Chrontel CH7038B Multi-Standard Display Interface Converter with Scaler

FEATURES

- 2 Lane DisplayPort Receiver and Transmitter compliant with DisplayPort specification version 1.2 and Embedded DisplayPort (eDP) Specification version 1.3. Optional HDCP version 1.4, Support VESA and CEA timing standards up to 1920x1200 in 8-bit input with 60Hz refresh rate
- HDMI Receiver and Transmitter compliant with HDMI 1.4 specification and DVI 1.0 specification.
- HDMI Receiver supports resolution up to 1080p, and HDMI Transmitter supports resolution up to 4Kx2K. Support HDMI repeater function.
- Single / Dual channel LVDS 18 / 24 bits receiver and Transmitter supports up to 165 Mpixels/s
- Support 16/18/24 bit parallel video input. Support SDR, DDR, 2X and 3X input timing mode.
- Support BT656 and BT1120 input and output, with embedded or separate sync mode
- Support DP/HDMI 3D input, and output DP/HDMI with repacked 3D content, or output LVDS with R/L View separately. Support LCD panel with resolution up to 1920x1200@60Hz in 2D mode or 1366x768@120Hz in 3D mode
- Three on-chip 9-bit high speed DACs providing flexible output capabilities. Such as single, double or triple CVBS outputs, YPbPr output, RGB output and simultaneous CVBS and S-video outputs
- VGA output is compliant with VESA VSIS v1r2 specification
- Support Component YPbPr output and analog RGB (VGA) monitor up to 1900x 1200 or 1080P
- Advanced pin-multiplexed technology to support multiple input/output display standards
- Support two independent display timing data received simultaneously from two separated input paths
- Advanced multi Picture-in-Picture (PIP) features
- OSD controller support
- Build-in flexible scaling engine. On-chip frame buffer supports frame rate conversion, upsize/downsize scaling and Image display rotation /flip
- TV / Monitor connection detection capability.
- Support LCD panel protection and power sequencing. PWM is available for controlling LCD backlight brightness. Dynamic backlight dimming to save power consumption Powerful image enhancement engine embedded
- SPDIF audio interface supports either 16-bit or 20-bit stereo data with sampling rate up to 192kHz/2ch.

GENERAL DESCRIPTION

Chrontel CH7038B is an innovative display interface product designed for embedded systems, consumer electronics and computing in which conversions among multiple high definition video/audio formats are required. Built in with multiple differential receivers and transmitters, a flexible scaling/overlay engine and easy-to-use audio interfaces, the CH7038B can drive LCD panels through either a single or dual channel LVDS/TTL interface or a 1/2 lane DisplayPort interface. It can also simultaneously output to external displays using standards such as HDMI/DVI, YPbPr, VGA, CVBS or S-Video. This device will help manufactures reduce design costs, accelerate time-to-market and expand product features for better user's experience.

The CH7038B has four input and four output ports to supports multiple display standards. Some ports are multiplexed with different signal types to reduce pin count. For example, the 24-bit wide digital port can be programmed to receive LVDS or TTL signals and supports various formats like RGB, BT1120, BT656, etc. while the 8-bit port can accept HDMI or BT656 inputs. The 2 Lane DP / eDP port stands alone because of its high data transfer rate. The lower speed SPI port can interface to external micro controller to display selectively refreshed data.

A powerful per pixel scaler engine is integrated inside the CH7038B. Together with its stacked 64Mb SDRAM, the scaler can process input resolutions up to 1080P and perform Frame Rate Conversion, Image Rotation/Flip and flexible Video Zoom. It can overlay a scaled video onto another bypassed graphics stream to achieve picture-in-picture display. This would allow user to view two display contents on a single monitor. The scaler also supports chroma-key to overlay irregularly shaped video with monochrome background onto a second video stream. Though its MCU and SPI interface, external micro controller can input complex OSD data into the overlay buffer using the selective refresh mode. These features make CH7038B an ideal solution to display multiple video sources onto multiple displays.

Through a 4x2 input switch matrix, the device's scaler can be configured to simultaneously accept two separated video formats with independent display timing. The input combination can be mixed among the TTL/BT1120/LVDS, the DP/eDP, the HDMI/BT656 and the SPI interface input in either RGB format (RGB-565, RGB-666 or RGB-888 and etc.) or YCrCb format (ITU-R

- Support 2 channel I2S digital audio input and 8(7.1) channel output for up to 24-bit data stream (32kHz/8ch, 44.1kHz/8ch, 48kHz/8ch, 88.2kHz/8ch, 96kHz/8ch, 176.4kHz/8ch and 192kHz/8ch)
- Supports LPCM, One Bit Audio, Dolby Digital, DTS, DSD,HBR digital audio formats
- 27MHz is available as crystal or oscillator clock input frequency
- MCU embedded to handle the control logic
- Integrated EDID Buffer
- IO and SPC/SPD supply voltages from 1.8V to 3.3V
- Programmable power management
- Device fully programmable through serial port or can automatically load firmware from EEPROM
- RoHS compliant and Halogen free package
- Offered in 196 pin BGA package

APPLICATIONS

- Docking Station
- Embedded System
- Notebook / Ultrabook
- Tablet Device
- IPTV Box
- Internet TV / SmartTV
- Video Conversion Cable / Adapter / Matrix
- DVR / Security field
- Stand Show / Medical Inspection Apparatus

601/656 and BT1120). A 2x4 output switch matrix can be programmed to drive the various output ports simultaneously with two kinds of independent timing.

