

# HORIZON JOURNEY™ 5 Automotive AI Processor

Efficient AI Computing at the Edge to Redefine Automated Driving

## Optimized Edge-AI Processor for Automotive Intelligence


Assisted and autonomous driving systems face real-time computation challenges today to deliver high performance at low latency, while maintaining high energy efficiency and high-cost effectiveness for perception, fusion, localization, planning and control tasks.

Following Journey 3, the Journey 5 AI processor harnesses the full potential of AI and deep learning to meet this challenge, with Horizon Robotics' highly efficient, domain specific AI compute architecture.

Journey 5's deep learning engine consists of two cutting-edge Brain-Processing Unit cores, known as the Bayes BPU™. Enabled by fully optimized scenario-based AI algorithms and an easy-to-use AI toolkit, Journey 5 achieves new levels of detection, classification and semantic segmentation for perception systems in a multi-sensor environment.

Journey 5 offers over 20 different cores to meet various automotive specific workload requirements, including the dual-core BPU, an Octa-core ARM Cortex CPU, two programmable DSP cores, two ISP engines, a CV engine with Optical Flow, Pyramid support, a video encoder and decoder, a crypto engine and two lockstep MCUs in a safety island. The processor's heterogenous architecture delivers an optimal mix of flexibility and efficiency.

To meet automotive quality and safety requirements, Journey 5 was designed under certified standards and processes of AEC-Q100 Grade 2, ASPICE CL2 and ISO-26262 ASIL B.

<b>128</b> Deep Learning TOPS	<b>A55</b> Octa-Core CPU
<b>16nm</b> TSMC Auto FinFET	<b>2x GbE</b> <b>CAN FD</b>
<b>Open</b> AI Toolkit	<b>DSP</b> Software Flexibility
<b>ASIL-B</b> <b>Grade 2</b>	





## KEY FEATURES

<b>CPU Processor Cores</b>	<ul style="list-style-type: none"> <li>Octa-Core ARM Cortex® A55 up to 1.2 GHz</li> <li>32KB L1 I-cache, 32KB L1 D-cache</li> <li>128KB L2 cache, 2MB L3 cache</li> <li>ECC/Parity protection</li> </ul>
<b>Brain Processing Unit</b>	<ul style="list-style-type: none"> <li>Dual core BPU AI Engine based on Bayes Architecture</li> <li>Up to equivalent 128 DL TOPS</li> <li>Fully optimized for ADAS and AV driving scenario</li> </ul>
<b>Image Processing</b>	<ul style="list-style-type: none"> <li>Two ISP for superb performance, up to 2x4K per ISP</li> <li>Multi-exposure HDR with pixel tone mapping. Multi camera support</li> <li>Flexible CFA support: RRGB, RCCC, RGBIR, RCCB, RCCG, RYYC</li> </ul>
<b>Pyramid</b>	<ul style="list-style-type: none"> <li>Up to 2x4K per Pyramid module</li> <li>YUV422/420 input. 6-channel downscaling output for programmable ROI</li> </ul>
<b>DSP</b>	<ul style="list-style-type: none"> <li>Two programmable DSP processors for CV acceleration and deep learning flexibility</li> </ul>
<b>Video codec</b>	<ul style="list-style-type: none"> <li>HEVC/MJPEG 4K video codec</li> </ul>
<b>Camera interface</b>	<ul style="list-style-type: none"> <li>RX: Four MIPI-CSI host controllers with D-PHY. 2.5Gbps per lane, 16 lanes/40Gbps</li> <li>TX: Two MIPI-CSI device controllers with D-PHY. 2.5 Gbps per lane, 8 lanes/20Gbps</li> </ul>
<b>Peripherals</b>	<ul style="list-style-type: none"> <li>Dual Gigabit Ethernet (RGMII) with PTP/AVB-TSN</li> <li>Dual PCIe Gen3 for high-speed data exchange between processors</li> <li>Quad CAN FD for radar and car network</li> </ul>
<b>Safety and Security</b>	<ul style="list-style-type: none"> <li>Target ISO 26262 ASIL B. Comprehensive coverage for single point and latent faults</li> <li>Safety island with dual lockstep MCU cores. Fault collection and handling module</li> <li>ARM Trustzone. Secure boot and crypto engine. Memory protection. Key management</li> </ul>
<b>AI Toolkit</b>	<ul style="list-style-type: none"> <li>Optimize and deploy deep learning networks on Journey 5</li> <li>Support quantization aware training by PyTorch, post-training quantization of ONNX model</li> <li>Training, quantization, automatic compiler optimization, deployment</li> <li>Design examples and best practices to achieve minimum time to market</li> </ul>

To learn more about Horizon Robotics visit [www.horizon.ai](http://www.horizon.ai)

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