

# HORIZON JOURNEY™ 3 Family

## Efficient AI Processing for Autonomous Machines

### New AI Processor for Modern Deep Learning Workloads

Fueled by the rapidly advancing research and development in autonomous machines, deep learning models are evolving and diversifying at a breakneck pace. Horizon Journey 3 keeps up with this high velocity to offer the most optimized AI processing architecture in the market today.

Journey 3 AI processor is a carefully balanced system-on-chip, integrating the cutting-edge and energy efficient Bernoulli BPU™ (Brain Processor Unit) with a host of other engines such as a Quad core Cortex A53 CPU, an assisting Cortex R5 MCU, a high-performance ISP, a versatile video Codec, a Security crypto-engine and high-speed peripherals and I/Os for maximum flexibility. Manufactured in the mature 16nm FinFET process, Journey 3 is both cost effective and power efficient, using less than 2.5Watts for typical perception, fusion or localization workloads.

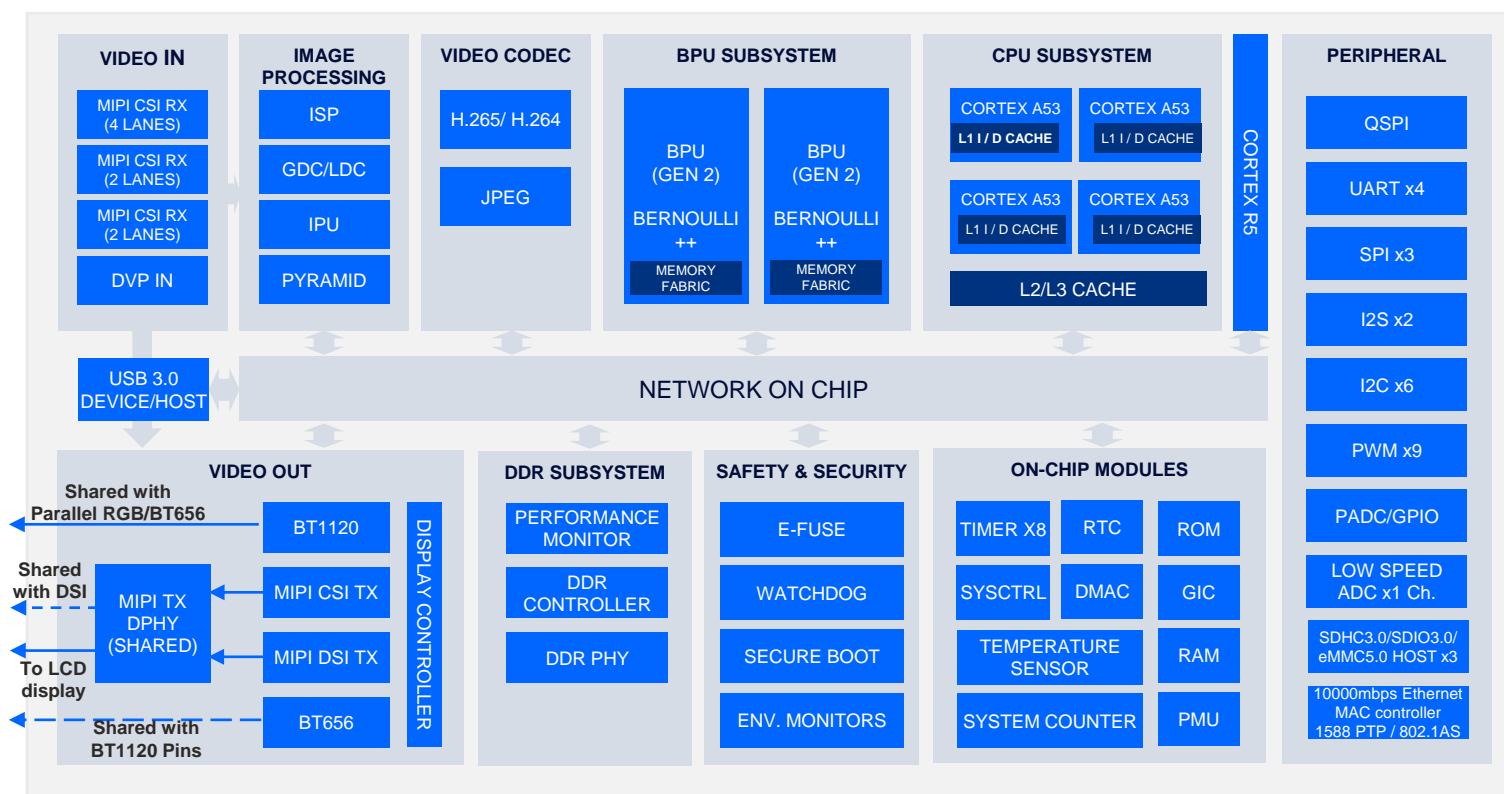
Journey 3 is your ideal deep learning and computer vision processor, that will deliver the high-performance and low-latency you need, with high energy efficiency and cost effectiveness. Journey 3 performs better than other processors in running MobileNetV2 and EfficientNet models and other modern neural networks. Please contact your Horizon sales representative for details.

