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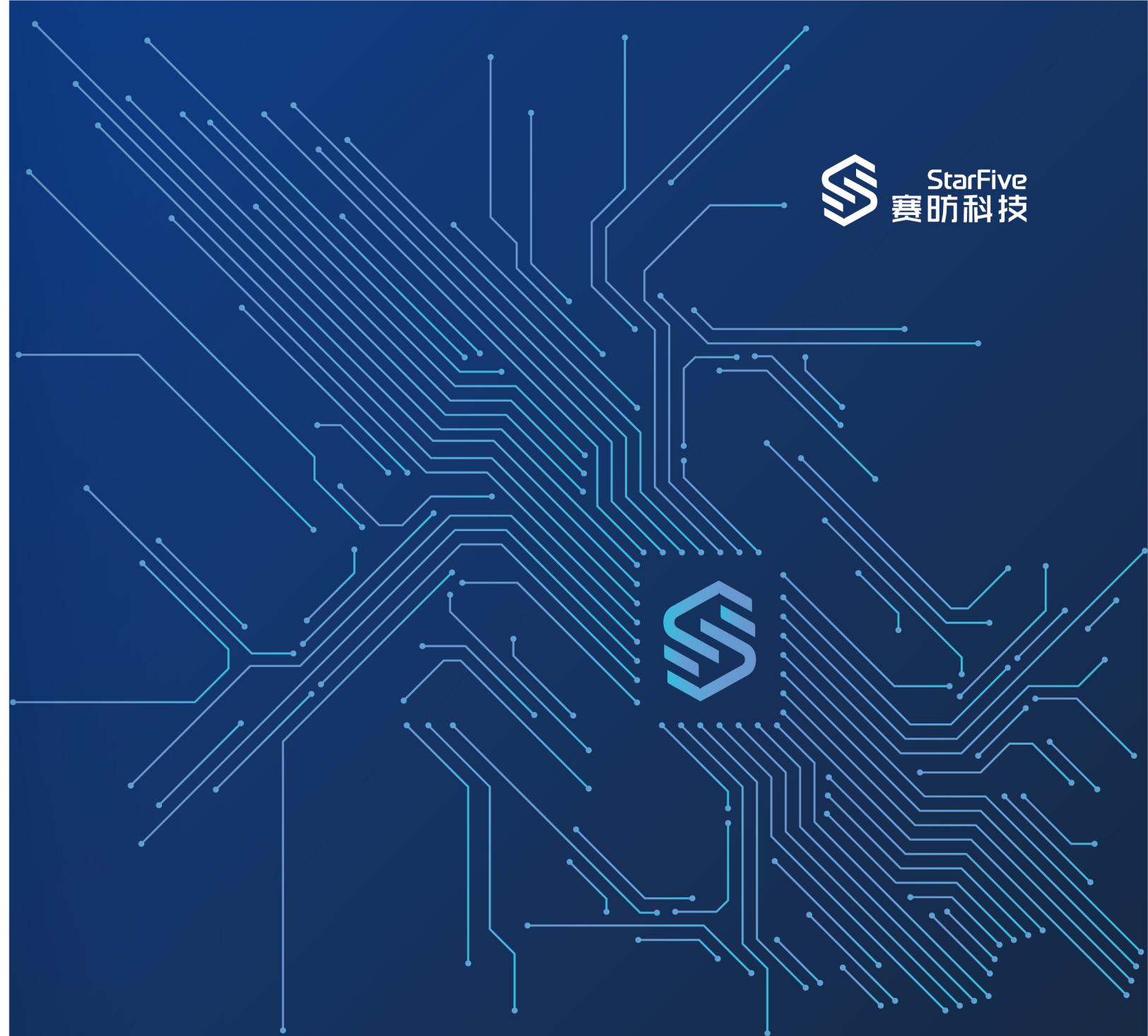
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INNOVATION
COMPUTING THE FUTURE
以创新计算未来

以创新计算未来

INNOVATION COMPUTING THE FUTURE



全球首款RISC-V AI单板计算机

World's first RISC-V AI single board computer



全球首款RISC-V智能视觉处理平台

World's first RISC-V AI vision processing platform



全球支持指令最全的RISC-V高性能微处理器内核

World's first high-performance RISC-V microprocessor core built with the most instruction extensions

关于我们

赛昉科技有限公司(StarFive)于 2018 年成立，是一家具有自主知识产权的本土高科技企业，提供全球领先的基于 RISC-V 的 CPU IP、SoC、开发板等系列产品，是中国 RISC-V 软硬件生态的领导者。

成立至今，赛昉科技已相继推出了基于 RISC-V 的系列产品：全球首款智能视觉处理平台、全球支持指令最全的高性能微处理器内核以及全球首款 AI 单板计算机。这些产品覆盖了智能家电、智能监控、工业机器人、交通管理、智能物流、穿戴设备、固态存储、网络通信、边缘计算等行业和场景。赛昉科技已在上海、顺德、北京、成都、深圳、马来西亚、新加坡等地设立了分支机构，提供完善的市场营销、技术支持和售后服务。

赛昉科技扎根中国，放眼世界，矢志于成为全球 RISC-V 技术和生态的推动者和领导者。未来赛昉科技将会从内核层、系统服务层、框架层和应用层等各方面与国内外生态合作伙伴开展全面的合作，通过引领 RISC-V 技术的发展，驱动产业创新，进而使得 RISC-V 进入更多高端应用领域，为全球开发者及客户创造更多的价值。



About us

Founded in 2018, StarFive is a Chinese high-tech company with independent intellectual property rights, providing world-leading and RISC-V based products including CPU IP, SoC, and development boards, etc. Also, StarFive is the leader of RISC-V technology and ecosystem development in China.

