

INFRA, INDUSTRIAL AND IOT STRATEGY UPDATE

AUGUST 6, 2020
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EVP AND GENERAL MANAGER
IOT AND INFRASTRUCTURE BUSINESS UNIT
RENESAS ELECTRONICS CORPORATION

MEGA TRENDS ARE LARGELY INTACT

DRIVING GROWTH FOR IOT AND INFRA BU



DATA-CENTER DISAGGREGATION

- **33% cloud data CAGR**
- Optimizing underutilized resources / Power / thermal inefficiencies
- Rise of data-centric computing



5G RAMP

- **~0% penetration in 2019 → ~20% in 2023**
- ~40% content expansion from 4G to 5G
- Sub-6GHz / mmWave
- SatCom market growth



INTELLIGENCE MOVING TO ENDPOINT

- **1T connected devices**
- Industry 4.0 / 150MM industrial edge devices enabled with AI shipped annually by 2022
- ~34% IoT sensors long-term growth forecast

MAJOR POST COVID-19 TRENDS

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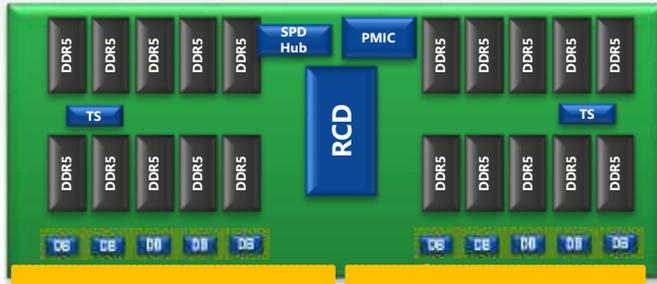
End Market	Products	Pre-CoVID-19	Post-CoVID-19	Reason
Data Center	 Memory Interface, Timing, Core Power	+	++	Bandwidth needs
Smart Phone	 Wireless Power, OIS	++	+	Consumers upgrading to 5G phones primarily
Laptop & Tablet	 Display Power, FGIC	+	++	Telecommuting driving demand
Healthcare & Environment	 Sensor Signal Conditioning IC, flow sensors, power	+	++	Temperature/Humidity/SPO2/HRM measurement, ventilators, environment focus
Surveillance, VUI	 MPUs and MCUs	neutral	+	AI & VUI moving to end-point
Rad Hard Technology	 Rad Hard Analog, RF, Power & MCUs	neutral	+	Focus on rural telemedicine via SatCom and space exploration

