R-Car V3H Delivers Best-in-Class TOPS/Watt for Cutting-Edge Computer Vision, Supports the latest NCAP 2020 requirements, including Driver Monitoring Systems and provide a migration path toward NCAP 2025. Building on the state-of-the-art recognition technology introduced with the R-Car V3H in February 2018, which includes integrated IP for convolutional neural networks (CNN), the updated R-Car V3H delivers 4 times the performance for CNN processing compared to the earlier version and is achieving up to overall 7.2 TOPS processing including all Computer Visions IPs – while maintaining low power consumption levels.

**Target Applications**
- Front Stereo Smart Camera for NCAP
- Surround View with 3D visualization
- Driver and Occupant Monitoring System
- Lidar System
- Intelligent Survey Camera
- Robotics
- Industrial Applications

**Key Features**
- 4 Arm® Cortex®-A53 : 9.2 kDMIPS
- Dual Cortex-R7 LockStep cores to run AUTOSAR : 2kDMIPS
- Overall Tops performance : 7.2 TOP:
  - CNN IP
  - Multi-Threading Computer Vision Engine
  - HW Accelerator: optical flow, object detection, …
- Integrated ISP with up to 8 Mpixel sensors, RGB-IR support
- Automotive Interface: Ethernet AVB, CAN FD and FlexRay
- ASIL D devel. process for systemic capability for the full SOC
- Supporting metric targets for ASIL B (sensor layer, application processors) and ASIL C (realtime Domain) safety goals

**Image pipeline**
- 2x ISP: Dual ISP with up to 8 Mpixel sensors
- 1x Display Unit
- 1x ODL/RGB output

**Computer vision & Deep Learning accelerators**
- 2x DMA: 2x UDMA
- 1x PSC: 64 channels
- 5x IMP cores: 32bit
- IMPC 2MB

**Video Codec**
- WCP16HE264 encoder
- VC1/263, 10bit/11bit/12bit

**Memory VF**
- 32bit LPDDR4-3200, 4xry, 800Mhz
- 2x QSPI (1x HyperFlash)
- 1x eMMC

**System**
- Security control (ICU-MCU)
- Power domain control
- Thermal Sensor
- JTAG Debug (Lowpower)

**Connectivity**
- 1x PCIe-Rev2.0 (SL)
- 1x PCI (320Mbas)
- FlexRay 20m
- Ethernet 1x Gigabit
- AURORA (PCIe)
- 3x CANFD 0B/CAN-PD
- 4x UART 5x SPI

**Package**
- FCBGA 538 pins
- 2 x 2.7mm power, 0.8mm pitch
**Benefits**

- R-Car V3H is tailored for the Intelligent Camera System use case, balancing Innovation and automotive constraint.
- Overall performance of 7,2 TOPS, capable of handling any state-of-the-art neural networks.
- Integrated ISP supporting majors Sensor Vendors ICs drastically reduce system BOM. 8 Mpixel Sensor enable V3H to be use for Level 3 while support of the latest RGB-IR standard make V3H ideal for Driver Monitoring system.
- ASIL certified SOC reduce SW development effort and remove the need additional redundant SOC.
- Real time ASIL C CPU core avoiding the need of external MCU to handle Realtime task and Autosar.
- Integrated development environment enables fast time-to-market for computer vision & deep learning-based solutions.
- Renesas Provide PMIC specially developed for R-Car V3H allowing optimized power management in ASIL environment.
- Wide Partners Ecosystem, providing HW tools, Perception System for Camera, Lidar and Sensor Fusion with Radar.

**Condor Development board**

- NOR flash memory
- LPDDR4-SDRAM for DBSC4
- DMI output connector for LVDS
- Camera input connectors
- eMMC memory for MMC
- PCIe x 4 connectors (2 lanes) for PCIe
- Ethernet n CAN, FlexRay
- Power supply: 12.0-V DC input

**Packages include**
- Evaluation Board
- Power Supply
- CD with User’s Manual

**Software**
- Linux BSP (Linux.Org)
- Boot SW

**V3H Starter Kit**

- 2 GBytes DDR3L-1600
- 64 Mbytes Hyper Flash & 64 Mbytes QSPI Flash
- 16 GBytes eMMC
- HDMI, RGB, LVDS, MipiCSI2, EthernetAVB, CAN
- JTAG, Debug Interface
- On board Connector with SOC signals

**Packages include**
- Starter Kit
- Power Supply
- USB & HDMI Cable

**Software**
- Linux BSP (Linux.Org)
- Configuration tools
- Mimi Monitor

**SW Development Environment**

- Renesas company wide IDE initiative with ADAS specific Plug-ins
- Edit, build, debug and profile R-Car applications on target and on simulator
- Seamless debug of ARM and hardware accelerator cores
- Profiler integration taking advantage of build-on Trace

**HW Ordering Reference**

<table>
<thead>
<tr>
<th>Renesas Board</th>
<th>Product Name</th>
<th>Reference</th>
<th>Comment</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condor Evaluation Board</td>
<td>RTP6A7990AS80CW0SA001#FWS</td>
<td>Japan Order Code</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V3H Starter Kit</td>
<td>Y-ASK-RCAR-V3H-WS20</td>
<td>Europe Order Code</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Global Order Code</td>
<td></td>
</tr>
</tbody>
</table>

| Partner Board | Product Name       | Description                           | Company | |
|---------------|--------------------|---------------------------------------|---------|
|               | eCube              | Development Platform for V3H & V3H2 Intelligent camera application | eST     | |
|               | VIDEOBOX (MINIPLUS)| Development Platform for V3H Intelligent camera application | Cogent  |  

renesas.com Renesas Electronics Europe GmbH | Arcadiastr. 10, 40472 Duesseldorf, Germany

© 2021 Renesas Electronics Europe GmbH. All rights reserved. All trademarks are property of their respective owners.

Document No. R33PF0004ED0100