



GSV2007

4 In to 1 Out HDMI2.0 Repeater with Audio
Extraction/Insertion

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PRODUCT SPECIFICATION

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1 General Information

1.1 General Information

The GSV2007 is HDMI1.4/2.0 compatible, HDCP 1.4/2.2 supported, configurable 4-in-1-out repeater device. All 4 inputs are identical on receiver capability. GSV2007's HDMI output can be routed from any HDMI input port.

The HDMI input and output maximum processing pixel clock frequency is 600MHz which means the video resolution can support up to 4kx2k@60Hz 4:4:4 8-bit. The maximum processing audio sample frequency is 192K Hz for non-compression timing. GSV2007 supports HDR10 and Dolby Vision HDR as input and output.

For audio extraction, 2 versatile TTL pin bus of GSV2007 can be configured as input mode or output mode regarding platform requirement. GSV2007 can support up to 8-channel I2S, 2-channel S/PDIF, 3D and multi-stream audio. In TDM mode, each audio pin supports up to 8 channels. Using 2 TTL audio buses, GSV2007 can extract input audio stream while output ARC stream.

Internal Scaler and Color Space Converter enables the input and output to be timing format independent and capable of long distance transmission.

With powerful HDMI Rx equalizer and Tx pre-emphasis capability, GSV2007 can cascade itself (or GSV2000 series chips) with at least 7 stages for all HDMI 1.3/1.4/2.0 timings.

1.2 Features

1.2.1 HDMI Video Input and Output

- Compliant with HDMI2.0b, HDMI1.4b
- Compliant with HDCP2.2/2.3 and HDCP1.4
- Data rate up to 18Gbps
- Programmable HDMI Tx output swing, slew-rate, pre-emphasis
- Adaptive receiver equalization
- AC-coupling capable
- Color Space Converter supports any conversion between different color spaces
- HDR supported (HDR10/HDR12/Dolby Vision/HLG)
- 5V tolerance on DDC/HPD/CEC
- Arbitrary video stream matrix between HDMI Rx and HDMI Tx

1.2.2 Audio Input/Output

- SPDIF/I2S/HBR/DSD/TDM Audio Extraction
- SPDIF/I2S/HBR/DSD/TDM Audio Insertion
- Configurable direction for each Audio bus
- Arbitrary audio stream matrix between HDMI Rx/HDMI Tx/Audio bus

1.2.3 Internal Downscaler

Scaler is only used to downscale 4k UHD timings to 2k FHD timings. The horizontal resolution and vertical resolution are both cut in half while frame rate remains the same.

1.2.4 Color Space Converter

Color Space Converter can convert RGB and YCbCr by the following table. It should be noted that YCbCr 422 shares the same color space with YCbCr 444 in internal routing. So any conversion that YCbCr 444 supports, YCbCr 422 also supports it.

Table 1. Color Space Converter Support Table

From	To	To
RGB	YCbCr 444	YCbCr 420
YCbCr 444	YCbCr 420	RGB
YCbCr420	YCbCr444	RGB

1.3 Chip Application Modes

1.3.1 Audio Extraction and Video Distribution

GSV2007 has 4 HDMI input ports and 1 HDMI output port. All of the ports are HDCP 1.4 and HDCP 2.2 capable. Generally, the block diagram is shown below. Detailed functional configurations are described in following sections.

One important purpose of extracting HDMI encrypted stream is to extract audio, process it in audio signal processing chip (DSP/FPGA e.g.). As shown below, TTL audio pins can be configured as output to implement this feature.

