Embedded Vision Solutions

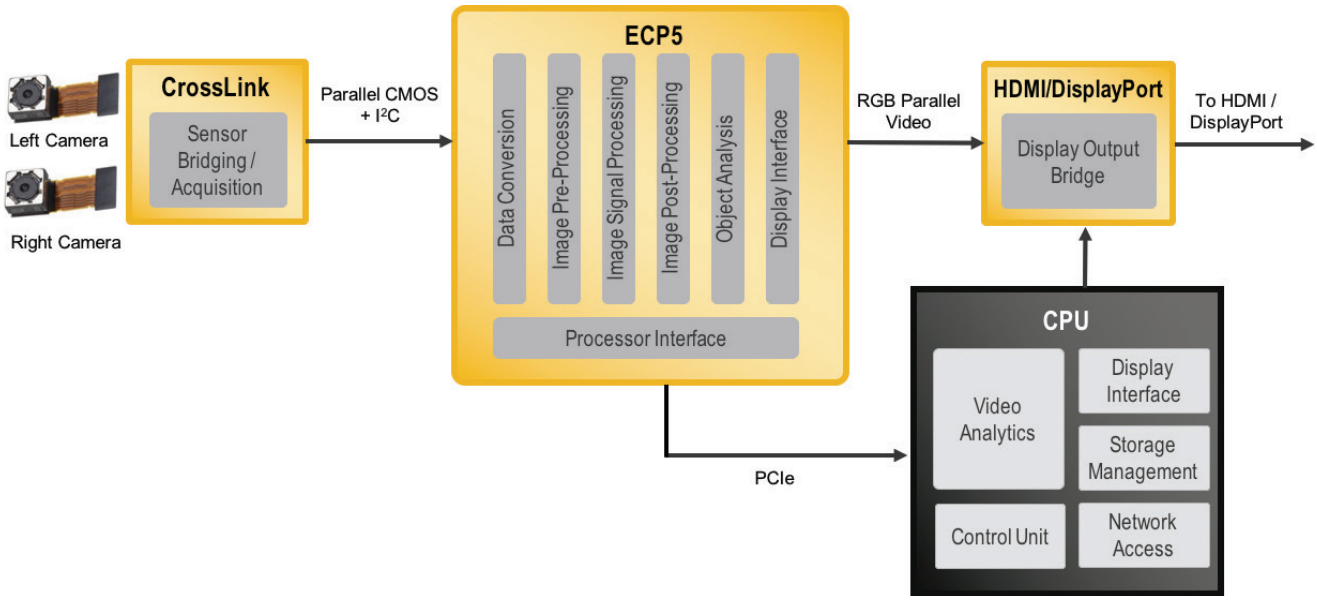
Embedded vision offers a promising future with many exciting new applications entering the market. These systems are used in industrial display systems for M2M applications and for Industry 4.0 implementations, Advanced Driver Assistance Systems (ADAS) and infotainment applications for automotive, DSLR cameras, drones, robotics, virtual reality (VR) systems, and medical equipment.

Lattice's product portfolio offers flexible solutions to address today's embedded vision designer's needs, such as evolving interface requirements, energy-efficient image signal processing and hardware acceleration.

Let Lattice and its partners help you create flexible and power-efficient solutions for Embedded Vision Processing at the Edge.

Embedded Vision Systems

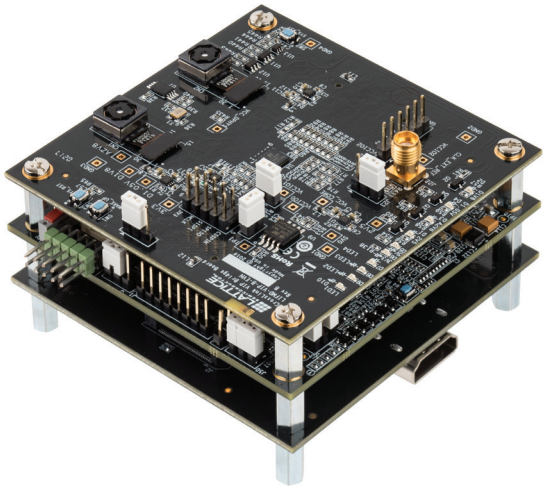
The growing implementation of cameras in almost every industry contributes towards the creation of smarter machines. Concepts like object recognition, depth perception, collision avoidance and decision making are penetrating the devices in our homes, cities, factories and cars. Computing at the Edge requires a variety of devices working together to make the machines more efficient. Consumer, industrial and automotive industries are looking at FPGAs to help them create a flexible and intelligent learning environment to realize this future.



