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## CH7210 DisplayPort to HDMI 2.0 Converter on USB Type C

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### FEATURES

- Compliant with DisplayPort Alternate Mode on USB Type C standard
- Compliant with DisplayPort Specification version 1.3 and Embedded DisplayPort (eDP) Specification version 1.4
- Support 2 Main Link Lanes at 1.62Gbps, 2.7Gbps (HBR) or 5.4Gbps (HBR2) link rate
- Automotive DP input signal detection and Lane swap supported for compliance with the USB type C cable plug orientation switch
- DP\_BR signaling modes supported
- DisplayPort receiver auto equalization supported for the compensation of input signal attenuation
- Support Spread Spectrum Clocking (de-spreading) for EMI reduction
- Fast and full Link Training for embedded DisplayPort system
- Support eDP Authentication: Alternative Scramble Seed Reset and Alternative Framing
- USB Power Delivery control module supported with HPD to PD converter integrated
- HDMI transmitter compliant with HDMI specification version 2.0 and DVI specification version 1.0
- HDMI transmitter supports up to 3.0Gbps data rate for video timing of 4Kx2K@30Hz, or 4K2K@60Hz on YCC 4:2:0 mode
- HDMI 3D dual view and 3D audio are supported
- High-Dynamic-Range (HDR) display are supported
- YCC 4:4:4/4:2:2 to YCC 4:2:2/4:2:0, Y-only(Gray display) conversion are supported
- HDCP engine compliant with HDCP 2.2 specification with internal HDCP Keys
- HDCP 2.2 repeater supported
- Active DDC buffer and related control register integrated
- IIC-over-AUX transaction supported
- Programmable equalizer
- Programmable Pre-Emphasis on output driver supported
- On-chip Audio Decoder which support 8 channel Audio input from DP Rx and output from HDMI Tx with sample rate up to 192KHz
- Embedded MCU to handle the control logic
- USB billboard module integrated
- USB 2.0 PHY supported
- Firmware run on On-chip Flash directly, integrated EDID Buffer
- AUX channel, USB and Type-C port are available for firmware update.
- Support Auto Power Saving mode and low stand-by current
- Anti-back drive support
- Low power architecture
- RoHS compliant and Halogen free package

### GENERAL DESCRIPTION

Chrontel's CH7210 is a low-cost, low-power semiconductor device that translates the DisplayPort signal to HDMI/DVI through the USB Type-C connector. This innovative USB Type-C based DisplayPort receiver with an integrated HDMI Transmitter is specially designed to target the USB Type-C to HDMI converter, adopter and docking device. Through the CH7210's advanced decoding / encoding algorithm, the input DisplayPort high-speed serialized multimedia data can be seamlessly converted to HDMI/DVI output.

The CH7210's DP/eDP receiver is compliant with the DisplayPort Specification 1.3 and Embedded DisplayPort (eDP) Specification version 1.4. With sophisticated DisplayPort signal detection and the Lane Swap/AUX polarity inversion logic, the CH7210 supports USB Type-C cable plug orientation switch. With internal HDCP key integrated, the device support HDCP 2.2 specifications. In the device's receiver block, which supports four DisplayPort Main Link Lanes input with data rate running at 1.62Gbps, 2.7Gbps or 5.4Gbps, and converted the input signal to HDMI output up to 4Kx2k@30Hz. Leveraging the USB Power Delivery control logic, the USB billboard module for USB device identify and DisplayPort's unique source/sink "Link Training" routine, the CH7210 is capable of instantly bring up the video display to the HDMI/DVI TV/Monitor when the initialization process is completed.

The CH7210 also supports up to 8-channel audio input from either DP Rx and output from HDMI Tx with sample rate up to 192 KHz. Available audio bandwidth depends on the pixel clock frequency, the video format timing, and whether or not content protection re-synchronization is needed.

