



GSV6127E

Type-C/DisplayPort 1.4/HDMI 2.0 to
MIPI/LVDS Converter with Audio Extraction
and Embedded MCU

May, 2024

Product Specification

1. General Description

1.1 General Information

Gschoolink GSV6127E is a high-performance, low-power Type-C/DisplayPort 1.4/HDMI 2.0 to MIPI CSI-2/LVDS converter. With Dual Port MIPI interface, genuine 4K60 444 can be transmitted using MIPI interface. By integrating enhanced microcontroller, GSV6127E has created a cost-effective solution that provides time-to-market advantages. The DisplayPort Receiver supports up to 32.4Gbps (HBR3, 4-lane), the HDMI Receiver supports up to 18Gbps (TMDS, 6G/3-lane). With embedded Channel Configuration (CC), Power Delivery (PD) controller and Billboard USB 2.0 controller, GSV6127E can support Type-C Alternate DisplayPort/HDMI to MIPI/Audio Extraction application. The superior architecture of GSV6127E provides economical smaller footprint solutions using QFN76, targeting automotive and video conference applications.

HDCP 1.4 and HDCP 2.2/2.3 are implemented in GSV6127E for its DisplayPort/HDMI Rx port. Color Space Conversion, 420-444/422 Conversion, De-Interlacer and Downscaler are supported for flexible video processing. Audio Extraction of DisplayPort/HDMI Rx is supported in GSV6127E for audio processing. With audio sample raw data detection feature, LPCM channel filled with consistent zero raw sample data will be automatically detected and muted.

Within 8kV HBM tolerance for Type-C interface pins, GSV6127E's operation temperature range is -40 °C to 85 °C using automotive qualified process.

An internal Video Generator can be used to generate any uncompressed video timing defined in DisplayPort HBR3 bandwidth, such as 4K@60Hz, 4K@30Hz, 480i@60Hz.

With embedded MCU and PD 3.0 controller, GSV6127E can be used with customized with external PMIC to charge external devices as source using Type-C interface.

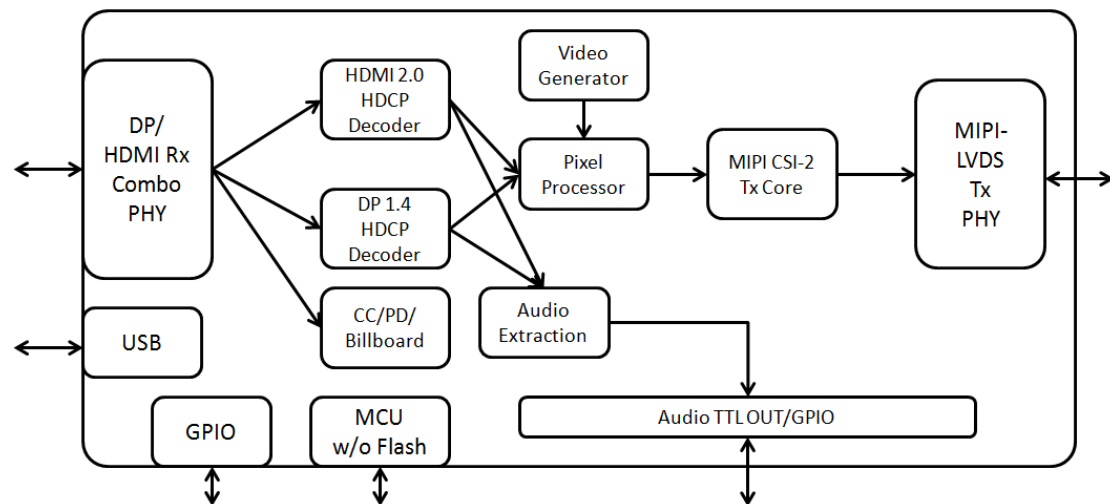


Figure 1. Top Diagram

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 DisplayPort Receiver

- Compliant with VESA DisplayPort 1.4a
- Compliant with HDCP 2.2/2.3 and HDCP 1.4
- Compliant with both DisplayPort and USB Type-C Alternative Mode
- Support HBR3, HBR2, HBR and RBR (8.1/5.4/2.7/1.62 Gbps)
- Flexible 1/2/4 lane Main-Link configuration
- Programmable Adaptive Equalization
- Support Full-Link Training and No-Link Training
- Support High Dynamic Range (HDR) and Dynamic/Static Metadata
- Support Audio Extraction
- Support Horizontal Blanking Expansion up to 4K@60Hz format
- Embedded arbitrary EDID and MCCS

