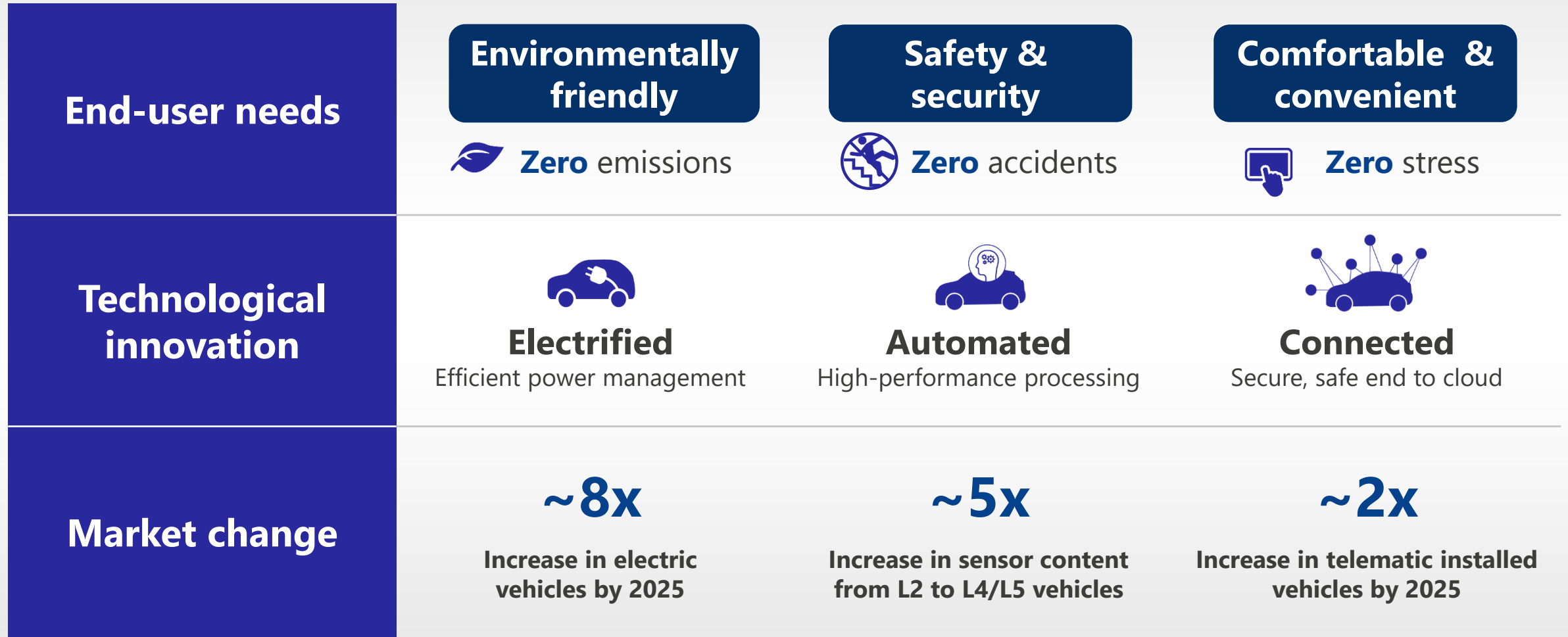


AUTOMOTIVE STRATEGY

FEBRUARY 17, 2020
AUTOMOTIVE BUSINESS SOLUTION UNIT
RENESAS ELECTRONICS CORPORATION

OVERALL

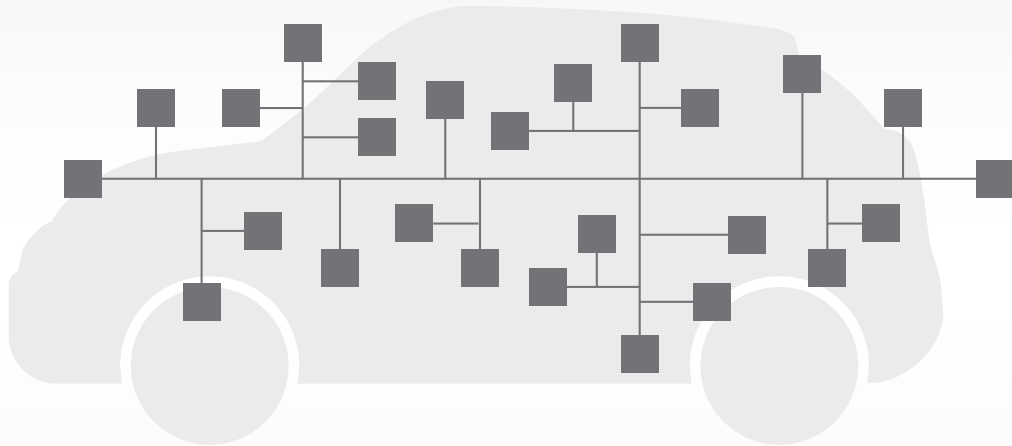
MEGATRENDS – FROM NEEDS TO MARKET CHANGE



Source: Strategy Analytics data

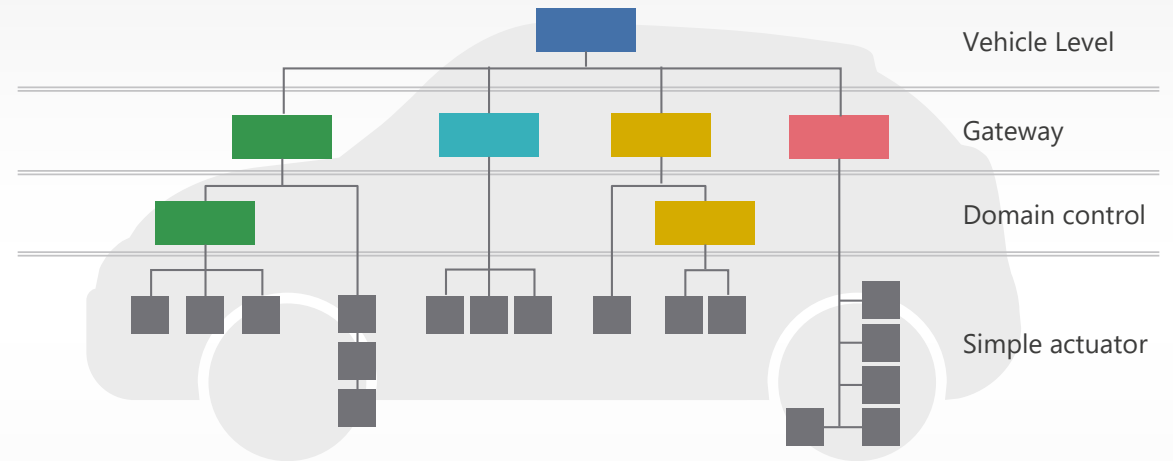
MEGATREND – ARCHITECTURE TRANSFORMATION

TODAY - Distributed architecture



- Increasing hardware varieties
- Increasing lines of code in vehicle
- Inefficient development
- Security & functional safety challenges
- Not easily upgraded or scaled

TOMORROW - Centralized architecture



- Scalable and easy to develop hardware
- Reusable software
- Efficient to develop
- Safe and redundant network
- Upgradable and scalable platform

2016 MID-TERM GROWTH STRATEGY REVIEW

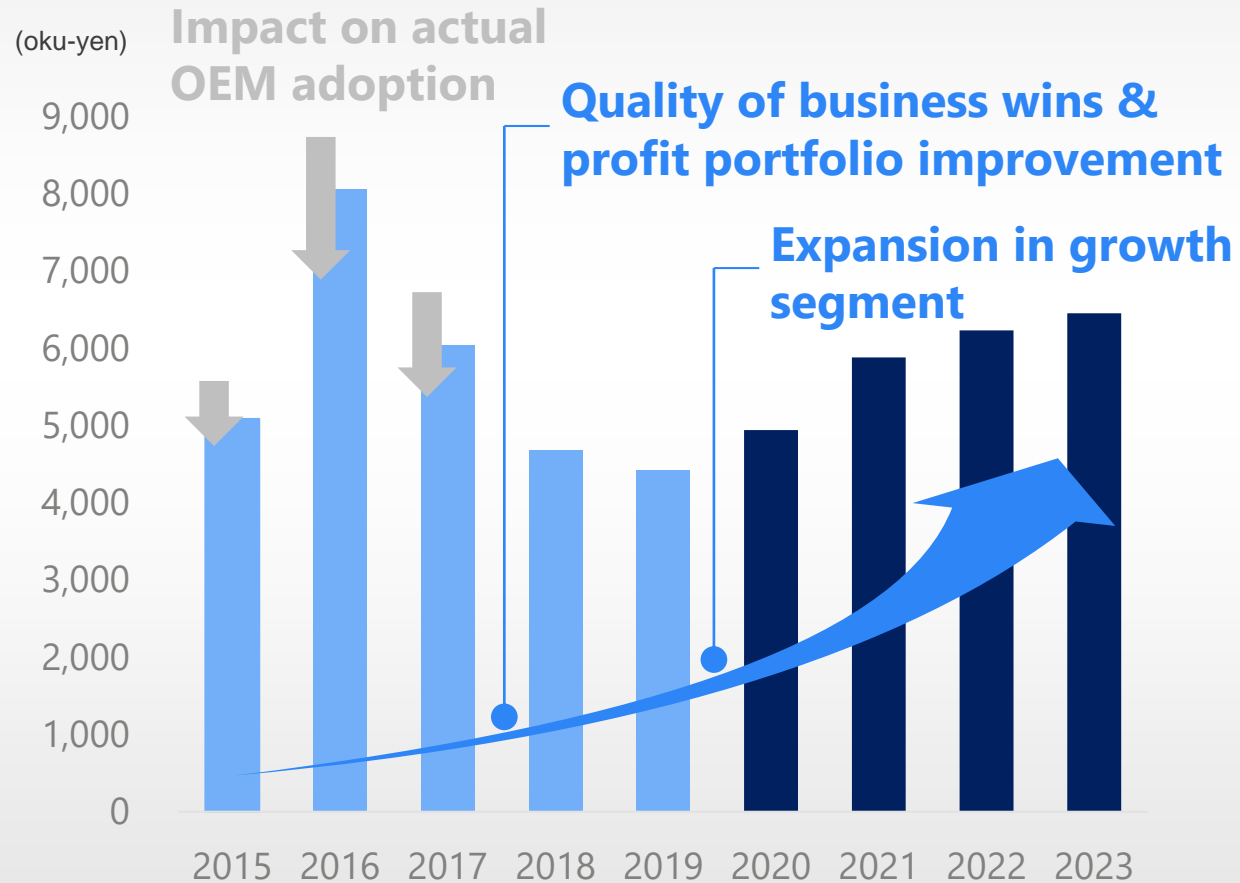
	Result	New guiding principle
Profitability	<ul style="list-style-type: none"> ▪ Short fall in GM ▪ Excessively optimistic Fab utilization 	<ul style="list-style-type: none"> ▪ Optimize fab utilization ▪ High added value solution transition
Design in (D-in)	<ul style="list-style-type: none"> ▪ Accumulation of a mountain of D-in ▪ Low quality of D-in 	<ul style="list-style-type: none"> ▪ Select high confidence business ▪ Strengthen strategic OEM relationship
Solution	<ul style="list-style-type: none"> ▪ Product-orientated ▪ Insufficient solution offering 	<ul style="list-style-type: none"> ▪ Enhance product combination ▪ Synergy with Intersil /IDT product



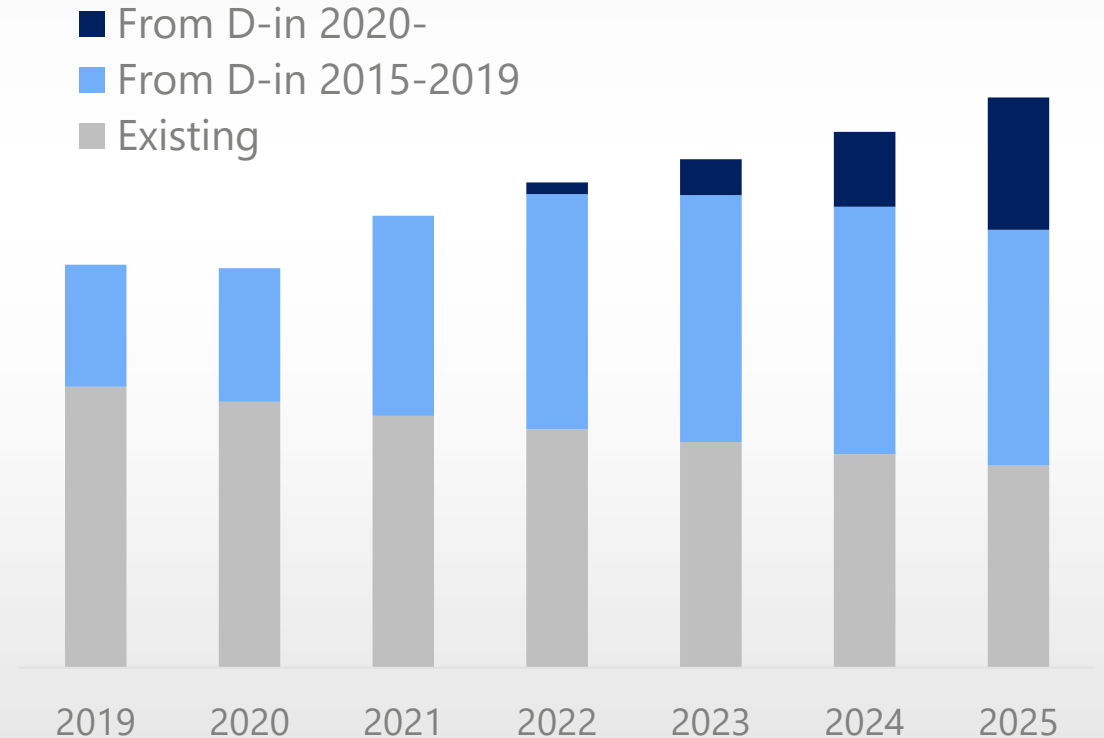
Pursue balanced biz growth & profitability

PROSPECT OF D-IN TO REVENUE CONVERSION

D-in LTV



D-in to revenue conversion



* FX 2019: Actual record, 2020:1USD=100yen, 1EUR=110yen, 2021-2025: 1USD=100yen, 1EUR=120yen