SAM EXPANSION TRENDS

EXPANDING DIMM CONTENT IN DDR5

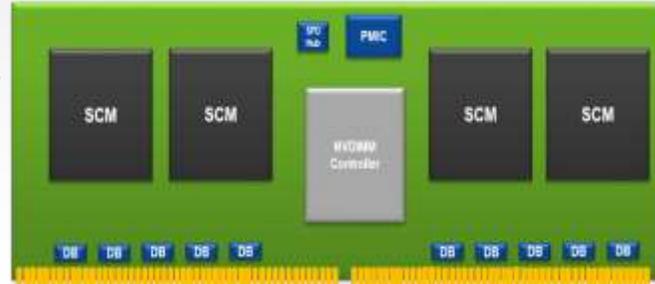
DDR5 LR/RDIMM

RCD
10 x DB
2 x TS
PMIC
SPD-Hub



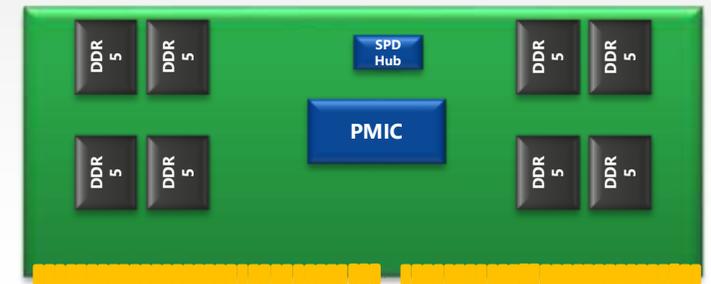
10 x DB
PMIC
SPD-Hub

DDR5 SCM NVDIMM



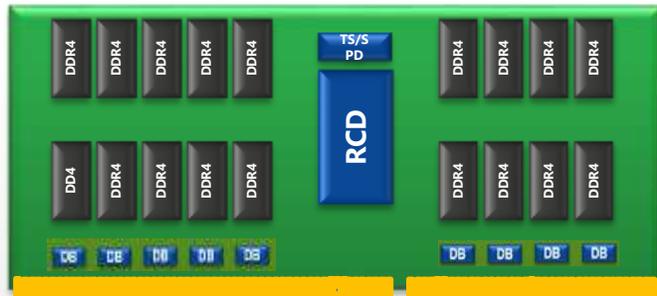
PMIC,
SPD-Hub

DDR5 SODIMM



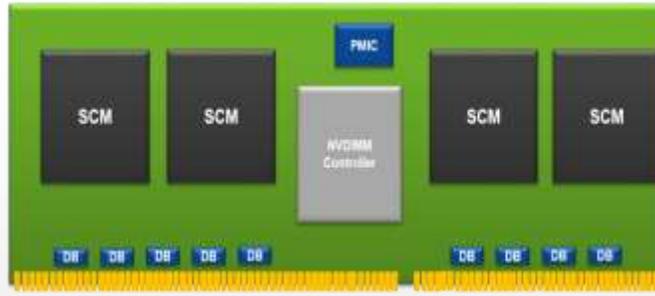
DDR4 LR/RDIMM

RCD,
9 x DB
TS/SPD

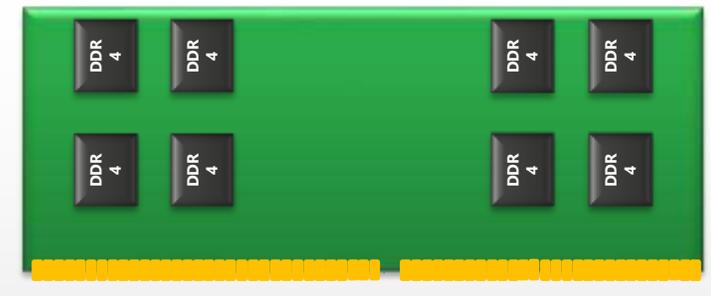


9 x DB
PMIC

DDR4 SCM NVDIMM



DDR4 SODIMM



Renesas gains significant content from DDR4 generation to DDR5 generation and Renesas register, temp sensor, hub and PMICs have already been qualified at leading CPU supplier.

WINNING ACROSS AN EXPANDING SOC ECOSYSTEM

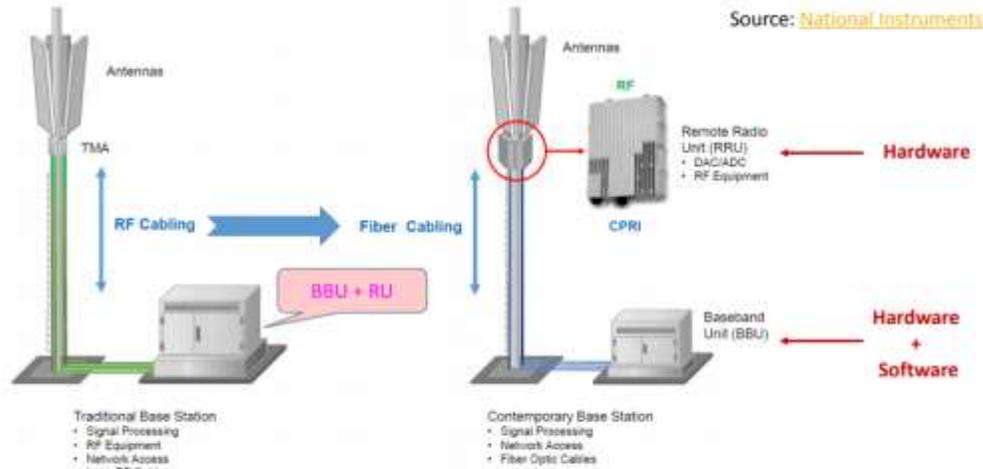
● Qualified
 ● In Process/Planning

RENESAS	intel	AMD	IBM	MARVELLO	AMPERE	China CPU #1
DDR3	●		●	●		
DDR4	●	●	●	●	●	●
DDR5	●	●	●	●	●	●

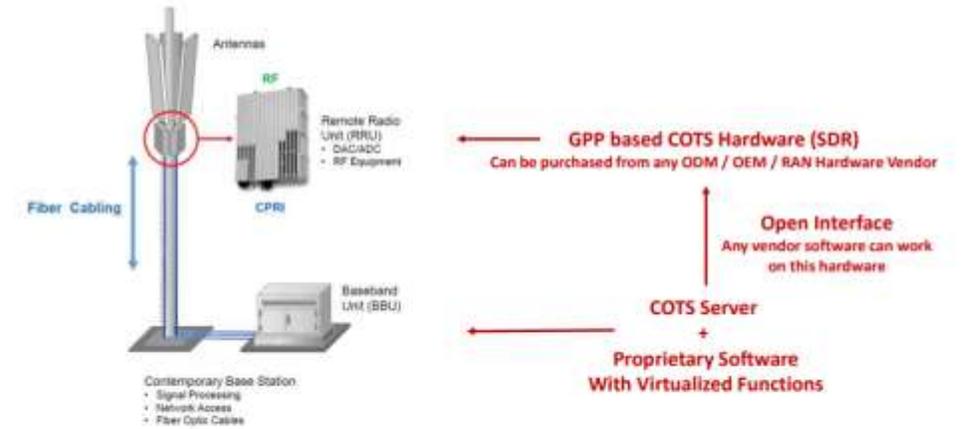
Renesas memory interface solutions are CPU architecture agnostic

VIRTUALIZATION OF 5G NETWORKS PROPRIETARY VS O-RAN

Mobile Towers in Real Life



Open RAN Vision



Source: 3G4G

VIRTUALIZATION OF 5G NETWORKS PROPRIETARY VS O-RAN

Mobile Towers in Real Life

Renesas Products

- RF
- Power
- Timing
- Optical

Traditional Base Station

- Signal Processing
- RF Equipment
- Network Access
- Long RF Cables

Contemporary Base Station

- Signal Processing
- Network Access
- Fiber Optic Cables

Software

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Open RAN Vision

Renesas Products

- RF
- Power
- Timing
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- Memory Interface
- Rapid I/O