The CH7038B supports 3D data structures defined by DP and HDMI standards. The device can translate and repack 3D data when DP signals are converted to HDMI and vice versa. 3D data can also be displayed as R/L frame via its LVDS output.

The CH7038B's DisplayPort receiver and transmitter are designed to comply with DisplayPort Specification 1.2 and Embedded DisplayPort (eDP) Specification version 1.3. It provides support for one or two Main Link lanes with data rate running at 1.62Gb/s or 2.7Gb/s. To further optimize the display quality and power dissipation, this device is equipped with seamless display refresh rate switching and progressive to interlace timing switching capabilities.

The CH7038B's HDMI receiver and transmitter are designed to meet HDMI Specification 1.4 and DVI Specification 1.0. The transmitter performs serialization and transmission of video/audio data up to 4Kx2K with the internal powerful scaler engine. On-chip HDCP cipher engine can be activated to protect the high definition media content.

Dual channel LVDS receiver and transmitter are incorporated into the CH7038B. The Panel protection mechanism is also built in to switch off the LCD instantly through device's automated panel on/off sequences if input data is missing or unstable. The backlight on/off control can be configured through programming internal registers. A built-in PWM generator can be used to adjust display brightness and dimming of the LCD. Dithering algorithm is implemented on chip in support of 18-bits LCD panels.

To support legacy analog displays, three high-performance 9-bit DACs along with separate horizontal and vertical sync outputs are used. CH7038B can output analog RGB signals for VGA monitor, YPrPb for HDTV and CVBS / S-Video for SDTV.

To support local digital audio input and output, the device has both SPDIF and 2-channel I²S digital audio interfaces. Like the video signal path, the audio path can take inputs from DP, HDMI, SPDIF and I2S sources and repack the data for the chosen outputs. Its high fidelity audio engine can handle sampling frequency for up to 192kS/s of stereo and 7.1 audio. The SPDIF interface supports PCM encoded data and compressed audio including Dolby Digital and DTS.

In summary, the CH7038B is a general purpose display interface converter. It is designed to handle both advanced and legacy display interface standards. It can be used in universal docking stations for phones, tablets, personal computers, OTT and IOT devices for both the office and the home markets.

