

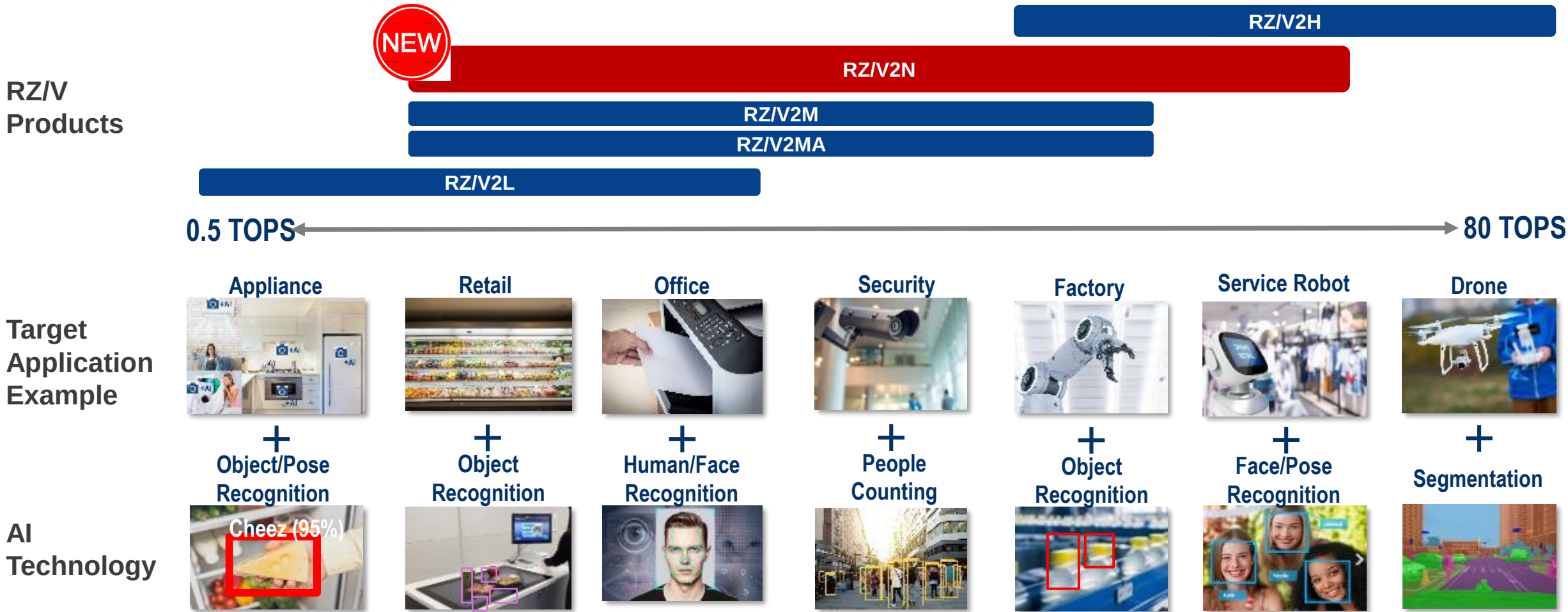
RZ/V SERIES

MAR 2025

EMBEDDED PROCESSING PRODUCT GROUP
EMBEDDED PROCESSING MARKETING DIVISION
APPLICATION PROCESSOR PRODUCT MARKETING DEPT

PRODUCT EXPANSION FOR VISION AI APPLICATIONS

RZ/V2N is a mainstream product that covers a wide range of applications for vision AI.



FEATURED PRODUCT RZ/V2H

TARGET APPLICATION

Note1: Cannot be used for external materials

Target customers

- ✓ Require **High AI performance.**
- ✓ Require **Multi MIPI camera input.**
- ✓ Require **OpenCV and/or visual SLAM.**
- ✓ **Replace from ,competitive AI MPU nVIDIA, TI, HAILO.**

 **nVIDIA**. Jetson orin nano

 **TEXAS INSTRUMENTS** AM69A

 **HAILO** Hailo-15
Empowering Intelligence

◆ Auto Mobile Robots



Service Robot



Drone



AGV/MAR



Agriculture Robot

◆ Smart Retails



Smart shopping cart



Smart scanner/POS



Retail camera
(Stereo vision People tracking etc)

◆ Smart City



AI box/Video analysis



Transportation system

◆ Factory automation



Industrial camera
Machine vision

FEATURED PRODUCT RZ/V2N

TARGET APPLICATION

RZ/V2N

□ Target customers

✓ Require **low power consumption** and **high AI performance**, and **lower price** than RZ/V2H.

✓ Require **Dual MIPI camera input**.

✓ Replace from ,competitive AI MPU NXP and TI.

NXP i.MB8M Plus



AM68A/AM62A7

◆ Autonomous mobile robot



Vacuum cleaner



Lawn mower

Note1



Communication robot

Note1

◆ AI Camera



Dash-Cam

Note1



Monitoring camera

Note1



Note1



Stereo camera

Note1

Note1: Cannot be used for external materials

TARGET CUSTOMERS FOR RZ/V2L

TARGET APPLICATION

RZ/V2L

□ Target customers

- ✓ *Don't have AI skills but want to evaluate AI*
- ✓ *Add AI function, but want to keep investment low*
- ✓ *Immediately bring AI products to market (mass production)*
- ✓ *Add AI functions to existing systems easily and conveniently.*

◆ Monitoring camera



DMS
Driving Monitoring System

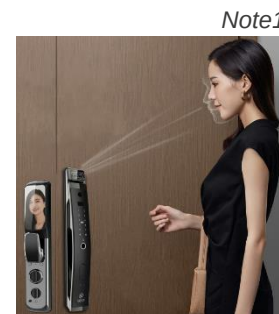


Pet camera



Trailcamera

◆ Security Camera



Smart door



Wearable camera
Body on camera



ANPR System
Automatic Number Plate Recognition

Note1: Cannot be used for external materials

RZ/V SERIES INTRODUCTION AND KEY BENEFITS

- RZ/V series features
- RZ/V series roadmap
- RZ/V series AI performance & Major Feature
- RZ/V series AI performance comparison
- RZ/V series functionality – Key differences

WHAT IS RZ/V SERIES

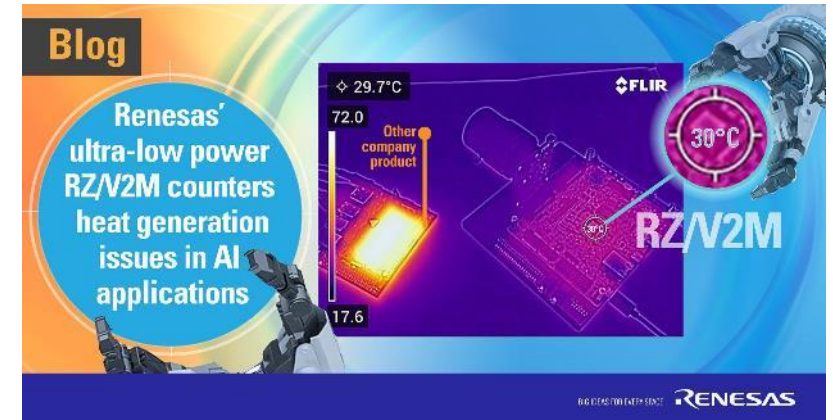
(*1) DRP-AI : Dynamically Reconfigurable Processor for AI

RZ/V series features

- MPU family for **embedded Vision AI applications**
- Integrates Renesas original **AI accelerator DRP-AI(*1)** to deliver up to **80TOPS**
- Delivers **AI power efficiency** up to **10TOPS/W**
- Provides AI performance **scalability** for wide range of applications



[RZ/V Embedded AI MPU | Renesas](#)



<https://www.renesas.com/blogs/farewell-heat-countermeasure-rzv2m-brings-innovation-ai-products>

RZ/V SERIES AI PERFORMANCE & MAJOR FEATURE

AI MPU Product		AI Performance	ISP	Major Feature	
	RZ/V2H	MP: Available	✓	H.264 H.265 55 55 M33 R8 G V DRP-AI3 Open CV Acc MIPIx4 55 55 R8 4K ISP	
				H.264 H.265 55 55 M33 R8 G V DRP-AI3 Open CV Acc MIPIx4 55 55 R8	
	New RZ/V2N	MP: Sep."24 NPI: Feb."25	✓	H.264 H.265 55 55 M33 G V DRP-AI3 MIPIx2 55 55 4K ISP	
				H.264 H.265 55 55 M33 G V DRP-AI3 +OpenCV MIPIx2 55 55	
	RZ/V2M	MP: Available	✓	H.264 H.265 53 G V DRP-AI +OpenCV MIPIx1 4K ISP	
	RZ/V2MA	MP: Available		H.264 H.265 53 53 V DRP-AI Open CV Acc	
	RZ/V2L	MP: Available		H.264 +Simple ISP/OpenCV 55 55 M33 G V DRP-AI MIPIx1	

