LT8668SX-D --- Product Brief
High Definition Display Controller

1. Features

- **USB Type-C**
  - Compliant with VESA DisplayPort Alt Mode on USB Type-C Standard 1.0b
  - DP Alt Mode support pin assignment C, D and E
  - Compliant with USB power delivery specification 3.0
  - Compliant with USB Type-C cable and connector specification 1.3
  - Built-in dual CC controllers for charger and normal communication
  - Data roles supported: UFP and DFP
  - Power roles supported: source, sink and DRP
  - Support USB Billboard function

- **DP1.4a/eDP1.4b Receiver**
  - Compliant with DisplayPort specification 1.4a for 1.62Gbps, 2.7Gbps, 5.4Gbps and 8.1Gbps
  - Compliant with Embedded DisplayPort specification version 1.4b
  - Support DisplayPort 1/2/4 lanes
  - Support HDCP 1.3/2.3
  - Support HDCP repeater
  - Support RGB 6/8/10/12 bpc, YCbCr4:4:4/YCbCr4:2:2/ YCbCr4:2:0 8/10/12 bpc
  - Support up to 8K@30Hz RGB 6bpc, YCbCr4:2:2 10 bpc or YCbCr4:2:0 12 bpc
  - Support up to 4K@120Hz RGB 6bpc, YCbCr4:2:2 10 bpc or YCbCr4:2:0 12 bpc
  - Support up to 8K@60Hz DSC pass-through
  - Support static HDR10
  - Support ASSR for eDP
  - Support SSC
  - Support SST/MST mode

- **HDMI2.1 Receiver**
  - Compliant with HDMI2.1, HDMI2.0b, HDMI1.4 and DVI1.0

- Data rate up to 8Gbps
- Support HDCP 1.4/2.3
- Support HDCP repeater
- Support RGB 8/10/12 bpc, YCbCr4:4:4/ YCbCr4:2:2/ YCbCr4:2:0 8/10/12 bpc
- Support up to 8K@30Hz RGB/YCbCr4:4:4/ YCbCr4:2:2 8bpc or YCbCr4:2:0 12 bpc
- Support up to 4K@120Hz RGB/YCbCr4:4:4/ YCbCr4:2:2 8bpc or YCbCr4:2:0 12 bpc
- Support up to 8K@60Hz DSC pass-through
- Support static HDR10
- Support FEC
- Support CEC
- Support VRR
- Integrated EDID shadow (max 512-byte)
- Support ARC

- **DP1.4a/eDP1.5 Transmitter**
  - Compliant with DisplayPort specification 1.4a for 1.62Gbps, 2.7Gbps, 5.4Gbps, 8.1Gbps
  - Compliant Embedded DisplayPort specification version 1.5
  - Support DisplayPort 1/2/4 lanes
  - Support HDCP 1.3/2.2/2.3
  - Support HDCP repeater
  - Support RGB 6/8/10/12 bpc, YCbCr4:4:4/YCbCr4:2:2/ YCbCr4:2:0 8/10/12 bpc
  - Support up to 8K@30Hz RGB 6bpc, YCbCr4:2:2 10 bpc or YCbCr4:2:0 12 bpc
  - Support up to 4K@120Hz RGB 6bpc, YCbCr4:2:2 10 bpc or YCbCr4:2:0 12 bpc
  - Support up to 8K@60Hz DSC pass-through
  - Support static HDR10
  - Support FEC
  - Support Adaptive-Sync
  - Support ASSR for eDP
  - Support SSC