Embedded Vision System Block Diagram

Embedded Vision Development Kit

The Embedded Vision Development Kit features CrossLink™, ECP5™ and SiI1136 devices and integrates a Sony IMX dual-cameras-to-HDMI® bridging. The kit creates the basis for an easy development platform and offers modular design for expandability.



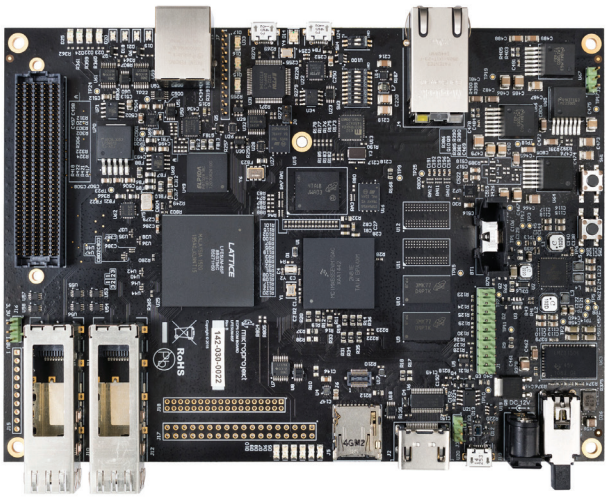
Product	Ordering Part Number
Embedded Vision Development Kit	LF-EVDK1-EVN

Features

- All-inclusive demo system with video sources
- CrossLink LIF-MD6000 input board with two Sony IMX 214 high-speed MIPI D-PHY interface camera sensors
- ECP5 processor board with pre-loaded HD Image Signal Processing (ISP) IP
- SiI1136, non-HDCP, output board connects any HDMI display to show results visually
- Includes 0.1” header prototyping
- Easy programming interface via USB with FTDI device
- Modular Video Interface Platform (VIP) for expandability through mixing and matching of input and output boards
- Develop custom video interfacing solutions for embedded vision and machine learning for with Lattice Diamond® software

Kondor AX Development Board

The Mikroprojekt KONDOR AX - Advanced System Development Board includes an ECP5 development platform and Freescale i.MX 6 Solo, a versatile discrete CPU with Linux OS system control support.



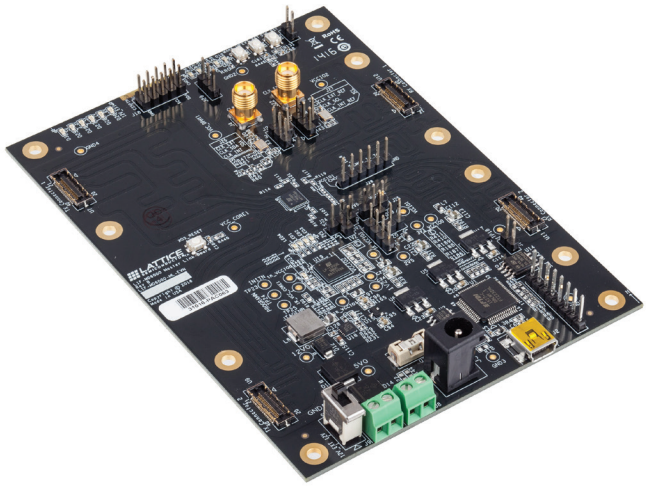
Features

- ECP5-85K LUTs device has 365 I/Os, 4 high-speed SERDES input and output channels, along with 400 MHz LPDDR3 memory support
- Freescale i.MX 6 Solo is an ARM Cortex-A9 1 GHz has 512 KB L2 cache, with MIPI CSI-2 interface and PCIe 2.0 x1
- Includes External connectors to standard interfaces such as HDMI®, Gigabit Ethernet, USB OTG, Camera, FMC, LVDS and GPIO
- ECP5's high performance DSP can be used for image processing, object analytics, algorithm development and machine learning
- Support for Omnivision OV5640 camera; SFP module can expand camera over GigE or Fiber
- Linux kernel with device drivers, applications/services, libraries, GNU tools (compilers, linkers, etc.), as well as deployment mechanisms