RZ/V SERIES FUNCTIONALITY – KEY DIFFERENCES

	RZ/V2L	RZ/V2M	RZ/V2MA	RZ/V2H	RZ/V2N
CPU	2x Cortex-A55@ 1.2GHz Parity/ECC Cortex-M33@200MHz	1x Cortex-A53@1GHz	2x Cortex-A53@1GHz	4x Cortex-A55@1.8GHz(O/D*) 2x Cortex-R8@800MHz, Cortex-M33@200MHz	4x Cortex-A55@1.8GHz(O/D*) Cortex-M33@200MHz
DRAM I/F	16bit x1ch DDR4(1600)/DDR3L(1333)	32bit x1ch LPDDR4(3200)	32bit x1ch LPDDR4(3200)	32bit x2ch LPDDR4/4X(3200)	32bit x1ch LPDDR4/4X(3200)
Video in	Support up to 5MP x 1camera 1x MIPI-CSI2 4lane (up to 5MP 30fps x 1cam) 1x parallel 8/10/16bit (up to 720p 30fps x 1cam)	Support up to 4K x 1camera 1x MIPI-CSI2 4lane	USB/Ether/PCIe	Support up to 4K 60fps@1camera Up to 8 camera input 4x MIPI-CSI2 4lane	Support up to 4K 30fps@1camera Up to 4 camera input 2x MIPI-CSI2 4lane
Video Codec	Encoding and Decoding : H.264	Encoding and Decoding : H.265 , H.264	Encoding and Decoding : H.265 , H.264	Support up to 4k 30fps Encoding and Decoding : H.265, H.264	Support up to 4k 30fps Encoding and Decoding : H.265, H.264
Camera ISP	Simple ISP by DRP	Yes (Dedicated H/W for specific sensors)	-	Yes (Dedicated H/W)	Yes (Dedicated H/W)
AI Accelerator	DRP-AI (Performance : ResNet-50 17fps)	DRP-AI (Performance : ResNet-50 28fps)	DRP-AI (Performance : ResNet-50 28fps)	DRP-AI3 (Performance : ResNet-50 830fps)	DRP-AI3 (Performance : ResNet-50 476fps)
GFX	3D Graphics (Arm Mali-G31)	2D Graphics	2D Graphics	3D Graphics (Arm Mali-G31)	3D Graphics (Arm Mali-G31)
Vision/Dynamics Accelerator	-	-	OpenCV accelerator (DRP)	OpenCV accelerator (DRP)	-
Display out	1xMIPI-DSI, 1xParallel	1xHDMI+PHY	-	MIPI-DSI x1	MIPI-DSI x1
USB	USB2.0 x2ch (1H, 1H/F/OTG)	USB3.1 x1ch (1H/F/OTG)	USB3.1 x1ch (1H/F/OTG)	USB3(Gen2x1) - host x 2ch USB2.0-host/func x1ch, host x 1ch	USB3(Gen2x1) - host x 2ch USB2.0-host/func x1ch, host x 1ch
Gbit Ether	2ch	1ch	1ch	2ch (w/PTP)	2ch (w/PTP)
PCIe	-	1ch (Gen2 1Lane)	1ch (Gen2 1Lane)	Gen 3 as 4Lane x1 or 2Lane x 2	Gen 3 as 4Lane x1 or 2Lane x 2
CAN	2ch (CAN-FD)	-	-	CAN-FD(P/L max 8MHz) / CAN 6ch	CAN-FD(P/L max 8MHz) / CAN 6ch
SD/MMC	SD/MMC x1ch, SD x1ch	SD x2ch, MMC x1ch	SD x2ch, MMC x1ch	SDx 3ch, MMC x 1ch	SDx 3ch, MMC x 1ch
Audio	I2S x4ch, SRC(Sampling Rate Converter)	I2S x1ch	-	SSI(I2S) TDM x 10ch, SPDIF x 3ch ASRC, PDM(input) x6	SSI(I2S) TDM x 10ch, SPDIF x 3ch ASRC, PDM(input) x6
Package	456pin PBGA, 15mm x 15mm 551pin PBGA, 21mm x 21mm	841pin FCBGA, 15mm x 15mm 0.5mm ball pitch	841pin FCBGA, 15mm x 15mm 0.5mm ball pitch	FCBGA, 19mm x 19mm 0.5mm ball pitch	FCBGA, 15mm x 15mm 0.5mm ball pitch
OS	Linux on CA55, free-RTOS on CM33	Linux	Linux	Linux on CA55, free-RTOS on CR8 , CM33	Linux on CA55, free-RTOS on CM33

RZ/V SERIES KEY BENEFITS

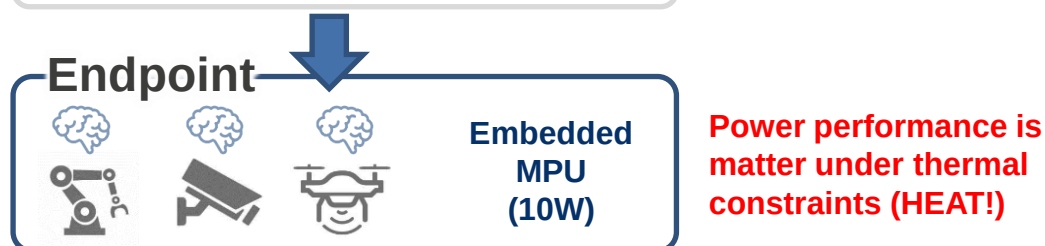
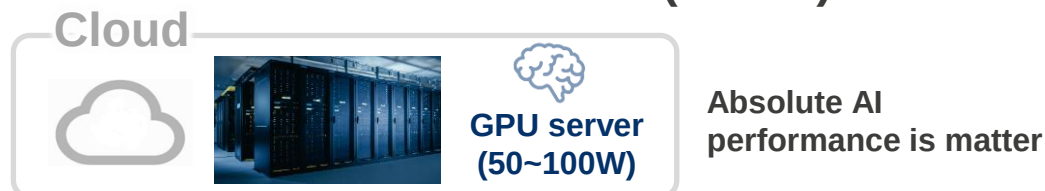
- Key benefits
- Thermal comparison
- RZ/V2H AI Performance positioning (AI inference)
- Low Power & AI Performance Technology : DRP-AI
- Ready to deploy AI Applications

KEY BENEFITS

WHY RZ/V SERIES ARE FOR YOU

- ✓ **Power Performance** : Enabling the embedded applications free from thermal constraints
- ✓ **Ready to deploy AI apps** : Easy-to-use apps gallery to deliver AI enabled products quickly to the market

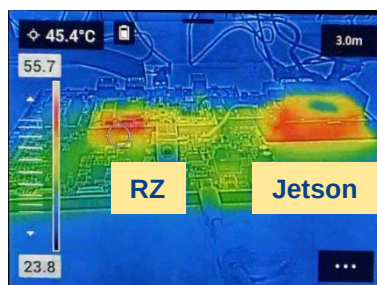
Power Performance(dense)



RZ/V2H
45.4°C
(No Cooling fan)

15 [fps/W]* (note)

Dense



*(note) In the case of YOLOX-s (Dense, INT8) running AI inference at 30fps
fps/W is calculated from measured inference time and board power

Jetson Orin Nano
50.6°C
(w/ Cooling fan)

6.2 [fps/W]* (note)

Dense

Ready to deploy AI apps

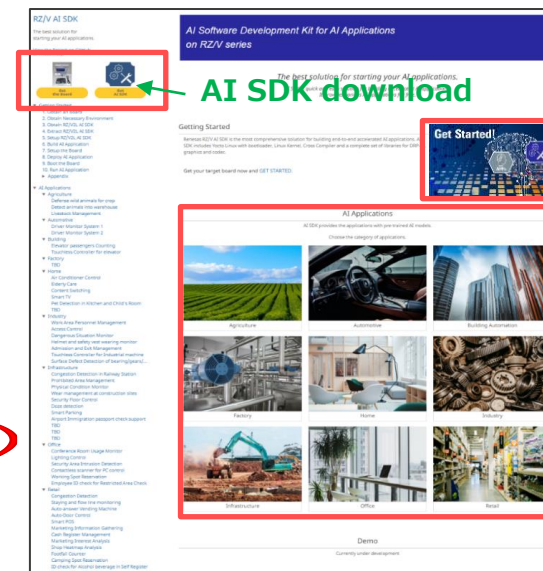
■ Selection from Easy-to-use AI Applications

① Easy to Find

② Easy to Get

③ Easy to Use

One Stop website



Getting Started

AI apps gallery

■ You will find the AI application you need!

