



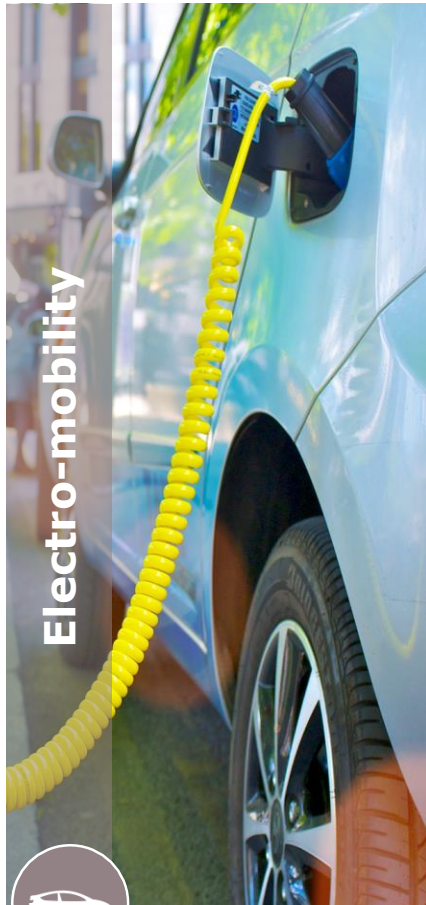
IFX Day 2018
Peter Schiefer
Division President Automotive

London, 12 June 2018



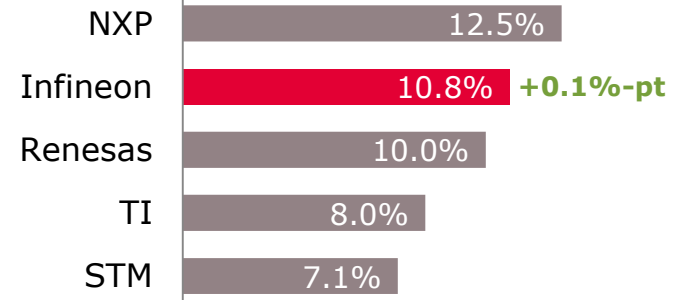
Infineon is well positioned in its addressed automotive product segments


Megatrends shaping the automotive market increasing semi content per car



Automotive semiconductors

2017 total market size: \$34.5bn



- › #1 in power with 26% (+0.4 %-pt)
- › #2 in sensors with 12.9% (+0.4 %-pt)
- › Significant design-wins for μ C in safety/ADAS/AD
- ›  Market share trend: Infineon benefits disproportionately from the megatrends
 - › Electro-mobility: power, drivers, μ C
 - › Automated driving: radar, lidar, μ C

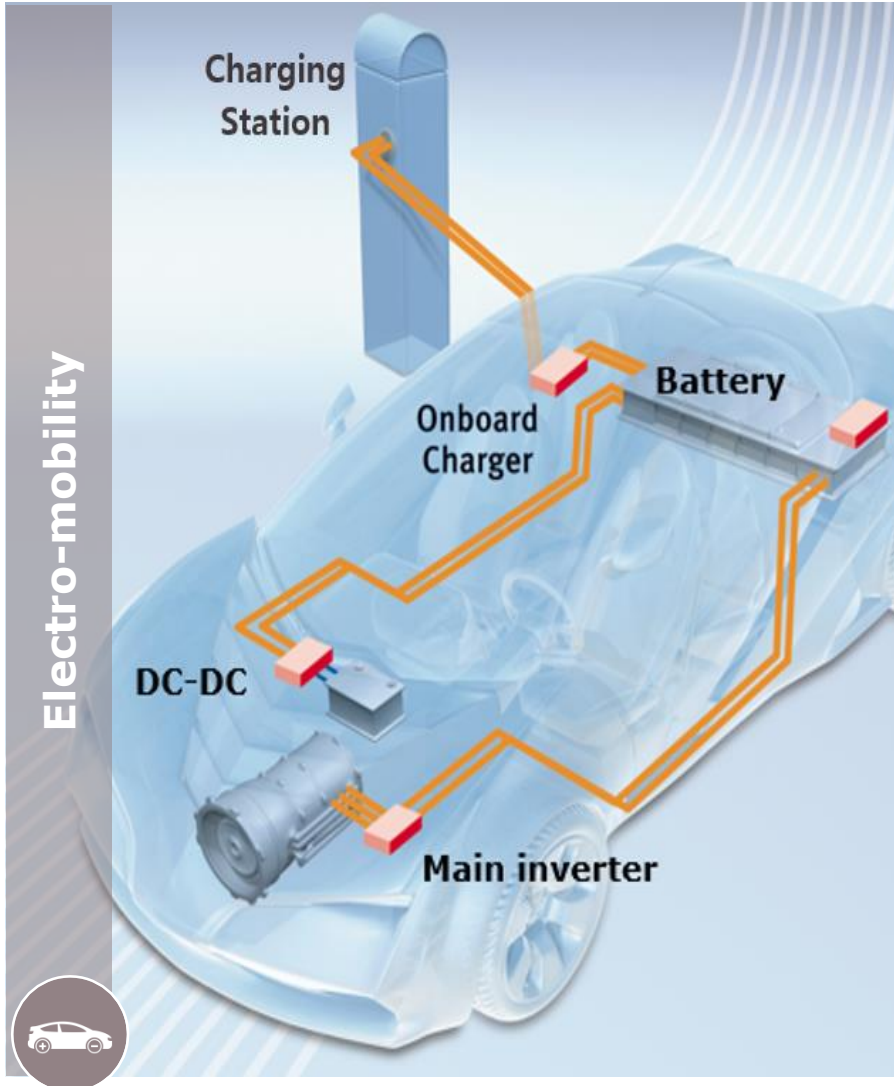
Source: Strategy Analytics, "Automotive Semiconductor Vendor Market Shares", April 2018



Electro-mobility



Megatrend electro-mobility is boosting businesses of ATV, IPC and PMM divisions



Charging station

- › Majority of charging points is Si-based (PMM: CoolMOS™, IPC: IGBTs)
- › First design-wins for SiC-based ultra high-power charger (> 350 kW) logged in (IPC)

Onboard charger

- › Si-based (PMM: CoolMOS™, ATV: IGBTs)
- › First application inside the car for SiC
- › long-term option for GaN

Main inverter (ATV)

- › Main source of power semi content
- › Dominated by Si-based solutions for the next decade
- › Premium cars will adopt SiC in 2020+; mass market to follow in 2025+

DC-DC converter (ATV)