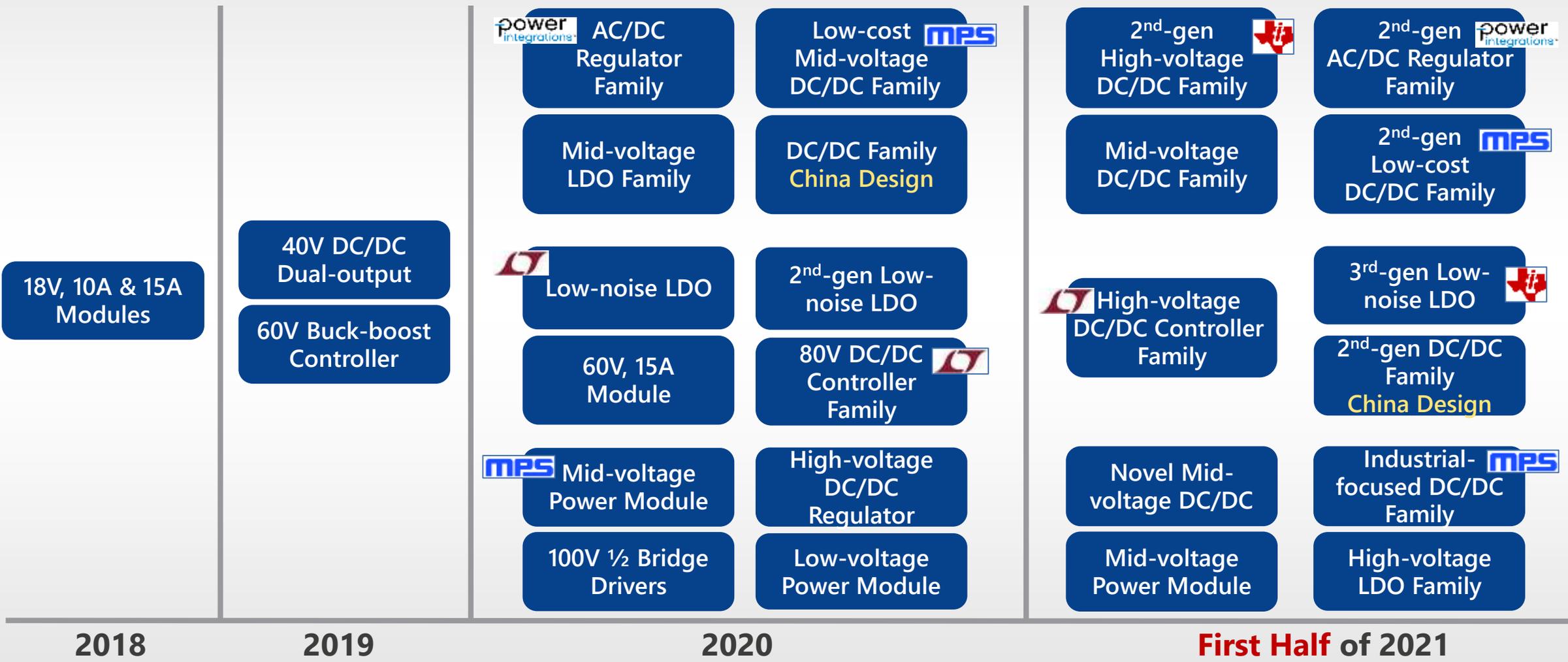
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Renesas has solutions to address both the traditional telecom providers as well as the new class of emerging O-RAN solution providers for the 5G market. We are seeing solid growth opportunities in the 5G markets.