With sophisticated MCU and the On Chip Flash, CH7210 support auto-boot and EDID buffer. Leveraging the firmware auto-loaded from Flash, CH7210 can support DP input detection, HDMI connection detection, and determine to enter into Power saving mode automatically.

- HBM 2KV ESD performance
- Offered in 48 pin QFN package (7 X 7 mm)

## **APPLICATION**

- USB Type C to HDMI 2.0 cable/Adapter/Docking Station
- On-board DP to HDMI 2.0 application
- Handheld/Portable Device

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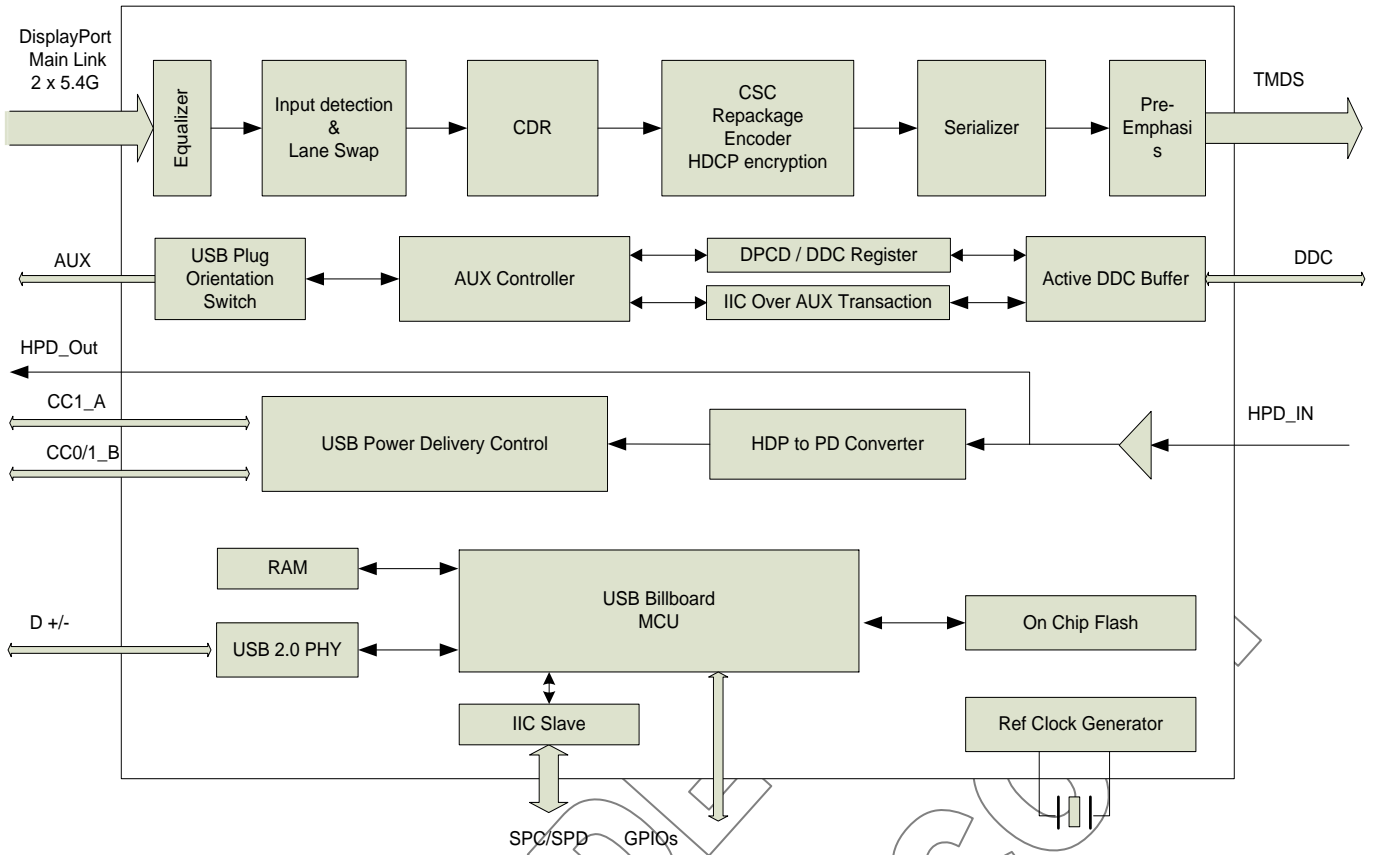