- Support Spread Spectrum Clock (SSC)
- 3D format support of frame sequential, stacked frame, side-by-side, top-to-bottom

1.2.2 HDMI Receiver

- Compliant with 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 18Gbps (TMDS 6Gbps/3 Lane)
- Programmable Adaptive Equalization
- Support High Dynamic Range (HDR) and Dynamic/Static Metadata
- 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

1.2.3 MIPI CSI-2 Transmitter

- Support MIPI CSI-2 v3.0 version transmission using D-PHY interface
- Support 2.5G bps 1/2/3/4/8-lane MIPI D-PHY Out
- Programmable output swing , slew-rate and pre-emphasis
- CSI-2 Lane Reassignment and Polarity Flip
- Support RGB888, RGB666, RGB565, RGB555, RGB444
- Support YUV 4:2:2 8-bit, 10-bit, 12-bit
- Support YUV 4:2:0 legacy 8-bit
- Support burst and non-burst mode

1.2.4 Dual-Port LVDS Transmitter

- Compatible with VESA and JEIDA standards
 - Single/Dual-Port LVDS Transmitter
 - Programmable output swing , slew-rate , common voltage and pre-emphasis
 - Data rate up to 1.5Gbps per lane

1.2.5 USB Type-C DisplayPort Alternative Mode Receiver

- Compliant with USB Type-C 1.1/1.0 Specification
- Compliant with USB Power Delivery 3.0 Specification
- Programmable USB Type-C Channel Configuration function

- Support Billboard in USB 2.0

1.2.6 Pixel Processor

- Color Space conversion
- YCbCr 444/422-420 timing conversion
- Downscaler with fixed horizontal and vertical 2 ratio for 4K to 2K conversion
- Deinterlacer for interlaced timing

1.2.7 Audio Output

- I2S and SPDIF Audio Extraction from DisplayPort Rx /Type-C Rx
- SPDIF/I2S/HBR/DSD/TDM Format Supported for Audio Extraction

1.2.8 System Features

- Optional External MCU (via I2C)/ Internal MCU mode
- Embedded MCU using External Flash
- External 25MHz Crystal required
- Available Pins for UART/Timer/GPIO control from embedded MCU
- Mailbox feature for external MCU access on chip function status
- Temperature Sensor Monitoring Circuit

1.3 Chip Application Modes

1.3.1 Type-C Alt-Mode In to MIPI Out Application

RxPort is configured as Type-C Alt-Mode (DisplayPort) Rx Input. Together with on-chip CC, USB 2.0 support, Type-C USB input can be configured to DisplayPort 1.4a input stream for processing. This mode is designed for Type-C to SoC MIPI panel front-end interconnection. If required, the MIPI interface can also be set to LVDS for output (up to 4K30 timing). MIPI D-PHY interface interconnection are both applicable based on application designs.

With internal Color Space Converter, De-Interlacer and Downscaler, DisplayPort input timing can be converted to MIPI compatible output timing. With Downscaler in Pixel Processor, output can be downscaled automatically when video stream bandwidth exceeds downstream capability.

Meanwhile, Audio extraction can be applicable if required.

