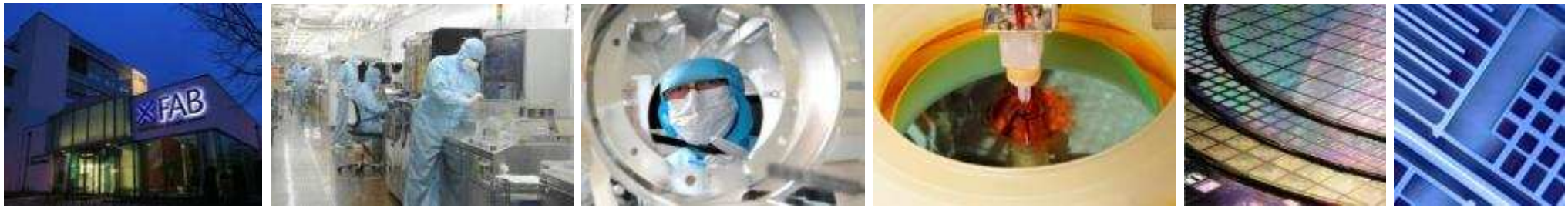
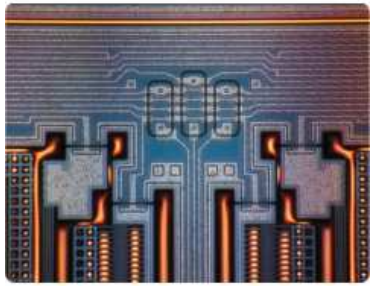
# X-FAB: THE SPECIALTY FOUNDRY

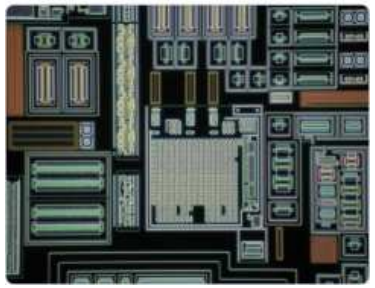
Rudi De Winter
CEO




29 September 2018 – VFB Dag van de Tips

1. **An introduction to X-FAB**
2. X-FAB – More than making chips
3. Financials
4. Key investment highlights





# X-FAB – Who we are today

## The Specialty Foundry

- 25 years of experience in pure-play foundry services for analog/ mixed-signal semiconductor applications
- Specialty foundry with a comprehensive set of technologies serving various market segments

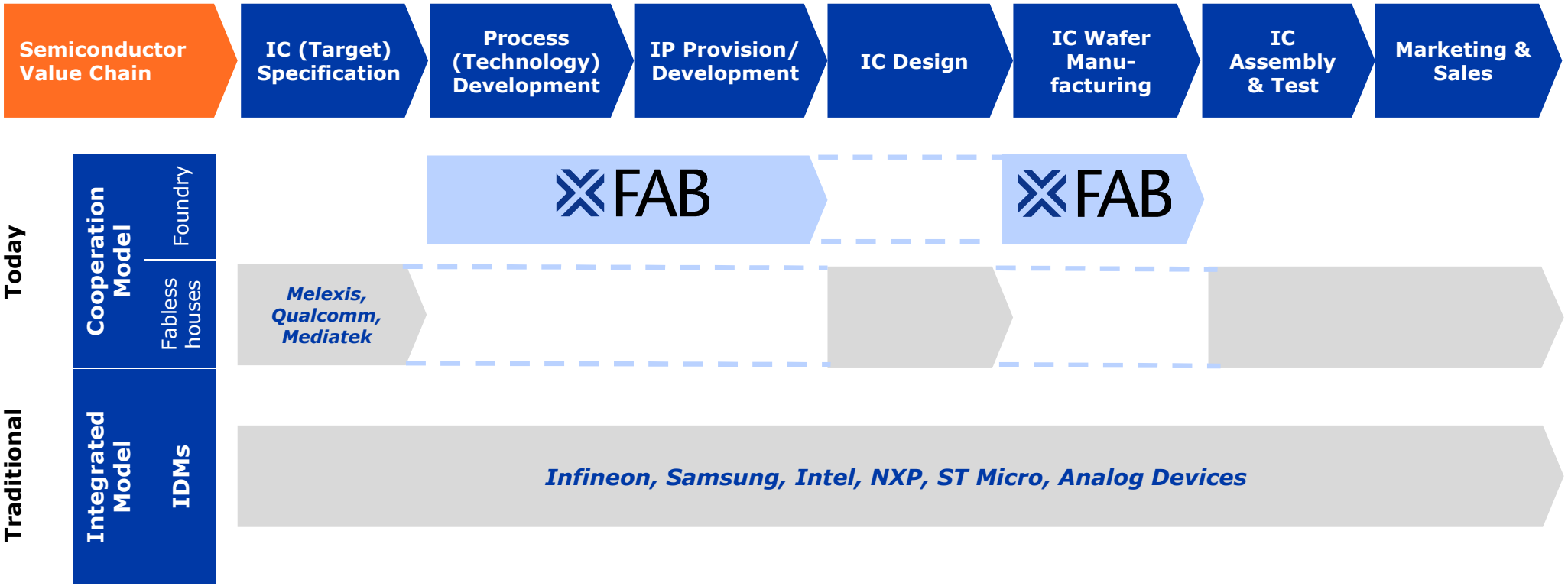
## Technologies interfacing the real world

- Expertise in analog/mixed-signal IC production, MEMS and SiC with a focus on high-growth automotive, medical and industrial end markets with long lifecycles
- Strong design support to drive customer engagement over the long-term with successful technology leaders

## Manufacturing excellence

- 6 wafer fab facilities in Germany, France, Malaysia and US
- Capacity: 98,000 wafer starts per month (200mm equiv.)
- All production sites are automotive qualified
- About 4,000 employees worldwide

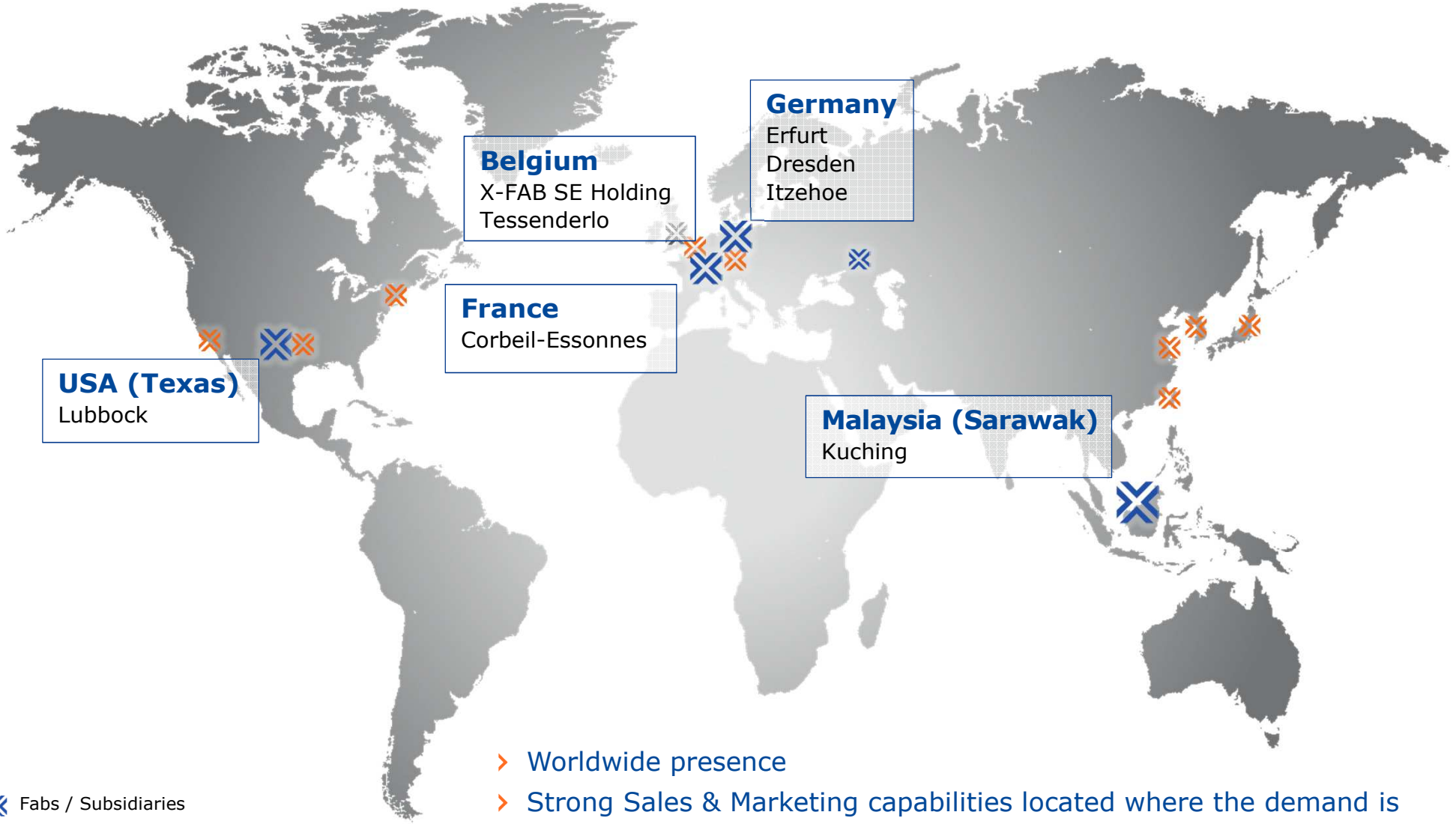
# Foundries and their role in the value chain