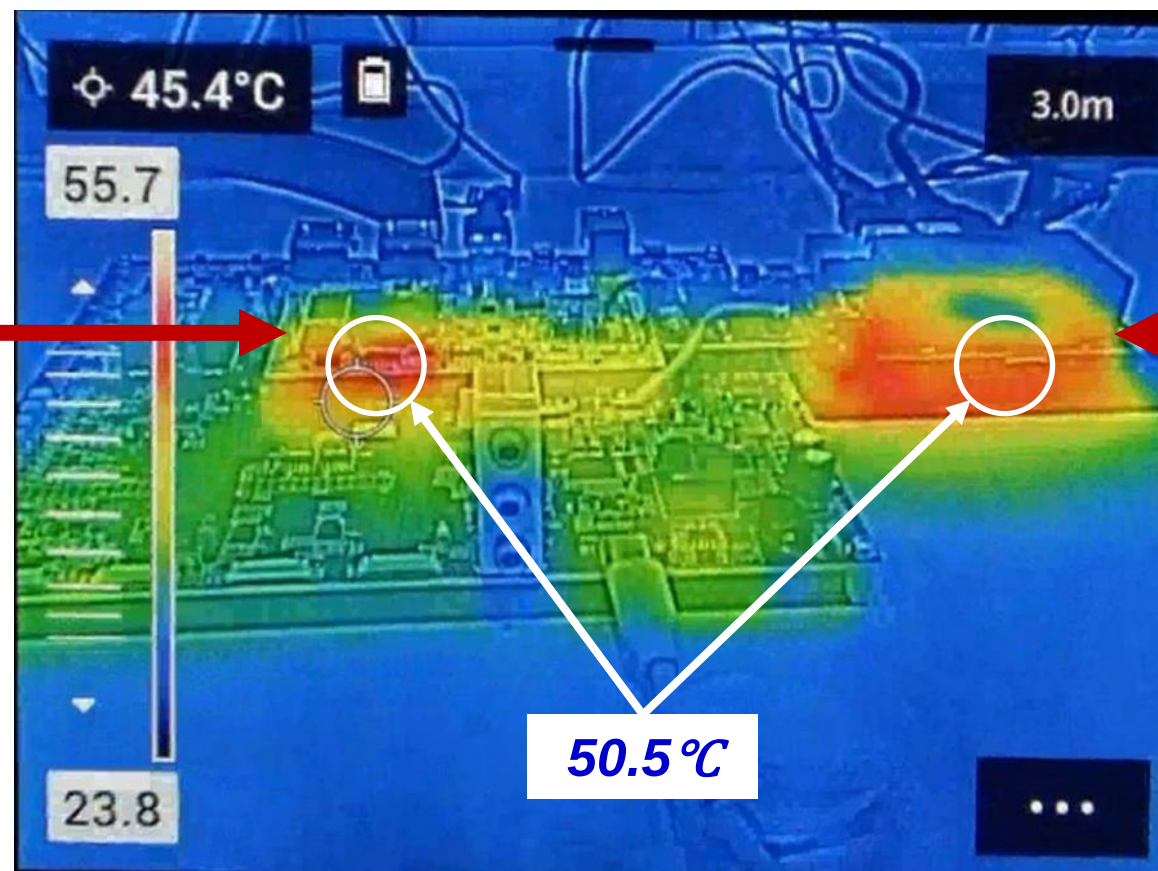
THERMAL COMPARISON

- ✓ *RZ/V can perform AI inference without FAN at the same case temperature as competitor with FAN.*

RZ/V2H



No FAN and Heat sink



Jetson Orin Nano



FAN on the Heat sink is running

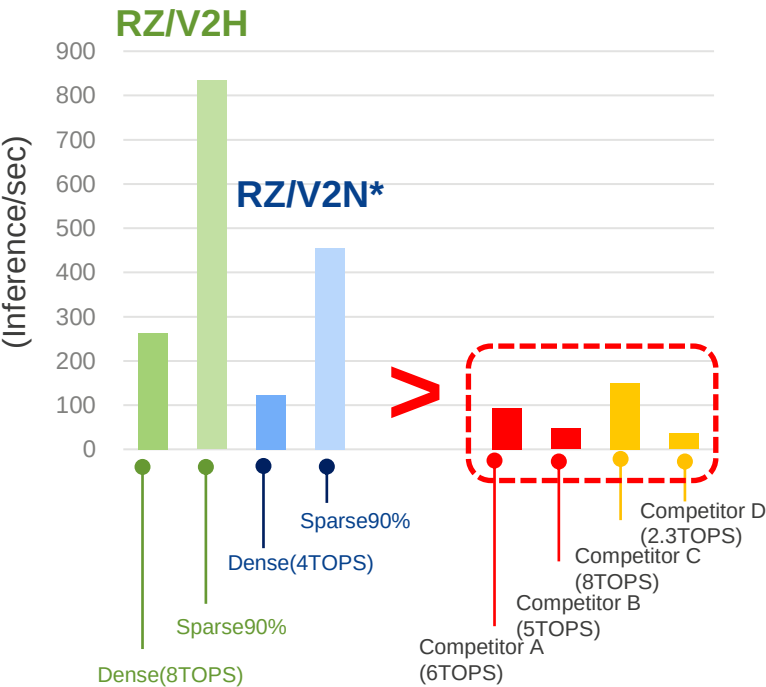
AI INFERENCE PERFORMANCE BENCHMARKS

(COMPARE AI INFERENCE ONLY; EXCLUDE PRE/POST PROCESSING)

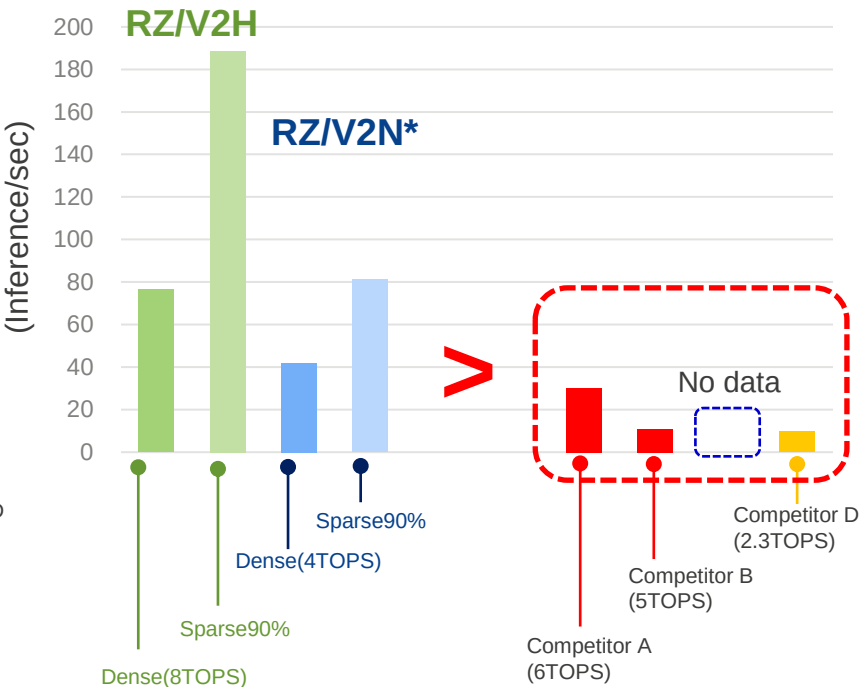
- RZ/V2N and RZ/V2H with latest DRP-AI3 have better AI capability compared to competitors.
- DRP-AI3 supports pruning technology, resulting in further AI acceleration