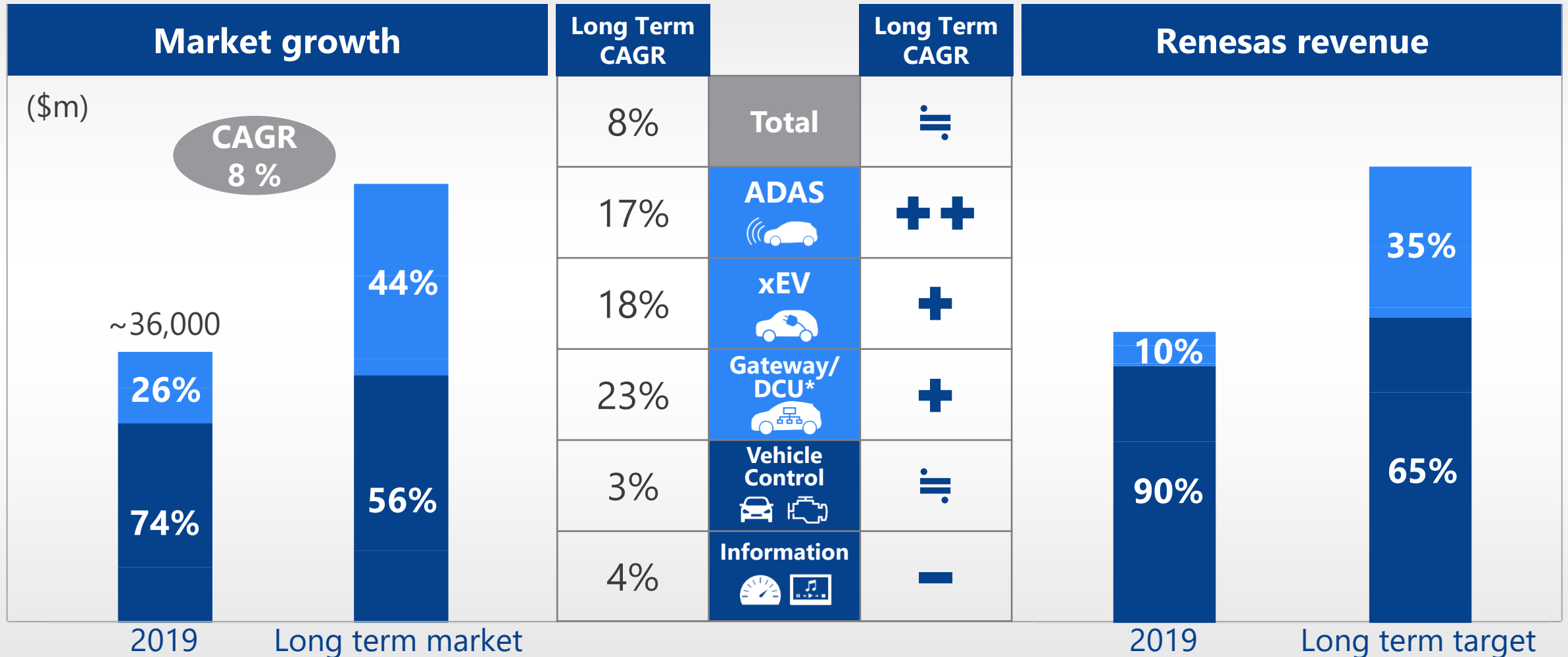
TARGET FINANCIAL MODEL

	2019 Adjusted*		Long-term target*
Revenue	3,330 oku-yen	➤	Grow @SAM
Gross margin	< 40%**	➤	40 - 45%
Operating margin	< 10%	➤	10 - 15%

* FX 1USD=100yen, 1EUR=120yen. Continuing business only

** After reclassification (part of SG&A reclassified to CoGs and R&D)

PORTFOLIO EXPANSION BY MARKET GROWTH DRIVER



Source: Strategy Analytics data ,SAM defined by Renesas *DCU: Domain Control Unit

VALUE PROPOSITION

Open



Scalable & Reusable assets & **Open Platform**
accelerating time to market

Trusted



Automotive safety & **Long-term commitment**
to customer

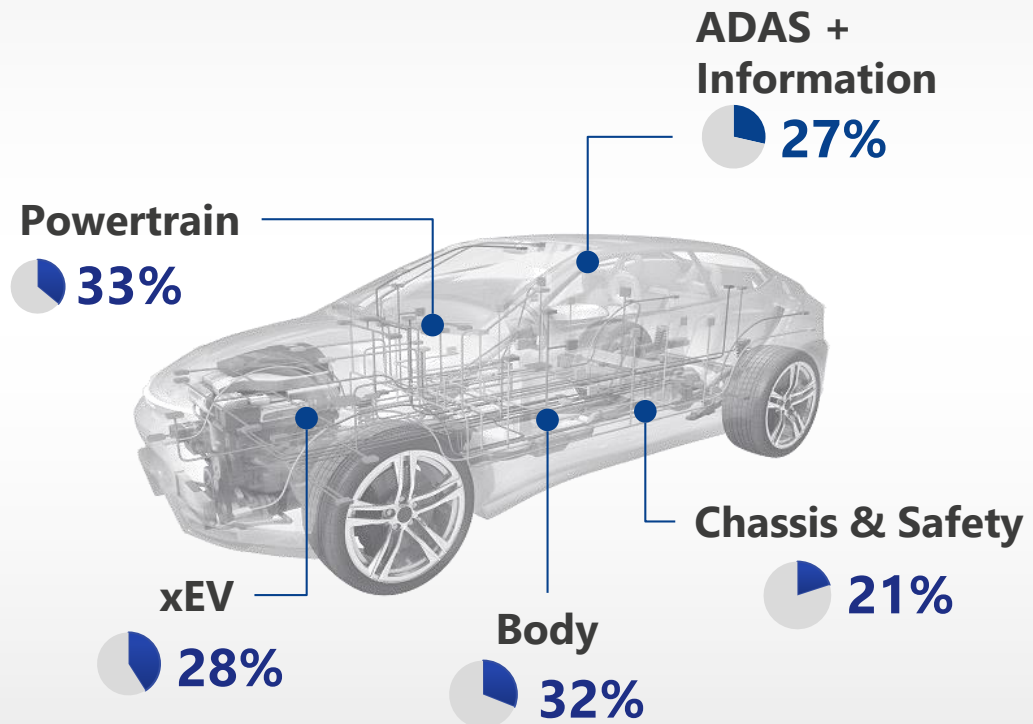
Innovative



End point computing & **Power consumption**
suitable for mass production

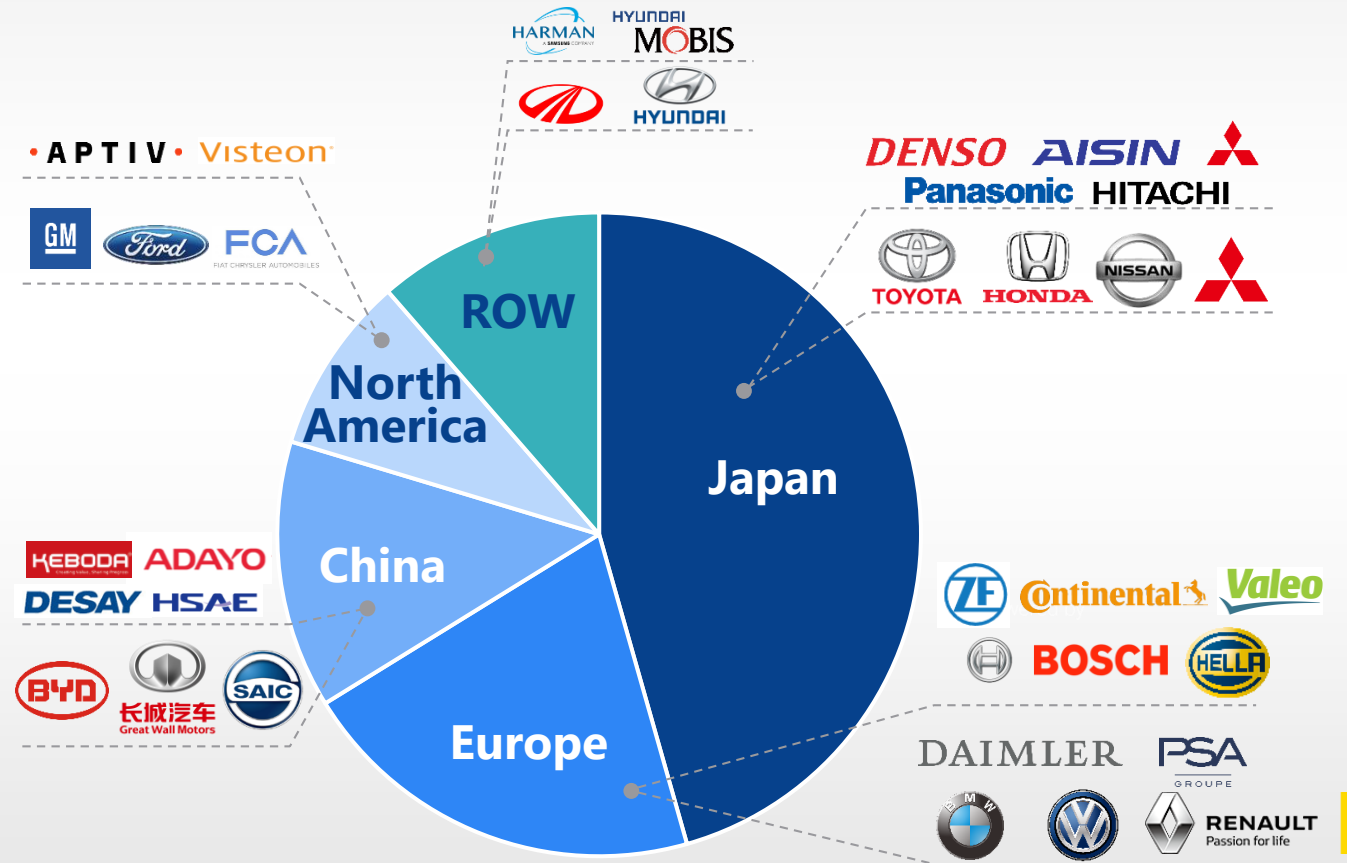
OUR FOOTPRINT

Market share in Auto MCU/SoC (2018)

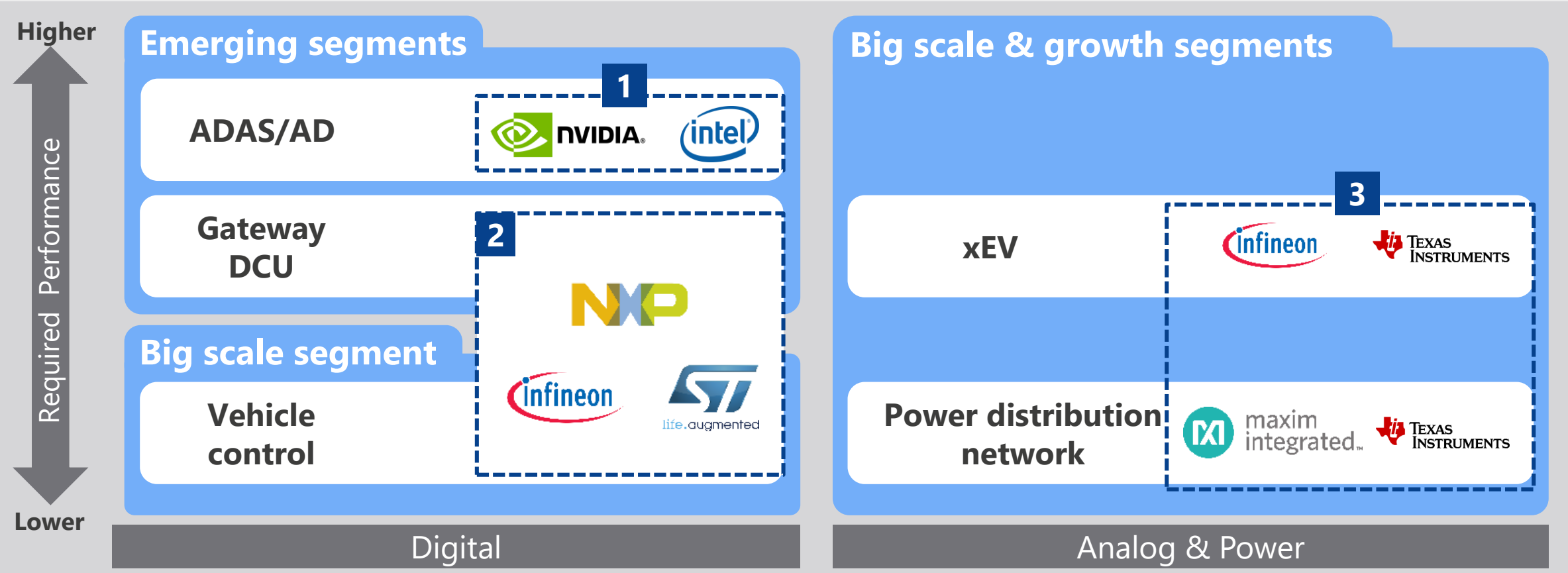


Source: Renesas estimate based on Strategy Analytics data

Revenue by region (2018)



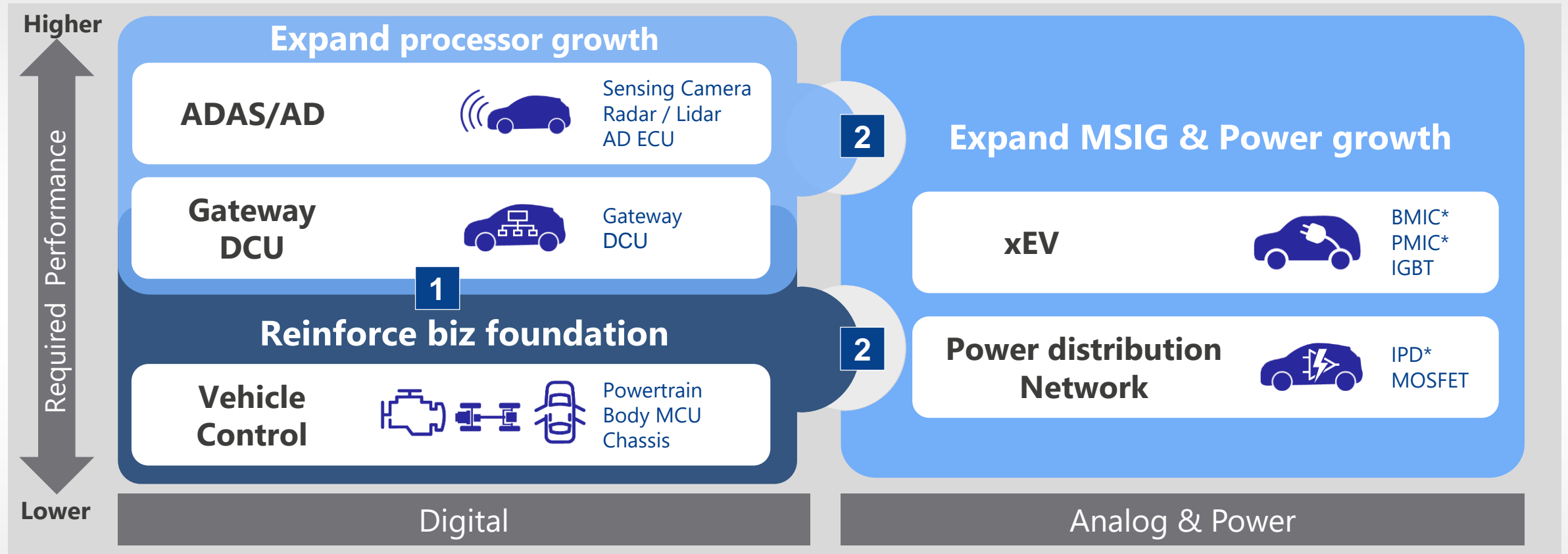
OUR COMPETITORS



- 1** New competitors enter ADAS/AD
- 2** Old rivals who have been fighting for years