Product	Ordering Part Number
KONDOR AX Development Board	http://www.mikroprojekt.hr/products/development-boards/kondor-ax

CrossLink: LIF-MD6000 Master Link Board

At the heart of CrossLink: LIF-MD6000 Master Link Board is the award-winning CrossLink FPGA camera and video bridge. With two built-in MIPI D-PHY interfaces (4 lane each, with 1.5Gbps per lane), this kit provides an optimal platform for applications like image sensors interface conversion and sensor aggregation.



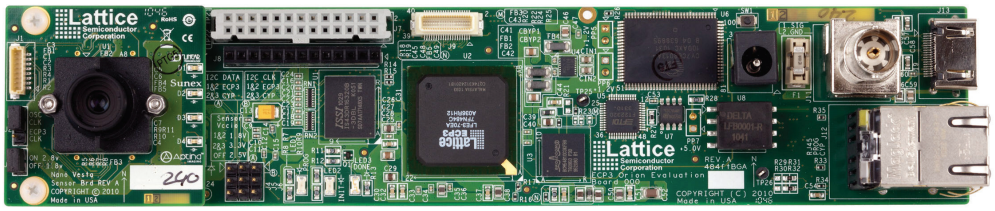
Features

- CrossLink LIF-MD6000 in 81-ball csfBGA package
- Ready-to-use pre-built IPs available in Lattice Diamond software URL
- Four connectors for interfacing to MIPI D-PHY and high-speed programmable I/Os
- Includes 0.1" header board, SMA board and LEDs for interfacing and control
- Provides an easy programming interface via USB with FTDI device

Product	Ordering Part Number
CrossLink: LIF-MD6000 Master Link Board	LIF-MD6000-ML-EVN

HDR-60 Video Camera Development Kit

LatticeECP3™ HDR-60 Video Camera Development Kit is a fully production-ready High Dynamic Range (HDR) camera, designed to fit into commercially available camera housings, and comes with Helion Vision's IONOS Image Signal Processing (ISP). The integrated IONOS ISP IP provides end-to-end sensor to displayable image ISP support. Lattice's HDMI PHY IP enables output to HDMI/DVI monitors.



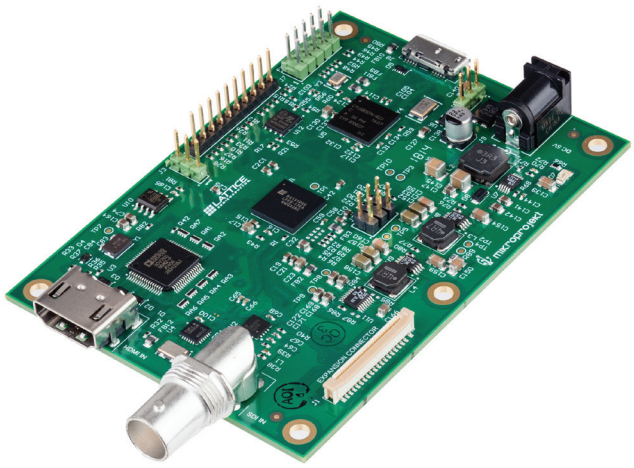
Product	Ordering Part Number
HDR-60 with MT9M024 NanoVesta	LFE3-70EA-HDR60-DKN
HDR-60 without NanoVesta	LFE3-70EA-HDR60-EVN
Dual Sensor Interface	LCMXO2-4000HE-DSIB-EVN
CSI2-to-Parallel Bridge	LF-C2P-EVN
MT9M024 Sensor NanoVesta	LF-9MT024NV-EVN
MN34041 Sensor NanoVesta	LF-PNV-EVN

Features

- LatticeECP3-based ISP with HDR camera development system
- Allows demonstration of image-sensor bridge or dual-image-sensor bridge
- Includes HDMI and Ethernet ports
- Supports Aptina MT9M024/AR0331, Panasonic MN34041, Sony or NIT sensors

Lattice USB 3.0 Video Bridge Development Kit

This is a production-ready, high-definition video capture and conversion system, based on the LatticeECP3 FPGA family.



