

# 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 / ML<sup>1</sup>  
accelerators**

**Generative AI**  
(e.g. ChatGPT)

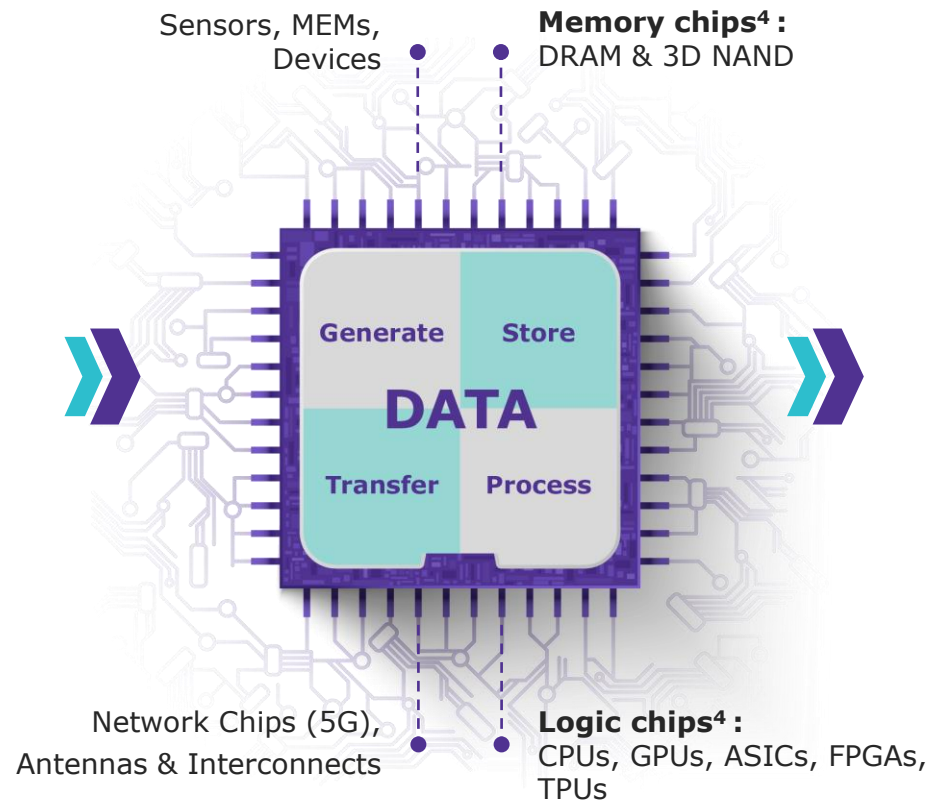
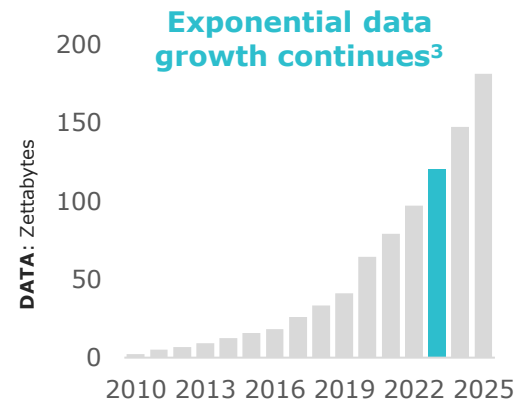
Sensors /  
IoT<sup>2</sup>

