

Xylon d.o.o.

Fallerovo setaliste 22
10000 Zagreb, Croatia
Phone: +385 1 368 00 26
Fax: +385 1 365 51 67
E-mail: support@logicbricks.com
URL: www.logicbricks.com



Figure 1: The Framework is Fully Compatible with the Xylon logiVID-ZU Vision Development Kits

Features

- The complete video design framework for embedded multi-camera vision applications
- Enables vision developers to quickly add their own algorithms in the provided infrastructure
- Jump-starts the development and saves valuable design time
- Includes complete reference designs with an integrated video processing block example:
 - HDMI¹ or camera video input to display output
 - Four camera video inputs to display output
- Designs are fully compatible with the Xylon logiVID-ZU Vision Development Kit based on the Xilinx[®] Zynq[®] UltraScale+[™] MPSoC
- Designs are prepared for hardware-centric design environments:
 - Xilinx Vivado[®] Design Suite 2019.1
- Runs on Linux OS and includes logicBRICKS software drivers and demo applications
- Use minimal resources (Table 1) and leave room for very complex vision functions
- Includes licensed² Xylon logicBRICKS IP cores
- Resolutions: IN 1928x1208³ and OUT 1920x1080
- Full evaluation version available online
- Documentation and Tech support (e-mail)

Table 1: Reference Designs Implementation Statistics

| | Available in XCZU9EG | Used Resources | |
|------------------------|----------------------|----------------|----------|
| | | CAM-HDMI | FOUR-CAM |
| Look-Up Tables (LUTs) | 274,080 | ~ 3.5% | ~ 8.2% |
| Flip Flops (FFs) | 548,160 | ~ 2.1% | ~ 4.8% |
| Block RAM (36 kB BRAM) | 912 | ~ 4.6% | ~ 13.8% |
| DSP slices (MULT/DSP) | 2,520 | ~ 0.4% | ~ 1.3% |

¹ The HDMI video input requires the Avnet HDMI Input/Output FMC module; part number AES-FMC-HDMI-CAM-G.

² Included 1-year Xylon Low-Volume IP Program (LVIP) seat licenses for used Xylon logicBRICKS IP cores.

³ For HDMI input resolution is 1920x1080.

Applications

- AD/ADAS, guided robotics, drones, machine vision, AR/VR and other vision applications

General Description

The logiADAK-VDF-ZU Video Design Framework enables Xylon logiVID-ZU Vision Development Kit users to quickly utilize the provided hardware platform for development of the Xilinx All Programmable Zynq UltraScale+ MPSoC based embedded multi-camera vision systems.

The framework includes pre-verified logicBRICKS reference designs for video capture from Xylon AR0231 video cameras and the HDMI video input, and the display output under the Linux operating system. Video capture can be either from:

- Xylon video cameras with the Maxim Integrated **GMSL2** high-speed digital video interface (Figure 3.):

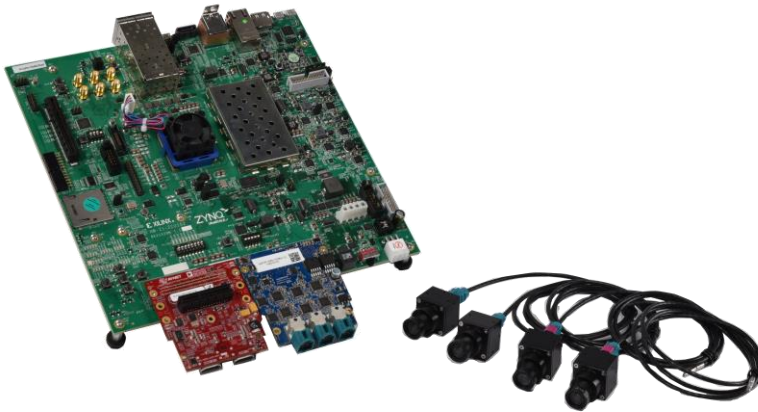


Figure 3: Xylon logiVID-ZU-GMSL2 Vision Development Kit

- Xylon video cameras with the TI[®] **FPD-Link III** high-speed digital video interface (Figure 4.):

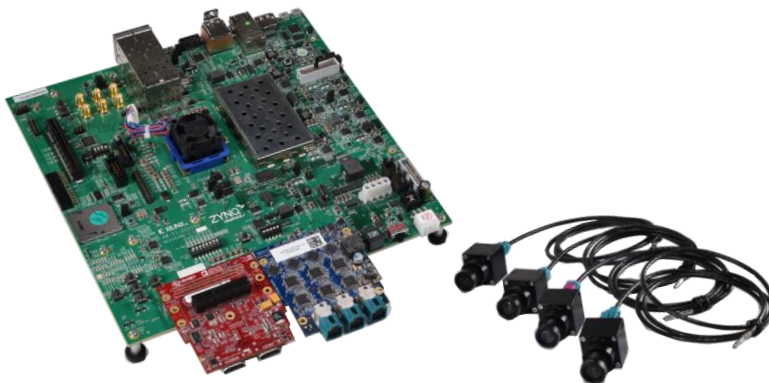


Figure 4: Xylon logiVID-ZU-FPD3 Vision Development Kit

Reference designs are prepared for Xilinx Vivado Design Suite.

