

Innovation vs. Standardization

Enabling smart medical products within an integrated value chain

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X-FAB at a glance



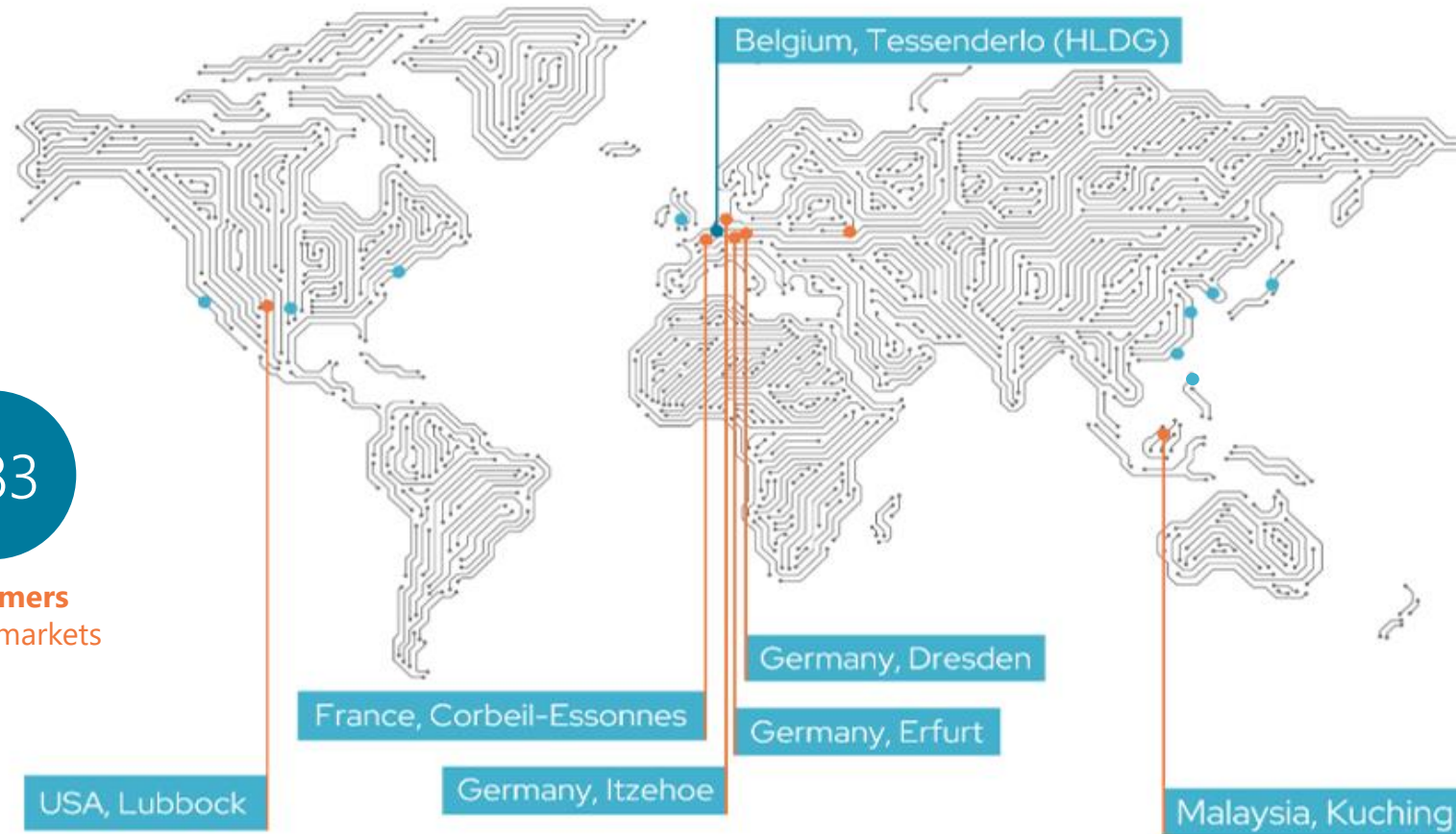
All sites are
automotive qualified

383

Customers
in 4 key markets

6

Manufacturing
facilities



100,000

Wafer starts
per month*

approx.
4,000

Employees

478

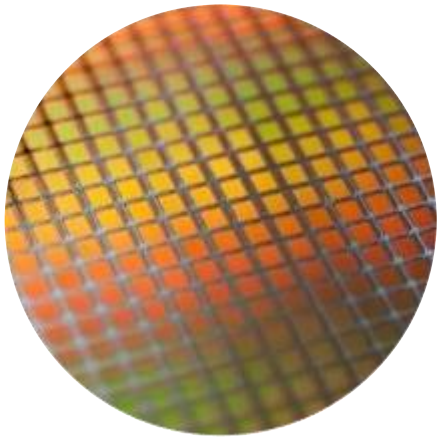
