# RTD2797P-CG

# MULTI-FUNCTION DISPLAY CONTROLLER

# DATASHEET

**Rev. 0.9**
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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 |
|---|---|---|
| 0.9 | 2015/09/01 | First release. |
| | | |

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# 1. General Description

The Realtek RTD2797P-CG monitor controller combines an analog RGB input interface, multiple HDMI 2.0 compliant digital input interfaces with HDCP1.4/HDCP2.2, multiple DP1.2 digital input interfaces with HDCP1.4, and multiple MHL2.2 digital input interfaces with HDCP1.4. The embedded MCU is based on an industrial standard 8051 core with external serial flash.

The RTD2797P-CG is suitable for multiple market segments and display applications, such as monitor, All in One PC, and embedded applications.

# 2. Features

### General

- RTD2797P-CG supports input format up to 4096x2160 @ 60Hz.
- RTD2797P-CG supports one analog RGB input and six multiple-digital-interface combo inputs
- Support multiple panel interfaces like, V-by-One, and eDP
- RTD2797P-CG supports PIP / PBP and 4P function
- 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 Combo Receiver

- 4 ports of Ultra-High Speed Combo Receivers.
- Support two HDMI2.0 (6GHz), and two 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) is supported
- In DisplayPort mode,DisplayPort audio is allowed to transmit to I2S/SPDIF output

**High Speed Combo Receiver**

- RTD2797P-CG supports 2 ports of High Speed Combo Receivers.
- Each port can be configured as HDMI1.4 (3GHz), MHL2.1 (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, MHL2.1 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)

**VividColor™**

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

**Embedded DDR3 Controller**

- RTD2797P-CG support maximal 2 external 16-bit DDR3 DRAM
- Support DDR3 speed up to 1.6GHz
- Support 90 degree image rotation: Portrait-to-Landscape or Landscape-to-Portrait
- LiveShow™ Function, High-performance RTC (response time compensation).
- Frame Rate Control Function
- RTD2797P-CG supports PIP / PBP and 4P function

**Output Interface**

- Support 8-bit / 10-bit output through either RTD2797P, V-by-1, or eDP
- RTD2797P-CG supports 8-lane V-by-One or 8-lane eDP (HBR) with the output format up to 4k2k (4096x2160 @ 60Hz).
- Support 4-lane eDP (HBR2) with the output format up to 4096x2160 @ 60Hz.
- Fully programmable display timing generator
- Flexible data pair swapping for easier system design.
- Fixed Last Line output for perfect panel capability

