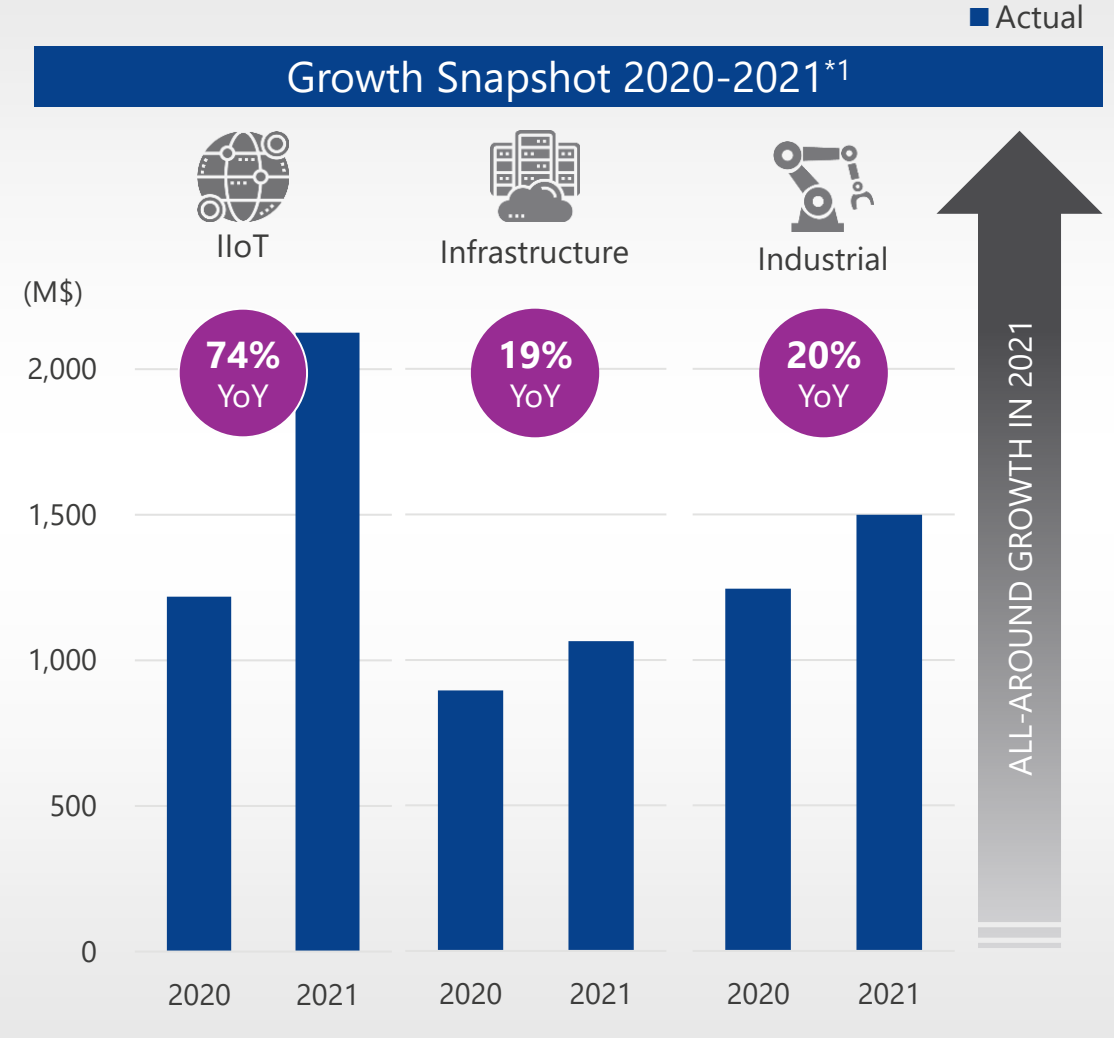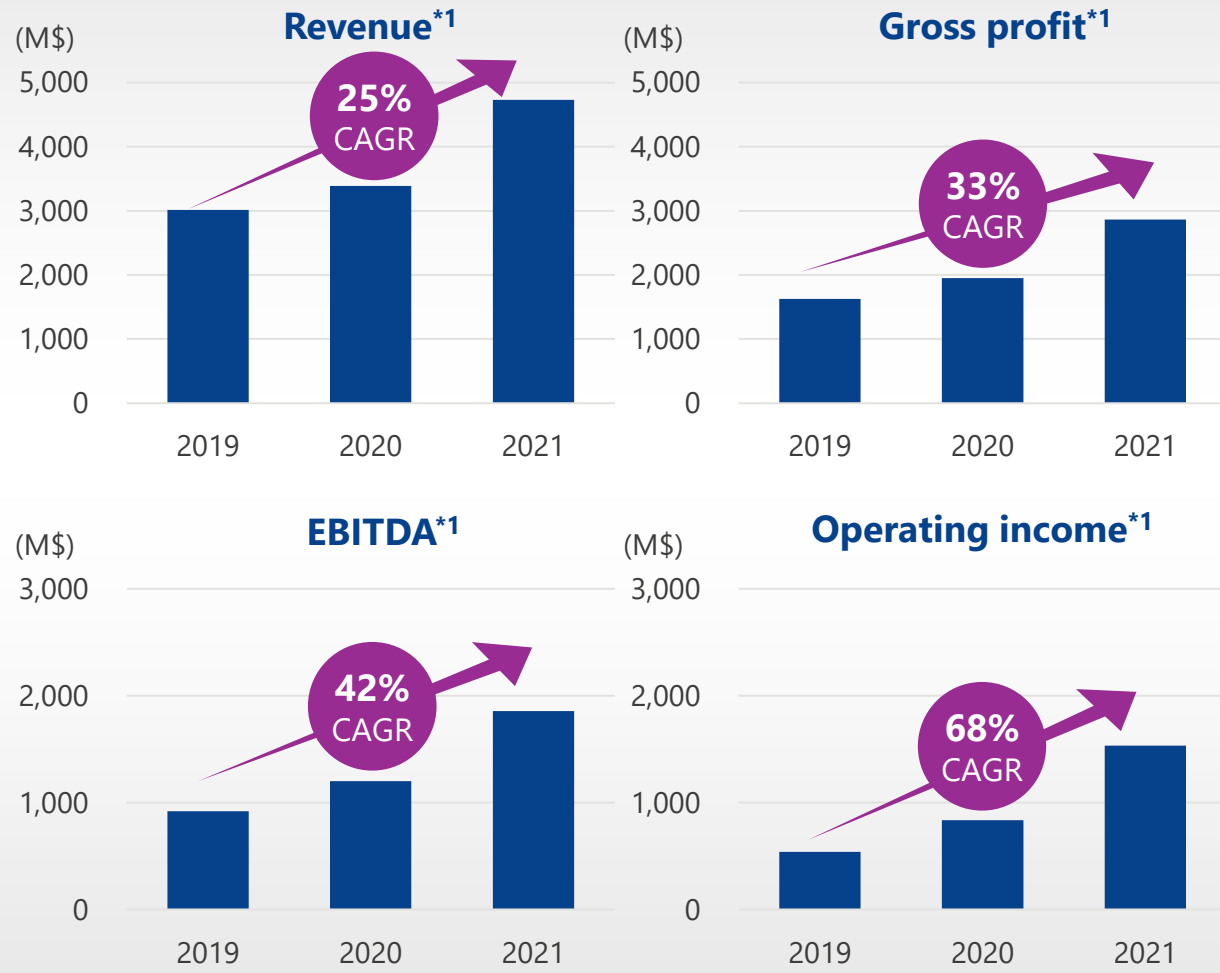# INDUSTRIAL, INFRASTRUCTURE AND IOT STRATEGY