*AI inference performance during capturing image from camera and displaying

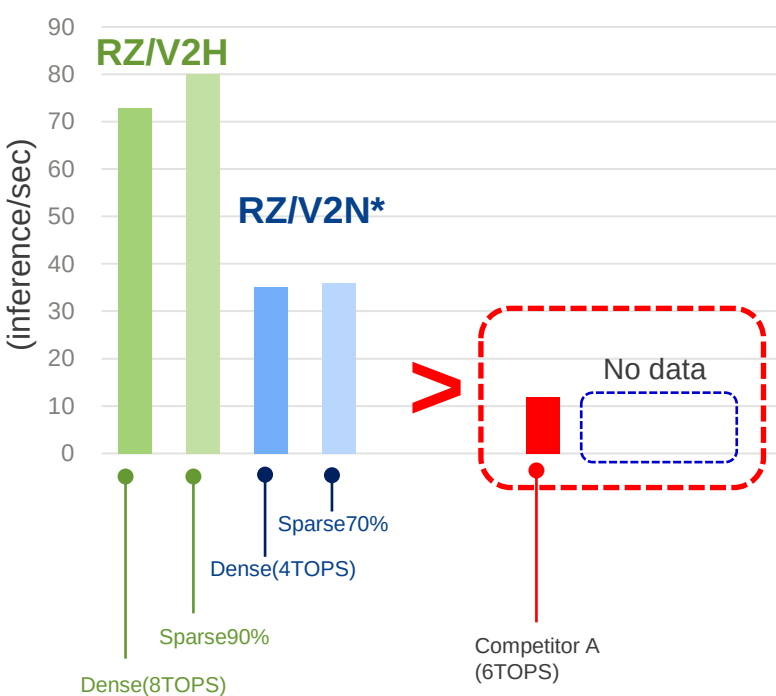
RESNET-50



YOLOv2



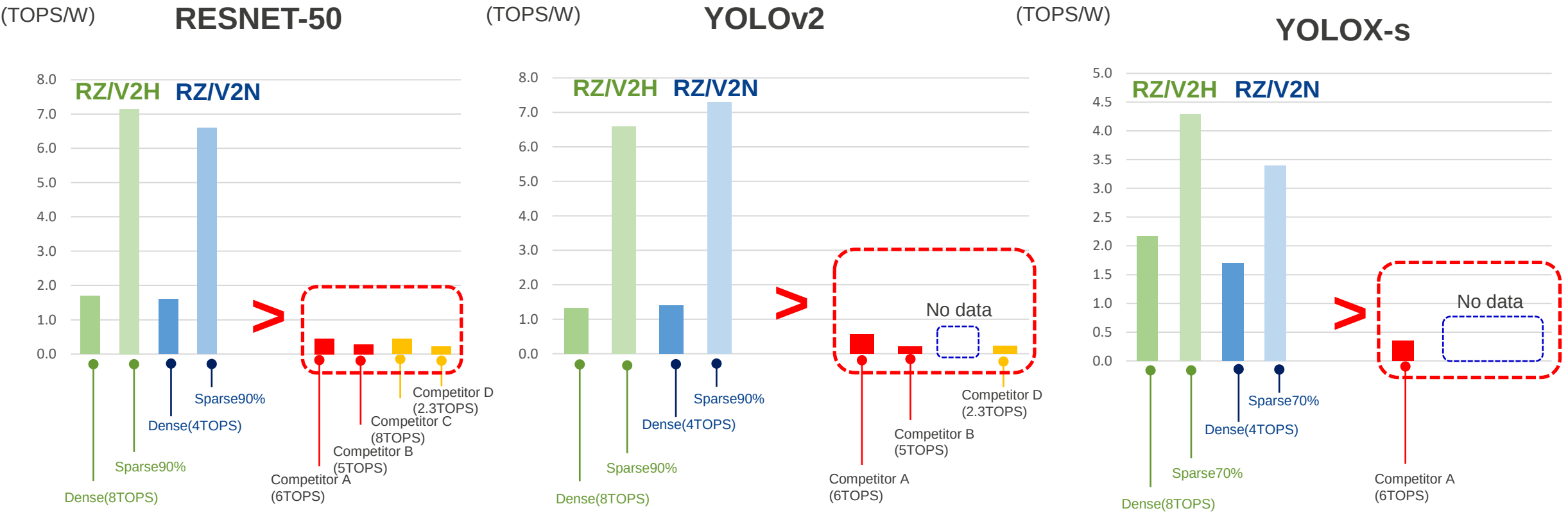
YOLOX-s



AI POWER EFFICIENCY BENCHMARKS

(COMPARE AI INFERENCE ONLY; EXCLUDE PRE/POST PROCESSING)

■ RZ/V2N and RZ/V2H have the best AI power efficiency (TOPS par watt) among competitors



LOW POWER & AI PERFORMANCE TECHNOLOGY : DRP-AI

RZ/V

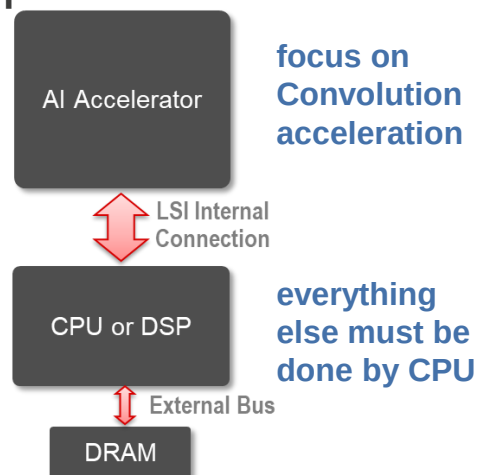
HOW LOWER POWER AI IS ACHIEVED

White Paper: [Embedded AI-Accelerator DRP-AI](#) (PDF | [English](#), [Japanese](#))

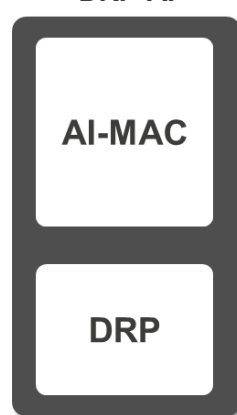
■ DRP-AI (Dynamically reconfigurable processor for AI) is the key enabler

- DRP-AI(Dynamically Reconfigurable Processor for AI) is the main contributor of low power consumption
 - ✓ Unique architecture: integration of MAC unit for AI and DRP
- End to end AI inference can be handled by DRP-AI unit alone without any CPU processing
 - ✓ Most of pre/post processing done by DRP's pipeline processing
 - ✓ Highest utilization of MAC operation
- Architecture to minimize external DRAM traffics by integrating buffer memories

Competitors



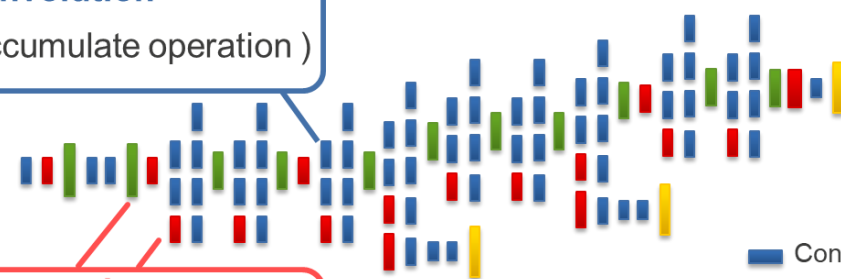
RENESAS
DRP-AI



Convolution
(Multiply-accumulate operation)

Pooling and so on
(Various other operations)

Neural Network Structure



■ Convolution
■ Pooling
■ SoftMax
■ Other

RZ/V SERIES DRP-AI COMPARISON

Product	RZ/V2L	RZ/V2M, V2MA	RZ/V2H	RZ/V2N
DRP-IP	1 st Gen		2 nd Gen	
DRP	DRP 192 ALU/DMU max 266Hz Same IP DRP 192 ALU/DMU max 315MHz		Upper Comp^(note) DRP 192 ALU/DMU max 420MHz	DRP 192 ALU/DMU max 420MHz
AI-MAC	576 MAC 400MHz Same IP 576 MAC 630MHz		4K MAC 1000MHz	2K MAC 1000MHz
Data type (Quantization)	FP16	FP16	INT8	INT8
Pruning	No	No	Yes	Yes

Note) DRP Libraries for RZ/V2L are migratable by recompiling

COMPETITION AND HOW WE WIN

- How to win against the competition
 - nVIDIA Jetson nano
 - NXP i.MX8M Plus
 - Rockchip RK1808
 - Hailo-8 + i.MX8M
 - Rockchip RK3588S
 - Hailo-15

- Other competitors
 - Price
 - Function

AI PERFORMANCE POSITION OF RZ/V AND COMPETITIVE PRODUCT

✓ Please use the table below to propose RZ/V products to your customers that compete with competing products.

Class	Renesas	TI	NXP		Rockchip
UltraHigh	V2H (80TOPS:Spares) (8TOPS:Dense)	AM69A (32TOPS)		Hailo-15 (20TOPS)	
High		AM68A (8TOPS)		Hailo-8 (AI Accelerator) (26TOPS)	RK3588 → RK3688 (6TOPS)
Mid	V2M → V2N (15TOPS:Spares) (4TOPS:Dense)	AM67A (4TOPS)	i.MX95 (2TOPS)		RK3576 (6TOPS)
Mid-Low		AM62A7 (2TOPS)	i.MX8M Plus (2.3TOPS)		
Low	V2L (~1TOPS)	AM62A3 (1TOPS)	i.MX93 (1TOPS)		RK1808 (3TOPS)

NEW

RENESAS RZ/V2H VS TI AM69A

✓ RZ/V2H has the advantage in AI performance, image input interface (MIPI-CSI, GbitEthernet) and price.



