

Semiconductor Solutions

Megatrends drive demand for wafers, materials and equipment

More applications cause
explosion in data...

...which requires **more
powerful chips...**

...driving **wafer
volume step up**

**AI / ML¹
accelerators**

Sensors /
IoT²

Wearables & devices

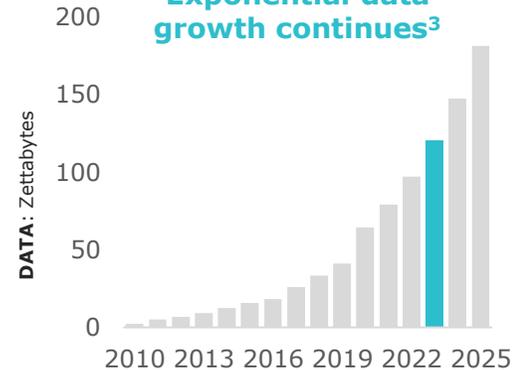
Generative AI
(e.g. ChatGPT)

Blockchain

Automotive

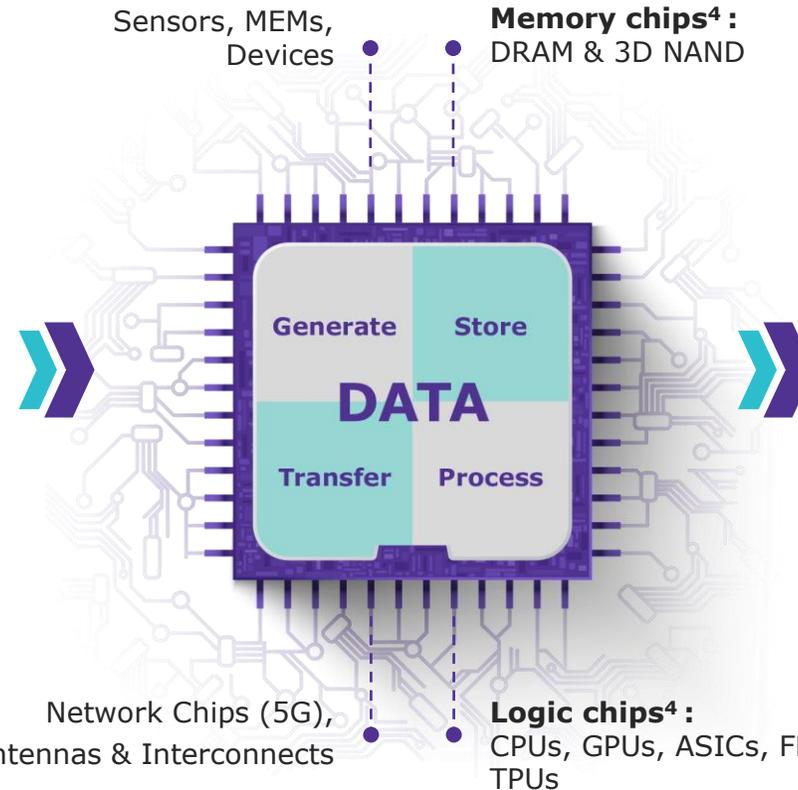
Cloud & big data

**Exponential data
growth continues³**



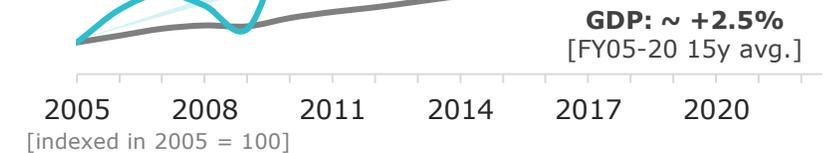
Sensors, MEMs,
Devices

Memory chips⁴ :
DRAM & 3D NAND



**Anticipated mid-term step up:
+5% to +7% CAGR⁶**

MSI⁵ : ~ +5.5%
[FY05-20 15y avg.]



**Our portfolio is mission critical
for the wafer fabrication
process on which chips are built**

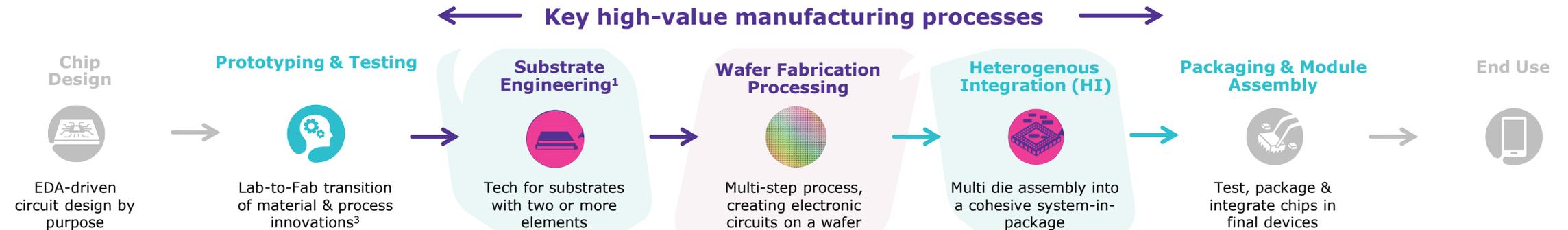
1) AI / ML = artificial intelligence / machine learning; 2) IoT = internet of things; 3) Statista; 4) DRAM = dynamic random-access memory, NAND = NOT AND, CPU = central processing unit, GPU = graphics processing unit, ASIC = application-specific integrated circuit, FPGA = field programmable gate arrays, and TPU = tensor processing unit;

