

Image Stitch IP FPGA

The Intel Image Stitch IP is a highly configurable FPGA IP Core for real time image stitching of up to 8 video streams into a single 4K/UHD video stream

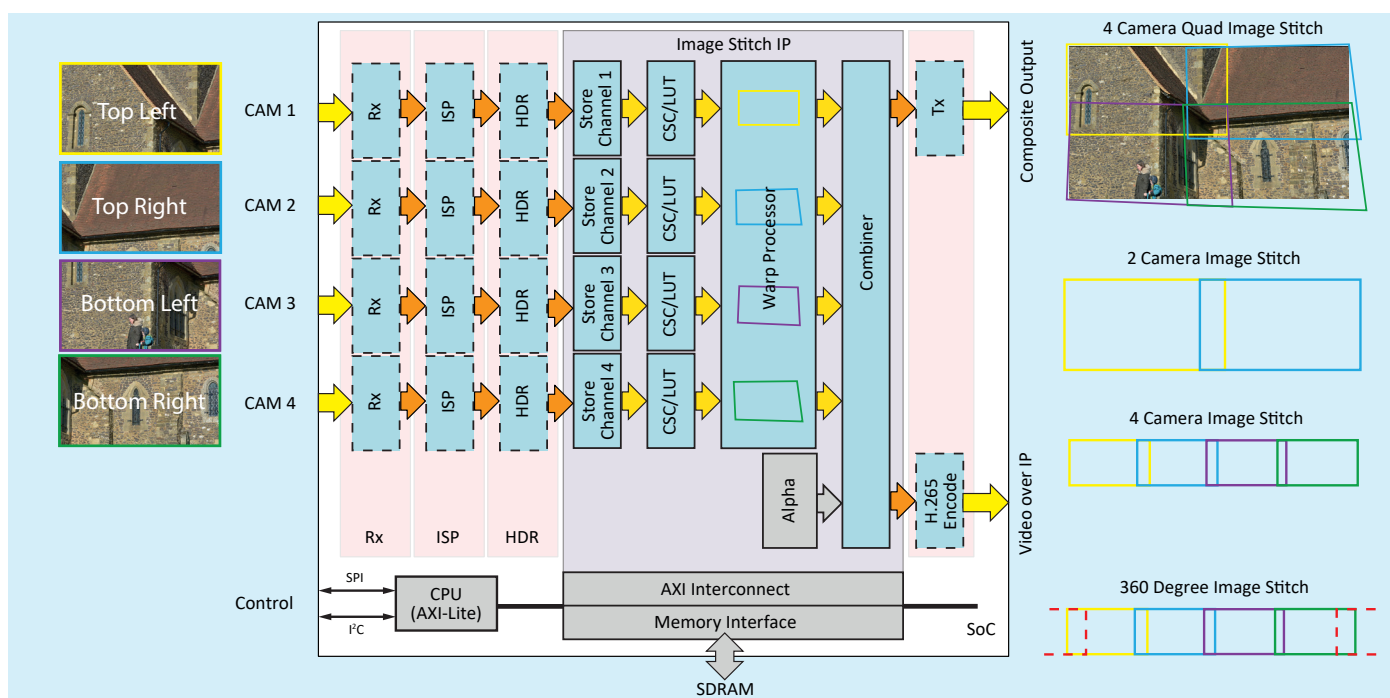


Figure 1. Image Stitch IP block diagram

Summary

The Intel Image Stitch IP is a highly configurable and optimised FPGA IP Core for real time image stitching of up to 8 video streams into a single 4K / UHD video stream.

The Image Stitch IP employs FPGA hardware to perform real time image stitching using image coordinates calculated using software running on the FPGA CPU.

Reference frames are captured at regular intervals from the live video streams and the CPU calculates the overlap and individual warps that need to be applied to the images to correctly stitch them together.

The Image Stitch IP can be used with the range Intel's Connectivity IP including SDI Rx, HDMI Rx, DisplayPort Rx, LVDS Rx, etc and can be used with Intel's ISP IP (to process the RAW sensor images) and Intel's HDR Tone-mapping IP (to improve image dynamic range and contrast).

