RTD2785T-CG

MULTI-FUNCTION DISPLAY CONTROLLER

DATASHEET

(CONFIDENTIAL: Development Partners Only)

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USING THIS DOCUMENT

This document is intended for the software engineer's reference and provides detailed programming information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide.

REVISION HISTORY

Revision	Release Date	Summary
0.01	2015/09/18	First release.

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1. General Description

The Realtek RTD2785T-CG monitor controller combines an analog RGB input interface, HDMI 2.0 compliant digital input interfaces with HDCP1.4/HDCP2.2, multiple DP1.2 digital input interfaces with HDCP1.4/HDCP2.2 and multiple HDMI1.4/MHL2.2/DVI digital input interfaces with HDCP1.4. The embedded MCU is based on an industrial standard 8051 core with external serial flash.

The RTD2785T-CG is suitable for multiple market segments and display applications, such as monitor, All in One PC, and embedded applications.

2. Features

General

- RTD2785T-CG supports input format up to 2560x1600 @ 60Hz, 2560x2048 @ 50Hz.
- Support multiple panel interfaces like LVDS, and eDP
- Zoom scaling up and down
- Embedded one MCU with SPI flash controller.
- It contains 4 ADCs in key pad application
- Require only one crystal to generate all timing.
- Programmable internal low-voltage-reset (LVR)
- High resolution 6 channels PWM output, and wide range selectable PWM frequency.

Crystal

- Support 14.318MHz crystal type

Analog RGB Input Interface

- 1 Analog input supported
- Integrated 8-bit triple-channel 210MHz ADC/PLL
- Embedded programmable Schmitt trigger of HSYNC
- Support Sync-On-Green (SOG) and various kinds of composite sync modes
- On-chip high-performance hybrid PLLs
- High resolution true 64 phase ADC PLL
- YPbPr support up to HDTV 1080p resolution

Ultra-High Speed Receiver

- RTD2785T-CG supports 1 ports of Ultra-High Speed Receiver can support DisplayPort1.2(5.4GHz, HBR2)
- In DisplayPort mode, three link layer speed HBR2 (5.4GHz), HBR (2.7GHz), RBR (1.62GHz) are supported
- In DisplayPort mode, 6-bit, 8-bit, 10-bit, and 12-bit color depth transport is supported
- In DisplayPort mode, High-Bandwidth Digital Content Protection (HDCP 1.4/HDCP2.2) is supported
- In DisplayPort mode, DisplayPort audio is allowed to transmit to I2S/SPDIF output

Ultra-High Speed Combo Receiver

- RTD2785T-CG supports 1 ports of Ultra-High Speed Combo Receivers.
- Each port can be configured as HDMI2.0, DisplayPort1.2(5.4GHz, HBR2),
- In HDMI mode, the latest HDMI2.0 is supported
- In HDMI mode, data enable only mode is supported
- In HDMI mode, 6-bit, 8-bit, 10-bit, and 12-bit color depth transport is supported
- In HDMI mode, High-Bandwidth Digital Content Protection (HDCP 1.4/HDCP2.2) is supported

- In HDMI mode, HDMI audio is allowed to transmit to I2S/SPDIF output
- In DisplayPort mode, the latest DisplayPort 1.2 is supported
- In DisplayPort mode, three link layer speed HBR2 (5.4GHz), HBR (2.7GHz), RBR (1.62GHz) are supported
- In DisplayPort mode, 6-bit, 8-bit, 10-bit, and 12-bit color depth transport is supported
- In DisplayPort mode, High-Bandwidth Digital Content Protection (HDCP 1.4/HDCP2.2) is supported
- In DisplayPort mode, HDMI audio is allowed to transmit to I2S/SPDIF output

High Speed Combo Receiver

- RTD2785T-CG supports 2 ports of High Speed Combo Receivers.
- Each port can be configured as HDMI1.4 (3GHz), MHL2.2 (3GHz), or DVI as desired
- In HDMI mode, HDMI1.4 is supported
- In HDMI mode, data enable only mode is supported
- In HDMI mode, 6-bit, 8-bit, 10-bit, and 12-bit color depth transport is supported
- In HDMI mode, High-Bandwidth Digital Content Protection (HDCP 1.4) is supported
- In HDMI mode, HDMI audio is allowed to transmit to I2S/SPDIF output
- In MHL mode, MHL2.2 is supported
- In MHL mode, High-Bandwidth Digital Content Protection (HDCP 1.4) is supported
- In MHL mode, packet pixel mode is supported
- In DVI mode, Digital Content Protection (HDCP 1.4) is supported
- In DVI mode, two adjacent receivers to support dual-link DVI with HDCP

Embedded MCU

- Industrial standard 8051 core with external serial flash
- Low speed ADC for various application
- I2C Master or Slave hardware supported

Auto Detection /Auto Calibration

- Input format detection
- Compatibility with standard VESA mode and support user-defined mode
- Smart engine for Phase/Image position/Color calibration

Audio

- Output: IIS , SPDIF
- Embedded Audio DAC
- Embedded headphone amp

Scaling

- Fully programmable zoom ratios
- Independent horizontal/vertical scaling
- Advanced zoom algorithm provides high image quality
- Sharpness/Smooth filter enhancement

- Support non-linear scaling from 4:3 to 16:9 or 16:9 to 4:3

Color Processor

- True 12-bit color processing engine
- Programmable 14-bit gamma support
- Programmable 12-bit 3D gamma support
- xvYCC supported
- Adobe/sRGB compliance
- Advanced dithering logic for the fewer panel color depth enhancement
- Dynamic overshoot-smear canceling engine
- Brightness and contrast control
- Peaking/Coring function for video sharpness
- Support UltraVivid III function to enhance image quality with minimal artificial effect on productivity applications
- Panel Uniformity (Brightness and color uniformity)