Figure 1: CH7210 Functional Block Diagram

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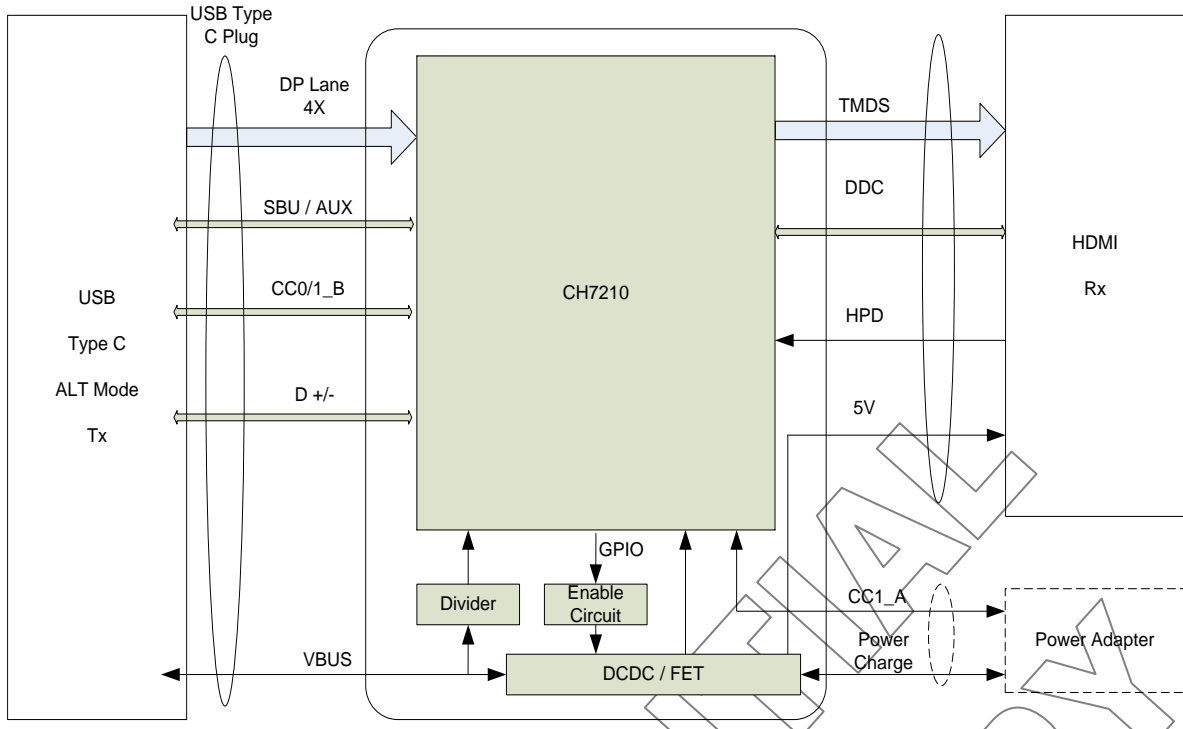


