GSV5100

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

August, 2018

PRODUCT SPECIFICATION

1 General Information

1.1 General Information

The GSV5100 has dual work modes to support both the CAT5e/6 extender and the HDMI cable.

In the extender modes, the internal video compression codec can be enabled to support the 4K60Hz 444 format transferred through the CAT6 cables up to be more than 70meters. Besides the video and audio can be transferred through the CAT cables, the IR, RS232, CEC, DDC and power can also be supported by Gscoolink patented technology named as the CCA(Clock Combined with Aux).

Rich video processing blocks can work with the patented video codec block together to support almost all the 4K formats and color space.

Besides working standalone to support the CAT extender, this part can also work with Valens or legacy optical extender module to make the 4K long distance transmission implementable.

For the HDMI working mode, it is HDMI1.4/2.0 compatible and HDCP 1.4/2.2 supported by each port. All 2 inputs are identical on receiver capability and all 2 outputs are same as transmitter capability, but it is not a matrix, and the dual input need to be muxed into one stream before spitted out.

For audio insertion and extraction, the versatile TTL pin bus of GSV5100 can be configured as either input mode or output mode based on the platform requirement. GSV5100 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, Color Space Converter and Compression/decompression Codec enables the input and output to be timing format independent and enable the long distance transmission.

With powerful HDMI Rx equalizer and Tx transmitter pre-emphasis capability, GSV5100 can cascade itself with at least 7 stages using HDMI or 12 stages using CAT5e/6 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

1.2.3 CAT cable Input/Output

- CAT5/5e/CAT6/CAT6e cable supported
- Programmable CAT Tx output swing, slew-rate, pre-emphasis
- Data rate up to 4.5Gbps

1.2.3 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

1.2.4 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.

1.2.5 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

1.2.6 Compression/Decompression Codec

The codec is the video compression/decompression block that developed based on the DSC compression yet optimized to be more suitable for this extender application. With this Codec block, long distance transmission can be applied with higher reliability.

1.3 Chip Application Modes

GSV5100 has dual input ports and dual output ports. All of the ports are HDCP 1.4 and HDCP 2.2 capable. Generally, the block diagram is shown below. The RXB can be reused as both the HDMI and CAT RX, and the TXB can be reused as both the HDMI and CAT TX.

GSV5100's RxB and TXB are configured as CAT6 input. In this extender mode, by using GsCoolink's technology, infrared/UART/DDC (internal core)/CEC can all be combined together and communicate bi-directional through the CAT cables.

DSC block can be configured as compression mode or decompression mode. In normal CAT6 extension usage, a pair of GSV5100s can match the DSC compression and decompression process and implement the long distance UHD HDMI video/audio transmission.

It should be noted that when CAT Tx enabling DSC block and output on TxB, HDMI TxA can only bypass HDMI input with no internal Color Converter/Scaler processing.

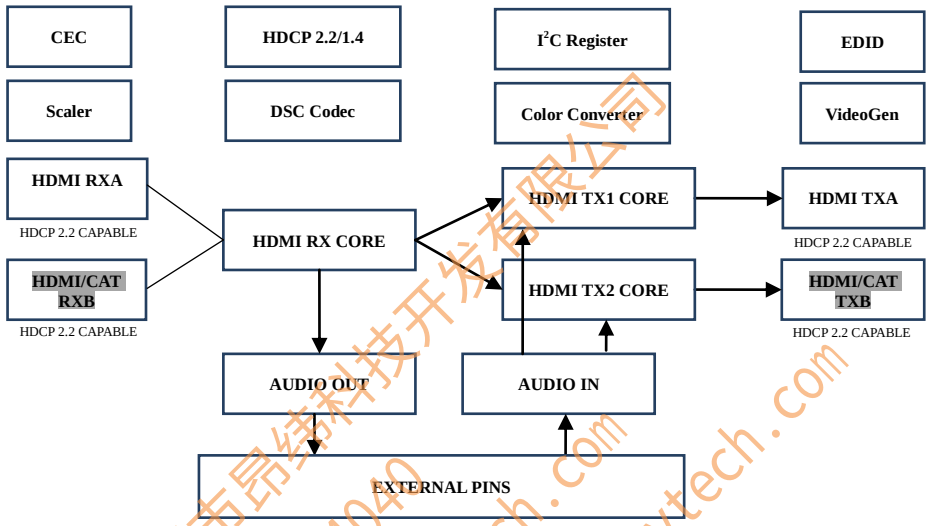


Figure 1. GSV5100 block connection diagram

1.3.1 Audio Insertion With No HDMI Input

With or without the video carried, external audio can still be transmitted through CAT cables. This enables audio transmission through CAT capable and flexible.