- 3** Existing proven players waiting on sidelines

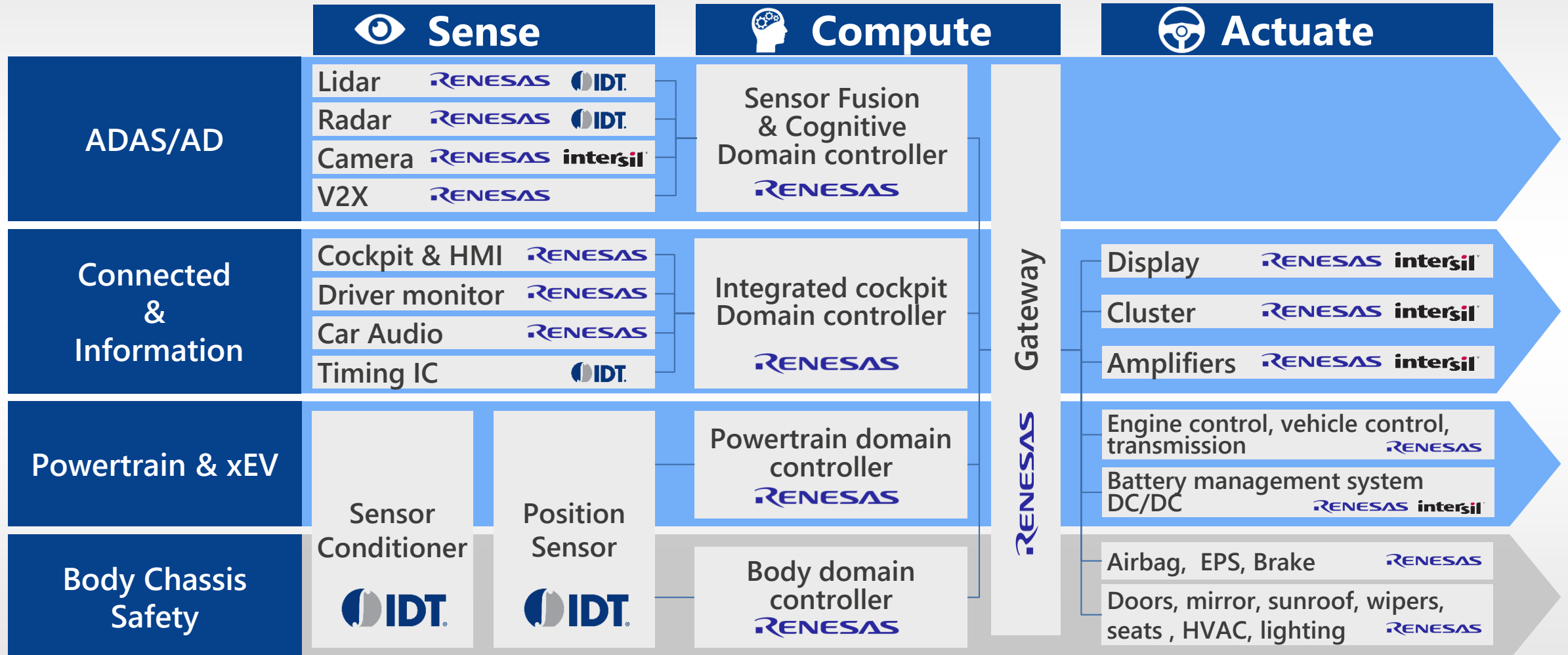
HOW WE WIN - GROWTH STRATEGY



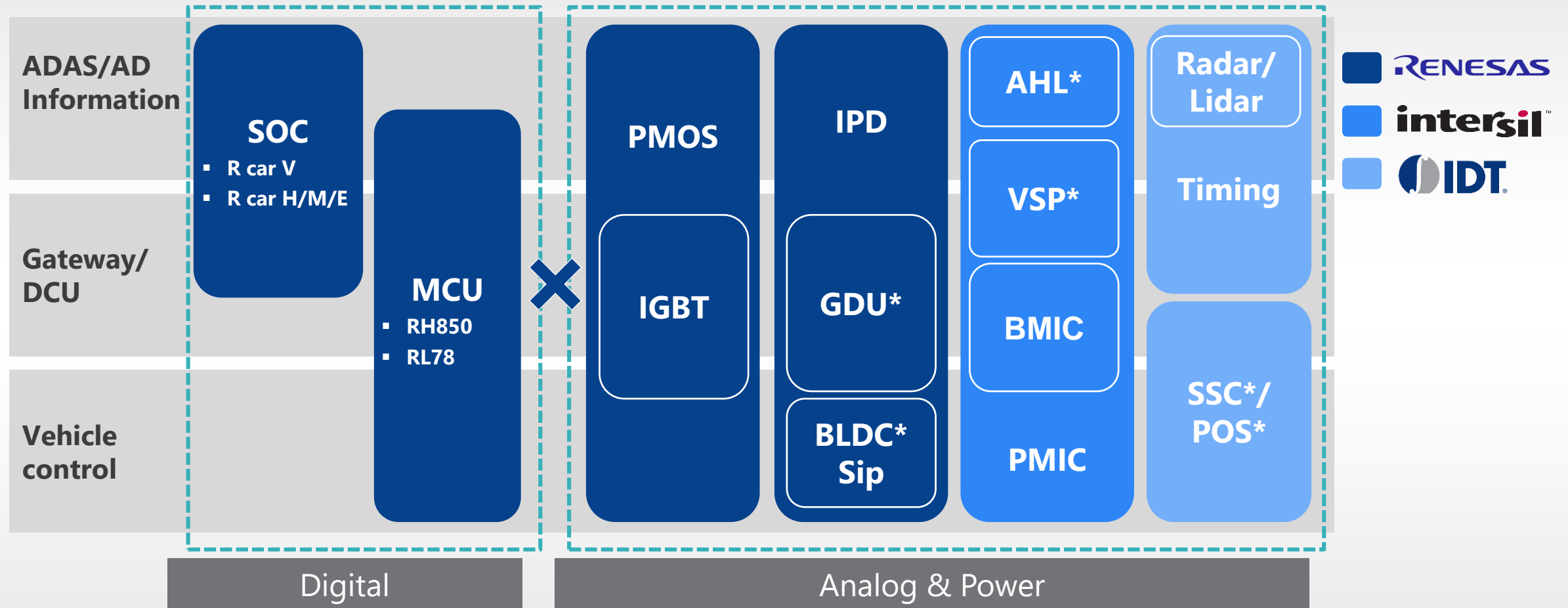
- 1** Expand scalability with reusable processor & functional safety/security knowledge
- 2** Leverage system solution based on processor footprint to capture MSIG & Power

*BMIC : battery management IC / PMIC : Power management IC / IPD : Intelligence power device

HOW WE WIN - SYSTEM-LEVEL & END-TO-END SOLUTION

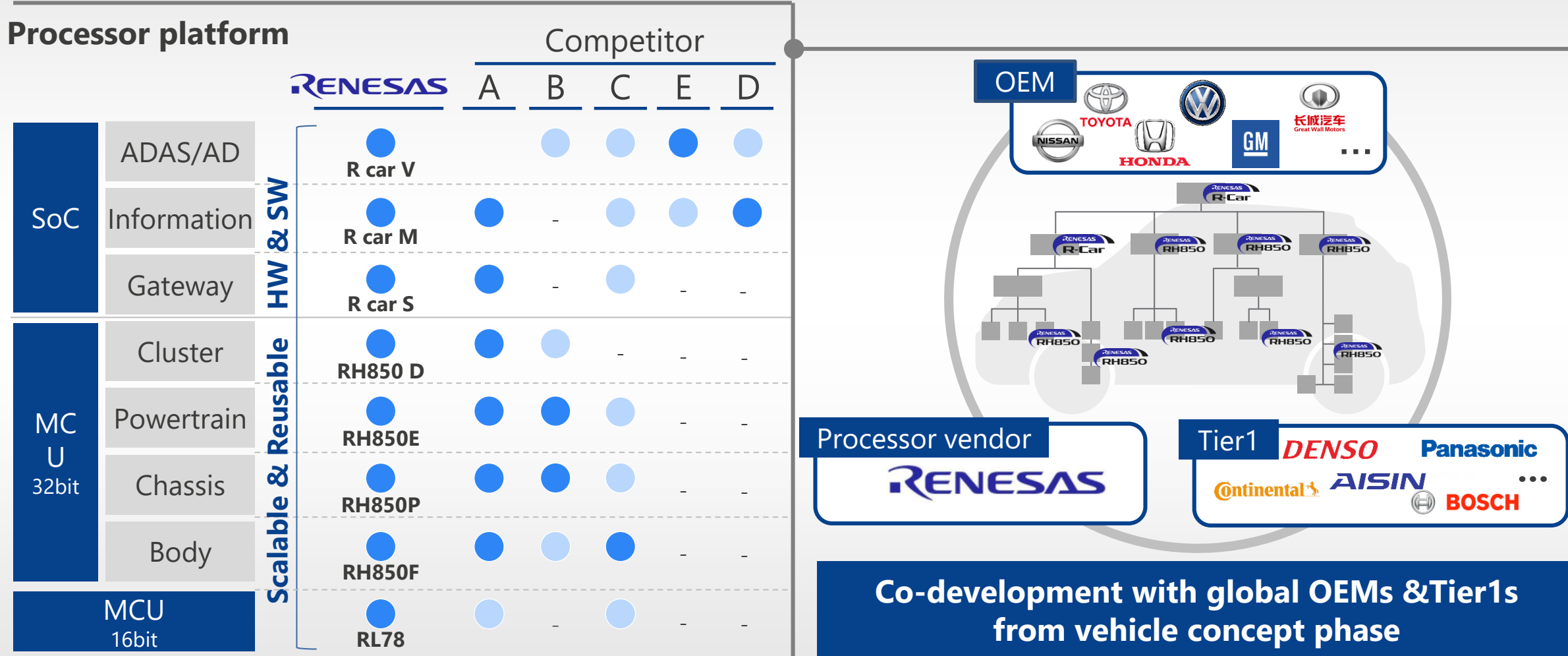


HOW WE WIN – WINNING COMBINATIONS



*AHL: Automotive HD Link / VSP: Video Signal Processor / GDU: Gate Driver Unit / BLDC: Brushless Direct Current / SSC: Sensor Conditioner / POS: Position sensor