Renesas RZ/V2H

Quad core CPU
ARM Cortex-A55 1.8GHz

AI Accelerator : DRP-AI
Dense:8TOPS, Spares:80TOPS

MIPI-CSI : 4 Channel@4K

GbitEthernet
2 Channel (10/100/1000 Base)

-40°C to +125°C

GOOD!

GOOD!

GOOD!

GOOD!

CPU performance

AI Performance

Camera input

Network

Temperature range

GOOD!

Octa core CPU
ARM Cortex-A72 2.0GHz

AI Accelerator : DSP(C7)+MMA
32TOPS (4x 8TOPS)

MIPI-CSI : 3 Channel@4K

GbitEthernet
1 Channel (10/100/1000 Base)

-40°C to +105°C



TEXAS INSTRUMENTS

NEW

RENESAS RZ/V2H VS TI AM68A

✓ *RZ/V2H is superior in all functional aspects, including CPU performance, AI performance, and high-speed I/F.*



Renesas RZ/V2H

Quad core CPU
ARM Cortex-A55 1.8GHz

AI Accelerator : **DRP-AI**
Dense:8TOPS, Spares:80TOPS

MIPI-CSI : **4** Channel@4K

GbitEthernet
2 Channel (10/100/1000 Base)

-40°C to **+125°C**



CPU performance



AI Performance



Camera input



Network



Temperature range

AM68A

Dual core CPU
ARM Cortex-A72 1.4GHz

AI Accelerator : **DSP(C7)+MMA**
8TOPS

MIPI-CSI : **2** Channel@4K

GbitEthernet
1 Channel (10/100/1000 Base)

-40°C to +105°C



TEXAS INSTRUMENTS

NEW

RENESAS RZ/V2N VS TI AM67A

✓ *RZ/V2N has advantages in CPU performance, AI performance, high-speed I/F, and price.
Camera input IF has fewer channels but supports the same resolution. Network has the same performance.*

Renesas RZ/V2N

Quad core CPU
ARM Cortex-A55 1.8GHz

AI Accelerator : DRP-AI
Dense:4TOPS, Spares:15TOPS

PCI Express: 1x **2**Lane

MIPI-CSI : 2 Channel@4K

GbitEthernet
2 Channel (10/100/1000 Base)

GOOD!

CPU performance

GOOD!

AI Performance

GOOD!

High speed I/F

GOOD!

Camera input

Network

AM67A

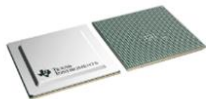
Quad core CPU
ARM Cortex-A53 1.4GHz

AI Accelerator : DSP(C7)+MMA
4TOPS (2x 2TOPS)

PCI Express: 1x **1**Lane

MIPI-CSI : **4** Channel@4K

GbitEthernet
2 Channel (10/100/1000 Base)



TEXAS INSTRUMENTS

NEW

RENESAS RZ/V2N VS. NXP I.MX95

- ✓ V2N has a high advantage in AI performance. It also has an advantage in video streaming processing due to its hardware codec.
- ✓ The i.MX95 CPU operating frequency is as high as 2.0GHz.



Renesas RZ/V2N

Quad core CPU
ARM Cortex-A55 1.8GHz

AI Accelerator : DRP-AI
Dense:4TOPS, Spares:15TOPS

Video codec : Enc/Dec 4K@30fps

CPU performance



AI Performance

Video encode



i.MX95

Hexa core CPU
ARM Cortex-A55 2.0GHz

AI Accelerator : NXP original NPU
2TOPS

Video codec : Enc/Dec 4K@60fps



NEW

RENESAS RZ/V2L VS. NXP I.MX93

- ✓ V2L has the advantage of camera I/F and video streaming processing.
- ✓ The i.MX93 CPU operating frequency is as high as 1.7GHz. But, it uses CPU resources for Video Enc/Dec.

Renesas RZ/V2L

Dual core CPU
ARM Cortex-A55 1.2GHz

AI Accelerator : DRP-AI
0.4TOPS

Hardware codec : Enc/Dec@FHD

MIPI-CSI : 1 Channel@5M

CPU performance

AI Performance

Video encode

Camera input

i.MX93
MIMX9352XVVMXA

Dual core CPU
ARM Cortex-A55 1.7GHz
* Using Resources for Video Enc/Dec

AI Accelerator : Ethos U-65
1TOPS

Software (CPU) : Enc/Dec@FHD

MIPI-CSI : 1 Channel@1080p



RENESAS RZ/V2H VS. HAILO-15

- ✓ *RZ/V2H positions richer functionality and higher computing power.*
- ✓ *RZ/V2H offers higher CPU power (CA55@1.8GHz) and sub-CPU for power management etc.*
- ✓ *Higher AI performance and power efficiency should be evaluated by customer selves.*



Renesas RZ/V2H

Quad core CPU
ARM Cortex-A55 1.8GHz

Sub CPU
ARM Cortex-R8 800MHz x2
ARM Cortex-M33 200MHz

830fps (ResNet-50)
Actual value

4 channel

-40°C to +125°C



CPU performance

Equipped with Sub CPU

AI Performance

MIPI-CSI channel

Temperature range

Hailo-15

Quad core CPU
ARM Cortex-A53 1.3GHz

Not equipped

700fps (ResNet-50)
official value

2 channel

-40°C to +105°C



HAILO
Empowering Intelligence

COMPETITION AND HOW WE WIN

RENESAS RZ/V2H VS. HAILO-8

RZ/V2H

HAILO
Empowering Intelligence

- ✓ *Hailo-8 is AI accelerator and requires host CPU → Total cost & mounting area is big issue*
(Success case: V2H beat the kit of “Hailo-8 + i.MX8M” for above reason)
- ✓ *Hailo-8’s AI performance highly depends on host CPU spec → Not easy to get published performance*

Renesas RZ/V2H



10TOPS/W

FAN less



Power efficiency

830fps (Resnet50)

80fps (Yolox-s)



AI Performance

1chip (RZ/V2H)



System configuration

Board / Device
Flexible



Business model

Hailo-8



3TOPS/W

Heat sink

23fps(Actual measurements) (Resnet50)

30fps(Actual measurements) (Yolox-s)

2chip (Hailo-8 + i.MX8M)

Accelerator module
Limited

COMPETITION AND HOW WE WIN

RENESAS RZ/V2H VS. ROCKCHIP RK3588S

RZ/V2H

Rockchip

- ✓ RK3588S has rich CPU & Video Processing → Avoid function comparison
(CPU: CA76*4 + CA55*4, VPU: 8K@30fps Enc/Dec H.265/H.264)
- ✓ Win by focusing on our strengths: AI performance and Low power consumption

Renesas RZ/V2H

10TOPS/W

FAN less



Power efficiency

Rockchip RK3588S

Less than 1TOPS/W

FAN and Heat sink



830fps (Resnet50)

80fps (Yolox-s)



AI Performance

By 6TOPS NPU

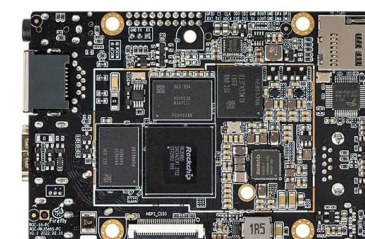
94fps (Resnet50)

4fps (Yolox-s)

Board / Device

Business model

Board / Device



- | Renesas | | | | | | Rockchip | | | | | | |
|---------|-----|-----|-----|----|-------|----------|--------|-----|-----|----|-------|-----|
| RZ/V2L | A55 | A55 | M33 | 3D | H.264 | DRP-AI | RK1808 | A35 | A35 | 2D | H.264 | NPU |

RK1808

GOOD!

Cortex A35 x 2

GOOD!

\$15~12

GOOD!

Very few

GOOD!