Applications

The Image Stitch IP can be used in a range of applications including:

- 360o Video capture and streaming
- Video conferencing systems requiring surround view
- Automotive surround view camera systems
- Surveillance systems
- Virtual Reality and Augmented Reality Headsets

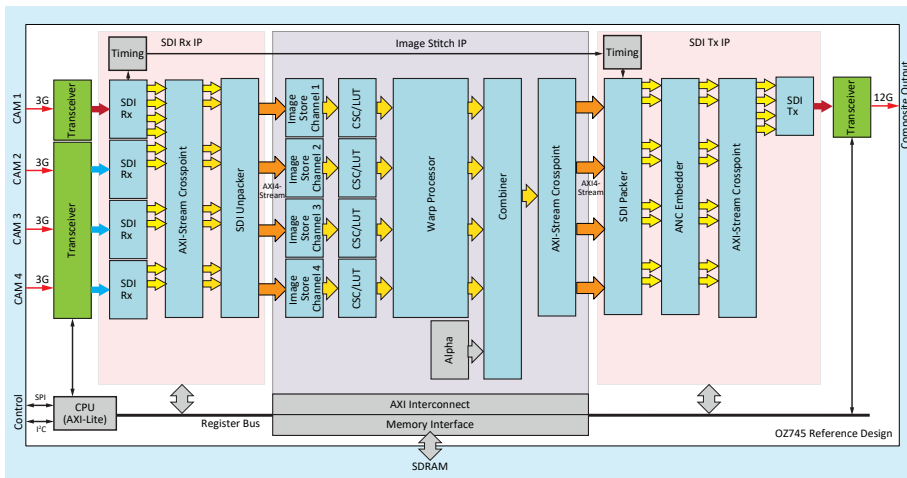


Figure 2. Block diagram

Key Features

- Automatic image geometry correction of up to 8 video streams
- Automatic white balance and colour correction
- Intelligent edge blending
- 4 quadrant image stitch, creating a 4K composite from 4 HD images
- 2-8 camera horizontal image stitch and 360o surround view
- 2-8 camera vertical image stitch
- Perspective or 360o video mapping
- Support for image sizes up to 4096 x 2160 at 60fps as 8, 10 and 12-bit, 4:2:0, 4:2:2 and 4:4:4.
- Composite output image up to 4096 x 2160 at 60fps as 8, 10 and 12-bit, 4:2:0, 4:2:2 and 4:4:4
- GUI control via web browser interface
- Efficient external memory interface
- 10-bit, RGB, 4:4:4 processing with 8, 10 and 12-bit, 4:2:0, 4:2:2 and 4:4:4 Rx/Tx interfaces

Image Stitch IP Sub Blocks

The **"Rx IP"** block optionally provides SDI Rx, HDMI Rx, DisplayPort Rx, LVDS Rx or TTL Rx input connectivity to the Image Stitch IP.

Up to 8 channels of video from the Rx Connectivity IP are passed to the **"Image Store"** blocks. Here snapshots are taken at regular intervals and accessed by the Image Stitch software running on the CPU.

Video from the **"Image Store"** blocks are passed to the corresponding **"CSC/LUT"** blocks (Colour Space Converter / Look-up Table blocks) where image colour correction is performed to match the video streams under control of the CPU.

The **"Warp Processor"** block manipulates the separate image streams using high level instructions from the CPU.

The **"Combiner"** block combines the image streams and blends them using the computer generated Alpha channel held in the "Alpha" block.

The **"AXI-Stream Crosspoint"** block routes a combined image stream to the

appropriate Tx Connectivity IP output.

The **"Tx IP"** block optionally provides SDI Tx, HDMI Tx, DisplayPort Tx, LVDS Tx, TTL Tx or V-by-one Tx output connectivity.

Image streams are stored and manipulated in external SDRAM via the **"AXI Interconnect"** and **"Memory Interface"** blocks.

Reference Platform & Design

Intel's OZ745 development kit includes all the basic components of hardware, design tools and IP, together with pre-verified reference designs, to rapidly develop video and image processing design prototypes. See OZ745 Data sheet for details

The reference design incorporates the Image Stitch IP alongside the OSVP Suite. It combines the video processing IP with connectivity IP to create a complete working FPGA design that can be used to evaluate the performance of the IP blocks in a video application.

The reference design can process 4 video streams of identical format up to 1920 x 1080 60 frames per second as 8, 10 and 12-bit, 4:2:0, 4:2:2 and 4:4:4 interface. All processing is 10-bit, RGB, 4:4:4.

The reference design can output a single video stream in formats up to 4096 x 2160 at 60fps as 8, 10 and 12-bit, 4:2:0, 4:2:2 and 4:4:4 interface.



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