Source: 3G4G

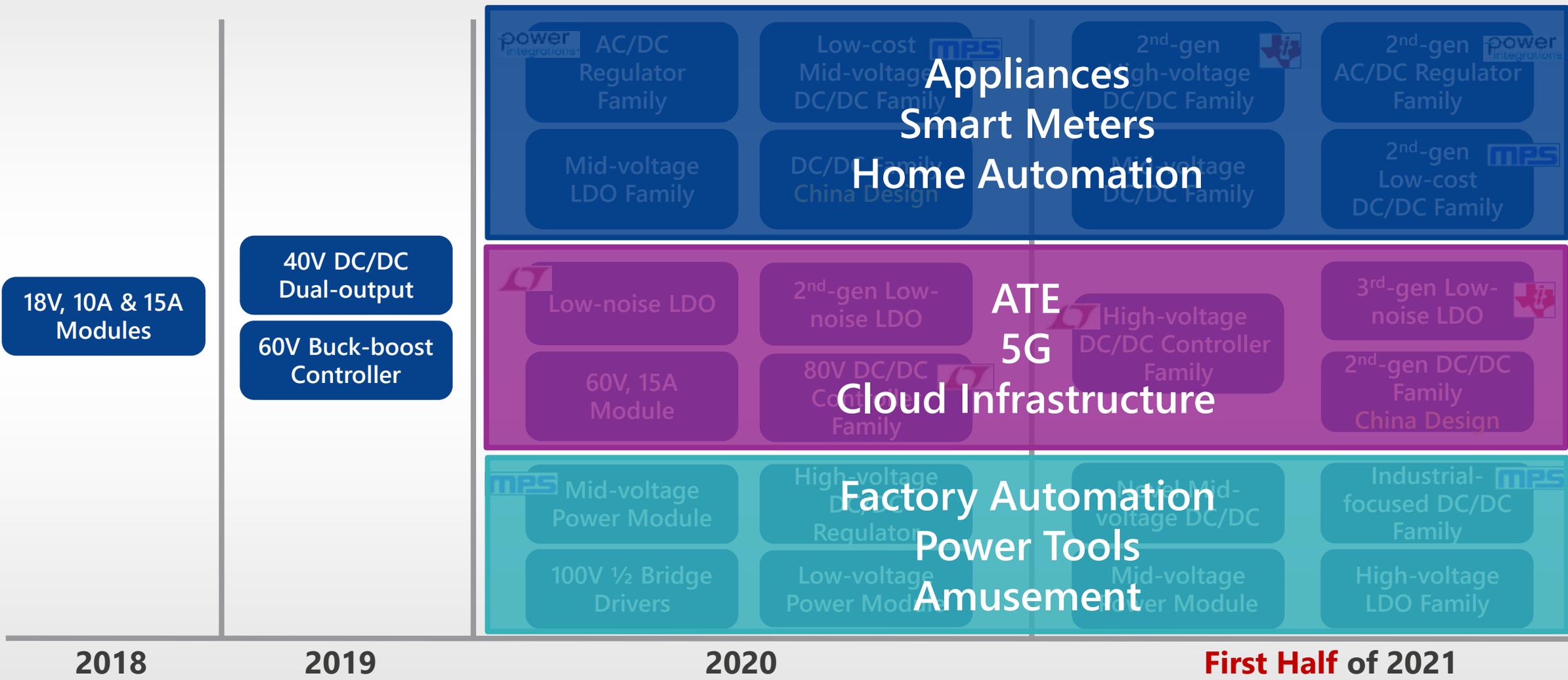
INDUSTRIAL POWER ROADMAP HIGHLIGHTS

– \$3B SAM EXPANSION!



INDUSTRIAL POWER ROADMAP HIGHLIGHTS

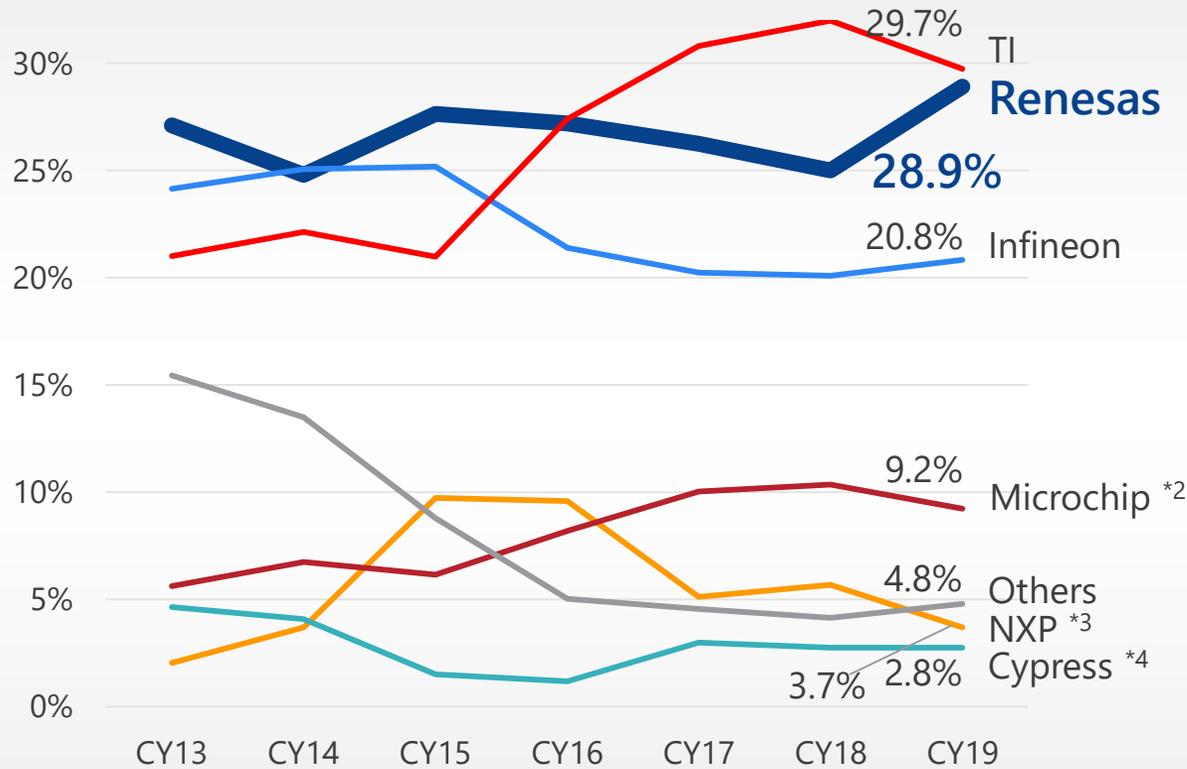
– \$3B SAM EXPANSION!