Consumer category

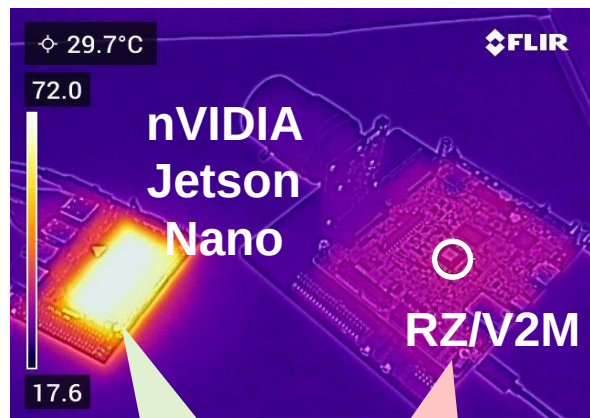
COMPETITION AND HOW WE WIN

RENESAS RZ/V2M, V2MA VS. NVIDIA JETSON NANO



RZ/V2M

- ✓ *DRP-AI provides better power efficiency. 3~4x power efficiency than nVIDIA Jetson Nano*
- ✓ *This enables heatsink-less AI system and realizes BOM cost saving & Smaller system*



Surface temp.:
75.0°C
with Heatsink
(+\$5~10)

Surface temp.:
30.0°C
without
Heatsink

Renesas RZ/V2M

3.1W
TinyYOLOv3



52fps
DRP-AI Accelerator



Expand High & Low-end
RZ/V2L,MA and V2H



DRP-AI & TVM
AI Application partners : 40

nVIDIA Jetson Nano

9.8W
TinyYOLOv3

46fps
GPU & CPU

Expand High-end Only
Jetson TX2, Xavier

CUDA-X™
AI Application partners : 40

Power consumption
When operating AI

AI Performance
When Using TinyYOLOv3

Wider portfolio

AI Support
AI Tool & eco system Partner

THE LATEST LEADING EDGE PRODUCT RZ/V2H

RZ/V2H

Note: Prices are quoted from TI's web

RENESAS

RZ/V2H

TEXAS
INSTRUMENTS

AM69A98

AM69A94

AM68A9

CPU			✓ CPU	✓ 4x Cortex-A55@1.8GHz ✓ 2x Cortex-R8@800MHz ✓ 1xCortex-M33@200MHz 	✓ 8x Cortex-A72@2.0GHz  ✓ 4x Cortex-R5F@1.0GHz 	✓ 4x Cortex-A72@2.0GHz  ✓ 4x Cortex-R5F@1.0GHz 	✓ 2x Cortex-A72@2.0GHz  ✓ 4x Cortex-R5F@1.0GHz 
AI performance		✓ Sparse ✓ Dense ✓ Power efficiency		✓ 80 TOPS  ✓ 8 TOPS  ✓ 10 TOPS/W 	-	-	-
Multi-Media		✓ Image Processing ✓ MIPI-CSI ✓ MIPI-DSI ✓ Video codec H.264 H.265		✓ Open CV Acc ✓ 4, (Up to 4K)  ✓ 1, (Up to 1920x1200) ✓ FHD@60fps ✓ 4K@30fps	✓ GPU ✓ 3, (Up to 4K) ✓ 2  ✓ 4K@60fps  ✓ 4K@60fps 	✓ GPU ✓ 3, (Up to 4K) ✓ 2  ✓ 4K@60fps  ✓ 4K@60fps 	✓ GPU ✓ 2x (Up to 4K) ✓ 2  ✓ 4K@60fps  ✓ 4K@60fps 
Connectivity		✓ PCI Express Gen3 ✓ USB ✓ Network ✓ CAN-FD ✓ Serial ✓ Analog		✓ 2x 2Lane, 4x 1Lane ✓ 2x USB3.2  ✓ 2x USB2.0  ✓ 2  ✓ 6 ✓ 10x UART, 9x I2C, 1x I3C, 10x SPI ✓ 12bit x 8 	✓ 2x 4Lane, 4x 2Lane ✓ 1x USB3.0/2.0 - ✓ 1 ✓ 20  ✓ 12x UART, 10x I2C, 1x I3C, 11x SPI ✓ 12bit x 2	✓ 2x 4Lane, 4x 2Lane ✓ 1x USB3.0/2.0 - ✓ 1 ✓ 20  ✓ 12x UART, 10x I2C, 1x I3C, 11x SPI ✓ 12bit x 2	✓ 1x 4Lane ✓ 1x USB3.0/2.0 - ✓ 1 ✓ 20  ✓ 12x UART, 10x I2C, 1x I3C, 11x SPI ✓ 12bit x 2
Other		✓ Package ✓ Temp		✓ 1368-pin FCBGA 19×19mm, 0.5mm pitch ✓ -40°C to +125°C 	✓ 1414-pin FCBGA 31x31mm, 0.8mm pitch ✓ -40°C to +105°C	✓ 1063-pin FCBGA 27x27mm, 0.8mm pitch ✓ -40°C to +105°C	✓ 770-pin FCBGA 23x23mm, 0.8mm pitch ✓ -40°C to +105°C

THE LATEST LEADING EDGE PRODUCT RZ/V2H

RZ/V2H

						
		RZ/V2H		Hailo-15H	Hailo-15M	Hailo-15L
CPU		✓ CPU	✓ 4x Cortex-A55@1.8GHz	✓ 4x Cortex-A53@1.3GHz		
			✓ 2x Cortex-R8@800MHz	-		
AI performance		✓ Sparse ✓ Dense ✓ Power efficiency	✓ 1xCortex-M33@200MHz	-		
			✓ 80 TOPS	-		
Multi-Media		✓ Image Processing ✓ MIPI-CSI ✓ MIPI-DSI ✓ Video codec H.264 H.265	✓ 10 TOPS/W	✓ 20 TOPS Unknown	✓ 11 TOPS Unknown	✓ 7 TOPS Unknown
			✓ Open CV Acc	-		
Connectivity		✓ PCI Express Gen3 ✓ USB ✓ Network ✓ CAN-FD ✓ Serial ✓ Analog	✓ 4, (Up to 4K)	✓ 2, (Up to 4K)		
			✓ 1, (Up to 1920x1200)	✓ 1, (Up to 4K)		
Other		✓ Package ✓ Temp	✓ FHD@60fps	✓ 4K@60fps		
			✓ 4K@30fps	✓ 4K@60fps		
			✓ 2x 2Lane, 4x 1Lane	✓ 4x 1Lane		
			✓ 2x USB3.2	✓ 1x USB3.0/2.0		
			✓ 2x USB2.0	✓ 1		
			✓ 2	-		
			✓ 6	✓ 4x UART, 4x I2C, 4x SPI		
			✓ 10x UART, 9x I2C, 1x I3C, 10x SPI	-		
			✓ 12bit x 8	✓ xxxx-pin FCBGA 15x15mm, 0.x mm pitch		
			✓ 1368-pin FCBGA 19×19mm, 0.5mm pitch	✓ -40°C to +85°C		
			✓ -40°C to +125°C			

THE LATEST LEADING EDGE PRODUCT RZ/V2H

RZ/V2H

		 RZ/V2H	 RK3588
CPU	 ✓ CPU	✓ 4x Cortex-A55@1.8GHz ✓ 2x Cortex-R8@800MHz ✓ 1xCortex-M33@200MHz	✓ 4x Cortex-A76@2.2GHz  ✓ 4x Cortex-A55@1.7GHz ✓ 1x Cortex-M0@200MHz
AI performance	 ✓ Sparse ✓ Dense ✓ Power efficiency	✓ 80 TOPS  ✓ 8 TOPS ✓ 10 TOPS/W 	- ✓ 6 TOPS ✓ 1 TOPS/W
Multi-Media	 ✓ Image Processing ✓ MIPI-CSI ✓ MIPI-DSI ✓ Video codec - H.264 - H.265	✓ Open CV Acc ✓ 4, (Up to 4K) ✓ 1, (Up to 1920x1200) ✓ FHD@60fps ✓ 4K@30fps	✓ GPU ✓ 4, (Up to 8K)  ✓ 2, (Up to 8K)  ✓ 8K@60fps(Dec), 8K@30fps(Enc)  ✓ 8K@60fps(Dec), 8K@30fps(Enc) 
Connectivity	 ✓ PCI Express Gen3 ✓ USB ✓ Network ✓ CAN-FD ✓ Serial ✓ Analog	✓ 2x 2Lane, 4x 1Lane ✓ 2x USB3.2 ✓ 2x USB2.0 ✓ 2 ✓ 6  ✓ 10x UART, 9x I2C, 1x I3C, 10x SPI  ✓ 12bit x 8 	✓ 2x 2Lane, 4x 1Lane ✓ 2x USB3.1/2.0 ✓ 2x USB2.0 ✓ 2 - ✓ 10x UART, 9x I2C, 6x SPI ✓ 18bit x 1
Other	✓ Package ✓ Temp	✓ 1368-pin FCBGA 19×19mm, 0.5mm pitch ✓ -40°C to +125°C 	✓ 1088-pin FCBGA 23x23mm, 0.65mm pitch ✓ -20°C to +85°C