Figure 2: CH7210 USB Type-C to HDMI Dongle Application Block Diagram

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1.0 PIN-OUT

1.1 Package Diagram

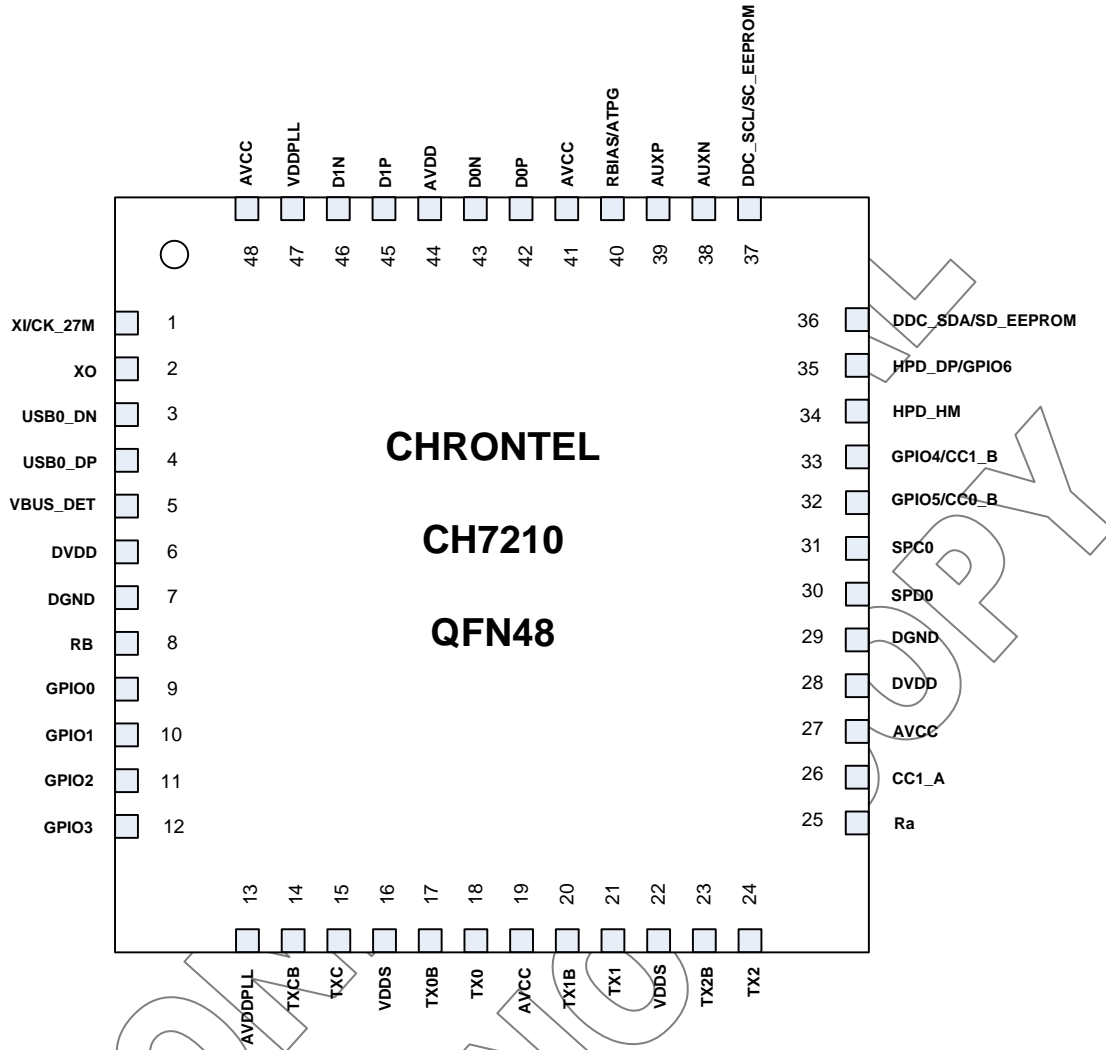


Figure 3: CH7210 48-Pin QFN Pin Out

1.2 Pin Description

Table 1: 48 QFN Pin Name Descriptions

Pin #	Type	Symbol	Description
1	In	XI	<b>Crystal Input / External Reference Input</b> A parallel resonance crystal should be attached between this pin and XO. An external 3.3V CMOS compatible clock also can drive the XI Input
2	Out	XO	<b>Crystal Output</b> A parallel resonance crystal should be attached between this pin and XI / FIN. However, if an external CMOS clock is attached to XI/FIN, XO should be left open
3,4	In/Out	USB0_DN/ USB0_DP	<b>D+/- Input of USB Type C Interface</b>
5	In	VBUS_DET	<b>USB VBUS Voltage Detection</b> Voltage input 0 ~ 5V
8	In	RB	<b>Reset* Input (Internal pull-up)</b> When this pin is low, the device is held in the power-on reset condition. When this pin is high, reset is controlled through the serial port register.
9~12	In/Out	GPIO[3:0]	<b>General Purpose Input/Output Interface</b>
14,15	Out	TXCB/ TXC	<b>HDMI Clock Outputs</b> These pins provide the differential clock output for the HDMI
17, 18	Out	TX0B/ TX0	<b>HDMI Data Channel 0 Outputs</b> These pins provide the TMDs differential outputs for data channel 0
20, 21	Out	TX1B/ TX1	<b>HDMI Data Channel 1 Outputs</b> These pins provide the TMDs differential outputs for data channel 1
23, 24	Out	TX2B/ TX2	<b>HDMI Data Channel 2 Outputs</b> These pins provide the TMDs differential outputs for data channel 2
25	In	Ra	<b>Ra Resistor</b> When used in typeC accessory mode, this pin needs connect to CC0.
26	In/Out	CC1_A	<b>Port A USB Type-C Configure Channel 1</b>
30	In/Out	SPD0	<b>Serial Port Data Input / Output</b> This pin functions as the bi-directional data pin of the serial port. External pull-up 6.8 KΩ resistor is required
31	In	SPC0	<b>Serial Port Clock Input</b> This pin functions as the clock pin of the serial port. External pull-up 6.8 KΩ resistor is required
