CH7117 HDMI to SDTV/HDTV/BT656/VGA Converter with Flexible Scaler

FEATURES

- HDMI Receiver compliant with HDMI 1.4 specification and DVI 1.0 specification
- Support input resolution up to 1080p. Support Hot Plug detection for HDMI/DVI
- Support multiple output formats:
  - SDTV format (CVBS or S-Video output, NTSC and PAL)
  - HDTV format (YPbPr output) for 480p, 576p, 720p, 1080i and 1080P
  - Analog RGB output for VGA with Triple 9-bit DAC up to 200MHz pixel rate. Sync signals can be provided in separated or composite manner. Support VESA and CEA timing standards up to UXGA and 1920x1080@60Hz
  - ITU-R 601 or ITU-R 656 compatible YCbCr 4:2:2 output format with embedded syncs or discrete syncs. Support resolution up to 1280 x 720@60Hz for YCbCr 4:2:2 output
- On-chip Audio encoder which support 8 channel IIS/ S/PDIF audio output
- Flexible scaler engine embedded
- VGA output is compliant with VESA VSIS v1r2 specification
- MCU embedded to handle the control logic
- Support device boot up by automatically loading firmware from on-chip flash
- Integrated EDID Buffer
- TV connection detection supported
- HDMI input detection supported
- Support Auto Power Saving mode and low stand-by current
- Support 422 to 444 conversion
- Support RGB to YCC conversion in ITU-R BT.601 and 709 color space for SDTV/HDTV/BT656 output
- IIC slave interface and HDMI DDC interface are available for debug and firmware update.
- Low power architecture
- RoHS compliant and Halogen free package
- Offered in 88 pin QFN package

GENERAL DESCRIPTION

Chrontel's CH7117 is an innovative semiconductor device that consists of HDMI receiver, three separate 9-bit video Digital-to-Analog Converters (DACs), SDTV encoder, HDTV encoder, YCbCr 4:2:2 encoder and audio encoder, which can convert HDMI signals into CVBS / S-Video / YPbPr / BT656 / Analog RGB outputs with IIS or SPDIF audio output.

The HDMI Receiver and HDMI Transmitter integrated are compliant with HDMI 1.4b. The DACs are based on current source architecture. With sophisticated scaler engine and DDR RAM integrated, CH7117 receives the HDMI input signal with resolution up to 1920x1080@60Hz, and output SDTV / HDTV / BT656 / Analog RGB signal with any specified resolution.

With sophisticated MCU Embedded and the On chip Flash, CH7117 support auto-boot and EDID buffer. Leveraging Firmware auto loaded from the embedded Flash, CH7117 can support HDMI input detection, DAC connection detection and can be programmed to enter into Power Saving mode automatically.

The CH7117 also supports up to 8-channel audio input from HDMI port and output from the special audio output port 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.

