

Deutsche Bank AutoTech Day

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Division President Automotive

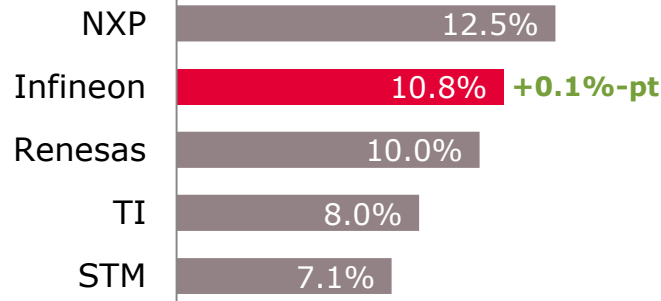
London, 22 June 2018



Infineon is well positioned in its addressed automotive product segments

Automotive semiconductors

2017 total market size: \$34.5bn

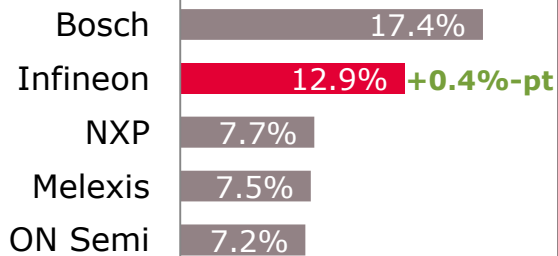


Market share trend

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

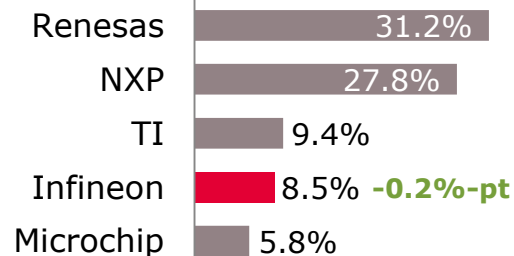


Sensors



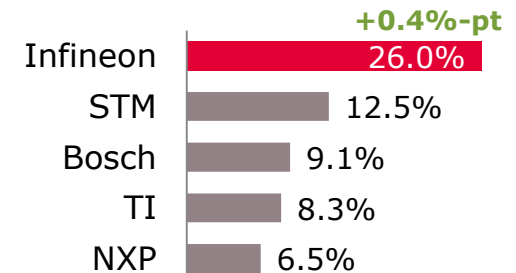
long-term drivers: > 24 / 77 GHz Radar
> Lidar

Microcontrollers



long-term drivers: > ADAS/AD
> Powertrain

Power



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

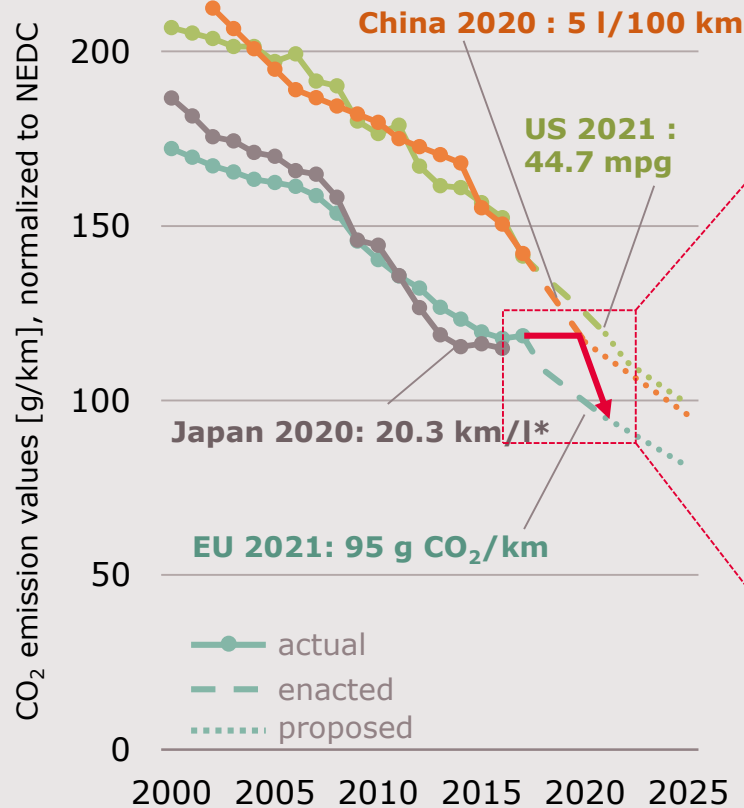
Source: Strategy Analytics, "Automotive Semiconductor Vendor Market Shares", April 2018