32	In/Out	CC0_B	<b>Port B USB Type-C Configure Channel 0</b>
	In/Out	GPIO5	<b>Port B General Purpose Input/Output</b>
33	In/Out	CC1_B	<b>USB Type-C Configure Channel 1</b>
	In/Out	GPIO4	<b>General Purpose Input/Output</b>
34	In	HPD_HM	<b>HDMI Tx HPD Input</b>
35	Out	HPD_DP	<b>DP Rx HPD Output</b>
	In/Out	GPIO6	<b>General Purpose Input/Output</b>
36	In	DDC_SDA	<b>Serial Port Data to HDMI Receiver</b> The pin should be connected to data signal of HDMI DDC. This pin requires a pull-up 1.8 kΩ resistor to the desired voltage level
	In/Out	SD_EEPROM	<b>Connect to External EEPROM I2C Port Data</b> The EEPROM is optional depending on FW size
37	Out	DDC_SCL	<b>Serial Port Clock Output to HDMI Receiver</b> The pin should be connected to clock signal of HDMI DDC. This pin

			requires a pull-up 1.8kΩ resistor to the desired voltage level
	Out	SC_EEPROM	<b>Connect to External EEPROM I2C Port Clock</b>
38, 39	In/Out	AUXN/AUXP	<b>AUX Channel Differential Input/Output</b> These two pins are DisplayPort AUX Channel control, which supports a half-duplex, bi-directional AC-coupled differential signal.
40	In	RBIAS	<b>HDMI Swing Control</b> This pin sets the swing level of the HDMI outputs. A 1K-ohm with 1% tolerance resistor should be connected between this pin and ground using short and wide traces.
42, 43	In	D0P/ D0N	<b>DP Main Link Differential Lane 0 Input</b> These pins accept four AC-coupled differential pair signals from the DisplayPort transmitter.
45, 46	In	D1P/ D1N	<b>DP Main Link Differential Lane 1 Input</b> These pins accept four AC-coupled differential pair signals from the DisplayPort transmitter.
19,27,41, 48	Power	AVCC	<b>Analog Power Supply(3.3V)</b>
6,28	Power	DVDD	<b>Digital Core/IO Power Supply (1.2V)</b>
7,29	Power	DGND	<b>Digital Ground</b>
13	Power	AVDDPLL	<b>PLL Power Supply (1.2V)</b>
16,22	Power	VDDS	<b>Serializer Power Supply (1.2V)</b>
44	Power	AVDD	<b>Analog Power Supply (1.2V)</b>
47	Power	VDDPLL	<b>PLL Power Supply (1.2V)</b>

