Datasheet for HDMI 2.1 8K/4K Frame Grabber

iWave Global

Document Revision History

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1. INTRODUCTION

The iWave HDMI 2.1 8K/4K Frame Grabber features a PCIe-based architecture designed to capture uncompressed HDMI 2.1 video at resolutions up to 8K @ 60 Hz and 4K @ 120 Hz, enabling real-time capture, output, and monitoring with low latency. Flexible HDMI input and output configurations, along with embedded multi-channel audio support, allow high-quality video streams to be transferred directly to the host system for recording, analysis, and processing.

The frame grabber is suitable for a wide range of applications including broadcast production, medical imaging, simulation platforms, AR/VR systems, machine vision, and advanced visualization environments, where simultaneous high-resolution capture and display are required. Linux and Windows driver support based on standard video frameworks ensures seamless system integration, scalability, and consistent high-performance operation across diverse deployment scenarios.

1.1. Features

- 2× HDMI 2.1 inputs, or 2× HDMI 2.1 outputs, or 1× HDMI 2.1 input/output configurations
- PCIe Gen3 x8 host interface for high-bandwidth data transfer
- HDMI 2.1 FRL input and output support
- Resolutions and refresh rates up to 8K @ 60 Hz, 4K @ 120 Hz, and 4K @ 60 Hz uncompressed video
- Compatibility with NVIDIA GPUDirect
- V4L2 framework compatibility for video capture and processing
- Windows OS or Linux OS compatibility for flexible deployment
- Video node detection for applications such as VLC Media Player, OBS Studio
- Sub frame data capture to host/GPU and Zero-latency loopback operation with Genlock capability
- A User controller & fail-safe loop-out enables power-only video pass-through in the event of software crash or other system failure on host
- Multi-resolution video support with RGB and YUV colour spaces, including 4:4:4, 4:2:2, and 4:2:0-pixel formats, with 8-bit, 10-bit, and 12-bit per-pixel depth
- Integrated on-board video test pattern generator