Since its establishment, StarFive has launched series of RISC-V based products, including world's first AI vision processing platform, world's first high-performance microprocessor core built with the most instruction extensions, and world's first AI single board computer. StarFive's products can be used in a great variety of industries and scenarios including smart home appliances, smart monitoring, industrial robots, traffic management, intelligent logistics, wearable devices, solid-state storage, network communication, and edge computing, etc. StarFive provides perfect marketing, technical support, and after-sales services with its branches set up in Shanghai, Shunde, Beijing, Chengdu, Shenzhen, Malaysia, and Singapore.

StarFive, rooting in China, and taking a broad view of the world, aims to become the leader and promoter of global RISC-V technology and ecosystem. StarFive will cooperate comprehensively with the global ecosystem partners in kernel layer, system service layer, frame layer, application layer and all other respects. StarFive will promote RISC-V technology into more high-end application areas and create more value for global developers and customers by leading the RISC-V development, and driving industry innovation.

昉·星光 V1 VisionFive V1

第一代高性价比的基于Linux系统的RISC-V计算机

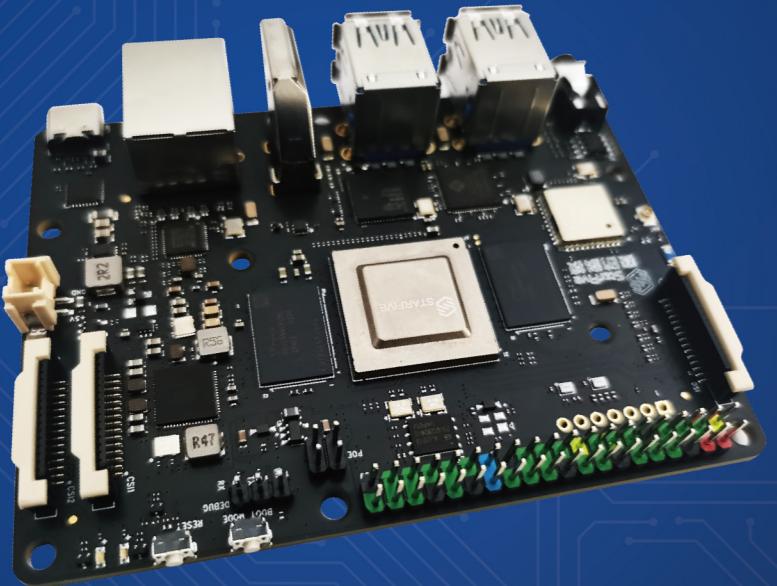
The first generation of affordable RISC-V boards designed to run Linux

内存 /Memory

- 8GB LPDDR4

处理器 /Processor

- U74 双核 / U74 Dual-Core



操作系统 /Operating System

- Linux

接口

- 4 x USB3.0 接口
- 1 x 千兆以太网网口
- 1 x 3.5mm 音频接口
- 支持 TRNG 和 OTP
- 支持 DMAC, QSPI 及其它外设
- 40 Pin GPIO Header (28 x GPIO, I2C, I2S, SPI, UART)
- 适用于操作系统和数据存储的 MicroSD 卡槽
- 1 x 2.4GHz Wi-Fi 和蓝牙 4.2
- 1 x 重启按钮及 1 x 调试按键

Peripherals

- 4 x USB3.0 Ports
- 1 x Gigabit Ethernet
- 1 x 3.5mm Audio jack
- Support TRNG and OTP
- Support DMAC, QSPI and other peripheral
- 40 Pin GPIO Header (28 x GPIO, I2C, I2S, SPI, UART)
- MicroSD card slot for operating system and data storage
- 1 x 2.4GHz Wi-Fi and Bluetooth 4.2s
- 1 x Reset button and 1 x Boot button

视频处理

- 视频编解码 (H264/H265): 高达 4K@60FPS
- 双路 ISP, 单路最高 4K@30FPS
- 2 x MIPI-CSI, 1 x MIPI-DSI
- 1 x HDMI 1.4, 最高可显示 1080P@60FPS
- 支持 MIPI-CSI TX, 用于 ISP 和 AI 处理后视频输出
- JPEG 编解码

Video Processing

- Video Encoder/Decoder (H264/H265) up to 4K@60FPS
- Dual channels of ISP, each channel support up to 4K@30FPS
- 2 x MIPI-CSI, 1 x MIPI-DSI
- 1 x HDMI 1.4 (up to 1080P@60FPS)
- Support MIPI-CSI TX for video output after ISP and AI processing
- JPEG Encoder/Decoder