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2.0 PACKAGE DIMENSION

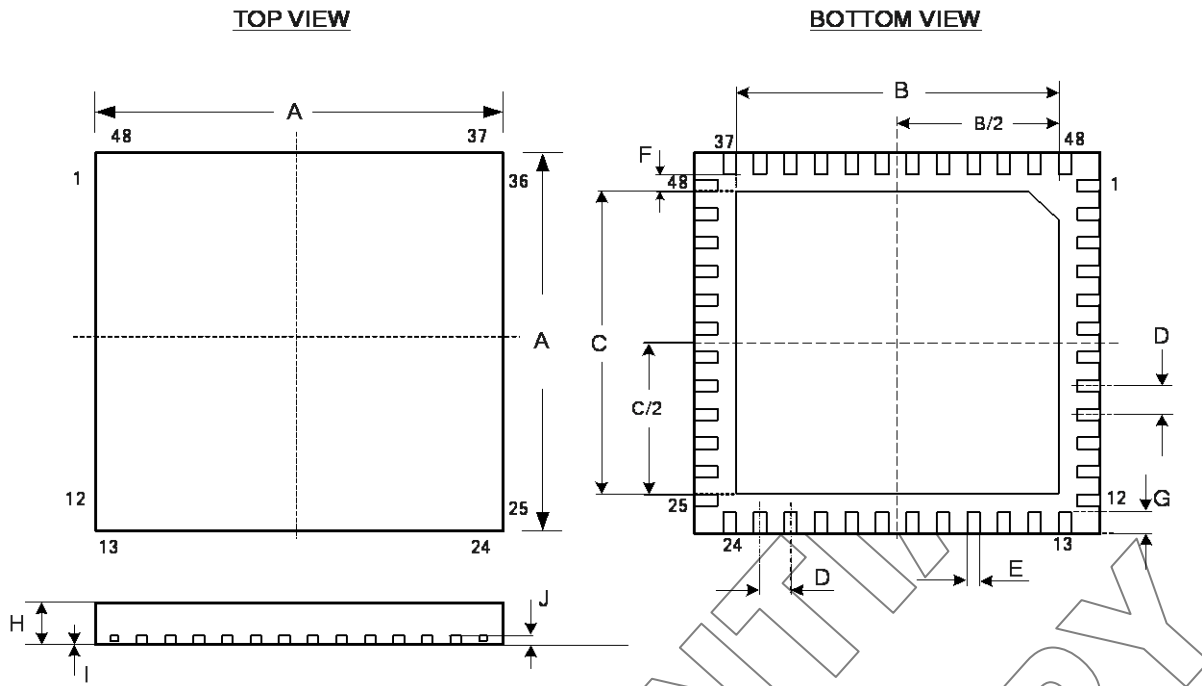


Figure 4: 48 Pin QFN Package

Table of Dimensions

No. of Leads		SYMBOL									
48 (7 X 7 mm)		A	B	C	D	E	F	G	H	I	J
Milli-meters	MIN	6.90	2.25	2.25	0.5	0.18	0.2	0.30	0.7	0	0.203
	MAX	7.10	5.80	5.80		0.30		1.0	0.05		

Notes:

1. Conforms to JEDEC standard JESD-30 MO-220.



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<b>ORDERING INFORMATION</b>			
<b>Part Number</b>	<b>Package Type</b>	<b>Operating Temperature Range</b>	<b>Minimum Order Quantity</b>
CH7210A-BF	48 QFN, Lead-free	Commercial: 0 to 70°C	<b>168/Tray</b>

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