million \$

Revenue
2020

● Fabs/subsidiaries

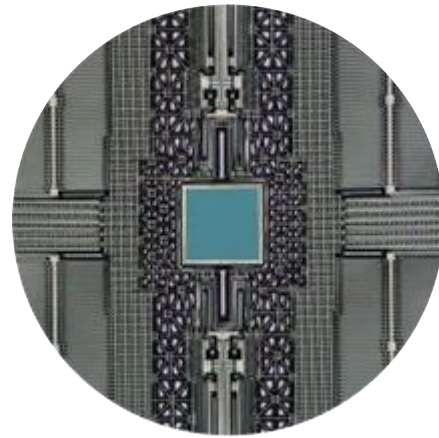
● Sales offices

*200mm & 150mm



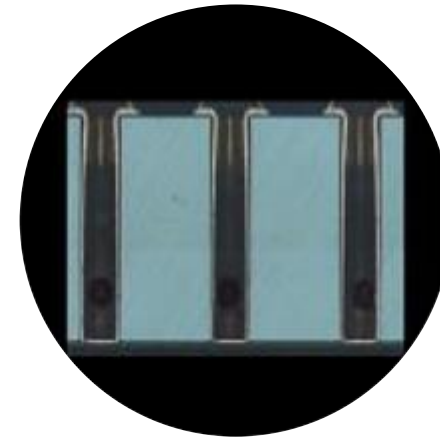
CMOS & SOI

13 process families with over 450 options



MEMS

MEMS with or without integrated CMOS



Heterogeneous integration

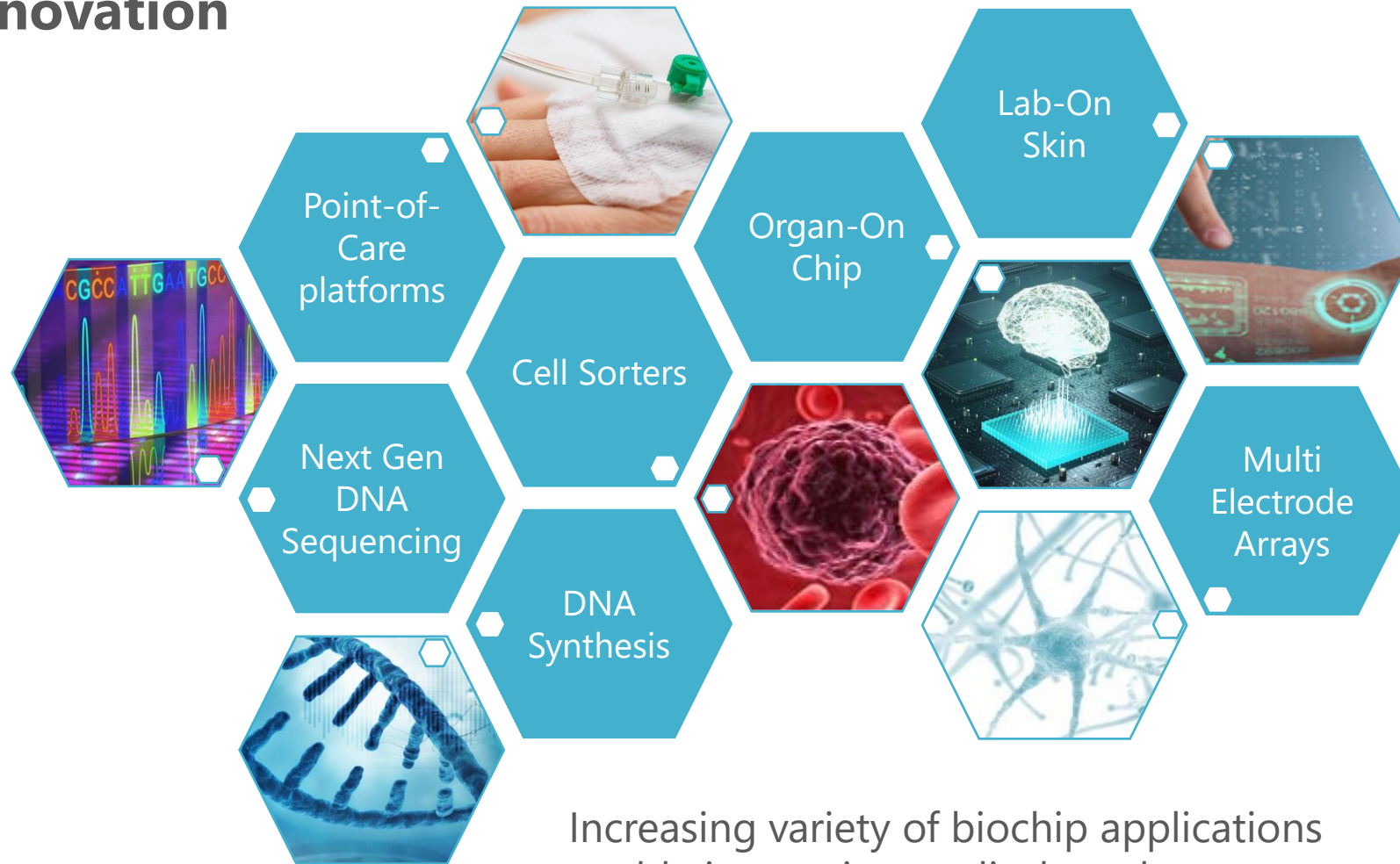
3D integration and wafer level package solutions