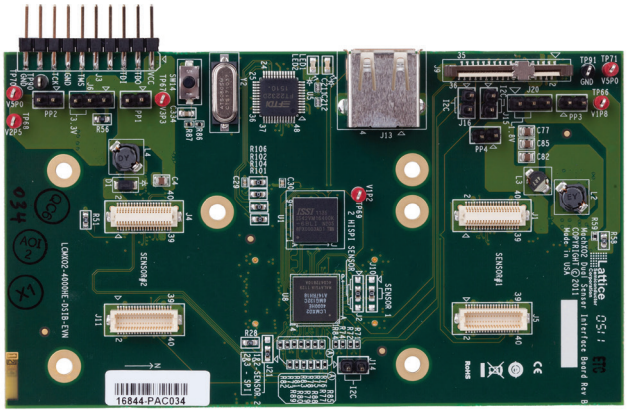
Features

- Production-ready USB 3.0 audio/video bridging reference design
- 1080p video streaming over USB 3.0 at 60fps
- HDMI 1.4a audio and video capture
- SD-, HD-, 3G-SDI audio and video capture
- Supports video capture from external MIPI CSI-2 , SubLVDS or parallel sensors
- Reference design provides fast USB 3.0 UVC and UAC class data packing
- Plug and play operations as a video capture device on multiple standard platforms (Windows, MacOS, Linux)

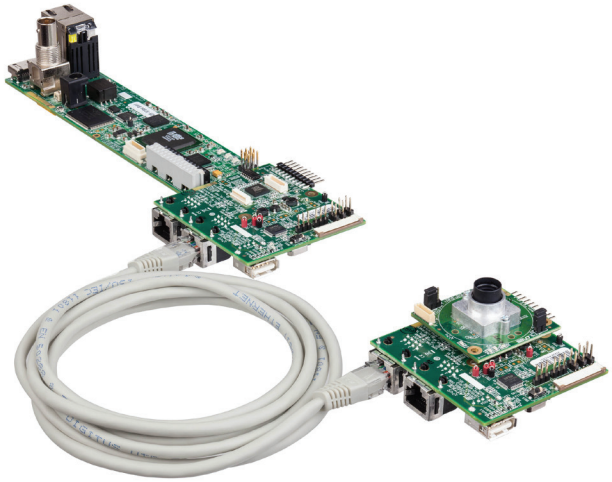
Product	Ordering Part Number
Lattice USB3 Video Bridge Development Kit	LFE3-17EA-USB3-EVN

Other Embedded Vision Solutions

Lattice offers a variety of other boards and development kits for embedded vision applications.



MachXO2 Dual Sensor Interface Board



SensorExtender Card

MachXO2™ Dual Sensor Interface Board provides a platform for support dual sensor designs such as 3D stereoscopic vision, black box car driver recorders and other applications that require more than one sensor. This board is designed for use with the HDR-60 Base Board.

SensorExtender Card allows the demonstration of an image sensor dislocated from an ISP. It requires the HDR-60 Base Board and MT9M024 Sensor NanoVesta Board to produce a working demonstration. The NanoVesta sensor plugs into the SensorExtender Board labeled TX. Using the included CAT5E cable, it can be connected to the SensorExtender RX board that plugs into the HDR-60 Base Board.

