



GSV2502

1 In to 2 Out HDMI 2.1 24Gbps Splitter with
Embedded MCU

April, 2022

Preliminary Product Specification

1. General Description

1.1 General Information

Gscoolink GSV2502 is a high-performance, low-power 1 In to 2 Out HDMI 2.1 to HDMI 2.1 splitter. By integrating enhanced microcontroller based on RISC-V, GSV2502 has created a cost-effective solution that provides time-to-market advantages. GSV2502's HDMI Receiver and HDMI Transmitter supports up to 24Gbps (FRL, 6G/4Lane). The superior architecture of GSV2502 provides economical smaller footprint solutions using QFN88, targeting applications of Consumer and ProAV.

GSV2502 supports all uncompressed HDMI input video/audio decoding/encoding and DSC stream pass-through to HDMI output. HDCP 1.4 and HDCP 2.2/2.3 are implemented in GSV2502 for both HDMI Input and Output in HDMI 2.0 and FRL mode. HDR-SDR Conversion, Deinterlacer, Downscaler, 444-420 Conversion, Color Space Conversion are supported in HDMI Tx in HDMI 2.0 and FRL mode. Flexible implementations of Audio Insertion, Audio Extraction and SPDIF to I2S conversion are supported in GSV2502. Embedded CEC engine enables flexible remote control of the entire HDMI signal chain.

An internal Video Generator can be used to generate any uncompressed video timing defined in HDMI 2.1 24Gbps bandwidth, such as 5K@60Hz, 4K@60Hz, 480i@60Hz.

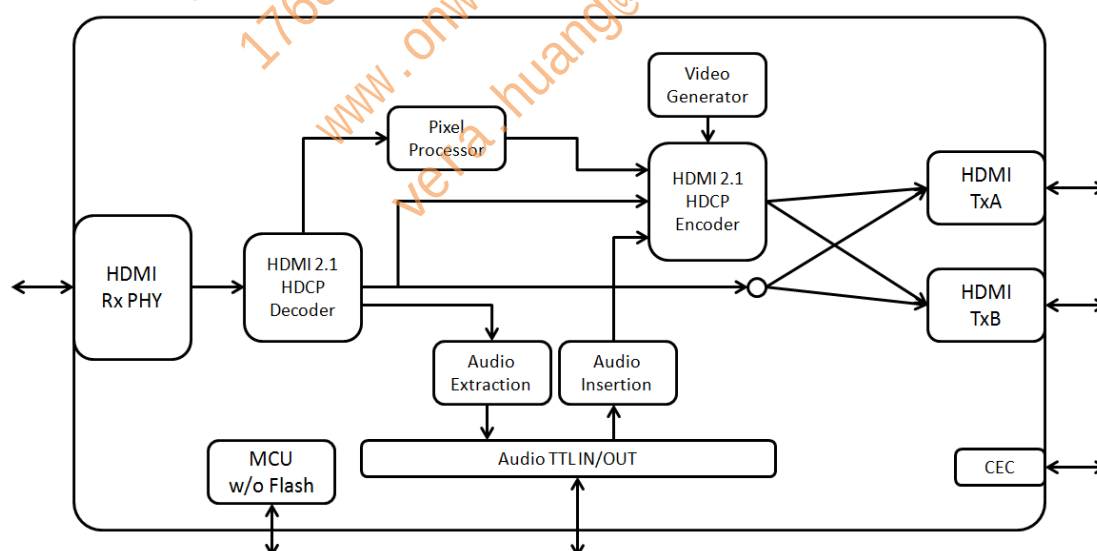


Figure 1. Top Diagram

The supported audio formats are listed in Table 1

Table 1. Supported Audio Format

Packet ID	Packet Type	Sampling Frequency (KHz)		
		32/44.1/48/88.2/ 96/176.4/192	256/352.8/384/ 512/705.6/768	64/128
0x02	Audio Sample Packet (LPCM and Compressed Audio)	Y		Y
0x07	One Bit Audio Sample Packet	Y		
0x08	DST Audio Packet	Y		
0x09	High Bit-rate Audio Stream Packet	Y	Y	

1.2 Features

1.2.1 HDMI Receiver

- Compliant with HDMI 2.1, HDMI 2.0b, HDMI 1.4b
- Compliant with HDCP 2.2/2.3 and HDCP 1.4 in repeater/receiver mode
- Data rate up to 24Gbps (FRL 6Gbps/4 Lane)
- Programmable Adaptive Equalization
- Support High Dynamic Range (HDR) and Dynamic/Static Metadata
- Support Variable Refresh Rate (VRR), FreeSync, G-Sync
- Support ALLM
- Support Forward Error Correction (FEC)
- Support DSC pass-through for compressed input timing
- Embedded arbitrary EDID (up to 512 bytes)
- 5V tolerance on DDC/HPD pins
- 3D format support of frame packing, side-by-side, top-and-bottom