- Focus on complex technology, design support and manufacturing solutions
- X-FAB does not have own products, as it does not want to compete with its customers

Source: X-FAB

# X-FAB – Worldwide



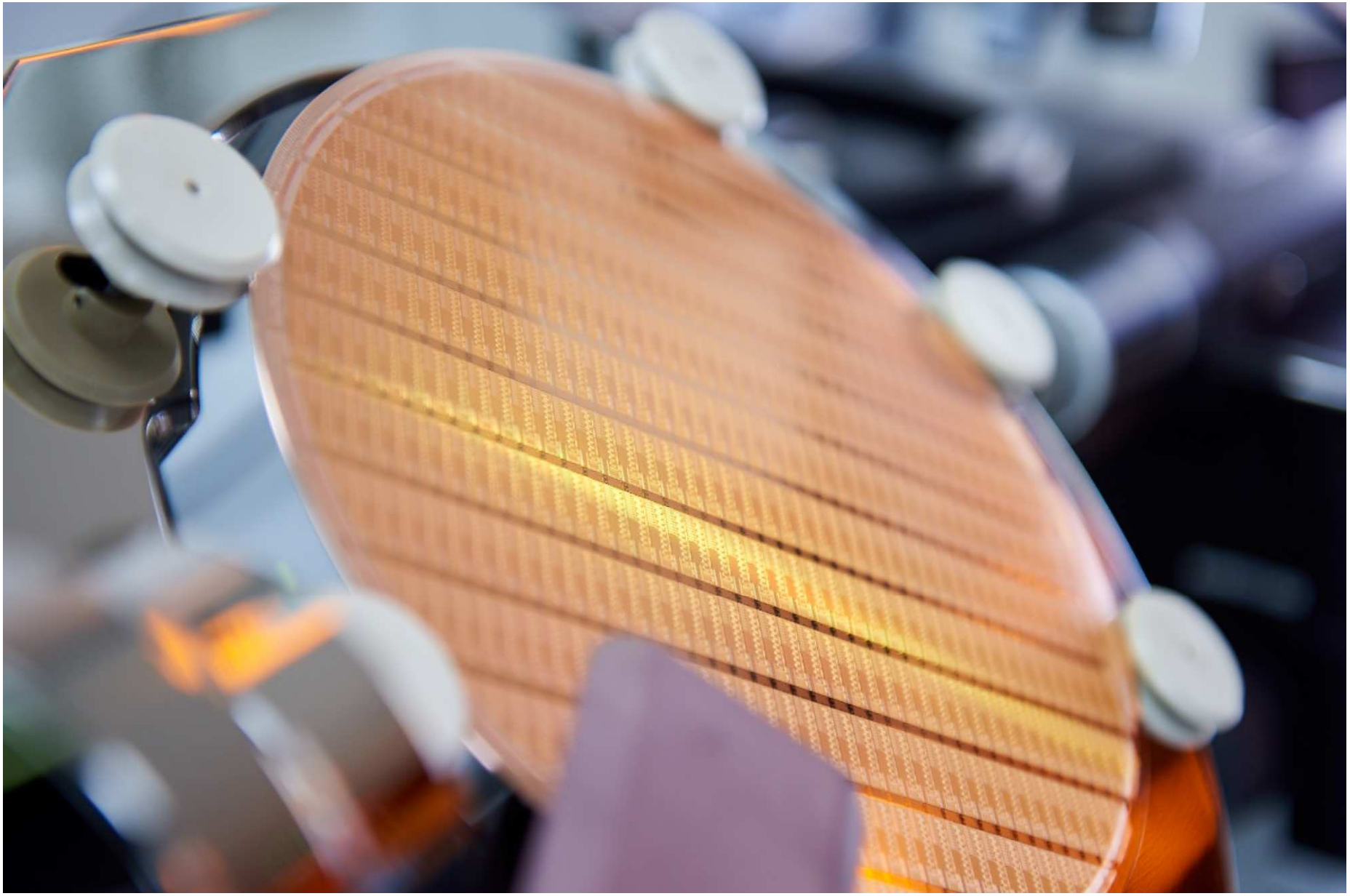

- Fabs / Subsidiaries
- Sales Offices
- Representatives

- Worldwide presence
- Strong Sales & Marketing capabilities located where the demand is
- Proximity to customers and best-in-class technical support

# Wafer manufacturing at X-FAB

# Wafer manufacturing at X-FAB

# Wafer manufacturing at X-FAB



# Wafer manufacturing at X-FAB

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# Wafer manufacturing at X-FAB

# Analog/mixed-signal – clearly different from the digital world

## Analog/mixed-signal

- Low capacity and technology capex
- Long product lifecycle
- High tech differentiation
- Large portfolio of process technologies
- Mid-size technology nodes

More than Moore

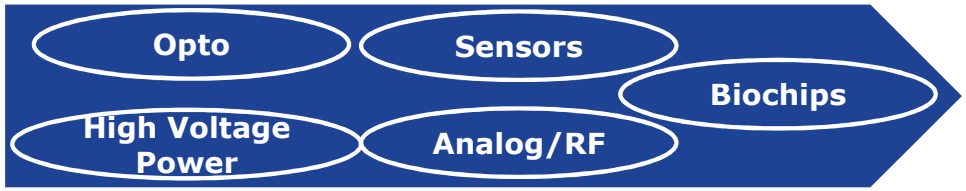
## Digital

- High capacity and technology capex
- Short product lifecycle
- Latest technology node differentiation
- Limited portfolio of process technologies
- Small-size technology nodes

More Moore

## X-FAB Business Model: Specialty mixed-signal technologies

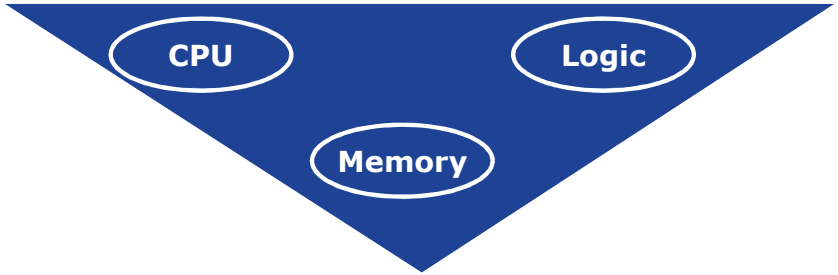
**Technological diversification to interface with the real world**