HOW WE WIN – #1 PRODUCT SCALABILITY

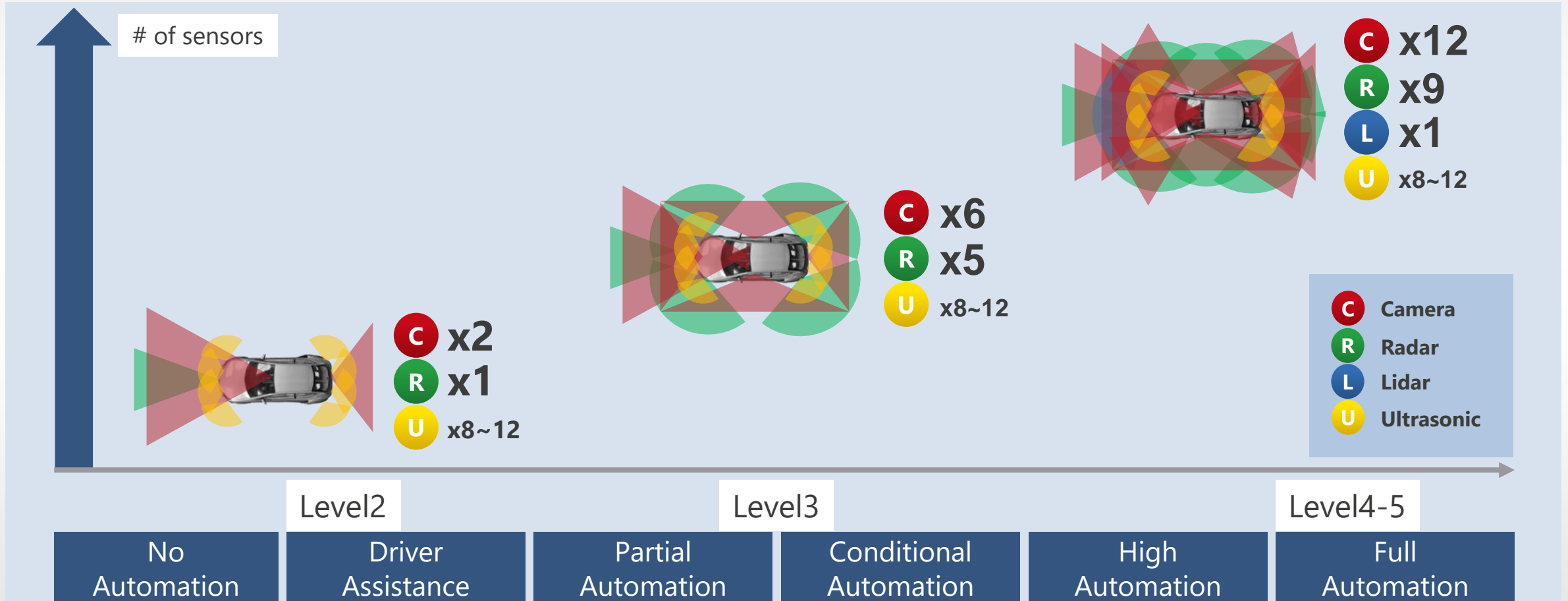


DIGITAL

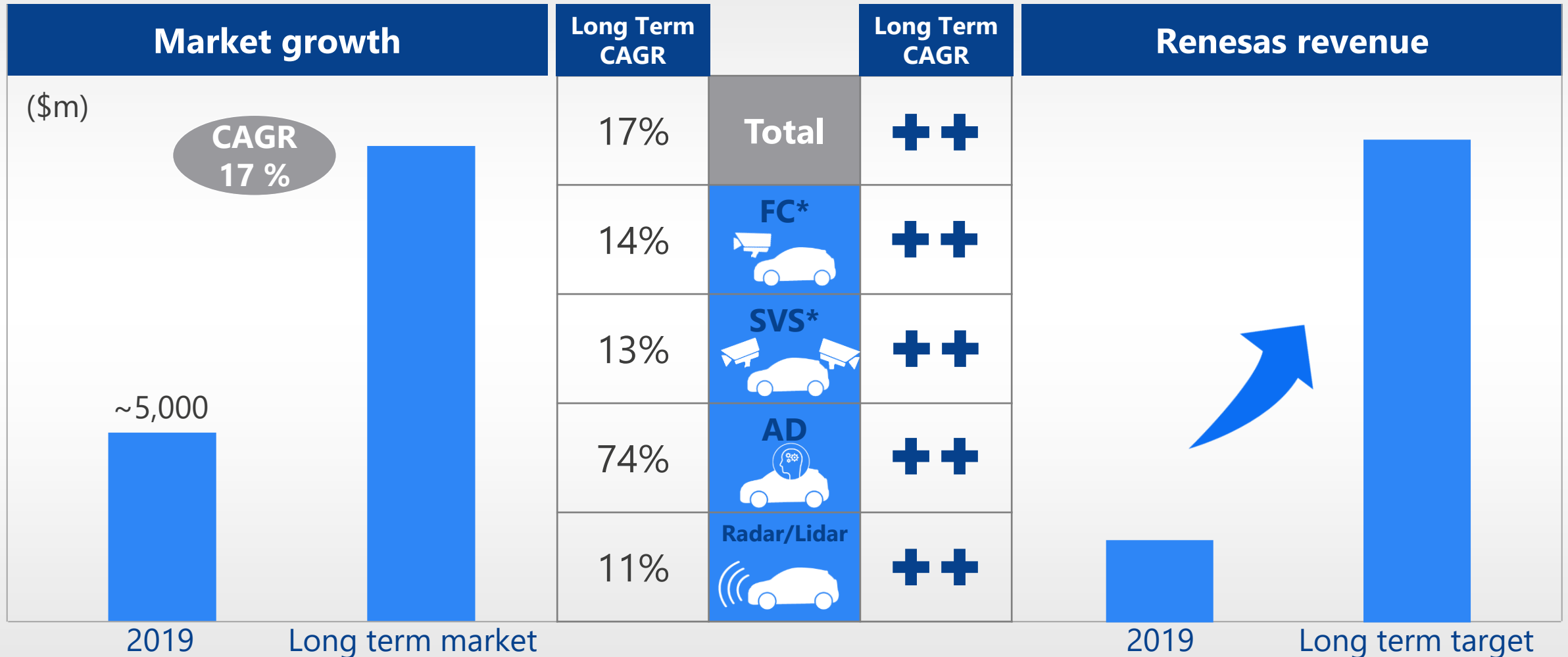
ADAS

ADAS/AD SYSTEM TREND

More cars with sensors, more sensors per car, more high-performance processors



ADAS/AD GROWTH OUTLOOK

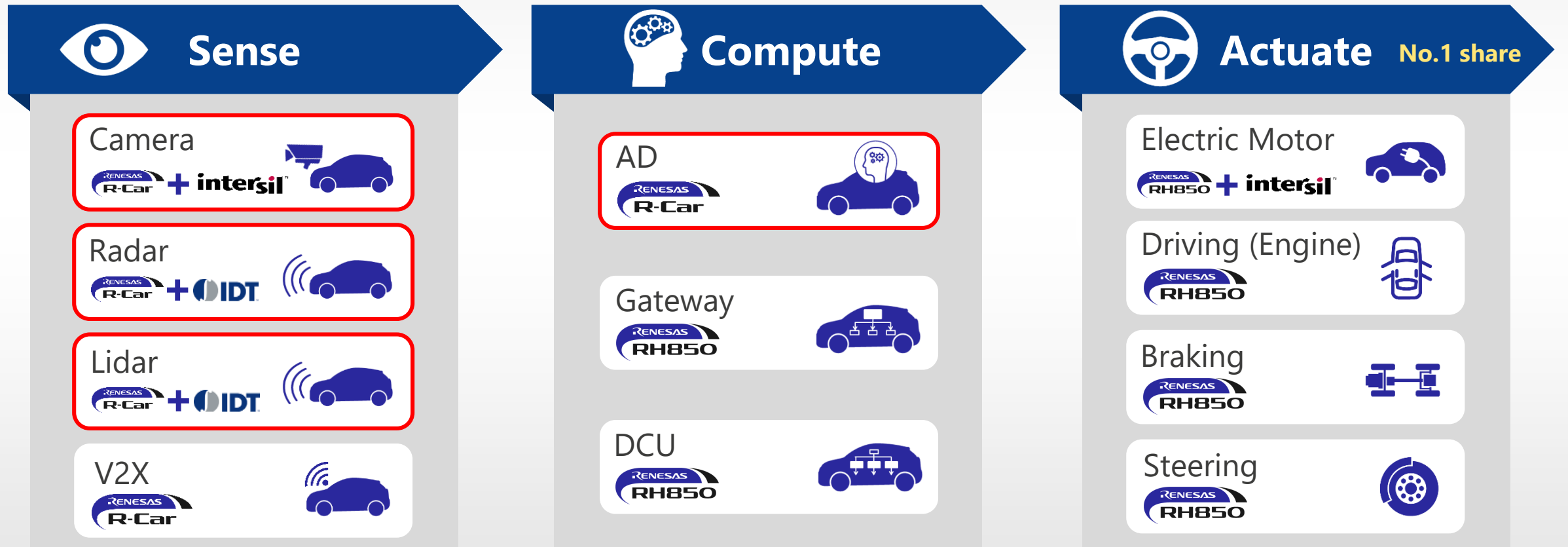


*FC: Front Camera / SVS : Surround View System

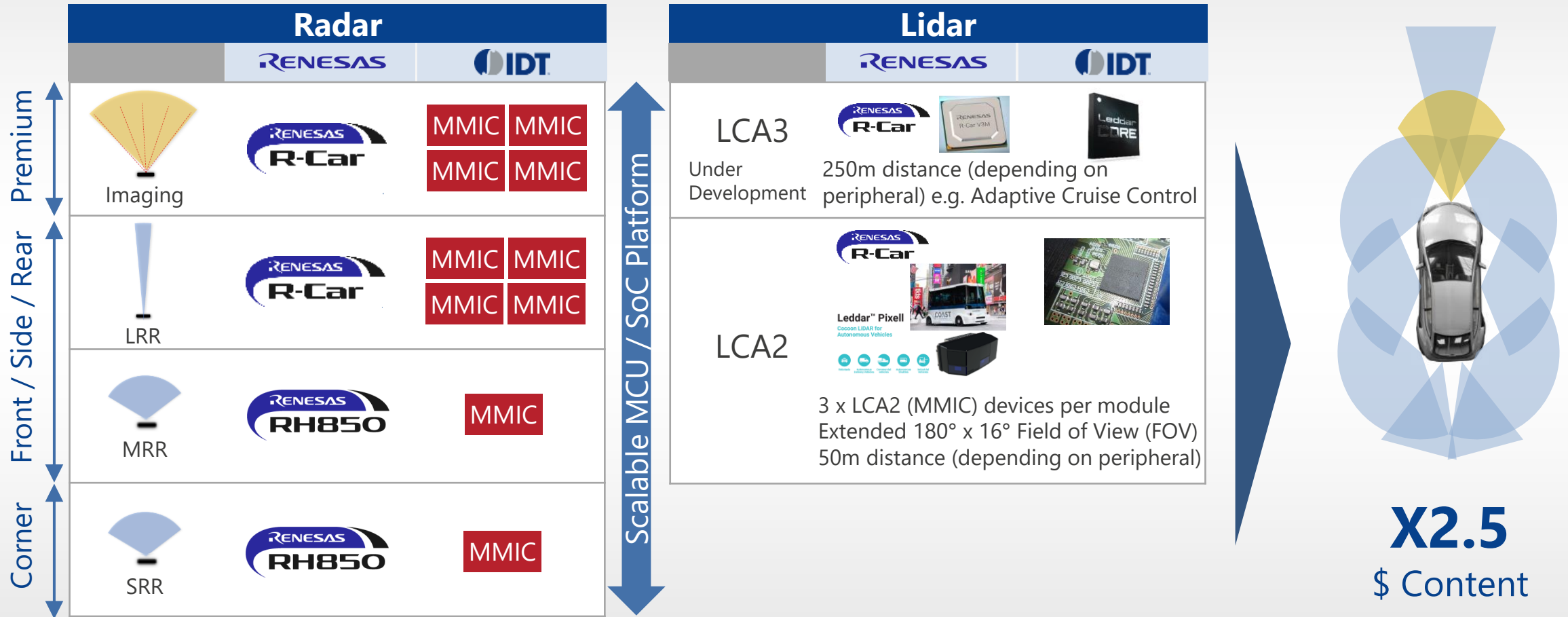
Source: Strategy Analytics data ,SAM defined by Renesas

HOW WE WIN - EXPANDING ADAS/AD PRODUCT PORTFOLIO

- Launching camera and cognitive mass production for major Tier1s/OEMs
- Expanding Radar/Lidar by combination R-Car Digital Processors and IDT Analog products

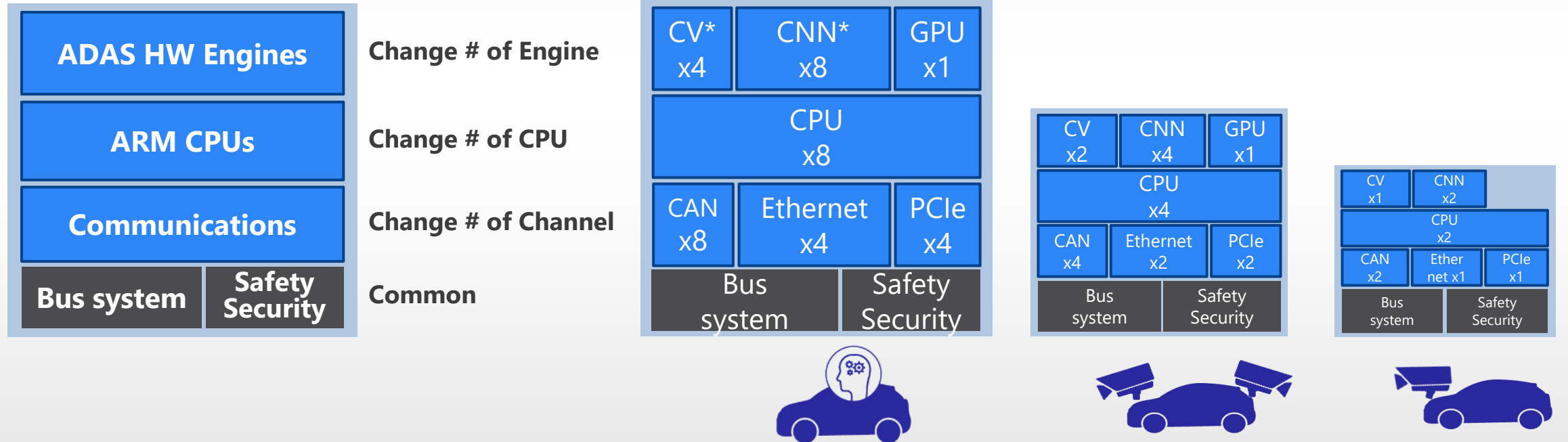


DIGITAL & ANALOG VALUE FOR RADAR/LIDAR



HOW WE WIN - SCALABILITY FOR SW DEVELOPMENT

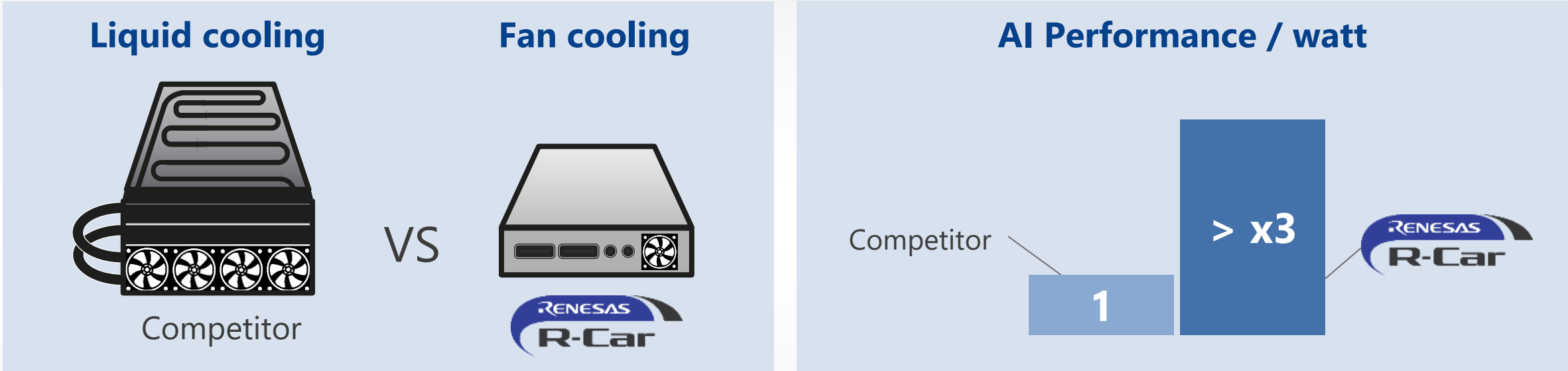
ADAS/AD PF maximizes customer SW reuse across ADAS applications



*CV: Computer Vision / CNN: Convolution Neural Network

HOW WE WIN - LOW POWER CONSUMPTION W/ R-CAR

Providing the best in class saves cooling cost and AI performance / watt



More cost competitive

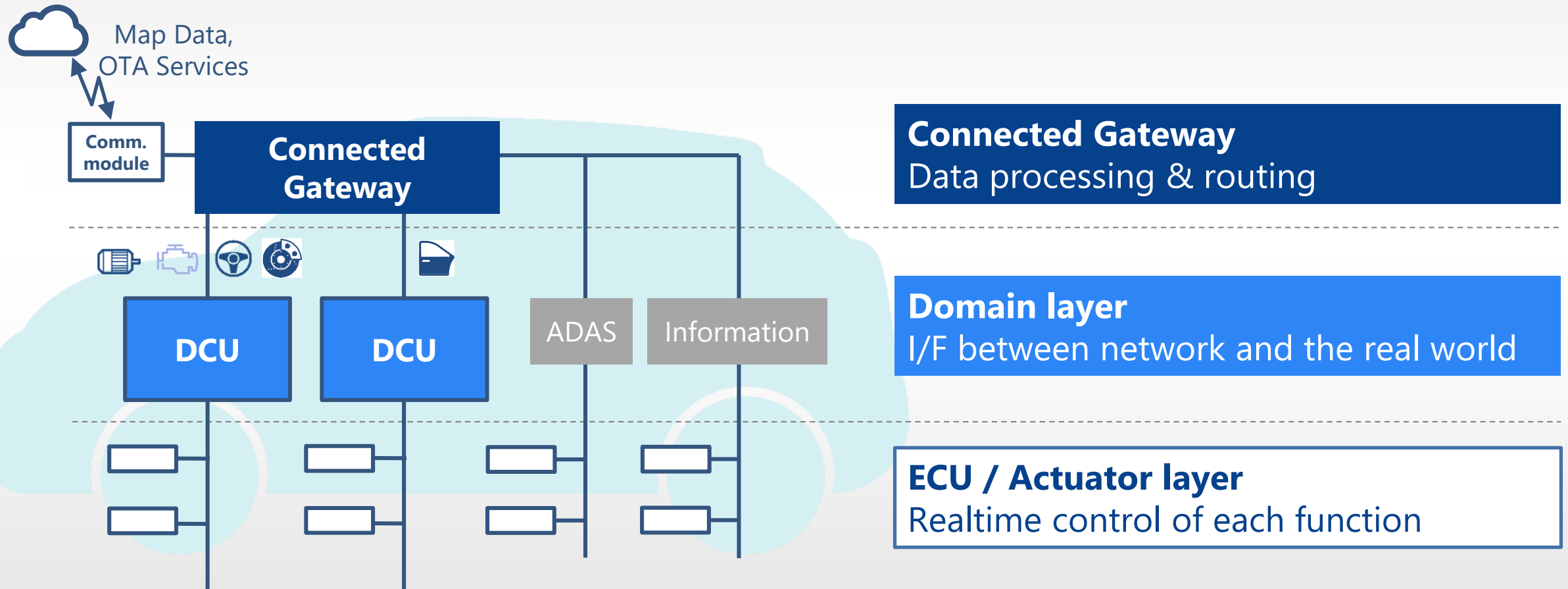
Less space and weight

More fuel efficient

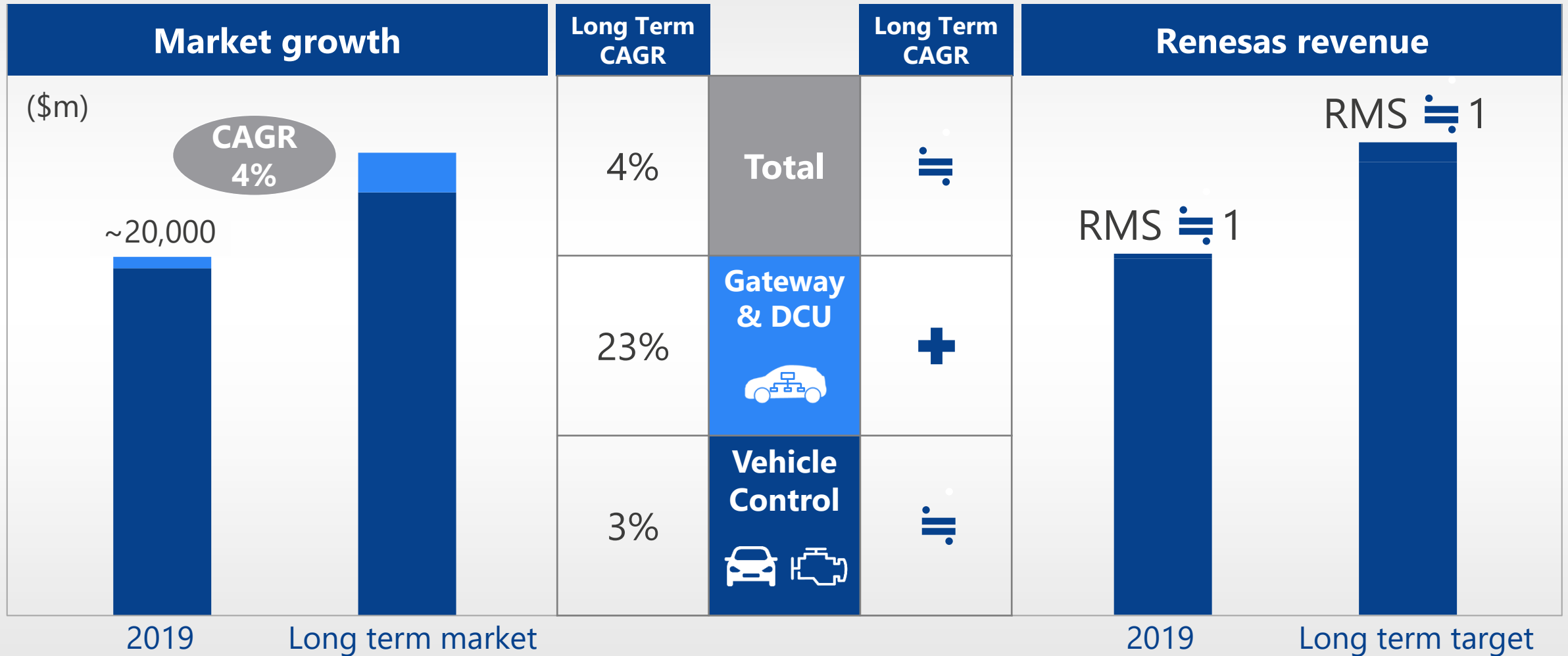
DOMAIN CONTROL UNIT (DCU) & GATEWAY

E/E ARCHITECTURE TRENDING TOWARDS "C A S E"