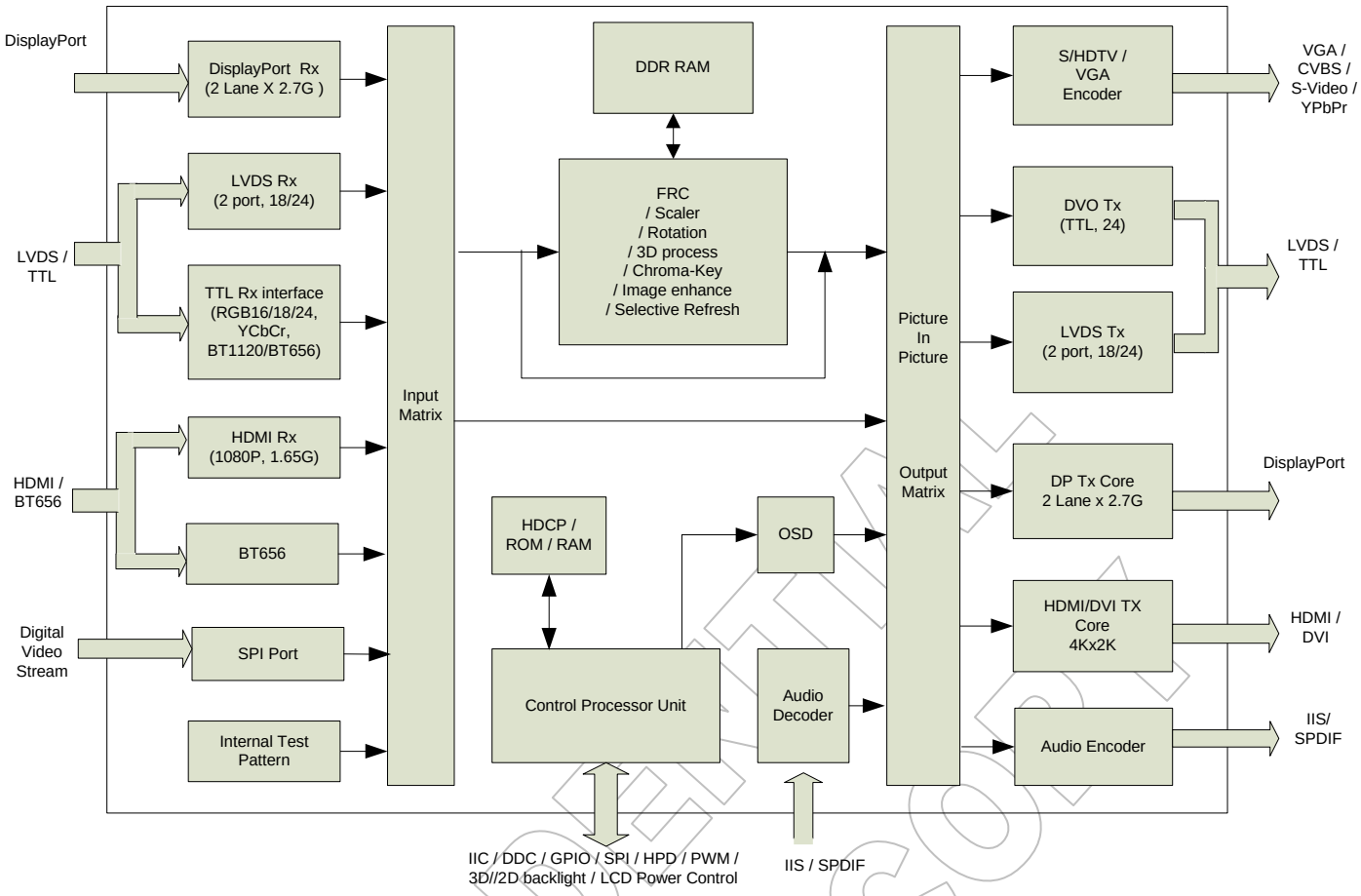

Figure 1: Functional Block Diagram

1.0 PIN-OUT

1.1 Package Diagram

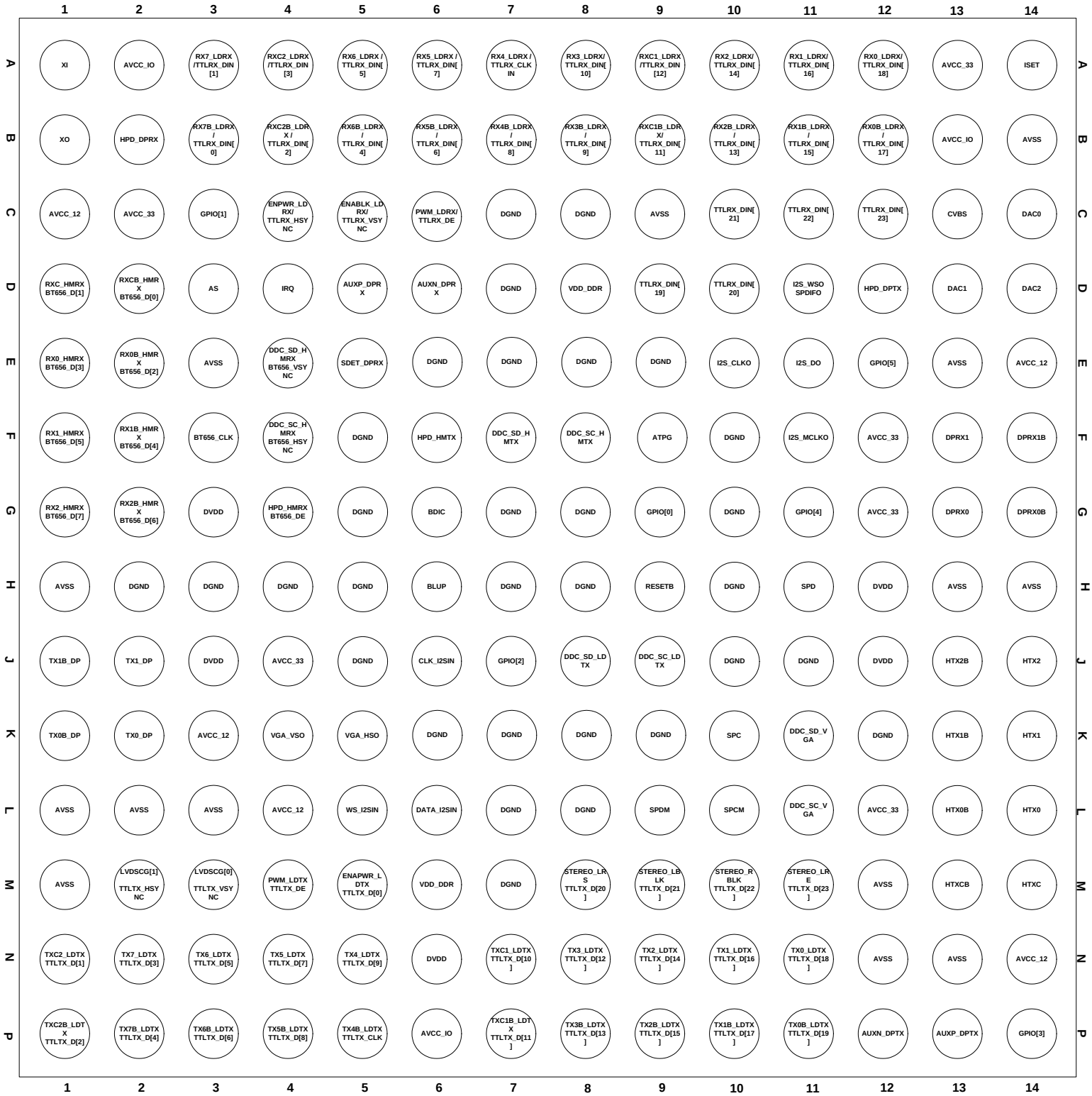

Figure 2: CH7038B 196-Pin BGA Pin Out

1.2 Pin Description

Table 1: BGA196 Pin Name Description

Pin #	Type	Symbol	Description
A1	In	XI	**Crystal Input / External Reference Input** A parallel resonance crystal should be attached between this pin and XO. An external 3.3V CMOS compatible clock can drive the XI Input.
A3	In	TTLRX_DIN[1]	**TTL Receiver Data Input Bit 1**
	In	RX7_LDRX	**LVDS Receiver Positive Even Data Channel 3**
A4	In	TTLRX_DIN[3]	**TTL Receiver Data Input Bit 3**
	In	RXC2_LDRX	**LVDS Receiver Positive Even Clock Channel**
A5	In	TTLRX_DIN[5]	**TTL Receiver Data Input Bit 5**
	In	RX6_LDRX	**LVDS Receiver Positive Even Data Channel 2**
A6	In	TTLRX_DIN[7]	**TTL Receiver Data Input Bit 7**
	In	RX5_LDRX	**LVDS Receiver Positive Even Data Channel 1**
A7	In	TTLRX_CLKIN	**TTL Receiver Clock Input**
	In	RX4_LDRX	**LVDS Receiver Positive Even Data Channel 0**
A8	In	TTLRX_DIN[10]	**TTL Receiver Data Input Bit 10**
	In	RX3_LDRX	**LVDS Receiver Positive Odd Data Channel 3**
A9	In	TTLRX_DIN[12]	**TTL Receiver Data Input Bit 12**
	In	RXC1_LDRX	**LVDS Receiver Positive Odd Clock Channel**
A10	In	TTLRX_DIN[14]	**TTL Receiver Data Input Bit 14**
	In	RX2_LDRX	**LVDS Receiver Positive Odd Data Channel 2**
A11	In	TTLRX_DIN[16]	**TTL Receiver Data Input Bit 16**
	In	RX1_LDRX	**LVDS Receiver Positive Odd Data Channel 1**
A12	In	TTLRX_DIN[18]	**TTL Receiver Data Input Bit 18**
	In	RX0_LDRX	**LVDS Receiver Positive Odd Data Channel 0**
A14	In	ISET	**VGA Output Current Set** This pin sets the DAC current. A 1 kΩ, 1% tolerance resistor should be connected between this pin and ground using short and wide traces.
B1	Out	XO	**Crystal Output** A parallel resonance crystal should be attached between this pin and XI. If an external CMOS clock is injected to XI, XO should be left open.
B2	Out	HPD_DPRX	**DisplayPort Receiver HPD Output**
B3	In	TTLRX_DIN[0]	**TTL Receiver Data Input Bit 0**
	In	RX7B_LDRX	**LVDS Receiver Negative Even Data Channel 3**
B4	In	TTLRX_DIN[2]	**TTL Receiver Data Input Bit 2**
	In	RXC2B_LDRX	**LVDS Receiver Negative Even Clock Channel**