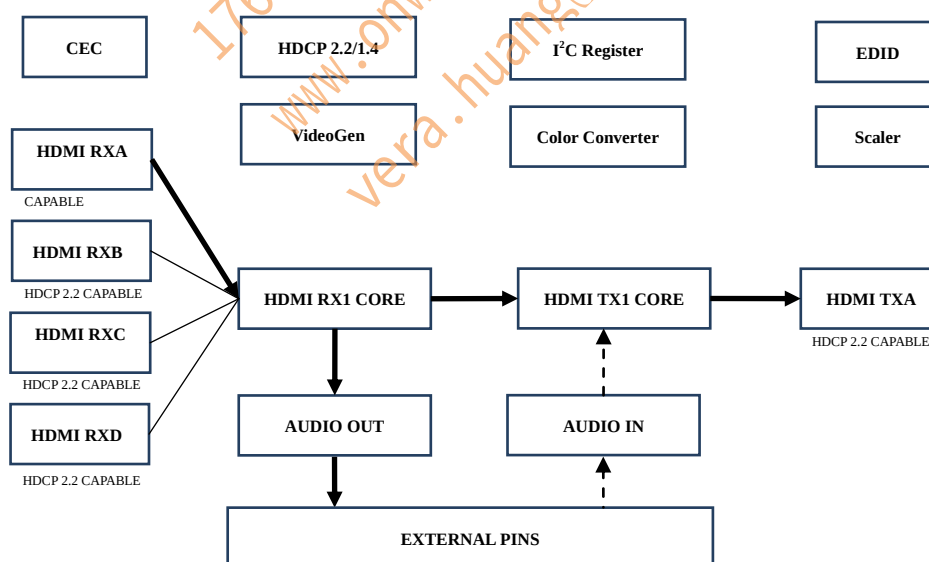


Figure 1. GSV2007 audio extraction diagram

1.3.3 HDMI 2.0 to HDMI 1.4 downscaler

Each HDMI Tx Core of GSV2007 has a built-in scaler and color converter. These blocks enable the chip to do internal video processing for matching HDMI source and sink's capability with a wider range and better performance. Flexible connection between IPs creates versatile usage modes.

Here are some common implementation examples. To make it perceivable and simple, following demonstration diagrams only show one HDMI core related signal chain. The other HDMI core's capability is exactly the same.

Here is an example of 4K YCbCr 420 (300MHz pixel clock) input, 4K RGB 444 (600MHz pixel clock) output and 1080p YCbCr 422 (150MHz pixel clock) output. It should be noted that Tx Core can still do color space conversion (except for YCbCr420) without Color Conversion block (using color space conversion in TxCore). This enables HDMI output flexible in color space support.

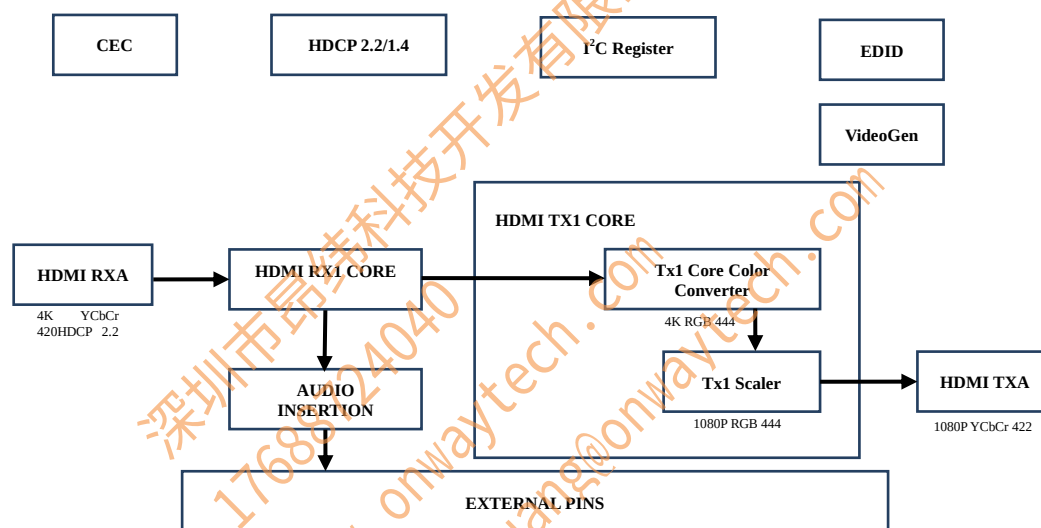


Figure 2. GSV2007 4K 420-to-1080p 422 diagram

1.3.4 HDMI 2.0 YCbCr 420 color space conversion

Here is an example of 4K RGB 444 (600MHz pixel clock) input, 4K YCbCr 420 (300MHz pixel clock) output. 420 can also be converted back to YCbCr444 using 444-420 converter.