Connected Gateway and DCU to play key role for "C A S E" implementations



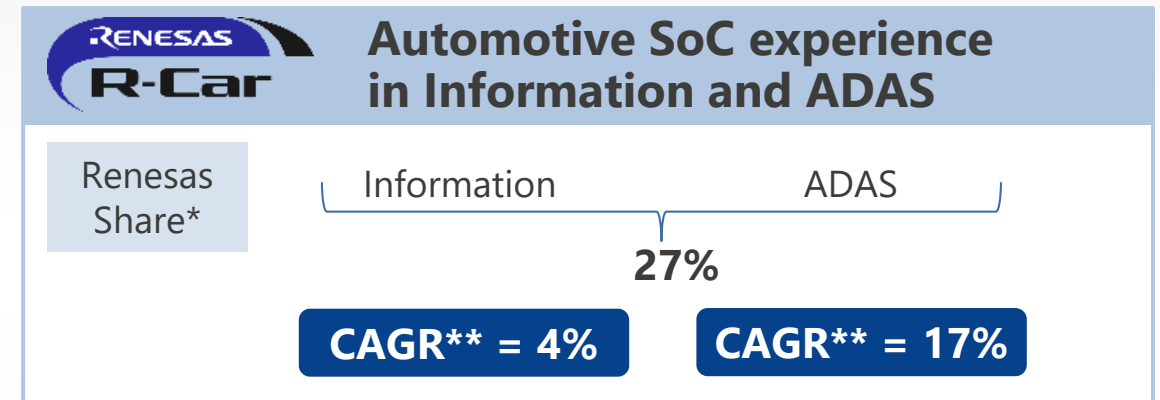
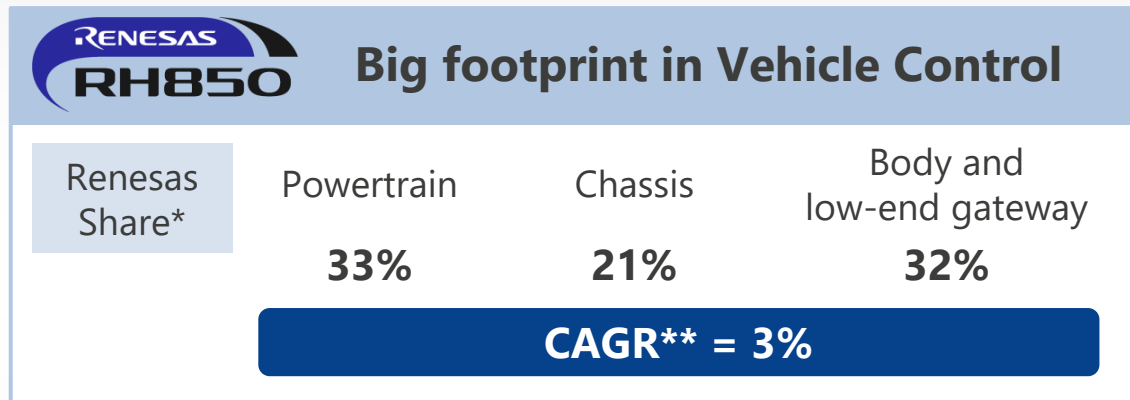
DCU & GATEWAY GROWTH OUTLOOK



Source: Strategy Analytics data ,SAM defined by Renesas

HOW WE WIN - GROWTH STRATEGY FOR DCU & GATEWAY

Enhancing our footprint in Gateway & DCU with wide Automotive portfolio across MCU & SoC, with strong RH850 Software assets in Vehicle Controller market



- SW Scalability
- Automotive Quality

Gateway & DCU
CAGR = 23%
(Long term market)

- Security IP
- Network IP Accelerator IP

* Digital only ** Long term market

HOW WE WIN - SOFTWARE SCALABILITY

- Automotive Software > 100,000,000 Lines of code
- R-CAR and RH850 Software scalability to reduce OEM/Tier1's Software development cost

		Within generation		From generation to generation	
		Within application	Across application		
ADAS/AD	R-CAR V	75%~95%	30~40%	45~60%	70%~80%
Information	R-CAR H/M/E			60~70%	
Gateway & DCU	R-CAR(New) RH850				
Vehicle Control	RH850				
Competitor A:		●	●	No scalable asset	
Competitor B:		● Limited Scalability (Only MCU)		●	
Competitor C:		●		●	

BUSINESS FOUNDATION ON DCU & GATEWAY

Continuously winning the new opportunities in DCU and Gateway

Major D-in in 2019

DCU



**Cross Domain
MCU Platform**

Standard MCU platform for
major tier1s
(mainly for DCU &
Powertrain)

Gateway



**Connected Gateway
Controller (SoC)**

Major OEM's gateway
controller for 2021
start of production
(at multiple Tier1s)



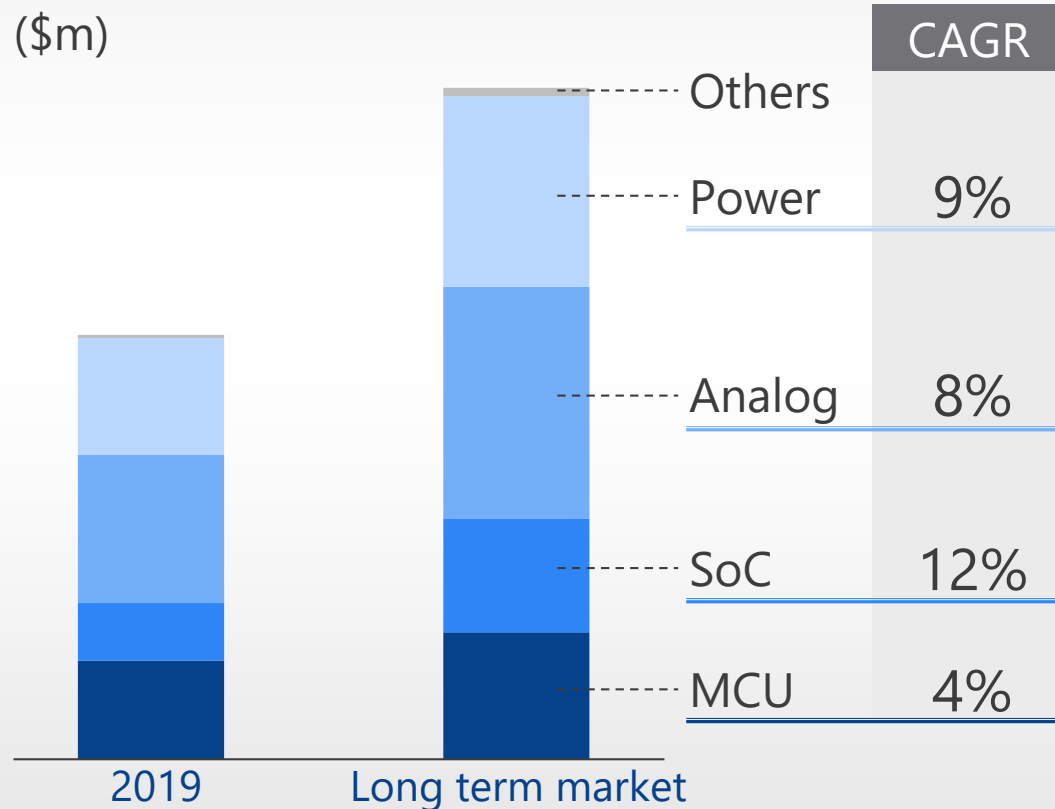
Gateway MCU

Standard MCU platform
for **major tier1s**
(central gateway
for ASIL-B / ASIL-D)

ANALOG & POWER

ANALOG AND POWER MARKET OUTLOOK

Automotive Analog & Power semiconductor market continues to grow driven by higher semiconductor content for CASE+E/E architecture trend



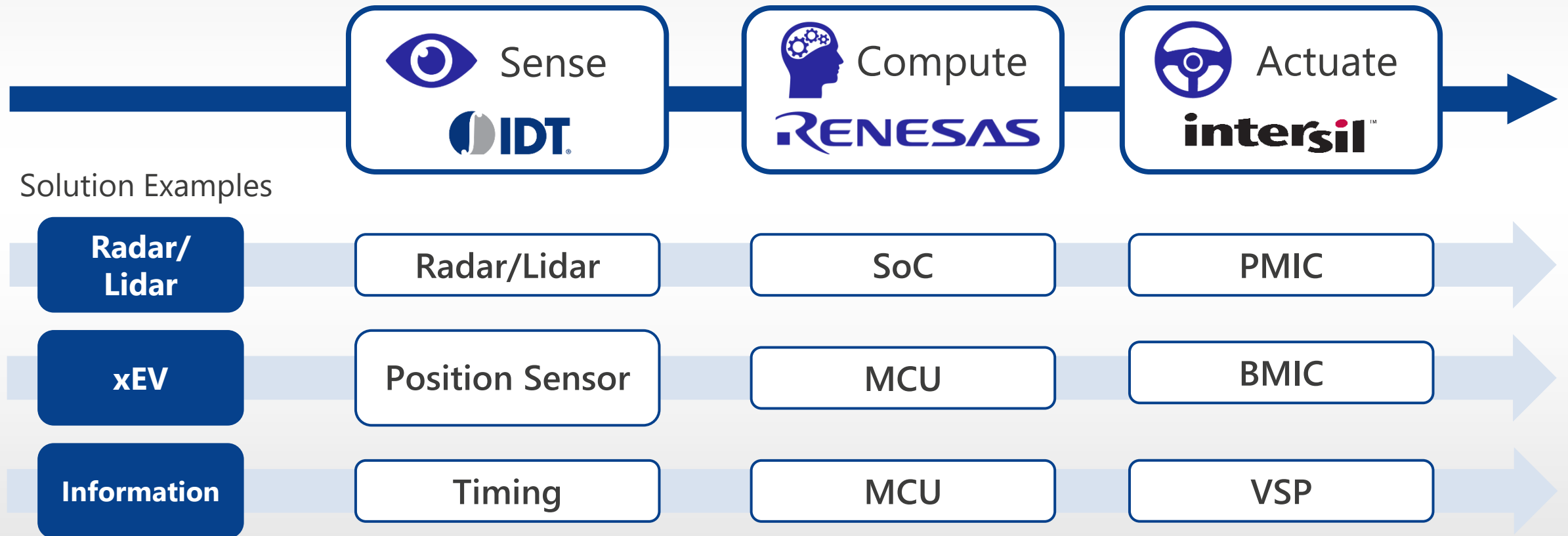
Market Drivers

- Growth of high voltage power discrete market driven by electrification of vehicles
- Diversified analog semiconductor products to control battery-driven vehicles
- Accelerated usage of semiconductor devices to replace conventional mechanical components
- Multiplication of sensor modules to support sophisticated ADAS functionality

"Strategy Analytics Powertrain, Body, Chassis & Safety Data:CY19Q2, Aug 2019

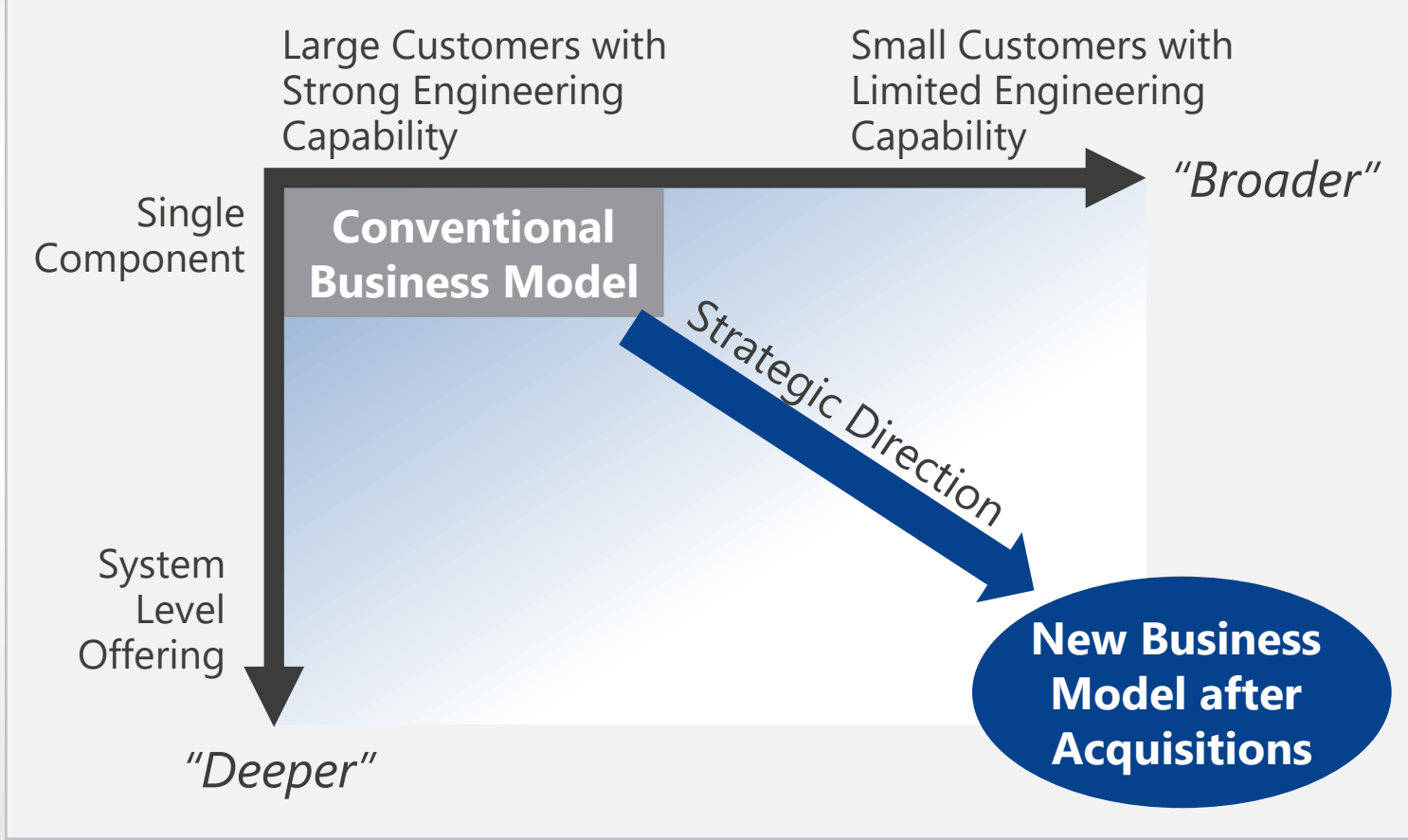
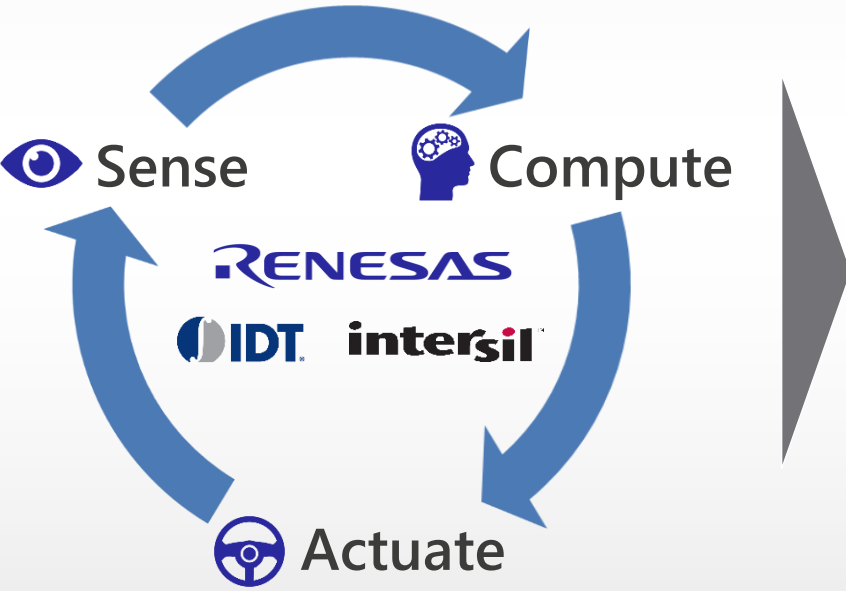
NEW CAPABILITIES GAINED THROUGH ACQUISITION