1.2.2 HDMI Transmitter

- Compliant with HDMI 2.1, HDMI 2.0b, HDMI 1.4b
- Compliant with HDCP 2.2/2.3 and HDCP 1.4
- Data rate up to 24Gbps (FRL 6Gbps/4 Lane)
- Programmable Voltage Swing, Slew-Rate and Pre-emphasis
- Support AC-coupling on TMDS
- Support Color Space Converter in FRL and HDMI 2.0 mode
- Support HDR (HDR10/HDR10+/Dolby Vision/HLG)

- Support Variable Refresh Rate (VRR), FreeSync, G-Sync
- Support ALLM
- Support DSC encoded stream pass-through
- Hardware CEC Engine for Low Level protocol decoding
- 5V tolerance on DDC/HPD/CEC pins
- 3D format support of frame packing, side-by-side, top-and-bottom

1.2.3 Pixel Processor

- HDR to SDR conversion for HDR10, HDR10+, HLG and Low Latency DolbyVision
- Color Space conversion
- YCbCr 444-420 timing conversion
- Downscaler with selectable 2/3/4/8/16/32 ratio
- Deinterlacer for interlaced timing

1.2.4 Audio Input/Output

- I2S and SPDIF Audio Extraction from HDMI Rx
- I2S/SPDIF Audio Insertion to HDMI Tx
- SPDIF/I2S/HBR/DSD/TDM Format Supported for Audio Extraction and Insertion
- SPDIF to I2S Conversion using single TTL bus in Bi-direction

1.2.5 System Features

- Optional External MCU (via I2C)/ Internal MCU mode for chip control
- Embedded MCU and External Flash
- External pins of Flash QSPI interface
- External 25MHz Crystal required
- Available Pins for UART/Timer/GPIO
- Temperature Sensor Monitoring Circuit

1.3 Chip Application Modes

1.3.1 HDMI 1to2 Repeater with audio extraction

The default 1to2 repeater application mode of GSV2502 is that 2 HDMI outputs copy the same TMDS/FRL stream from HDMI input. Other than HDMI input lane frequency, GSV2502 HDMI Outputs have an advanced feature of generating a shared secondary FRL/TMDS lane frequency. For example, HDMI input timing is 4K@60Hz using FRL 6G/4Lane, and secondary lane frequency is set to HDMI 2.0 TMDS mode. Any of the 2 HDMI outputs can choose either default 4K@60Hz using FRL 6G/4Lane, or secondary 4K@60Hz using HDMI 2.0 TMDS mode.

Meanwhile, Audio extraction can be applicable if required.

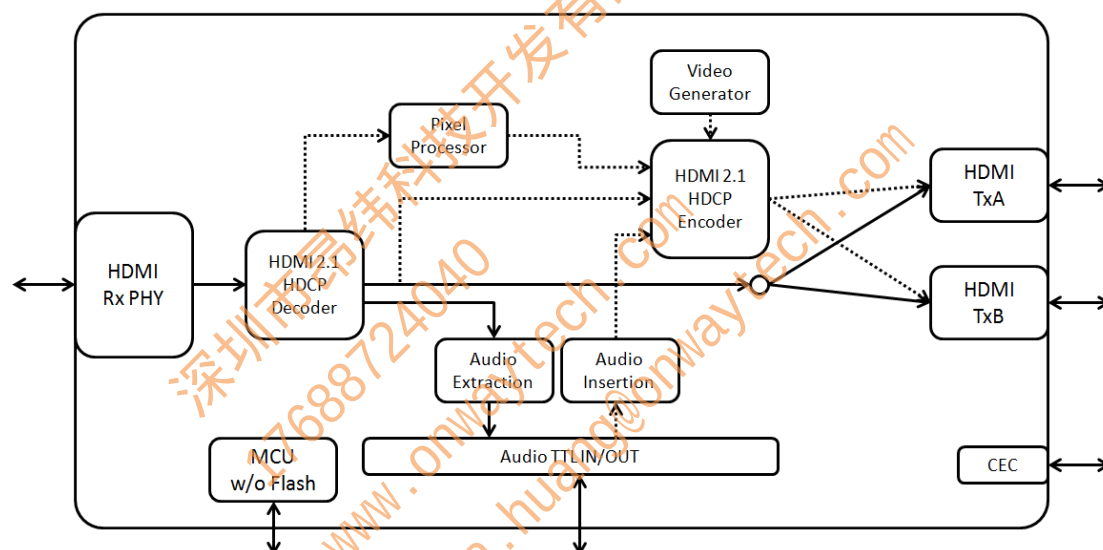


Figure 2. HDMI to HDMI 1to2 repeater with audio extraction

1.3.2 HDMI 1to2 Repeater with compatible HDMI 1.4 timing

Within bandwidth limitation, GSV2502 can keep input stream consistent and intact, while dynamically switch output between FRL and HDMI 2.0 mode for the best compatibility. For example, when FRL6G/4Lane 4K@60Hz timing is input, GSV2502 can convert to HDMI 2.0 or FRL 6G/3Lane, FRL 6G/4Lane as output. During HDMI output mode switch, HDMI input stream will not be disturbed.