**Embedded OSD**

- Embedded 64K 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

**Power Supply**

- 3.3V / 1.5V / 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

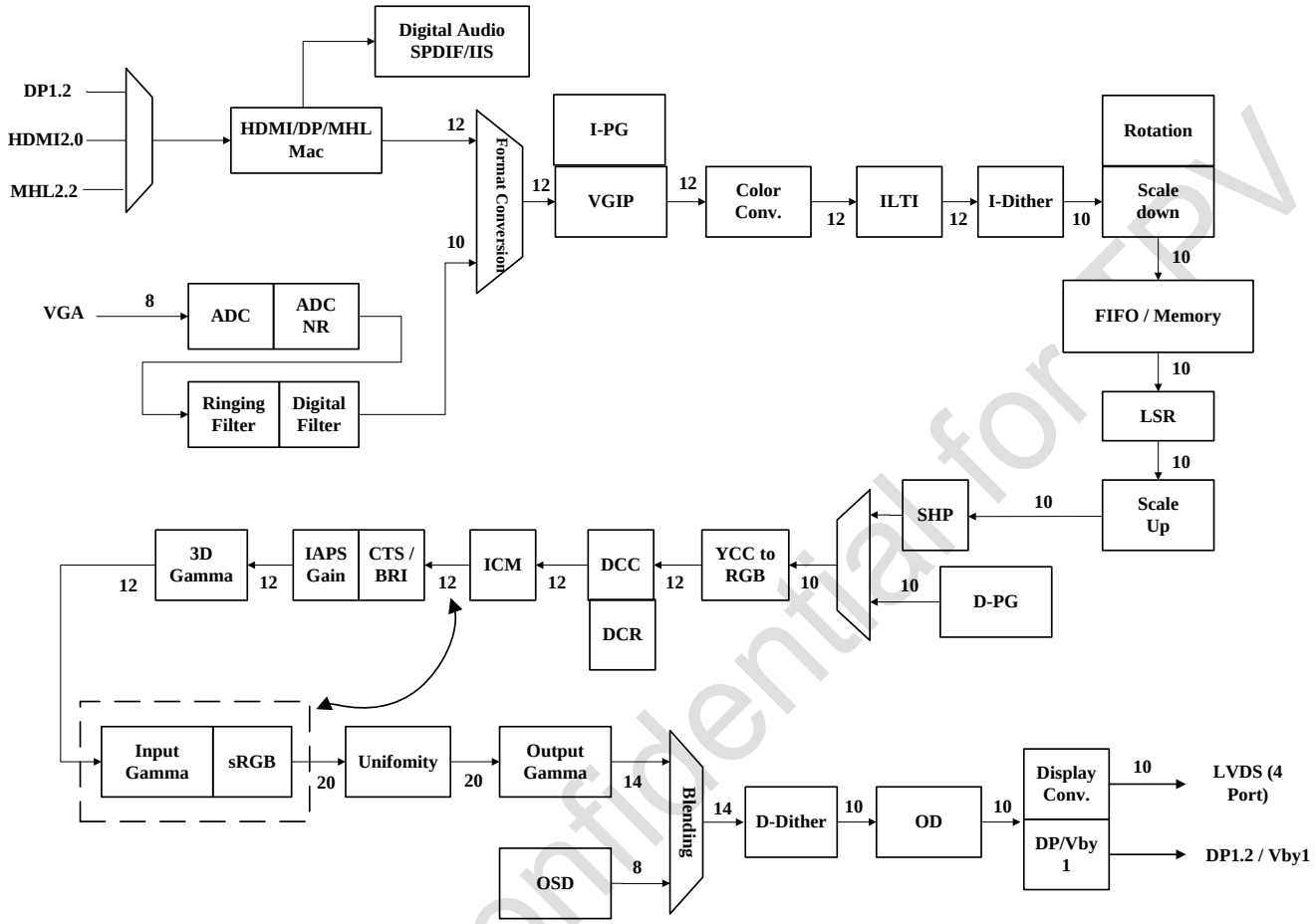


**Figure 1. Data Path**

# 5. Pin Assignments

## 1024 Ball EDHS BGA

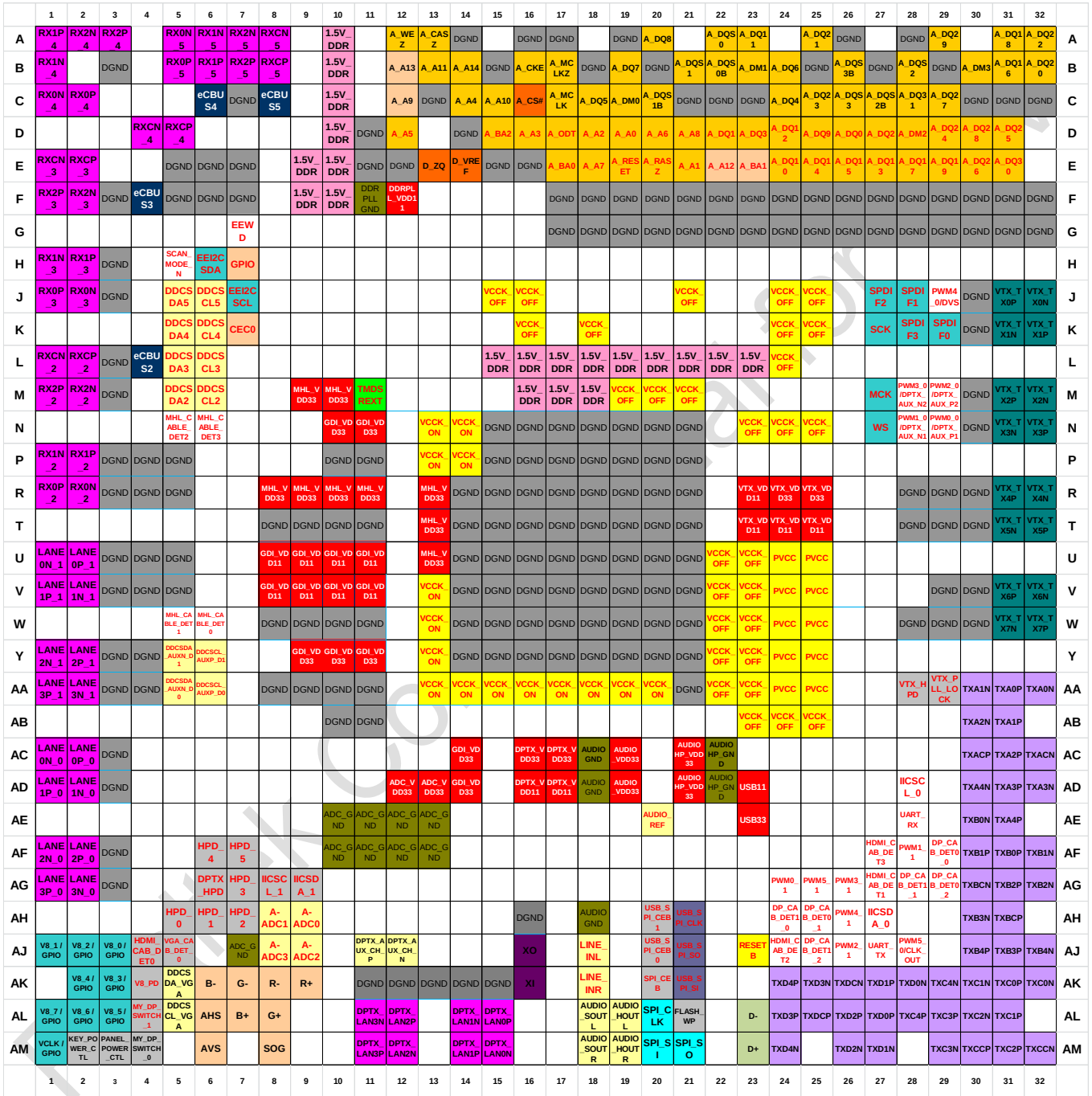

**Figure 2. Ball Diagram of EDHS BGA**

Ball Diagram of RTD2797P-CG

# 6. Pin Assignments Table

## EDHS BGA Pin Table

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

Signals Total : 318 balls

**Table 1. Signals Pin Assignment of EDHS BGA**

| Pin Name | I/O | Pin # | Description | Note |
|---|---|---|---|---|
| TMDS REXT | AI | M11 | Impedance Match Reference Resistor<br>For Scan mode,it should be pulled high | Ref value:<br>12 K ohm<br>(Reference to GND) |
| eCBUS5 | AIO | C8 | MHL eCBUS 5 / Hot Plug Detect 5<br>/ MCU GPIO | 5V tolerance even when power-off |
| RXCP_5 | AI | B8 | TMDS Differential Signal Input | 3.3V tolerance |
| RXCN_5 | AI | A8 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2P_5 | AI | B7 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2N_5 | AI | A7 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1P_5 | AI | B6 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1N_5 | AI | A6 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0P_5 | AI | B5 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0N_5 | AI | A5 | TMDS Differential Signal Input | 3.3V tolerance |
| eCBUS4 | AIO | C6 | MHL eCBUS 4 / Hot Plug Detect 4<br>/ MCU GPIO | 5V tolerance even when power-off |
| RXCP_4 | AI | D5 | TMDS Differential Signal Input | 3.3V tolerance |
| RXCN_4 | AI | D4 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2P_4 | AI | A3 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2N_4 | AI | A2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1P_4 | AI | A1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1N_4 | AI | B1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0P_4 | AI | C2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0N_4 | AI | C1 | TMDS Differential Signal Input | 3.3V tolerance |
| eCBUS3 | AIO | F4 | MHL eCBUS 3 / Hot Plug Detect 3<br>/ MCU GPIO | 5V tolerance even when power-off |