Analog/Mixed Signal product portfolio complements signal chain and supports to establish end-to-end solution



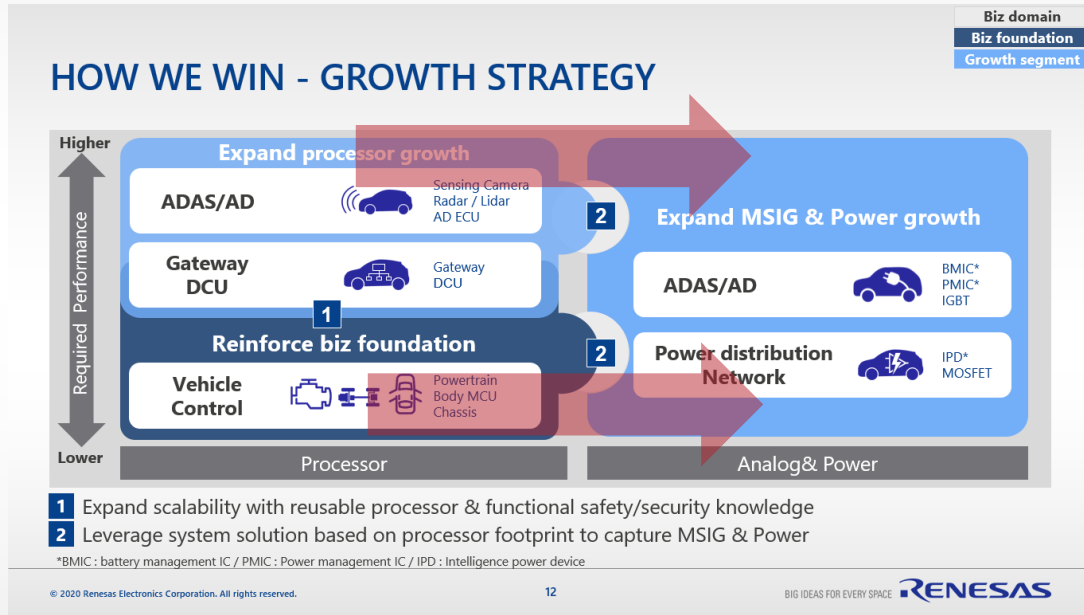
SOLUTION CAPABILITY TO BUSINESS MODEL ENHANCEMENT

End-to-end solution capability enables "Deeper" and "Broader" transformation of business model

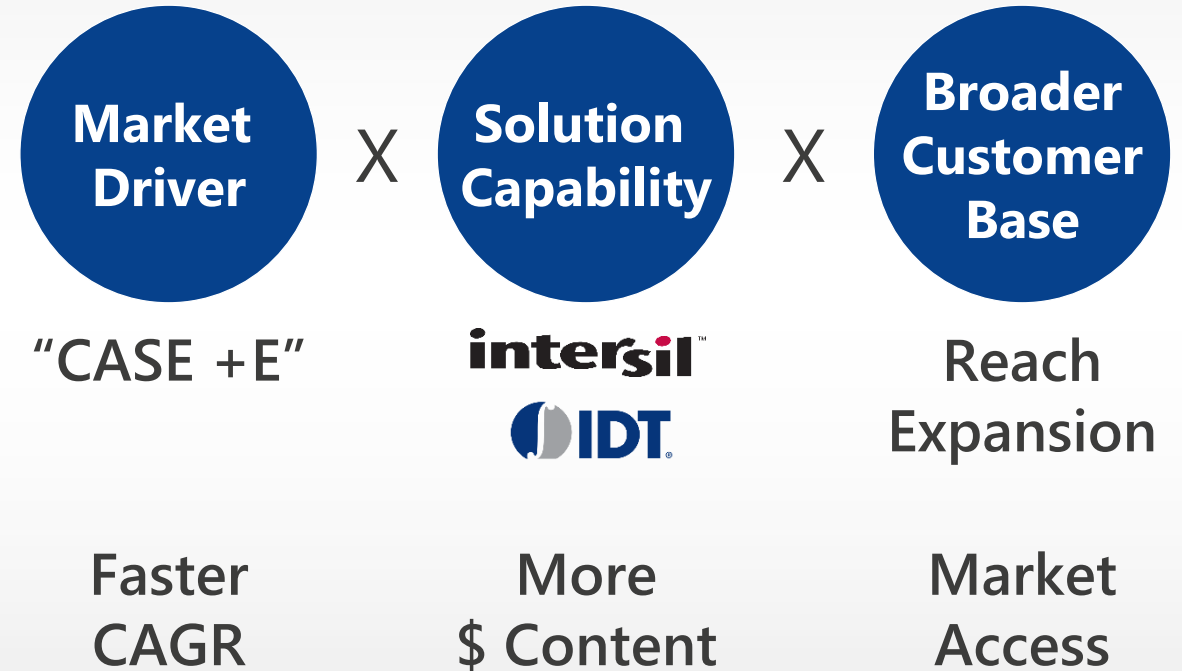


NEW GROWTH MODEL

Leveraging digital product footprint and enhancing business model to accelerate growth

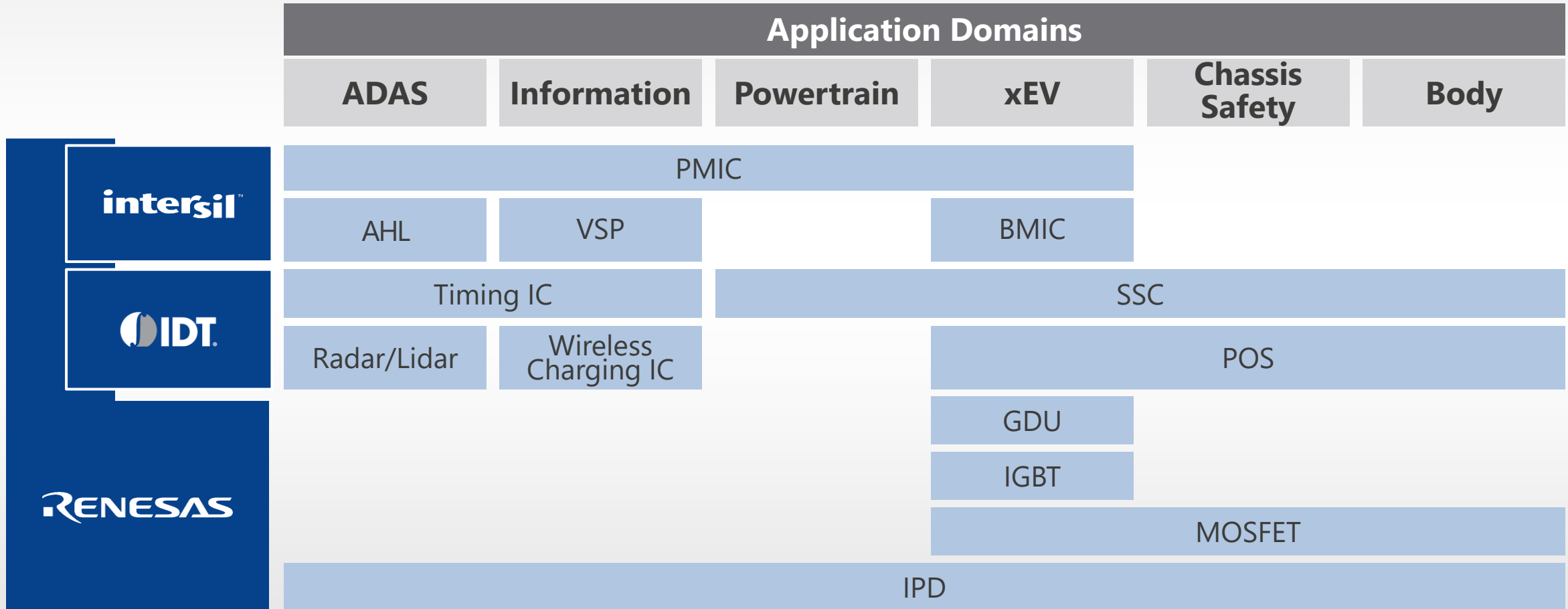


Leveraging processor footprint



ANALOG & POWER PRODUCT LINE UP

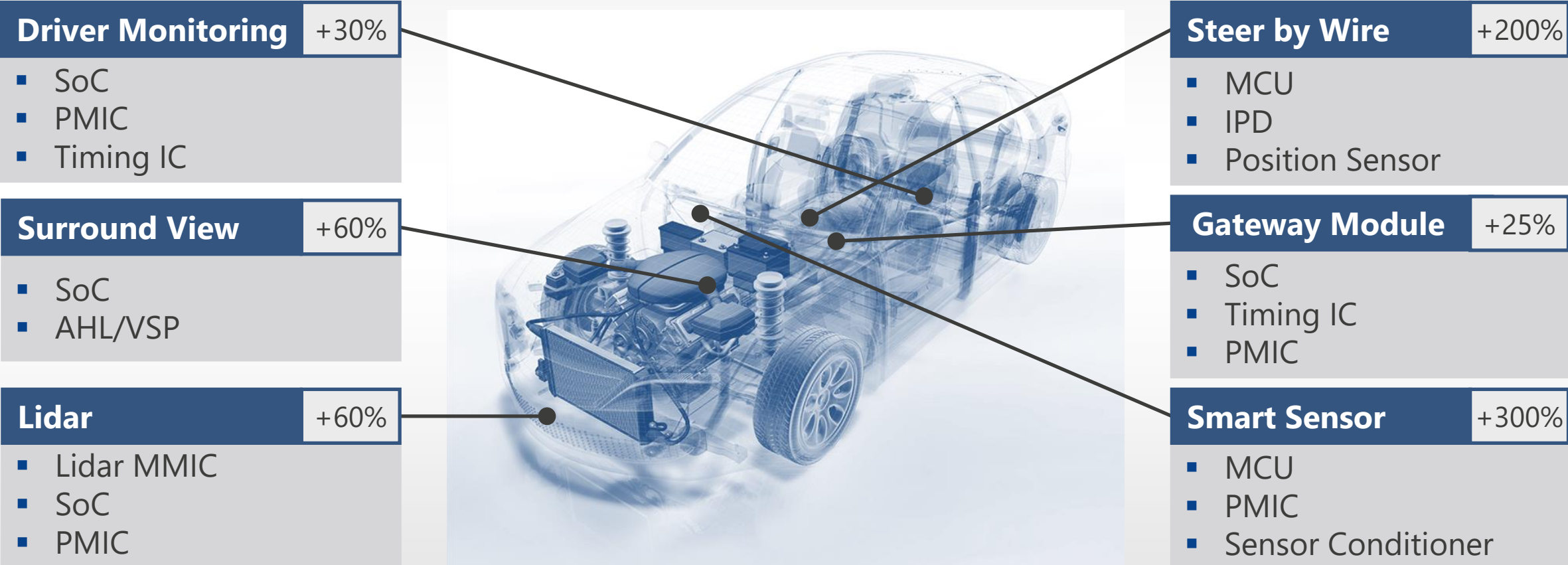
Rich analog and power products to cover growing application fields



FUNCTIONALITY ENHANCEMENT BY SEMICONDUCTOR

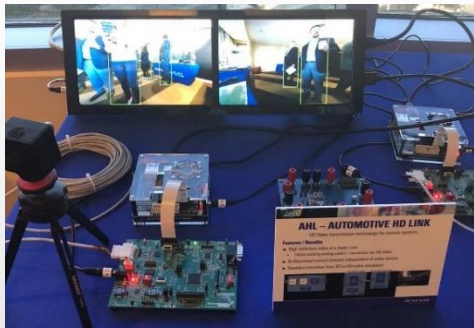
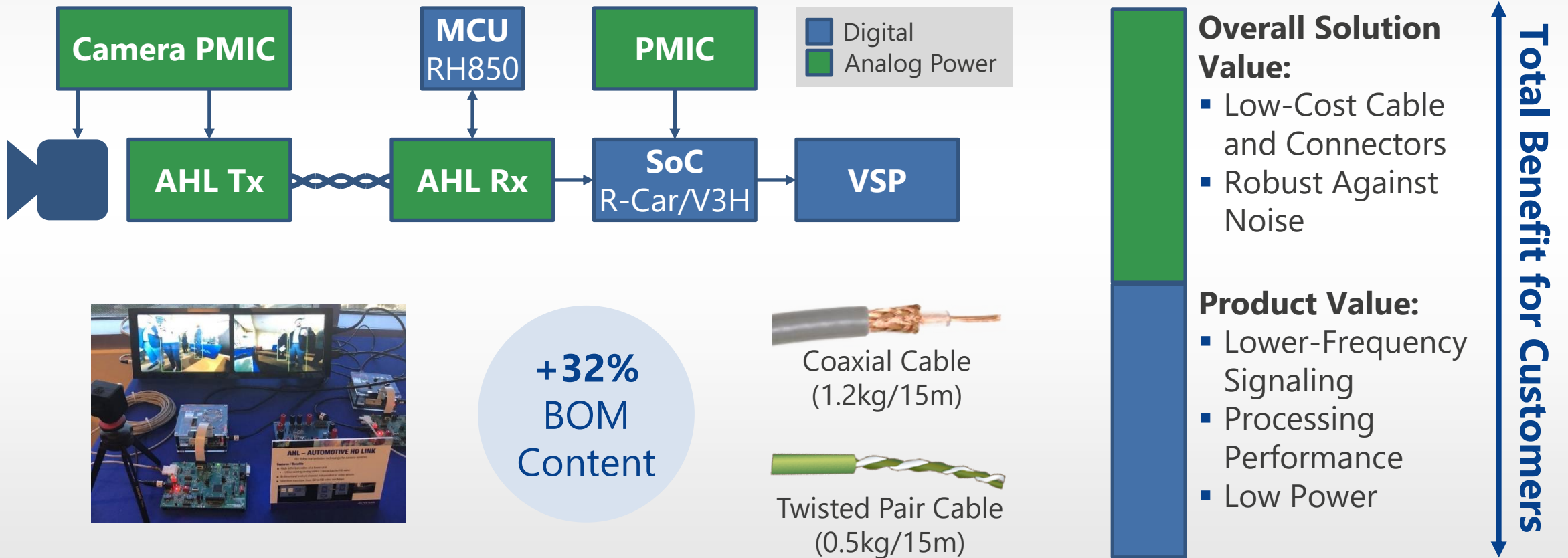
As vehicles are equipped with more sophisticated functions, more semiconductor content is necessary