***Larger technology nodes with much more lifetime suitable for mixed signal***

## Digital: continuous miniaturization

**Ever smaller feature sizes and higher computation power**

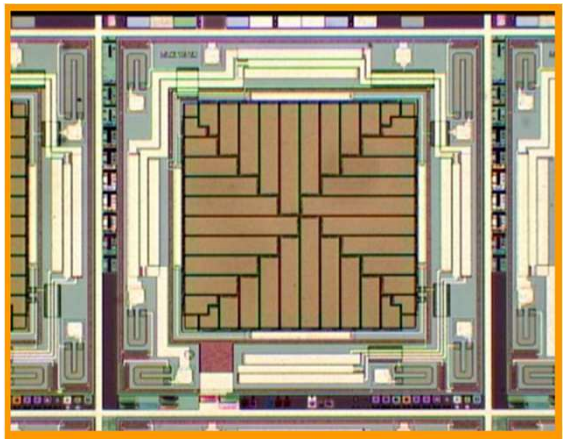



***Fabs/machines need to be replaced for ever newer ones***

≥500 nm
350 nm
180 nm
130 nm
90 nm
65 nm
45 nm
32 nm
22 nm
14 nm
10 nm

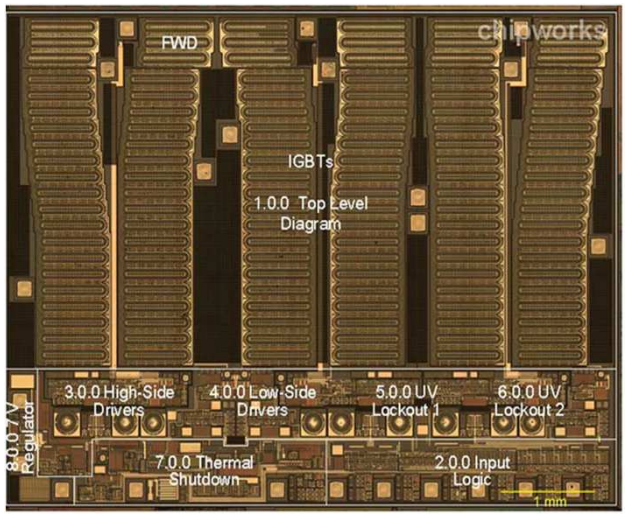
Source: X-FAB

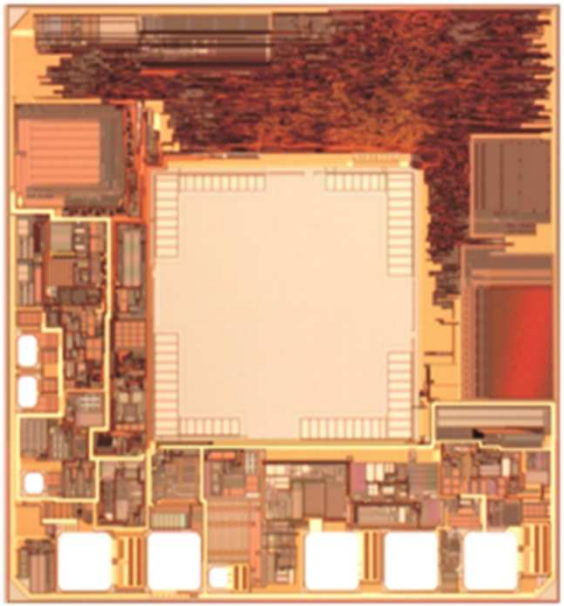
# Shrinking makes limited sense in the analog/mixed-signal world



1µm infrared temperature sensor

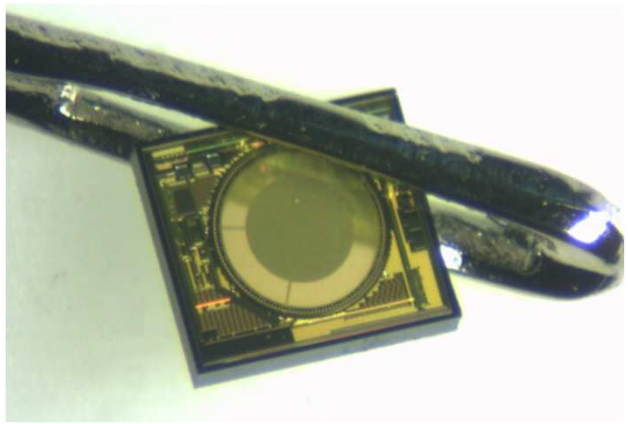
400V motor driver IC



350nm integrated pressure sensor

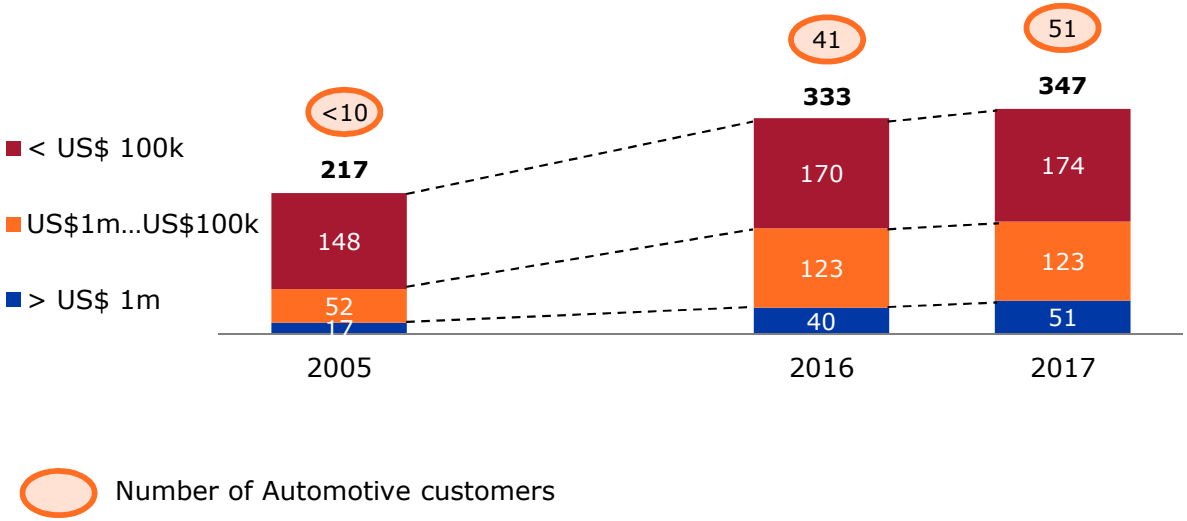
350nm integrated MEMS microphone



Source: X-FAB

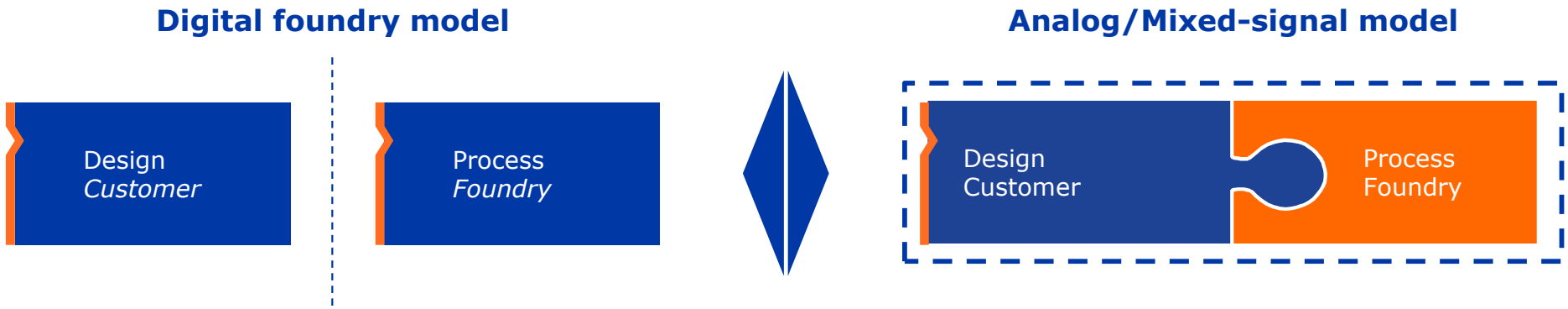
# Attractive, diversified and global customer base

## X-FAB has grown to a diverse base of 347 customers worldwide




- More than 1,600 unique products in production plus more than 1,000 products in prototyping stage
- Top 5 customers accounted for 65% of revenue in 2017
  - Melexis accounting for 35% of 2017 revenue down from 42% in 2015 and 2014
- For more than 90% of X-FAB's products in 2017, X-FAB was the only source

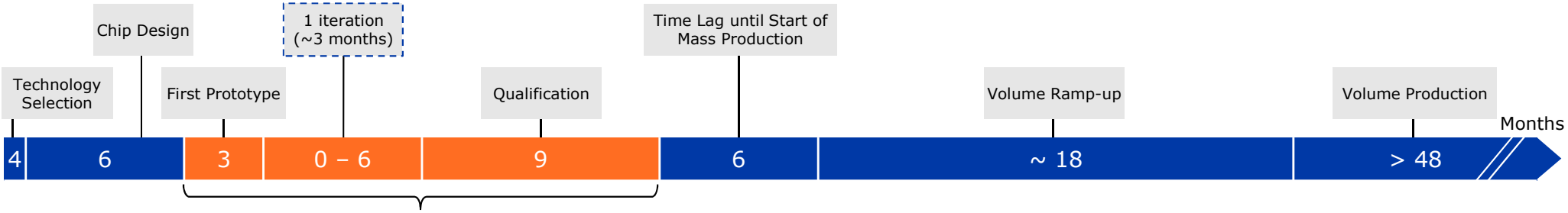
## X-FAB's close relationships with customers create barriers to entry for competitors