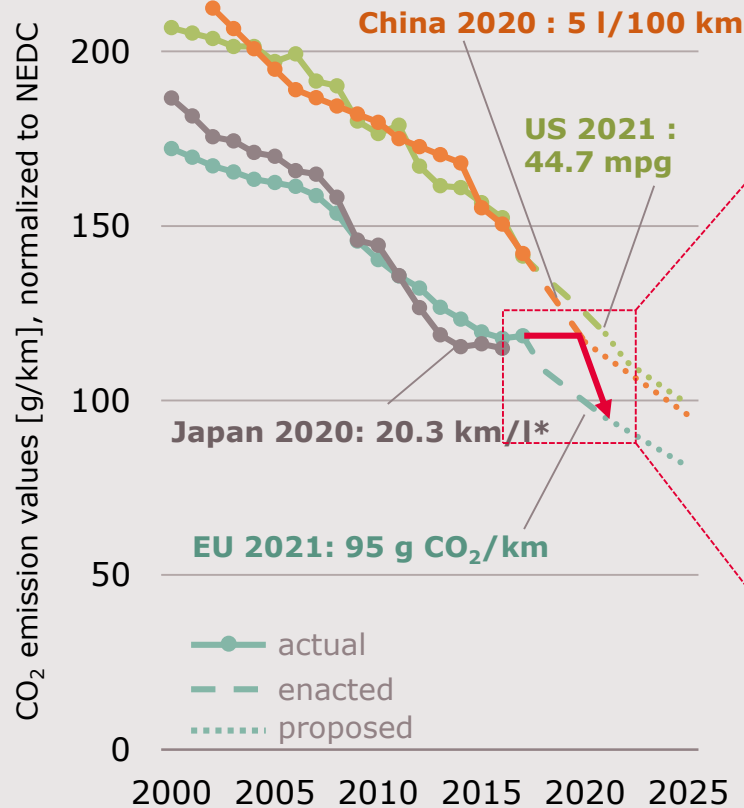
- › Si-based; long-term option for SiC and GaN

Battery

- › IGBTs (ATV) and CoolMOS™ (PMM) for battery switch

xEV growth driven by emission regulation; but consumer preferences thwart CO₂ reduction

CO₂ emission development and regulations for main regions



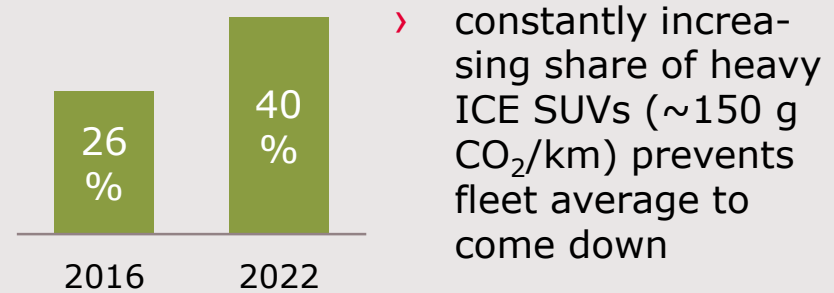
*Note: Japan has already met its 2020 statutory target as of 2013

Source: 1) IHS Markit, Automotive Group, Report, January 2018

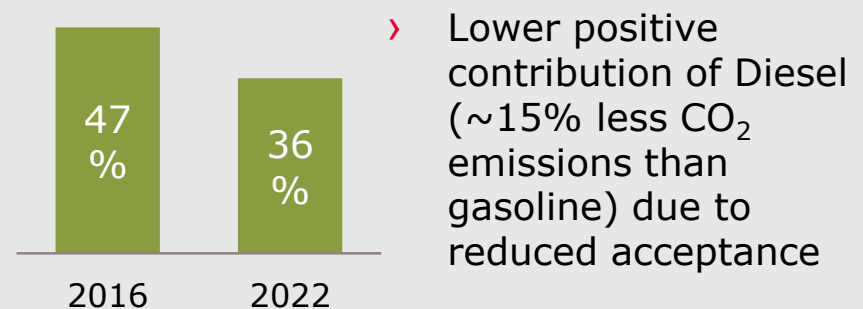
2) IHS Markit, Automotive Group, "Light Vehicle Alternative Propulsion Forecast", March 2018

Two consumer trends countervail CO₂ reduction

(1) SUV share of registered cars in Europe¹⁾



(2) Diesel share of registered cars in Europe²⁾



Short-term, MHEV/FHEV/PHEVs are first choice; mid-term BEVs are preferred solution

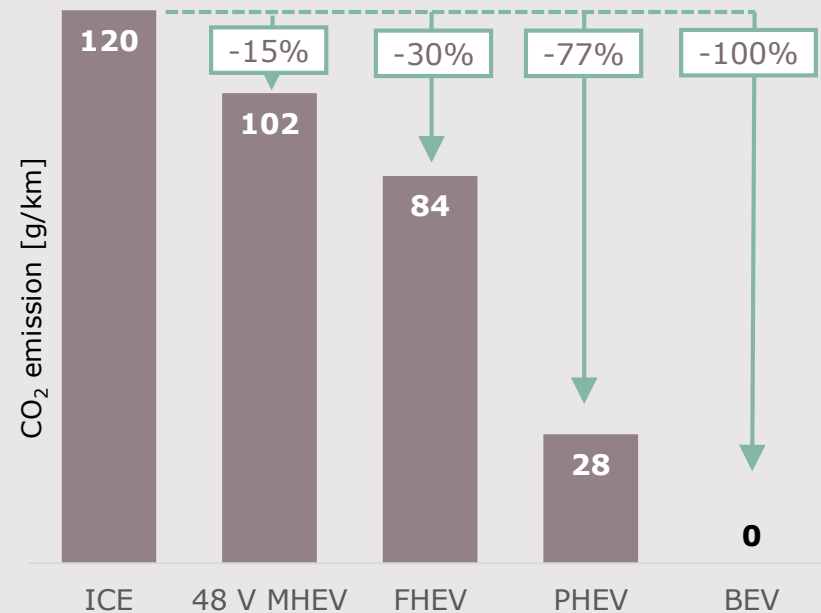
Growth drivers of electro-mobility

- + Regulation
- + Incentives; China industry politics
- + Decreasing Diesel share
- + Increasing SUV share



- Cost and range vs. ICE
- Limited charging infrastructure
- Further ICE improvements
- Attractive oil price