5) MSI = million square inches of silicon wafers; 6) company estimates

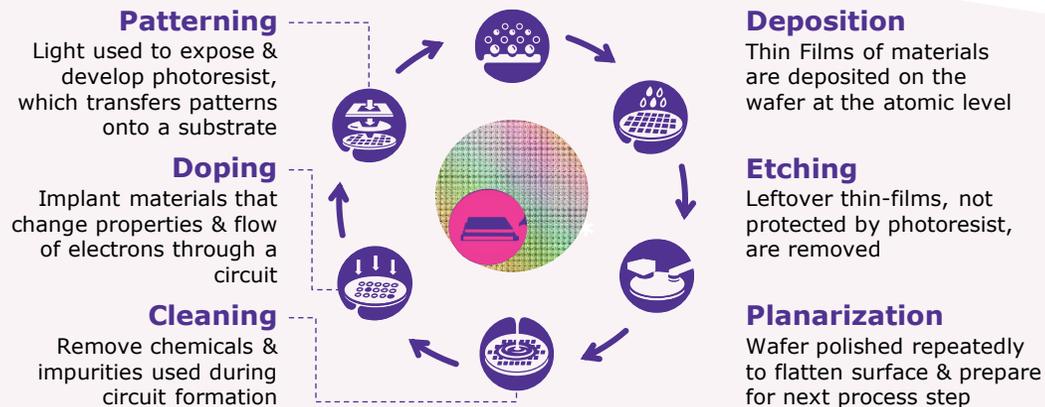


Semiconductor Solutions Group is a critical enabler of the Semiconductor Ecosystem

Materials, Delivery Equipment and Metrology & Inspection enable key process steps



Key materials and DS&S processes



Key metrology & inspection processes

Packaging chiplets has moved toward front-end processes:

TSV² formation

vertical electrical connection that passes through the silicon die or wafer to allow stacking of chiplets in 2.5 & 3D

Hybrid Bonding

Directly connect chips using copper-to-copper bonds, enhancing electrical conductivity, increasing interconnect density & reducing interconnect length



New **3D-metrology instruments** needed to drive **yield** by:

- Measure extensive 3D structures **super-fast** with **nanometer accuracy**
- Examine bow, warp and **bonding** delamination defects
- Measure defects** on transparent carriers / **compound substrates**

Note: 1) substrate engineering is finding use cases for compound semiconductors which have 1 or more elements beyond traditional single element silicon wafers such as Silicon Carbide (SiC) and Gallium Nitride (GaN) which are often transparent and difficult to measure aka wide bandgap semiconductors; 2) Through Silicon Via (TSV); 3) Intermolecular serves this market and is Company's Silicon Valley science hub for testing, validation and innovation services (both internally and customer focused)

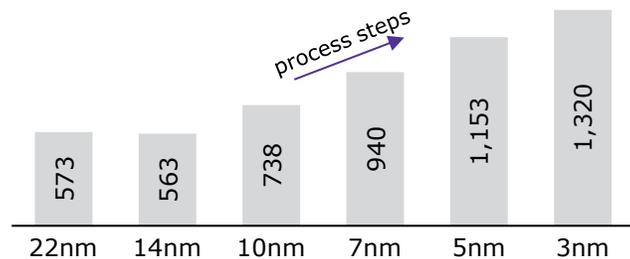


Semiconductor Solutions Company Creates More Customer Value per Wafer

1a) Miniaturization¹: more process steps^{2,3}, more materials

FinFET logic nodes

#process steps on logic FinFET node sizes

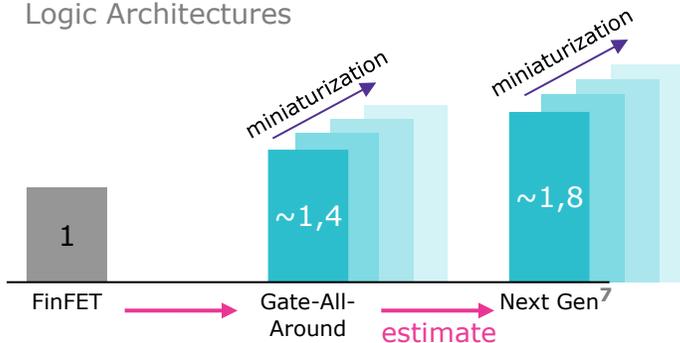


1b) Process Engineering, new advanced & high-value materials

- Novel high-value material adoption such as **Molybdenum, Lanthanum, Cobalt** and **Ruthenium**
- Adv. scaling requires ~2/3 of the available non-radioactive elements