产品简介

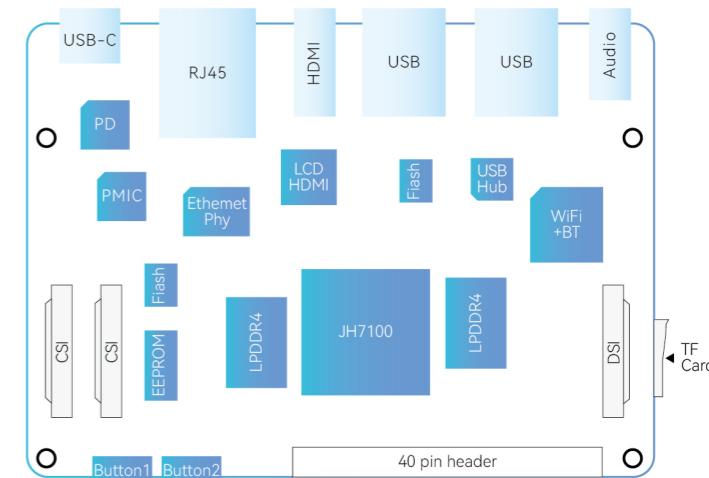
Product Introduction

昉·星光 V1 作为星光单板计算机的迭代版本, 具有相同的性能及配置, 是全球第一代高性价比的基于 Linux 系统的 RISC-V 计算机。基于 RISC-V 架构的昉·星光 V1 使开源达到更高的水平, 开发者从而得到更大的自由及更强的能力去创新和设计行业领先的解决方案。

VisionFive V1, the iteration version of StarLight single-board computer, has the same performance and configurations. It is the world's first generation of affordable RISC-V boards designed to run Linux. Based on the RISC-V architecture, VisionFive V1 pushes open-source to the next level and gives developers more freedom and power to innovate and design industry-leading solutions.

昉·星光 V1

VisionFive V1



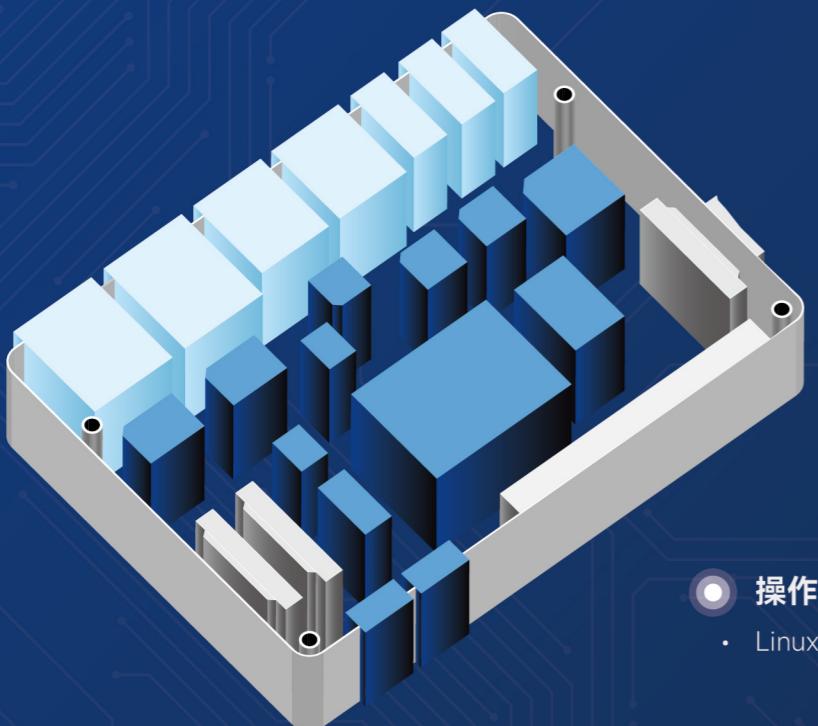
昉·星光 V2 VisionFive V2

昉·星光V1的升级版本，更高性能的RISC-V计算机

Updated version of VisionFive V1 and higher performance RISC-V boards

内存 /Memory

- 2GB/4GB/8GB LPDDR4 SDRAM



操作系统 /Operating System

- Linux

接口

- 4×USB3.0 接口
- 2×RJ45 千兆以太网
- 1×3.5mm 音频接口
- 支持 TRNG 和 OTP
- 支持 DMAC, QSPI 及其他外设
- 40 Pin GPIO Header (I2C, SPI, I2S, UART, CAN-Bus, PWM)
- 适用于操作系统数据存储的 MicroSD 卡槽
- 适用于蜂窝网络模组的 MicroSIM 卡槽
- 1×5GHz Wi-Fi 和蓝牙 5.1
- 1×重启按钮及 1×调试按键

Peripherals

- 4×USB3.0 Ports
- 2×RJ45 Gigabit Ethernet
- 1×3.5mm Audio jack
- Support TRNG and OTP
- Support DMAC, QSPI and other peripherals
- 40 Pin GPIO Header (I2C, SPI, I2S, UART, CAN-Bus, PWM)
- MicroSD card slot for operating system and data storage
- MicroSIM card slot for cellular network module
- 1×5GHz Wi-Fi and Bluetooth 5.1s
- 1×Reset button and 1×Boot button

视频处理

- 视频编码 (H265): 高达 1080p@30fps
- 视频解码 (H264/H265): 高达 4K@30fps
- 2×MIPI-CSI, 1×MIPI-DSI
- 支持 1×MIPI CSI and 1×DVP 输入通道
- 支持 LCD 或 MIPI-DSI 输出, 高达 1080p@30fps
- 1×HDMI 2.0 , 最高可显示 4K@60fps
- JPEG Encoder/Decoder