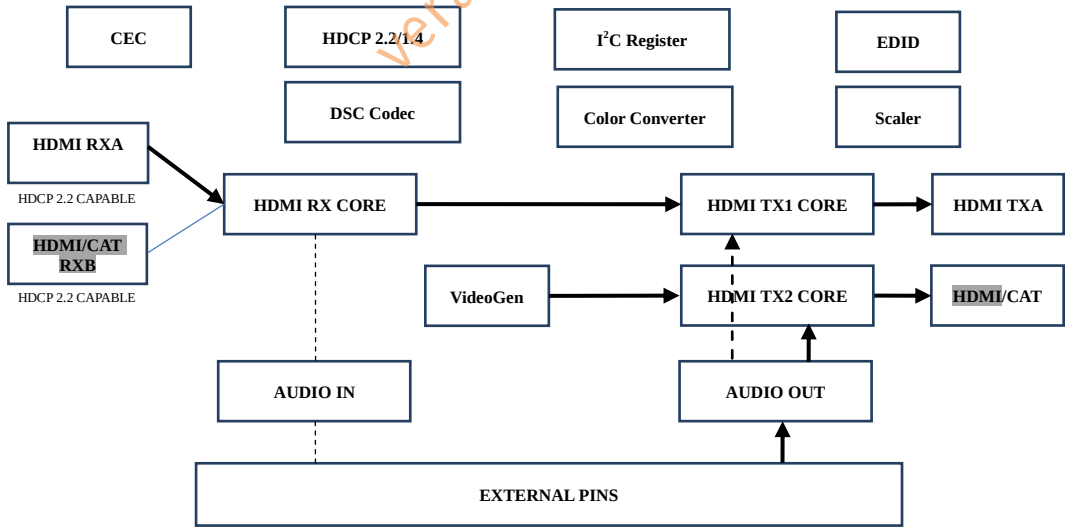


Figure 2. GSV5100 audio extension diagram

1.3.2 Default Application of CAT5e/6 Extender

A general function map is shown as below.
Description:
1, For Cat6 Tx, HDMI input can be routed from RxA or RxB while audio insertion is added.
2, With DDC enabled using CAT cable, GSV5100 can guarantee the HDCP encrypted input content kept encrypted while transmitting on CAT cable which is the HDMI standard's MUST requirement. By reading the Tx's registers, software can guarantee the CAT Rx is qualified HDCP Receiver or Repeater before sending video and audio to downstream on the CAT RX.
3, When Infrared and Uart are both bi-directionally enabled, audio insertion can only support up to 4 channel L-PCM because AP2/AP3 are both used as GPIOs.
4, Infrared and UART input and output both follow 3.3V TTL.