APPLICATIONS

- Car Infotainment Device
- Converter Box
- Tablet Device
- OTT/IPTV Box

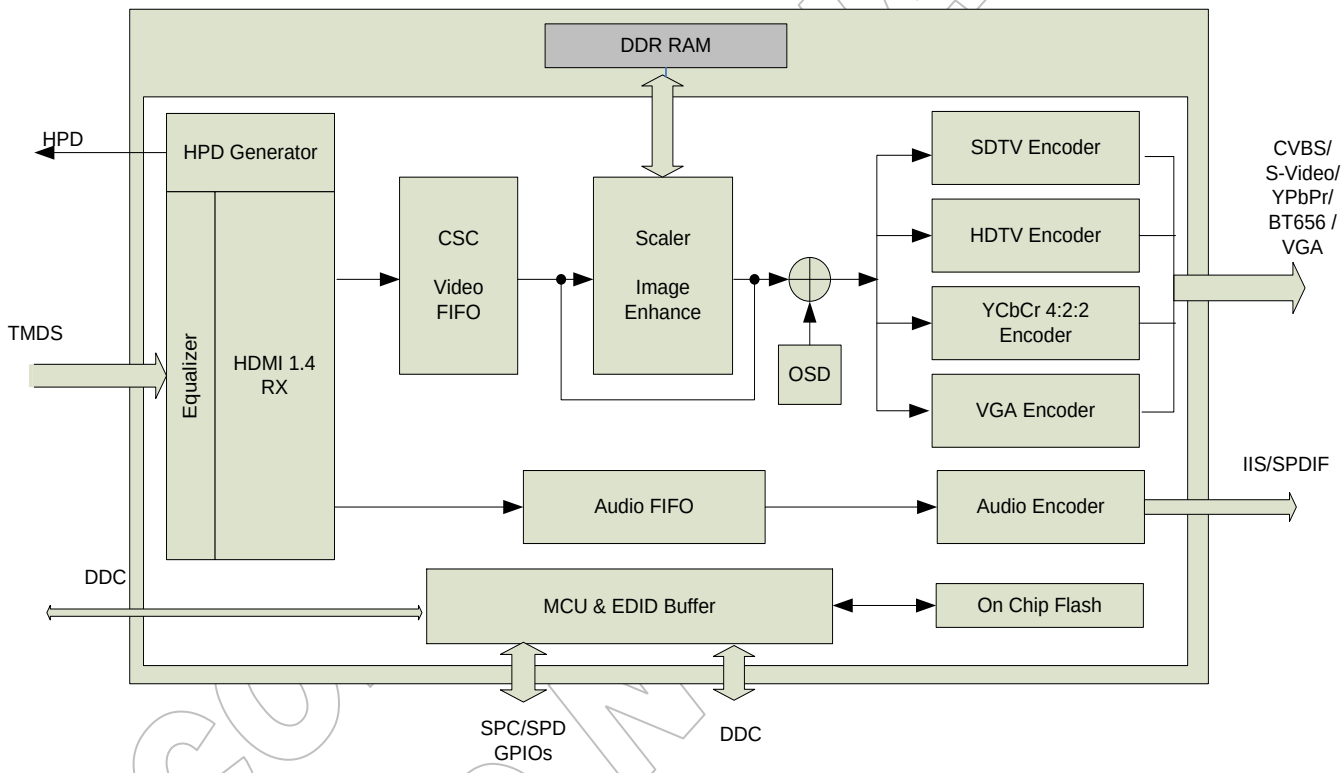

Figure 1: CH7117 Functional Block Diagram

1.0 PIN-OUT

1.1 Package Diagram

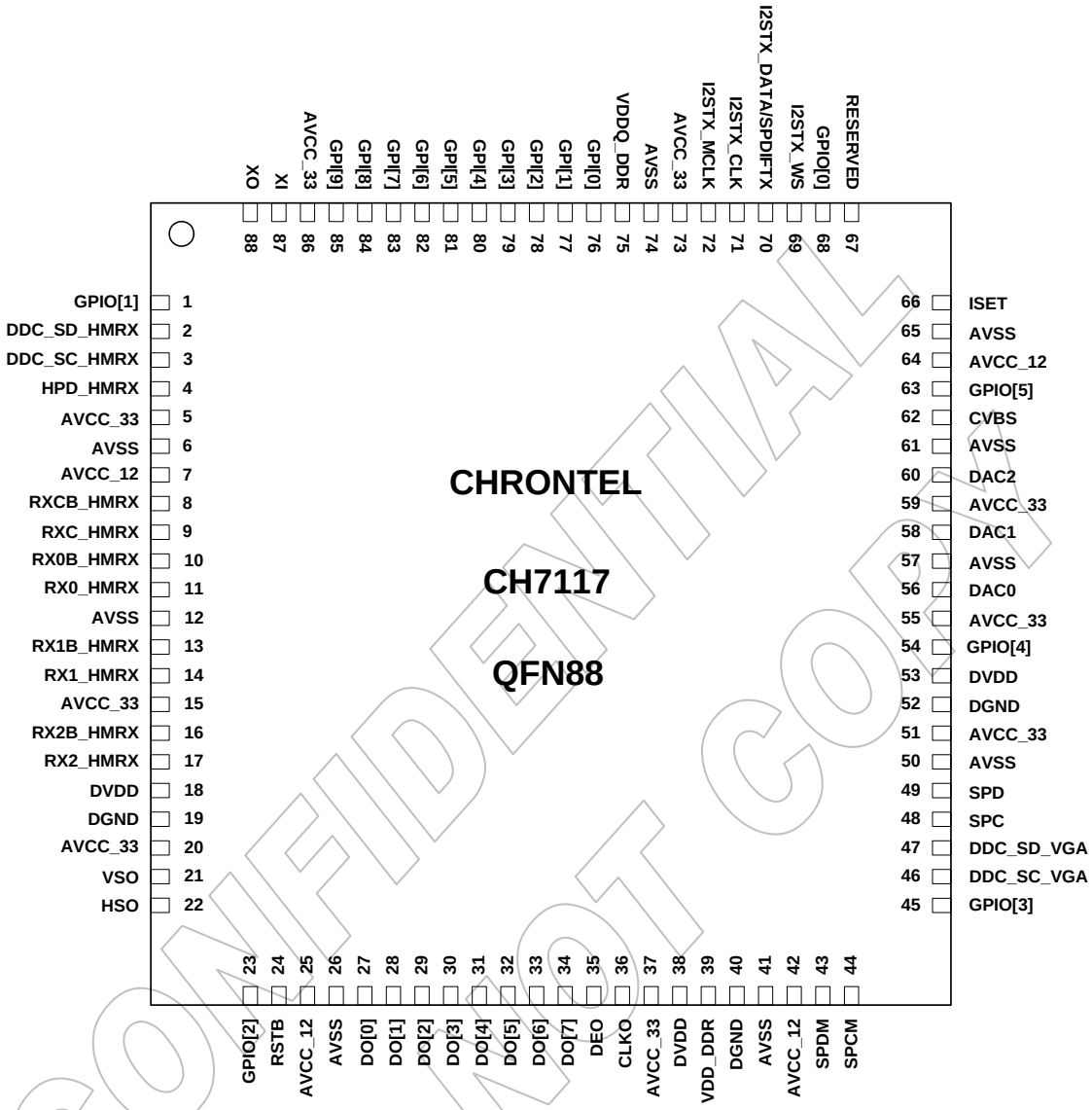

Figure 2: CH7117 88-pin QFN Pin Out

1.2 Pin Description

Table 1: Pin Name Descriptions

Pin #	Type	Symbol	Description
1,23,45, 54,63,68	In/Out	GPIO[5:0]	**General Purpose Input/Output** GPIO[0], GPIO[5:4] and I2STX_DATA can be composed for the 8 channel I2S audio data output.
2	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 source. This pin will require a pull-up 47 kΩ Resistor to the desired voltage level.
3	In	DDC_SC_HMRX	**HDMI Receiver DDC Clock Channel** This pin functions as the clock bus of the serial port to HDMI DDC source. This pin will require a pull-up 47 kΩ Resistor to the desired voltage level.
4	Out	HPD_HMRX	**HDMI Receiver HPD Output**
8	In	RXCB_HMRX	**HDMI Rx Negative Clock Channel**
9	In	RXC_HMRX	**HDMI Rx Positive Clock Channel**
10	In	RX0B_HMRX	**HDMI Rx Negative Data Channel 0**
11	In	RX0_HMRX	**HDMI Rx Positive Data Channel 0**
13	In	RX1B_HMRX	**HDMI Rx Negative Data Channel 1**
14	In	RX1_HMRX	**HDMI Rx Positive Data Channel 1**
16	In	RX2B_HMRX	**HDMI Rx Negative Data Channel 2**
17	In	RX2_HMRX	**HDMI Rx Positive Data Channel 2**
21	Out	VSO	**VGA/BT656 VSYNC Output Pin**
22	Out	HSO	**VGA/BT656 HSYNC Output Pin**
24	In	RSTB	**Chip Reset** Low to 0V for reset. Typical High level is 3.3V
27~34	Out	DO[7:0]	**BT656 Output Data Pins**
35	Out	DEO	**BT656 Data Enable Output Pin**
36	Out	CLKO	**BT656 Output Clock Pin**
43	In/Out	SPDM	**I2C Master Serial Port Data** This pin functions as the bi-directional data pin of the serial port to chip firmware and external 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.
44	Out	SPCM	**I2C Master Serial Port Clock** This pin functions as the clock bus of the serial port to chip firmware and external 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.