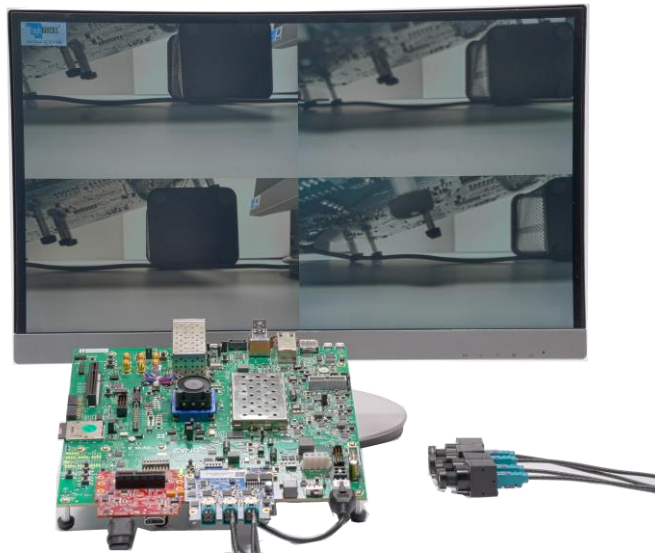


Figure 5: Four-Camera Demo View

The complete camera-to-display MPSoC designs, which use just a fraction of available programmable logic (Table 1), significantly save the design time. Instead of starting from scratch and having to spend months designing and building a new design framework, the logiADAK-VDF-ZU design framework users can immediately focus on specific vision-based parts of their next MPSoC design. The logiADAK-VDF-ZU hardware platform can be installed on test vehicles (cars, robots...) and used in exhaustive tests, i.e. for testing and validation of the new AD/ADAS developments in the test vehicle and under different road conditions.

CAM-HDMI reference design

This design implements a single video input, and the display output with the RGB overlay. The video input can be sourced from the attached Xylon AR0231 video camera (either GMSL2 or FPD-Link III), or through the HDMI video input. The HDMI video input is particularly suited for use with the PC and playback of prepared test videos, such as the video recordings of road and traffic situations that make test cases for the video ADAS processing implemented in the Xilinx Zynq UltraScale+ MPSoC device. The design displays a single video source, and automatically switches to the HDMI video input upon detection of the plugged-in HDMI cable.

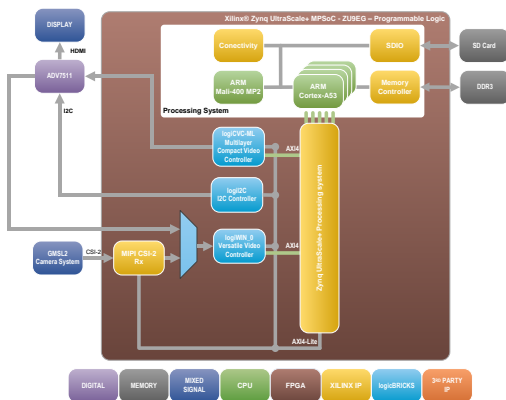


Figure 5: CAM-HDMI SoC Design

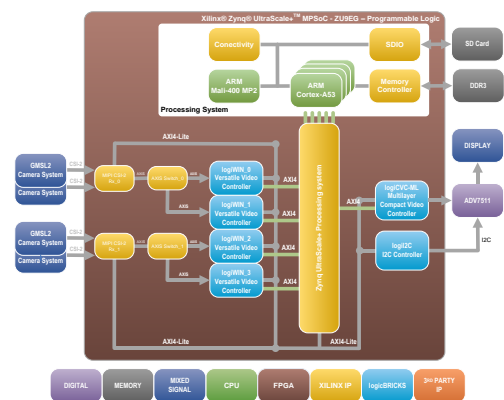


Figure 6: FOUR-CAM SoC Design

FOUR-CAM Reference Design

This design implements four parallel video inputs from or Xylon AR0231 cameras (either GMSL2 or FPD-Link III), and the display output with the RGB overlay. All video inputs are stored in the video memory, and by mean of the on-board push buttons, the design user can select each of them for the single camera or all cameras full screen display output.

logiADAK-VDF-ZU reference designs include Xylon logicBRICKS IP cores and design files prepared for the Xilinx Vivado Design Suite.