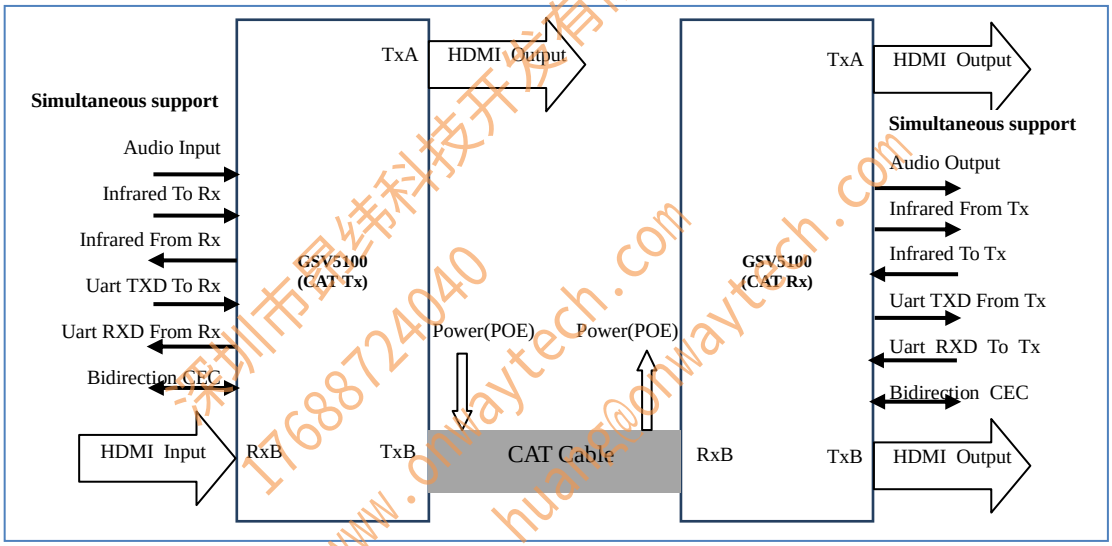


Figure 3. GSV5100 CAT Extension diagram

1.3.3 Cascading CAT Extension

GSV5100 can be cascaded to enable the HDMI connection chain.
It should be noted, even with multiple stages, GSV5100 still can guarantee HDCP Repeater on CAT6 can collect all the downstream encrypt keys and protect the encryption chain not damaged.