- Support SST/MST pass-through
- **HDMI2.1 Transmitter**
  - Compliant with HDMI2.1, HDMI2.0b, HDMI1.4 and DVI1.0
  - Data rate up to 8Gbps
  - Support HDCP 1.4/2.2/2.3
  - Support HDCP repeater
  - Support RGB 8/10/12 bpc, YCbCr4:4:4/ YCbCr4:2:2/ YCbCr4:2:0 /8/10/12 bpc
  - Support up to 8K@30Hz RGB/YCbCr4:4:4/ YCbCr4:2:2 8bpc or YCbCr4:2:0 12 bpc
  - Support up to 4K@120Hz RGB/YCbCr4:4:4/ YCbCr4:2:2 8bpc or YCbCr4:2:0 12 bpc
  - Support up to 8K@60Hz DSC pass-through
  - Support static HDR10
  - Support FEC
  - Support CEC
  - Support ARC
- **Four-Port LVDS Transmitter**
  - Compatible with VESA and JEIDA standard
  - Support 1/2/4 configurable ports
  - 1 Clock lane and 3/4/5 configurable data lanes per port
  - Data rate up to 1.2Gbps per data lane
  - Support up to 8K@30Hz YCbCr422 8bit
  - Support up to 4K@120Hz YCbCr422 8bit
  - Support up to 4K@60Hz
  - Support side by side 3D
  - Programmable transmitter swing
  - Support SSC
- **Four-Port MIPI® DSI/CSI Transmitter**
  - Compliant with D-PHY1.2 & DSI 1.3 & CSI-2 1.3；1 clock lane, and 1/2/3/4 configurable data lanes, and 8 configurable data lanes only for CSI；2.5Gbps per data lane
  - Compliant with C-PHY1.0 & DSI-2 1.0 & CSI-2 2.0；1/2/3 configurable data lanes；5.7Gbps per data lane
  - Support 1/2/4 configurable ports and only 1 port for CSI D-PHY 8-lane mode
  - Support up to 8K@30Hz YUV422 8bit for CSI D-PHY 8-lane mode
  - Support up to 4K@120Hz

- Support up to 8K@60Hz DSC pass-through
- Support overlap mode
- DSI Support 16/20/24-bit YCbCr4:2:2, 16/18/24/30-bit RGB
- CSI Support RGB888/666/565, YUV422 8/10bit, YUV420 8bit(legacy)
- Support side by side 3D
- **eDP1.4b Transmitter**
  - Compliant Embedded DisplayPort specification version 1.4b for 1.62Gbps, 2.7Gbps, 5.4Gbps
  - Support 1/2/4/8 lanes
  - Support RGB 6/8/10/12 bpc, YCbCr4:4:4/YCbCr4:2:2/ YCbCr4:2:0 8/10/12 bpc
  - Support up to 4K@120Hz RGB 8bpc, YCbCr4:2:2 10 bpc or YCbCr4:2:0 10 bpc
  - Support up to 8K@60Hz DSC pass-through
  - Support static HDR10
  - Support Adaptive-Sync for 4-lane mode
  - Support ASSR
  - Support SSC
- **eDPx Transmitter**
  - Support data rate up to 3Gbps
  - Support 1/2/4/8 pairs
  - Support 1/2/4 sections
  - Support RGB/YCbCr 8/10 bpc
  - Support up to 4K@60Hz
  - Support SSC
- **Video Process**
  - Vertical blanking interval expansion
  - Video format conversion for I to P
  - 90/270 degree image rotation
  - Frame rate control function
  - Image segmentation
  - 3D format conversion: frame packing 3D to side by side 3D
  - Gamma adjustment
  - Zoom scaling up and down(4K max)
  - Support font-based and bit-map OSD
- **Digital Audio Input and Output**
  - I2S interface supports up to 8-channel audio, with sample rates of 32~192 KHz and sample sizes of 16~24 bits

- SPDIF interface supports PCM, Dolby digital, DTS digital audio at up to 192KHz frame rate
- Compliant with IEC60958 or IEC61937

● **DSC Decoder and Encoder**

- Compliant with DSC 1.2a
- Support up to hactive 4096
- Support up to pixel clock 1.2GHz
- Support 1/2/4 slices
- Support color space RGB, YCbCr4:4:4, YCbCr4:2:2, and YCbCr4:2:0
- Support color depth 8bit and 10bit
- Support bpp precision 1 bit
- Support only constant refresh rate

● **Miscellaneous**

- CSC: RGB <-> YCbCr444 <-> YCbCr422<-> YCbCr420
- Integrated 100/400KHz I2C slave
- External oscillator 25MHz, +/-50ppm
- Integrated microprocessor
- Embedded DRAM
- Embedded SPI flash for firmware and HDCP keys
- Support PWM control
- Firmware update through SPI or I2C or USB interface
- Power supply: 3.3V,1.1V ,1.2V and 1.8V

2. General Description

LT8668SX-D can be configured to work under HDMI2.1 standard with maximum 8Gbps data rate.

LT8668SX-D also can be configured to work under DP1.4a with up to 8.1Gbps data rate.