Electro-mobility

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

CO₂ emission development and regulations for main regions



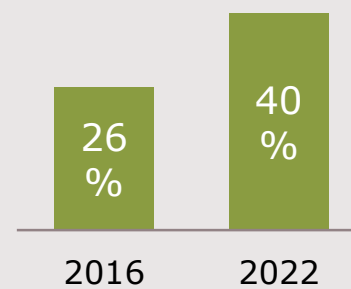
*Note: Japan has already met its 2020 statutory target as of 2013

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

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

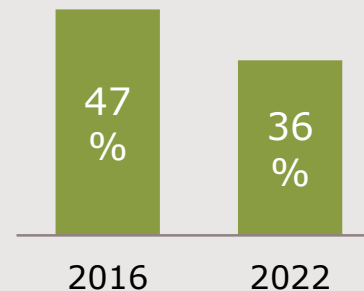
Two consumer trends countervail CO₂ reduction

(1) SUV share of registered cars in Europe¹⁾



> constantly increasing share of heavy ICE SUVs (~150 g CO₂/km) prevents fleet average to come down

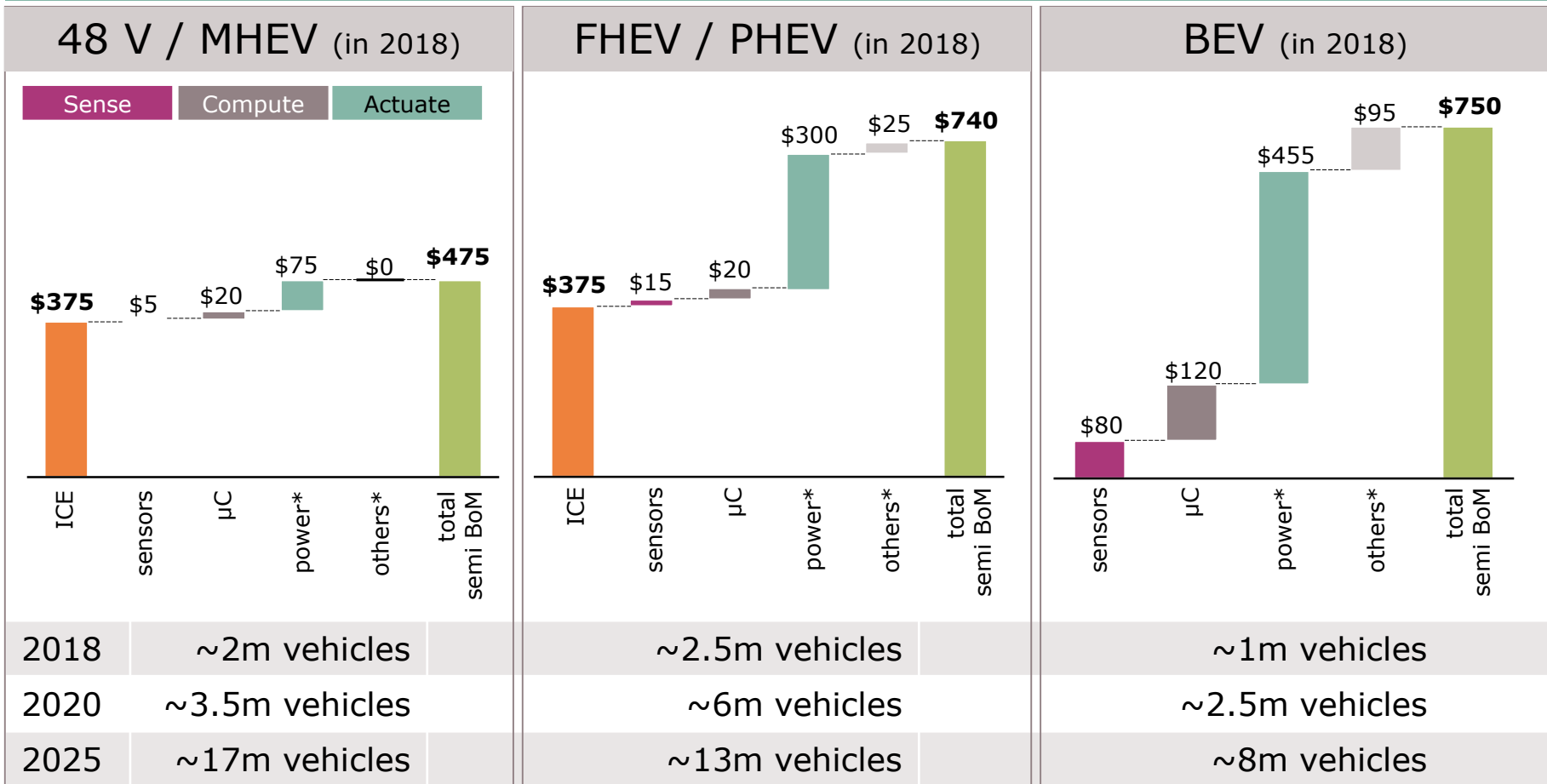
(2) Diesel share of registered cars in Europe²⁾