Blockchain

Automotive

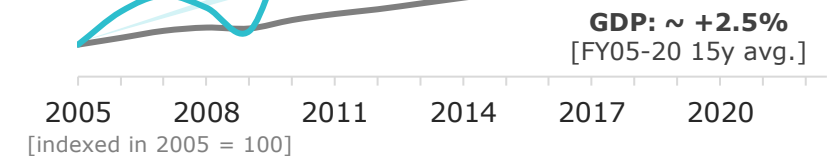
Wearables & devices

Cloud & big data



**Anticipated mid-term step up:  
+5% to +7% CAGR<sup>6</sup>**

**MSI<sup>5</sup> : ~ +5.5%**  
[FY05-20 15y avg.]



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

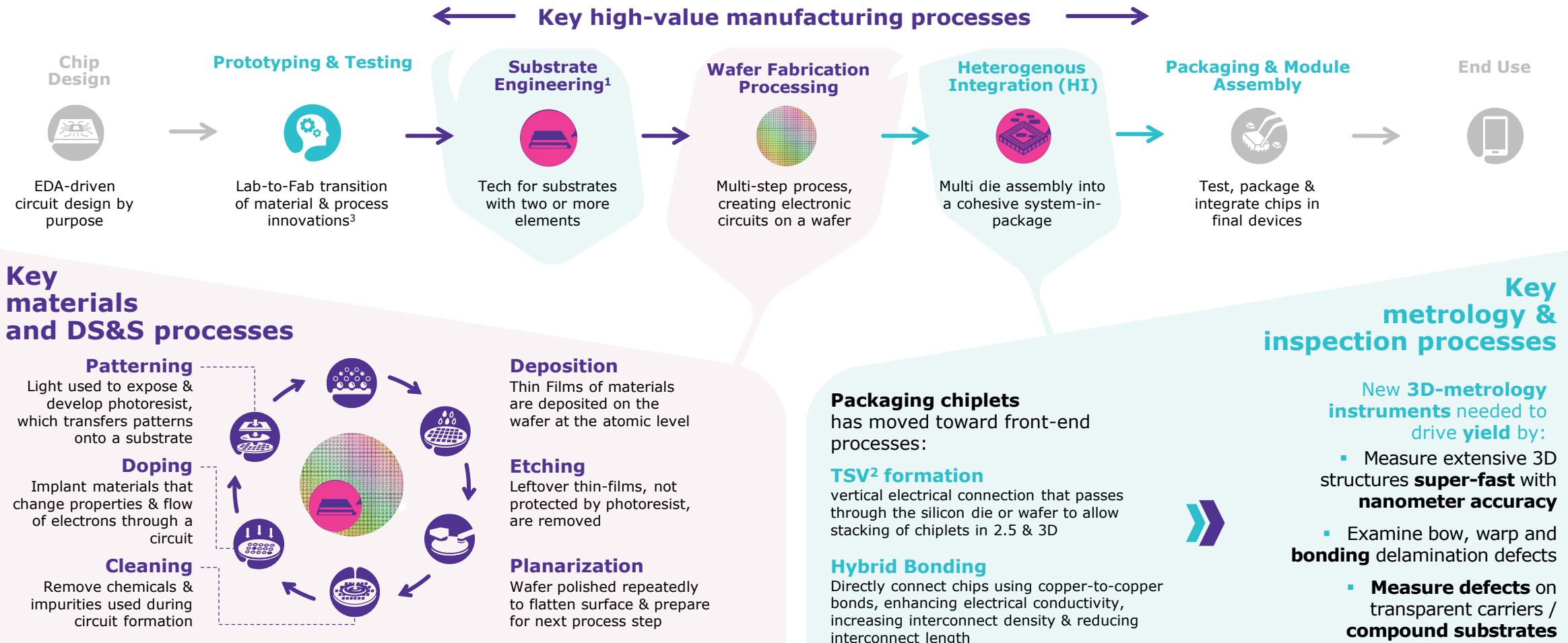
1) AI / ML = artificial intelligence / machine learning; 2) IoT = internet of things; 3) Statista; 4) DRAM = dynamic random-access memory, NAND = NOT AND, CPU = central processing unit, GPU = graphics processing unit, ASIC = application-specific integrated circuit, FPGA = field programmable gate arrays,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



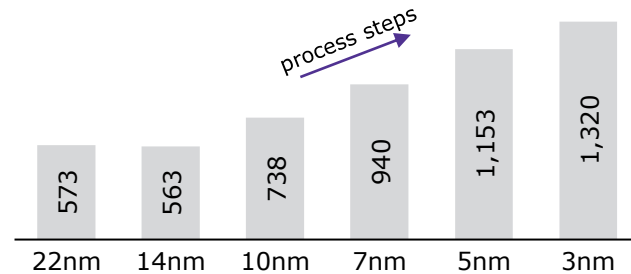
Note: 1) substrate engineering is finding use cases for compound semiconductors which have 1 or more elements beyond traditional single element silicon wafers such as Silicon Carbide (SiC) and Gallium Nitride (GaN) which are often transparent and difficult to measure aka wide bandgap semiconductors; 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 Group creates more customer value per wafer