2. Block Diagram

2.1. Hardware Architecture

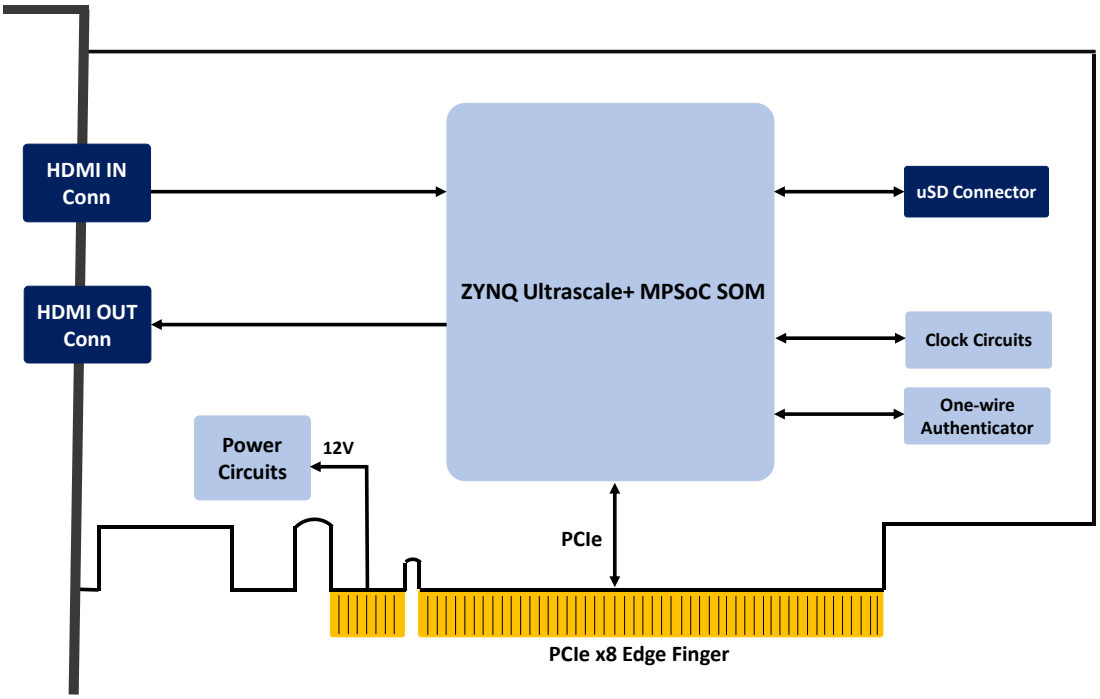

Figure 1 : Hardware Architecture of HDMI 2.1 8K/4K Frame Grabber

2.2. Technical Specification

Table 1 : Technical Specification

FPGA	Zynq Ultrascale+ MPSoC SOM
Interfaces	PCIe Gen3.0 x8 Host Interface 2# HDMI 2.1 Input/Output Micro SD connector
Linux OS	V4L2 (Video4Linux2) driver Custom driver and SDK for Linux to support specialized and application-specific workflows NVIDIA GPU Direct support for low-latency, zero-copy data transfer to GPU memory Compatible with third-party applications, multimedia frameworks Media Development SDK ➢ NVIDIA DeepStream ➢ NVIDIA Holoscan
Windows OS	AVStream driver GPU Direct support for accelerated, low-latency video pipelines Custom driver and SDK for Windows to support specialized and application-specific workflows Compatible with video streaming applications and multimedia frameworks
Security & Status	One-wire Authenticator, Power LEDs and User LEDs on board to monitor board health
Third Party Applications	OBS Studio VLC Media Player Other third-party streaming and capture applications
Multimedia Libraries	FFmpeg GStreamer
Power Input	12V@5.5A DC via PCIe Edge Finger
Form Factor	Full Height, Half length (FHHL) single slot
Cooling	Active Cooling
Operating Temperature	-40°C to 70°C[1]
Relative Humidity	20% to 90% non-condensing

[1] *To maintain optimal performance under high ambient temperature conditions, system-level airflow assistance is required.*

2.3. Software Features

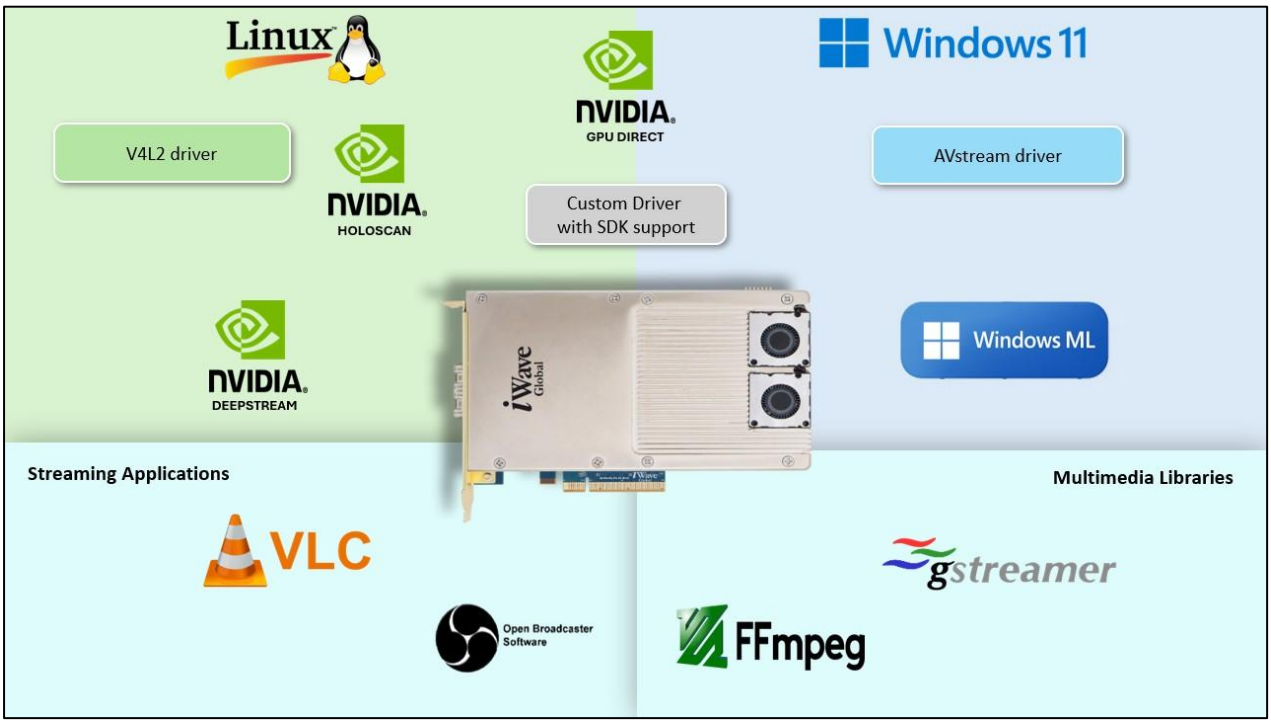

Figure 2 : Software Support Platform

Table 2 : Software Features

Feature	Linux	Windows
Driver Support	The V4L2 driver exposes video nodes, allowing software like FFmpeg, VLC, and GStreamer to access the video stream for processing and streaming	The AVStream driver provides the interface for video capture, enabling applications like OBS, FFmpeg, and VLC to access and work with the video feed.
NVIDIA GPU Integration	Uses NVIDIA GPUDirect via a custom Linux driver to Avoid unnecessary system memory copies and CPU overhead by copying data through pinned host memory.	Uses NVIDIA GPUDirect via a custom Windows driver to Avoid unnecessary system memory copies and CPU overhead by copying data through pinned host memory.
GPU & AI Video Processing	Linux leverages Holoscan & DeepStream for accelerated video processing using GPU resources, with access provided through V4L2.	Integrates with Windows ML for AI-based video analytics. A custom Windows driver enables GPUDirect-based data transfer from the frame grabber FPGA to GPU memory, supporting low-latency inference and accelerated video processing pipelines.