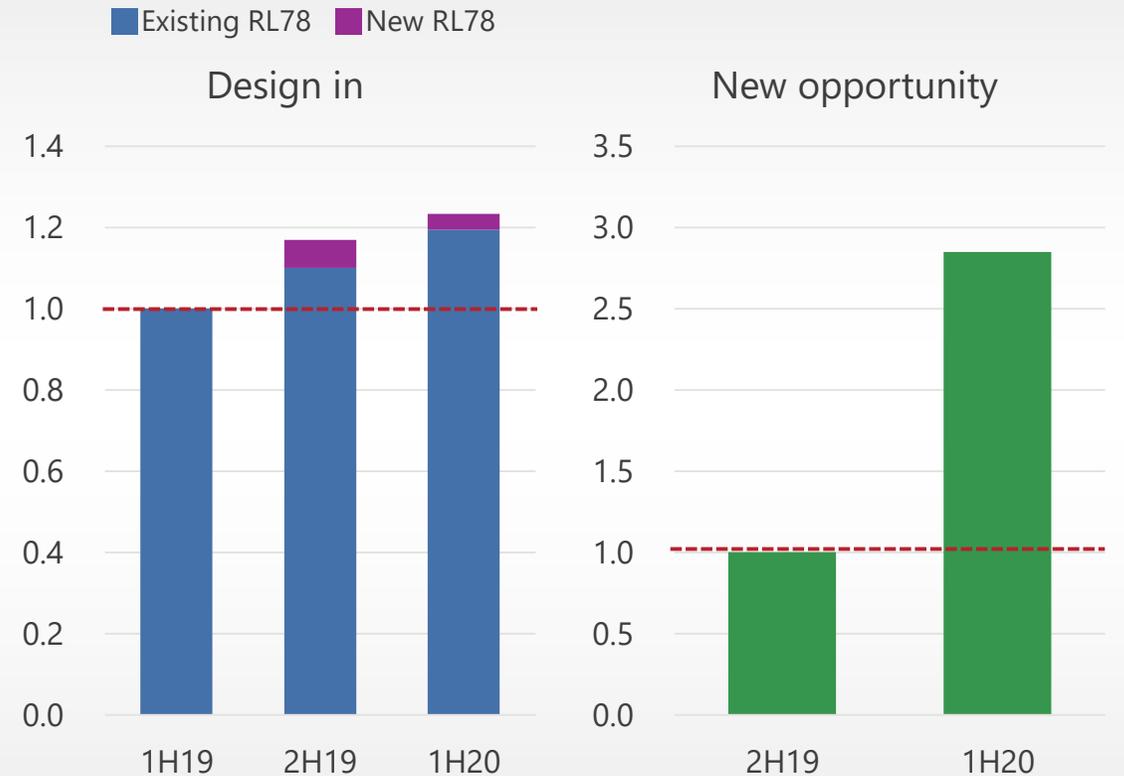
MCU, MPU & RAD HARD PRODUCT UPDATES

16-BIT BASED MCU

Market share (excluding Automotive) *1



D-in and opportunity

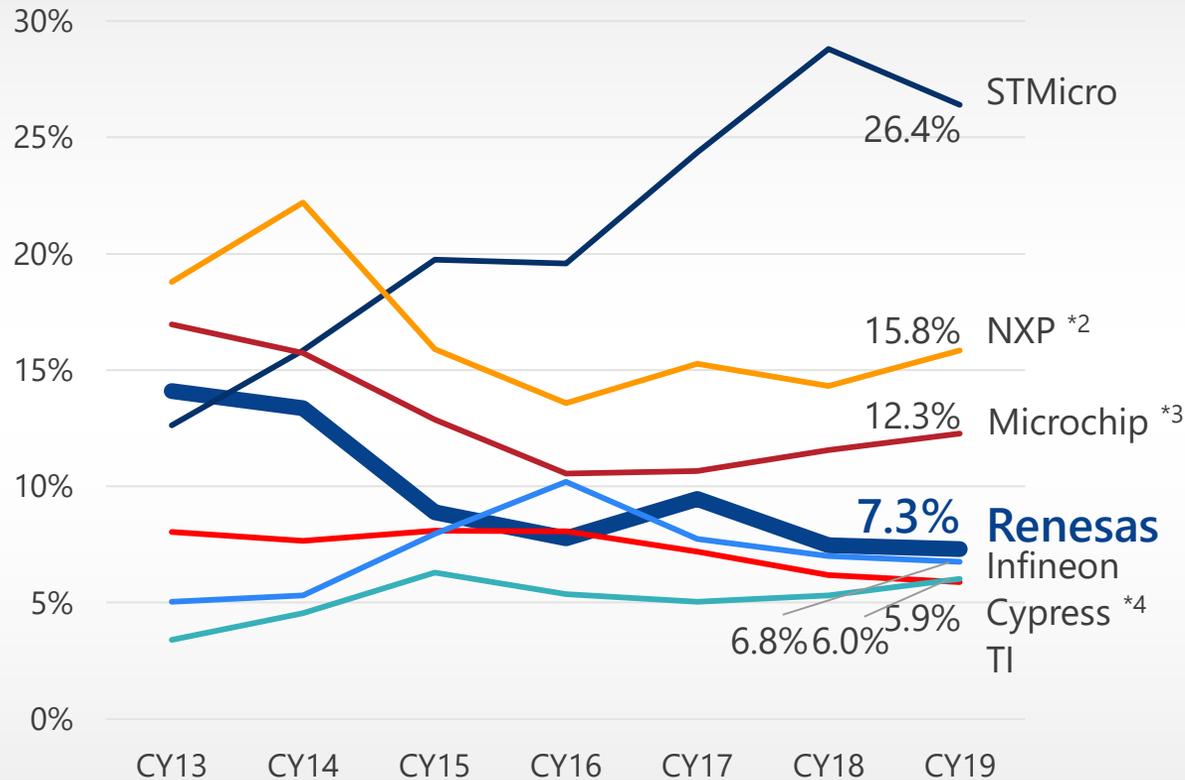