B5	In	TTLRX_DIN[4]	**TTL Receiver Data Input Bit 4**
	In	RX6B_LDRX	**LVDS Receiver Negative Even Data Channel 2**

B6	In	TTLRX_DIN[6]	**TTL Receiver Data Input Bit 6**
	In	RX5B_LDRX	**LVDS Receiver Negative Even Data Channel 1**
B7	In	TTLRX_DIN[8]	**TTL Receiver Data Input Bit 8**
	In	RX4B_LDRX	**LVDS Receiver Negative Even Data Channel 0**
B8	In	TTLRX_DIN[9]	**TTL Receiver Data Input Bit 9**
	In	RX3B_LDRX	**LVDS Receiver Negative Odd Data Channel 3**
B9	In	TTLRX_DIN[11]	**TTL Receiver Data Input Bit 11**
	In	RXC1B_LDRX	**LVDS Receiver Negative Odd Clock Channel**
B10	In	TTLRX_DIN[13]	**TTL Receiver Data Input Bit 13**
	In	RX2B_LDRX	**LVDS Receiver Negative Odd Data Channel 2**
B11	In	TTLRX_DIN[15]	**TTL Receiver Data Input Bit 15**
	In	RX1B_LDRX	**LVDS Receiver Negative Odd Data Channel 1**
B12	In	TTLRX_DIN[17]	**TTL Receiver Data Input Bit 17**
	In	RX0B_LDRX	**LVDS Receiver Negative Odd Data Channel 0**
C3	In/Out	GPIO[1]	**General Purpose Input/Output**
C4	In	TTLRX_HSYNC	**TTL Receiver HSYNC Input**
	In	ENPWR_LDRX	**General Purpose Input**
C5	In	TTLRX_VSYNC	**TTL Receiver VSYNC Input**
	In	ENBLK_LDRX	**General Purpose Input**
C6	In	TTLRX_DE	**TTL Receiver DE Input**
	In	PWM_LDRX	**General Purpose Input**
C10	In	TTLRX_DIN[21]	**TTL Receiver Data Input Bit 21**
C11	In	TTLRX_DIN[22]	**TTL Receiver Data Input Bit 22**
C12	In	TTLRX_DIN[23]	**TTL Receiver Data Input Bit 23**
C13	Out	CVBS	**CVBS Output** Signal switched from DAC0 internally. While this pin is CVBS output enabled, no signal output from the pin of DAC0.
C14	Out	DAC0	**DAC Output**
D1	In	RXC_HMRX	**HDMI Receiver Positive Clock Channel**
	In	BT656_D[1]	**BT656 Input Data Bit 1**
D2	In	RXCB_HMRX	**HDMI Receiver Negative Clock Channel**
	In	BT656_D[0]	**BT656 Input Data Bit 0 (LSB)**
D3	In	AS	**Serial Port Slave Device Address Selection**
D4	In/Out	IRQ	**General Purpose Input/Output** Default definition is interrupt to CH7038 Host
D5	In/Out	AUXP_RX	**DisplayPort Receiver Positive AUX CH**
D6	In/Out	AUXN_RX	**DisplayPort Receiver Negative AUX CH**
D9	In	TTLRX_DIN[19]	**TTL Receiver Data Input Bit 19**
D10	In	TTLRX_DIN[20]	**TTL Receiver Data Input Bit 20**
D11	Out	I2S_WSO	**I2S Output Channel Select** CMOS level signal, typical 3.3 for high, 0 for low**.**