CO₂ emission reduction by powertrain system

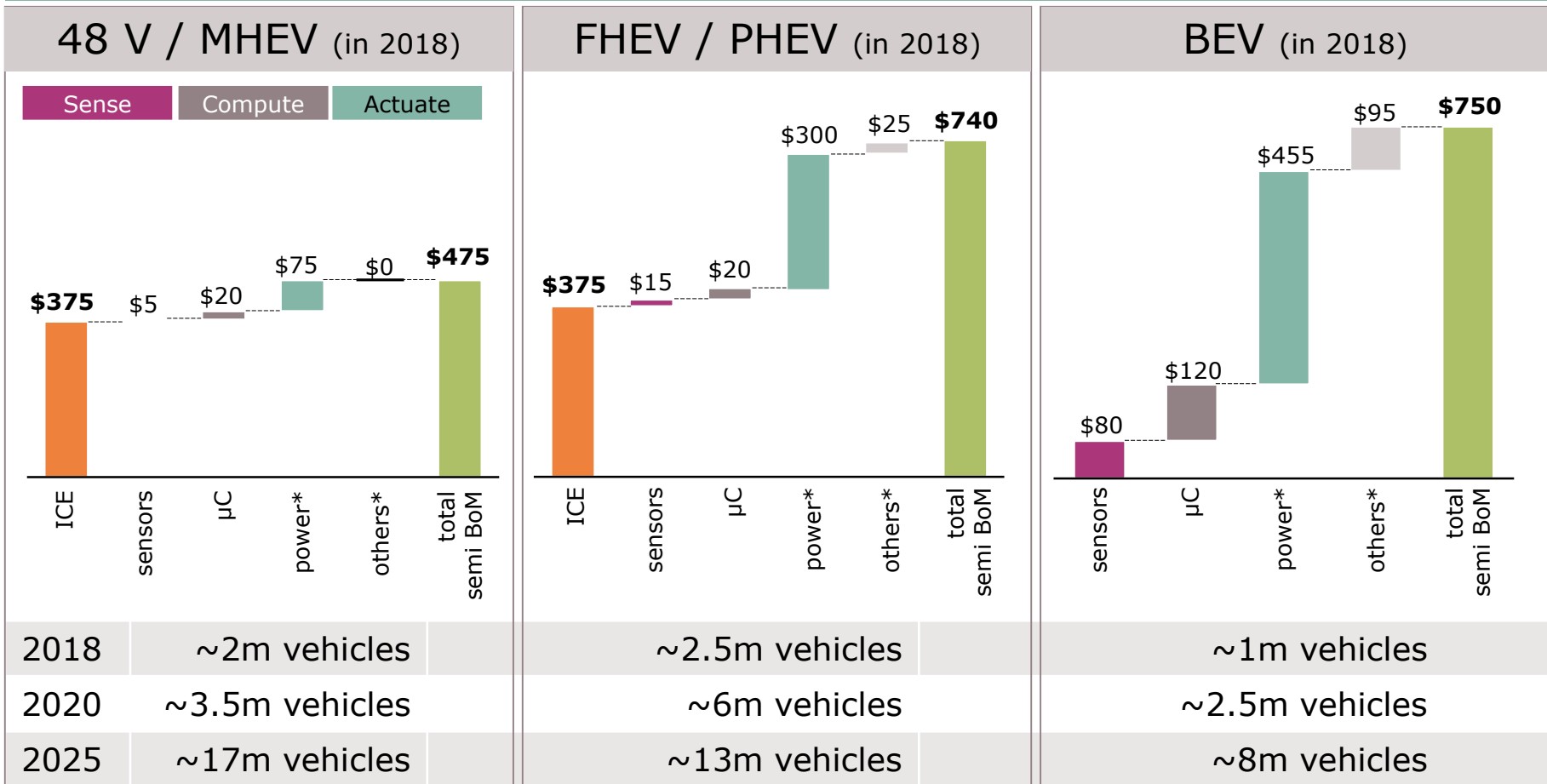


Source: Infineon estimates

- > Due to absence of improvements in CO₂ reduction in the past years, OEMs have to switch to "catch-up" mode until 2021
- > OEMs expected to push 48 V MHEV, FHEV, PHEV systems near-term to meet CO₂ targets
- > Mid- to long-term, BEVs will become the preferred solution

The incremental demand of power semi-conductors is a significant opportunity

2018 average xEV semiconductor content by degree of electrification



Source: Strategy Analytics, "Automotive Semiconductor Content", May 2018; Infineon estimates

* "power" includes linear and ASIC; "others" include opto, small signal discrete, memory

Infiniteon has unparalleled expertise and portfolio for high-power xEV applications



Bare dies



Discretes

Diodes

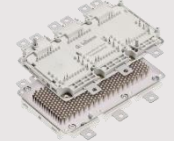
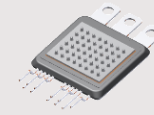
MOSFETs



Modules

molded

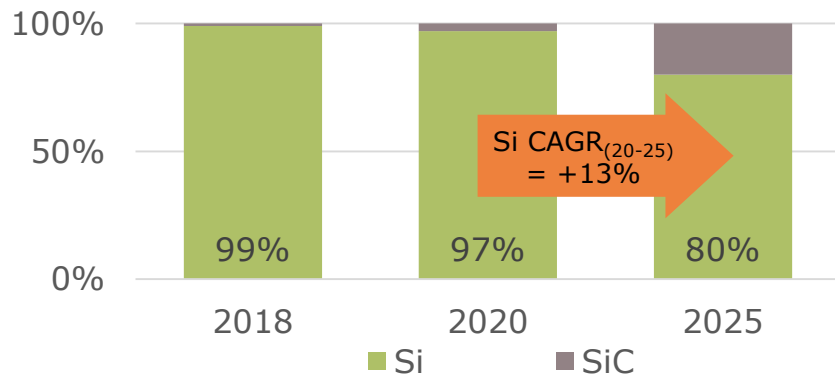
frame-based



Si will dominate the xEV market throughout next decade*



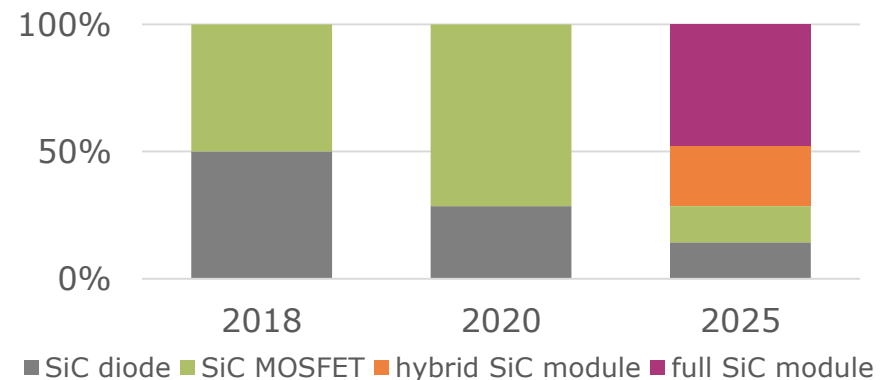
[by \$ value]



Modules will be preferred form factor in SiC mass market*



[by \$ value]



* Source: Infineon estimates

SiC follows Infineon's standards wrt quality, application understanding, and portfolio size



On-board charger

First design-win to ramp in 2019!