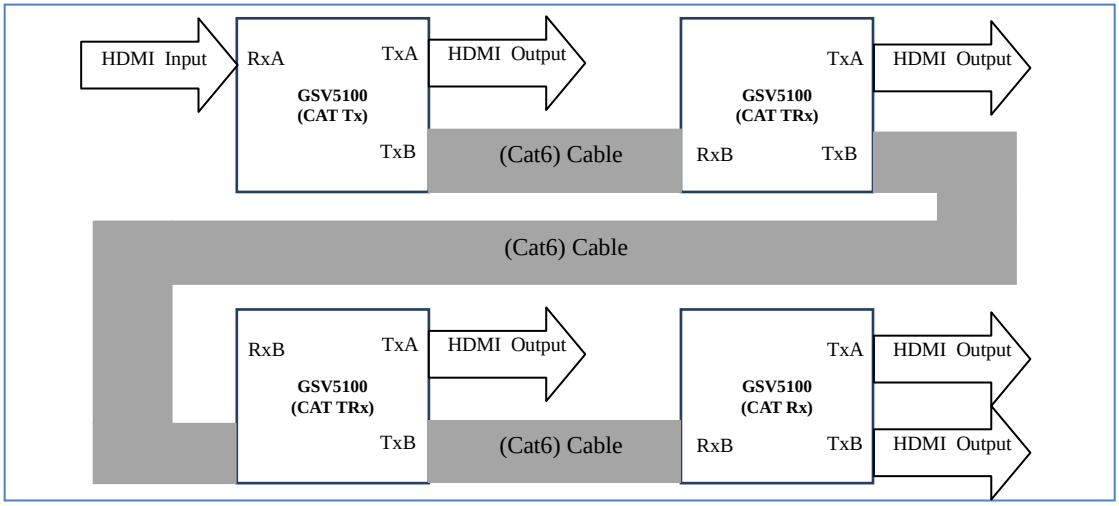


Figure 4. GSV5100 CAT Cascading Chain Diagram

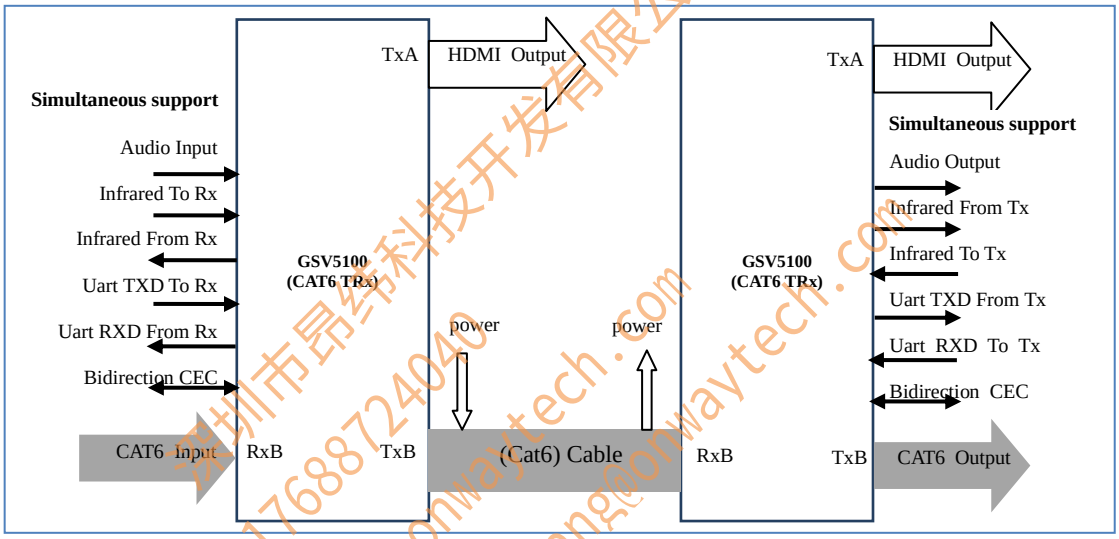


Figure 5. GSV5100 CAT Cascading Block Diagram

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

2 Pin Description

2.1 Pin Diagram

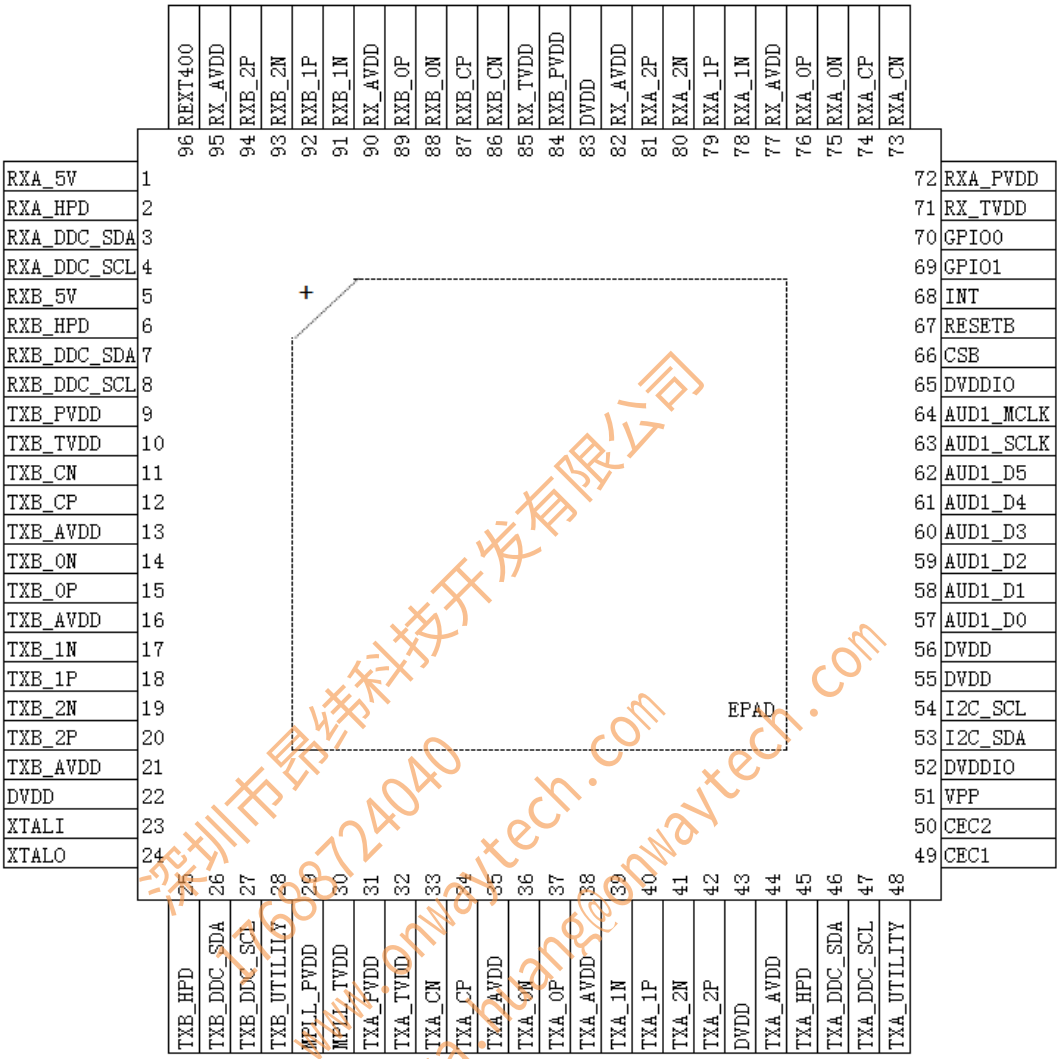


Figure 6. Pin Mapping

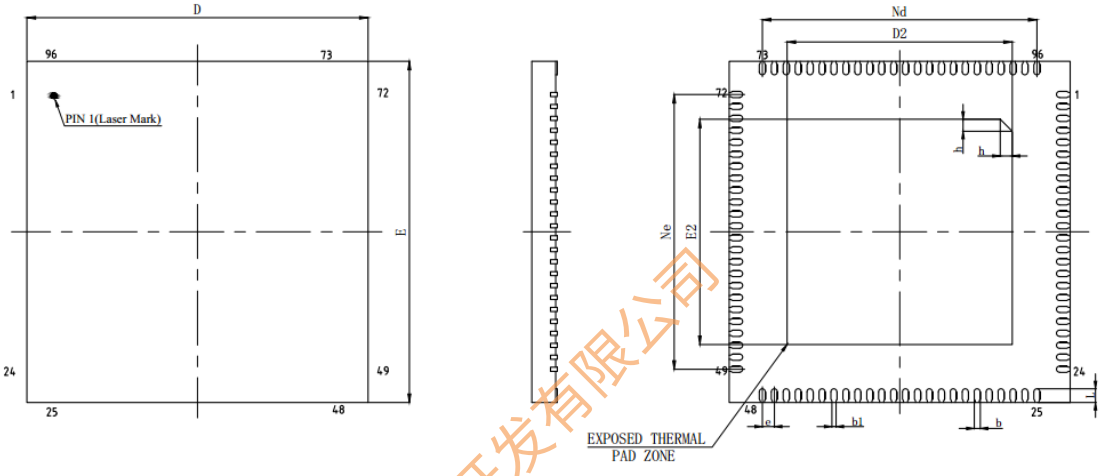
2.2 Pin Description

Table 7. Pin Description

Pin No.	Pin Name	Direction	Description
1	RXA_5V	Power	RXA 5V POWER
2	RXA_HPD	I/O	RXA 5V tolerance HPD PAD
3	RXA_DDC_SDA	I/O	RXA 5V tolerance DDC SDA PAD
4	RXA_DDC_SCL	I	RXA 5V tolerance DDC SCL PAD
5	RXB_5V	Power	RXB 5V POWER
6	RXB_HPD	I/O	RXB 5V tolerance HPD PAD
7	RXB_DDC_SDA	I/O	RXB 5V tolerance DDC SDA PAD
8	RXB_DDC_SCL	I	RXB 5V tolerance DDC SCL PAD
9	TXB_PVDD	Power	PLL 1.2V voltage power supply for TXB channel When PCB combined with DVDD, TX_PVDD can also be increased to 1.28V~1.32V(typical 1.30V) for compensation of complex system level integrity margin loss
10	TXB_TVDD	Power	Analog 3.3V voltage power supply for TXB channel

4 Package Information

The GSV5100 device is packaged in a 96-pin, 10mmx10mm QFN96L package. There is an ePad as the electrical ground of the device. It is critical to solder the entire ePad firmly onto the PCB. A weak connection of the ePad could result in poor performance on higher frequency HDMI video timing.



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.13	0.18	0.23
b1		0.12REF	
c	0.18	0.20	0.25
D	9.90	10.0	10.10
D2	6.50	6.60	6.70
e		0.35BSC	
Nd		8.05BSC	
E	9.90	10.0	10.10
E2	6.50	6.60	6.70
Ne		8.05BSC	
L	0.35	0.40	0.45
h	0.30	0.35	0.40

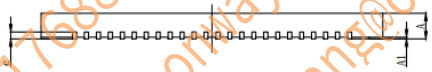


Figure 10. GSV5100 package dimensions

Description
Pin 1 Identifier
Logo
Part Number
DateCode-Version-Trackingcode YY:Year; WW: week; VV: Part version; TT: tracking code PP: packing bonding version
LOT: wafer lot id; XXX: wafer id