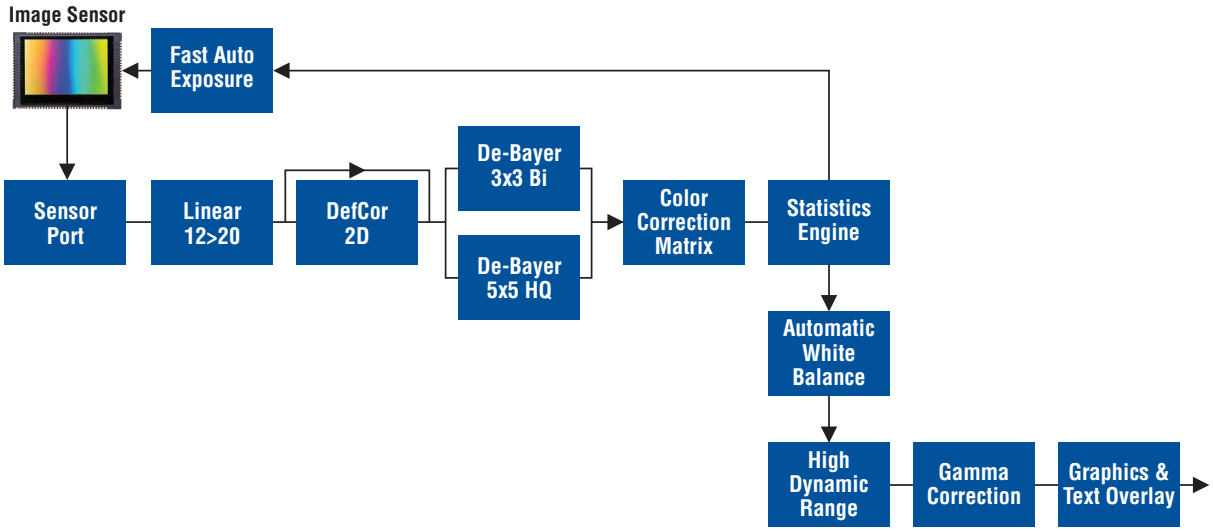
Aptina MT9M024 Sensor NanoVesta Head Board plugs directly onto MachXO2 Dual Sensor Interface Board.

Product	Description	Ordering Part Number
MachXO2 Dual Sensor Interface Board	• Interface board to two image sensors • Output is a combined bus for the HDR-60 Base Board or Texas Instruments IP camera	LCMXO2-4000HE-DSIB-EVN
SensorExtender Card	• Distances Image Sensor from ISP via a single CAT5e/6 cable with remote power to the image sensor via the CAT5e/6 cable • Interfaces to ISP after de-serializing can be parallel or serial along with bi-directional I²C write programming offered via the same CAT5e/6 cable • Flexible sensor interface before serial conversion	LCMXO2-4000HE-SEC-EVN
NanoVesta Sensors	• 720p and 1080p sensors • Plugs into the HDR-60 Base Board or MachXO2 Dual Sensor Interface Board	LF-PNV-EVN LF-9MT024NV-EVN

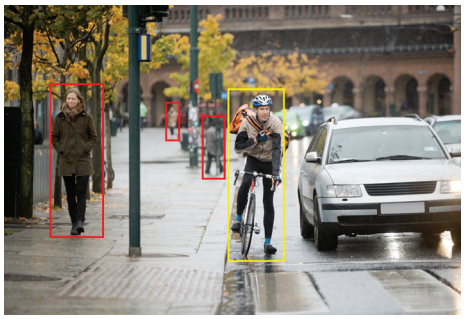
Image Signal Processing (ISP) from Helion Vision

Lattice has partnered with Helion Vision, GmbH to provide a fully comprehensive selection of image processing pipelines, ranging from basic to advanced HDR-pipelines, which can be quickly evaluated on Lattice's Embedded Vision Development Kit and HDR-60 Camera Development Kit. This approach reduces development time and costs.

IONOS Imaging IP Core Suite is a plug and play ISP pipeline containing a library of more than 150 individual pieces of IP Cores, available for licensing either entirely or in parts.



