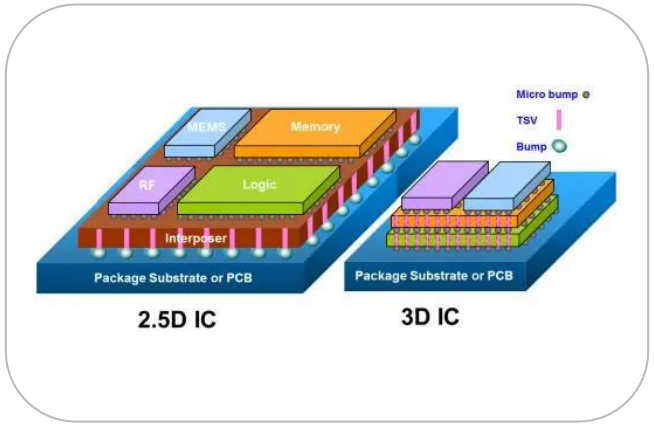


ARM Server CPUs
- New players, new architectures

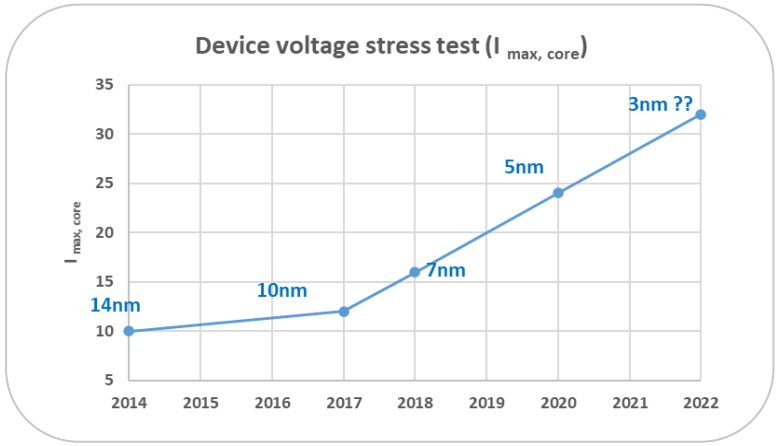
Complexity Growth
- New process nodes 5nm, 3nm, ..