VividColorTM

- Independent color management (ICM)
- Dynamic contrast control (DCC)
- 2nd generation of Precise color mapping (PCM)
- Content adaptive backlight control (CABC)
- Support ADC Noise Reduction

Output Interface

- Support 8-bit / 10-bit output through LVDS
- Support 4-port LVDS with the speed of each port up to 93MHz
- Flexible data pair swapping for easier system design.
- Fixed Last Line output for perfect panel capability

Embedded OSD

- Embedded 128K SRAM dynamically stores OSD command and fonts
- Support multi-color RAM font, 1, 2 and 4-bit per pixel
- 64 color palette
- Maximum 26 window with alpha-blending /
- gradient / gradient target color / gradient reversed color/ dynamic fade-in/fade-out, bordering/ shadow
- Rotate 90,180,270 degree
- Independent row shadowing/bordering
- Programmable blinking effects for each character
- OSD-made internal pattern generator for factory mode
- Support 12x18 ~ 4x18 proportional font
- Hardware decompression for OSD font
- Support OSD scrolling
- Support 2 independent font based OSD

Frame Buufer Support

- LiveShow™ Function, High-performance RTC (response time compensation)
- Frame Rate Function

Power Supply

- 3.3V / 2.5V / 1.1V power supply

3. System Applications

- Display System on Motherboard, Monitor
- Display System for All in One PCs and embedded applications