Share has gained and Renesas new LPC and next-gen products are seeing significant traction in the market

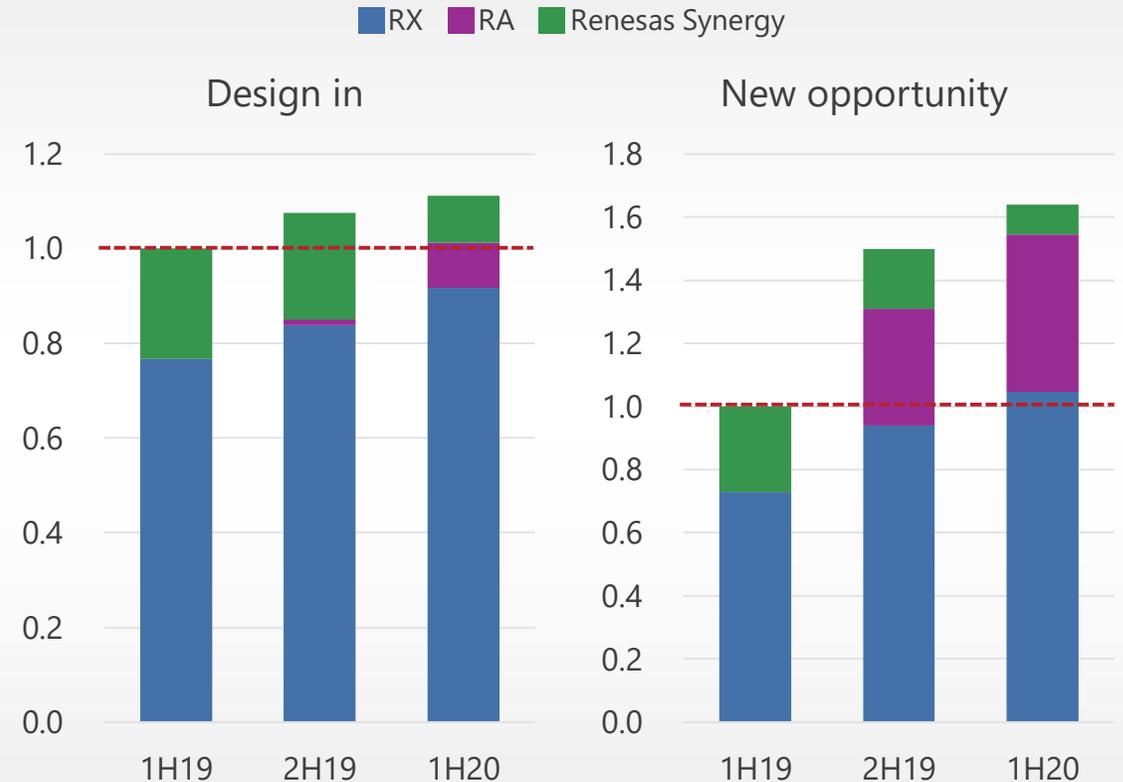
*1 Source: Gartner *2 Including Atmel *3 Including Freescale *4 Including Spansion