Source: X-FAB

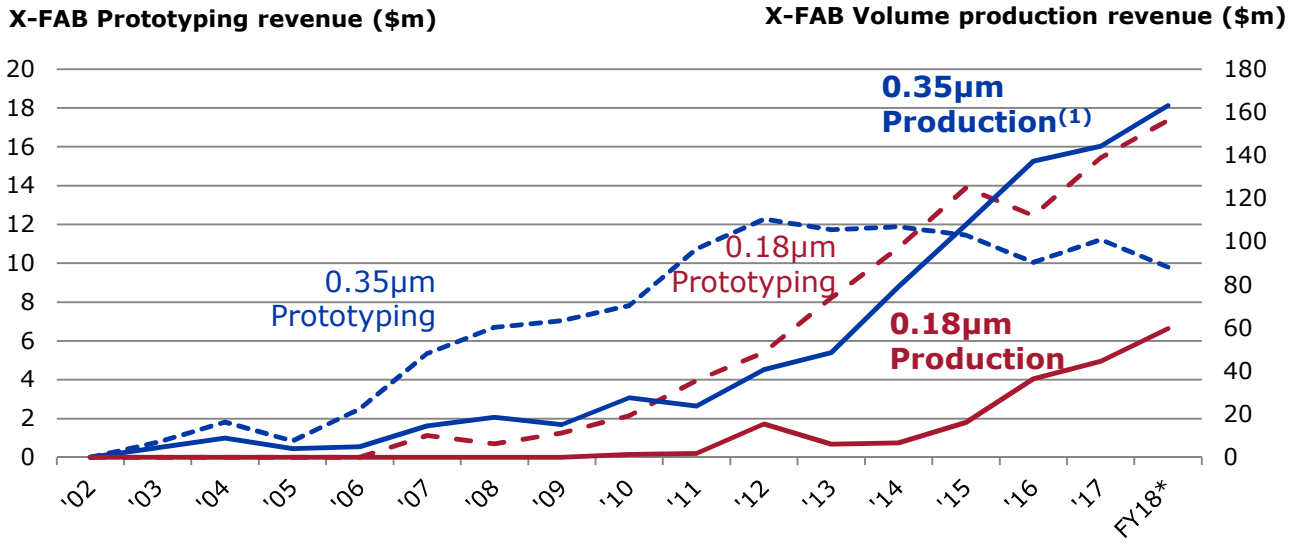
# Long product lifecycle and robust prototyping provide clear future revenue visibility

## Illustrative lifecycle for automotive ASIC product




- At least 12 months of finalizing chip design for mass-production
- Customers 'locked-in' given high switching costs (time and cost)
- Prototypes cash funded by customers
- Consistent high quality and process experience increases customer stickiness

## Prototyping is an early indicator for future production




*Half-year values extrapolated to full year

## Comments

- Prototyping (or NRE = Non-Recurring Engineering) revenue in 0.18µm already exceeding its predecessors' (0.35µm) NRE revenue record
- Production ramp-up in 0.18µm expected to accelerate further

(1) Excluding subcontracted business

Source: X-FAB

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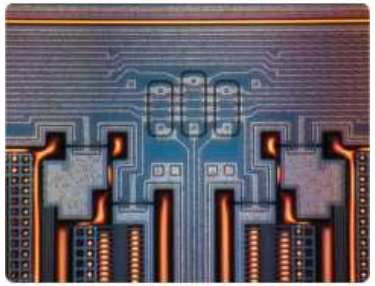
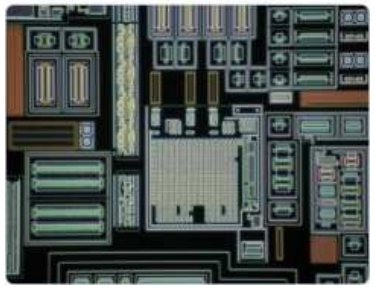




# X-FAB – more than making chips

## Saving lives

- Advanced applications like cell sorters, DNA sequencers and biomedical screening
- Products for continuous glucose monitoring, pacemakers, x-ray detectors or hearing aids

## Sustainable energy

- Efficient power conversion
- Silicon Carbide (SiC) as perfect alternative to silicon through increased efficiency, lower power loss, faster switching speed and higher operating temperatures

## Connecting people

- Radio Frequency (RF) functionality as core element of high-performing communication devices
- Latest generation RF SOI devices are key for RF functionality enabling optimal communication experience

## Cleaner transportation

- Engine management systems rely on a multitude of microelectronic sensors
- Sensing of gases, pressures, positions and other physical values for cleaner engines

Source: X-FAB

# Automotive applications

Barometric pressure sensor, inertial sensor and compass for navigation

IR temperature sensor for cabin

Occupant detection

Pressure sensor for Diesel particle filter

Bolometer for night-vision

Micro-LED for smart headlamps

Pressure sensor, inertial switch and energy harvesting for TPMS

Pressure sensors, flow sensors & strain gauges for engine management

Microphones for voice-control, hands-free phone

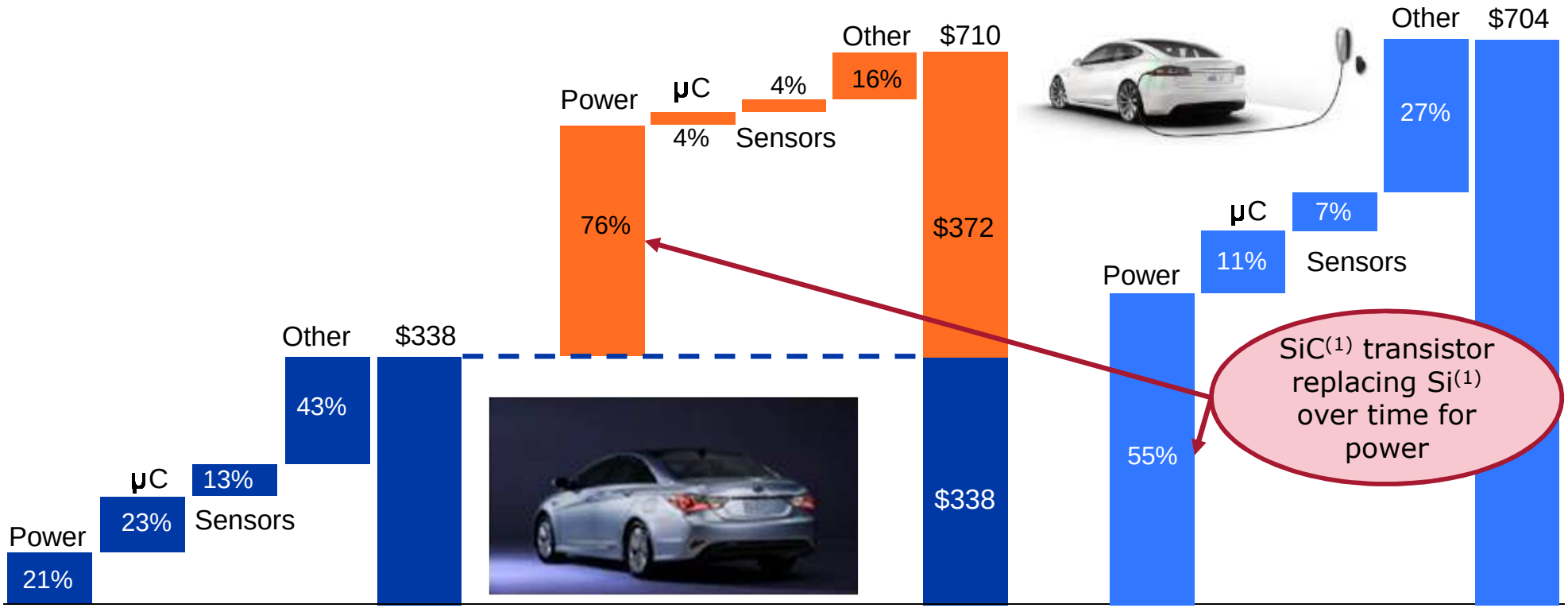
Pressure and inertial sensors for crash detection