3D Packaging
- Micro bump → hybrid bonding



Power & Thermal
- More power & thermal challenges



High-Speed Fabrics
- Large and fast data center networks

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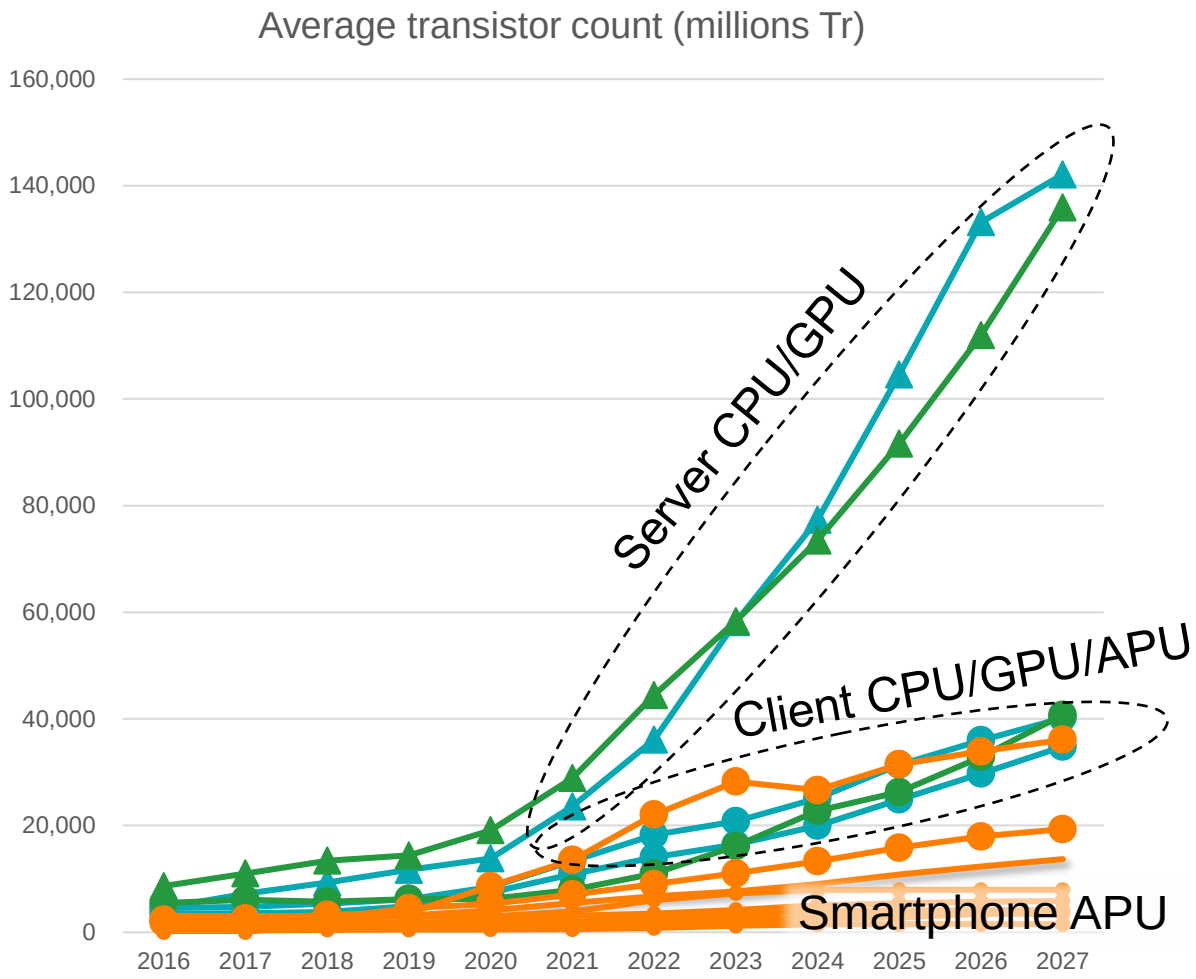
Growing Complexity drives Market Size for ATE



Source: Processor Quarterly Market Monitor, Q2 2022 - Yole Intelligence

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**

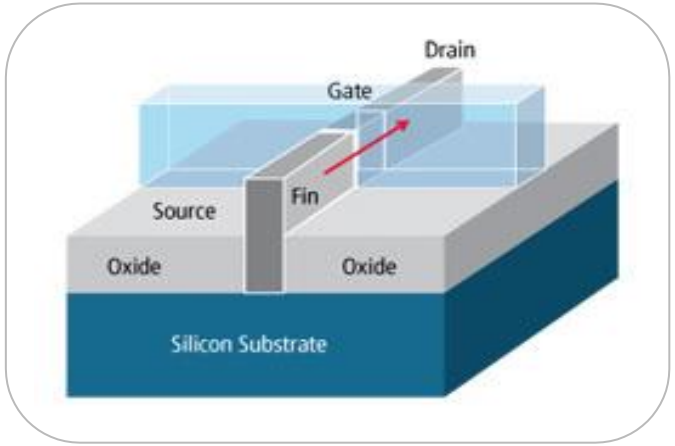
Power becomes a major Challenge for Test