GSV2502 can also support fixed output FRL rate, regardless of HDMI input mode. For

example, when HDMI 2.0 4K@30Hz is input, GSV2502 can convert it to FRL 6G/4Lane output. And when FRL 6G/4Lane 5K@30Hz is input, GSV2502 can still maintain FRL 6G/4Lane output with timing conversion.

And using pixel processor, For any HDMI 2.1 uncompressed timing, while most HDMI outputs can copy HDMI 2.1 input stream for HDMI 2.1 downstream devices. The secondary HDMI 1.4 or DVI timing with SDR color can be generated as output stream for any compatible HDMI 1.4 or DVI downstream devices.

Meanwhile, Audio extraction can be applicable if required.

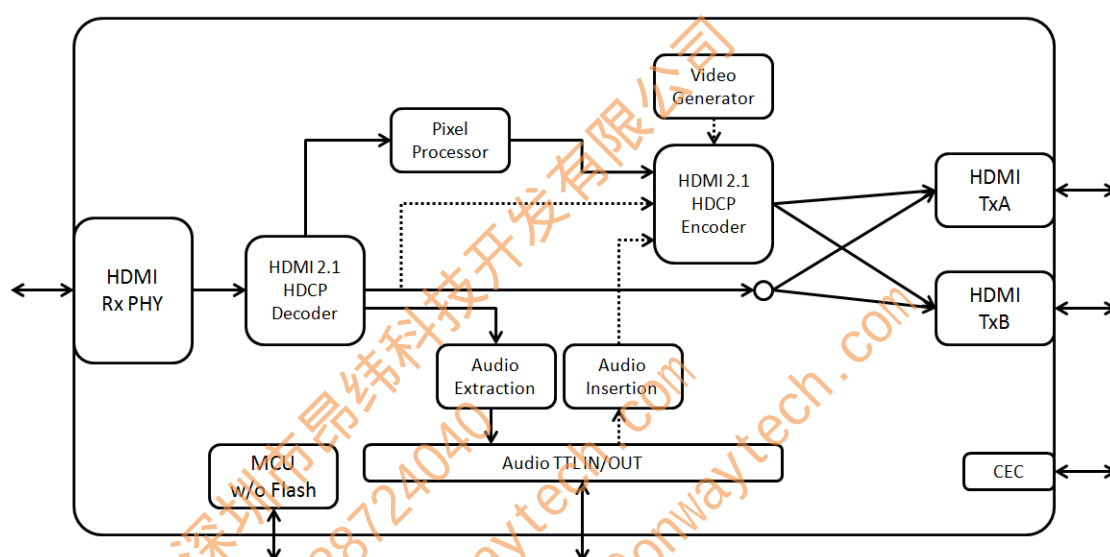


Figure 3. HDMI 1to2 repeater with compatible HDMI 1.4 timing

1.3.3 Audio Insertion for HDMI Tx

I2S/SPDIF audio stream and HDMI Rx video can be inserted into HDMI Tx. While video stream is the same, audio stream can be chosen between HDMI Rx audio or inserted audio.