MARCH 3, 2022

SAILESH CHITTIPEDDI

EXECUTIVE VICE PRESIDENT AND GENERAL MANAGER

IOT AND INFRASTRUCTURE BUSINESS UNIT

RENESAS ELECTRONICS CORPORATION

BIG IDEAS FOR EVERY SPACE
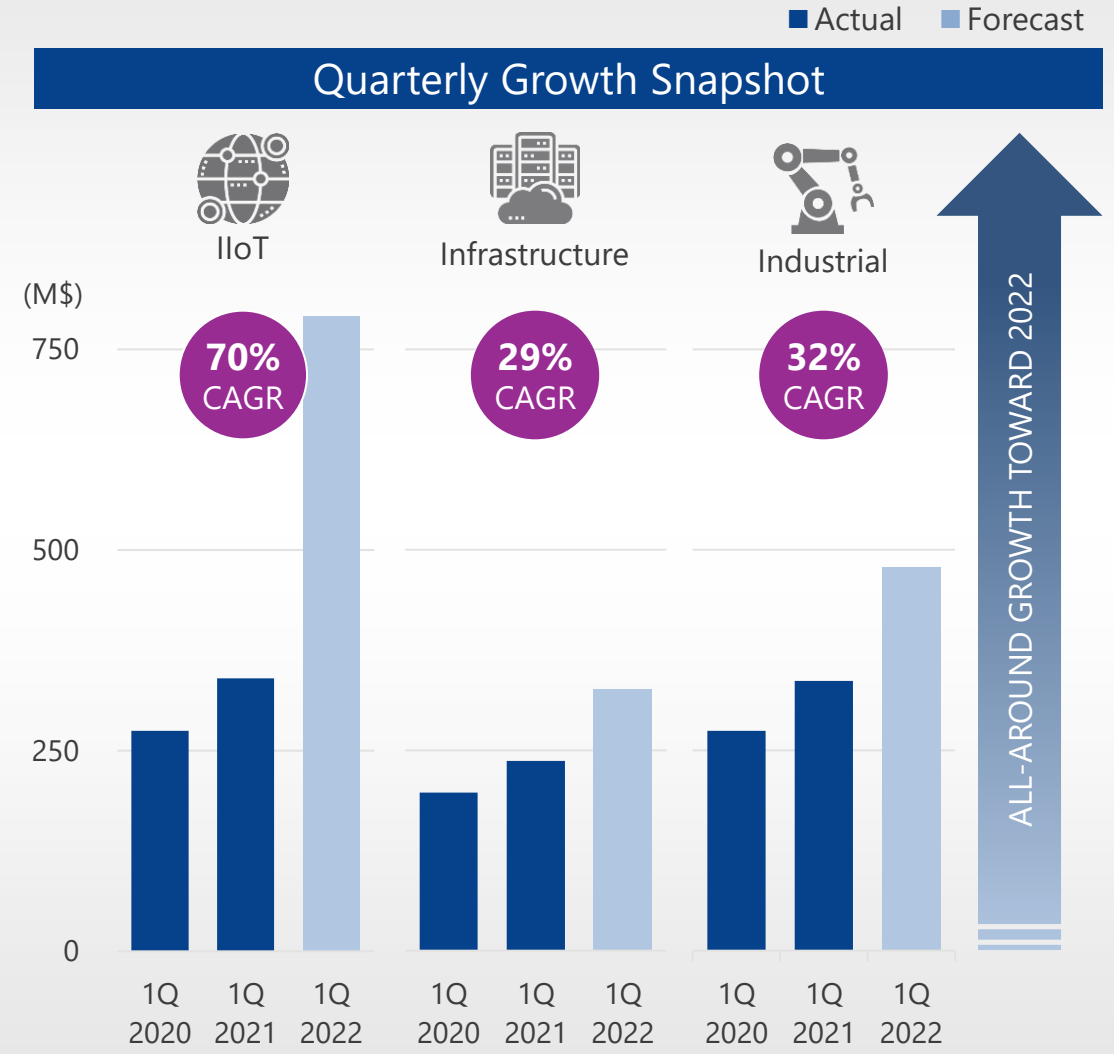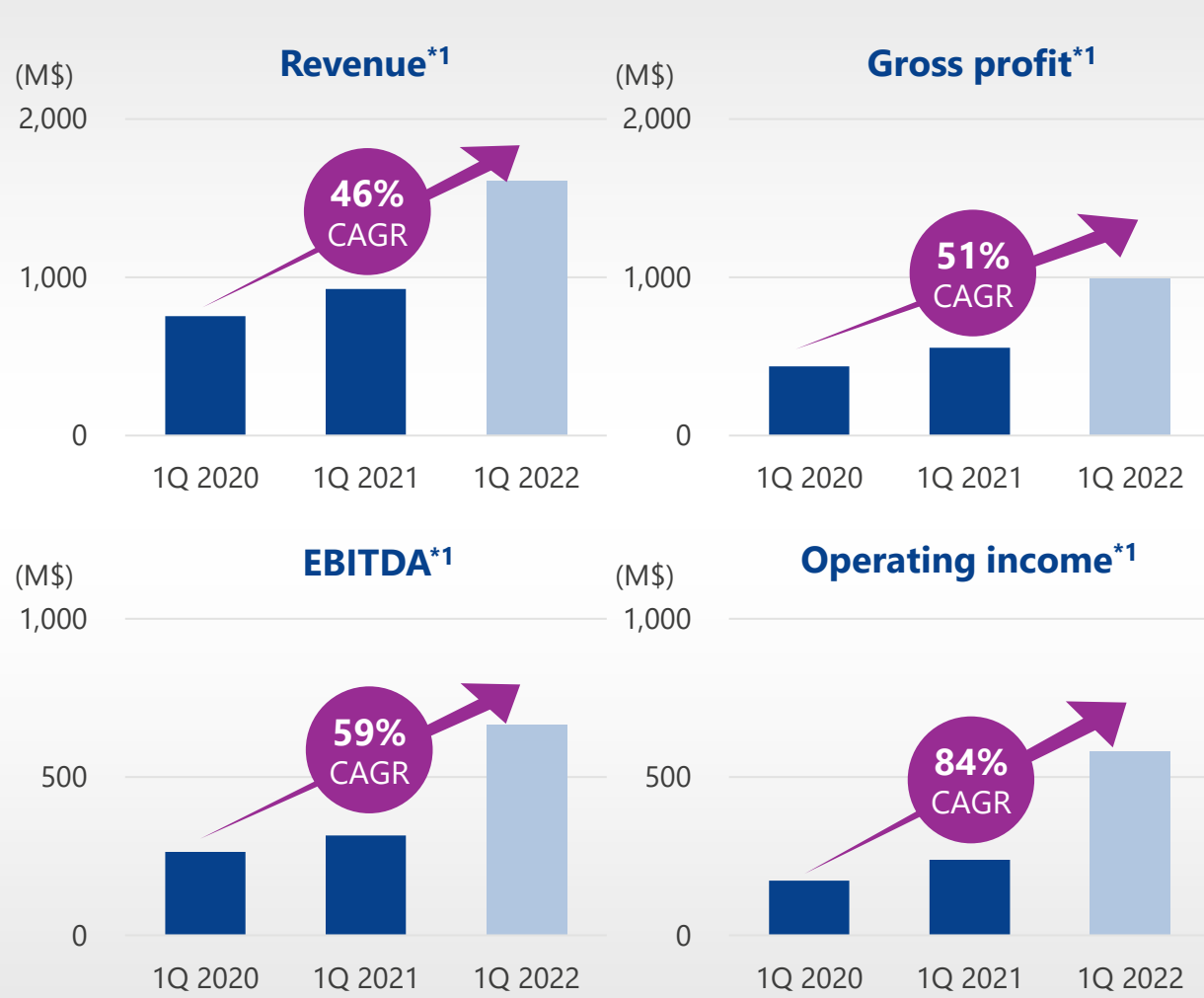
RENESAS

