GSV2006

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

August, 2018

PRODUCT SPECIFICATION

1 General Information

1.1 General Information

The GSV2006 is HDMI1.4/2.0 compatible, HDCP 1.4/2.2 supported, configurable 2-in-4-out repeater device. All 2 inputs are identical on receiver capability and all 4 outputs are identical on transmitter capability. GSV2006's 4 HDMI outputs can be independently 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. GSV2006 supports HDR10 and Dolby Vision HDR as input and output.

For audio insertion and extraction, 2 versatile TTL pin buses of GSV2006 can be configured as either input mode or output mode regarding platform requirement. GSV2006 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.

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, GSV2006 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

GSV2006 supports 6Gb/s HDMI 2.0 and 1.4 protocol. The 4 video outputs can be fed from any of the 2 video inputs. That means any 1 video input port can drive 4 video outputs at the same time.

In any cross switch mode, GSV2006 has the capability to guarantee one video/audio output stream is not disturbed while the other video/audio output stream is switching between all video inputs.

HDMI video output will not be disturbed when audio insertion is switched between different audio input formats.

With powerful HDMI Rx equalizer and Tx pre-emphasis capability, GSV2006 can cascade itself (or GSV2000 series chips) with at least 7 stages for all HDMI 1.3/1.4/2.0 timings.

There are 2 separate TTL audio buses. Any TTL audio bus can be configured as output port which extracts audio timing from the selected HDMI input port. Or, the TTL audio bus can be configured as input port which inserts audio timing into any HDMI output port.

1.3.1 Audio Extraction and Video Distribution

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. It should be noted that extracted audio stream can be routed from any HDMI Rx Core.

With 2 audio TTL buses, when 1 stream audio extraction is implemented, 1 stream audio insertion can still be implemented. Also, if needed, 2 audio TTL buses can both

be used as audio extraction channels.

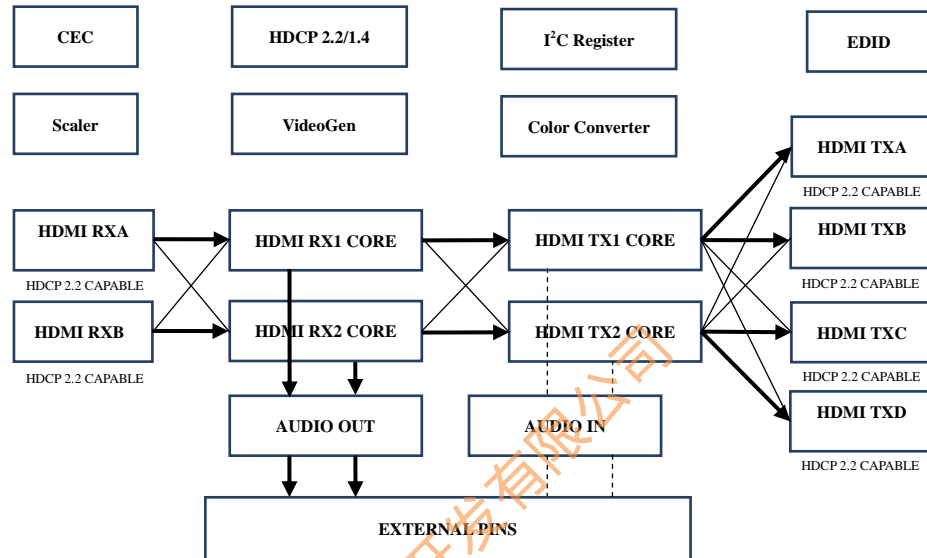As shown below, two audio streams are separately extracted from HDMI Rx Cores to TTL buses.

Figure 1. GSV2006 audio extraction diagram

1.3.2 Audio Insertion and Video Distribution

Inserted audio can be routed to any individual Tx or both Tx streams while HDMI video is still routed from HDMI Rx.