Video Processing

- Video Encoder(H265) up to 1080p @30fps
- Video Decoder (H264/H265) up to 4K@30fps
- 2×MIPI-CSI, 1×MIPI-DSI
- Support 1×MIPI CSI and 1×DVP input channels
- Support LCD or MIPI-DSI output up to 1080p@30fps
- 1×HDMI 2.0 (Up to 4K@60fps)
- JPEG Encoder/Decoder

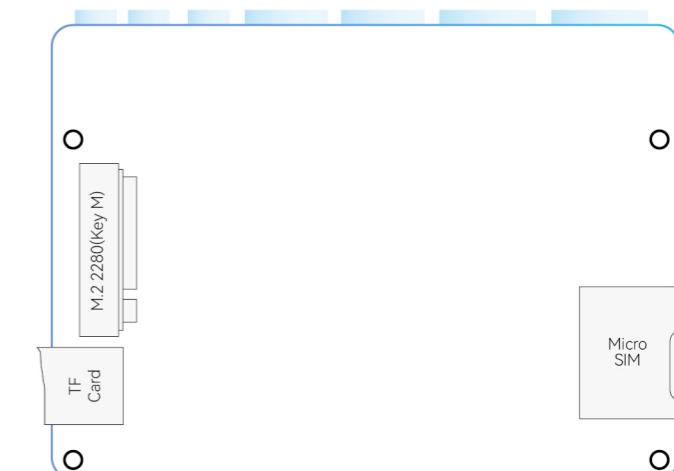
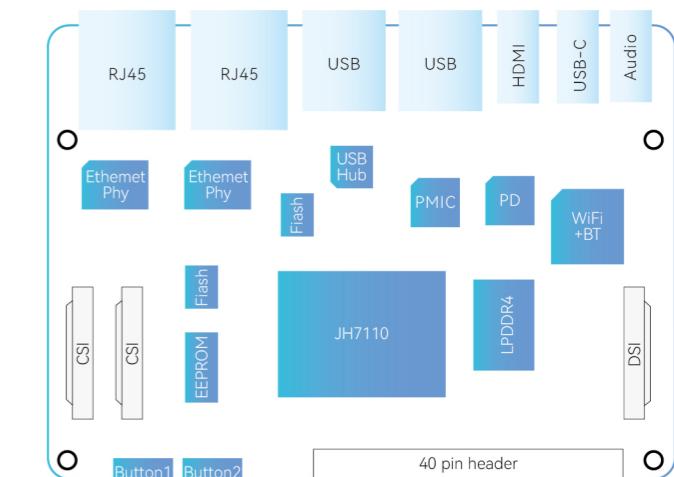
产品简介

Product Introduction

昉·星光 V2 是昉·星光 V1 的升级版本，在硬件上保持了昉·星光 V1 的兼容性，并保留了第一代开发板已有的外设接口，在图像处理上的优化使昉·星光 V2 拥有更好的性能。

VisionFive V2 is an upgraded version of VisionFive V1. It maintains the compatibility of VisionFive V1 on the hardware and retains the existing peripheral interfaces of the first generation board. Optimization in image processing makes VisionFive V2 have better performance.

昉·星光 V2 VisionFive V2



昉·惊鸿7100 JH7100

人工智能视觉处理平台 AI Visual Processor Platform

产品简介 Product Introduction

昉·惊鸿7100搭载了双核U74，共享2MB的二级缓存，工作频率最高可达1.2GHz，支持Linux操作系统。其中，赛昉科技自主研发的ISP适配主流的摄像机传感器，内置的图像视频处理子系统支持H265/H264/JPEG编解码。集成高性能、低功耗的Vision DSP和NNE让所思更加智能且高效。惊鸿7100能完成各种复杂的视频图像处理与智能视觉计算，满足边缘端的多种视觉实时性处理需求。

Equipped with dual-core U74, JH7100 shares 2MB of L2 cache and supports Linux OS. The StarFive ISP is compatible with mainstream camera sensors and the built-in image/video processing subsystem supports H265/H264/JPEG codec. With high-performance, low-power Vision DSP and NNE integrated, JH7100 will make thinking more intelligent and efficient. JH7100 can meet the various real-time visual processing needs of the edge end thanks to the capabilities of various complex image/video processing and intelligent visual calculations.

产品亮点

Product Highlights



64位高性能 RISC-V 双核 U74 处理器

- 2MB 二级缓存, 工作频率最高可达 1.2GHz
- 缓存一致性的双核

64-bit High-performance RISC-V Dual-core U74 Processor

- 2MB L2 cache, working@1.2GHz
- Cache coherence for dual core

强大的图像视频处理系统

- 赛昉ISP
- Vision DSP
- H264/265 视频编解码
- 显示引擎
- MIPI 接口

Powerful Image and Video Processing System

- StarFive ISP
- Vision DSP
- H264/265 Video Codec
- Display engine
- MIPI interface

强大的深度学习处理引擎

- 赛昉神经网络引擎 (NNE) (1 TOPS)
- 英伟达开源深度学习硬件架构 (NVDLA) (3.2 TOPS)