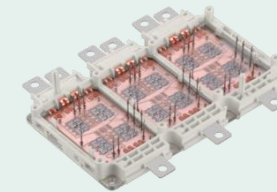


CoolSiC™ Automotive MOSFET



Main inverter

First design-win to ramp in 2020!



HybridPACK™ Drive CoolSiC™

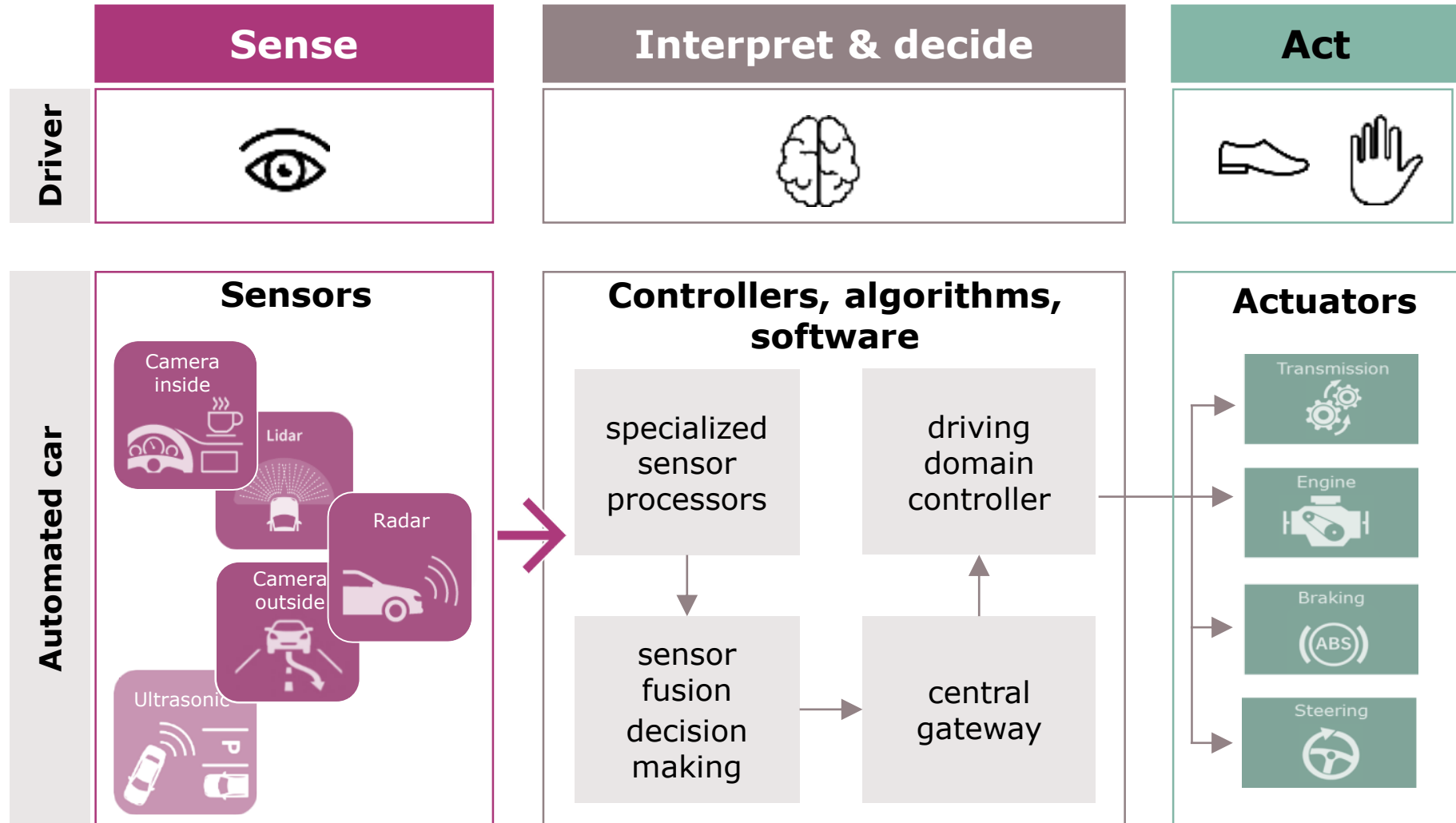
Increased scalability supports OEM platform strategy

- › More than 20 leading OEMs and tier-1s are evaluating Infineon's SiC solutions for automotive
- › Customer feedback clearly shows that Infineon has deepest understanding of technical quality threats
- › Infineon's internal quality test procedures exceed common industry norm; test results proof that Infineon's SiC products reach that quality level
- › Industry's broadest portfolio allows customer to "pick what they need" rather than to "take what we have"



Automated Driving

For Automated Driving more compute power but also a higher security and safety is needed



Increased sensor requirements drive the content in the next 5 years and beyond

More sensors required for any next level of automation			
	NCAP 5 Star, AD L2	AD L3	AD L4/L5
Application*	Automatic emergency brake/ forward collision warning		
	Parking assist		Valet parking
	Lane keep assist	Highway assist	Highway and urban chauffeur
Radar # of modules**	Corner MRR/LRR New: Corner starting 2020 ≥ 3	MRR/LRR Corner ≥ 6	Imaging Surround ≥ 10
Camera # of modules**	 ≥ 1	 ≥ 4	 ≥ 8
Lidar # of modules**	0	 ≤ 1	 ≥ 1
Others	> Ultrasonic	> Ultrasonic > Interior camera	> Ultrasonic > Interior camera > V2X

* Source: VDA (German Association of the Automotive Industry); Society of Automotive Engineers

** Market assumption

Infiniteon opens the door for mass-deployable lidar systems for Automated Driving



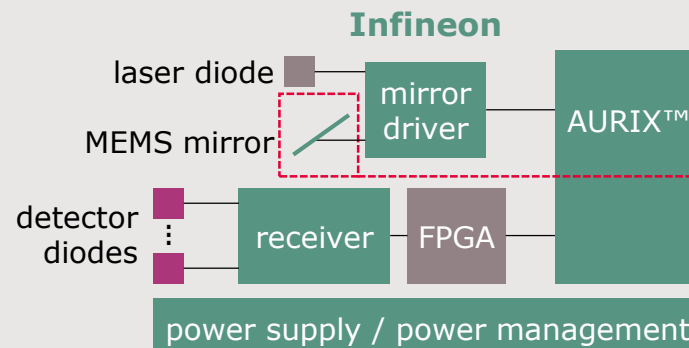
Classification of long-range lidar systems

mechanically moving mirror	solid state optical system		
	scanning optical phased array	flash lidar	scanning MEMS-based mirror
<ul style="list-style-type: none"> ⊕ proven concept ⊖ bulky ⊖ expensive 	<ul style="list-style-type: none"> ⊕ allows optical beam forming ⊖ high demand of laser power, especially for long-range 	<ul style="list-style-type: none"> ⊕ no moving parts ⊖ more complex laser system (more expensive, higher power demand) 	<ul style="list-style-type: none"> ⊕ robust signal path ⊕ more compact ⊕ more cost-effective ⊕ roadmap for higher level of integration