4. Block Diagram

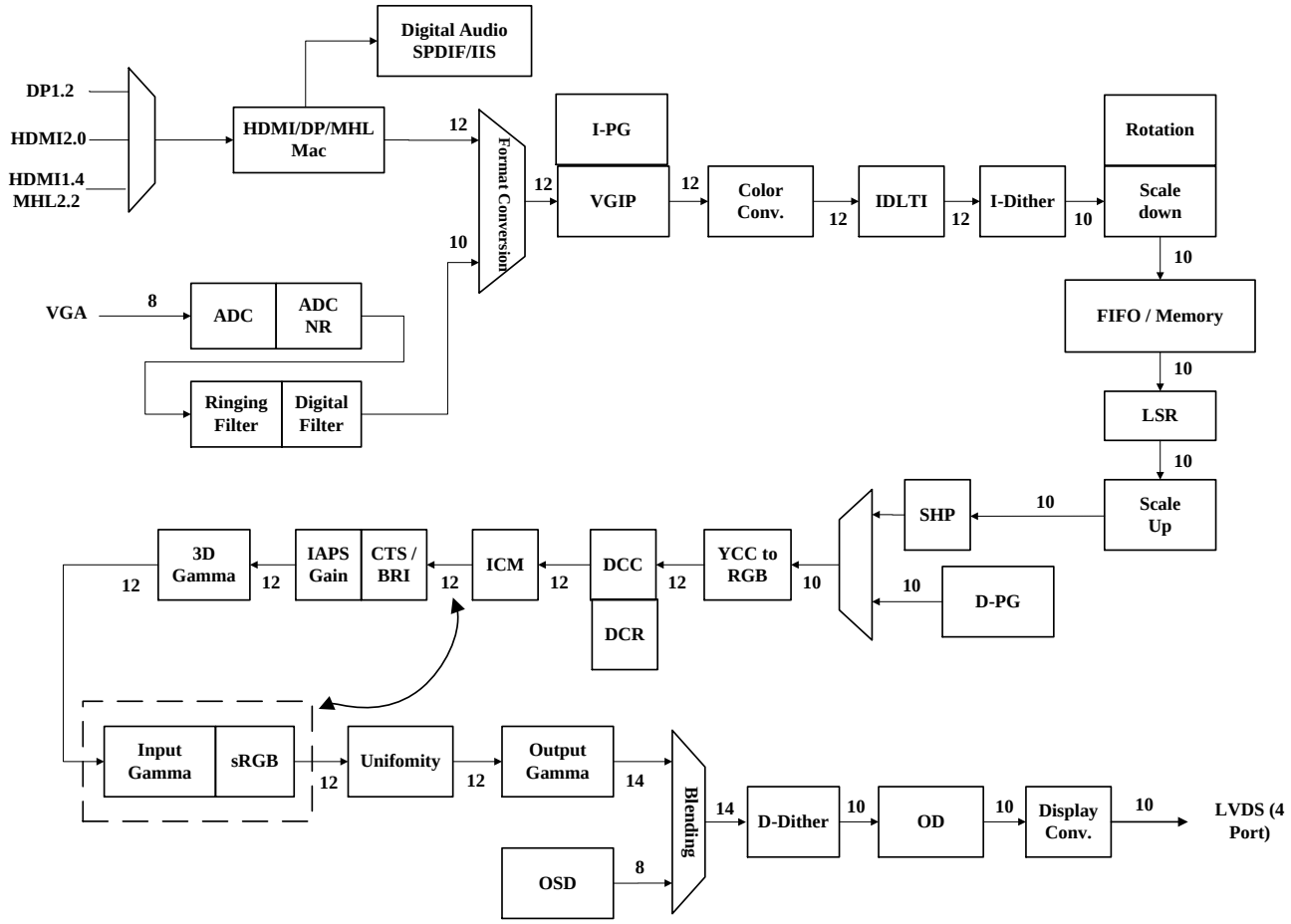

Figure 1. Data Path

5. Pin Assignments

LQFP216

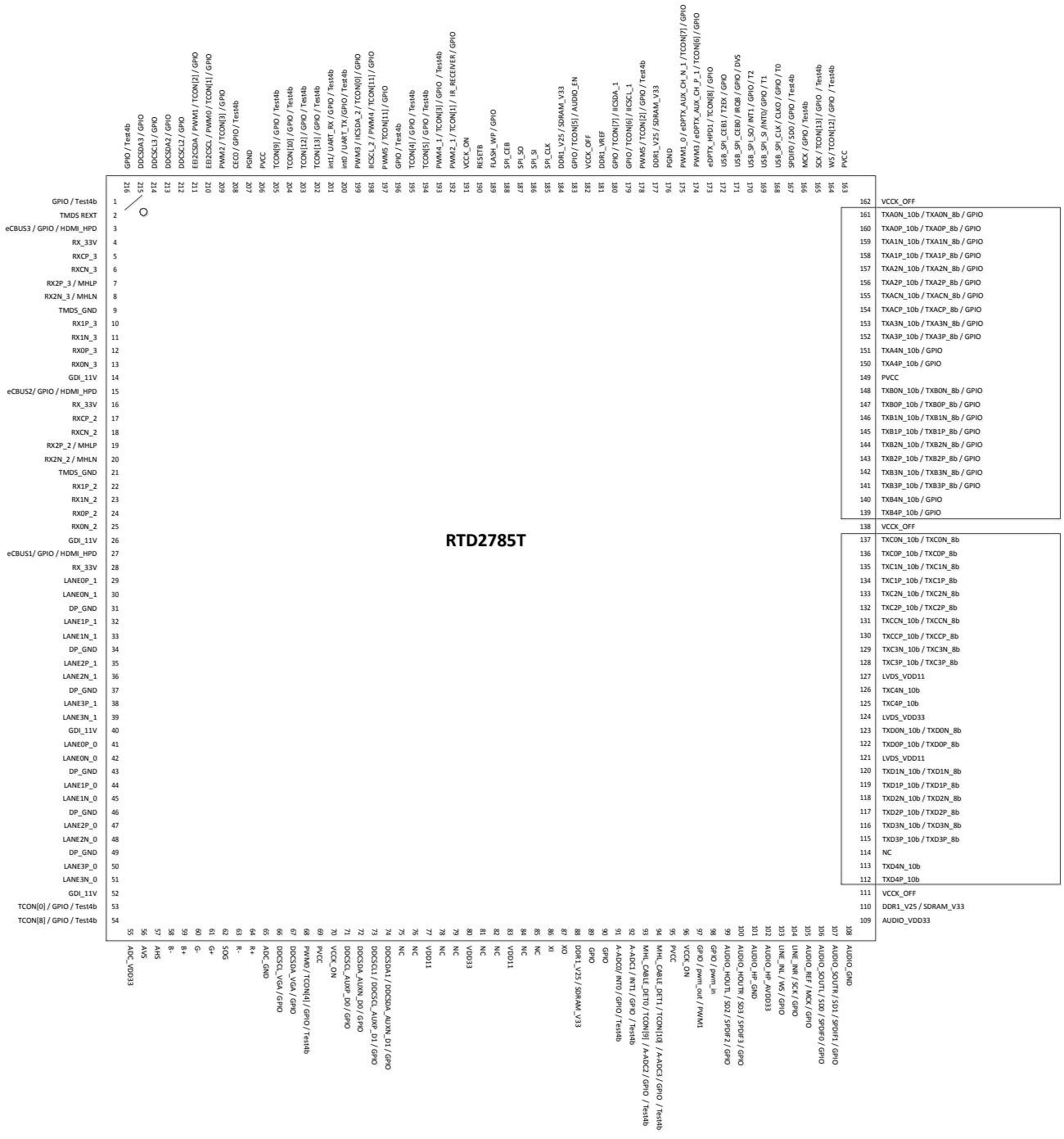

Figure 2. Pin Diagram of RTD2785T-CG

6. Pin Assignments Table

LQFP216 Pin Table

(I/O Legend: A = Analog, I = Input, O = Output, P = Power, G = Ground)

Table 1. Signals Pin Assignment of LQFP216

Pin Name	I/O	Pin #	Description	Note
GPIO / Test4b	IO	1	MCU_GPIO / Test4b	5V Tolerance when power off
TMDS REXT	AI	2	Impedance Match Resistor	12K ohm Reference to GND
eCBUS3 / GPIO / HDMI_HPD	AI O	3	MHL CBus / MCU_GPIO / HDMI Hot-plug	5V Tolerance when power off
RX_33V	AP	4	GDI 3.3V Power	(3.3V)
RXCP_3	AI	5	TMDS Differential Signal Input	
RXCN_3	AI	6	TMDS Differential Signal Input	
RX2P_3 / MHLP	AI	7	TMDS Differential Signal Input	
RX2N_3 / MHLN	AI	8	TMDS Differential Signal Input	
TMDS_GND	AG	9	TMDS Ground	
RX1P_3	AI	10	TMDS Differential Signal Input	
RX1N_3	AI	11	TMDS Differential Signal Input	
RX0P_3	AI	12	TMDS Differential Signal Input	
RX0N_3	AI	13	TMDS Differential Signal Input	
GDI_11V	AP	14	GDI 1.1V Power	(1.1V)
eCBUS2/ GPIO / HDMI_HPD	AI O	15	MHL CBus / MCU_GPIO / HDMI Hot-plug	5V Tolerance when power off
RX_33V	AP	16	GDI 3.3V Power	(3.3V)
RXCP_2	AI	17	TMDS Differential Signal Input	
RXCN_2	AI	18	TMDS Differential Signal Input	
RX2P_2 / MHLP	AI	19	TMDS Differential Signal Input	
RX2N_2 / MHLN	AI	20	TMDS Differential Signal Input	
TMDS_GND	AG	21	TMDS Ground	
RX1P_2	AI	22	TMDS Differential Signal Input	
RX1N_2	AI	23	TMDS Differential Signal Input	
RX0P_2	AI	24	TMDS Differential Signal Input	
RX0N_2	AI	25	TMDS Differential Signal Input	
GDI_11V	AP	26	GDI 1.1V Power	(1.1V)
eCBUS1/ GPIO / HDMI_HPD	AI O	27	MHL CBus / MCU_GPIO / HDMI Hot-plug	