Powerful Deep Learning Processing Engine

- StarFive Neural Network Engine (NNE) (1 TOPS)
- NVIDIA Open Source Deep Learning Hardware Architecture(NVDA) (3.2 TOPS)

产品应用 Applications

公共安全

- 视频监控
- 交通管理

工业智能

- 工业机器人
- 无人货柜
- 物流机器人
- 智能无人机 (UAV), AV, ADAS

智能家居

- 扫地机器人
- 智能门锁
- 智能视觉家电 (冰箱、微波炉等)

Public Security

- Video surveillance
- Traffic management

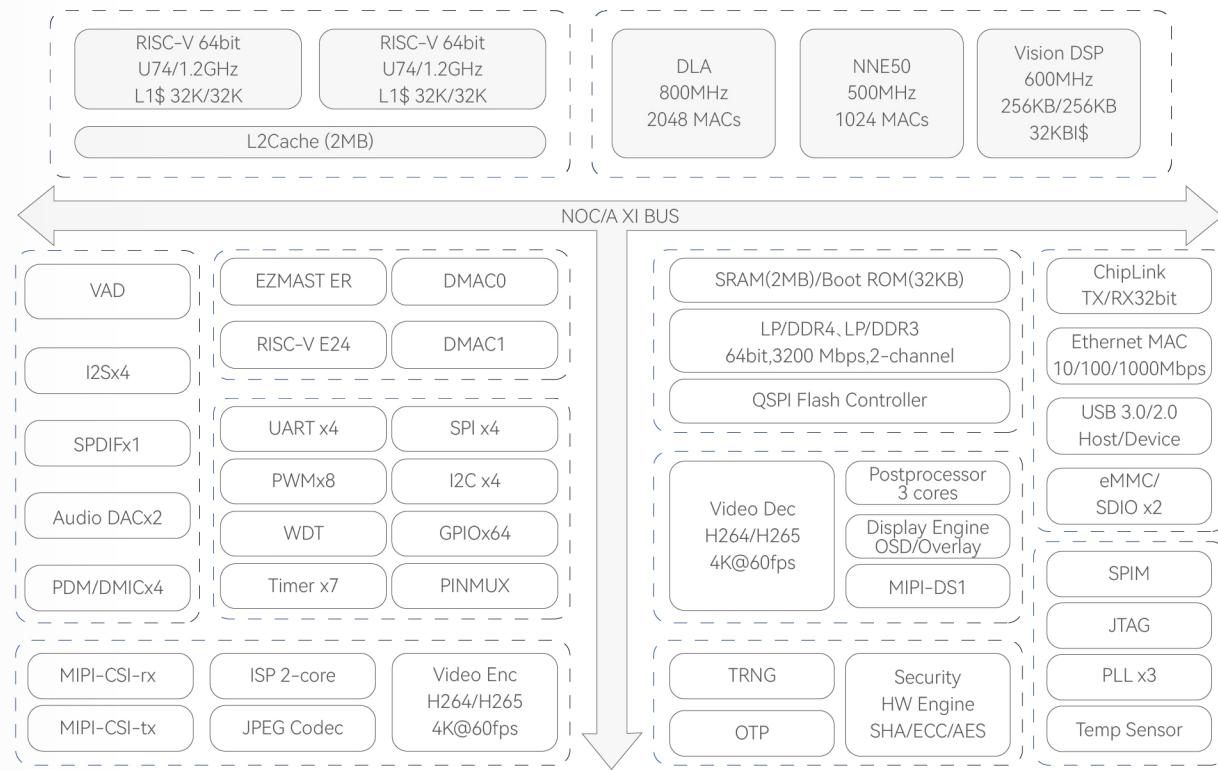
Industrial Intelligence

- Industrial robot
- Unmanned container
- Logistics robot
- Intelligent unmanned aerial vehicle (UAV), AV, ADAS

Smart Home

- Sweeping robot
- Smart door lock
- Intelligent visual home appliances (refrigerator, microwave oven, etc.)

框架图 Diagram



产品特点 Features

CPU 子系统

- 64 位 RISC-V CPU (U74) 搭载 2MB 二级缓存的双核, 支持 Linux, 频率达 1.2GHz
- 用于实时控制的 32 位 RISC-V CPU 核 (E24)

视觉与人工智能计算(AI)

- Vision DSP: 面向计算视觉的 VP6
- AI 处理器 : NNE (1024 MAC@500MHz) 及 NVDA Engine (2048 MACs@800MHz)

内存与存储

- 32 位 LPDDR4/DDR4 双通道 , 高达 3200Mbps
- 具有 DLA 引擎的 2MB 总线 RAM
- 支持 QSPI 闪存

视频处理子系统

- 视频解码器及编码器相互独立 , 皆支持 4K@60FPS 及 H264/H265 多码流
- JPEG 编解码
- 双路 ISP, 单路最高 4K@30FPS
- 最高支持 3 个视频输入接口 ,1 个 DVP 接口及两个 MIPI-CSI 接口 (4D2C 高达 4K@30FPS)