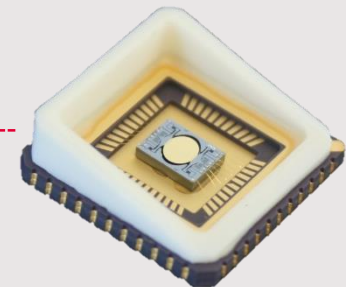


- › Lidar is Infineon's AD portfolio expansion adjacent to radar
- › Infineon intends to repeat its radar success story
- › In addition to MEMS, room to increase BoM by receiver, microcontroller, power management ICs

1st System reference design



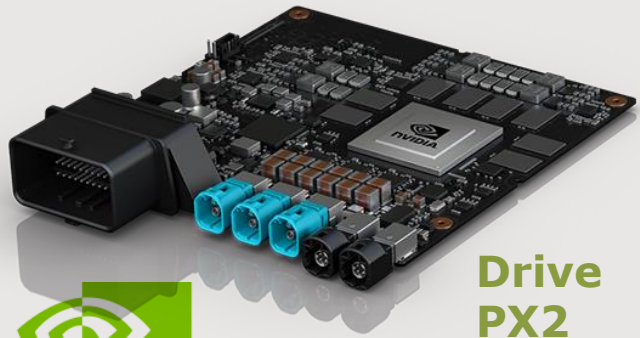
MEMS mirror



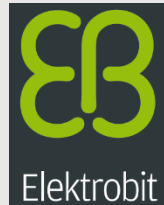
Outstanding characteristics make AURIX™ first-choice μ C in the AD platform market



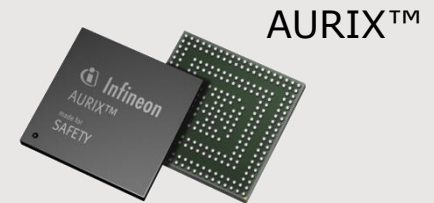
AURIX™ is the market reference as host controller in central computing platforms complementing CPU/GPU to make central computer robust and fail operational



Go™ Automated Driving Platform with AURIX™



EB robinos



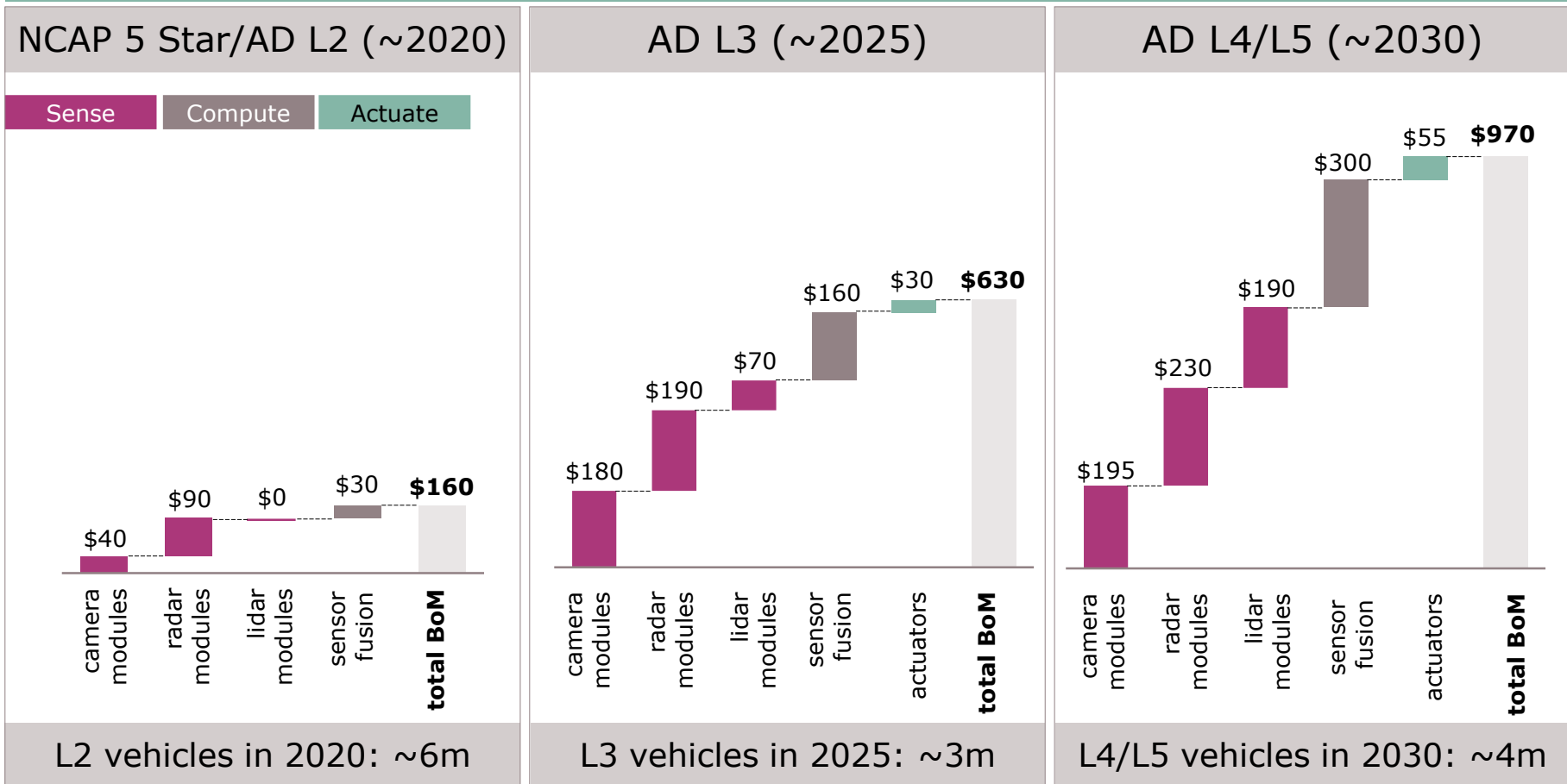
AURIX™

- › Safety host monitoring the operation of the data fusion ECU enables ISO 26262 ASIL-D
- › Safe and secure gateway to the vehicle network
- › Fallback operation in case of a GPU/CPU fail
- › Safe communication to actuator control units

- › Awareness for safety and security aspects of AD is increasing rapidly
- › Infineon is cooperating with the leading AD platform providers

ADAS/AD semi growth driven by radar and camera sensor modules over the next 5 years

Average semi content per car by level of automation at the given years



Source: Strategy Analytics; Infineon

Bill of material (BoM) contains all type of semiconductors (e.g. radar modules include μ C); sensor fusion does not include memory

BoM are projected figures for the respective time frame



Mid-term outlook

Clean cars, ADAS/AD, and adoption of premium features drive growth

Vehicle production



- › ~2% growth p.a.