With 2 audio TTL buses, when 1 stream audio insertion is implemented, 1 stream audio extraction can still be implemented. Also, if needed, 2 audio TTL buses can both be used as audio insertion channels.
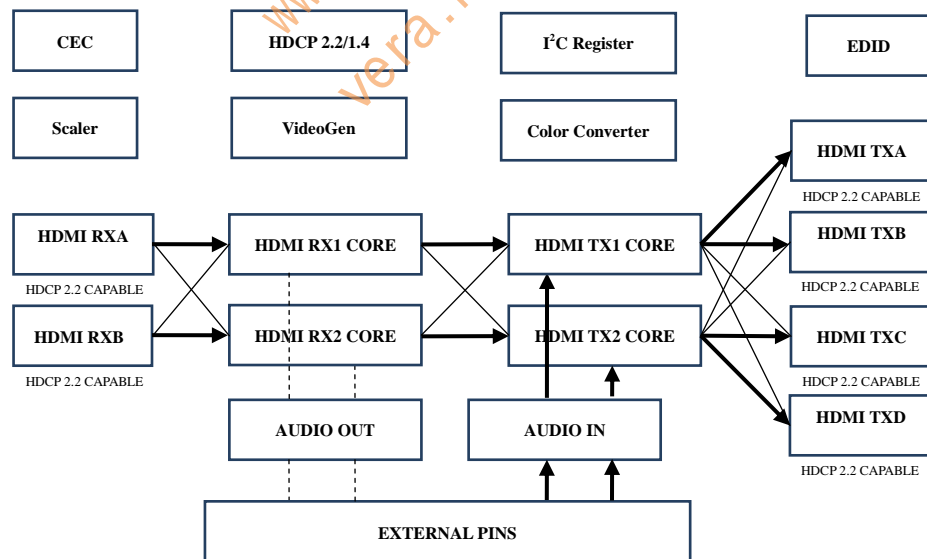
Figure 2. GSV2006 audio insertion diagram

1.3.3 HDMI 2.0 1to4 Video Distribution

With 4 HDMI Txs, GSV2006 can implement 1-in-4-out HDMI distribution.
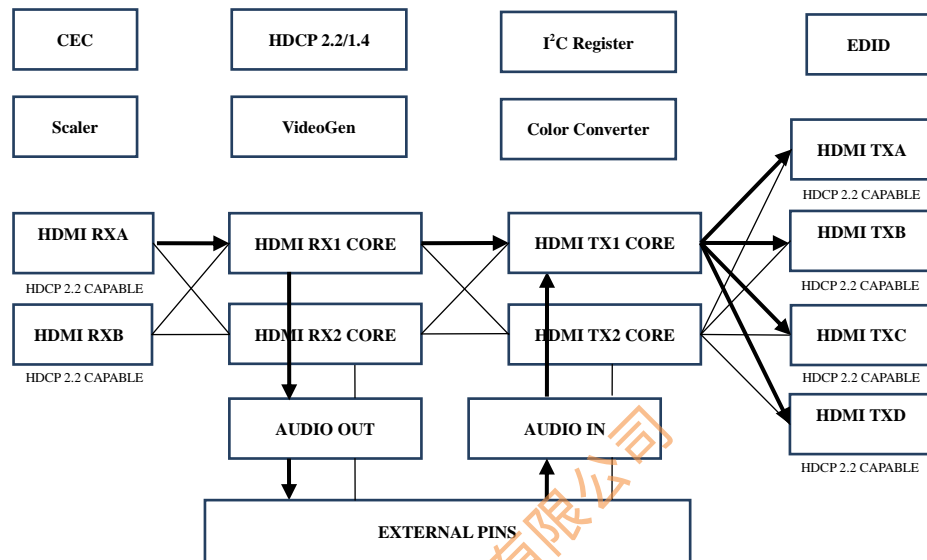