46	Out	DDC_SC_VGA	**VGA DDC Clock Channel** This pin functions as the clock output 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.
47	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.
48	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.
49	In/Out	SPD	**I2C Slave Serial Port Data Input / Output** This pin functions as the bi-directional data pin of the serial port. External pull-up 6.8 kΩ Resistor is required.
56	Out	DAC0	**HDTV Pb Component / SDTV C Component / Analog B component output**
58	Out	DAC1	**HDTV Y Component / SDTV Y Component / Analog G component output**
60	Out	DAC2	**HDTV Pr Component / CVBS / Analog R component output**
62	Out	CVBS	**CVBS Output Pin**
66	In	ISET	**Basic Current Set** This pin sets the basic current. A 1 kΩ, 1% tolerance resistor should be connected between this pin and ground using short and wide traces.
69	Out	I2STX_WS	**I2S Output Channel Select** CMOS level signal, typical 3.3 for high, 0 for low.
70	Out	I2STX_DATA	**I2S Data Output** CMOS level signal, typical 3.3 for high, 0 for low. GPIO[0]&GPIO[5:4] can be configured as I2S data output channels to support up to 7.1 audio output port.
	Out	SPDIFTX	**SPDIF Output Channel**
71	Out	I2STX_CLK	**I2S Output Clock** CMOS level signal, typical 3.3 for high, 0 for low.
72	Out	I2STX_MCLK	**I2S Output Clock** I2S_MCLKO can be configured to be 128/256/384*I2S_CKO through SPP registers CMOS level signal, typical 3.3 for high, 0 for low.
76~85	In	GPI[9:0]	**General Purpose Input Pins**
87	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.
88	In	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.
5,15,20,37,51,55,59,73,86	Power	AVCC_33	**Analog 3.3V Power Supply**
6,12,26,41,50,57,61,65,74,Thermal Pad	Power	AVSS	**Analog Ground**
7,25,42,64	Power	AVCC_12	**Analog 1.2V Power Supply**
18,38,53	Power	DVDD	**Digital 1.2V Power Supply**
19,40,52	Power	DGND	**Digital Ground**