D12	In	HPD_DPTX	**DisplayPort Transmitter HPD Input**
D13	Out	DAC1	**DAC Output**
D14	Out	DAC2	**DAC Output**
E1	In	RX0_HMRX	**HDMI Receiver Positive Data Channel 0**
	In	BT656_D[3]	**BT656 Input Data Bit 3**
E2	In	RX0B_HMRX	**HDMI Receiver Negative Data Channel 0**
	In	BT656_D[2]	**BT656 Input Data Bit 2**
E3	In	AVSS_PLL	**Analog ground**
E4	In	BT656_VS	**BT656 Input VSYNC**
	In/Out	DDC_SD_HMRX	**HDMI Receiver DDC Data Channel** This pin functions as the bi-directional data pin of the serial port to HDMI DDC receiver. This pin will require a pull-up 47 kΩ Resistor to the desired voltage level.
E5	IN	SDET_DPRX	**DisplayPort Receiver Detection**
E10	Out	I2S_CLKO	**I2S Output Clock** CMOS level signal, typical 3.3 for high, 0 for low.
	In/Out	GPIOR[3]	**General Purpose Input/Output**
	Out	SPDIF_DO0	**SPDIF Data Output 0 for 8 CH mode**
E11	Out	I2S_DO	**I2S Data Output for 2 CH mode or I2S Data Output 0 for 8 CH mode** CMOS level signal, typical 3.3 for high, 0 for low.
	Out	SPDIF_DO	**S/PDIF Data Output**
	In/Out	GPIOR[1]	**General Purpose Input/Output**
E12	In/Out	GPIO[5]	**General Purpose Input/Output**
F1	In	RX1_HMRX	**HDMI Receiver Positive Data Channel 1**
	In	BT656_D[5]	**BT656 Input Data Bit 2**
F2	In	RX1B_HMRX	**HDMI Receiver Negative Data Channel 1**
	In	BT656_D[4]	**BT656 Input Data Bit 3**
F3	In	BT656_CLK	**BT656 Input Clock**
F4	In	BT656_HS	**BT656 Input HSYNC**
	In	DDC_SC_HMRX	**HDMI Receiver DDC Clock Channel** This pin functions as the clock bus of the serial port to HDMI DDC receiver. This pin will require a pull-up 47 kΩ Resistor to the desired voltage level.
F6	In	HPD_HMTX	**HDMI Transmitter HPD Input**
F7	In/Out	DDC_SD_HMTX	**HDMI Transmitter DDC Data Channel** This pin functions as the bi-directional data pin of the serial port to HDMI DDC receiver. This pin will require a pull-up 1.8 kΩ Resistor to the desired voltage level.
F8	Out	DDC_SC_HMTX	**HDMI Transmitter DDC Clock Channel** This pin functions as the clock bus of the serial port to DDC receiver. This pin will require a pull-up 1.8 kΩ Resistor to the desired voltage level.
F9	In	ATPG	**ATPG Enable**
F11	Out	I2S_MCLKO	**I2S Output Clock** I2S_MCLKO can be configured to be 128/256/384*Fs CMOS level signal, typical 3.3 for high, 0 for low.

	In/Out	GPIOR[0]	**General Purpose Input/Output**
	Out	SPDIF_DO3	**SPDIF Data Output 3 for 8 CH mode (RevC Only)**
F13	In	DPRX1	**DisplayPort Receiver Positive Lane 1**
F14	In	DPRX1B	**DisplayPort Receiver Negative Lane 1**
G1	In	RX2_HMRX	**HDMI Receiver Positive Data Channel 2**
	In	BT656_D[7]	**BT656 Input Data Bit 0 (MSB)**
G2	In	RX2B_HMRX	**HDMI Receiver Negative Data Channel 2**
	In	BT656_D[6]	**BT656 Input Data Bit 1**
G4	In	BT656_DE	**BT656 Input DE**
	Out	HPD_HMRX	**HDMI Receiver HPD Output**
G6	In	BDIC	**Power Level Detection** Pull Low to disable 3.3V power level detection; Pull High to enable 3.3V power level detection;
G9	In/Out	GPIO[0]	**General Purpose Input/Output**
G11	In/Out	GPIO[4]	**General Purpose Input/Output**
	Out	I2S_DO1	**I2S Data Output 1 for 8 CH mode**
G13	In	DPRX0	**DisplayPort Receiver Positive Lane 0**
G14	In	DPRX0B	**DisplayPort Receiver Negative Lane 0**
H6	In/Out	BLUP/ GPIOL[0]	**General Purpose Input/Output** Default definition is LCD backlight brightness control
	In	MCLK_I2SIN	**Input I2S Clock**
H9	In	RESETB	**Chip Reset** Low to 0V for reset. Typical High level is 3.3V
H11	In/Out	SPD	**I2C Slave Serial Port Data** This pin functions as the data pin of the serial port. External pull-up 6.8 kΩ Resistor is required.
J1	Out	TX1B_DPTX	**DisplayPort Transmitter Lane 1 Negative Data**
J2	Out	TX1_DPTX	**DisplayPort Transmitter Lane 1 Positive Data**
J6	In	CLK_I2SIN	**Input Clock of I2S Input**
	In/Out	GPIOL[3]	**General Purpose Input/Output**
J7	In/Out	GPIO[2]	**General Purpose Input/Output**
J8	In/Out	DDC_SD_LDTX	**LVDS Transmitter DDC Data Channel** This pin functions as the bi-directional data pin of the serial port to LVDS DDC receiver. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level.
J9	Out	DDC_SC_LDTX	**LVDS Transmitter DDC Clock Channel** This pin functions as the clock bus of the serial port to LVDS DDC receiver. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level.
J13	Out	HMTX2B	**HDMI Transmitter Negative Data 2 Channel**
J14	Out	HMTX2	**HDMI Transmitter Positive Data 2 Channel**
K1	Out	TX0B_DPTX	**DisplayPort Transmitter Lane 0 Negative Data**
K2	Out	TX0_DPTX	**DisplayPort Transmitter Lane 0 Positive Data**
K4	Out	VGA_VSYNC	**VGA VSYNC Output**
	In/Out	GPIO[7]	**General Purpose Input/Output**

