

HORIZON JOURNEY™ 3 Family

Efficient AI Processing for Autonomous Machines

Carefully crafted AI processor to efficiently process advanced deep learning models

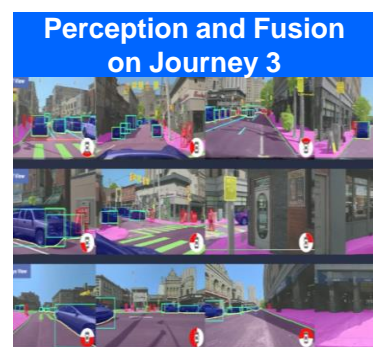
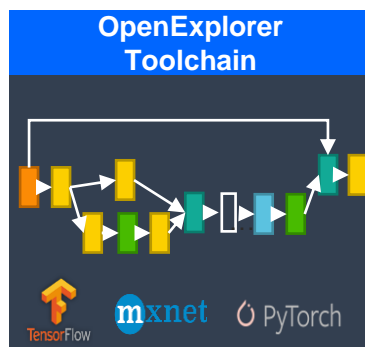
Fueled by the rapidly advancing research and development in autonomous machines, deep learning models are evolving and diversifying at a breakneck pace. Horizon Journey 3 keeps up with this high velocity to offer the most optimized AI processing architecture in the market today.

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 matured 16nm FinFET process, Journey 3 is both cost effective and power efficient, using less than 2.5Watts of power for typical perception, fusion or localization workloads in autonomous driving modes.

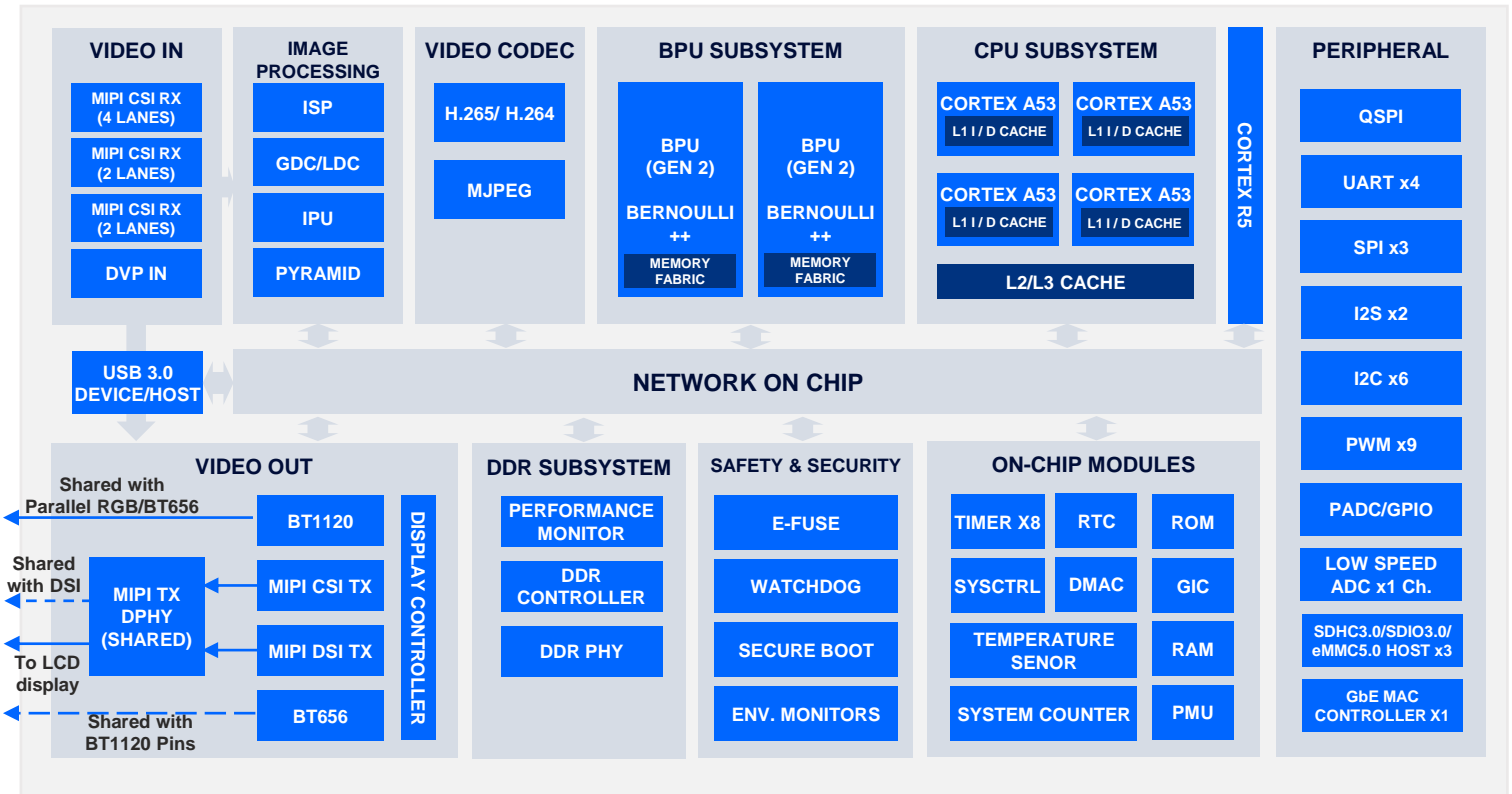
Journey 3 is your ideal deep learning and computer vision processor, that will deliver the high performance and low latency you need, with high energy efficiency and high cost effectiveness. Journey 3 performs better than other processors in running MobileNetV2, EfficientNet models and other modern neural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

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 deep learning models on Journey 3 BPU. A large choice of sample models from our Model Zoo helps accelerate developer's projects.

5 Deep Learning BPU TOPS	A53 & R5 Quad core CPU One R5 MCU
2.5W Typical perception workload	Efficient With modern DNN models
16nm TSMC FinFET process	ISP & Codec On-chip
Open AI Toolchain & example code	Grade 2 AEC-Q100 qualified



Journey 3 Block Diagram



Journey 3 Key Features

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

To learn more about Horizon Robotics visit www.horizon.ai