显示子系统

- 支持高达 4K@30FPS 的 LCD 及 MIPI-DSI 输出
- 支持 MIPI-CSI TX, 用于 ISP 和 AI 处理后视频输出

连接子系统

- USB3.0/2.0 主机 / 设备模式
- 用于 10/100/1000Mbps 的千兆以太网
- SD/SDIO/eMMC 主机控制器

Security Subsystem 安全子系统

- 加密引擎 : AES, SHA, ECC/RSA, HASH
- 符合 NIST SP800-90a/b/c 及 BSI AIS 20/31 TRNG
- 2KB OTP 关键数据片上存储

音频子系统

- I2S I/F, 支持 DMA 接口
- S/PDIF, 支持 RX 和 TX 模式
- 适用于 DMIC 应用的 4 路 PDM 输入
- 具有 PWM 接口的 DAC 输出

丰富的系统接口

- 支持 4 x SPI 的主从模式
- 4 x UART
- 4 x I2C
- 8 x PWM 输出
- 64 x GPIO

CPU Subsystem

- 64-bit RISC-V CPU (U74) dual cores with 2MB L2 cache, support Linux, 1.2GHz
- 32-bit RISC-V CPU core (E24) for real-time control

Vision and AI Computing

- Vision DSP: VP6 for computing vision
- AI Processors: NNE (1024 MAC@500MHz) and NVDA Engine (2048 MACs@800MHz)

Memory and Storage

- 2 channels of 32-bit LPDDR4/DDR4, up to 3200Mbps
- BUS RAM 2MB share with DLA Engine
- Support QSPI flash memory

Video Processing Subsystem

- Separate video decoder and encoder, both support up to 4K@60FPS and multi-stream for H264/H265
- JPEG encoder/decoder
- Dual channels of ISP, each channel support up to 4K@30FPS
- Support up to 3 video inputs, one for DVP and two for MIPI-CSI with 4D2C up to 4K@30FPS

Display Subsystem

- Support LCD or MIPI-DSI output up to 4K@30FPS
- Support MIPI-CSI TX for video output after ISP and AI processing

Connectivity Subsystem

- USB3.0/2.0 Host/Device mode
- Ethernet GMAC for 10/100/1000Mbps
- SD/SDIO/eMMC host controller

Security Subsystem

- Encrypt Engines: AES, SHA, ECC/RSA, HASH
- Compliant with NIST SP800-90a/b/c and BSI AIS 20/31 TRNG
- 2KB OTP for key data on-die storage

Audio Subsystem

- I2S I/F, support DMA interface
- S/PDIF, support RX and TX mode
- 4 channels PDM input for DMIC application
- DAC output with PWM interface

Rich System Peripherals

- 4 x SPI support Slave and Master mode
- 4 x UART
- 4 x I2C
- 8 x PWM output
- 64 x GPIO

昉·惊鸿7110 JH7110

智能视觉处理平台 Intelligent Visual Computing Platform

产品简介 Product Introduction

昉·惊鸿 7110 是一款高性能 RISC-V SoC, 是昉·惊鸿 7100 的升级版本, 具有高性能、低功耗和高安全性的特点。相比于第一代版本, 由 64 位 RISC-V 双核处理器升级为 RISC-V 四核处理器, 主频由 1.2GHz 升级为 1.5GHz, 提供更为丰富的高速接口, 集成 GPU 使其拥有更强的图像渲染能力。

JH7110 is a high-performance RISC-V SoC, an upgraded version of JH7100, featuring high performance, high power efficiency and high security. Compared with the first-generation, JH7110 upgrades from 64 bit dual-core processor to quad-core processor and increases the frequency from 1.2GHz to 1.5GHz with richer high-speed interfaces and integrated GPU, enabling stronger image processing capabilities, such as 3D rendering.