## 1) Miniaturization<sup>1</sup>: more process steps<sup>2,3</sup>, more materials

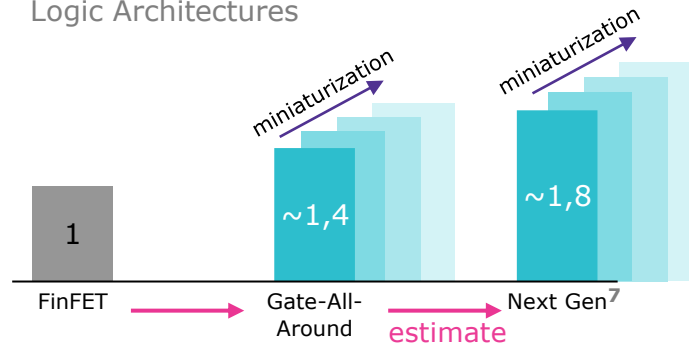
FinFET logic nodes



Number of process steps on logic node sizes (nm = node) within the FinFET architecture

## 2) Vertical stacking creates complexity<sup>5</sup> and more value<sup>6</sup>

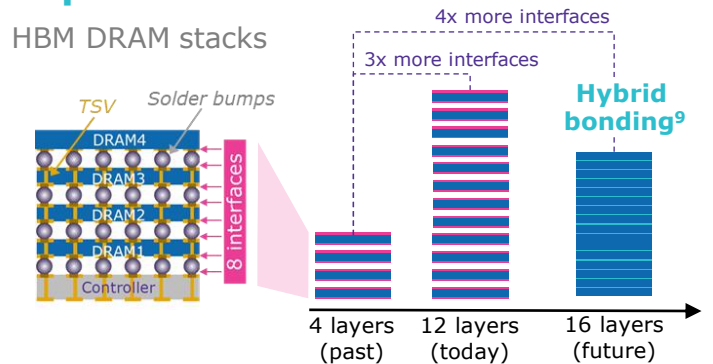
Logic Architectures



ALD benefits disproportionately from transition to GAA<sup>7</sup>; 3D Nand also benefits from vertical stacking as each layer needs more materials (across 100s of layers)

## 3) HI<sup>8</sup> interconnect density and sophistication drives more value

HBM DRAM stacks



Each & every interconnect and component must be measured in HBM and HI, quickly and in high volume manufacturing, driving the need for metrology and inspection tools alongside front-end materials



## Customers need Electronic's Materials Intelligence™ and Metrology Tools to advance their technology roadmaps...

...and we also leverage these competences into automotive, industrial IoT and related markets, solving customers innovation challenges such as **power efficiency** with offerings for **compound semiconductors** and **other analog applications**



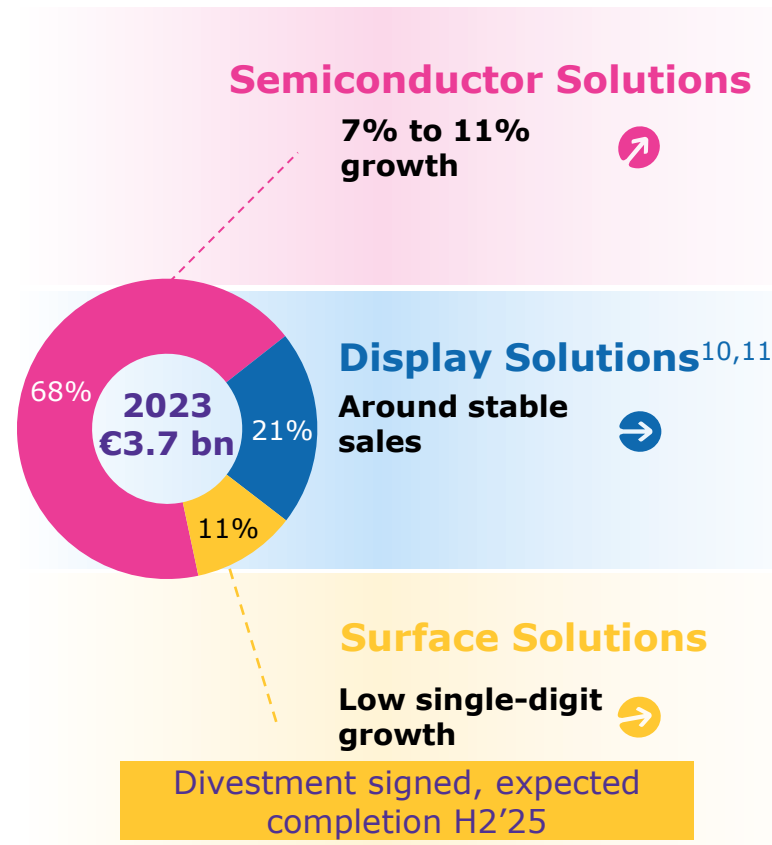
...contributing to **outperformance of MSI<sup>4</sup> by +200 to +300 basis points**