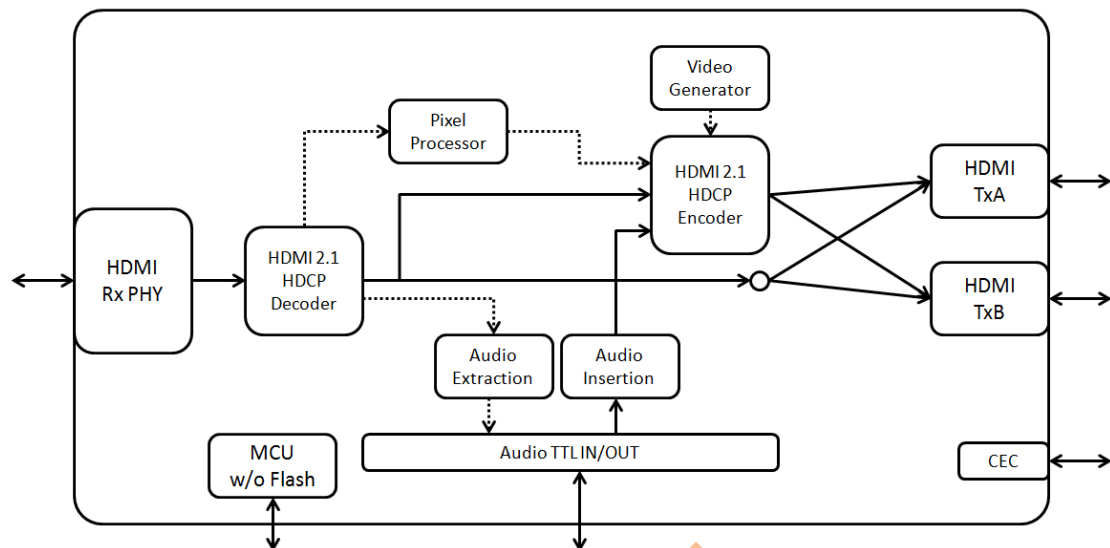


Figure 4. Audio Insertion Application

1.4 Audio Bus Output Configuration

When one group of audio bus is configured as output, I2S and SPDIF are output at the same time. General configuration of pin settings is shown below:

Table 2. I2S/SPDIF Audio Extraction

Pin Name	Alias	Direction	Description
AUD_D0	SDATA[0]	Output	I2S Data, default stereo channels
AUD_D1	SDATA[1]	Output	I2S Data, 3/4 channels
AUD_D2	SDATA[2]	Output	I2S Data, 5/6 channels
AUD_D3	SDATA[3]	Output	I2S Data, 7/8 channels
AUD_D4	SPDIF	Output	SPDIF channel
AUD_D5	LRCLK/WS	Output	Fs (0 = Left, 1 = Right)
SCLK	BCLK	Output	Fixed to 64Fs
MCLK	Sys Clock	Output	Selected from 128Fs/256Fs/384Fs/512Fs

For HBR application, it is also capable of sending out SPDIF in 4-pin mode.

Table 3. HBR Audio Extraction in SPDIF

Pin Name	Alias	Direction	Description
AUD_D0	SPDIF[0]	Output	SPDIF Data[0], 1/2 channels
AUD_D1	SPDIF[1]	Output	SPDIF Data[1], 3/4 channels
AUD_D2	SPDIF[2]	Output	SPDIF Data[2], 5/6 channels
AUD_D3	SPDIF[3]	Output	SPDIF Data[3], 7/8 channels

4. Package Information

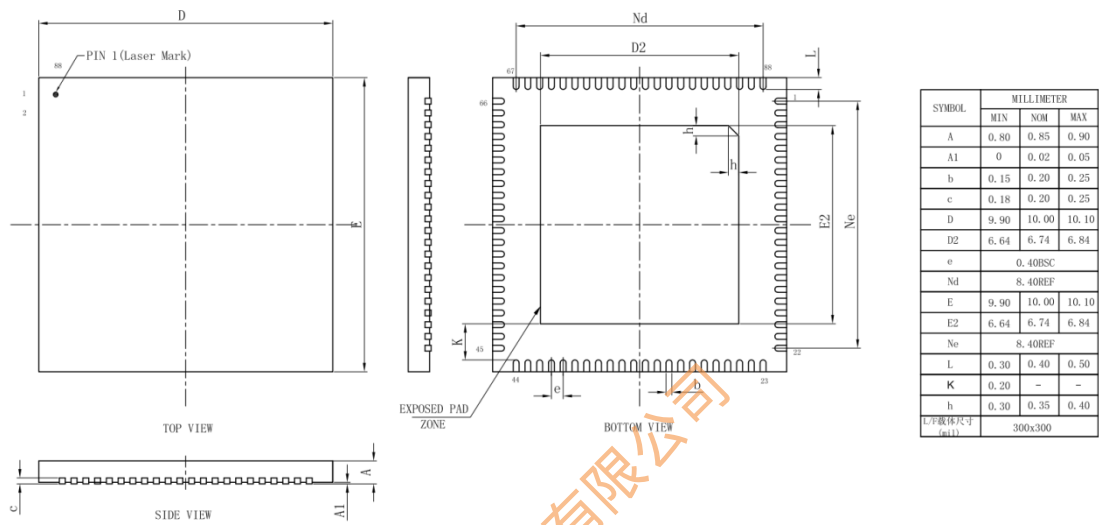


Figure 12. Package Dimensions (QFN88)

5. Ordering Guide

Table 12. Ordering Information

Part Number.	Temperature Range	Package Description	Packing Type
GSV2502	−20°C to +85°C	QFN88	Tray

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