IR imager for pedestrian detection

Pressure sensor for brake-booster

# Electrification of vehicles will require more ICs

## Average semiconductor content per type of vehicle




(1) SiC = Silicon Carbide, Si = Silicon

Source: X-FAB, Investor and Analyst Presentation by Jochen Hanebeck, Division President Automotive, IFX, 28 Sep 2016
(original source: Strategy Analytics, Industry estimates)

# X-FAB will benefit from the increasing use of SiC for power applications

## Benefits of silicon carbide

- Significant increase in energy efficiency due to
  - shorter switching times
  - reduced power losses
- Operates at higher temperatures
  - requires less cooling, reducing overall system size
- Extending the range of a battery

## X-FAB key facts

- USD 12m invested since 2014[1]
- Additional USD 12m to be invested to respond to clients' demand
- Strong engagement with more than 10 customers
- First production shipment in Q4 2017 and start of volume production in 2018
- With its SiC customer base, X-FAB has exposure to all SiC applications available in the market

**SiC applications:**

- **Electric vehicles and chargers**
- **Wind mills**
- **Solar panels**

**SiC power semiconductor market forecast to grow at a CAGR of 29% until 2023 reaching $1.4bn by 2023[2]**

[1] as per year-end 2017
[2] Source: Yole Développement, press release "Automotive is driving SiC adoption", July 2018, CAGR relating to the period 2017-2023

Source: X-FAB

# Medical applications

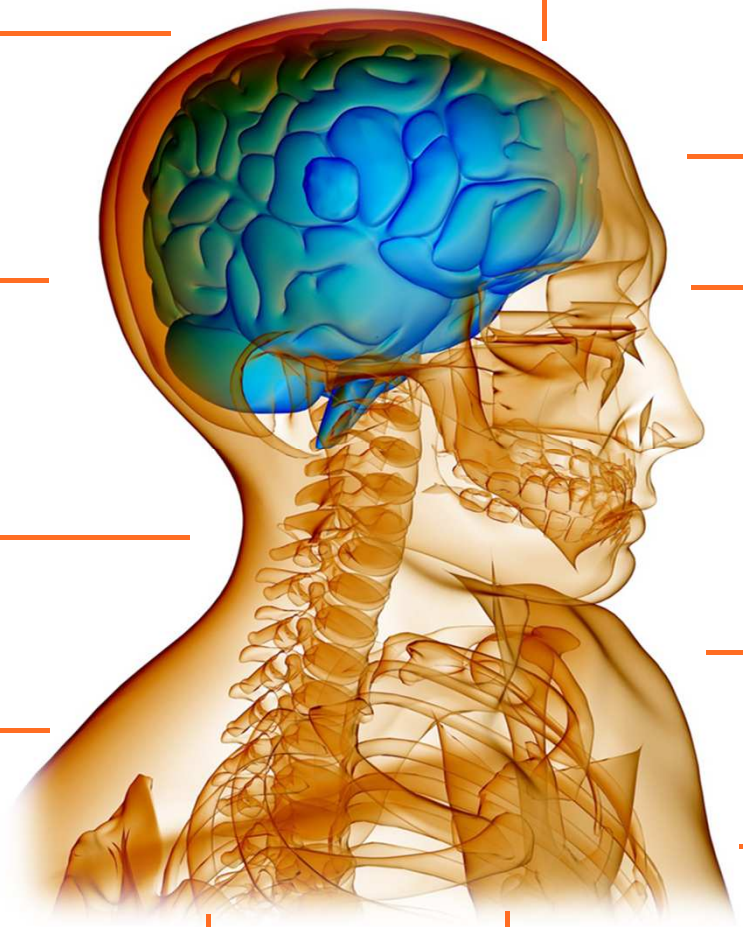
Ultrasonic transducers and receivers

Lab-on-Chip
- Chemical analysis
- Disease diagnosis
- Drug detection
- Cell analysis

DNA analysis and genome sequencing

Implant for continuous glucose monitoring

MEMS diffusor head for medical sprays



Blood pressure sensors

X-ray scintillators

Eye-pressure measurement

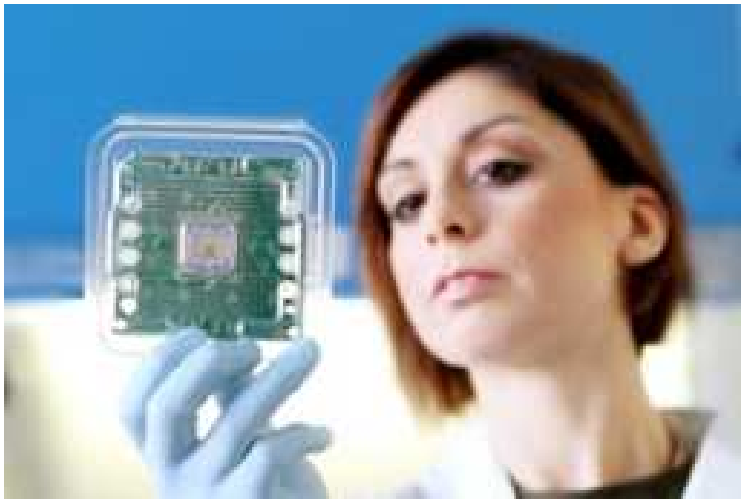
Pressure sensors for respirators

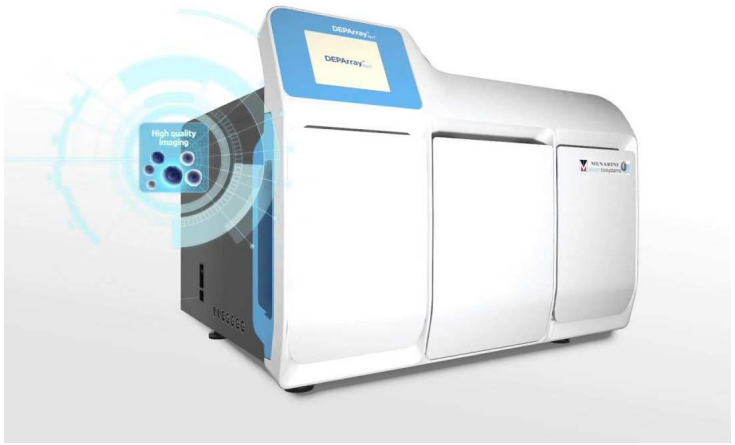
Ingestible smart pills

Cancer cell sorting

Flexible electronics for catheters

# Lab-on-Chip being on the rise






## Growth drivers

- Aging population and rising number of lifestyle diseases
- Increasing demand for personalized medicine and advanced healthcare devices
- Decentralization of health care by point of care diagnostics

## Characteristics of lab-on-chip applications

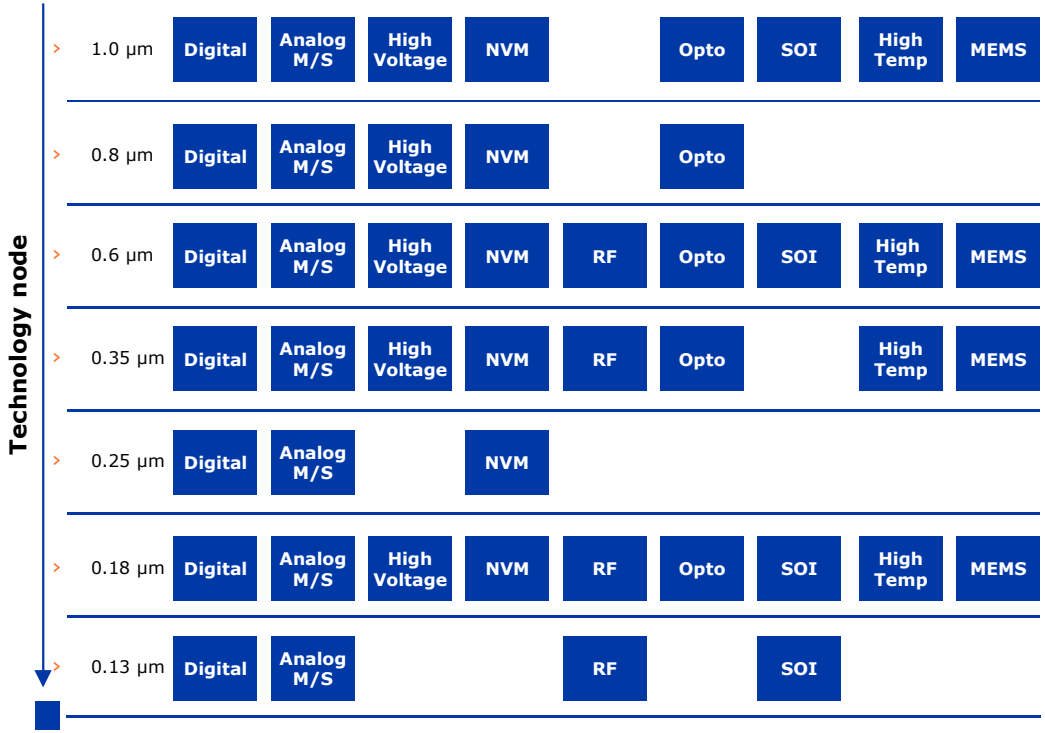
- Disposables – can only be used once
- Customer-specific development requires tight collaboration with customer
- Directly working with medical company
- Large chips – high value add