32-BIT BASED MCU

Market share (excluding Automotive) *1



D-in and opportunity



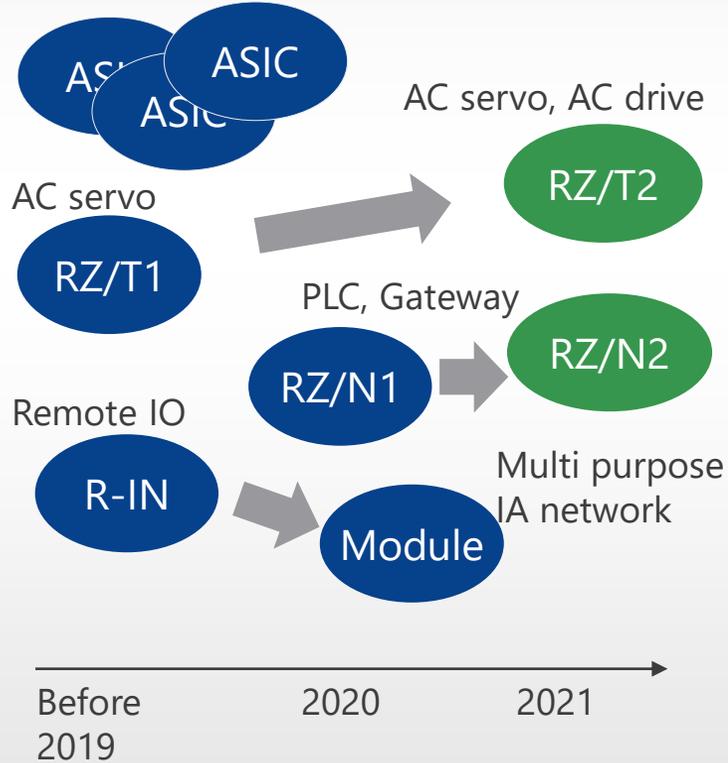
Share erosion has slowed significantly, and Renesas new products are seeing significant traction in the market

*1 Source: Gartner *2 Including Freescale *3 Including Atmel *4 Including Spansion

ROADMAP IMPROVEMENT

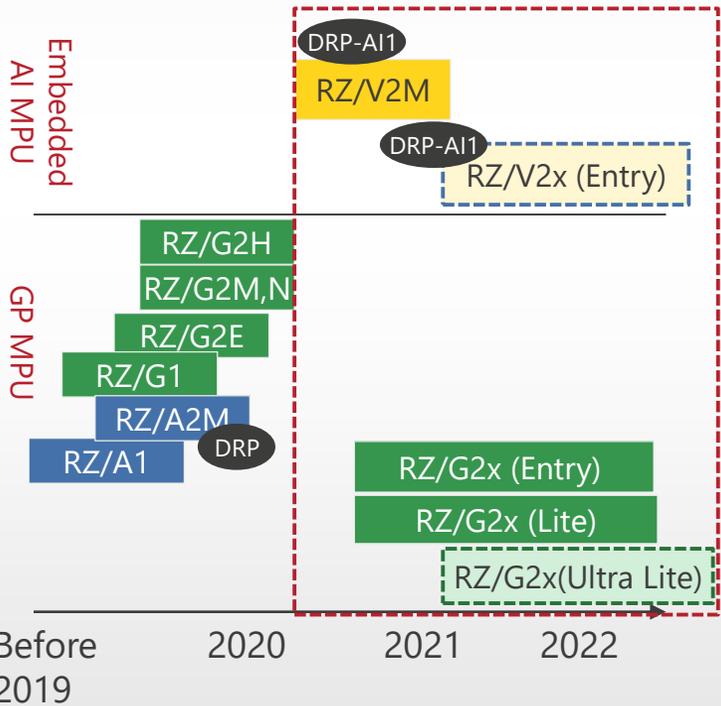
Industrial Automation ASSP

Top IA customer



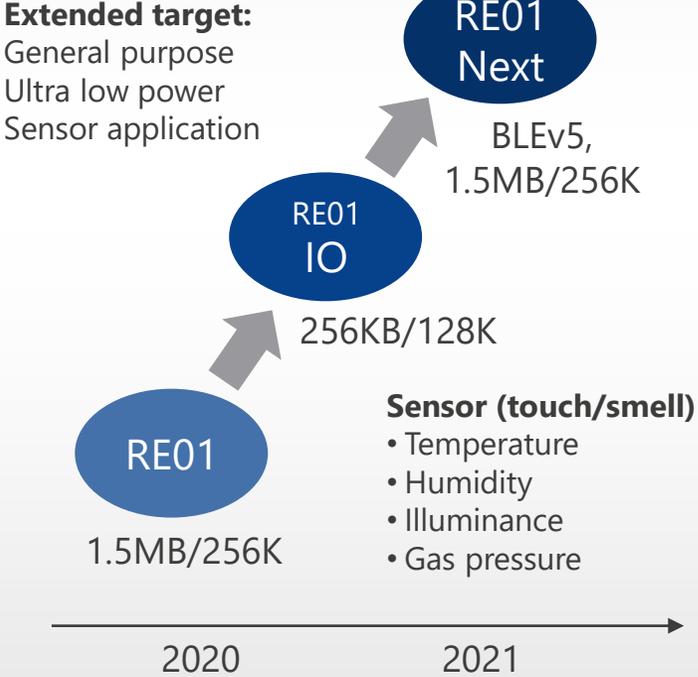
General-Purpose MPU

Enhanced low-end GP MPU (RZ/G series)
& Embedded AI MPU (RZ/V series)