> Lower positive contribution of Diesel (~15% less CO₂ emissions than gasoline) due to reduced acceptance

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

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



On-board charger

First design-win to ramp in 2019!

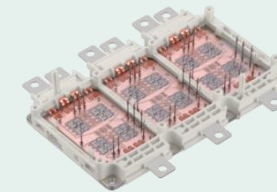


CoolSiC™ Automotive MOSFET



Main inverter

First design-win to ramp in 2020!



HybridPACK™ Drive CoolSiC™

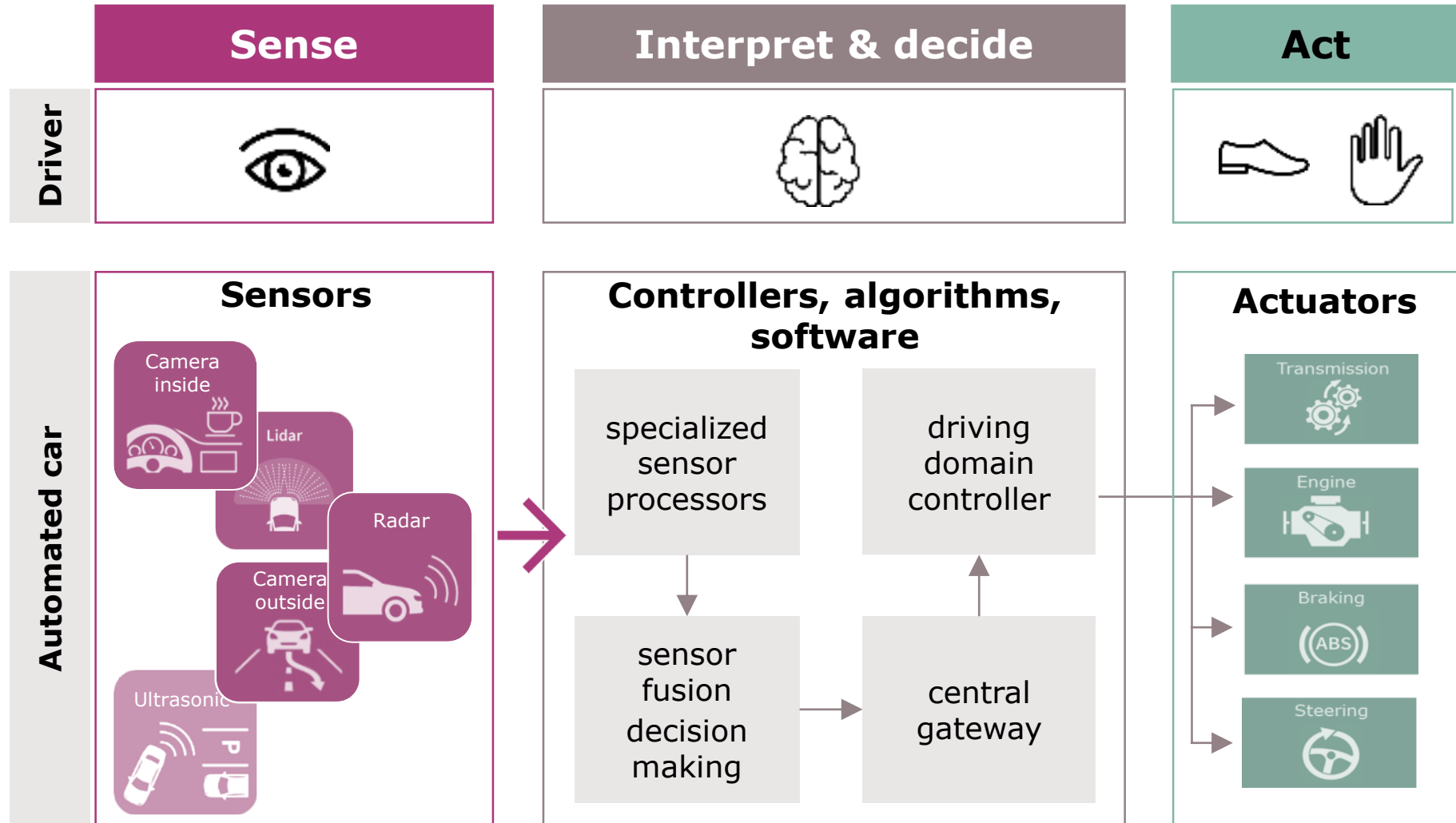
Increased scalability supports OEM platform strategy