THE LATEST LEADING EDGE PRODUCT RZ/V2N

RZ/V2N

Note: Prices are quoted from TI's web

					
			RZ/V2N	AM67A94	AM62A7
CPU		✓ CPU	✓ 4x Cortex-A55@1.8GHz	✓ 4x Cortex-A53@1.4GHz	✓ 2x Cortex-A53@1.4GHz
			✓ 1xCortex-M33@200MHz	✓ 3x Cortex-R5F@800MHz	✓ 2x Cortex-R5F@1.0GHz
AI performance		✓ Sparse	✓ 15 TOPS	-	-
		✓ Dense	✓ 4 TOPS	-	-
Multi-Media		✓ Power efficiency	✓ 10 TOPS/W	✓ 4 TOPS	✓ 2 TOPS
				✓ 1 TOPS/W	✓ 1 TOPS/W
		✓ Image Processing	-	✓ GPU	-
		✓ MIPI-CSI	✓ 2, (Up to 4K)	✓ 1, (Up to 4K)	✓ 1, (Up to 5M)
		✓ MIPI-DSI	✓ 1, (Up to 1920x1200)	✓ 1, (Up to 3840x1080)	✓ 1, (Up to 2048x1080)
		✓ Video codec	✓ FHD@60fps	✓ 4K@30fps	✓ 4K@30fps
Connectivity		H.264	✓ 4K@30fps	✓ 4K@30fps	✓ 4K@30fps
		H.265			
		✓ PCI Express Gen3	✓ 1x 2Lane	✓ 1x 1Lane	-
		✓ USB	✓ 1x USB3.2	✓ 1x USB3.0	-
			✓ 1x USB2.0	✓ 1x USB2.0	✓ 2x USB2.0
		✓ Network	✓ 2	✓ 2	✓ 2
Other		✓ CAN-FD	✓ 6	✓ 4	✓ 3
		✓ Serial	✓ 10x UART, 9x I2C, 1x I3C, 10x SPI	✓ 8x UART, 6x I2C, 5x SPI	✓ 9x UART, 6x I2C, 5x SPI
		✓ Analog	✓ 12bit x 24	✓ 12bit x 2	✓ 12bit x 2
		✓ Package	✓ 840-pin FCBGA 15×15mm, 0.5mm pitch	✓ 594-pin FCBGA 18x18mm, 0.65mm pitch	✓ 484-pin FCBGA 18x18mm, 0.8mm pitch
		✓ Temp	✓ -40°C to +125°C	✓ -40°C to +125°C	✓ -40°C to +125°C

THE LATEST LEADING EDGE PRODUCT RZ/V2N

RZ/V2N

Note: Prices are quoted from NXP's web

			
		RZ/V2N	WS i.MX95 i.MX8M Plus
CPU 	✓ CPU	✓ 4x Cortex-A55@1.8GHz - ✓ 1x Cortex-M33@200MHz	✓ 6x Cortex-A55@2.0GHz  ✓ 1x Cortex-M7@800MHz  ✓ 1x Cortex-M33@333MHz
			✓ 4x Cortex-A53@1.8GHz ✓ 1x Cortex-M7@800MHz 
AI performance 	✓ Sparse	✓ 15 TOPS 	-
	✓ Dense	✓ 4 TOPS	✓ 2 TOPS
Multi-Media 	✓ Power efficiency	✓ 10 TOPS/W	Unknown
			✓ 2.3 TOPS
Connectivity 	✓ Image Processing	-	✓ GPU
	✓ MIPI-CSI	✓ 2, (Up to 4K)	✓ 2, (Up to 4K)
Other	✓ MIPI-DSI	✓ 1, (Up to 1920x1200)	✓ 1, (Up to 4K) 
	✓ Video codec H.264 H.265	✓ FHD@60fps	✓ 4K@60fps 
Connectivity	✓ PCI Express Gen3	✓ 4K@30fps	✓ 4K@60fps 
	✓ USB	✓ 1x 2Lane	✓ 2x 1Lane
Connectivity	✓ Network	✓ 1x USB3.2 	✓ 1x USB3.0/2.0
	✓ CAN-FD	✓ 1x USB2.0	2x USB3.0/2.0
Connectivity	✓ Serial	✓ 2	-
	✓ Analog	✓ 6	-
Other	✓ Package	✓ 10x UART, 9x I2C, 1x I3C, 10x SPI 	✓ 3 (1x 10GbE, 2x GbE) 
	✓ Temp	✓ 12bit x 24 	✓ 5
Other		✓ 840-pin FCBGA 15×15mm, 0.5mm pitch	✓ 8x UART, 8x I2C, 2x I3C, 8x SPI
		✓ -40°C to +125°C	✓ 12bit x 8
Other			✓ xxx-pin FCBGA 19x19mm, 0.7mm pitch 15x15mm, 0.5mm pitch
			✓ -40°C to +125°C
Other			✓ 4x UART, 5x I2C, 3x SPI
			-
Other			✓ xxx-pin FCBGA 15x15mm, 0.5mm pitch
			✓ -40°C to +105°C

THE LATEST LEADING EDGE PRODUCT RZ/V2N

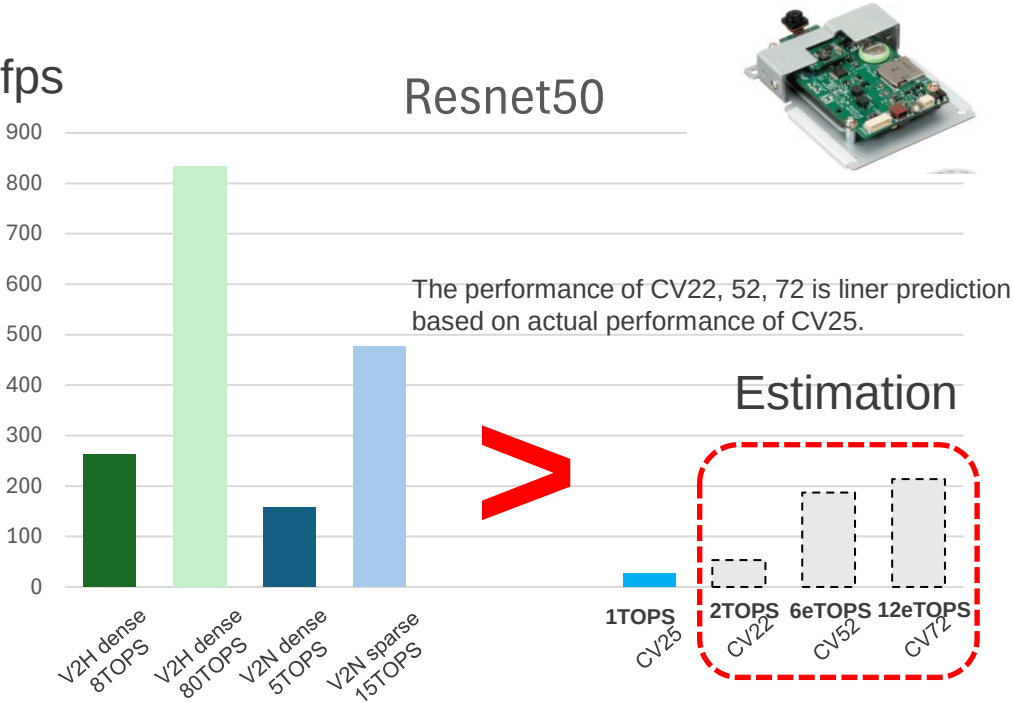
RZ/V2N

		 RZ/V2N	 RK3576
CPU	 ✓ CPU	✓ 4x Cortex-A55@1.8GHz ✓ 1xCortex-M33@200MHz	✓ 4x Cortex-A72@2.2GHz  ✓ 4x Cortex-A53@1.8GHz  ✓ 1x CM0@200MHz
AI performance	 ✓ Sparse ✓ Dense ✓ Power efficiency	✓ 15 TOPS  ✓ 4 TOPS ✓ 10 TOPS/W 	- ✓ 6 TOPS - Unknown
Multi-Media	 ✓ Image Processing ✓ MIPI-CSI ✓ MIPI-DSI ✓ Video codec - H.264 - H.265	- ✓ 2, (Up to 4K) ✓ 1, (Up to 1920x1200) ✓ FHD@60fps ✓ 4K@30fps	✓ GPU ✓ 4, (Up to 4K)  ✓ 2, (Up to 4K)  ✓ 4K@120fps(Dec), 4K@30fps(Enc)  ✓ 4K@120fps(Dec), 4K@30fps(Enc) 
Connectivity	 ✓ PCI Express Gen3 ✓ USB ✓ Network ✓ CAN-FD ✓ Serial ✓ Analog	✓ 1x 2Lane ✓ 1x USB3.2 ✓ 1x USB2.0 ✓ 2 ✓ 6  ✓ 10x UART, 9x I2C, 1x I3C, 10x SPI ✓ 12bit x 24 	✓ 2x 2Lane, 4x 1Lane ✓ 2x USB3.1/2.0  ✓ 1x USB2.0 ✓ 2 ✓ 2 ✓ 12x UART, 10x I2C, 2x I3C, 5x SPI ✓ 12bit x 2
Other	✓ Package ✓ Temp	✓ 840-pin FCBGA 15×15mm, 0.5mm pitch ✓ -40°C to +125°C 	✓ 698-pin FCBGA 16x17mm, 0.6mm pitch ✓ -20°C to +85°C

