STDP2690

Advanced DisplayPort to DisplayPort (dual mode) converter

Features

- DisplayPort® (DP) transmitter
  - DP 1.2 compliant
  - Link rate HBR2/HBR/RBR
  - 1, 2, or 4 lanes
  - AUX CH 1 Mbps
  - HDMI/DVI operation with level translator
- DisplayPort receiver
  - DP 1.2 compliant
  - Link rate HBR2/HBR/RBR
  - 1, 2, or 4 lanes
  - AUX CH 1 Mbps
- SPDIF audio output
  - 192 kHz/24 bits
  - Compressed/LPCM
- HDCP repeater with embedded keys
- AUX to I2C bridge for EDID/MCCS pass through
- Spread spectrum on DisplayPort interface for EMI reduction

- Device configuration options
  - SPI Flash
  - I2C host interface
- Deep color support
  - RGB/YCC (4:4:4) – 16-bit color
  - YCC (4:2:2/4:2:0) – 16-bit color
  - Color space conversion – YUV to RGB and RGB to YUV
- Bandwidth
  - Video resolution up to 4K x 2K @ 30 Hz; 1920 x 1080 @ 120 Hz
  - Audio 7.1 Ch up to 192 kHz sample rate
- Low power operation; active 500 mW, standby 25 mW
- Package
  - 81 BGA (8 x 8 mm)
- Power supply voltages
  - 3.3 V I/O; 1.2 V core

Applications

- Audio-video accessory (dongle) for PC/notebooks and docking stations
- Thunderbolt source and peripheral devices

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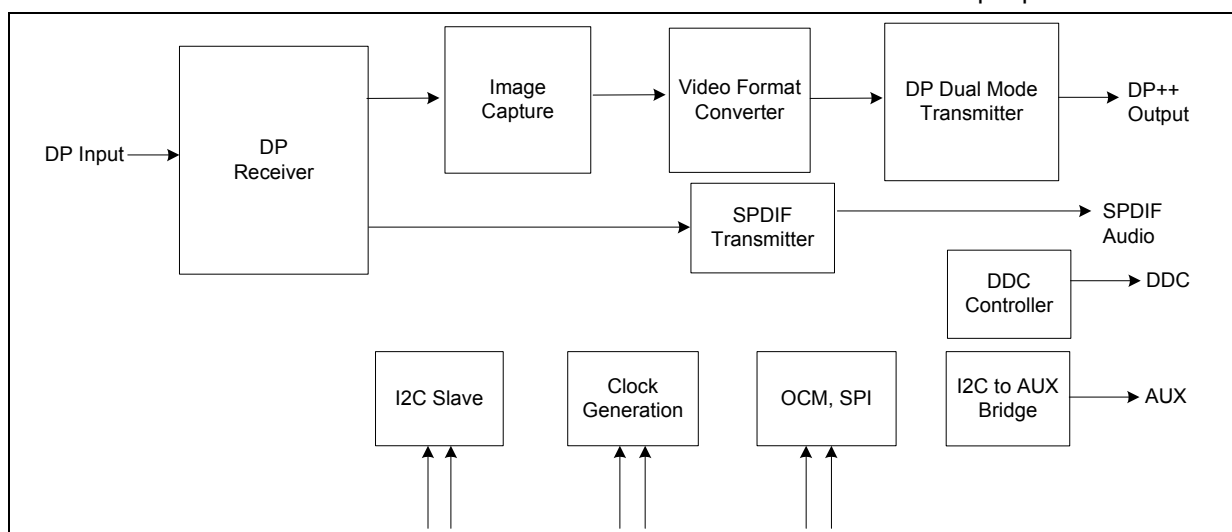
1 Description

The STDP2690 is a high-speed DisplayPort to DisplayPort dual mode converter IC targeted for applications such as audio-video accessories, docking stations, Thunderbolt storage devices, etc. This device includes a VESA DP Standard Ver. 1.2 compliant receiver and transmitter, implementing single link DisplayPort input and output ports comprising four Main lanes, AUX CH, and HPD.

The STDP2690 uses ST's latest generation DisplayPort dual mode transmitter technology that supports both DisplayPort and TMDS signal formats (DP++). DisplayPort receiver and transmitter support HBR2 speed, a data rate of 5.4 Gbps per lane with a total bandwidth of 21.6 Gbps link rate. In addition, the transmitter is capable of supporting HDMI or single link DVI output through a passive level translator (dongle). When configured as HDMI output, this device supports link rate up to 2.97 Gbps that corresponds to a pixel rate of 297 MHz, quite adequate for handling video timings up to FHD 120 Hz 3D formats. This device delivers deep color video up to 16-bits per color at 1080p 60 Hz and lower video resolutions. The STDP2690 allows audio transport from the source to desired audio rendering devices over the DP++ output or through the SPDIF port. The audio signal from the source can be routed simultaneously to DP++ and SPDIF output ports. For example, the STDP2690 allows routing of any two audio channels on the SPDIF port, while transporting up to eight channels on the DP++ port.

The STDP2690 supports RGB and YCbCr colorimetric formats with color depth of 16, 12, 10, and 8 bits. This device features HDCP 1.3 content protection scheme with an embedded key option for secure transmission of digital audio-video content. It also operates as an HDCP repeater for the downstream sink.