Figure 3. GSV2006 1-to-4 distribution diagram

1.3.4 HDMI 2.0 to HDMI 1.4 downscaler

Each HDMI Tx Core of GSV2006 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 demostration 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.
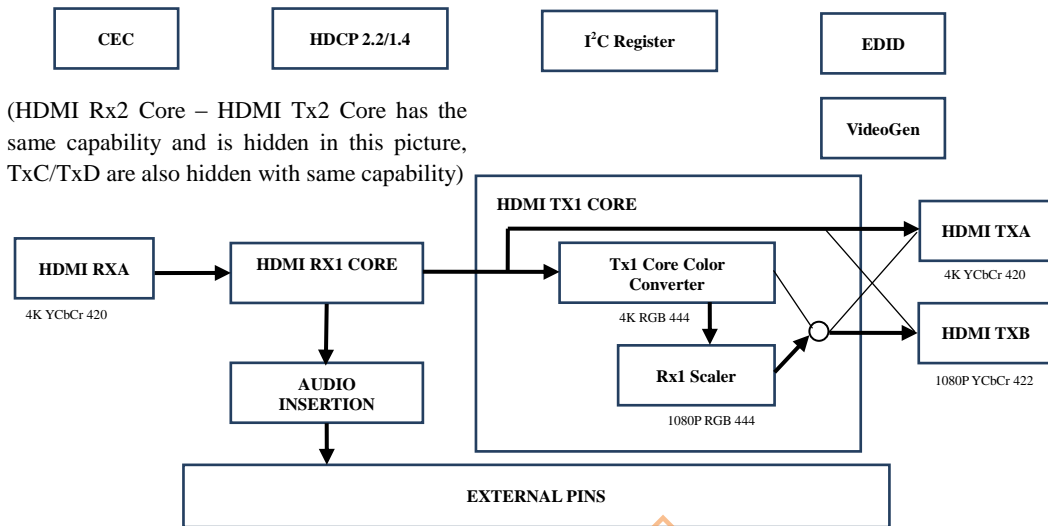
Figure 4. GSV2006 4K 420-to-1080p 422 diagram

1.3.5 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. YCbCr 420 can also be converted back to YCbCr444 using 444-420 converter.
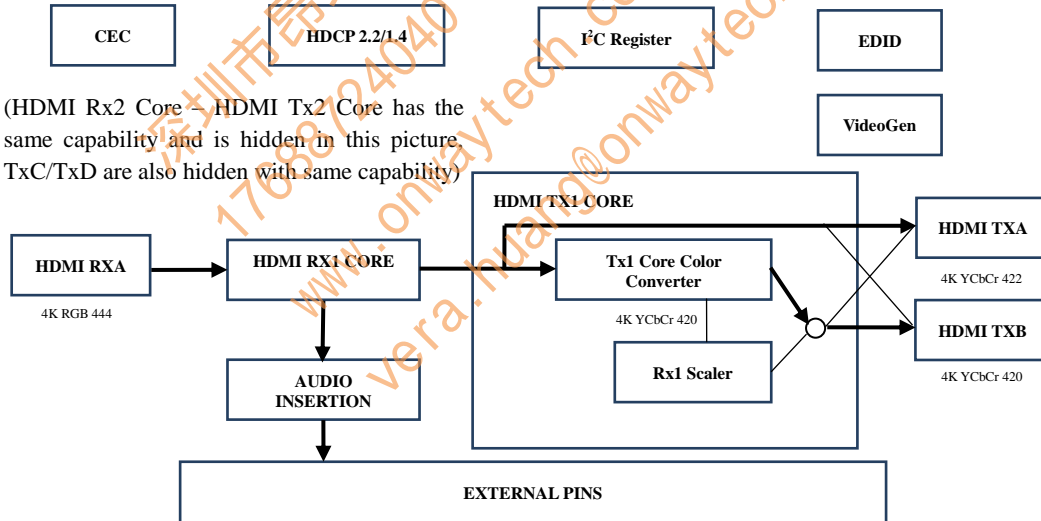