To harness the full potential of the innovation in neural networks, Journey 3 is offered as an open platform, with Horizon Robotics OpenExplorer™, an easy-to-use AI toolchain to train, quantize, optimize and deploy models on the Journey 3 BPU. Sample models from our Model Zoo helps accelerate developer’s projects.

<b>5</b> Deep Learning BPU TOPS	<b>A53 &amp; R5</b> Quad core CPU One R5 MCU
<b>2.5W</b> Typical perception workload	<b>Efficient</b> With modern DNN models
<b>16nm</b> TSMC FinFET process	<b>ISP/Codec</b> On-chip
<b>Open</b> AI toolchain and example code	<b>Automotive</b> AEC-Q100 grade 2 qualified

<b>Journey3 SOC</b> 	<b>Journey3 Dev kit</b> 	<b>OpenExplorer toolchain</b> 	<b>Algorithms</b> 
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## Journey 3 Block Diagram



### Journey 3 Key Features

<b>CPU Cores</b>	<ul style="list-style-type: none"> <li>Quad-Core ARM Cortex® A53</li> <li>1x Cortex R5 MCU assistant</li> </ul>
<b>Brain Processing Unit</b>	<ul style="list-style-type: none"> <li>Dual core Bernoulli-architecture v2 BPU specialized in Neural networks model inference</li> <li>Equivalent 5 INT8 DL TOPS . Fully optimized for ADAS and AV driving scenario</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>32-bit off-chip DDR4/LPDDR4/LPDDR54x; Up to 4GB DRAM capacity; Inline ECC;</li> </ul>
<b>Image Processing</b>	<ul style="list-style-type: none"> <li>High performance ISP for superb image quality</li> <li>Multi-camera, multi-exposure HDR, 3A functions, local tone mapping, 3DNR/LDC/GDC</li> <li>Up to 8Mp@30fps</li> </ul>
<b>Video codec</b>	<ul style="list-style-type: none"> <li>H.264 and H.265 video codec at 4k@30fps. MJPEG, 8Mpixels@30fps</li> <li>CBR/VBR/AVBR/FixQp/QpMap Bitrate control</li> <li>JPEG encode/decode up to 16Mpixels resolution</li> </ul>
<b>Camera input and output</b>	<ul style="list-style-type: none"> <li>3x MIPI CSI-2 receivers; 2.0Gbps per lane; Total 8 lanes/16Gbps; 4096x2160pixels@30fps input</li> <li>RAW 8/10/12/14/16-bit; 8/10-bit YUV 422</li> <li>1x MIPI CSI-2 transmitter; 4 lanes; 8Mpixels@30fps output; Shared TX DPHY with DSI TX</li> <li>1x MIPI DSI transmitter; 4 lanes; 2Mpixels@60fps output; Shared DPHY with CSI TX</li> </ul>
<b>High speed peripherals and I/Os</b>	<ul style="list-style-type: none"> <li>One 100M/1G Ethernet MAC; RMIII and RGMII interface for external Ethernet PHY</li> <li>USB 3.0 Device/Host</li> <li>3x SDIO/SD3.0; 4x UART; 3x SPI; 6x I2C; 2x I2S; 1x QSPI; 9x PWM</li> </ul>
<b>Security Engine</b>	<ul style="list-style-type: none"> <li>Secure boot; Memory and I/O security protected</li> <li>Hardware encryption and decryption accelerators; TRNG</li> </ul>
<b>OpenExplorer Toolkit</b>	<ul style="list-style-type: none"> <li>Linux SDK and Open SDK</li> <li>Easy porting and optimizing CNNs to Journey3 BPU; MXNet, Tensorflow, ONNX and PyTorch support</li> <li>Design examples and best practices to achieve minimum time to market</li> </ul>
<b>Process and power</b>	<ul style="list-style-type: none"> <li>16nm FinFET from TSMC</li> <li>2.5Watts power consumption for typical perception workloads</li> </ul>

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