Drivers for semiconductor content per car

Electro-mobility



- › Legislation
- › Improvements of ICE
- › Higher efficiency of all electric consumers
- › Adoption of xEV

Automated Driving



Today

- › crash avoidance
- › ADAS

Tomorrow

- › Autonomous Driving

Comfort, premium

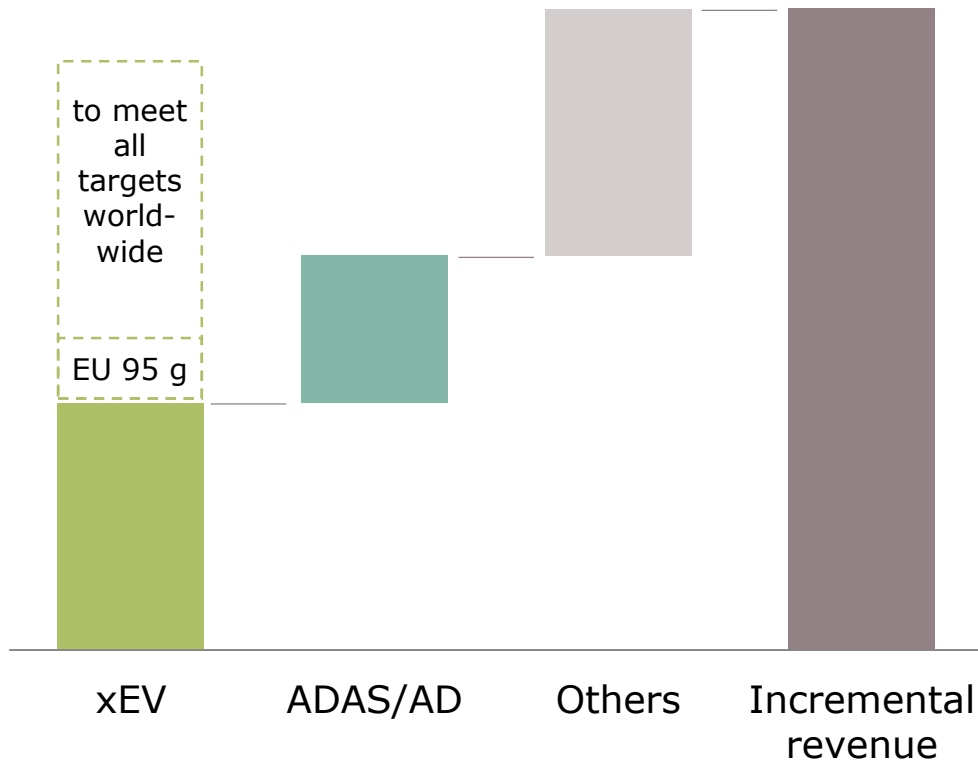


- › Premium cars are early adopters of high-end comfort and safety features
- › Trickle down to mid-range

~10% p.a. through-cycle growth

ATV's mid-term growth is strongly driven by xEV and ADAS/AD

Composition of incremental € revenue over five year planning horizon by application



xEV

- › Driven by emission regulations and consumer preferences towards SUV and reduced acceptance of diesel
- › Short-term, PHEVs and MHEVs are first choice; mid-term BEVs are the preferred solution

ADAS/AD

- › NCAP and ADAS/AD Level 1-2 drive the semiconductor content in the next years
- › AD Level 3-5 will create structural growth long-term

ATV's trendline growth:
~10%

Key take-aways

Infineon enables **clean, safe and smart cars** with its **unparalleled expertise** in process technology, application understanding, quality know-how as well as broadest range of package options.

In addition, Infineon's portfolio ideally fits the fast growing trends of ADAS/AD and xEV. Thus Infineon expects to outgrow the market by targeting **10% revenue CAGR**.

Automated driving requires more sensors and microcontrollers for any next level of automation ensuring redundancy, safety, security, and computing power.

Current consumer trends thwart CO2 emission targets. Hence, near- and mid-term, share of **Electromobility** needs to increase distinctly.

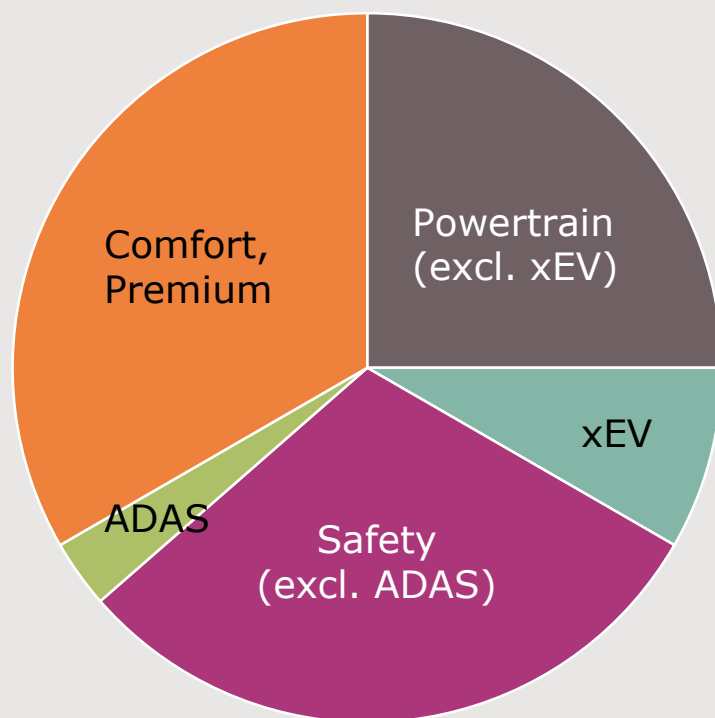


Part of your life. Part of tomorrow.