For LVDS output, LT8668SX-D can be configured as single, dual or quad-port LVDS with 1 high-speed clock lane, and 3~5 high-speed data lanes, operating at

maximum 1.2Gbps per lane, which can support a total bandwidth of up to 24Gbps. LT8668SX-D supports flexible video data mapping path for 2D and side by side 3D applications.

For MIPI output, LT8668SX-D features configurable single-port or dual-port or quad-port MIPI®DSI/CSI with 1 high-speed clock lane and 1~4 high-speed data lanes operating at maximum 2.5Gbps per lane with D-PHY, which can support a total bandwidth of up to 40Gbps for four port. Also support 5.7Gbps per lane with C-PHY, which can support a total bandwidth of up to 68.4Gbps for four port.

For eDP1.4b output, it consists of 8 data lanes, supporting RBR (1.62Gbps), HBR (2.7Gbps) and HBR2 (5.4Gbps) link speeds. The build-in optional SSC function reduces EMI effect on EMI-concerned system application.

For eDPx output, it consists of 8 data lanes, with operating at maximum 3Gbps per lane, can support 4K@60Hz.

Two digital audio interfaces are available I2S and SPDIF. The I2S interface supports 8-ch LPCM and the SPDIF interface supports 2-ch LPCM or compressed audio, both at maximum 192 KHz sample rate.

The device is capable of automatic operation which is enabled by an integrated microprocessor that uses an embedded SPI flash for firmware storage. System control is also available through the configuration I2C slave interface.

3. Applications

● Display System on Motherboard, Monitor

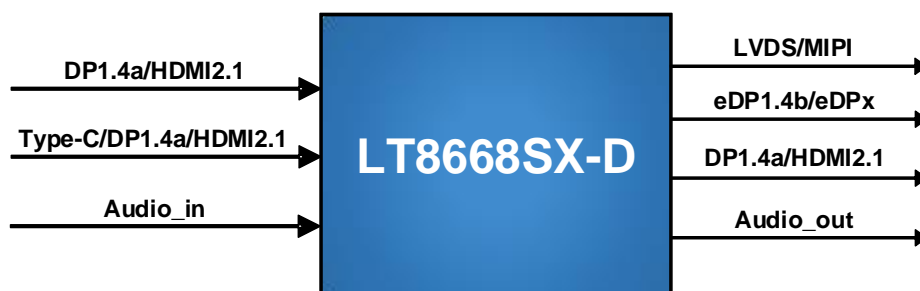● Display System for PCs and embedded applications

Figure 3.1 Application Diagram

4. Ordering Information

<div align="center">**Table 4.1 Ordering Information**</div>

Product Name	Part Number	Product Status	Package	Bonding Wire	Grade	Operating Temperature Range	Stack Die Option	Packing Method	MPQ
LT8668SX-D	LT8668SX-D_U3B03AEI LT8668SX-D_U3B05AEI	MP	BGA288 (12*12)	Au	E	−40°C to +85°C	I	Tray	1890pcs
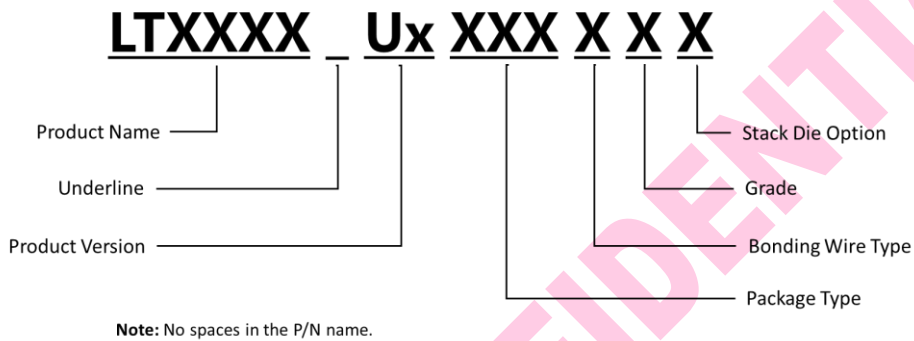
Figure 4.1 Part Number Naming Rules

Visit our corporate web page at: www.lontiumsemi.com
Technical support: support@lontium.com
Sales: sales@lontium.com