Figure 11. GSV5100 Top Marking Information

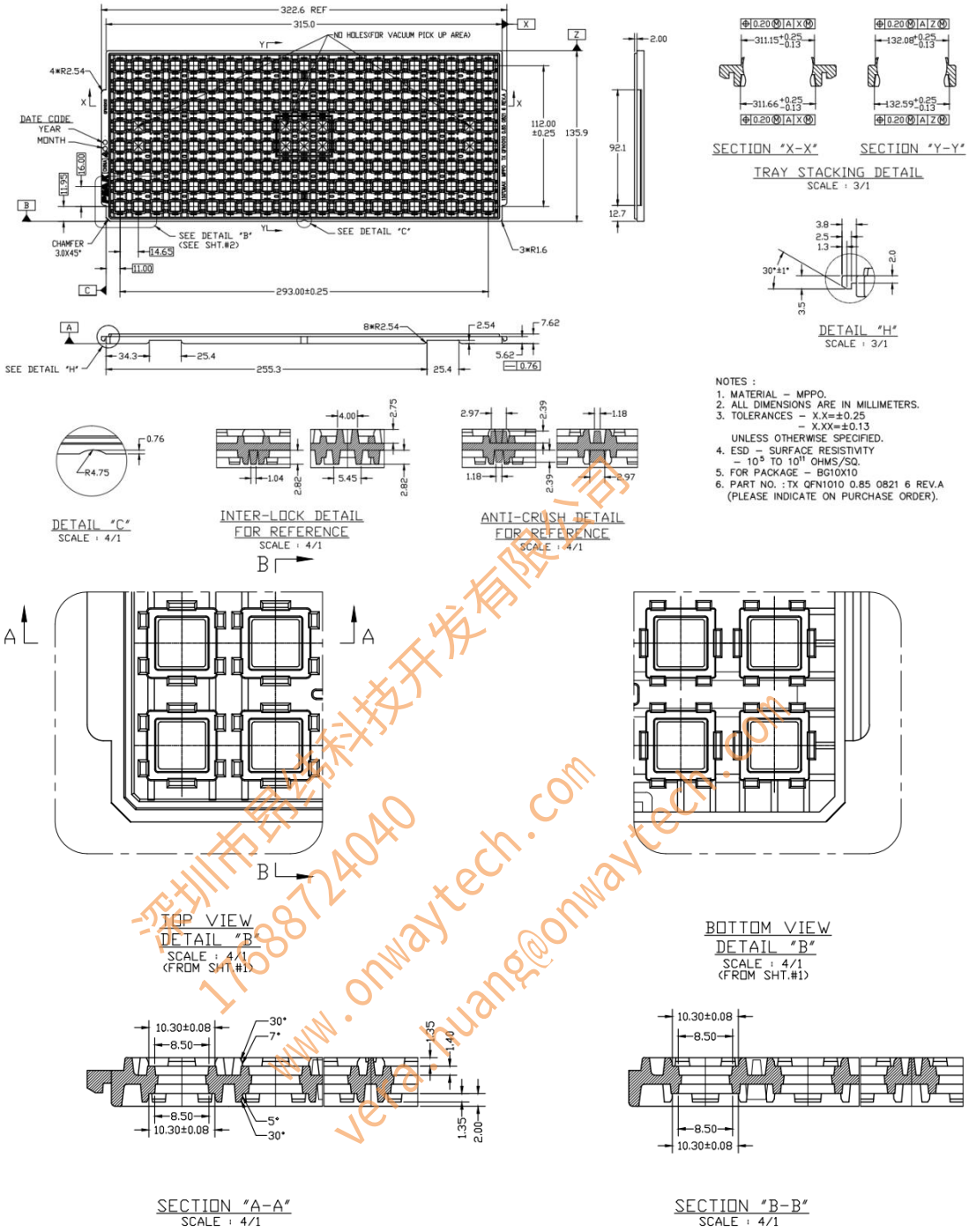


Figure 12. GSV5100 Tray Information

5 Ordering Guide

Table 10. Ordering Infomation

Part Number.	Temperature Range	Package Description	Packing Type
GSV5100	−20 ℃ to +85 ℃	QFN96L, 0.35 mm pin pitch, 10 mm x 10 mm outline	Tray