Source: X-FAB

# X-FAB's comprehensive technology offering

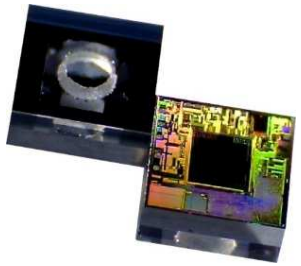
## Large portfolio of process technologies

X-FAB process portfolio and features

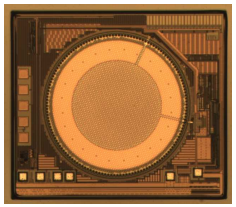



## Strong expertise in MEMS technology

- Over 20 years track-record in MEMS offering
- Investment into MEMS Foundry Itzehoe in 2011, and expansion of the Erfurt site with the creation of a new cleanroom in 2014



**Automotive Integrated MEMS pressure sensor for harsh media**



**Integrated MEMS microphone**

## Pioneer in 150mm SiC technology

- X-FAB joined the "Power America" consortium with the US Department of Energy in 2014
- X-FAB established the world's first 150mm SiC foundry offering

M/S = mixed-signal | NVM = non volatile memory | RF = radio frequency
SOI = silicon on insulator | MEMS = microelectromechanical systems | SiC = silicon carbide

* as per year-end 2017

Source: X-FAB

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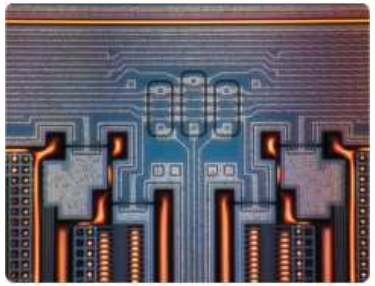
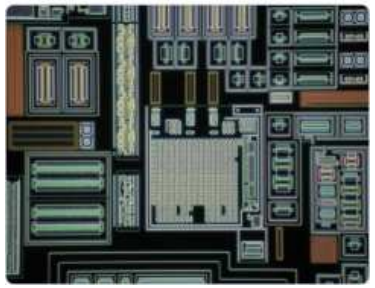
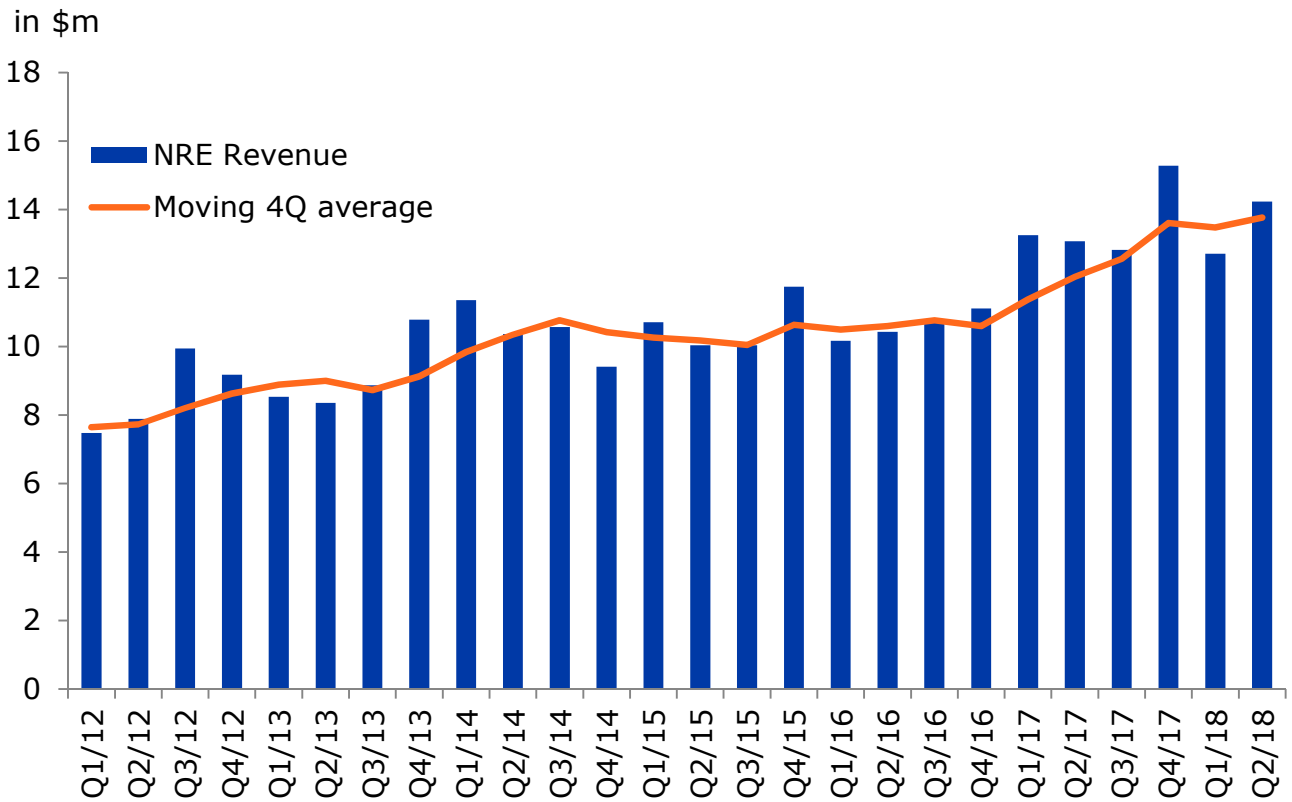