Cross-Platform Video Capture	Seamless integration with existing multimedia pipelines using standard V4L2 interfaces. FFmpeg and GStreamer can directly access the frame grabber via /dev/video* nodes, enabling plug-and-play capture, streaming, recording, and processing with minimal configuration.	Straightforward integration through AVStream-based DirectShow filters. The frame grabber is automatically detected as a capture device, allowing FFmpeg, GStreamer, and other DirectShow-compatible applications to immediately use it within standard video processing pipelines.

Table 3: Use Case

	With GPU Acceleration	Without GPU (CPU-Only)
Use Case	Real-time video processing and rendering pipelines	Standard video capture and recording workflows
	AR/VR or simulation platforms requiring direct GPU memory access	Video analysis or monitoring applications that don't require GPU acceleration
	High-performance machine learning inference on live video streams	Streaming to software applications such as VLC Media Player or OBS Studio
	Low-latency broadcast or production workflows with GPU offload	Embedded systems or Linux-based deployments with minimal hardware

2.4. Target Application

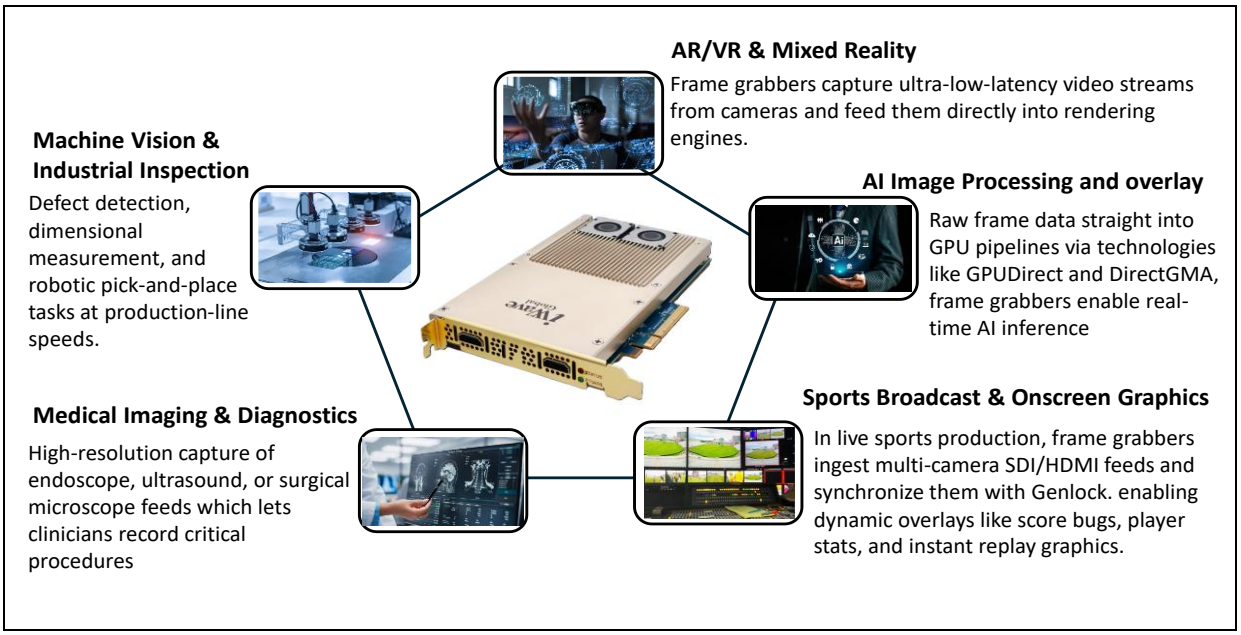

Figure 3 : Target Application

2.5. Product Accessories

Thermal Solutions

- For highly integrated Frame Grabber products, thermal design is a critical factor. iWave supports the use of fansinks to ensure efficient thermal management and reliable operation.

PCIe Bracket

- Enables secure installation, ensures compatibility with standard chassis, and provides resistance to mechanical stress.

2.6. Software Deliverables

Table 4 : Software Deliverables

Linux	Windows
V4L2 driver	AV Stream
Software User manual	Software User manual
Custom driver	Custom driver
SDK Dynamic Library	SDK Dynamic Library
SDK Documentation	SDK Documentation

2.7. Ordering Information

The table below lists the standard orderable part numbers for the available Frame Grabber variants.
For further information, or if a required part number or custom configuration is not listed, please contact iWave.

Table 5 : Ordering Information

Product Part Number	Description
iG30F-H3IO-PCI-ACL	Single Input & Output HDMI 2.1 Frame grabber
iG30F-H3I2-PCI-ACL	Dual Input HDMI 2.1 Frame grabber
iG30F-H3O2-PCI-ACL	Dual Output HDMI 2.1 Frame grabber
iG30F-H2IO-PCI-ACL	Single Input & Output HDMI 2.0 Frame grabber
iG30F-H2I2-PCI-ACL	Dual Input HDMI 2.0 Frame grabber
iG30F-H2O2-PCI-ACL	Dual Output HDMI 2.0 Frame grabber

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