Figure 5. GSV2006 4K 444-to-4K 420 diagram

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

4 Package Information
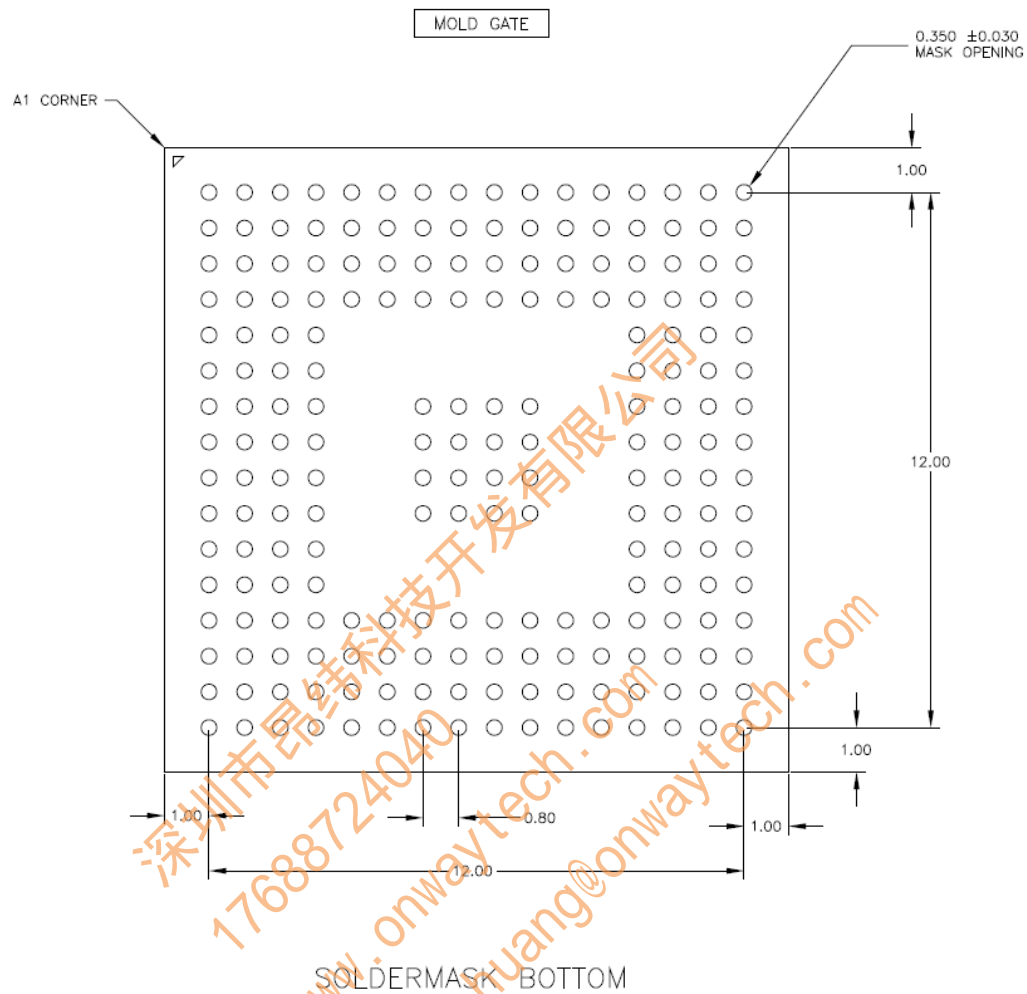
Figure 11. GSV2006 solder mask bottom view

TOP VIEW

SEATING PLANE

DETAIL A(2:1)

BOTTOM VIEW

DETAIL B(2:1)