Future Test Needs & Solutions

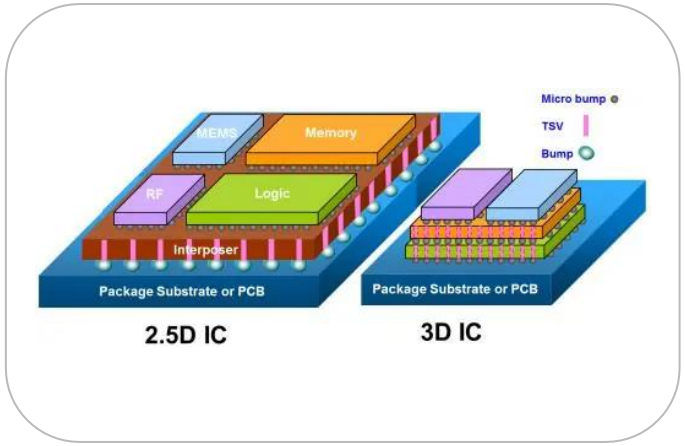
ADVANTEST®

100x Complexity – Moore's Law + 3D Integration

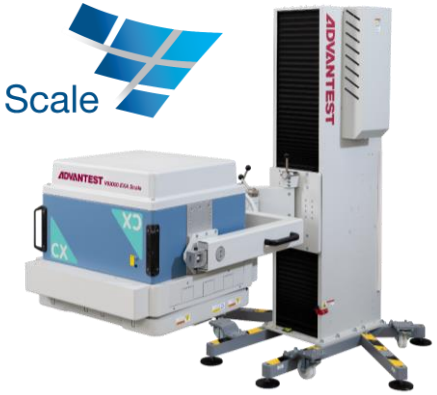
Test data will continue to explode



3D Integration with drive density by factors



V93000 EXA Scale

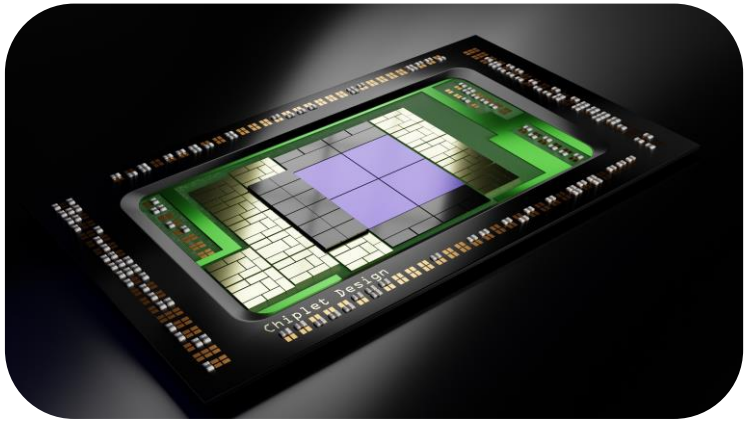


Advantest – Test Processor
2.5D Integrated, Multi-Core + Memory

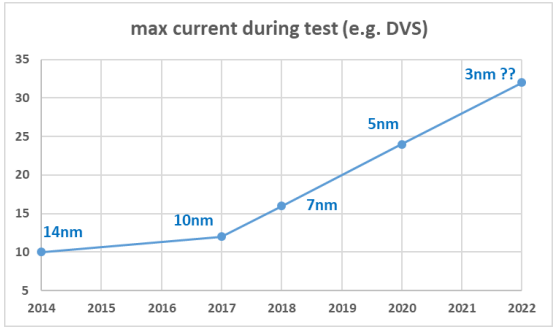
- **Industry's only 5Gbps ATE**
- **Deepest ATE Memory**
- **Enabling Future High Speed IO Scan**

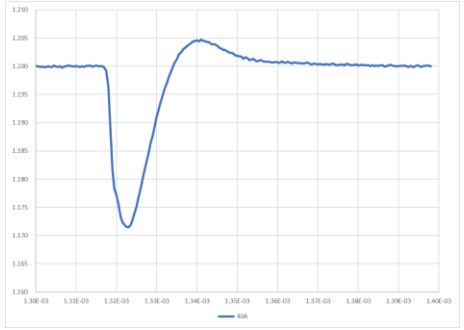
Power and Thermal beyond 1000W

Power and Cooling become major Challenge

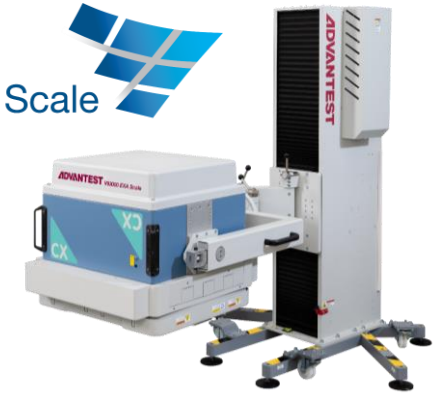


High Currents and Dynamics require new approaches for Power Supply and Cooling during test