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 & Company 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



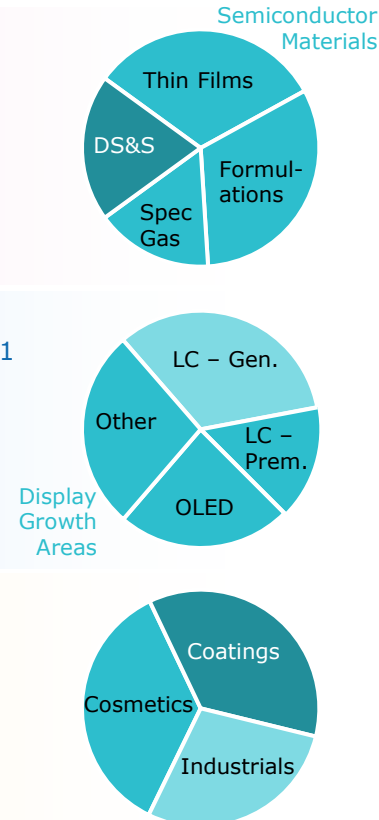
# Leveraging portfolio transition to enable **5% to 9%<sup>9</sup> growth CAGR**

## Sales split<sup>1</sup>



## Mid-term outlook<sup>2</sup>

## Business Split<sup>3</sup>



## Fundamental growth drivers

- 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, Packaging and others**
- 5 to 7%** market growth<sup>4</sup>
- Outperform market by **+200 to +400bps**: more material content per wafer, comprehensive portfolio and strategic partner to customers
- Driven by trends towards **more devices, complex & demanding form factors** and **miniaturization** (inc. mobile, AR & VR)
- 2 to 5% growth of LCD area<sup>5</sup>, amid continual price pressure; general applications market decreasing, with growth opportunities in premium
- 10 to 15% growth of total OLED area<sup>5</sup> with slight to moderate market share gains
- Further upside<sup>6</sup> from AR/VR, Silicon Photonics & Metrology
- Balanced exposure to **coatings, cosmetics** and **industrials** markets
- Drivers: rising living standards, higher disposable income in growing markets & higher demand for high value products at reasonable prices
- Light vehicle recovery delayed with shortages; expected to reach 2019 levels around 2024 as shortages ease<sup>7</sup>; electric transition issues remain
- Relevant cosmetics end markets already well above 2019 levels; market expects continued structural growth<sup>8</sup>

1) Based on FY 2022, CAGR is organic mid-term ambition; 2) growth rates are organic CAGRs; 3) indicative only; 4) Source: Company estimate based on industry forecasts related to million square inches of silicon wafers; 5) Source: Omdia Display Market Outlook, Q1 2023; 6) Upside not included in mid-term ambition; 7) Sources: LMC Automotive Light Vehicles Forecast, June 2023; 8) Sources: Euromonitor BPC (Beauty & Personal Care) May 2023; 9) mid-term ambition excludes Surface Solutions; 10) intention to rebrand Display announced on 31.10.2024 with the completion of the acquisition of UnitySC; 11) Growth areas in Display include LC premium applications, OLED and new tech. as the general LC business declines in light of continuous price pressure and competition.