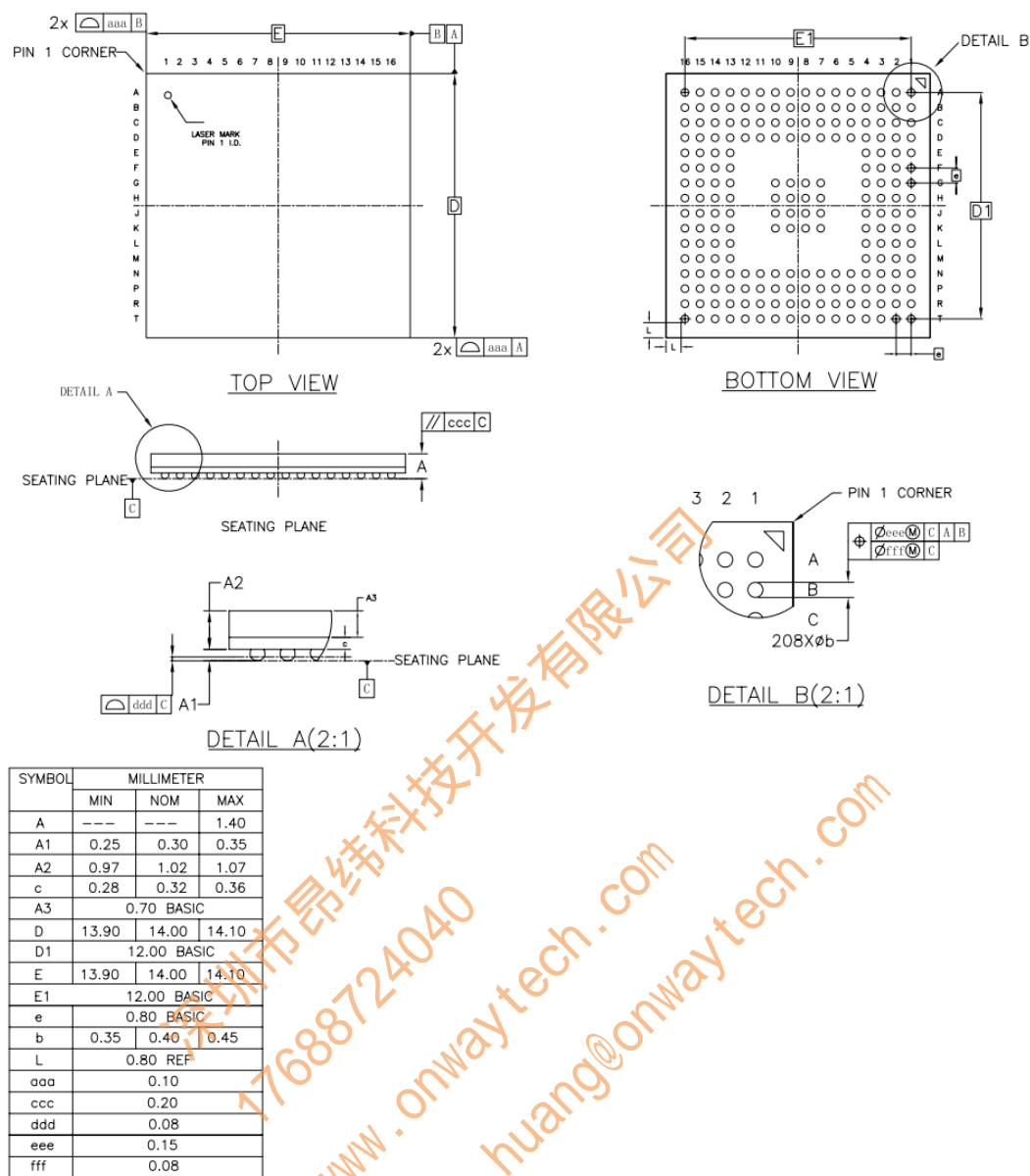| SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.40
A1	0.25	0.30	0.35
A2	0.97	1.02	1.07
c	0.28	0.32	0.36
A3	0.70 BASIC		
D	13.90	14.00	14.10
D1	12.00 BASIC		
E	13.90	14.00	14.10
E1	12.00 BASIC		
e	0.80 BASIC		
b	0.35	0.40	0.45
L	0.80 REF		
aaa	0.10		
ccc	0.20		
ddd	0.08		
eee	0.15		
fff	0.08		

Figure 12. GSV2006 package dimensions

5 Ordering Guide

Table 10. Ordering Infomation

Part Number.	Temperature Range	Package Description	Packing Type
GSV2006	−20 ℃ to +85 ℃	LFBGA208, 0.8 mm ball pitch, 14 mm x 14 mm outline	Tray