RX_33V	AP	28	GDI 3.3V Power	(3.3V)
LANE0P_1	AI	29	DP Differential Signal Input / TMDS Differential Signal Input	
LANE0N_1	AI	30	DP Differential Signal Input / TMDS Differential Signal Input	
DP_GND	AG	31	DP Ground	
LANE1P_1	AI	32	DP Differential Signal Input / TMDS Differential Signal Input	
LANE1N_1	AI	33	DP Differential Signal Input / TMDS Differential Signal Input	
DP_GND	AG	34	DP Ground	
LANE2P_1	AI	35	DP Differential Signal Input / TMDS Differential Signal Input	
LANE2N_1	AI	36	DP Differential Signal Input / TMDS Differential Signal Input	
DP_GND	AG	37	DP Ground	
LANE3P_1	AI	38	DP Differential Signal Input / TMDS Differential Signal Input	
LANE3N_1	AI	39	DP Differential Signal Input / TMDS Differential Signal Input	
GDI_11V	AP	40	GDI 1.1V Power	(1.1V)
LANE0P_0	AI	41	DP Differential Signal Input	
LANE0N_0	AI	42	DP Differential Signal Input	
DP_GND	AG	43	DP Ground	
LANE1P_0	AI	44	DP Differential Signal Input	
LANE1N_0	AI	45	DP Differential Signal Input	
DP_GND	AG	46	DP Ground	
LANE2P_0	AI	47	DP Differential Signal Input	
LANE2N_0	AI	48	DP Differential Signal Input	
DP_GND	AG	49	DP Ground	
LANE3P_0	AI	50	DP Differential Signal Input	
LANE3N_0	AI	51	DP Differential Signal Input	
GDI_11V	AP	52	GDI 1.1V Power	(1.1V)
TCON[0] / GPIO / Test4b	IO	53	TCON / MCU_GPIO / Test4b	5V Tolerance when power off
TCON[8] / GPIO / Test4b	IO	54	TCON / MCU_GPIO / Test4b	5V Tolerance when power off
ADC_VDD33	AP	55	ADC 3.3V Power	(3.3V)
AVS	AI	56	ADC Vertical Sync Input	5V Tolerance when power off
AHS	AI	57	ADC Horizontal Sync Input	5V Tolerance

				when power off
B-	AI	58	Negatice Blue analog input (Pb-)	3.3V Tolerance
B+	AI	59	Positive Blue analog input (Pb+)	3.3V Tolerance
G-	AI	60	Negatice Green analog input (Y-)	3.3V Tolerance
G+	AI	61	Positive Green analog input (Y+)	3.3V Tolerance
SOG	AI	62	Sync-On-Green	3.3V Tolerance
R-	AI	63	Negative RED analog input (Pr-)	3.3V Tolerance
R+	AI	64	Positive RED analog input (Pr+)	3.3V Tolerance
ADC_GND	AG	65	ADC Ground	
DDCSCL_VGA / GPIO	IO	66	DDC VGA (Open drain I/O) / MCU GPIO	5V Tolerance when power off
DDCSDA_VGA / GPIO	IO	67	DDC VGA (Open drain I/O) / MCU GPIO	5V Tolerance when power off
PWM0 / TCON[4] / GPIO / Test4b	IO	68	PWM / TCON / MCU_GPIO / Test4b	5V Tolerance when power off
PVCC	DP	69	Pad Power	(3.3V)
VCCK_ON	DP	70	Core Power	(1.1V)
DDCSCL_AUXP_D0 / GPIO	IO	71	AUX-CH / MCU GPIO	5V Tolerance when power off
DDCSDA_AUXN_D0 / GPIO	IO	72	AUX-CH / MCU GPIO	5V Tolerance when power off
DDCSCL1 / DDCSCL_AUXP_D1 / GPIO	IO	73	DDC Channel (Open drain I/O) / DPRX AUX-CH / MCU GPIO	5V Tolerance when power off
DDCSDA1 / DDCSDA_AUXN_D1 / GPIO	IO	74	DDC Channel (Open drain I/O) / DPRX AUX-CH / MCU GPIO	5V Tolerance when power off
NC	NC	75	NC Pin	
NC	NC	76	NC Pin	
DPTX_VDD11	AP	77	1.1V Power	(1.1V)
NC	NC	78	NC Pin	
NC	NC	79	NC Pin	