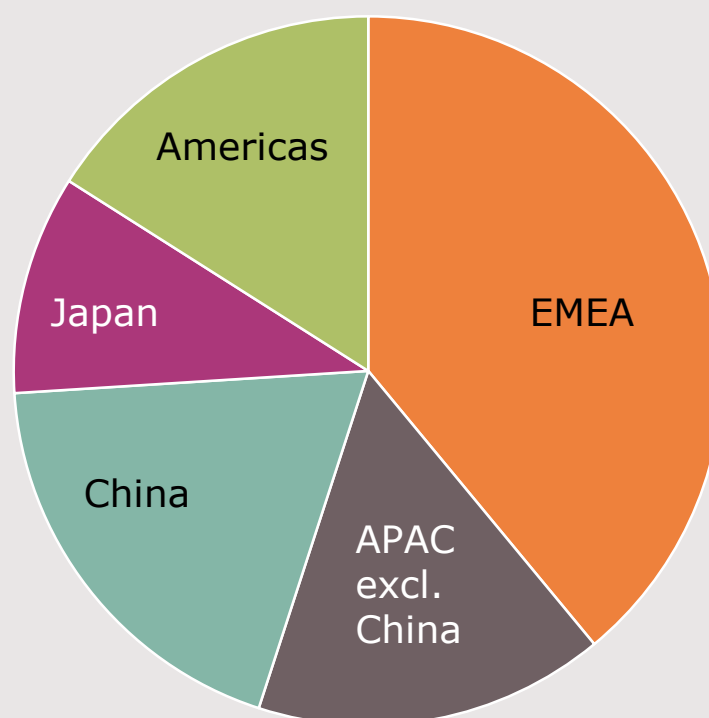


Dashboard

ATV FY17 revenue by application

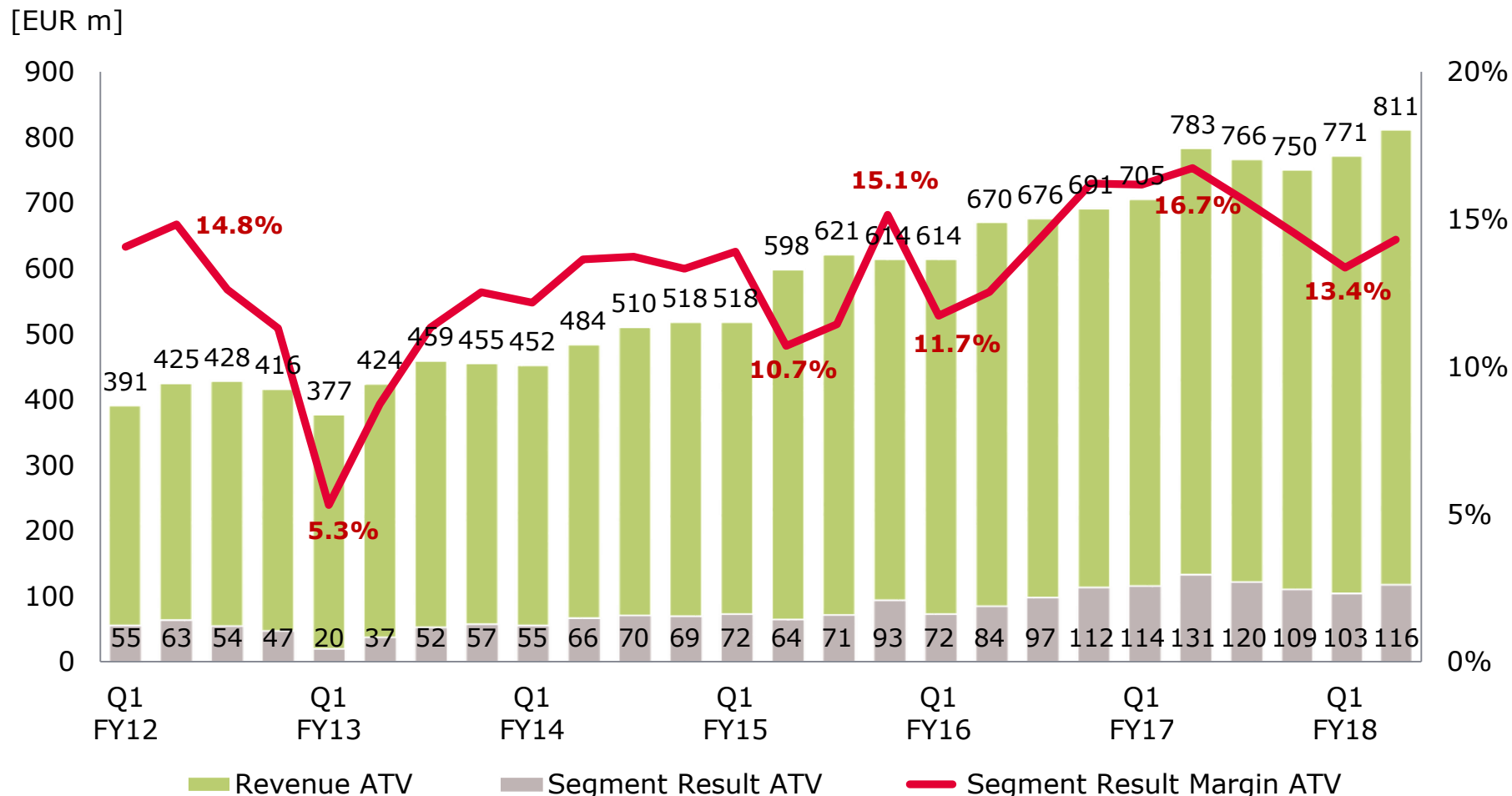


ATV FY17 revenue by region



ATV historic financial figures

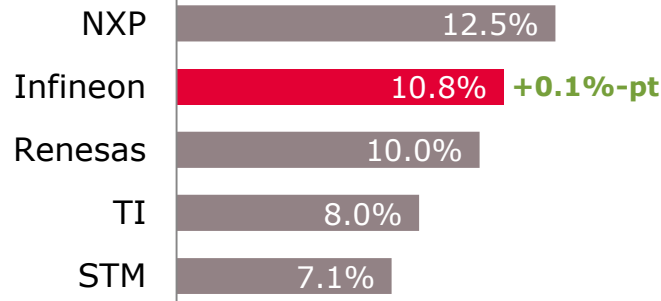
Revenue and segment result development



Infineon is well positioned in its addressed automotive product segments

Automotive semiconductors

2017 total market size: \$34.5bn

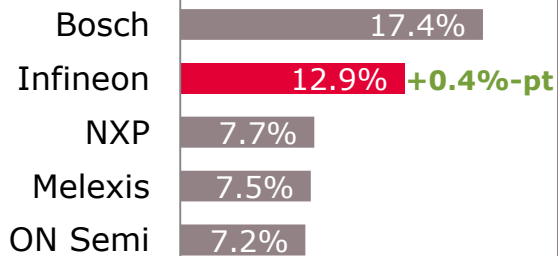


Market share trend

- > Infineon benefits disproportionately from the two mega trends
 - ADAS/AD
 - clean cars