AGENDA

- Industrial, Infrastructure and IoT Business Financial Recap

- Trends Driving Growth

- Industrial, Infrastructure and IoT Business Growth Drivers

  - Industrial: Focus on MPU

  - IoT: Focus on MCU, Connectivity

  - Infrastructure: Focus on Power for Data Center and Computing

  - New Growth Vectors: Metaverse, FPGA's

- Summary

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IIOT AND INDUSTRIAL ANNUAL FINANCIAL TRENDS

Actual

Revenue*1
(M$)

- 5,000
- 4,000
- 3,000
- 2,000
- 1,000
- 0

25% CAGR

2019 2020 2021

Gross profit*1
(M$)

- 5,000
- 4,000
- 3,000
- 2,000
- 1,000
- 0

33% CAGR

2019 2020 2021

EBITDA*1
(M$)

- 3,000
- 2,000
- 1,000
- 0

42% CAGR

2019 2020 2021

Operating income*1
(M$)

- 3,000
- 2,000
- 1,000
- 0

68% CAGR

2019 2020 2021

Growth Snapshot 2020-2021*1

IIoT   Infrastructure   Industrial

(M$)

- 2,000
- 1,500
- 1,000
- 500
- 0

74% YoY   19% YoY   20% YoY

2020 2021   2020 2021   2020 2021

ALL-AROUND GROWTH IN 2021

*1: The financial data of each fiscal year is converted at the prevailing U.S. dollar rate of each year

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IIOT AND INDUSTRIAL QUARTERLY FINANCIAL TRENDS

■ Actual ■ Forecast

Revenue[1] (M$)
- 46% CAGR
- 1Q 2020, 1Q 2021, 1Q 2022

Gross profit[1] (M$)
- 51% CAGR
- 1Q 2020, 1Q 2021, 1Q 2022

EBITDA[1] (M$)
- 59% CAGR
- 1Q 2020, 1Q 2021, 1Q 2022

Operating income[1] (M$)
- 84% CAGR
- 1Q 2020, 1Q 2021, 1Q 2022

Quarterly Growth Snapshot

IIoT — 70% CAGR
Infrastructure — 29% CAGR
Industrial — 32% CAGR

(M$): 750, 500, 250, 0

- IIoT: 1Q 2020, 1Q 2021, 1Q 2022
- Infrastructure: 1Q 2020, 1Q 2021, 1Q 2022
- Industrial: 1Q 2020, 1Q 2021, 1Q 2022

ALL-AROUND GROWTH TOWARD 2022

*1: The financial data of each quarter is converted at the 1Q prevailing U.S. dollar rate of each year (guidance rate for 1Q 2022)

4

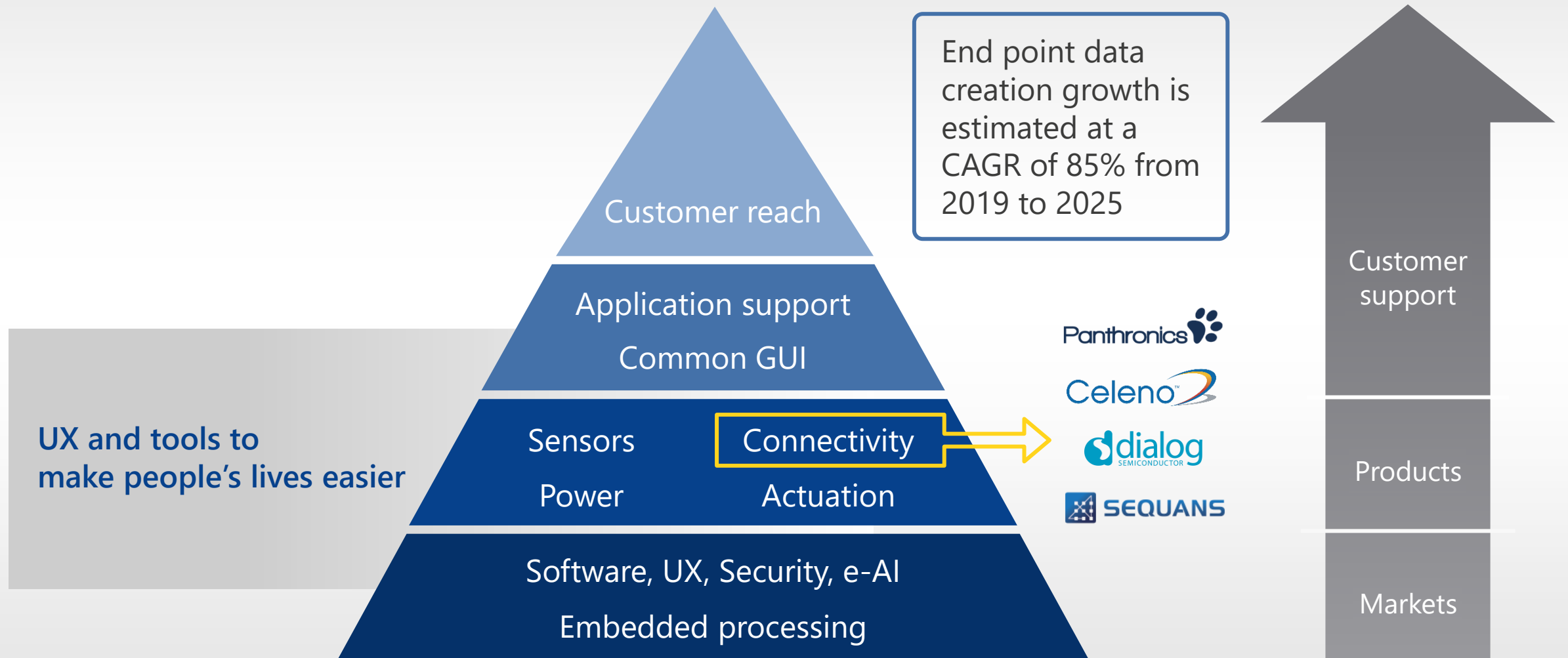BIG IDEAS FOR EVERY SPACE RENESAS

OUTLOOK FOR 2022 BY MARKET SEGMENT

Segment	2021	2022	Comment
Industrial (Industrial automation)	++	++	Sustainability and increased automation
Industrial Home Appliance	++	+	Moderating growth
Industrial (General)	++	++	Move to increased efficiency
IoT (Mobile)	++	+	Normalized growth post share shifts from Huawei
IoT (Laptop/ NB/ tablets)	++	+	Enterprise and gaming growth offset consumer declines
IoT (Mass market)	++	++	Strength in broad market
Infrastructure (Data center)	++	++	Growth in Hyperscalers and cloud computing
Infrastructure (5G)	+	+	Slow Growth mmW