□ \$ content increase % with Analog and Power



WINNING COMBINATIONS – VIDEO SIGNALING

Flexible and robust connectivity enabled by AHL can provide system level benefit for video camera attached system



**+32%
BOM
Content**



Total Benefit for Customers

Overall Solution Value:

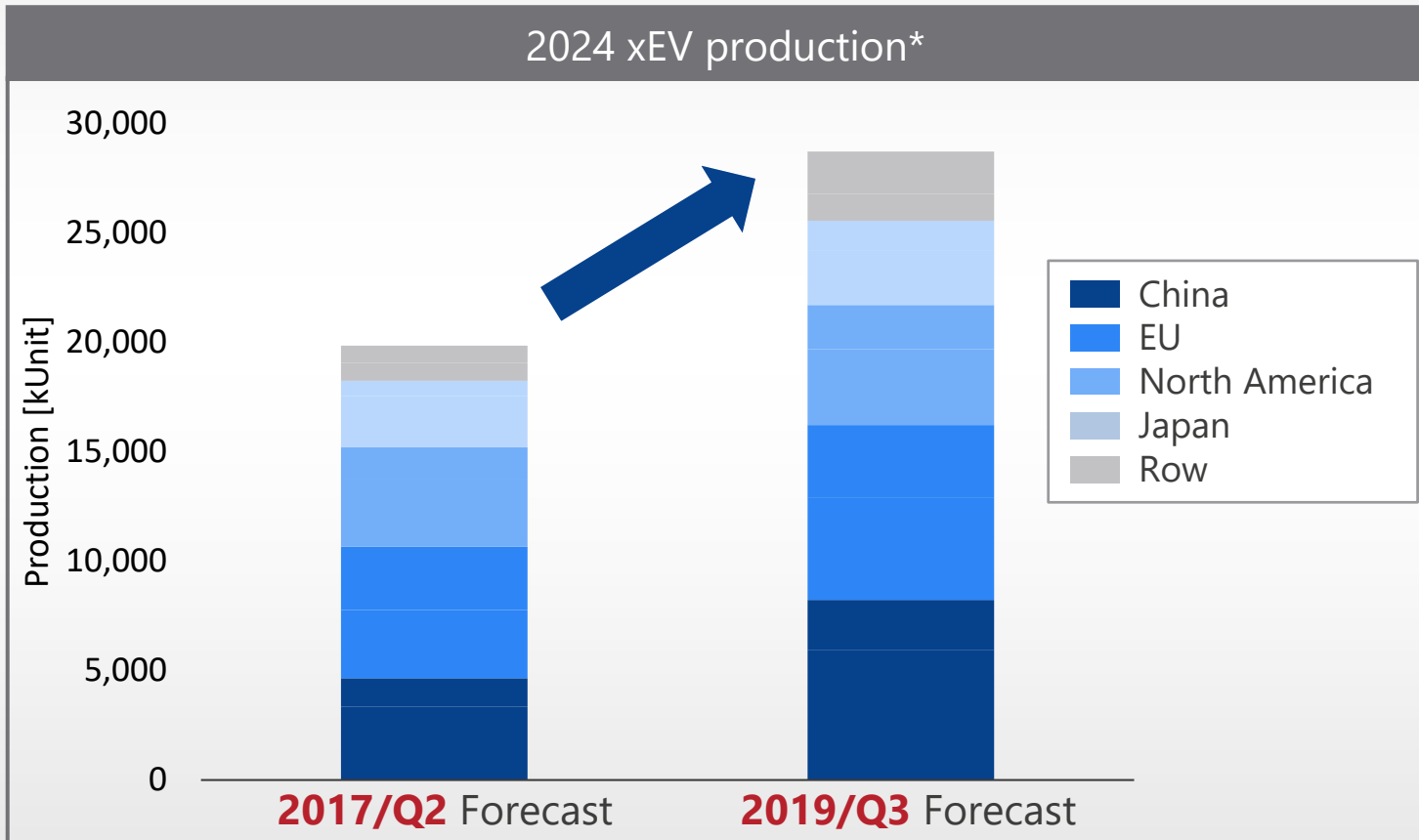
- Low-Cost Cable and Connectors
- Robust Against Noise

Product Value:

- Lower-Frequency Signaling
- Processing Performance
- Low Power

xEV MARKET OUTLOOK

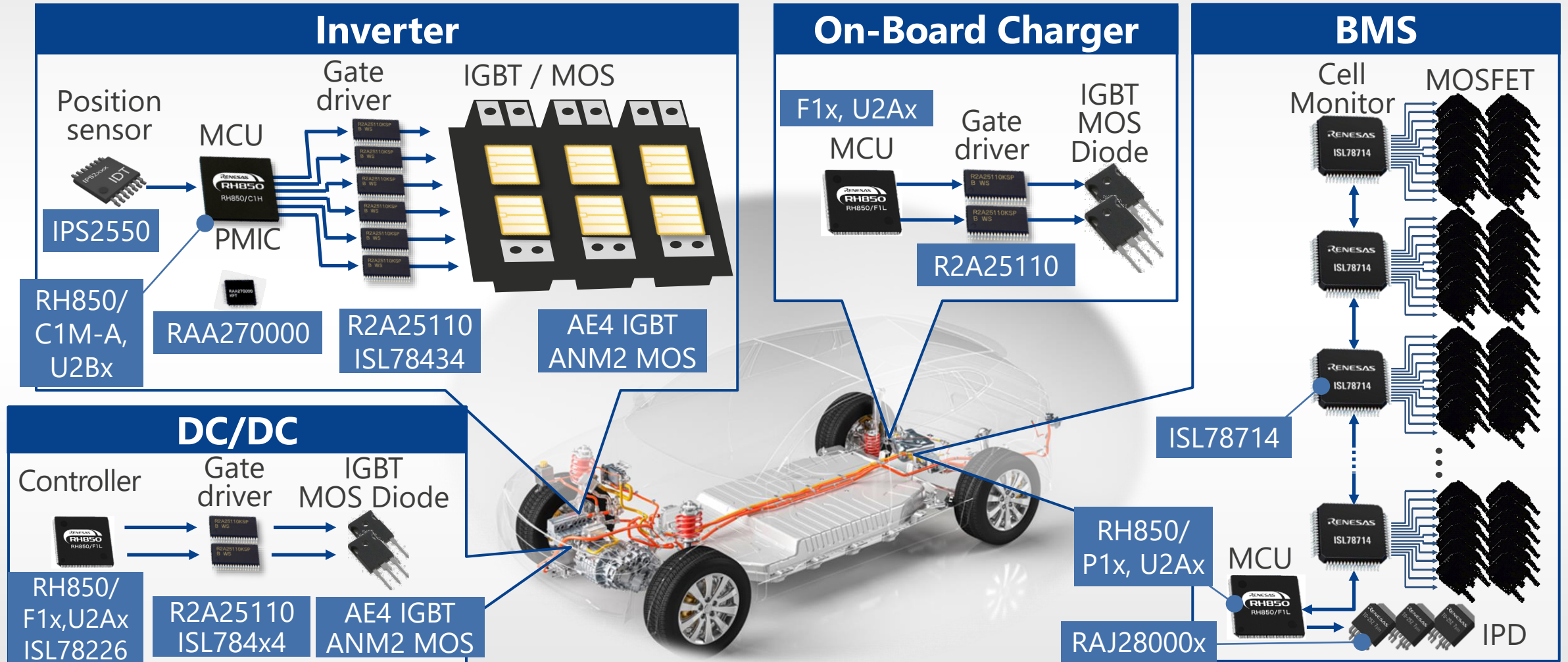
Forecasts for high-voltage Inverter in China and EU, MHEV in China are upward adjusted



Source: Strategy Analytics

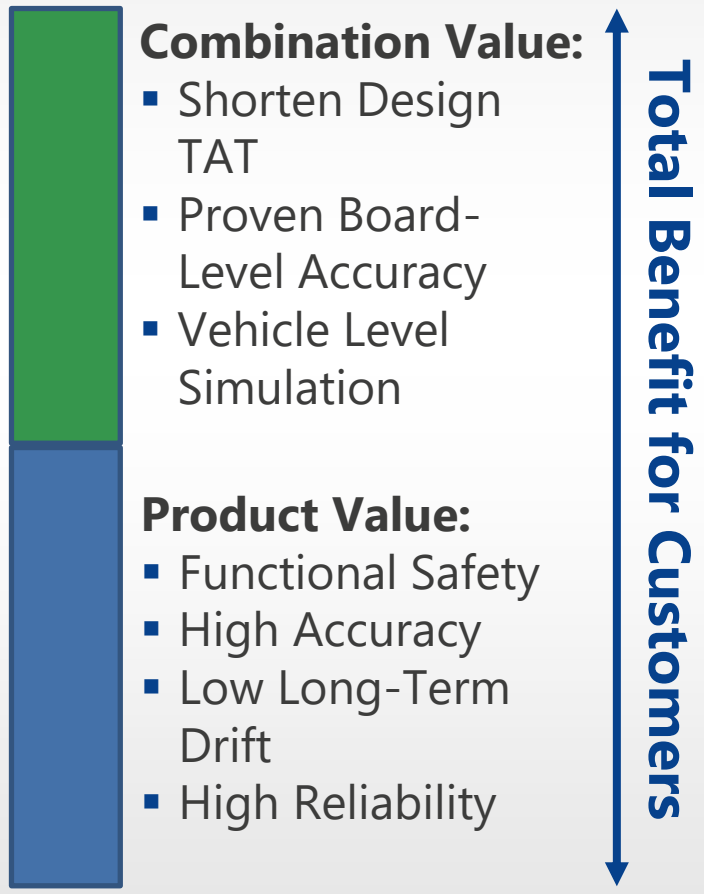
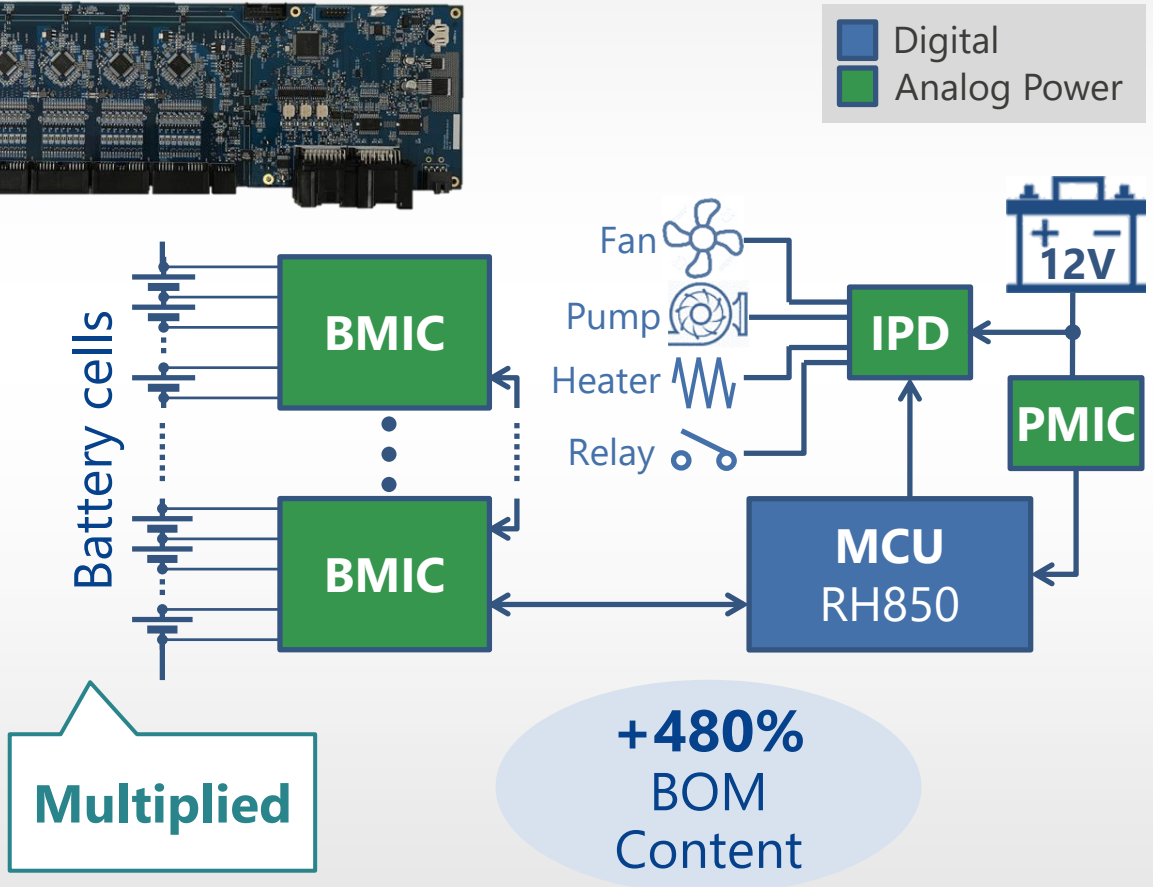
- Most market research companies have adjusted forecasts for xEV upward.
→ **More confidence** for the xEV market outlook
- The bullish outlook after 2021 is backed by the European and Chinese governments' policy to support xEV purchase and to limit ICE vehicles.
- The trend of low price for battery continues.

xEV SYSTEM ARCHITECTURE AND SOLUTION OFFERING



WINNING COMBINATIONS – BATTERY MANAGEMENT

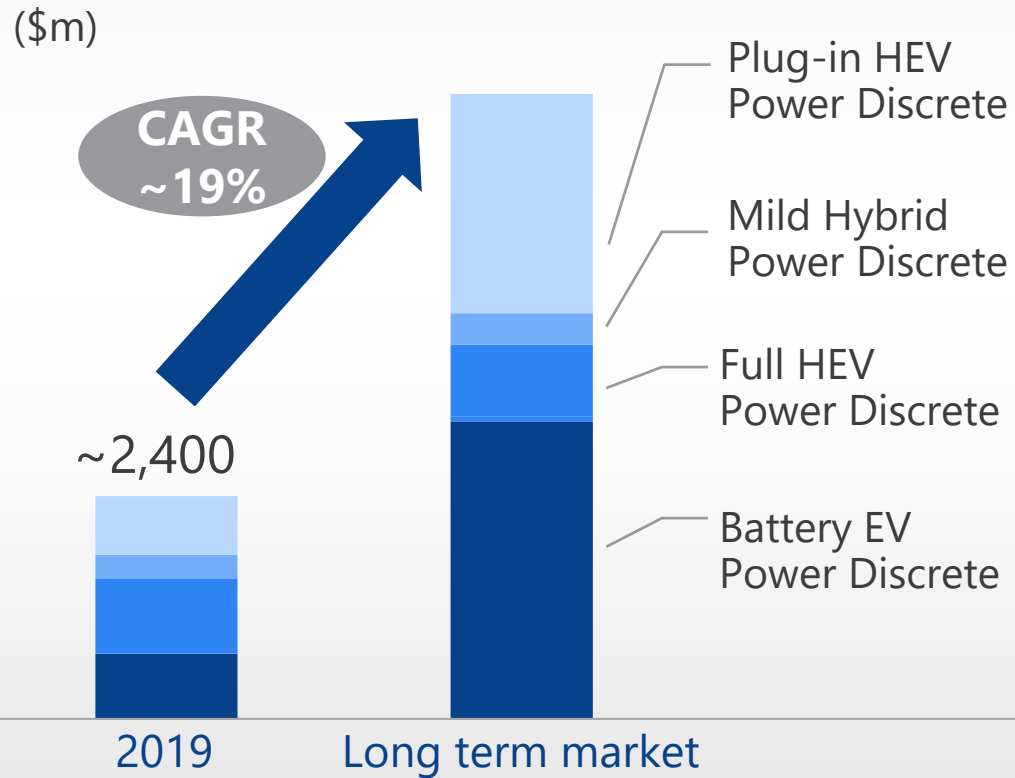
High accuracy of BMIC is enhanced by combination with MCU for vehicle level simulation