All IP cores are supplied with bare-metal and appropriate Linux software drivers. The provided video capture and display demo applications run in Linux operating system.

To download the evaluation version of the logiADAK-VDF-ZU Video Design Framework and to purchase it, please visit our online catalog: <http://www.logicbricks.com/Products/logiADAK-VDF-ZU.aspx>.



The logiADAK-VDF-ZU users who do not have video cameras can evaluate the CAM-HDMI design with the Avnet HDMI Input/Output FMC board attached to the ZCU102 evaluation kit.

Framework Content

logiADAK-VDF-ZU Reference Designs for the Xilinx Vivado Design Suite:

Hardware Design Files

- Configuration bitstream file for the programmable logic and the SDK export of the reference design that allows for instant design check-up and software changes
- Two reference SoC designs
- Xylon logicBRICKS IP cores:
 - logiCVC-ML Compact Multilayer Video Controller
 - logiWIN Versatile Video Input
 - logiI2C I2C Bus Master Controller

Software

- Linux user space drivers with driver examples
- Bare-metal software drivers for logicBRICKS IP cores
- logiVIOF VideoIn-VideoOut library
- Demo application sources

Binaries

- FPGA bitstream
- Linux binaries:
 - boot.bin
 - First Stage Boot Loader
 - Universal Boot Loader
 - FPGA
 - Platform Management Unit Firmware
 - image.ub
 - kernel image
 - device tree blob
 - minimal Root File System
 - Camera/HDMI demo (either GMSL2 or FPD-Link III)
 - Four Camera demo (either GMSL2 or FPD-Link III)

Recommended Design Experience

The users, who want to make changes on the provided designs, should have experience in the following areas:

- Xilinx design tools
- C programming
- Embedded hardware and software design

All logicBRICKS IP cores provided with the design framework are fully compatible with Xilinx implementation tools and their use does not require any particular skills beyond general Xilinx tools knowledge.

Related Xylon Products

The logiVID-ZU Vision Development Kit provides system designers with everything they need to efficiently develop multi-camera vision applications on the Xilinx Zynq UltraScale+ MPSoC devices. The kit includes the complete hardware platform to support a single HDMI video input, and depending on the kit version, up to four inputs from Xylon GMSL2 or FPD-Link III video cameras, as well as the fully licensed logiADAK-VDF-ZU Video Design Framework (only with Xylon AR0231 cameras). To learn more about this product, please contact Xylon or visit our website:

Email: support@logicbricks.com
URL: <http://www.logicbricks.com/Products/logiVID-ZU.aspx>

The logiADAK Automotive Driver Assistance kit is a great programmable platform for upcoming automotive ADAS/AD applications. The kit comes with a full set of user customizable demo applications, advanced software for quick setup on any vehicle, documentation and skilled Xylon technical support. The provided hardware platform is appropriate for quick test vehicle installations and rapid engagements in proof-of-concept or demonstration projects:

Email: support@logicbricks.com
URL: <http://www.logicbricks.com/Products/logiADAK.aspx>

Ordering Information

Product is available directly from Xylon. Please visit our web shop or contact Xylon for pricing and additional information:

Email: sales@logicbricks.com
URL: <http://www.logicbricks.com/Products/logiADAK-VDF-ZU.aspx>

This publication has been carefully checked for accuracy. However, Xylon does not assume any responsibility for the contents or use of any product described herein. Xylon reserves the right to make any changes to product without further notice. Our customers should ensure that they take appropriate action so that their use of our products does not infringe upon any patents. Xylon products are not intended for use in the life support applications. Use of the Xylon products in such appliances is prohibited without written Xylon approval.

Related Information

Xilinx Programmable Logic

For information on Xilinx programmable logic or development system software, contact your local Xilinx sales office, or:

Xilinx, Inc.

2100 Logic Drive

San Jose, CA 95124

Phone: +1 408-559-7778

Fax: +1 408-559-7114

URL: www.xilinx.com

Revision History

| Version | Date | Note |
|---------|-------------|---|
| 2.00 | 01.09.2017. | Initial public release. |
| 2.01 | 07.09.2018. | Xylon FPD-Link III FMC module. |
| 2.02 | 30.10.2018 | Update to Vivado Design Suite 2017.4. |
| 2.03 | 19.07.2019. | Updated to support cameras with MIPI interface. |
| 3.00 | 15.12.2019. | Update to Vivado Design Suite 2019.1. Unified GMSL2 and FPD-Link III documentation. |
| 3.10 | 14.07.2021. | Updated to support the newest versions of GMSL2 and FPD-Link III FMCs and cameras. |