HOW TO WIN AGAINST AMBARELLA

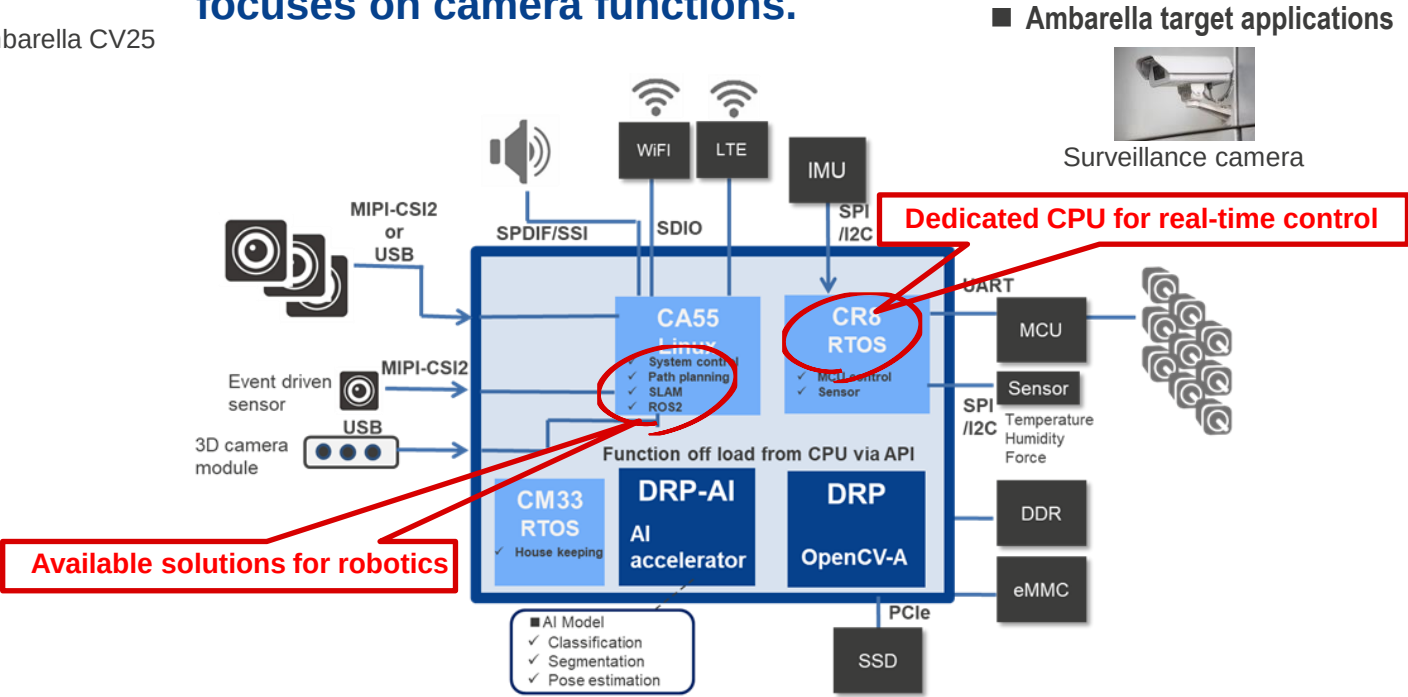
- ✓ RZ/V2N, H have a big advantage in AI capability with pruning technology

We used [i pro camera module](#) equipped Ambarella CV25



*eTOPS means GPU-equivalent TOPS, Ambarella's measure of the amount of GPU horsepower required to run the same AI processing tasks

- ✓ RZ/V2H is more suitable for applications combining AI and real-time control than Ambarella which focuses on camera functions.



Target applications for RZ/V2H & RZ/V2N



COMPARISON TABLE : AMBARELLA CV2 GENERATION

	 RZ/V2N 2x MIPI-CSI2 4L	 CV25 1x MIPI-CSI2 4L	 CV22 2x MIPI-CSI2 4L
CPU	✓ 4x CA55@1.8GHz ✓ 1x CM33@200MHz Rich real time system control GOOD!	✓ 4x CA53@1.0GHz	✓ 4x CA53@1.0GHz
AI performance	✓ 15TOPS GOOD!	✓ ~1 TOPS	✓ ~ 2TOPS
Image processing	✓ 1x 4K 60fps ISP ✓ 1x 4K 30fps codec	✓ CVflow ✓ 1x 4K 60fps ISP ✓ 1x 4K 30fps enc	✓ CVflow ✓ 2x 4K 60fps+ ISP ✓ 2 x 4K 60fps+ enc only ✓ Simultaneous stream support
Connectivity	✓ 1x PCIe Gen3 2-Lane Rich high-speed I/F ✓ 2x GbEther ✓ 1x USB3.2(H), 1x USB2.0(H/D) ✓ 6x CAN-FD GOOD!	✓ 1x GbEther ✓ 1x USB2.0(H/D)	✓ 1x GbEther ✓ 2x USB2.0(H/D)

- ✓ RZ/V2N excels over Ambarella products in **AI performance**
- ✓ Cortex M33 helps **flexible system control**
- ✓ RZ/V2N has **various high-speed I/F capabilities**.
- ✓ Ambarella emphasizes vision processing.

THE LATEST LEADING EDGE PRODUCT RZ/V2N

RZ/V2H

			RENESAS	Ambarella™	
			RZ/V2H	CV72	CV52
CPU		✓ CPU	✓ 4x Cortex-A55@1.8GHz	✓ 2x Cortex-A76@1.6GHz	✓ 2x Cortex-A76@1.6GHz
AI performance		✓ Sparse	✓ 2x Cortex-R8@800MHz	-	-
		✓ Dense	✓ 1xCortex-M33@200MHz	-	-
		✓ Power efficiency	✓ 80 TOPS	-	-
Multi-Media		✓ Image Processing	✓ 8 TOPS	✓ 12 eTOPS*	✓ 6 eTOPS*
		✓ MIPI-CSI	✓ 10 TOPS/W	-	-
		✓ MIPI-DSI	✓ Open CV Acc	✓ CVflow	✓ CVflow
		✓ Video codec	✓ 4, (Up to 4K)	✓ 2, (Up to 4K)	✓ 2, (Up to 4K)
Connectivity		H.264	✓ 1, (Up to 1920x1200)	✓ 2, (Up to 4K)	✓ 2, (Up to 4K)
		H.265	✓ FHD@60fps	✓ 4K@60fps	✓ 6K@30fps
		✓ PCI Express Gen3	✓ 4K@30fps	✓ 4K@60fps	✓ 6K@30fps
		✓ USB	✓ 2x 2Lane, 4x 1Lane	✓ 1x 1Lane	✓ 1x 4Lane
		✓ Network	✓ 2x USB3.2	✓ 1x USB3.2	✓ 1x USB3.2
		✓ CAN-FD	✓ 2x USB2.0	✓ 1x USB2.0	✓ 2x USB2.0
		✓ Serial	✓ 2	✓ 2	✓ 2
Other		✓ Analog	✓ 6	✓ 2	✓ 3
		✓ Package	✓ 10x UART, 9x I2C, 1x I3C, 10x SPI	✓ 5x UART, 1>x I2C, 1>x SPI	✓ 6x UART, 1>x I2C, 1>x SPI
		✓ Temp	✓ 12bit x 8	✓ 12bit x 1>	✓ 12bit x 1>
		✓ 1368-pin FCBGA 19×19mm, 0.5mm pitch	✓ xxx-pin TFBGA 16x16mm, 0.65mm pitch	✓ 484-pin TFBGA 13x13mm, 0.5mm pitch	
		✓ -40°C to +125°C	✓ -25°C to +85°C	✓ -20°C to +85°C	

Renesas.com