K5	Out	VGA_HSYNC	**VGA HSYNC Output**
	In/Out	GPIO[6]	**General Purpose Input/Output**
K10	In	SPC	**I2C Slave Serial Port Clock Input** This pin functions as the clock pin of the serial port. External pull-up 6.8 kΩ Resistor is required.
K11	In/Out	DDC_SD_VGA	**VGA DDC Data Channel** This pin functions as the bi-directional data pin of the serial port to VGA DDC receiver. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level.
K13	Out	HMTX1B	**HDMI Transmitter Negative Data 1 Channel**
K14	Out	HMTX1	**HDMI Transmitter Positive Data 1 Channel**
L5	In	WS_I2SIN	**WS of I2S Input**
	In/Out	GPIOL[2]	**General Purpose Input/Output**
L6	In	DATA_I2SIN	**Data of I2S Input**
	In	SPDIF_IN	**SPDIF Input**
	In/Out	GPIOL[1]	**General Purpose Input/Output**
L9	In/Out	SPDM	**I2C Master Serial Port Data** If EEPROM is not included inside CH7038 then this pin functions as the bi-directional data pin of the serial port to chip firmware and HDCP Key EEPROM. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level. A pull-low resistor 10 kΩ to ground if unused. If EEPROM is included inside CH7038 then this pin can be connected to Host I2C SC to burn EEPROM in production or in evaluation.
L10	Out	SPCM	**I2C Master Serial Port Clock** If EEPROM is not included inside CH7038 then this pin functions as the clock bus of the serial port to chip firmware and HDCP Key EEPROM. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level. A pull-low resistor 10 kΩ to ground if unused. If EEPROM is included inside CH7038 then this pin can be connected to Host I2C SC to burn EEPROM in production or in evaluation.
L11	Out	DDC_SC_VGA	**VGA DDC Clock Channel** This pin functions as the clock bus of the serial port to VGA DDC receiver. This pin will require a pull-up 5.6 kΩ Resistor to the desired voltage level.
L13	Out	HMTX0B	**HDMI Transmitter Negative Data 0 Channel**
L14	Out	HMTX0	**HDMI Transmitter Positive Data 0 Channel**
M2	Out	TTLTX_HSYNC	**TTL Transmitter HSYNC Output**
	In/Out	LVDSCG[1]	**General Purpose Input/Output** Default definition is LVDS Panel Selection control
M3	Out	TTLTX_VSYNC	**TTL Transmitter VSYNC Output**
	In/Out	LVDSCG[0]	**General Purpose Input/Output** Default definition is LVDS Panel Selection control
M4	Out	TTLTX_DE	**TTL Transmitter DE Output**
	In/Out	PWM_LDTX	**General Purpose Input/Output** Default definition is LVDS Panel PWM
M5	Out	TTLTX_D[0]	**TTL Transmitter Data Bit 0**
	In/Out	ENPWR_LDTX	**General Purpose Input/Output** Default definition is LVDS Panel Power Enable