Inventory levels continue to be low across the product segments

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INDUSTRIAL, INFRASTRUCTURE AND IOT BUSINESS GROWTH DRIVERS

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MOVING INTELLIGENCE FROM CORE TO END POINT SUSTAINABLY
MAKING PEOPLE'S LIVES EASIER

End point data creation growth is estimated at a CAGR of 85% from 2019 to 2025

Pyramid (top to bottom):
- Customer reach
- Application support / Common GUI
- Sensors | Connectivity | Power | Actuation
- Software, UX, Security, e-AI / Embedded processing

UX and tools to make people's lives easier

Logos: Panthronics · Celeno · dialog SEMICONDUCTOR · SEQUANS

Arrow (bottom to top):
- Markets
- Products
- Customer support

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INDUSTRIAL:
SCALABLE MPU SOLUTIONS

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SCALABLE MPU PRODUCTS & DESIGN-IN GROWTH

WINNING IN INDUSTRIAL MARKETS, AND GOING BROADER ADDRESSING A 1.3B$ SAM OPPORTUNITY IN 2021
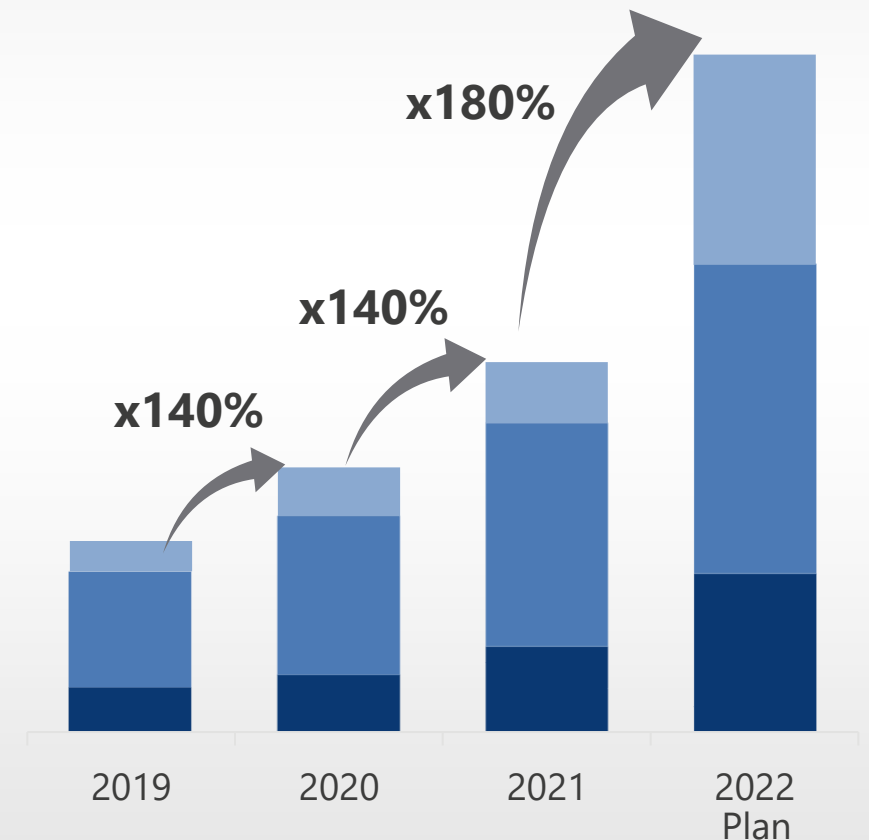
Enhancing portfolio covering wider application domain

RENESAS RZ

RZ/Five: Ready to use RISC-V MPU – IoT Gateway

The number of products

	~2019	2021	2023	
AI MPU	2	4	7	↑ Performance / Vision AI / ↓ Power & Cost
GP MPU	10	17	23	Platform SW & expand apps
Industry ASSP	5	7	10	Expand access layer portfolio
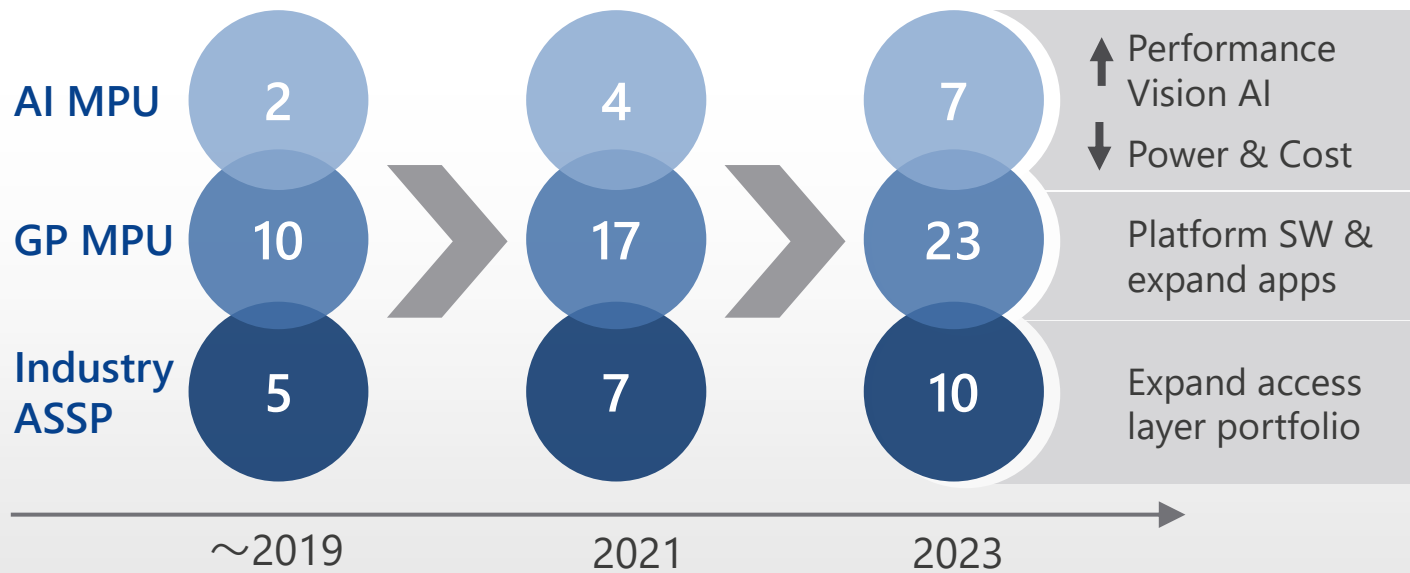
Design-in LTV Growth at 150%+ YoY