产品亮点 Product Highlights

64 位高性能 RISC-V 四核处理器

- 2MB 二级缓存, 工作频率可达 1.5GHz
- 缓存一致性的四核

64-bit High-performance RISC-V Quad-core Processor

- 2MB L2-cache, working@1.5GHz
- Cache coherence for quad core

强大的图像视频处理系统

- IMG GPU
- 赛昉 ISP
- 视频编解码
- 显示引擎

Powerful Image and Video Processing System

- IMG GPU
- StarFive ISP
- Video Codec
- Display Engine

丰富的外设接口

- PCIE2.0
- HDMI2.0
- MIPI CSI RX
- MIPI DSI TX
- USB3.0/2.0
- Ethernet 1Gbps

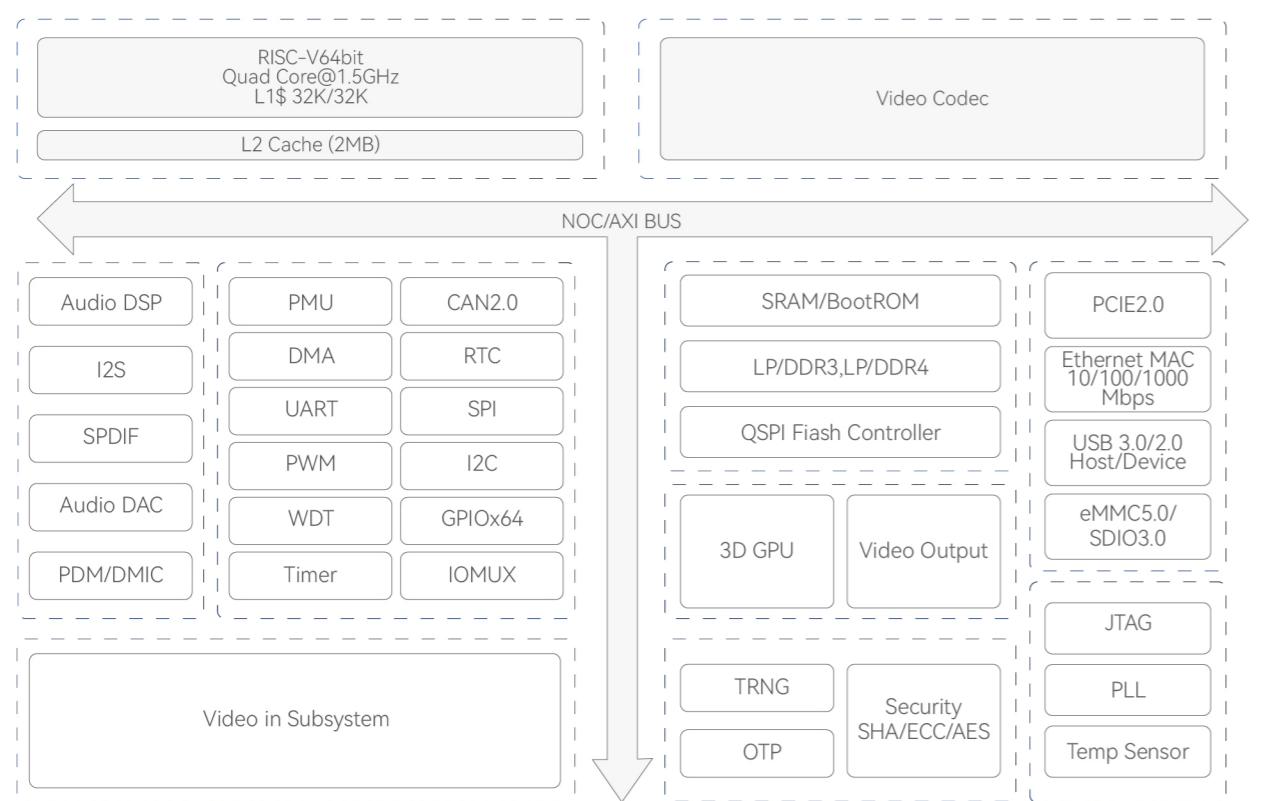
Powerful Peripheral Interface

- PCIE2.0
- HDMI2.0
- MIPI CSI RX
- MIPI DSI TX
- USB3.0/2.0
- Ethernet 1Gbps

产品应用 Applications



框架图 Diagram



昉·天枢 Dubhe

适用于高性能计算应用场景的64位超高性能RISC-V处理器

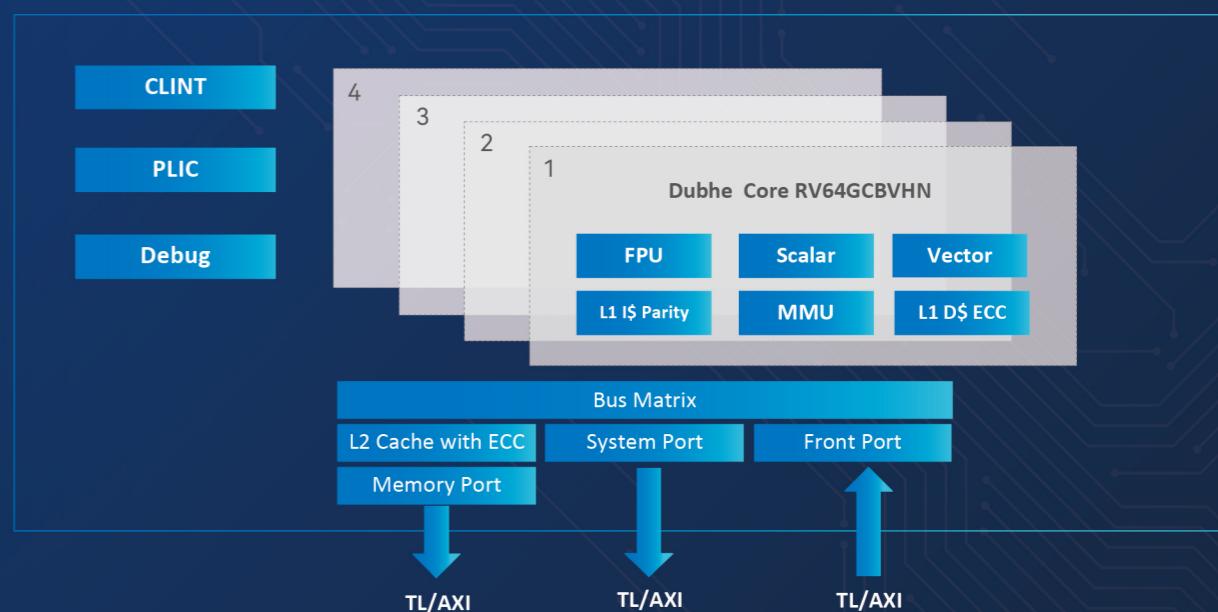
Supreme 64-Bit RISC-V CPU for High-Performance Computing