- › 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	Corner	MRR/LRR	MRR/LRR
# of modules**	≥ 3 New: Corner starting 2020	≥ 6 Corner	≥ 10 Surround
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



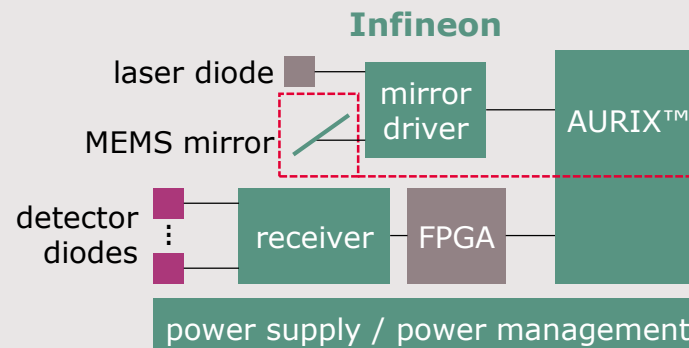
Classification of long-range lidar systems

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"> ⊕ entire situation captured in real-time ⊖ more complex laser system (more expensive, higher power demand) 	<ul style="list-style-type: none"> ⊕ robust signal path ⊕ more compact and cost-effective ⊕ roadmap for higher level of integration ⊖ more complex to scale field of view

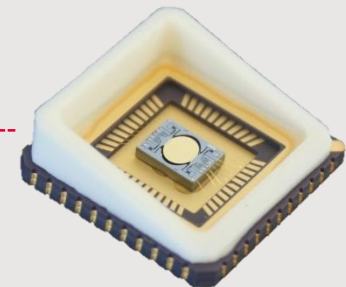


- › Lidar is Infineon's AD portfolio expansion adjacent to radar
- › Infineon intends to repeat its radar success story
- › In addition to MEMS, room to increase BoM by receiver, microcontroller, power management ICs

1st System reference design



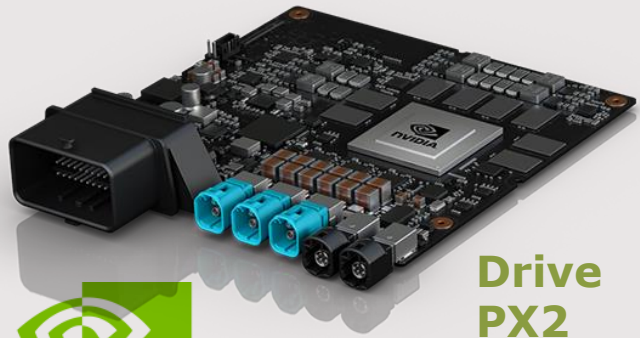
MEMS mirror



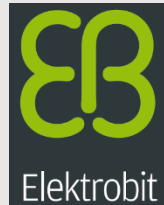
Outstanding characteristics make AURIX™ first-choice μ C in the AD platform market