■ Industry ASSP ■ GP MPU ■ AI MPU

x180%

x140%

x140%

2019   2020   2021   2022 Plan

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IoT:
MCU PROGRESS & CONNECTIVITY

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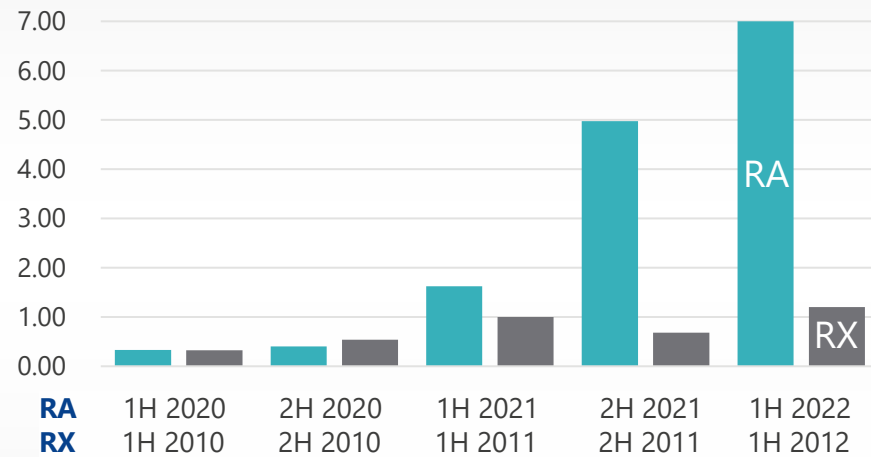# SCALABLE 32-BIT MCU SOLUTIONS FOR AIOT LEADERSHIP

RENESAS RA

RA Design-in already surpassed all time RX record high in < 2 years!

RA8 series
High performance

Strategic partnership with Syntiant and Arduino

- Syntiant for voice based embedded AI
- Arduino for the eco-system

	1H 2020	2H 2020	1H 2021	2H 2021	1H 2022
RA	1H 2020	2H 2020	1H 2021	2H 2021	1H 2022
RX	1H 2010	2H 2010	1H 2011	2H 2011	1H 2012

UX Improvement

We are asking for your proposals regarding User Experience (UX) improvement for our MCU and SoC products, solutions and services. A team of nominated MCU & SoC team members will check and assess all inputs on a regular basis and the best suggestions will be passed on to our top management for consideration. No proposal is too big or too small, all will contribute to our goal.
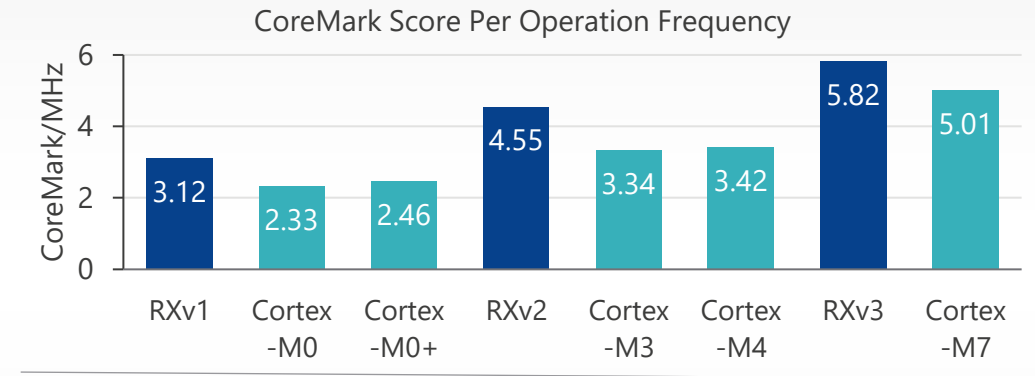
RA Microcontroller Kits Feedback

Our vision is to provide the world's best microcontroller kit experience that will help you jumpstart innovation with RA family of microcontrollers and take your products to the market faster. We have put in much love, attention to detail, and customer-centric thinking in every aspect of the RA microcontroller innovation kits. We hope these kits have exceeded your expectations. We look forward to knowing how we have done and what we can do to enhance your experience.

Ashish Ahuja
RA MCU Kits Team

UX Feedback: Making People's Lives Easier

RENESAS RX

1 BILLION devices shipped!

CoreMark Score Per Operation Frequency

RXv1	Cortex-M0	Cortex-M0+	RXv2	Cortex-M3	Cortex-M4	RXv3	Cortex-M7
3.12	2.33	2.46	4.55	3.34	3.42	5.82	5.01

RISC-V MCUs – Purpose Built Solutions

- Single motor drive, pre-programmed motor control algorithms
- Configurable parameters programmed by user
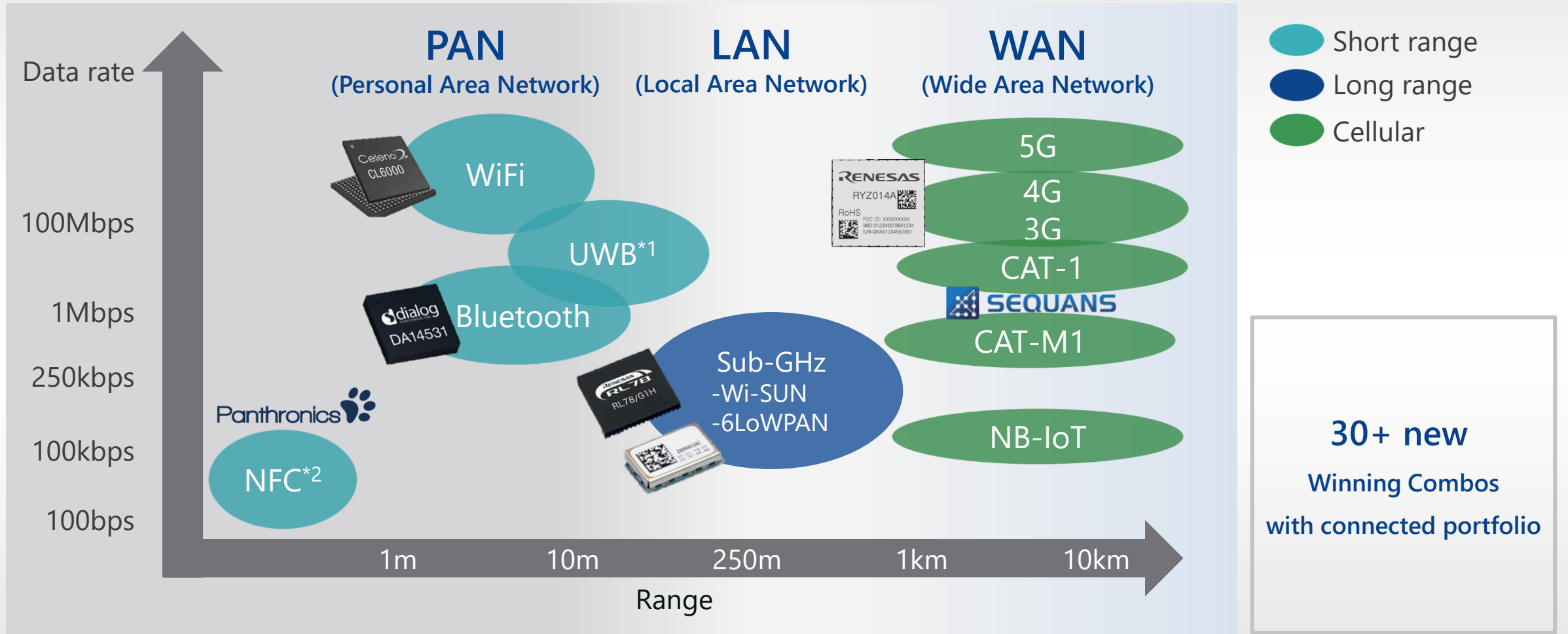- IEC60730 safety test libraries and extended 125 °C capability