SiC & GaN

First 6-inch SiC foundry offering worldwide

Innovation



Increasing variety of biochip applications enable innovative medical products

Market Growth



Global biochip market will grow at a **CAGR** of **22.2%** to **USD 42.92 billion** in 2026*

*www.marketdataforecast.com/market-reports/biochips-market

Application Benefits of Biochips

Micro-manufactured biochips...



Are effective on compact and portable platforms



Allow the usage of a small sample size



Provide a fast and highly selective analysis



Are cost efficient



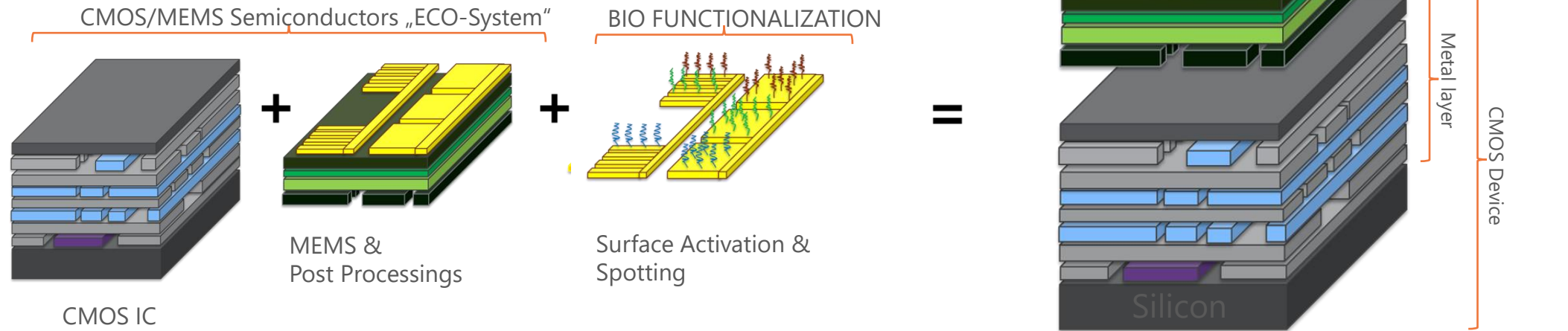
What are Biochips?

Biochip ['bɪəʃɪp]