产品简介 Product Introduction

昉·天枢是一款超高性能的 RISC-V CPU IP，采用 12 级流水线，具备乱序执行设计，支持最丰富的标准 RISC-V RV64GCBVHN 指令集，支持最新的 B (位操作), V (Vector) 以及 H (Hypervisor) 扩展，支持缓存一致性的 1-4 个多核配置，支持虚拟化，适用于广泛的高性能计算应用场景。昉·天枢具有高度可扩展性，针对最高性能和频率进行了优化，具备 SPECint2k6 31 分的超高性能。昉·天枢通过 Core Complex 预集成和验证，简化了 SoC 的开发工作。

StarFive Dubhe is the first commercial RISC-V CPU IP to support a rich set of RISC-V extensions, including latest B (bit-manipulation), V (vector) and H (hypervisor) extensions, enabling more edge cloud and high-performance computing applications running on RISC-V. Dubhe is a superior high-performance 12-stage pipeline out-of-order RISC-V CPU core which supports standard RISC-V RV64GCBVHN extensions and targets for applications which require high-performance computation capability. It is highly scalable, optimized for highest performance and frequency design, bringing the total 31 SPECint2k6 supreme performance. Dubhe is pre-integrated and verified into the core complex to ease SoC development efforts and provides options of single core, dual-core, or quad-core in a single cluster with memory coherency.

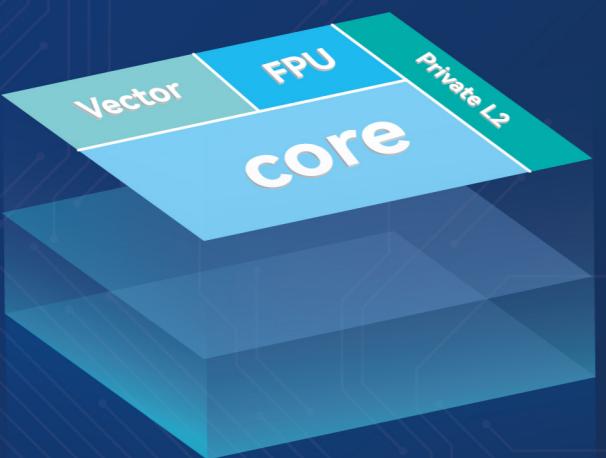
昉·天枢 Dubhe



产品亮点 Product Highlights

超优性能 Superior Performance

- 频率: 2GHz@TSMC 12nm
- SPECint2006: Target 8.9/GHz
- Superior Performance**
- Frequency: 2GHz@TSMC 12nm
- SPECint2006: Target 8.9/GHz



RISC-V 向量扩展的有效设计 Efficient Design to RISC-V Vector Extension

- 数据类型: 浮点数、定点数和整数
- VLEN=128~1024 bits
- ALU & 数据通路宽度 =128 或 256 bits
- 支持全向量寄存器分组 (LMUL)
- Efficient Design to RISC-V Vector Extension**
- Data types: floating point, fixed point, and integer
- VLEN=128~1024 bits
- ALU & data path width=128 or 256 bits
- Full vector register grouping (LMUL) support

支持具有内存一致性的多核架构 Pre-integrated Multi-Core with Memory Coherency Support

- 可配置 1-4 核
- Pre-integrated Multi-Core with Memory Coherency Support**
- Options of single core, dual-core, or quad-core in a single cluster

注: 实际频率、功耗及面积取决于具体配置、综合、硅晶圆供应商、工艺及单元库。

Note: Frequency, power consumption and size depend upon configuration options, synthesis, silicon vendor, process, and cell libraries.

产品应用 Applications

边缘 / 云数据中心 Edge / Cloud Data Centers

- 边缘云计算
- 智能网卡及数据处理单元
- 企业及计算存储
- 基板管理控制器

通信 / 网络 Communication / Networking

- 5G 应用场景和基站
- 无线访问接入点
- 企业交换机及防火墙 / 下一代防火墙
- 车联网 (V2X) 通讯

人工智能 / 机器学习 Artificial Intelligence (AI) / Machine Learning (ML)

- 自动驾驶 / 高级驾驶系统
- 车载信息娱乐 / 集群 / 抬头显示器
- 机器人 / 无人机 / 工业控制
- 计算机视觉 / 增强现实 (AR) / 虚拟现实 (VR) / 混合现实 (MR)

产品特点 Features

完全符合 RISC-V ISA 规范 Fully-Compliant with the RISC-V ISA Specification

- 标准 RISC-V ISA RV64GCBVHN (G = "IMAFD")
- 向量扩展 (V) v1.0
- 位操作扩展 (B)
- 虚拟机管理程序扩展 (H)
- 用户级中断 (N)

昉·天枢高性能应用处理器 Tianshu High-Performance Application Processor

- 12 级流水线超标量
- 5-Wide 乱序 RISC-V 机器
- 注重性能且具有良好可扩展性的 Uncore 设计

存储子系统 Memory Subsystem

- 一级指令缓存, 奇偶校验
- 一级数据缓存, ECC
- 二级缓存, ECC
- 16-Region 物理内存保护 (PMP)
- 支持 SV39/ SV48 虚拟内存

特权模式 Privilege Modes

- 机器模式 (M-mode)
- 监督模式 (S-mode)
- 用户模式 (U-mode)
- 虚拟监督模式 (VS)
- 虚拟用户模式 (VU)