DPTX_VDD33	AP	80	3.3V Power	(3.3V)
NC	NC	81	NC Pin	
NC	NC	82	NC Pin	
DPTX_VDD11	AP	83	1.1V Power	(1.1V)
NC	NC	84	NC Pin	
NC	NC	85	NC Pin	
XI	AI	86	Crystal Input	3.3V Tolerance
XO	AO	87	Crystal Output	3.3V Tolerance
DDR1_V25 / SDRAM_V33	AP	88	DDR1 2.5V Power / SDR 3.3V Power	(2.5V / 3.3V)
GPIO	IO	89	MCU GPIO	3.3V Tolerance
GPIO	IO	90	MCU GPIO	3.3V Tolerance
A-ADC0/ INT0 / GPIO / Test4b	AI O	91	5bits MCU ADC Input / MCU EXINT / MCU GPIO / Test4b	3.3 V tolerance when using ADC Input; 5V Tolerance power on when using GPIO
A-ADC1 / INT1 / GPIO / Test4b	AI O	92	5bits MCU ADC Input / MCU EXINT / MCU GPIO / Test4b	3.3 V tolerance when using ADC Input; 5V Tolerance power on when using GPIO
MHL_CABLE_DET0 / TCON[9] / A-ADC2 / GPIO / Test4b	AI O	93	MHL_Cable_Detect / TCON / 5bits MCU ADC Input / MCU GPIO / Test4b	3.3 V tolerance when using ADC Input; 5V Tolerance power on when using GPIO
MHL_CABLE_DET1 / TCON[10] / A-ADC3 / GPIO / Test4b	AI O	94	MHL_Cable_Detect / TCON / 5bits MCU ADC Input / MCU GPIO / Test4b	3.3 V tolerance when using ADC Input; 5V Tolerance

				power on when using GPIO
PVCC	DP	95	Pad Power	(3.3V)
VCCK_ON	DP	96	Core Power	(1.1V)
GPIO / pwm_out / PWM1	IO	97	MCU GPIO / PWM_OUT / PWM	5V Tolerance when power off
GPIO / pwm_in	IO	98	MCU GPIO / PWM_IN	5V Tolerance when power off
AUDIO_HOUTL / SD2 / SPDIF2 / GPIO	AIO	99	AUDIO_HOUTL / I2S / SPDIF / MCU GPIO	3.3V Tolerance
AUDIO_HOUTR / SD3 / SPDIF3 / GPIO	AIO	100	AUDIO_HOUTL / I2S / SPDIF / MCU GPIO	3.3V Tolerance
AUDIO_HP_GND	AG	101	AUDIO HP Ground	
AUDIO_HP_AVDD33	AP	102	AUDIO HP 3.3V Power	(3.3V)
LINE_INL / WS / GPIO	AIO	103	LINE_INL / I2S / MCU GPIO	3.3V Tolerance
LINE_INR / SCK / GPIO	AIO	104	LINE_INR / I2S / MCU GPIO	3.3V Tolerance
AUDIO_REF / MCK / GPIO	AIO	105	AUDIO_REF / I2S / MCU GPIO	3.3V Tolerance
AUDIO_SOUTL / SD0 / SPDIF0 / GPIO	AIO	106	AUDIO_SOUTL / I2S / SPDIF / MCU GPIO	3.3V Tolerance
AUDIO_SOUTR / SD1 / SPDIF1 / GPIO	AIO	107	AUDIO_SOUTR / I2S / SPDIF / MCU GPIO	3.3V Tolerance
AUDIO_GND	AG	108	Audio DAC Ground	
AUDIO_VDD33	AP	109	Audio DAC 3.3V Power	(3.3V)
DDR1_V25 / SDRAM_V33	AP	110	DDR1 2.5V Power / SDR 3.3V Power	(2.5V / 3.3V)
VCCK_OFF	DP	111	Core Power	(1.1V)
TXD4P_10b	AO	112	LVDS	3.3V Tolerance
TXD4N_10b	AO	113	LVDS	3.3V Tolerance
NC	NC	114	NC Pin	
TXD3P_10b / TXD3P_8b	AO	115	LVDS	3.3V Tolerance
TXD3N_10b /	AO	116	LVDS	3.3V

TXD3N_8b				Tolerance
TXD2P_10b / TXD2P_8b	AO	117	LVDS	3.3V Tolerance
TXD2N_10b / TXD2N_8b	AO	118	LVDS	3.3V Tolerance
TXD1P_10b / TXD1P_8b	AO	119	LVDS	3.3V Tolerance
TXD1N_10b / TXD1N_8b	AO	120	LVDS	3.3V Tolerance
LVDS_VDD11	AP	121	LVDS 1.1V Power	(1.1V)
TXD0P_10b / TXD0P_8b	AO	122	LVDS	3.3V Tolerance
TXD0N_10b / TXD0N_8b	AO	123	LVDS	3.3V Tolerance
LVDS_VDD33	AP	124	LVDS 3.3V Power	(3.3V)
TXC4P_10b	AO	125	LVDS	3.3V Tolerance
TXC4N_10b	AO	126	LVDS	3.3V Tolerance
LVDS_VDD11	AP	127	LVDS 1.1V Power	(1.1V)
TXC3P_10b / TXC3P_8b	AO	128	LVDS	3.3V Tolerance
TXC3N_10b / TXC3N_8b	AO	129	LVDS	3.3V Tolerance
TXCCP_10b / TXCCP_8b	AO	130	LVDS	3.3V Tolerance
TXCCN_10b / TXCCN_8b	AO	131	LVDS	3.3V Tolerance
TXC2P_10b / TXC2P_8b	AO	132	LVDS	3.3V Tolerance
TXC2N_10b / TXC2N_8b	AO	133	LVDS	3.3V Tolerance
TXC1P_10b / TXC1P_8b	AO	134	LVDS	3.3V Tolerance
TXC1N_10b / TXC1N_8b	AO	135	LVDS	3.3V Tolerance
TXC0P_10b / TXC0P_8b	AO	136	LVDS	3.3V Tolerance
TXC0N_10b / TXC0N_8b	AO	137	LVDS	3.3V Tolerance
VCCK_OFF	DP	138	Core Power	(1.1V)
TXB4P_10b / GPIO	AIO	139	LVDS / MCU GPIO	3.3V Tolerance
TXB4N_10b / GPIO	AIO	140	LVDS / MCU GPIO	3.3V Tolerance