39	Power	VDD_DDR	**Digital 1.8V Power Supply**
75	Power	VDDQ_DDR	**Digital 1.8V Power Supply**

2.0 PACKAGE DIMENSION

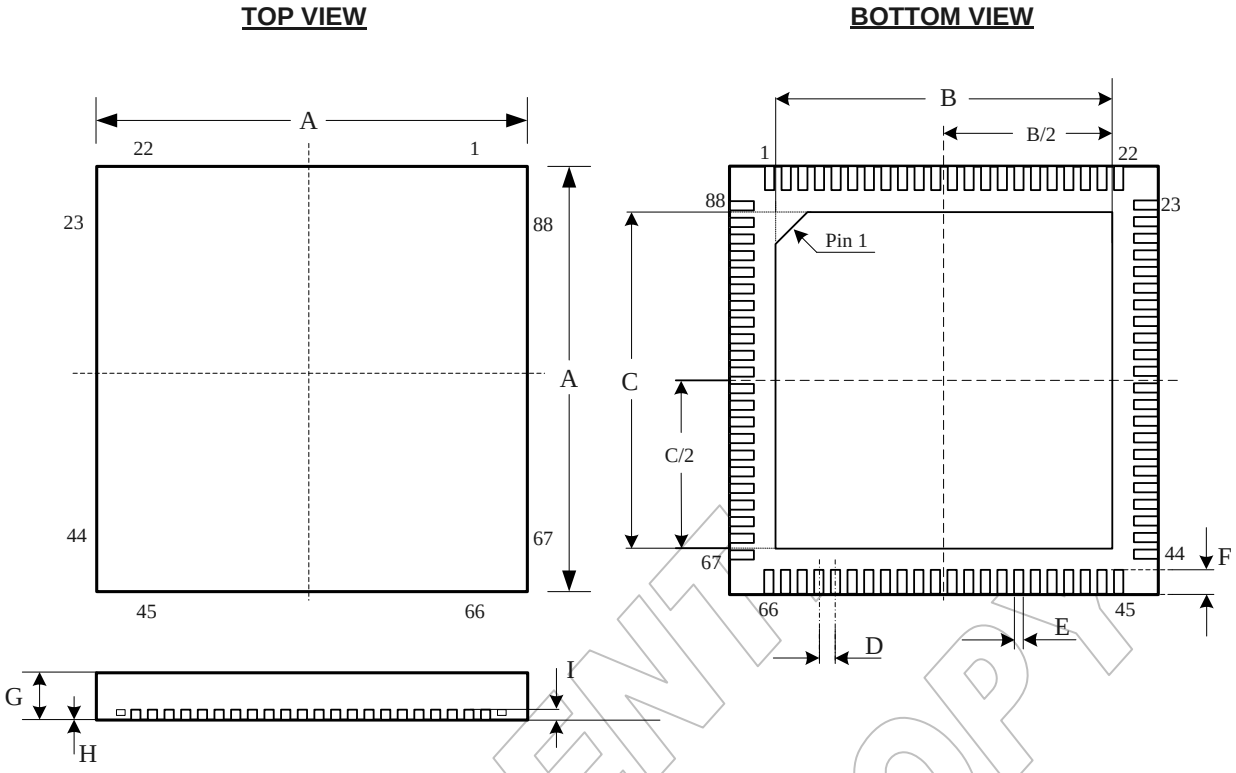

Figure 3: 88 Pin QFN Package (10 x 10 mm)

Table of Dimensions

No. of Leads		SYMBOL								
88 (10 X 10 mm)		A	B	C	D	E	F	G	H	I
Milli-meters	MIN	9.90	6.65	6.65	0.30	0.15	0.40	0.80	0	0.20
	NOM	10.00	6.75	6.75	0.40	0.20	0.50	0.85	-	
	MAX	10.10	6.85	6.85	0.50	0.25	0.60	0.90	0.05	

Notes:

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

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ORDERING INFORMATION

Part Number	Package Type	Operating Temperature Range	Minimum Order Quantity
CH7117A-BF	88 QFN, Lead-free	Commercial : 0 to 70°C	168/Tray

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