VOICE USER INTERFACE

MOTOR CONTROL

- Ready to go solution enabling everyday electronics with voice commands
- Simple interface to add wake words and commands
- Extensible with analog/digital mics, external CODECS, external amps and speakers
- Additional solutions developed on RA and RX devices

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RENESAS WIRELESS CONNECTIVITY: ENABLING SEAMLESS CLOUD ENABLEMENT

Data rate

PAN
(Personal Area Network)

LAN
(Local Area Network)

WAN
(Wide Area Network)

- Short range
- Long range
- Cellular

100Mbps — WiFi, UWB*1, 5G, 4G, 3G, CAT-1

1Mbps — Bluetooth, SEQUANS

250kbps — Sub-GHz -Wi-SUN -6LoWPAN, CAT-M1

100kbps — NFC*2, NB-IoT

100bps

Panthronics

Celeno CL6000
dialog DA14531
RENESAS RL78/G1H
RENESAS RYZ014A RoHS FCC ID: XXXXXXXXX IMEI:012345678901234 S/N:IQNA012345678901

1m   10m   250m   1km   10km

Range

30+ new
Winning Combos
with connected portfolio

*1: UWB: Ultra Wide Band   *2: NFC: Near Field Communication

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INFRASTRUCTURE:
GROWTH IN POWER FOR DATA CENTER & COMPUTING

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DATACENTER AND COMPUTING POWER STRENGTH
PMIC FOR PROCESSORS

Server and Desktop PC Digital Power

>100% CAGR

Server/Data center
Desktop digital power
Desktop
Server

2019 · 2020 · 2021
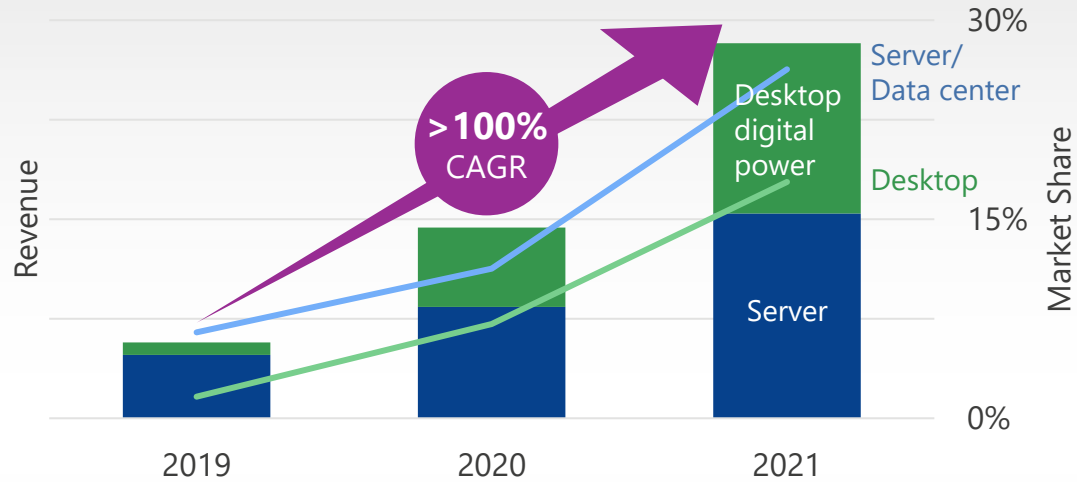
Mobile Compute Business - Chargers, Core Power, Fuel Gauge

50% CAGR

Mobile
Mobile compute

2019 · 2020 · 2021
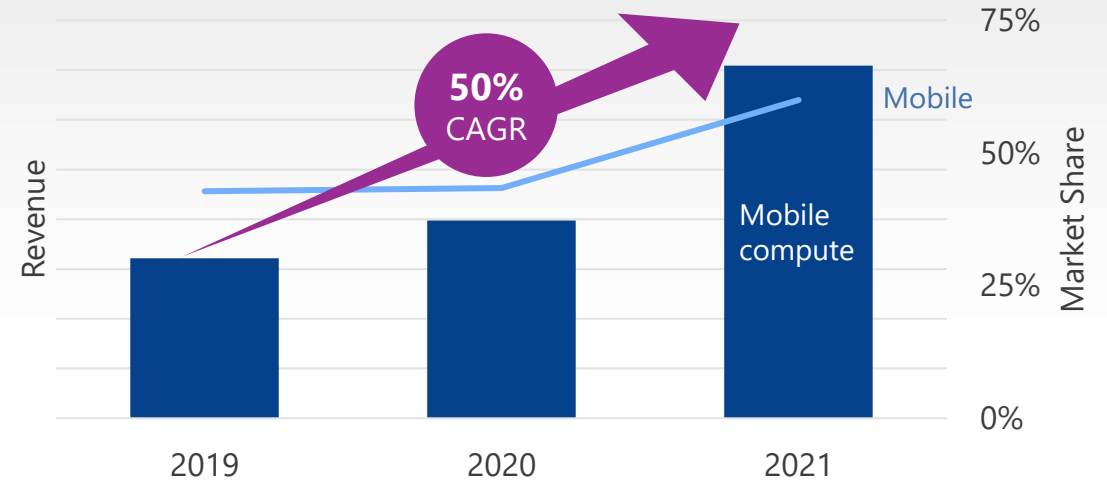
Server and Computing Power Design Momentum

30% CAGR

2019 · 2020 · 2021
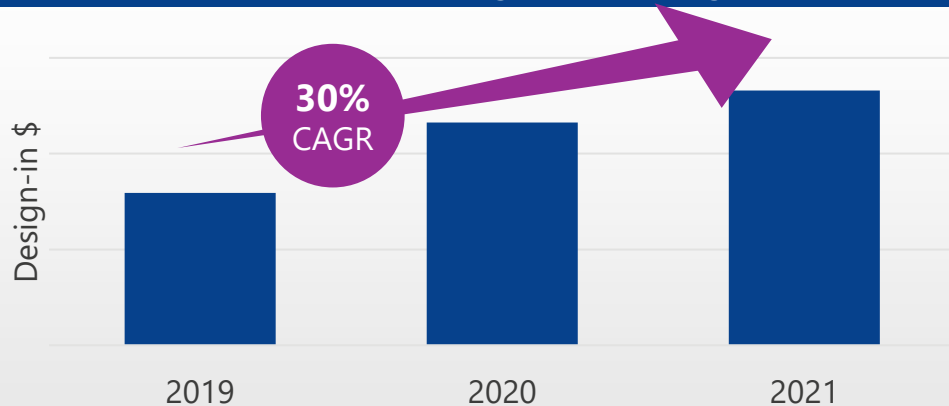
- Server and Desktop digital power growth driven by market share gains with Renesas' world class digital controller technology