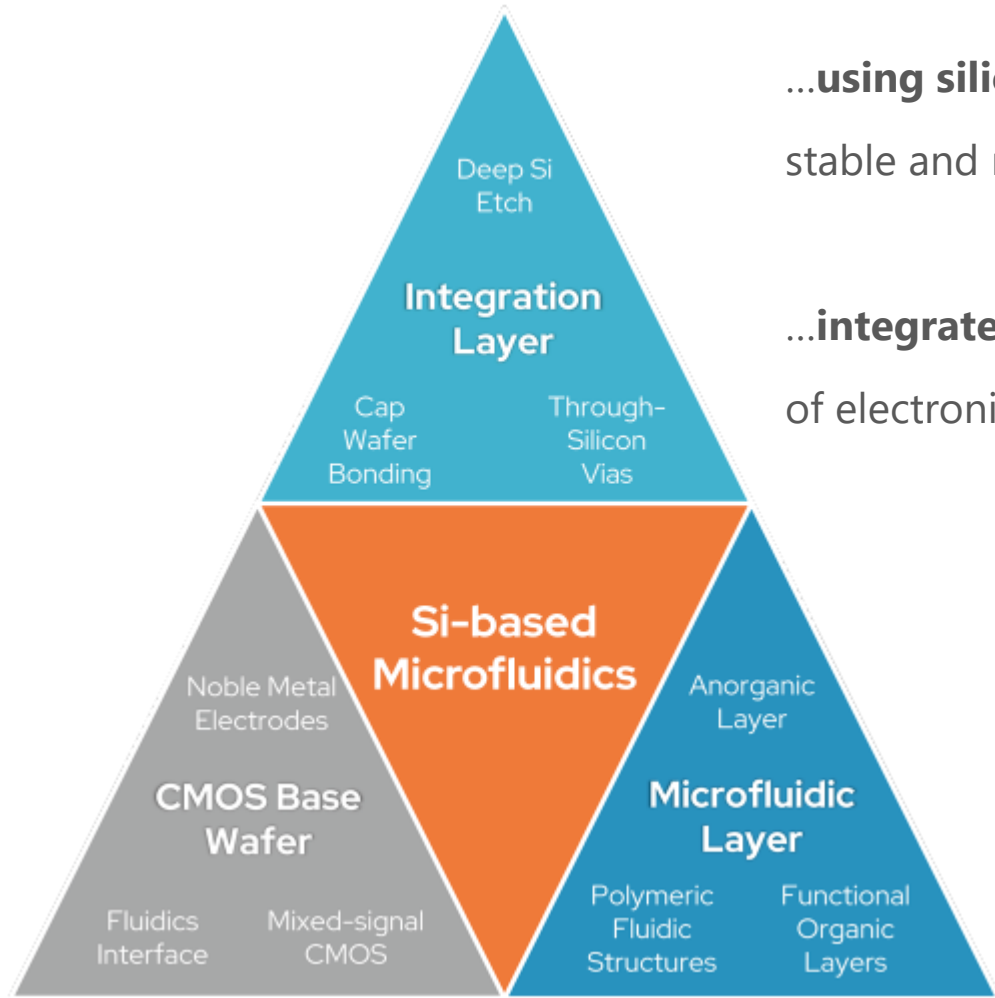
A **microchip** designed or intended to function in **biological environment**

- Sample preparation - Microfluidics
- Clinical diagnostics - Sensor
- Application-specific integrated circuits - ASICs

Manufacturing Biochip schematic:

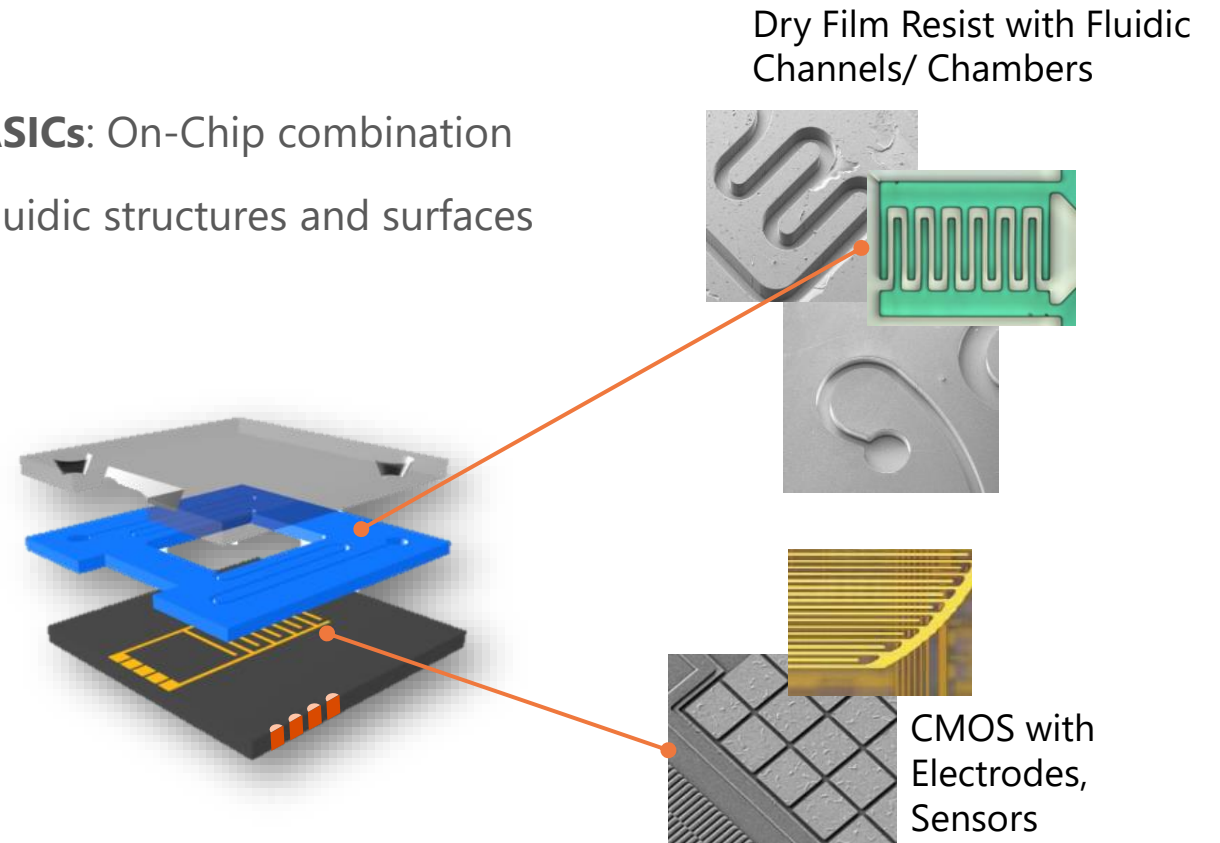


X-FAB 's Toolbox for Biochips

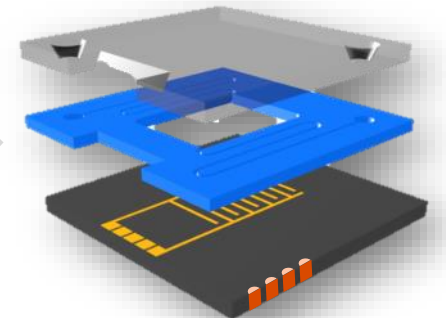
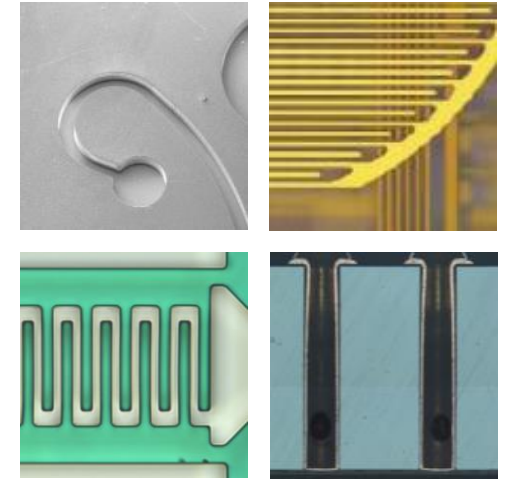
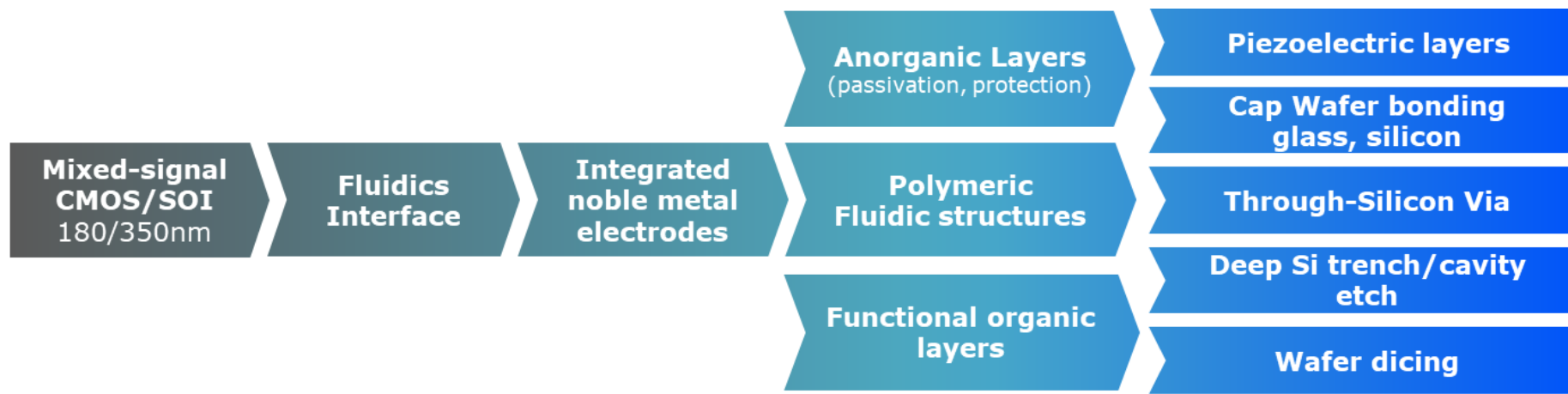


...using silicon technology: high integration density, stable and reproducible manufacturing process