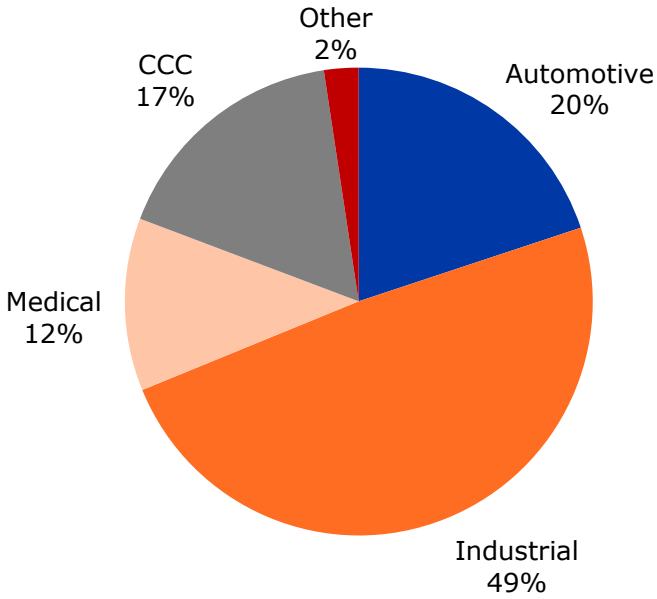


# Prototyping revenue development X-FAB Group

## Prototyping revenue per quarter




## Prototyping revenue by market segment Q2 2018



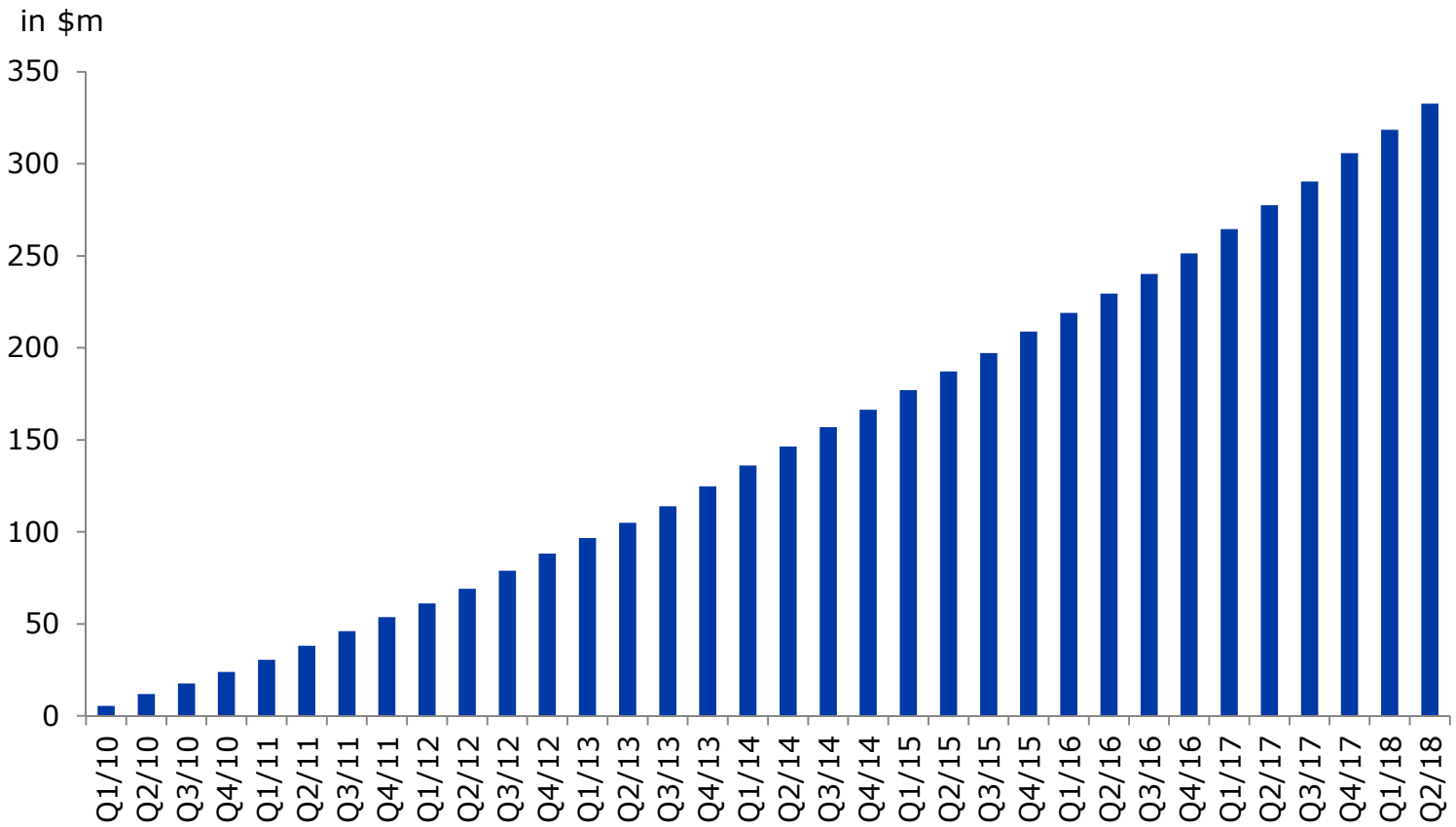

› Prototyping revenue as indicator for future business.

NRE = non-recurring engineering, also referred to as prototyping

Source: X-FAB

# Growing product portfolio

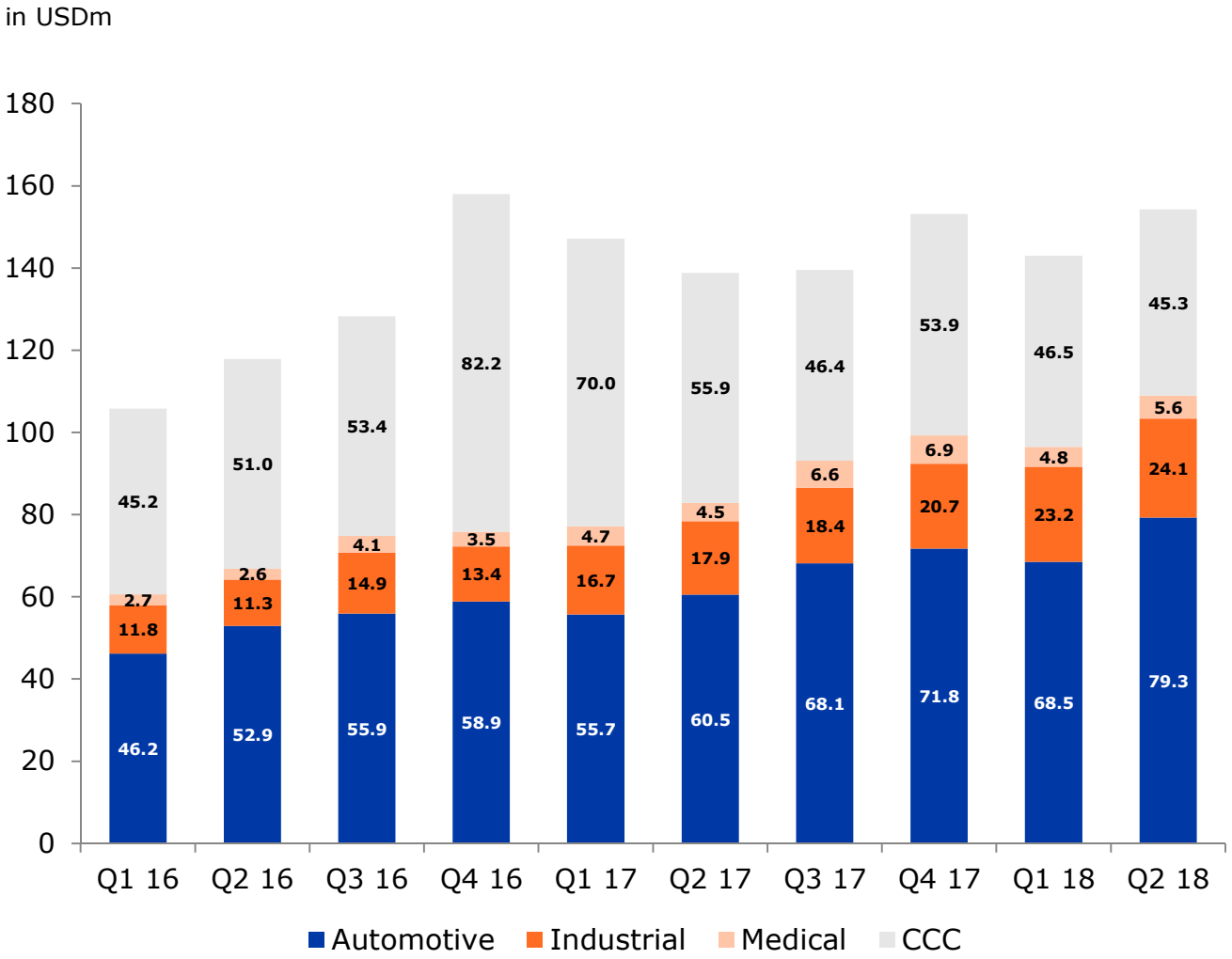
**Cumulated prototyping revenue as of Q1 2010**




- Strong pipeline of projects to support future growth

Source: X-FAB

# Revenue development core markets




## Growth above industry average

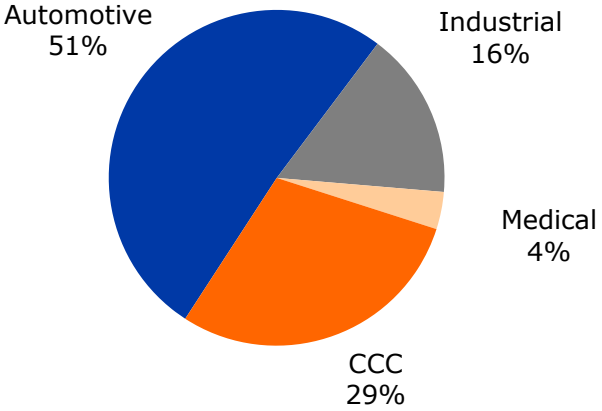
- Automotive +30%*
- Industrial +28%*
- Medical +24%*