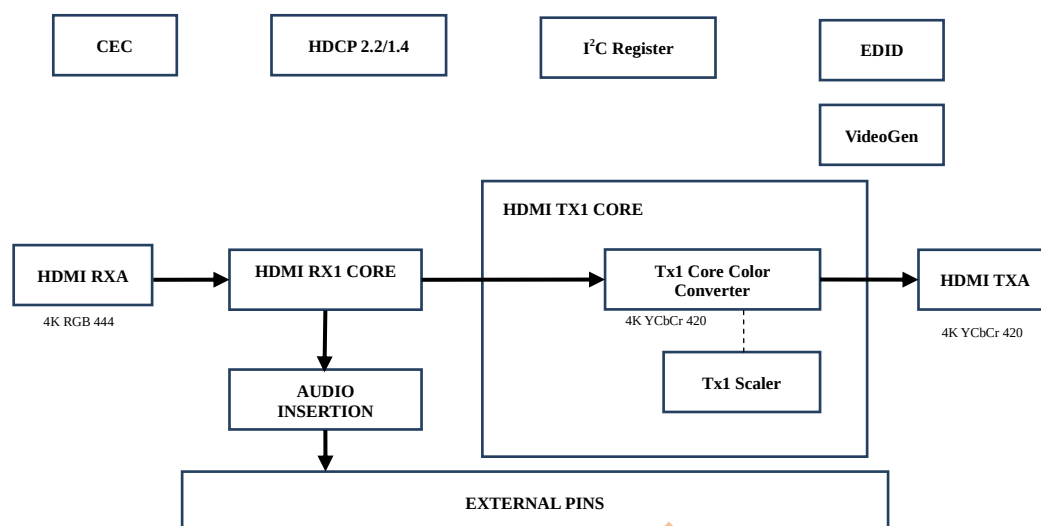


Figure 3. GSV2007 4K 444-to-4K 420 diagram

1.4 Audio Bus Output Capability

When one group of audio bus is configured as output, I2S and SPDIF are output at the same time. Normal Pin Setting is as below.

Table 2. I2S/SPDIF Audio Extraction

Pin Name	Alias	Direction	Description
AP0	SDATA[0]	Output	I2S Data, default stereo channels
AP1	SDATA[1]	Output	I2S Data, 3/4 channels
AP2	SDATA[2]	Output	I2S Data, 5/6 channels
AP3	SDATA[3]	Output	I2S Data, 7/8 channels
AP4	SPDIF	Output	SPDIF channel
AP5	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, SPDIF are also capable of sending out with 4 pins.

Table 3. HBR Audio Extraction in SPDIF

Pin Name	Alias	Direction	Description
AP0	SPDIF[0]	Output	SPDIF Data[0], 1/2 channels
AP1	SPDIF[1]	Output	SPDIF Data[1], 3/4 channels
AP2	SPDIF[2]	Output	SPDIF Data[2], 5/6 channels
AP3	SPDIF[3]	Output	SPDIF Data[3], 7/8 channels
AP4	SPDIF	Output	SPDIF channel, 1/2 channels

1.5 Audio Bus Input Capability

When Audio Bus is set to Input, either I2S or SPDIF can be selected as audio input source. It should be noted that MCLK must be externally fed into GSV chip in I2S