...integrated on silicon ASICs: On-Chip combination of electronics with microfluidic structures and surfaces



System Integration vs. Process Complexity

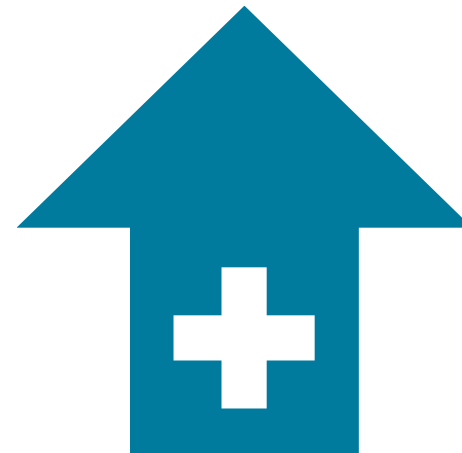




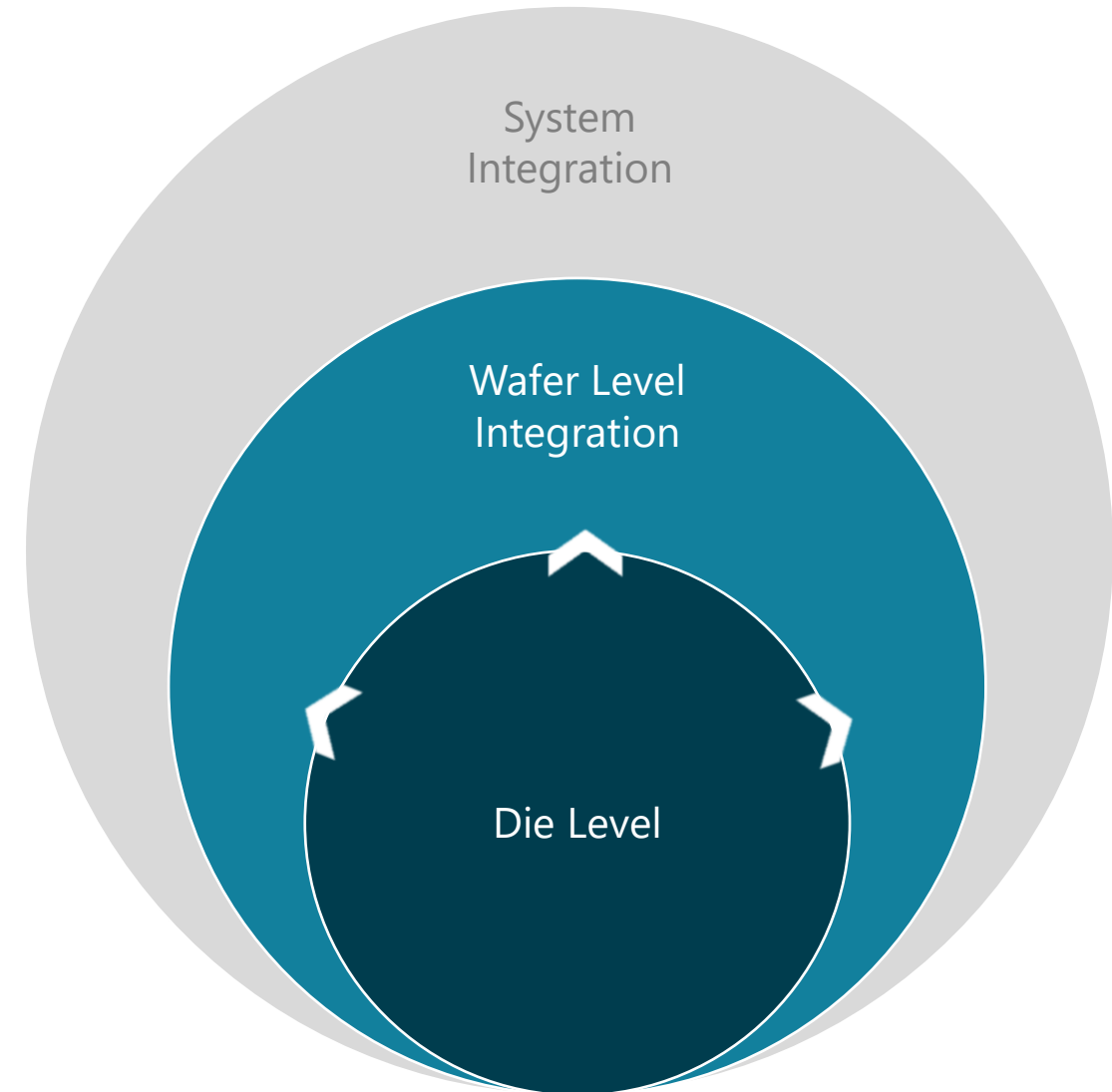
- High process complexity in volume production
 - Cross contamination control
 - Distributed manufacturing
 - Tool utilization management
- Standardisation is challenging – customer specific technologies
- R&D resource intense