* Q2 2018 compared to Q2 2017 CCC = Computer, Communications & Computer

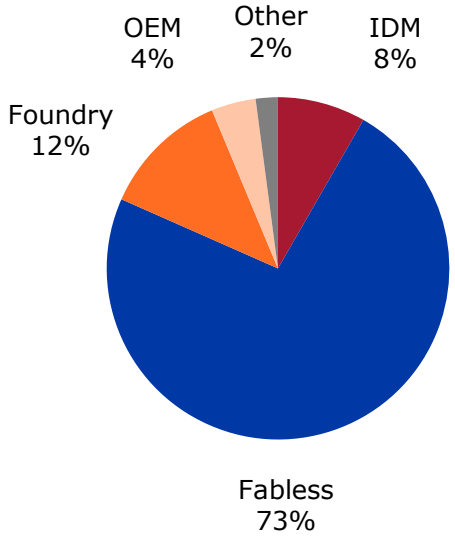
Source: X-FAB

# Revenue breakdown

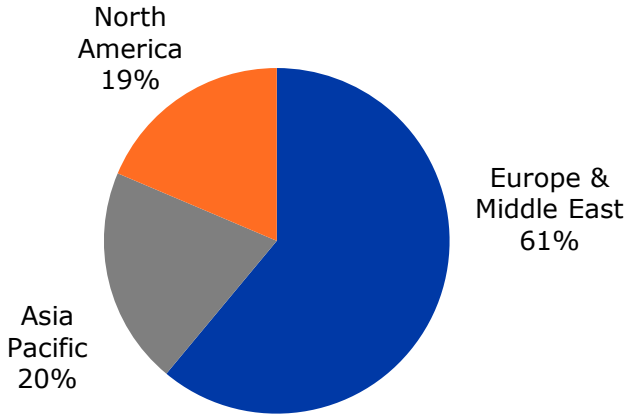
## Revenue by market segment Q2 2018*




## Revenue by customer type Q2 2018




## Revenue by geography Q2 2018



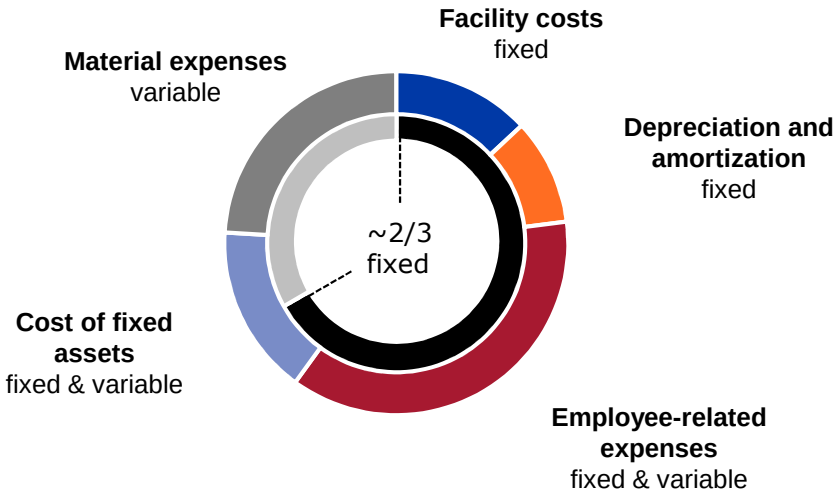

*Key end markets*: 71%*

* including legacy business X-FAB France; predominantly CCC with a small amount of automotive and industrial business

Source: X-FAB

# A cost base allowing for future scalability

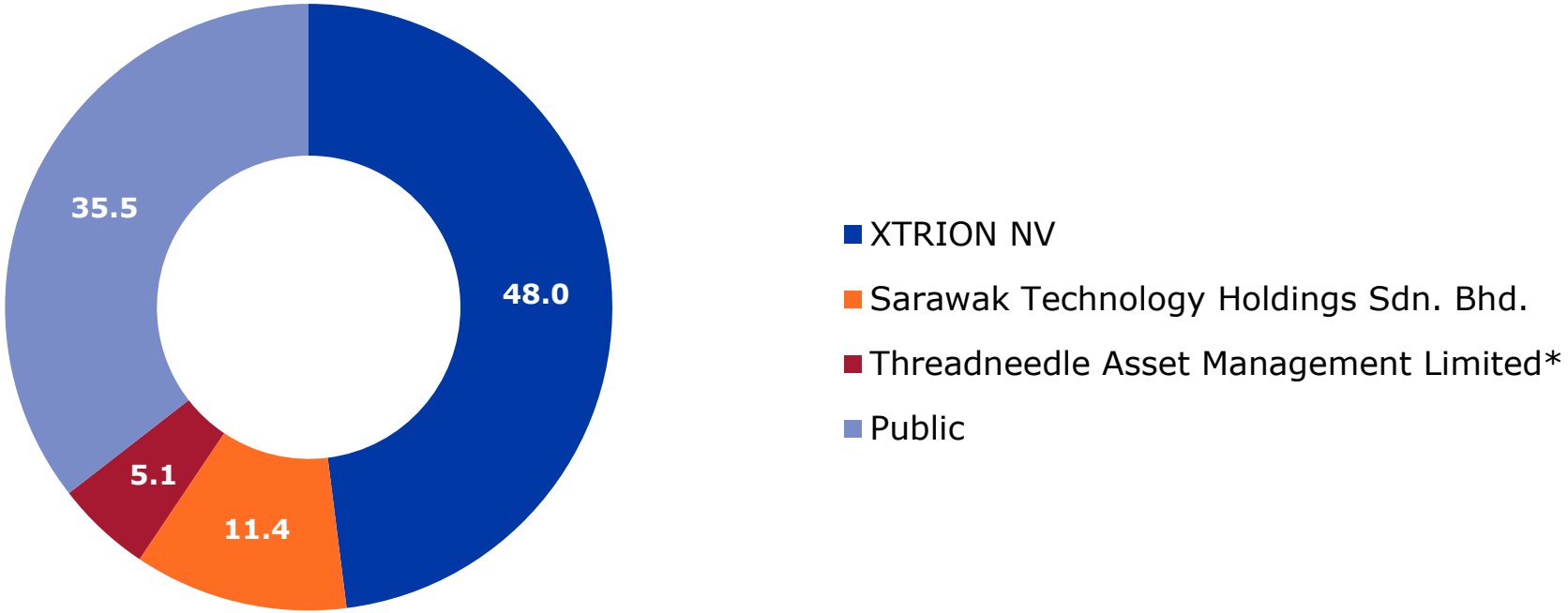
## Cost of sales composition (2017)




- With two thirds of fixed costs, a revenue increase of 1$ leads to a bottom line improvement of about 66cent.

Source: X-FAB

# X-FAB shareholder structure




*based on transparency notification as per July 26th, 2017

Source: X-FAB

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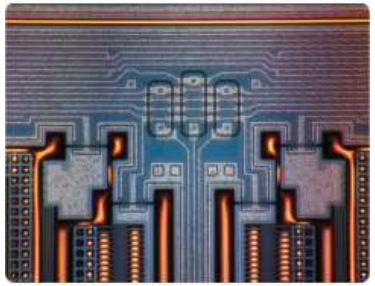

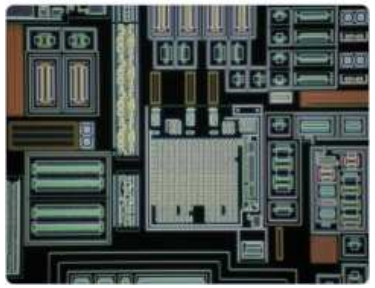

# Key investment highlights

- **Riding the wave of global megatrends**
  - Green mobility
  - Aging population
  - Sensors everywhere, Internet of Things
- **Addressing a global market**
- **Close & long-term partnership with our customers** and a **strong projects pipeline** supporting future growth
- **Proven business model** with CAGR of 22% over the last three years in X-FAB's core markets

Source: X-FAB

# Disclaimer

**Forward-looking information**

- This presentation may include forward-looking statements. Forward-looking statements are statements regarding or based upon our management's current intentions, beliefs or expectations relating to, among other things, X-FAB's future results of operations, financial condition, liquidity, prospects, growth, strategies or developments in the industry in which we operate. By their nature, forward-looking statements are subject to risks, uncertainties and assumptions that could cause actual results or future events to differ materially from those expressed or implied thereby. These risks, uncertainties and assumptions could adversely affect the outcome and financial effects of the plans and events described herein.

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# Thank you!