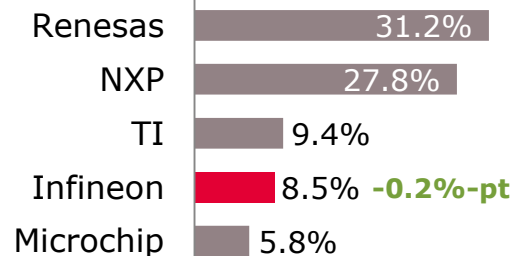


Sensors



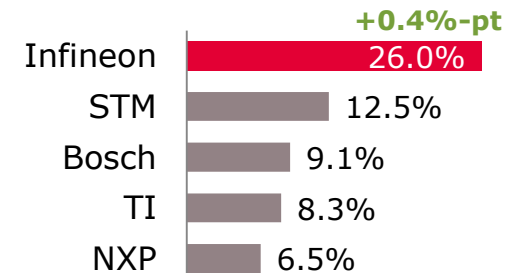
long-term drivers: > 24 / 77 GHz Radar
> Lidar

Microcontrollers



long-term drivers: > ADAS/AD
> Powertrain

Power



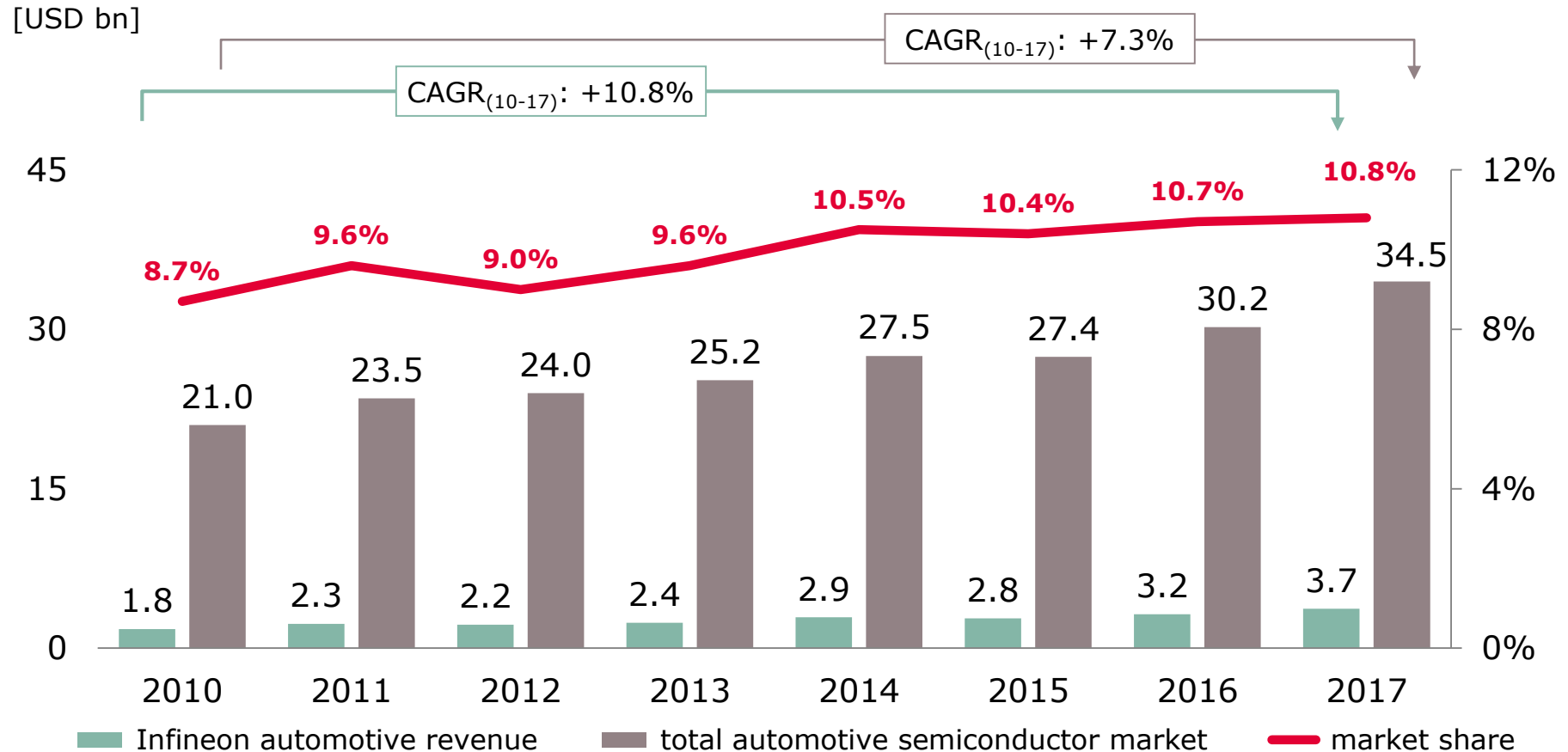
long-term drivers: > xEV penetration
> EPS
> Lighting

Source: Strategy Analytics, "Automotive Semiconductor Vendor Market Shares", April 2018

Infineon is continuously outgrowing the market since 2010



Infineon automotive market share development*



* Infineon automotive revenue as reported to Strategy Analytics incl. revenue from ATV, IPC and PMM. Adjusted to calendar year.
Source: Strategy Analytics, "Automotive Semiconductor Vendor 2017 Market Share", April 2018.

Glossary

AD	automated driving
ADAS	advanced driver assistance system
AEB	automatic emergency braking
EPS	electric power steering
EV	electric vehicle
FHEV	full hybrid electric vehicle
FPGA	field programmable gate array
GaN	gallium nitride
HEV	hybrid electric vehicle
HSM	hardware security module
ICE	internal combustion engine
lidar	light detection and ranging
μC	microcontroller
micro-hybrid	vehicles using start-stop systems and limited recuperation
mild-hybrid	vehicles using start-stop systems, recuperation, DC-DC conversion, e-motor
OBC	on-board charger
PHEV	plug-in hybrid electric vehicle
SiC	silicon carbide
SiGe	silicon germanium
V2X	vehicle-to-everything communication
xEV	all degrees of vehicle electrification (EV, MHEV, FHEV, PHEV)

Peter Schiefer

Division President Automotive



- › since 2016: Division President Automotive
- › Sep 2012: Head of Operations, responsible for Manufacturing, Supply Chain, Purchasing
- › Jan 2012: Division President Power Management & Multimarket
- › 2013 – 2016: Member of the Supervisory Board of Infineon Technologies Austria
- › since 2012: Member of the Supervisory Board of Infineon Technologies Dresden
- › since 2018: Member and Vice Chairman of the Board of Directors of the JV SIAPM (SAIC Infineon Automotive Power Modules (Shanghai) Co. Ltd.)
- › Peter Schiefer was born in Munich, Germany, in 1965. He holds a Diploma in Electrical Engineering from the University of Applied Sciences in Munich.
- › He joined Infineon (Siemens AG until 1999) in 1990.

Disclaimer

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