- Mobile compute growth driven by share gains in battery chargers and FGIC[*1] as well as significant market growth due to pandemic

*1: FGIC: Fuel Gauge IC

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DDR5 PMIC KEY DESIGN-INS – PMIC IN MEMORY MODULES

CPU

intel AMD IBM aws AMPERE RAMAXEL

OEM/CSP

DELL Hewlett Packard Enterprise lenovo Microsoft aws CISCO Google Meta hp SUPERMICRO GIGABYTE ASUS PEGATRON Inventec

Memory

SAMSUNG SK hynix Micron NANYA intel CXMT

Module

Kingston TECHNOLOGY innodisk viking TECHNOLOGY CORSAIR G.SKILL ADATA Apacer Virtium v-color Team Group Inc. ATP

Renesas is the DDR5 market share leader and only PMIC supplier approved for Intel Alder Lake

Server Laptop PC Desktop PC Gaming

DDR5 PMIC Design-in

4x vs 2020

5.00	
4.00	
3.00	
2.00	
1.00	
0.00	

2020 2021 2022

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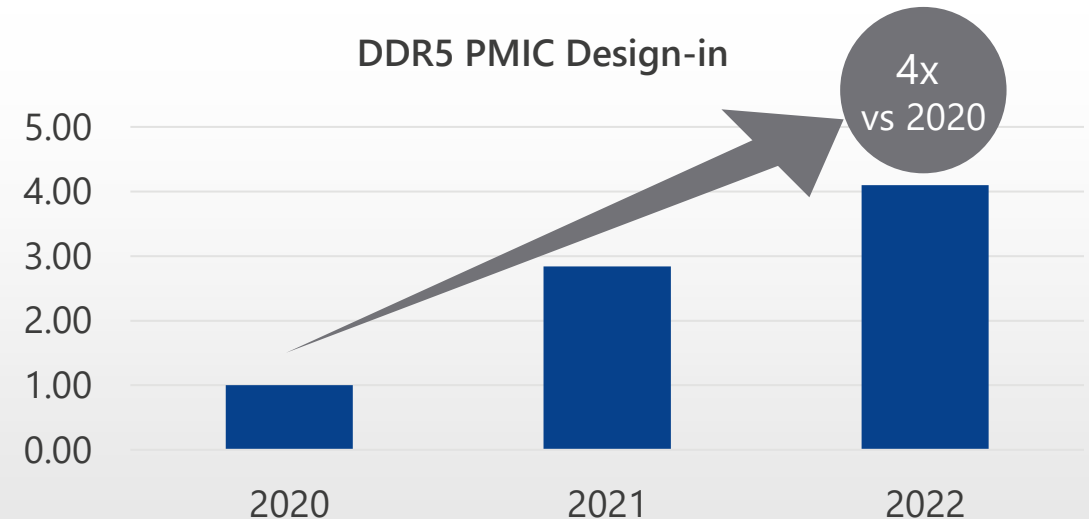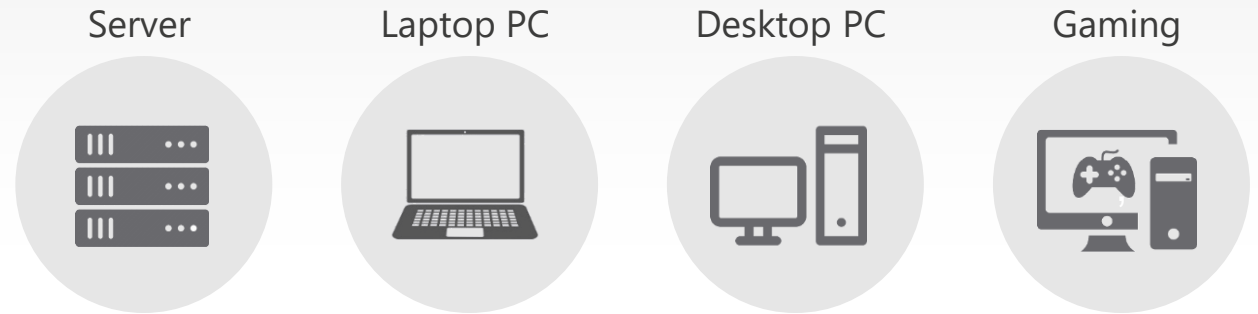
ADDITIONAL DRIVERS OF GROWTH:
RENESAS IN THE METAVERSE, FORGE FPGA

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RENESAS IN METAVERSE

Arm-based and workload optimized AI CPU/GPU
"cloud" power BOM
Potential for 10s of millions of boards per year
**Up to 60 Digital Controllers and Power
Stages per board**
Board BOM up to ~$72.00