M8	Out	TTLTX_D[20]	**TTL Transmitter Data Bit 20**
	In/Out	STEREO_LRS	**General Purpose Input/Output** Default definition is Left/Right Eye Swap for 3D mode
M9	Out	TTLTX_D[21]	**TTL Transmitter Data Bit 21**
	In/Out	STEREO_LBLK	**General Purpose Input/Output** Default definition is Left Eye Backlight Enable for 3D mode
M10	Out	TTLTX_D[22]	**TTL Transmitter Data Bit 22**
	In/Out	STEREO_RBLK	**General Purpose Input/Output** Default definition is Right Eye Backlight Enable for 3D mode
M11	Out	TTLTX_D[23]	**TTL Transmitter Data Bit 23**
	In/Out	STEREO_LRE	**General Purpose Input/Output** Default definition is Left/Right Eye Indicator for 3D mode
M13	Out	HMTXCB	**HDMI Transmitter Negative Clock Channel**
M14	Out	HMTXC	**HDMI Transmitter Positive Clock Channel**
N1	Out	TTLTX_D[1]	**TTL Transmitter Data Bit 1**
	Out	TXC2_LDTX	**LVDS Transmitter Positive Even Clock Channel**
	Out	DSD_DO0	**DSD Audio (One Bit Audio) Output 0**
N2	Out	TTLTX_D[3]	**TTL Transmitter Data Bit 3**
	Out	TX7_LDTX	**LVDS Transmitter Positive Even Data Channel 3**
	Out	DSD_DO2	**DSD Audio (One Bit Audio) Output 2**
N3	Out	TTLTX_D[5]	**TTL Transmitter Data Bit 5**
	Out	TX6_LDTX	**LVDS Transmitter Positive Even Data Channel 2**
	Out	DSD_DO4	**DSD Audio (One Bit Audio) Output 4**
N4	Out	TTLTX_D[7]	**TTL Transmitter Data Bit 7**
	Out	TX5_LDTX	**LVDS Transmitter Positive Even Data Channel 1**
	Out	DSD_DO6	**DSD Audio (One Bit Audio) Output 6**
N5	Out	TTLTX_D[9]	**TTL Transmitter Data Bit 9**
	Out	TX4_LDTX	**LVDS Transmitter Positive Even Data Channel 0**
	Out	DSD_WS	**DSD Audio (One Bit Audio) WS**
N7	Out	TTLTX_D[10]	**TTL Transmitter Data Bit 10**
	Out	TXC1_LDTX	**LVDS Transmitter Positive Odd Clock Channel**
N8	Out	TTLTX_D[12]	**TTL Transmitter Data Bit 12**
	Out	TX3_LDTX	**LVDS Transmitter Positive Odd Data Channel 3**
N9	Out	TTLTX_D[14]	**TTL Transmitter Data Bit 14**
	Out	TX2_LDTX	**LVDS Transmitter Positive Odd Data Channel 2**
N10	Out	TTLTX_D[16]	**TTL Transmitter Data Bit 16**
	Out	TX1_LDTX	**LVDS Transmitter Positive Odd Data Channel 1**
N11	Out	TTLTX_D[18]	**TTL Transmitter Data Bit 18**
	Out	TX0_LDTX	**LVDS Transmitter Positive Odd Data Channel 0**
P1	Out	TTLTX_D[2]	**TTL Transmitter Data Bit 2**
	Out	TXC2B_LDTX	**LVDS Transmitter Negative Even Clock Channel**
	Out	DSD_DO1	**DSD Audio (One Bit Audio) Output 1**

P2	Out	TTLTX_D[4]	**TTL Transmitter Data Bit 4**
	Out	TX7B_LDTX	**LVDS Transmitter Negative Even Data Channel 3**
	Out	DSD_DO3	**DSD Audio (One Bit Audio) Output 3**
P3	Out	TTLTX_D[6]	**TTL Transmitter Data Bit 6**
	Out	TX6B_LDTX	**LVDS Transmitter Negative Even Data Channel 2**
	Out	DSD_DO5	**DSD Audio (One Bit Audio) Output 5**
P4	Out	TTLTX_D[8]	**TTL Transmitter Data Bit 8**
	Out	TX5B_LDTX	**LVDS Transmitter Negative Even Data Channel 1**
	Out	DSD_DO7	**DSD Audio (One Bit Audio) Output 7**
P5	Out	TTLTX_CLK	**TTL Transmitter Clock Output**
	Out	TX4B_LDTX	**LVDS Transmitter Negative Even Data Channel 0**
	Out	DSD_CLK	**DSD Bit Clock Output**
P7	Out	TTLTX_D[11]	**TTL Transmitter Data Bit 11**
	Out	TXC1B_LDTX	**LVDS Transmitter Negative Odd Clock Channel**
P8	Out	TTLTX_D[13]	**TTL Transmitter Data Bit 13**
	Out	TX3B_LDTX	**LVDS Transmitter Negative Odd Data Channel 3**
P9	Out	TTLTX_D[15]	**TTL Transmitter Data Bit 15**
	Out	TX2B_LDTX	**LVDS Transmitter Negative Odd Data Channel 2**
P10	Out	TTLTX_D[17]	**TTL Transmitter Data Bit 17**
	Out	TX1B_LDTX	**LVDS Transmitter Negative Odd Data Channel 1**
P11	Out	TTLTX_D[19]	**TTL Transmitter Data Bit 19**
	Out	TX0B_LDTX	**LVDS Transmitter Negative Odd Data Channel 0**
P12	In/Out	AUXN_DPTX	**DisplayPort Transmitter AUX CH Negative Data**
P13	In/Out	AUXP_DPTX	**DisplayPort Transmitter AUX CH Positive Data**
P14	In/Out	GPIO[3]	**General Purpose Input/Output**
A2,B13, P6	Power	AVCC_IO	**LVDS /TTL Rx/Tx Analog Power Supply(1.8~3.3V)** While for LVDS configure, the power supply should be 3.3V
A13,C2, F12,G12 ,J4,L12	Power	AVCC_33	**Analog 3.3V Power Supply**
B14,C9, E13,H1, H13,H1 4,L1,L2, L3,M1, M12,N1 2,N13	Power	AVSS	**Analog ground**
C1,E14, K3,L4,N 14	Power	AVCC_12	**Analog 1.2V Power Supply**
C7,C8, D7,E6~ E9,F5,F 10,G5,G 7,G8,G1	Power	DGND	**Digital Power Ground**