TXB3P_10b / TXB3P_8b / GPIO	AI O	141	LVDS / MCU GPIO	3.3V Tolerance
TXB3N_10b / TXB3N_8b / GPIO	AI O	142	LVDS / MCU GPIO	3.3V Tolerance
TXB2P_10b / TXB2P_8b / GPIO	AI O	143	LVDS / MCU GPIO	3.3V Tolerance
TXB2N_10b / TXB2N_8b / GPIO	AI O	144	LVDS / MCU GPIO	3.3V Tolerance
TXB1P_10b / TXB1P_8b / GPIO	AI O	145	LVDS / MCU GPIO	3.3V Tolerance
TXB1N_10b / TXB1N_8b / GPIO	AI O	146	LVDS / MCU GPIO	3.3V Tolerance
TXB0P_10b / TXB0P_8b / GPIO	AI O	147	LVDS / MCU GPIO	3.3V Tolerance
TXB0N_10b / TXB0N_8b / GPIO	AI O	148	LVDS / MCU GPIO	3.3V Tolerance
PVCC	DP	149	Pad Power	(3.3V)
TXA4P_10b / GPIO	AI O	150	LVDS / MCU GPIO	3.3V Tolerance
TXA4N_10b / GPIO	AI O	151	LVDS / MCU GPIO	3.3V Tolerance
TXA3P_10b / TXA3P_8b / GPIO	AI O	152	LVDS / MCU GPIO	3.3V Tolerance
TXA3N_10b / TXA3N_8b / GPIO	AI O	153	LVDS / MCU GPIO	3.3V Tolerance
TXACP_10b / TXACP_8b / GPIO	AI O	154	LVDS / MCU GPIO	3.3V Tolerance
TXACN_10b / TXACN_8b / GPIO	AI O	155	LVDS / MCU GPIO	3.3V Tolerance
TXA2P_10b / TXA2P_8b / GPIO	AI O	156	LVDS / MCU GPIO	3.3V Tolerance
TXA2N_10b / TXA2N_8b / GPIO	AI O	157	LVDS / MCU GPIO	3.3V Tolerance
TXA1P_10b / TXA1P_8b / GPIO	AI O	158	LVDS / MCU GPIO	3.3V Tolerance
TXA1N_10b / TXA1N_8b / GPIO	AI O	159	LVDS / MCU GPIO	3.3V Tolerance
TXA0P_10b / TXA0P_8b / GPIO	AI O	160	LVDS / MCU GPIO	3.3V Tolerance
TXA0N_10b / TXA0N_8b / GPIO	AI O	161	LVDS / MCU GPIO	3.3V Tolerance
VCCK_OFF	DP	162	Core Power	(1.1V)
PVCC	DP	163	Pad Power	(3.3V)
WS / TCON[12] / GPIO / Test4b	IO	164	I2S / TCON / MCU GPIO / Test4b	5V Tolerance when power

				off
SCK / TCON[13] / GPIO / Test4b	IO	165	I2S / TCON / MCU GPIO / Test4b	5V Tolerance when power off
MCK / GPIO / Test4b	IO	166	I2S / MCU GPIO / Test4b	5V Tolerance when power off
SPDIF0 / SD0 / GPIO / Test4b	IO	167	SPDIF / I2S / MCU GPIO / Test4b	5V Tolerance when power off
USB_SPI_CLK / CLKO / GPIO / T0	IO	168	SPI Serial Clock / CLKO / MCU GPIO / Timer	5V Tolerance when power off
USB_SPI_SI /INT0/ GPIO / T1	IO	169	SPI Serial Data Input / MCU EXINT / MCU GPIO / Timer	5V Tolerance when power off
USB_SPI_SO/ INT1 / GPIO / T2	IO	170	SPI Serial Data Output / MCU EXINT / MCU GPIO / Timer	5V Tolerance when power off
USB_SPI_CEB0 / IRQB / GPIO / DVS	IO	171	SPI Chip Enable / IRQB / MCU GPIO / DVS	5V Tolerance when power off
USB_SPI_CEB1 / T2EX / GPIO	IO	172	SPI Chip Enable / T2EX / MCU GPIO	5V Tolerance when power off
eDPTX_HPD1 / TCON[8] / GPIO	IO	173	eDPTX_HPD / TCON / MCU GPIO	5V Tolerance when power off
PWM3 / eDPTX_AUX_CH_P_1 / TCON[6] / GPIO	IO	174	PWM / eDPTX AUX / TCON / MCU GPIO	5V Tolerance when power off
PWM1_0 / eDPTX_AUX_CH_N_1 / TCON[7] / GPIO	IO	175	PWM / eDPTX AUX / TCON / MCU GPIO	5V Tolerance when power off
PGND	DP	176	Pad Ground	
DDR1_V25 / SDRAM_V33	AP	177	DDR1 2.5V Power / SDR 3.3V Power	(2.5V / 3.3V)
PWM5 / TCON[2] / GPIO / Test4b	IO	178	PWM / TCON / MCU GPIO / Test4b	5V Tolerance when power off
GPIO / TCON[6] / IICSCL_1	IO	179	MCU GPIO / TCON / IIC BUS	5V Tolerance when power off