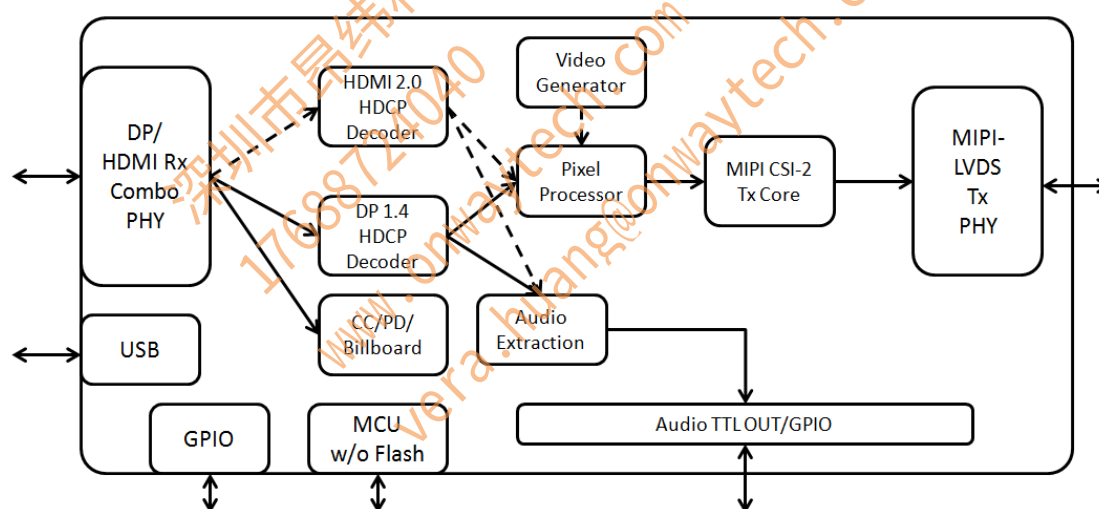


Figure 2. Type-C Alt-Mode In to MIPI Out Application

In order to control external PMIC, extra MIPI-B or AUD1/AUD2 bus can be reused as GPIO for further control. PMIC, Vconn, Vbus can thus be controlled. I2S/SPDIF Extraction and TDM Extraction Pin assignment examples are shown below.

2. Pin Description

2.1 Pin Diagram

QFN76 Pin definition is defined as below.

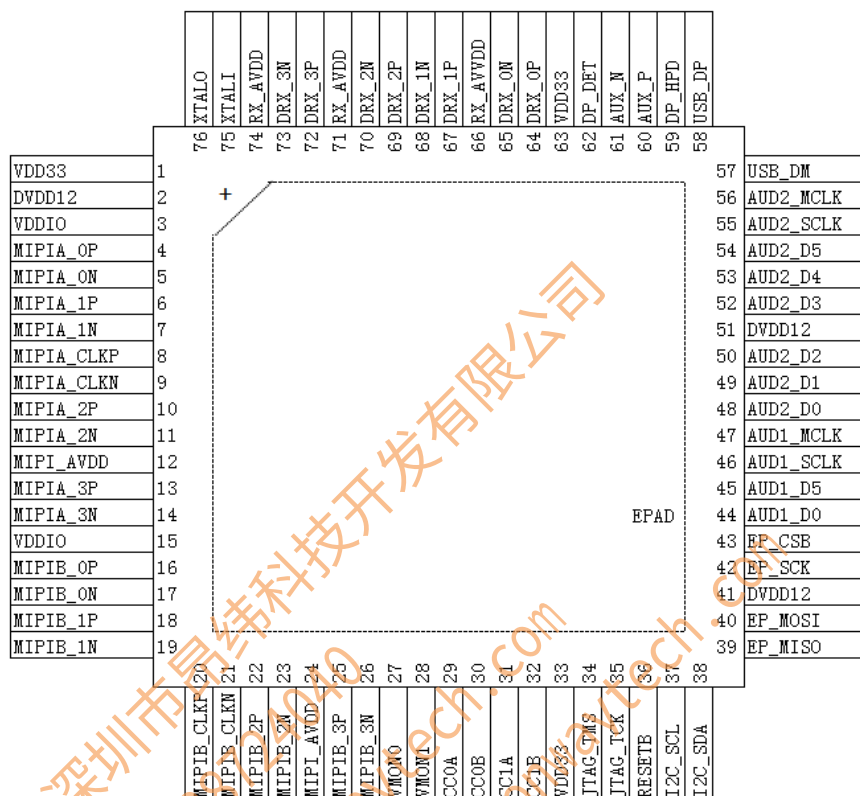


Figure 7. GSV6127E QFN76 Pin Diagram

2.2 QFN76 Pin Description

Table 5. QFN76 Pin Description

Pin Name	Direction	Pin No.	Description
DisplayPort RX Pins			
DP_DET	I	62	HDMI: RX 5V Detection PAD DP: RX DP Detection PAD
DP_HPD	O	59	HDMI: RX HPD PAD DP: RX HPD PAD
AUX_P	I/O	60	HDMI: RX DDC SDA PAD DP: RX AUX_P PAD
AUX_N	I/O	61	HDMI: RX DDC SCL PAD DP: RX AUX_N PAD