End User Device PMIC/power BOM Potential for
100s of millions of devices per year
Host SOC/Apps Processor PMIC
System BOM up to ~$3.00
TWS*[1], Charger PMIC
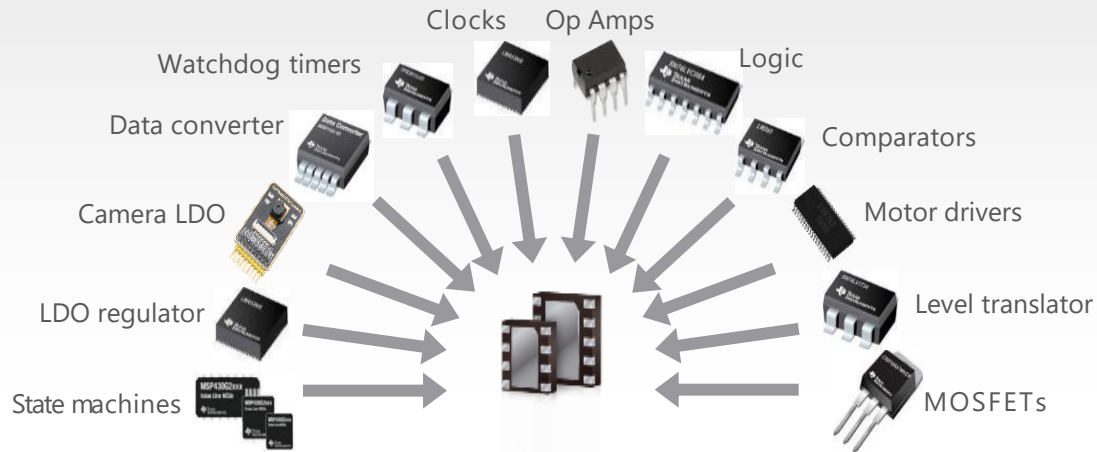**System BOM up to ~$3.50**
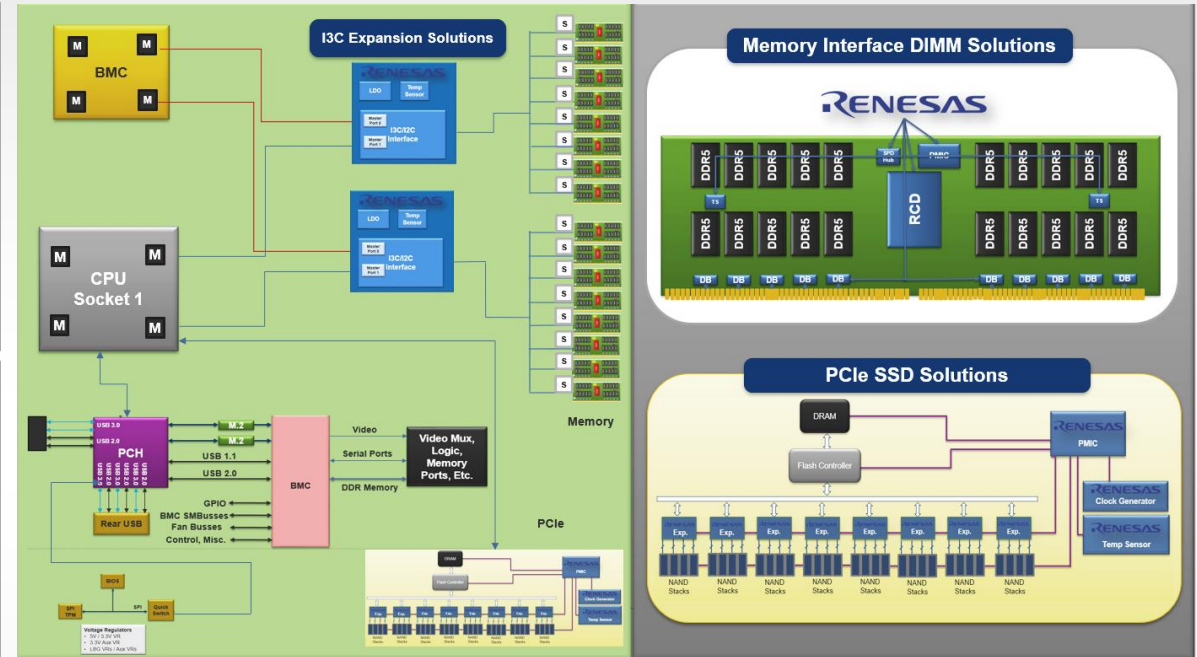
- Exponential growth in AI accelerator cards and Arm-based/workload optimized CPUs

- As AR/VR use cases expand, backend cloud processing requirements expand leading to more cards/systems

- AR/VR and Wearable devices require ultra high efficiency and ultra-dense integrated power solutions – with the Dialog acquisition Renesas is the technology leader in PMICs for AR/VR
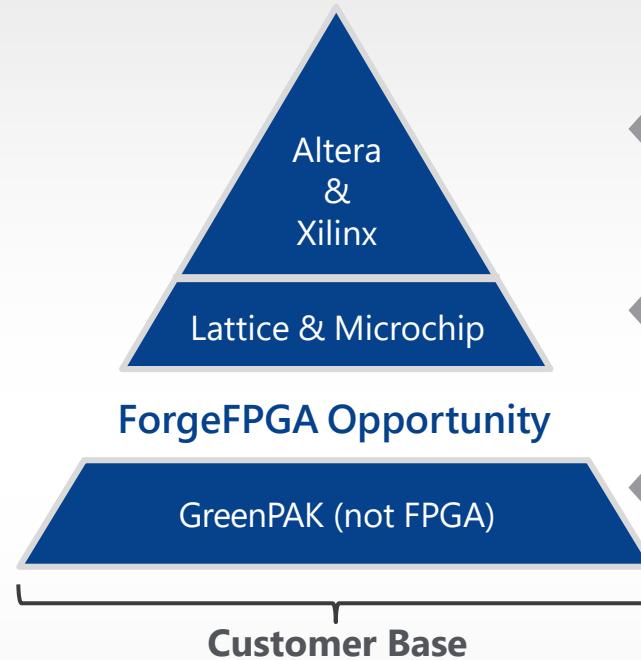
*1: TWS: Total Wireless Stereo

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GREENPAK TO FORGE FPGA
EASY TO USE SOFTWARE CAPABILITIES FOR INDUSTRIAL AND IOT MARKETS

Watchdog timers
Clocks
Op Amps
Logic
Data converter
Comparators
Camera LDO
Motor drivers
LDO regulator
Level translator
State machines
MOSFETs

	Discrete components	GreenPAK	Mixed signal ASIC
Time to market	Medium	**Fastest**	Slowest
Per unit cost	Medium	**Low**	Lowest
NRE changes	Zero	**Zero**	High

ForgeFPGA

- FPGA functionality to next generation GreenPAK
- Free development software
- Co-pack GPAK die with FPGA die

Altera & Xilinx

Lattice & Microchip

ForgeFPGA Opportunity

GreenPAK (not FPGA)

Customer Base

Mixed-signal control   Enhanced digital capability

GreenPAK — Power Gating — FPGA

Interface IO

Highest Density, $20+
Auto, Aero, 5G, Core Networking

Mid to Low Density, $2 to $20
Auto, Aero, Networking, Industrial, Medical

Lowest Density, <$0.50
Auto, Aero, Networking, Industrial, Medical, IoT & General Consumer

SW environment 2 modes:

- Macrocell mode that uses a schematic capture-based development flow
- HDL mode that provides a familiar Verilog environment

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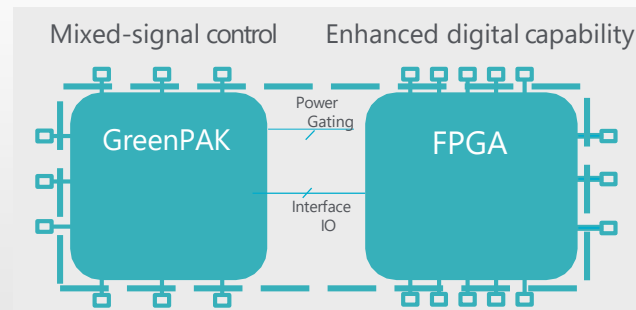
SUMMARY

- **Industrial, Infrastructure and IoT** continue to see significant opportunities for growth into 2022. aligned with our mission of making people's lives easier

- **Celeno and Dialog** integrations on-track and product lines are fully integrated

- **Inventory levels** in the channel and key customers continue to be low

- We are setting **aggressive growth targets** for Design-in and launching new products to set the foundation for our long-term growth

- We are well positioned with our **connectivity portfolio** and recently announced partnership with Sequans for cellular

- Traction for our **Arm-based cores** continues to be solid. We also are announcing a strategic partnership with Arduino for ecosystem growth and Syntiant for voice based NNP[1] capabilities

- **MPUs** are on an early trajectory for growth

- **Data center and emerging metaverse** show prospects for future growth

- **Meet or exceed our financial model for IIBU** of >>SAM growth, GM ≈60%, OM 30-35%

*1: NNP: Neuro Network Processor

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Renesas.com

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