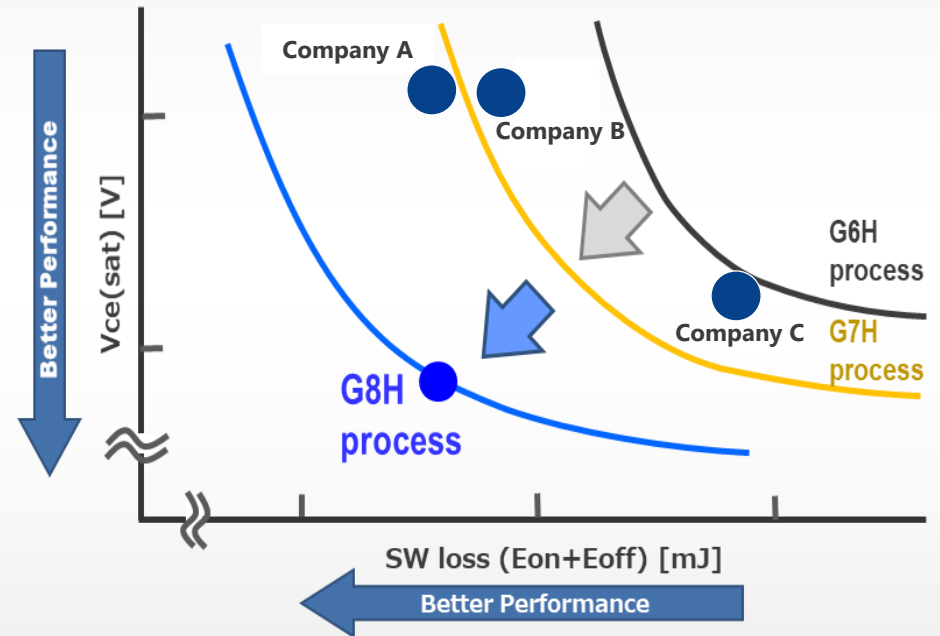
xEV MARKET POTENTIAL FOR POWER DISCRETE

xEV market growth brings proliferation of new application for power discrete

Power Discrete Market Size



Power Discrete Product Strength



Renesas IGBT has clear competitive edge in its product feature

Source: Strategy Analytics * Power Discrete include IGBT , MOSFET , PIC.

48V SYSTEM TREND

Battery-driven vehicles are creating new market for 48V: new requirement for Analog & Power

Benefit of 48V

- Higher efficiency for Electric Vehicle (Low current)
- Cost efficiency for safety requirement
- Easier packaging
- Fitness to existing system (12V)

Mechanical to Electric:

Replacement of mechanical drive or hydraulic drive

New Category:
Light Vehicle



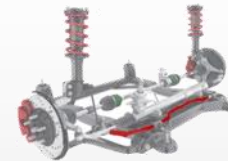
48V traction



48V turbo



HVAC



Roll stabilizer



2/3-wheelers
Light Vehicle

xEV INVERTER SOLUTION

MCU capability creates additional value for strong IGBT product feature

MCU

- Powertrain Platform MCU
- >100,000rpm with EMU/ RDC
- Built-in dual RDC and Functional Safety

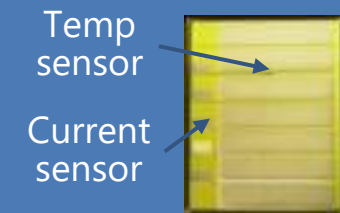
Gate Driver

- Switching loss reduction, reducing cooling cost
- Higher-voltage(5kV) and Isolation
- Functional Safety



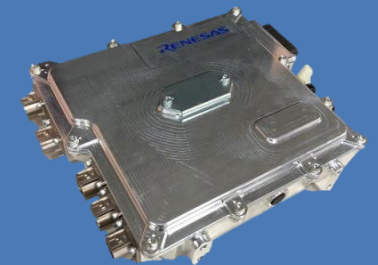
IGBT

- Higher current (350A/cm²), lower loss
- Built-in sensor for preventing destruction.



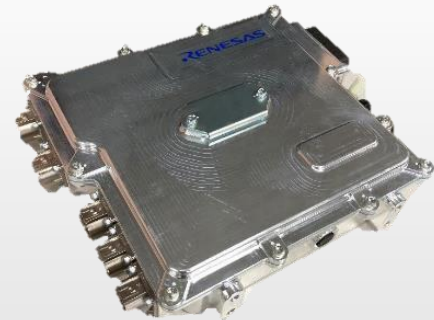
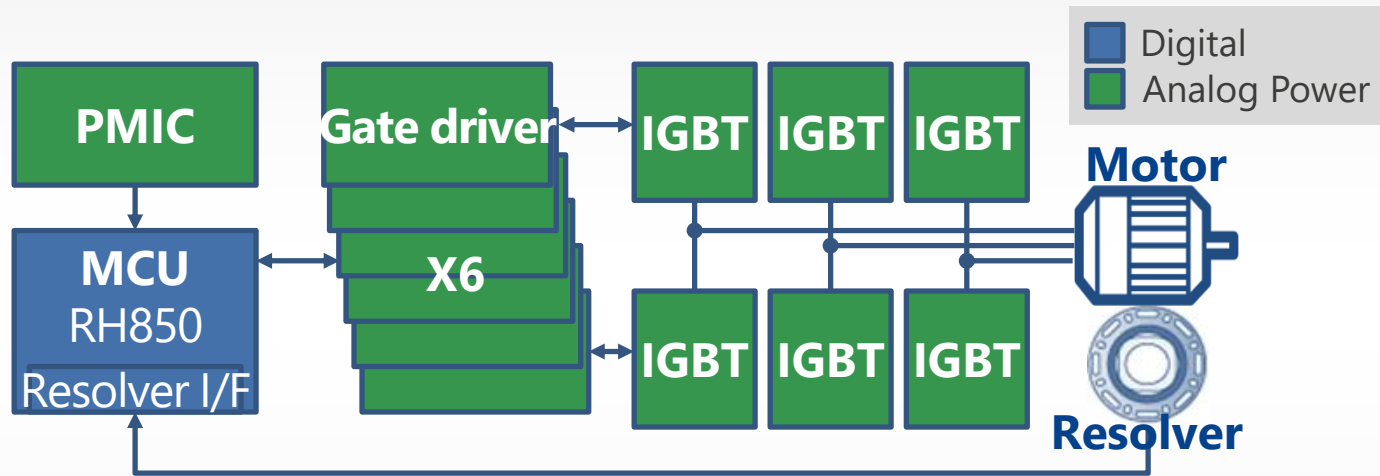
Inverter Kit Solution

- Easy to develop, Reducing TAT
- More power can be derived by accurate TJ sensing with built-in temp sensor & SW.

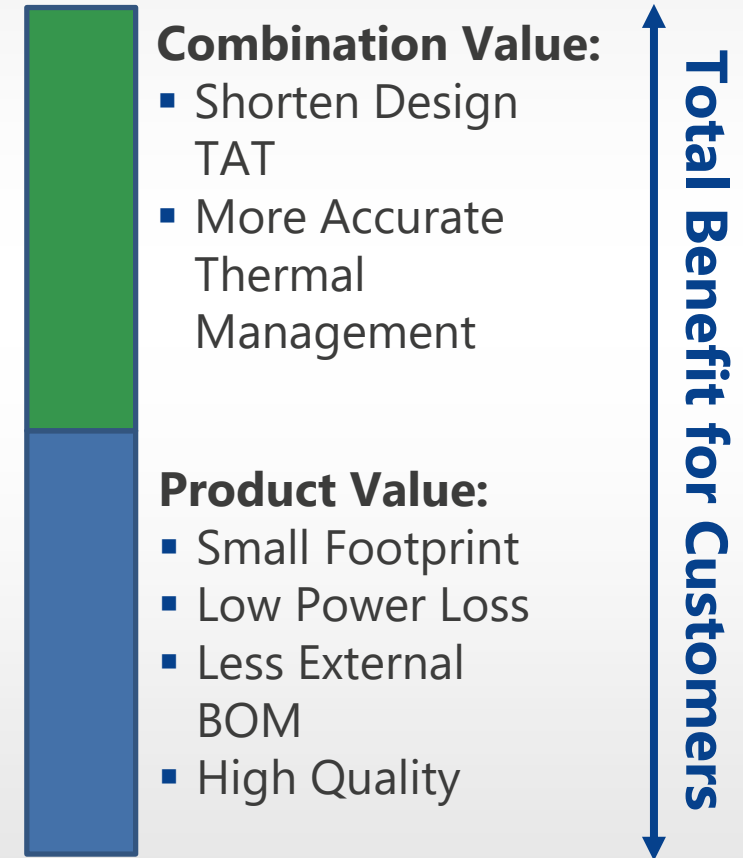


WINNING COMBINATIONS- xEV INVERTER

Sensor embedded feature of IGBT is enhanced by MCU's system optimization for thermal management

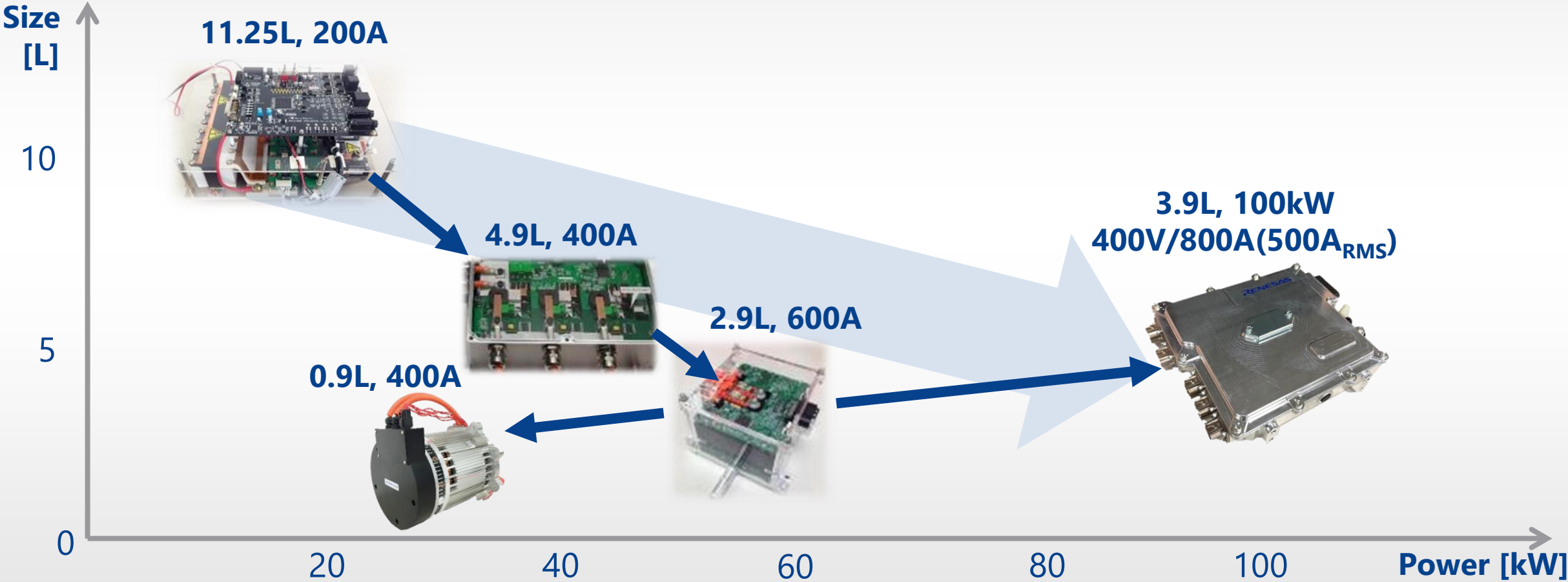


+1140%
BOM
Content



SOLUTION CAPABILITY FOR xEV MAIN INVERTER

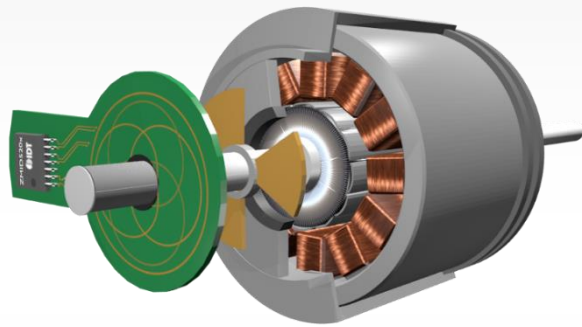
Combination of MCU, IGBT and Driver expertise can provide the optimal solution at system level



POSITION SENSING



Thin, Light, Cost Effective, Field Immune



x5 to x10 thinner

x2 to x100 lighter

Total Stray Field immune

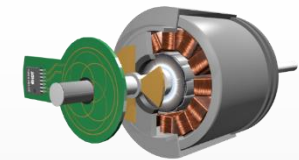
Cost Effective

- No magnet
- No resolver
- Can reduce number of wires (single-ended)

Rotation



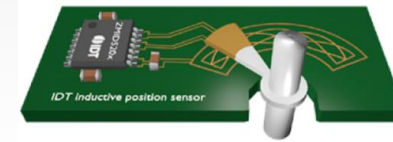
Motor control



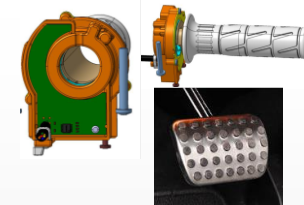
Dial



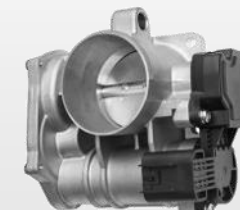
Narrow Angle



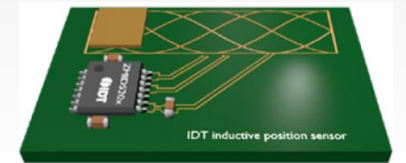
Pedal / Handle



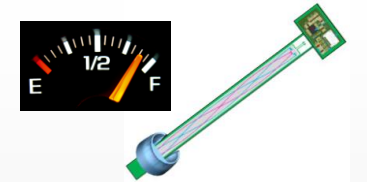
Valve control



Linear Slider



Fuel / Oil / Fluid Gauge



Gear Selector



ANALOG AND POWER GROWTH OUTLOOK

By leveraging market drivers and Renesas strengths, Analog product revenue to outgrow the market, while Power Discrete growth is offset by planned EOL