4. Package Information

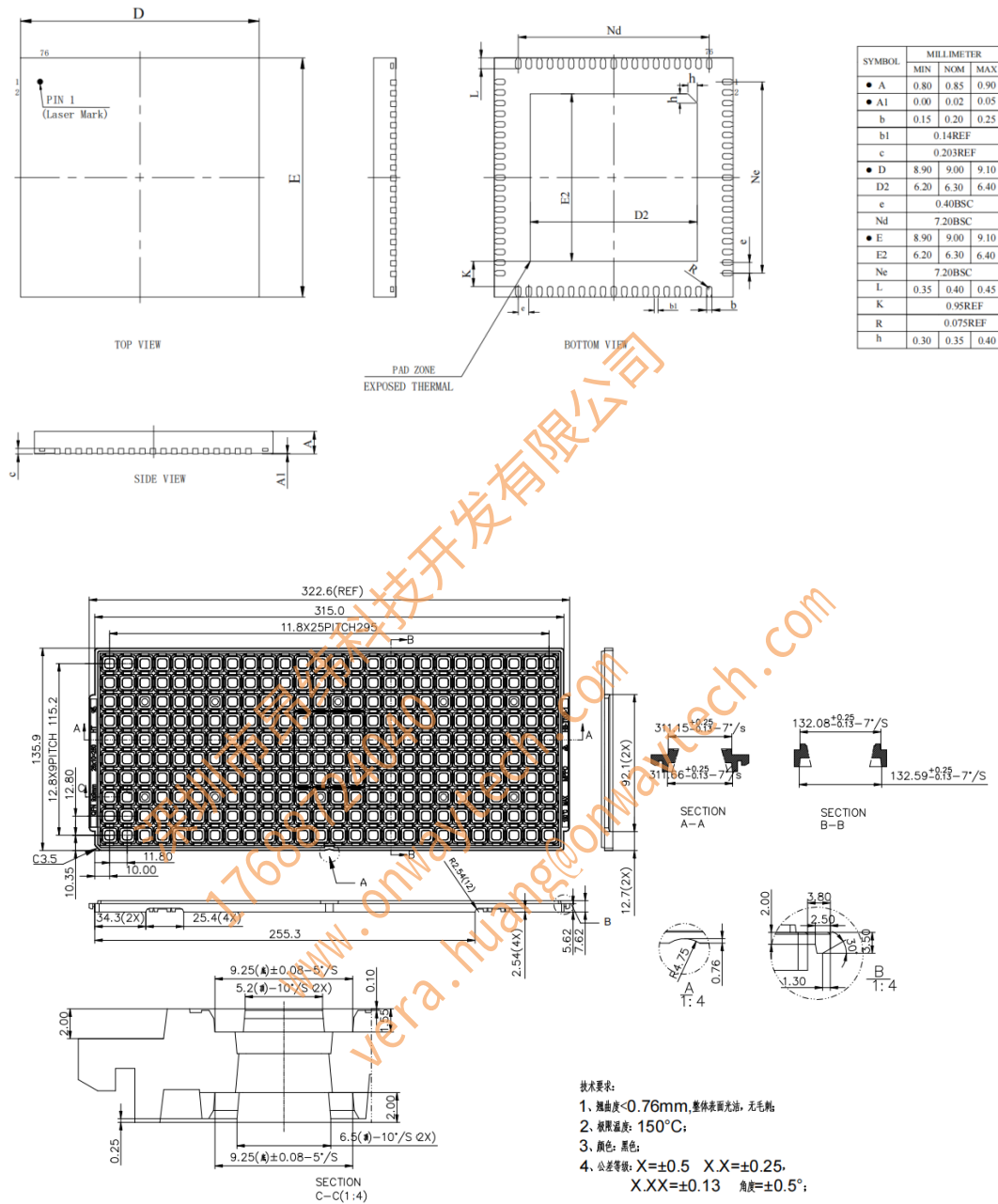


Figure 11. Package Dimensions (QFN76)

5. Ordering Guide

Table 15. Ordering Information

Part Number.	Temperature Range	Package Description	Packing Type
GSV6127E	−40°C to +85°C	QFN76	Tray

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