V93000 EXA Scale

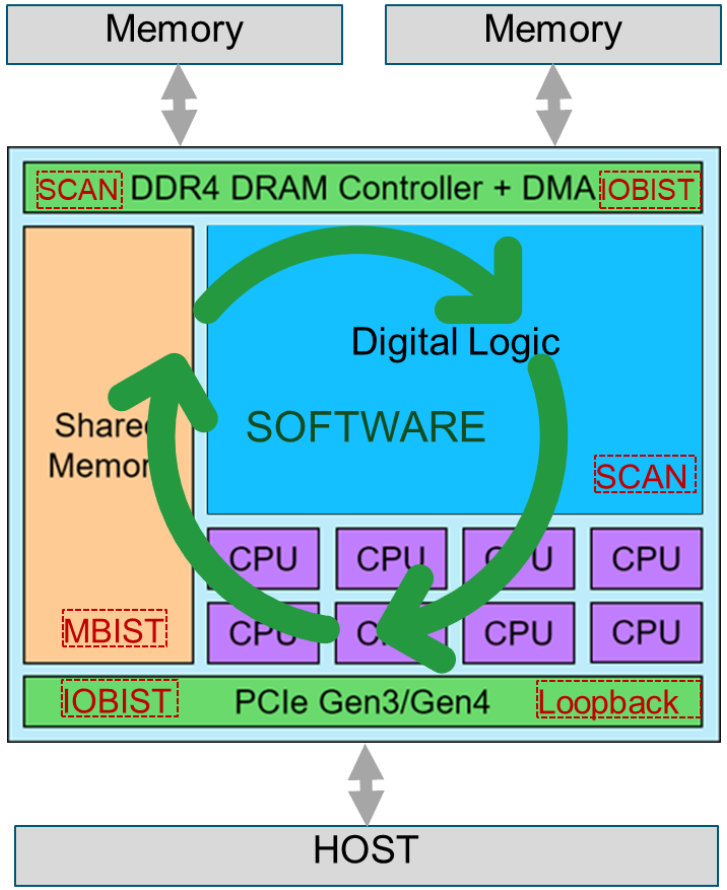


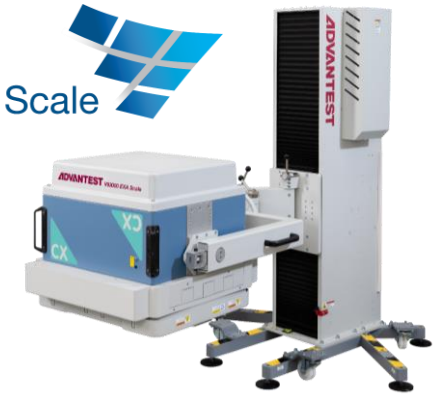
XPS256
Industry highest Power Integration

- **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



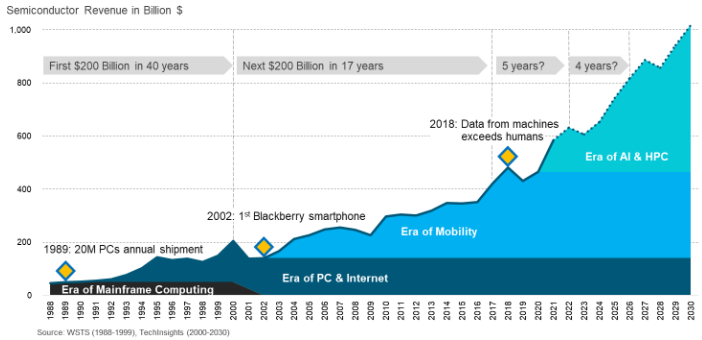


Link Scale
First integrated Computing Platform

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

Summary

Market

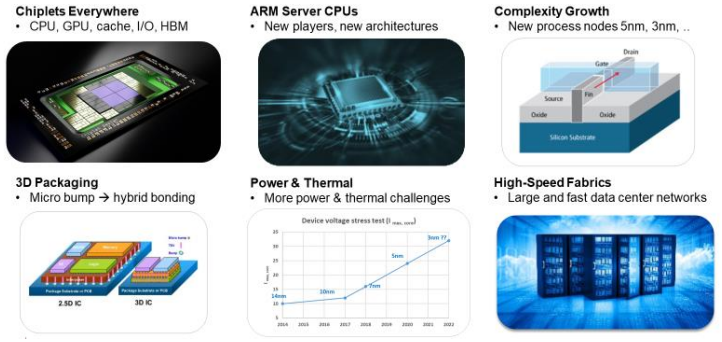


Semiconductor Market to grow to **$1Trillion by 2030**

ATE will grow in **line with Semi-conductor 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**