2 Pin Description

2.1 Pin Diagram

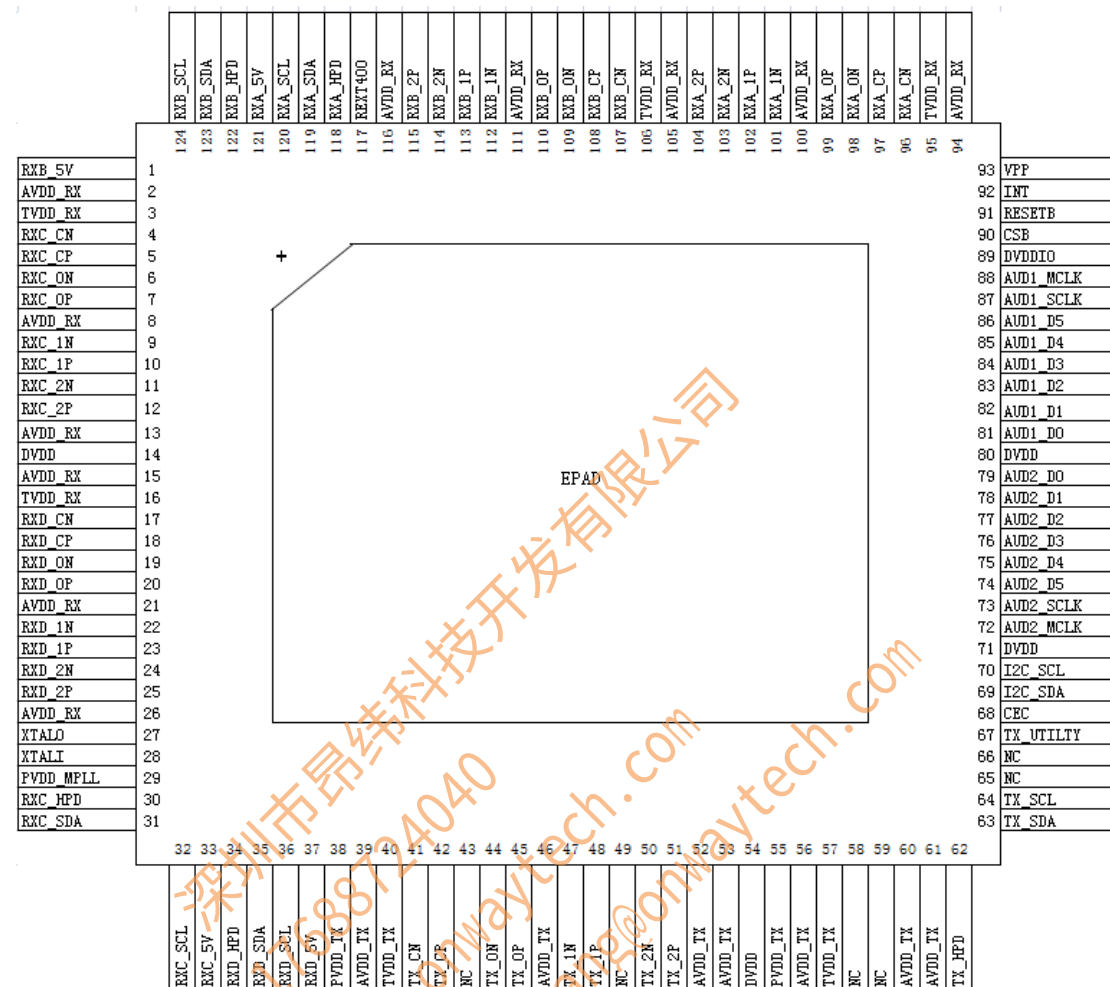


Figure 4. Pin Mapping

2.2 Pin Description

Table 7. Pin Description

Pin Name	Direction	Pin No.	Description
5V Tolerance Pins			
CEC	I/O	68	5V tolerance CEC PAD
RXA_5V	Power	121	RXA 5V POWER
RXA_HPD	I/O	118	RXA 5V tolerance HPD PAD
RXA_SDA	I/O	119	RXA 5V tolerance DDC SDA PAD
RXA_SCL	I	120	RXA 5V tolerance DDC SCL PAD
RXB_5V	Power	1	RXB 5V POWER
RXB_HPD	I/O	122	RXB 5V tolerance HPD PAD
RXB_SDA	I/O	123	RXB 5V tolerance DDC SDA PAD
RXB_SCL	I	124	RXB 5V tolerance DDC SCL PAD
RXC_5V	Power	33	RXC 5V POWER
RXC_HPD	I/O	30	RXC 5V tolerance HPD PAD
RXC_SDA	I/O	31	RXC 5V tolerance DDC SDA PAD
RXC_SCL	I	32	RXC 5V tolerance DDC SCL PAD
RXD_5V	Power	37	RXD 5V POWER
RXD_HPD	I/O	34	RXD 5V tolerance HPD PAD