0,H2~H5,H7,H8,H10,J5,J10,J11,K6~K9,K12,L7,L8,M7			
D8,M6	Power	VDD_DDR	**DDR Power supply(1.8V)**
G3,H12,J3,J12,N6	Power	DVDD	**Digital Power Supply, 1.2V**

2.0 PACKAGE DIMENSION

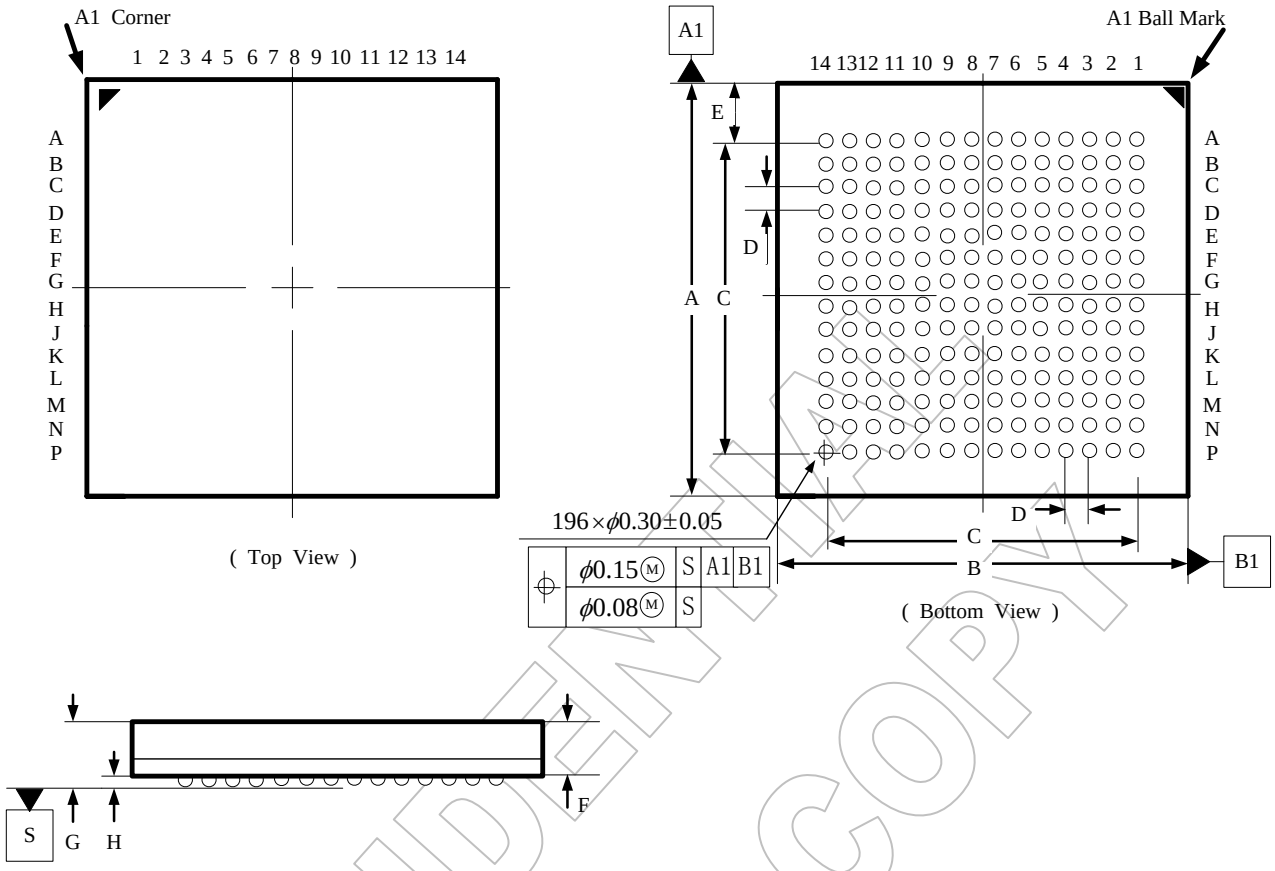

Figure 3: 196 Pin BGA Package (10x10 mm)

Table of Dimensions

No. of Leads		SYMBOL							
196 (10x10 mm)		A	B	C	D	E	F	G	H
Milli-meters	MIN	9.90	9.90	8.45	0.65	0.78 REF	0.76	-	0.16
	NOM	10.00	10.00				0.81	-	0.21
	MAX	10.10	10.10				0.86	1.12	0.26

Notes:

1. All dimensions are in millimeters.
2. Solder ball dimension is post reflow diameter.

3.0 REVISION HISTORY

Rev. #	Date	Section	Description
1.0	2017.12.05		First Official Release
1.1	2018.03.01	1.0	Update the LVDS RX pin name

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ORDERING INFORMATION			
Part Number	**Package Type**	**Operating Temperature Range**	**Minimum Order Quantity**
CH7038B-GF	196 BGA, Lead-free	Commercial : 0 to 70°C	184/Tray

Chrontel

Chrontel International Limited

129 Front Street, 5th floor,
Hamilton, Bermuda HM12
www.chrontel.com
E-mail: sales@chrontel.com