GPIO / TCON[7] / IICSDA_1	IO	180	MCU GPIO / TCON / IIC BUS	5V Tolerance when power off
DDR1_VREF	AP	181	DDR1 1.25V Vref Power	(1.25V)
VCCK_OFF	DP	182	Core Power	(1.1V)
GPIO / TCON[5] / AUDIO_EN	IO	183	MCU GPIO / TCON	5V Tolerance when power off
DDR1_V25 / SDRAM_V33	AP	184	DDR1 2.5V Power / SDR 3.3V Power	(2.5V / 3.3V)
SPI_CLK	IO	185	SPI flash serial clock	3.3V Tolerance
SPI_SI	IO	186	SPI flash serial Data Input	3.3V Tolerance
SPI_SO	IO	187	SPI flash serial Data Output	3.3V Tolerance
SPI_CEB	IO	188	SPI flash Chip Enable	3.3V Tolerance
FLASH_WP / GPIO	IO	189	FLASH Write Protect / MCU GPIO	3.3V Tolerance
RESETB	I	190	Chip reset bar	Low active; 5V tolerance even when power-off
VCCK_ON	DP	191	Core Power	(1.1V)
PWM2_1 / TCON[1] / IR_RECEIVER / GPIO	IO	192	PWM / TCON / IR Receiver / MCU GPIO	5V Tolerance when power off
PWM4_1 / TCON[3] / GPIO / Test4b	IO	193	PWM / TCON / MCU GPIO / Test4b	5V Tolerance when power off
TCON[5] / GPIO / Test4b	IO	194	TCON / MCU GPIO / Test4b	5V Tolerance when power off
TCON[4] / GPIO / Test4b	IO	195	TCON / MCU GPIO / Test4b	5V Tolerance when power off
GPIO / Test4b	IO	196	GPIO / Test4b	5V Tolerance when power off
PWM5 / TCON[11] / GPIO	IO	197	PWM / TCON / MCU GPIO	5V Tolerance when power off
IICSCL_2 / PWM4	IO	198	IIC BUS / PWM / TCON / MCU	5V Tolerance

/ TCON[11] / GPIO			GPIO	when power off
PWM3 / IICSDA_2 / TCON[0] / GPIO	IO	199	PWM / IIC BUS / TCON / MCU GPIO	5V Tolerance when power off
int0 / UART_TX /GPIO / Test4b	IO	200	MCU EXINT / UART TX / MCU GPIO / Test4b	5V Tolerance when power off
int1/ UART_RX / GPIO / Test4b	IO	201	MCU EXINT / UART RX / MCU GPIO / Test4b	5V Tolerance when power off
TCON[13] / GPIO / Test4b	IO	202	TCON / MCU GPIO / Test4b	5V Tolerance when power off
TCON[12] / GPIO / Test4b	IO	203	TCON / MCU GPIO / Test4b	5V Tolerance when power off
TCON[10] / GPIO / Test4b	IO	204	TCON / MCU GPIO / Test4b	5V Tolerance when power off
TCON[9] / GPIO / Test4b	IO	205	TCON / MCU GPIO / Test4b	5V Tolerance when power off
PVCC	DP	206	Pad Power	(3.3V)
PGND	DG	207	Pad Ground	
CEC0 / GPIO / Test4b	IO	208	CEC / MCU GPIO / Test4b	5V Tolerance power on
PWM2 / TCON[3] / GPIO	IO	209	PWM / TCON / MCU GPIO	3.3V Tolerance
EEI2CSCL / PWM0 / TCON[1] / GPIO	IO	210	EEprome IIC BUS / PWM / TCON / MCU GPIO	3.3V Tolerance
EEI2CSDA / PWM1 / TCON[2] / GPIO	IO	211	EEprome IIC BUS / PWM / TCON / MCU GPIO	3.3V Tolerance
DDCSCL2 / GPIO	IO	212	DDC Channel (Open drain I/O) / MCU GPIO	5V Tolerance when power off
DDCSDA2 / GPIO	IO	213	DDC Channel (Open drain I/O) / MCU GPIO	5V Tolerance when power off
DDCSCL3 / GPIO	IO	214	DDC Channel (Open drain I/O) / MCU GPIO	5V Tolerance when power off
DDCSDA3 / GPIO	IO	215	DDC Channel (Open drain I/O) /	5V Tolerance

			MCU GPIO	when power off
GPIO / Test4b	IO	216	MCU GPIO / Test4b	5V Tolerance when power off

7. Electrical Specifications

Electrical Specifications
LQFP216 DC Characteristics (RTD2785T-CG)

7.1. Recommended Operating Conditions

Table 2. Recommended Operating Conditions of LQFP216

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Voltage on Input (5V tolerance)	V_{IN}	-1		5	V
Supply Voltage	PVCC	3.14	3.30	3.47	V
DDR Voltage	2.5V_DDR	2.38	2.5	2.63	V
Core Power On Voltage	VCCK_ON	1.05	1.1	1.15	V
Core Power Off Voltage	VCCK_OFF	1.05	1.1	1.15	V
Electrostatic Discharge	V_{ESD}			±2.5	kV
Latch-Up	I_{LA}			±100	mA
Ambient Operating Temperature	T_A	0		70	ºC
Storage Temperature (plastic)	T_{STG}	-55		110	ºC
Thermal Resistance (Junction to Air)	θ_{JA}		26.0		ºC/W
Thermal Resistance (Junction to Case)	θ_{JC}		9.9		ºC/W
Junction Acceptable Temperature	T_j			125	ºC

7.2. Absolute Maximum Ratings

Table 3. Absolute Maximum Ratings of LQFP216

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Supply Voltage	PVCC			3.6	V
Storage Temperature (plastic)	T_{STG}			150	ºC
Junction Acceptable Temperature	T_j			125	ºC

Note : Operation under the absolute maximum ratings does not imply well-functioning. Long-term stress to the absolute maximum ratings would probably affect the device reliability or further cause permanent damage.