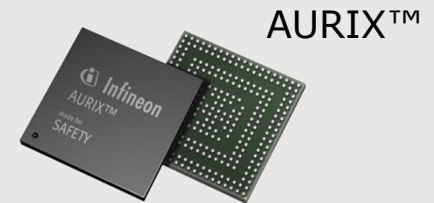
AURIX™ is the market reference as host controller in central computing platforms complementing CPU/GPU to make central computer robust and fail operational



Go™ Automated Driving Platform with AURIX™



EB robinos



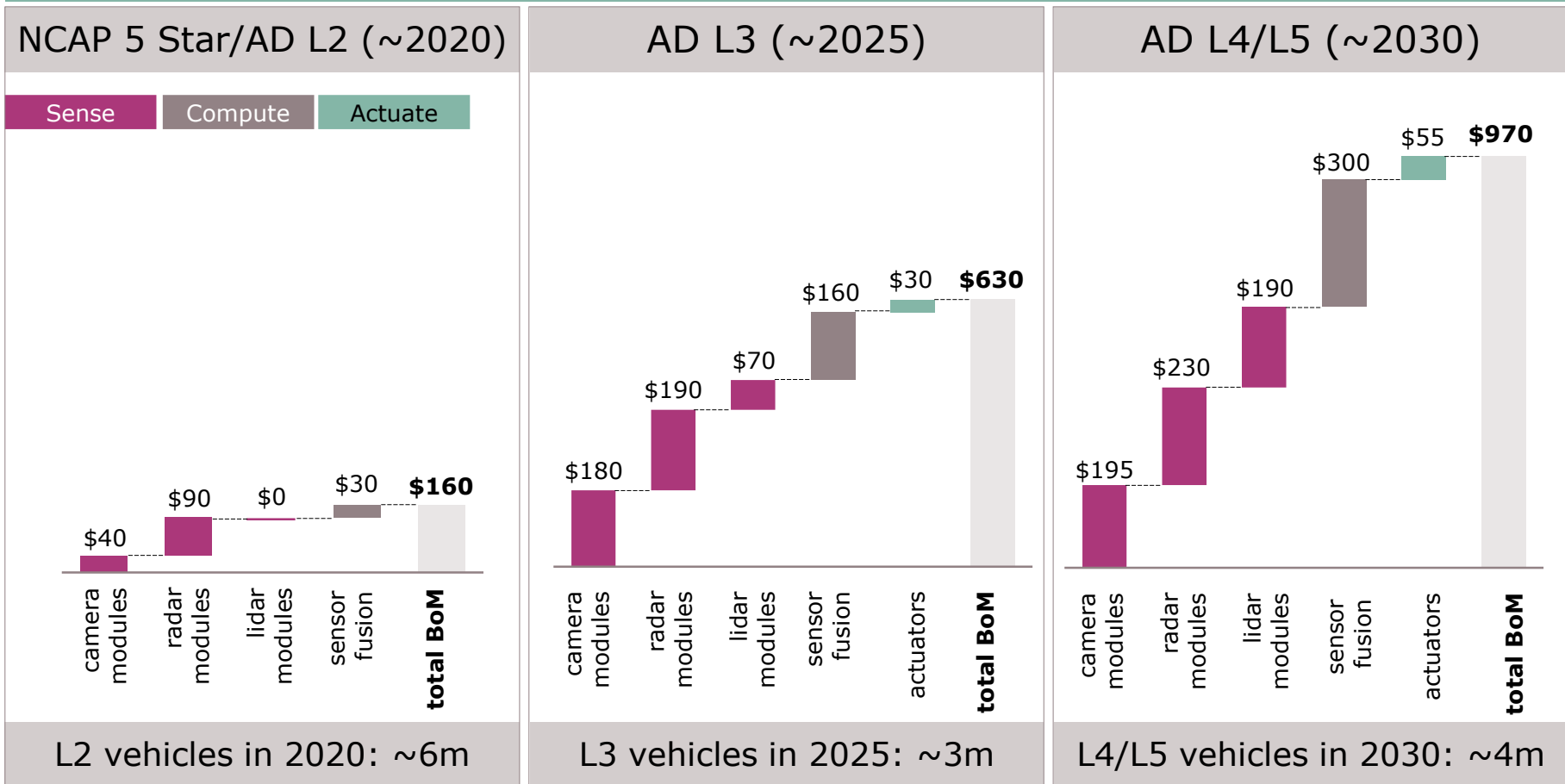
AURIX™

- › 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

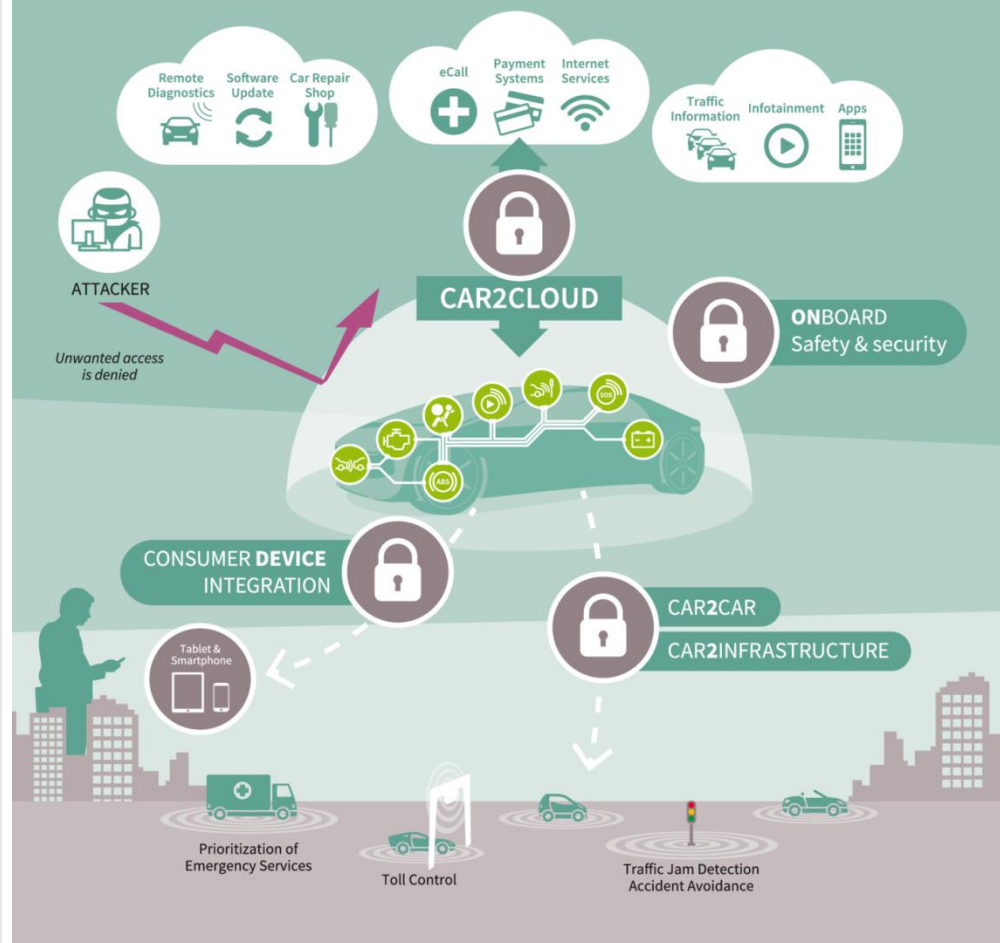
Bill of material (BoM) contains all type of semiconductors (e.g. radar modules include μ C); sensor fusion does not include memory

BoM are projected figures for the respective time frame

Security is a system approach

- › As humans, machines, 'things' are getting connected, the risks of security attacks increase strongly as attacks paths increase
- › Accordingly, there is a greater need for security in fields like smart home, connected cars, information and communication technologies, Industry 4.0
- › Many manufacturers of devices and systems do not have the necessary security know-how

Example: Automotive Security





Part of your life. Part of tomorrow.