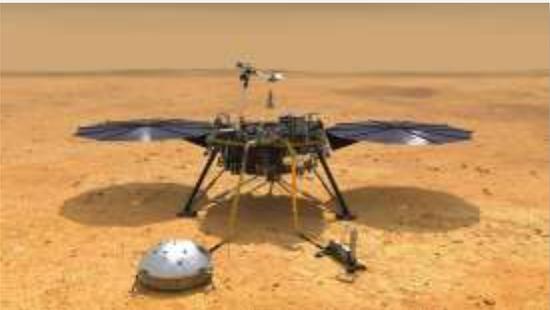
RE Family Extreme Low Power Controller

ULP Mark-CP score 705

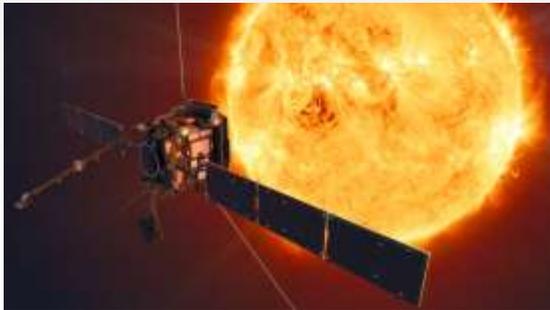


RENESAS RAD HARD PRODUCTS CRITICAL TO SATCOM, SPACE & PLANET EXPLORATION

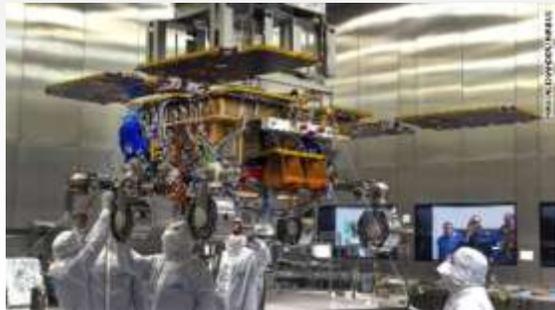
Renesas provides radiation hardened semiconductors for mission critical power management, precision data handling and data processing for Satcom & Key Space Exploration :



NASA Rover InSight
Landed in late 2018



NASA/ESA Solar Orbiter
Launched Early 2020



ESA ExoMars Rover
Launch targeted for 2022

ISRO Chandrayaan Moon Missions
Orbiter/Lander/Rover launched mid 2019

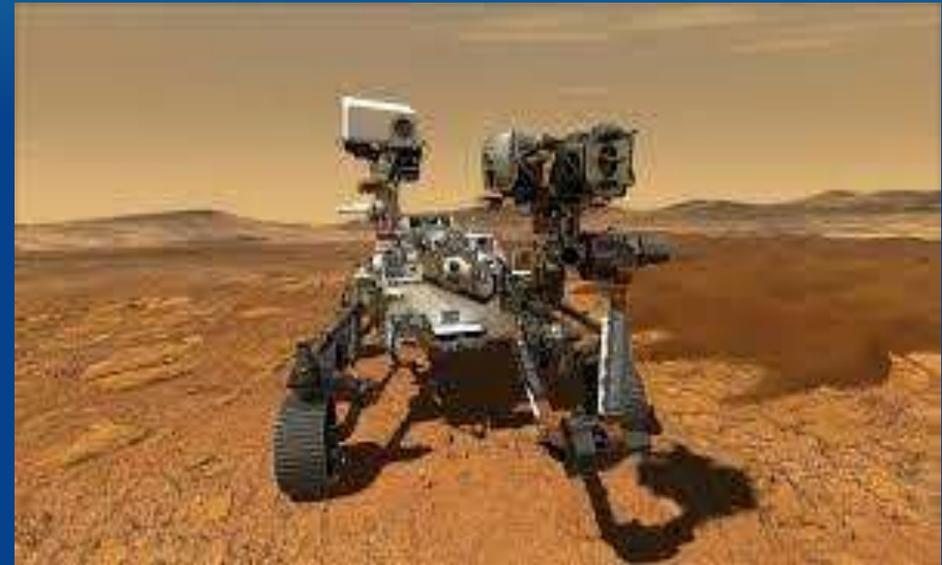


JAXA Hayabusa 2 Asteroid Mission
Returning asteroid samples to earth late 2020



RENESAS RAD HARD PRODUCTS CRITICAL TO SATCOM, SPACE & PLANET EXPLORATION

For the MARS 2020 Explorer which launched July 31st
Renesas had 20+ unique parts on Perseverance Rover
covering several sub-systems



WINNING COMBOS

DRIVING REVENUE SYNERGIES WITH WINNING COMBOS



Sensor Board with BLE and ML



CN268 IEEE-1588 Solution for Synchronization of timing networks



48 V Scooter



Camera Module: ~\$25 BOM



UWB based social distancing bands (sampling 2H20)

- 146 New Winning Combinations since April 2019
- Achieved over 390 M\$ D- ins cross selling and combo Sales
- Renesas has leveraged the portfolio of its acquisitions to drive D-In growth

SUMMARY

- Growth drivers for IIBU are largely intact post COVID-19
- In certain areas the increased needs for telecommuting, remote health-care, environmental awareness, and e-AI is leading to demand growth for our products supporting those areas
- We are continuing our design-in momentum to achieve our LT growth targets of 6-8% growth
- Traction for winning combinations in the market place continues to be solid
- The re-vamp of the MCU and the MPU roadmaps is starting to show early signs of success
- We are regaining share in the 16-bit market and our expectation is as the RA family continues to get traction we should see growth in the 32-bit area as well
- The Shiga closure does not materially impact our offerings to be successful in addressing the needs of the 400 G/800G Optical market

[Renesas.com](https://www.renesas.com)