The AUX-to-I2C translator in the STDP2690 allows the upstream DisplayPort source to access EDID and transfer MCCS commands to a downstream sink over the HDMI interface when used with a level translator. The device has an on-chip microcontroller with SPI and I2C host interface for system configuration purposes. STDP2690 can be configured with an external SPI Flash for custom applications or simply configured from an external host controller through I2C interface.

2 Application overview

Figure 1.   STDP2690 in PC/notebook accessory application
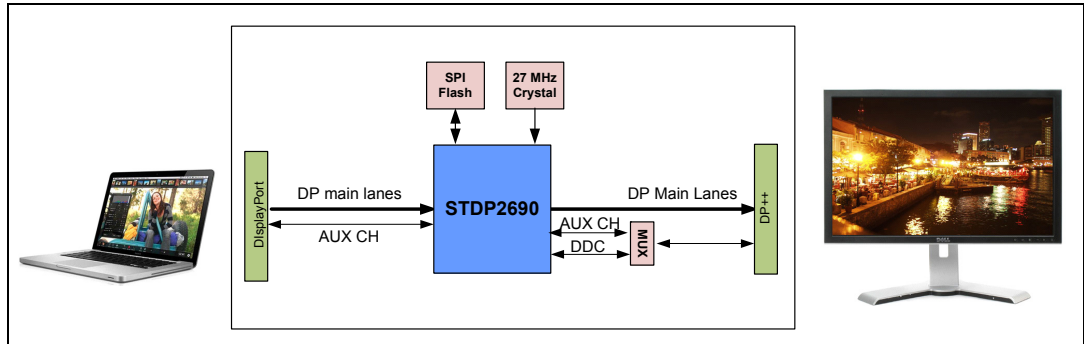
3 Feature attributes

3.1 Input interface

- DP standard Ver. 1.2 compliant
- Main link configuration (SST format only, no MST format support)
  - HBR2/HBR/RBR link rate
  - 1, 2, or 4 lanes
- AUX CH: 1 Mbps Manchester transaction format
- HPD: IRQ_HPD assertion
- Video: EDID 1.4 and CEA861 video timing and formats from 24 to 48 bits/pixel in RGB or YCC422 or YcC444 colorimetry
- Audio: DisplayPort 1.2 standard info frame packets andIEC60958/61937 type audio stream packets ranging from 16 to 24 bits/sample, 32 to 192 kHz sample rates

3.2 Output interface

- DP++ transmitter interface featuring
  - AC coupled DisplayPort Ver. 1.2 interface
  - AC coupled HDMI 1.4 interface to external level translators
- DP main link configuration (SST format only, no MST format support)
  - HBR2/HBR/RBR link rate
  - 1, 2, or 4 lanes
- AUX CH: Manchester transaction format
- HPD: IRQ_HPD assertion
- Video: EDID 1.4 and CEA861 video timing and formats from 24 to 48 bits/pixel in RGB or YCC422 or YcC444 colorimetry
- Audio: DisplayPort 1.2 standard info frame packets and IEC60958/61937 type audio stream packets ranging from 16 to 24 bits/sample, 32 to 192 kHz sample rates
- HDMI link rate: 2.97 Gbps/data pair max

3.3 Deep color support

- RGB/YCC (4:4:4) – 16-bit color
- YCC (4:2:2/4:2:0) – 16-bit color
- Color space conversion – YUV to RGB and RGB to YUV

3.4   Supported video timings

- 4096 x 2160 (4K x 2K) 60 Hz: 24 bits/pixel (DP to DP only)
- 4096 x 2160 (4K x 2K) 24 Hz/30 Hz: 24 bits/pixel (DP to HDMI)
- 1920 x 1080 (FHD) 120 Hz: 24 bits/pixel
- 2560 x 1600 (WQXGA) 60 Hz: 24 bits/pixel
- Up to 1920 x 1080 (FHD) 60 Hz, 48, 36, 30 bits/pixel
- All compatible 3D formats defined in DP 1.2 and HDMI 1.4 specifications
- All standard CEA861 timing formats

3.5   Supported audio timings

- All audio formats as specified in DP 1.2 and HDMI 1.4 specifications
- SPDIF; 2-Ch LPCM, AC3, DTS, bit depth up to 24 bits, sample rate up to 192 kHz

3.6   Control channel interfaces

- AUX CH, I2C host interface, SPI (optional), and UART (UART for test/debug purposes only)

3.7   HDCP 1.3 support

- Key sets for DP RX and DP/HDMI TX integrated in one-time programmable ROM (OTP)
- Standalone HDCP repeater capability

3.8   Package

- 81 BGA (8 x 8 mm), 0.8 ball pitch

3.9   Power supply voltages

- 3.3 V I/O; 1.2 V core

3.10   ESD

- 2 KV HBM, 500 V CDM

4 Ordering information

Table 1. Order codes

Part number	Description
STDP2690	81 BGA (8 x 8 mm)

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

5 Revision history

Table 2. **Document revision history**

Date	Revision	Changes
05-Jun-2012	1	Initial release.

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