4 Package Information

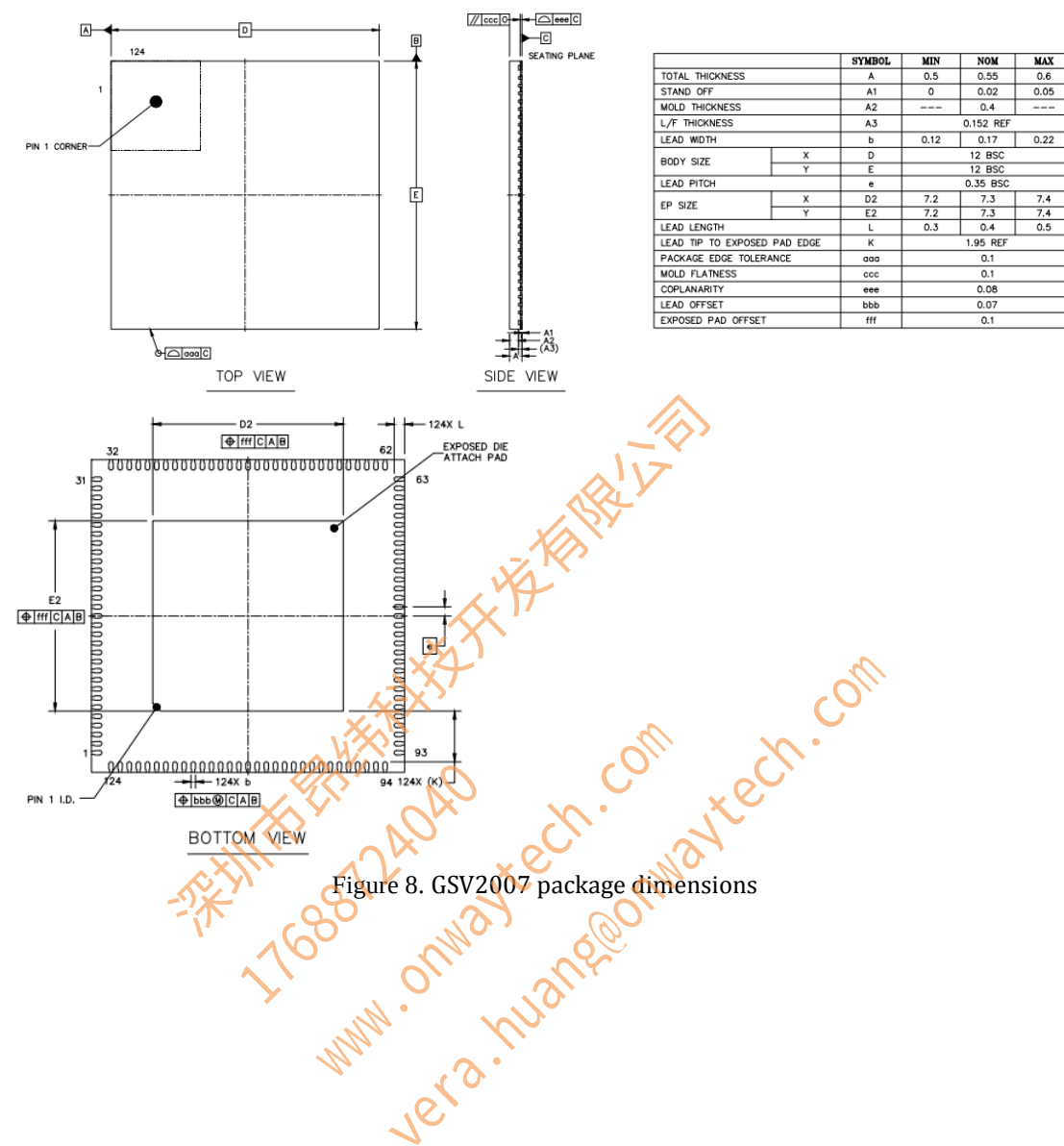


Figure 8. GSV2007 package dimensions

5 Ordering Guide

Table 10. Ordering Information

Part Number.	Temperature Range	Package Description	Packing Type
GSV2007	−20 °C to +85 °C	QFN124, 0.35 mm pitch, 12 mm x 12 mm outline	Tray

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