2) Vertical stacking creates complexity⁵ and more value⁶

Logic Architectures

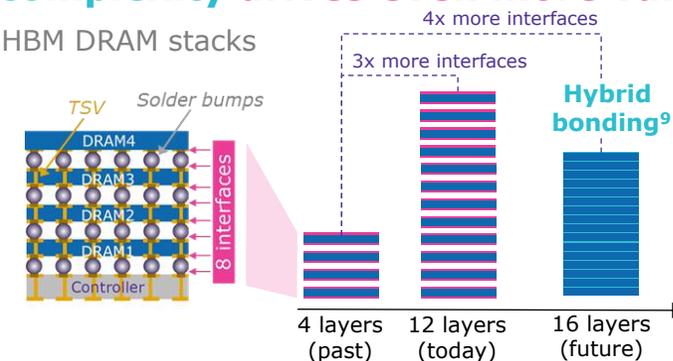


ALD benefits disproportionately from GAA⁷ transition; 3D NAND benefits from vertical stacking as **each layer needs more materials** (across 100s of layers)



3) HI⁸ interconnect density and complexity drives even more value

HBM DRAM stacks



Each & every interconnect and component must be measured in HBM and HI, quickly and in HVM, driving the need for metrology and inspection tools

Electronic's Materials Intelligence™ and Metrology Tools advance customer tech roadmaps...



...contributing to **outperformance of MSI⁴ by +200 to +400 basis points**

1) Evolution within transistor technology generation; 2) Process steps including: lithography, deposition, etching, doping, cleaning, patterning & planarization; 3) Bardon et al., DTCO including sustainability, IEEE/IEDM, 2020; 4) MSI = million square inches silicon wafers; 5) Source: TechInsights (IC Knowledge & Group est.); 6) index to last FinFET node with process steps as proxy for value 7) ALD = atomic layer deposition, Next Gen Architecture features: CFET, back-side power, embedded DRAM 8) Heterogenous Integration of multiple chiplets into higher-level assembly, or system-in-package, enabling functionality & improved operating characteristics 9) Future sophistication via Hybrid Bonding (2x interconnect density) & other stacked chiplets drive further customer value from HI



Pureplay Electronics business drives **5% to 9%⁶ growth CAGR**

Sales split

Mid-term outlook¹

Business Split²

Fundamental growth drivers

Semiconductor Solutions

**7% to 11%
growth¹**

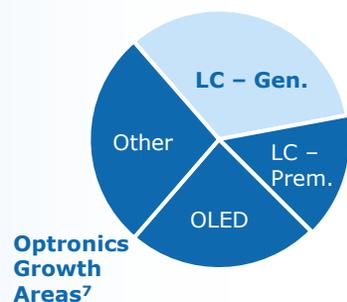
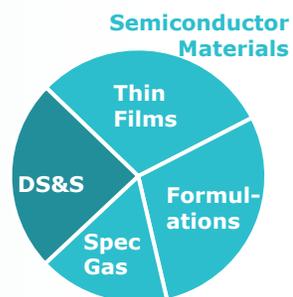
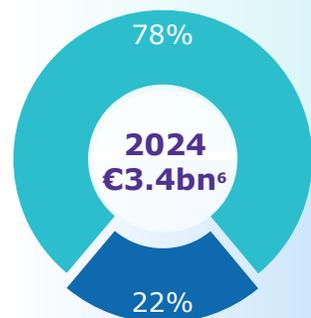


Semiconductor
Materials ~60-65%²

DS&S ~15-20%²

Optronics ~20%²

**Around stable
sales¹**



- Continued market growth due to technological advances that generate, transfer, store and process more data (AI / ML, 5G, Big Data and cloud, IoT) serving customers in **Logic, Memory, Analog and Packaging**
- Semiconductors driven by **3D densification**: miniaturization, process engineering, vertical stacking and heterogenous integration
- 5 to 7%** market growth³
- Outperform market by +2 to 4%** (total +7 to 11%): more material & value per wafer, broad portfolio and strategic partnership with customers
- Driven by trends towards **more devices, complex & demanding form factors** and **miniaturization** (inc. mobile, AR & VR)
- 2 to 3% growth of LCD area⁴, amid continual price pressure; general applications market decreasing, with growth opportunities in premium
- 8 to 10% growth of total OLED area⁴ with slight to moderate market share gains
- Further upside⁵ from AR/VR, Silicon Photonics and Metrology & Inspection

Optronics

1) Organic sales CAGRs; 2) indicative mid-term view; 3) Group estimate based on industry forecasts related to million square inches of silicon wafers; 4) Omdia Display Market Outlook, Q1 2025; 5) Upside not included in mid-term ambition; 6) mid-term ambition excl. Surface Solutions which was divested on 31 July 2025, 2024 sales excl. Surface; 7) Optronics growth areas incl. LC premium applications, OLED and new technologies. as the general LC business declines with continuous price pressure and competition.