7.3. Reset Period

Table 4. Reset Period of LQFP216

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Reset Pulse Period	Trst-en[1]	1120			ns
Power-on-Reset Period	Tpor-rst[2]	145	146.5	148	ms

1. 16 * Xtal_cycle(1/14.3Mhz)
2. 65536*16*2*Xtal_cycle(1/14.3Mhz)

8. Mechanical Specifications

Low Profile Plastic Quad Flat Package 216 Leads

24x24mm^2 Outline

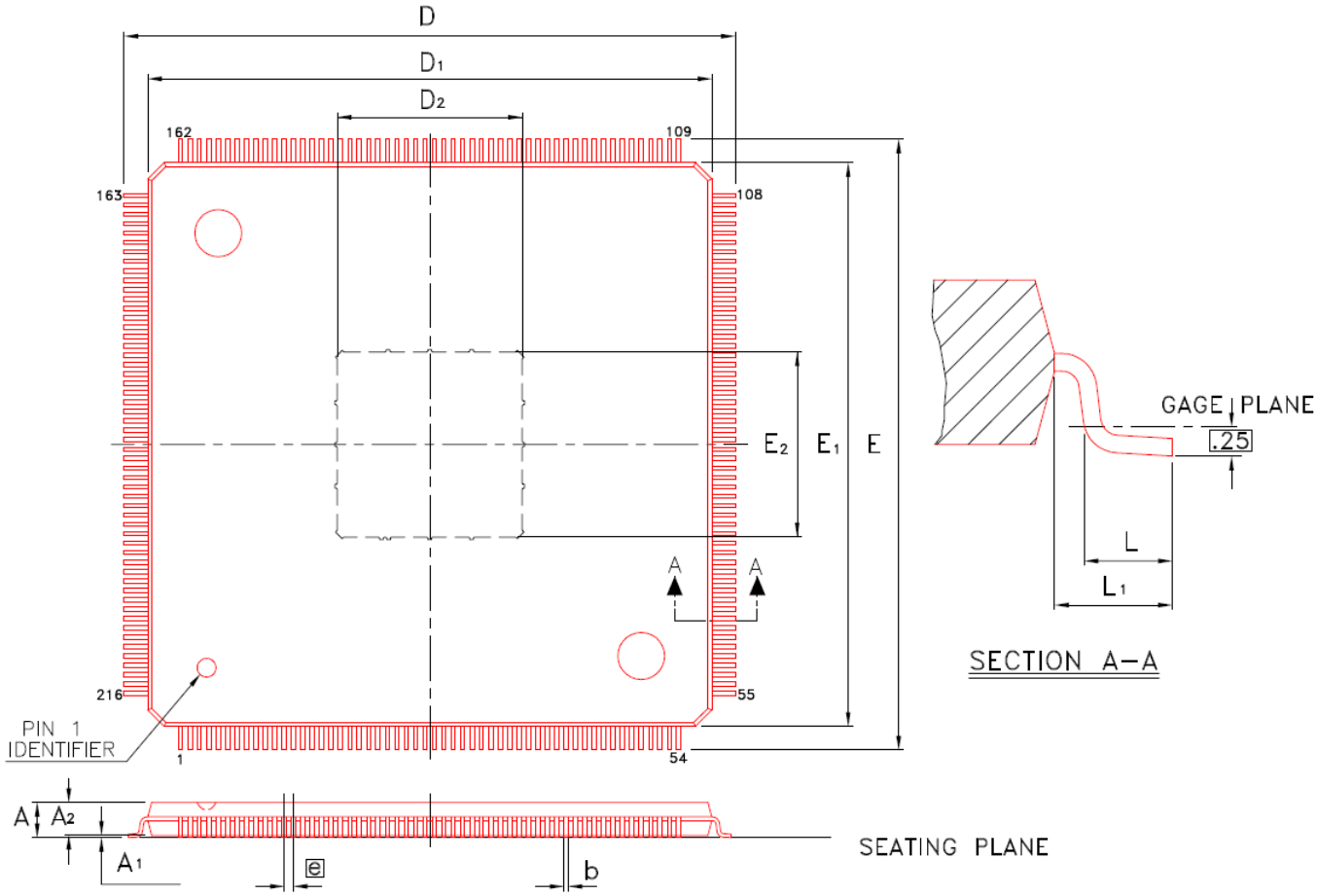

Figure 3. Mechanical Specification of LQFP216 Leads

Symbol	Dimension in mm			Dimension in inch		
	Min	Nom	Max	Min	Nom	Max
A	—	—	1.60	—	—	0.063
A_1	0.05	—	0.15	0.002	—	0.006
A_2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.13	0.18	0.23	0.005	0.007	0.009
D/E	26.00 BSC			1.024 BSC		
D_1/E_1	24.00 BSC			0.945 BSC		
D_2/E_2	7.62	7.87	8.12	0.300	0.310	0.320
e	0.40 BSC			0.016 BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00 REF			0.039 REF		

Notes：

1. CONTROLLING DIMENSION：MILLIMETER(mm).
2. REFERENCE DOCUMENTL：JEDEC MS-26.

Table 5. Mechanical Specification of LQFP216 Leads

9. Ordering Information

Table 6. Ordering Information

Part No.	Max. Resolution	Input : VGA	Input : DP1.2 HBR2	Input : DP1.2 HBR2/ HDMI2.0	Input : HDII1.4/ MHL2.1/ DVI	Output : LVDS	FRC	OD	PKG
RTD2785T -CG	2560x1600 @60Hz	●	1 Ports	1 Ports	2 Ports	●	●	●	QFP216

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