Helion IONOS Image Signal Processing Pipeline



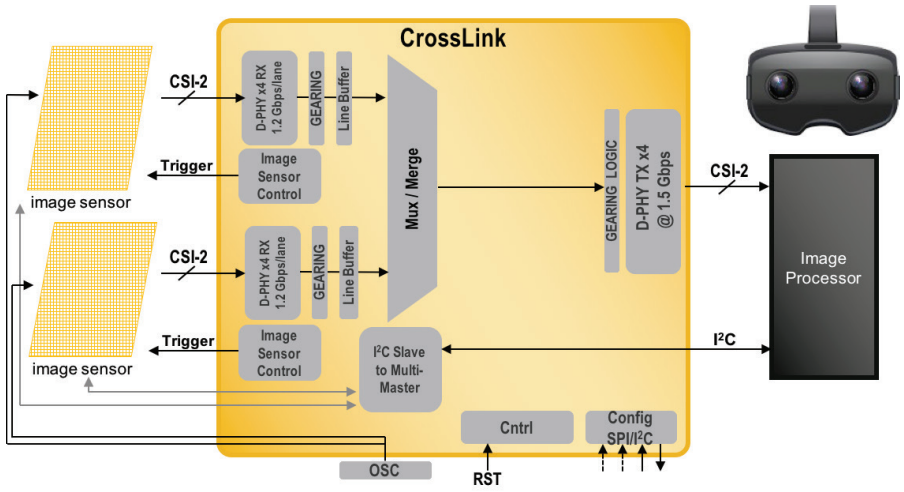
Features

- ISP available for ECP5 and LatticeECP3
- HDR (WDR) improves the dynamic range between the lightest and darkest areas of an image
- Solutions for Aptina, Panasonic and NIT sensors
- Stand-alone auto focus algorithm
- Advanced Video Analytics software for people counting, intrusion detection, object detection and camera tampering

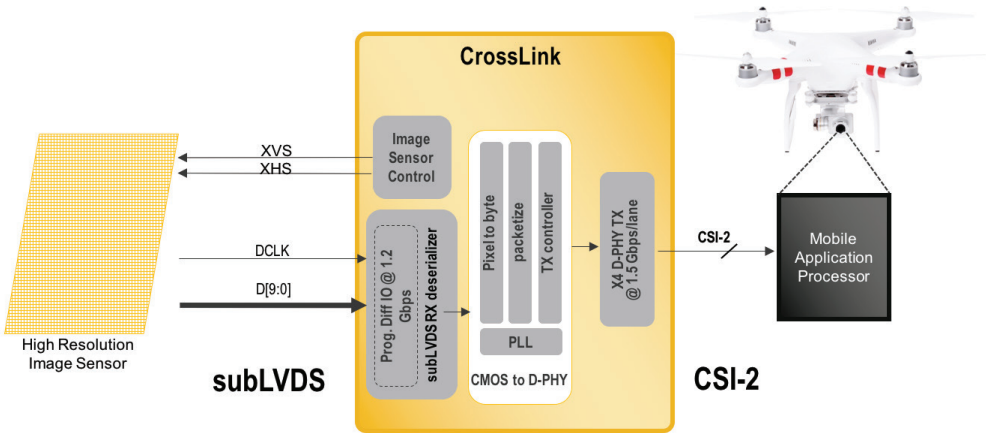
CrossLink IP Solutions from Lattice

CrossLink FPGA IP Cores are ready-to-use IPs available in Lattice Diamond software. These IPs provide conversion bridging, as well as connectivity between traditional camera and display interfaces, and MIPI D-PHY interfaces.

CrossLink IP	IP Provider
CMOS to MIPI CSI-2 Interface Bridge IP	Lattice
Four Input to One Output MIPI CSI-2 Camera Aggregator Bridge	Lattice
MIPI CSI-2 to CMOS Image Sensor Bridge	Lattice
MIPI DSI to OpenLDI LVDS Display Interface Bridge	Lattice
MIPI DSI to RGB Display Interface Bridge	Lattice
One Input to One Output MIPI CSI-2 Camera Repeater Bridge	Lattice
One Input to One Output MIPI DSI Display Interface Bridge	Lattice
One Input to Two Output MIPI CSI-2 Camera Splitter Bridge	Lattice
One Input to Two Output MIPI DSI Display Splitter Bridge	Lattice
OpenLDI LVDS to MIPI DSI Display Interface Bridge	Lattice
RGB to MIPI DSI Display Interface Bridge	Lattice
SubLVDS to MIPI CSI-2 Image Sensor Bridge	Lattice
Two Input to One Output MIPI CSI-2 Camera Aggregator Bridge	Lattice



Multi CSI 2 Image Sensor Interface Bridging



Camera Interface Conversion Bridging

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