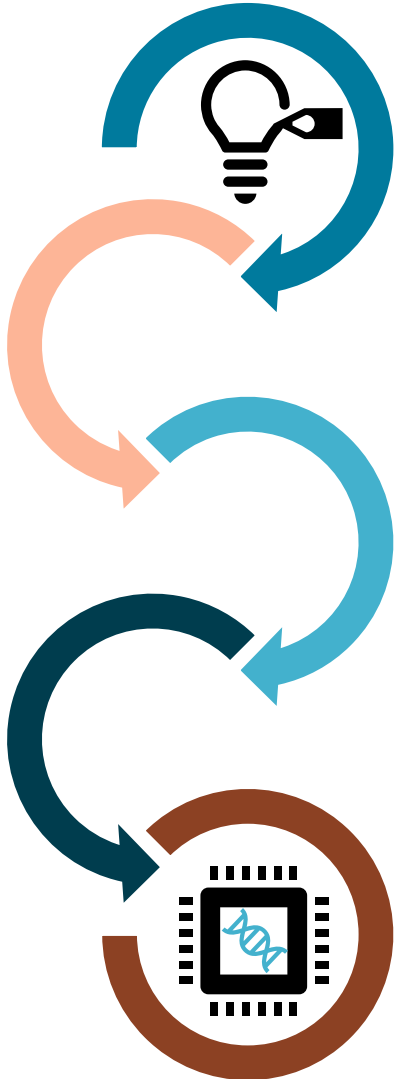
- Separation of fluidic and/or optical path from electrical connection
- Smart devices
 - Integration of high performance electrical and optical sensors together with sensor interface on chip
 - Digital interface to deal with massive amount of data
 - Form factor reduction & flexibility in mounting



- › Provides **streamlined development** and **operations** cycles
- › Allows **direct ownership** of various stages of **process steps**
- › **Reduces** external **contractors or suppliers**

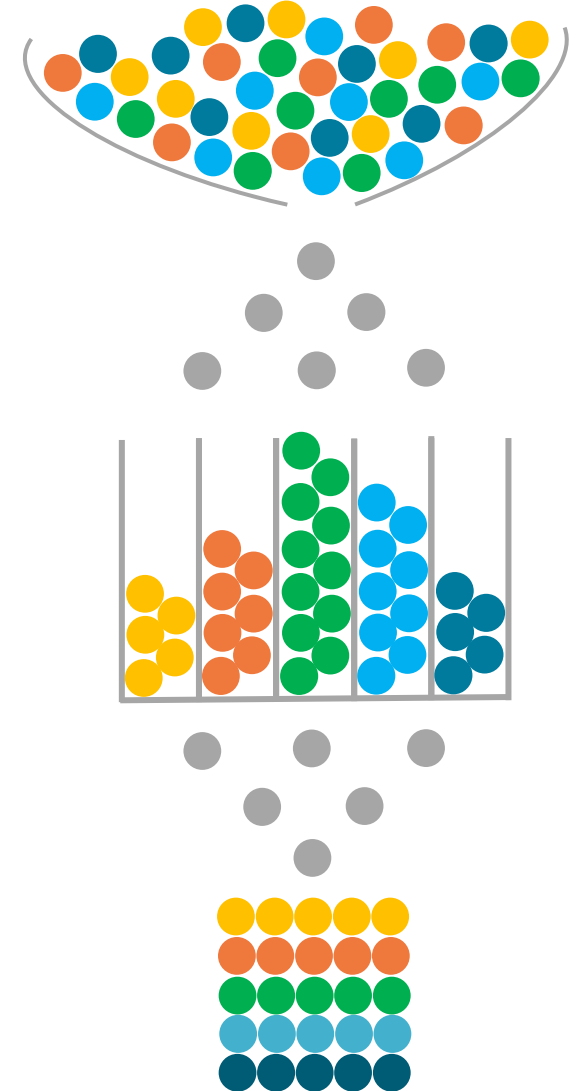


Innovation



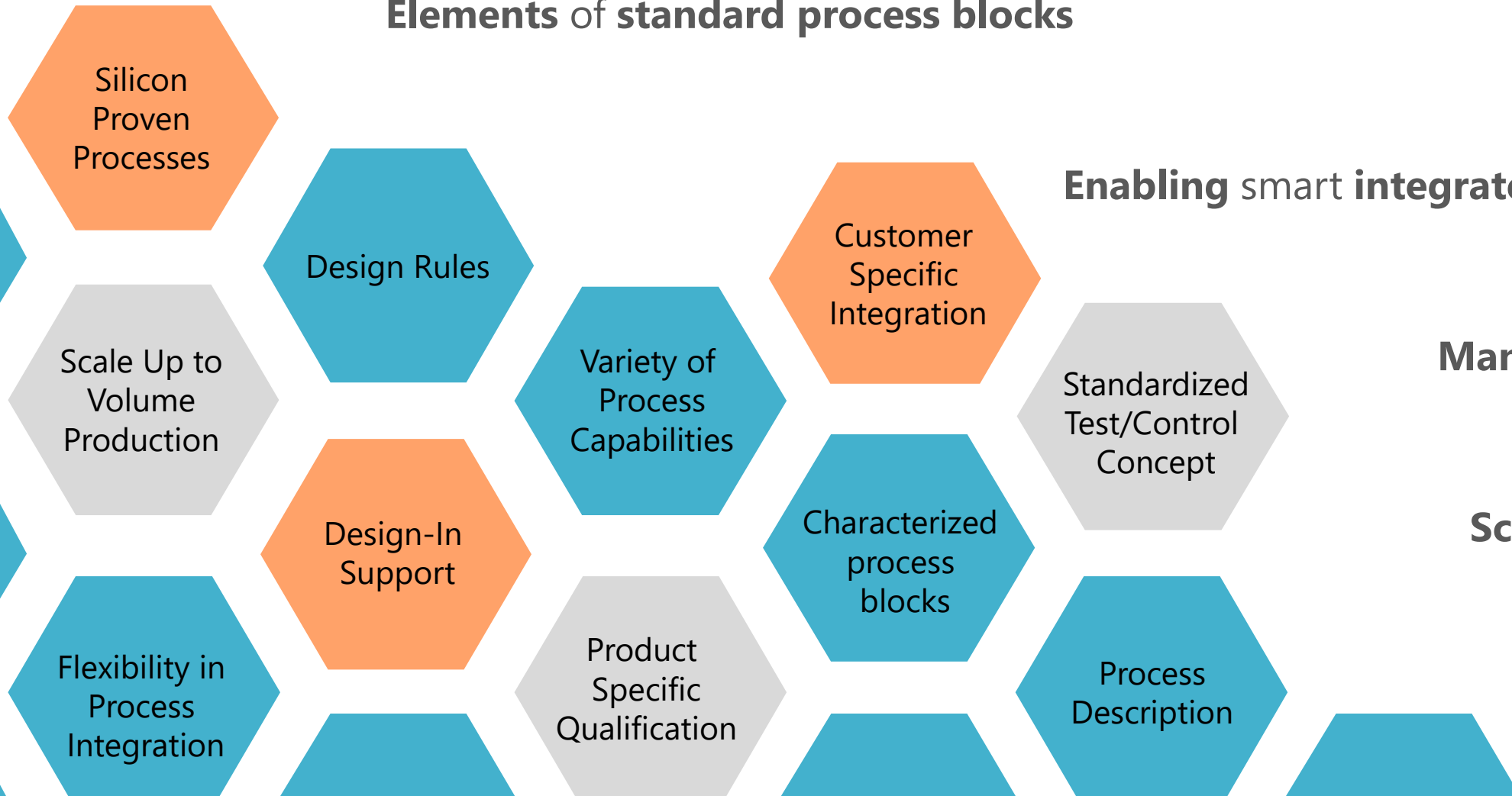
Standardization fosters Innovation

- > **Compatibility** – Increasing variety of **system products**
 - > Baseline **quality/safety** process **standards**
 - > **Low threshold** engagements are possible
 - > Variety reduction – **economics of scale**
 - > **Standardized** information – **PDK's**
 - > **Optimized development** cycles
 - > **Efficiency** in supply chains



Standardization

Elements of standard process blocks



Enabling smart **integrated** medical **products**.

Manage the **complexity**.

Scale up your business.

Key Messages

- › The pace of development and industrialization of smart medical products has been growing – and will further accelerate
- › X-FAB is developing a comprehensive tool box for smart integrated biochips to tackle the future opportunities of digital healthcare
- › Choosing the optimal integration approach is key
 - Trade-off between time to market, risk, performance and cost



“Let’s pave the way for further innovation by vertical integrated value chains and standardized key elements.”

>> Check out X-FAB’s unique Prototyping Platform for Si-based Microfluidics



xfab

Thank you.

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