| | | | | |
|---|---|---|---|---|
| RXCP_3 | AI | E2 | TMDS Differential Signal Input | 3.3V tolerance |
| RXCN_3 | AI | E1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2P_3 | AI | F1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2N_3 | AI | F2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1P_3 | AI | H2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1N_3 | AI | H1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0P_3 | AI | J1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0N_3 | AI | J2 | TMDS Differential Signal Input | 3.3V tolerance |
| eCBUS2 | AIO | L4 | MHL eCBUS 2 / Hot Plug Detect 2 / MCU GPIO | 5V tolerance even when power-off |
| RXCP_2 | AI | L2 | TMDS Differential Signal Input | 3.3V tolerance |
| RXCN_2 | AI | L1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2P_2 | AI | M1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX2N_2 | AI | M2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1P_2 | AI | P2 | TMDS Differential Signal Input | 3.3V tolerance |
| RX1N_2 | AI | P1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0P_2 | AI | R1 | TMDS Differential Signal Input | 3.3V tolerance |
| RX0N_2 | AI | R2 | TMDS Differential Signal Input | 3.3V tolerance |
| LANE0P_1 | AI | U2 | DP Input : LANE0P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE0N_1 | AI | U1 | DP Input : LANE0N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE1P_1 | AI | V1 | DP Input : LANE1P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE1N_1 | AI | V2 | DP Input : LANE1N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE2P_1 | AI | Y2 | DP Input : LANE2P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE2N_1 | AI | Y1 | DP Input : LANE2N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE3P_1 | AI | AA1 | DP Input : LANE3P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE3N_1 | AI | AA2 | DP Input : LANE3N / TMDS Differential Signal Input | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| LANE0P_0 | AI | AC2 | DP Input : LANE0P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE0N_0 | AI | AC1 | DP Input : LANE0N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE1P_0 | AI | AD1 | DP Input : LANE1P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE1N_0 | AI | AD2 | DP Input : LANE1N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE2P_0 | AI | AF2 | DP Input : LANE2P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE2N_0 | AI | AF1 | DP Input : LANE2N / TMDS Differential Signal Input | 3.3V tolerance |
| LANE3P_0 | AI | AG1 | DP Input : LANE3P / TMDS Differential Signal Input | 3.3V tolerance |
| LANE3N_0 | AI | AG2 | DP Input : LANE3N / TMDS Differential Signal Input | 3.3V tolerance |
| MHL_CABLE_DET1 | IO | W5 | MHL Cable Detect 1 / MCU GPIO | 5V tolerance even when power-off |
| MHL_CABLE_DET0 | IO | W6 | MHL Cable Detect 0 / MCU GPIO | 5V tolerance even when power-off |
| DDCSCL_AUXP_D1 | IO | Y6 | AUX-CH 1 / DDC1 (Open drain I/O) / MCU GIPO | 5V tolerance even when power-off |
| DDCSDA_AUXN_D1 | IO | Y5 | AUX-CH 1 / DDC1 (Open drain I/O) / MCU GIPO | 5V tolerance even when power-off |
| DDCSCL_AUXP_D0 | IO | AA6 | AUX-CH 1 / DDC1 (Open drain I/O) / MCU GIPO | 5V tolerance even when power-off |
| DDCSDA_AUXN_D0 | IO | AA5 | AUX-CH 1 / DDC1 (Open drain I/O) / MCU GIPO | 5V tolerance even when power-off |
| V8_0 | IO | AJ3 | Video 8 input 0 / MCU GPIO | 5V tolerance even when |

| | | | | |
|---|---|---|---|---|
| | | | | power-off |
| V8_1 | IO | AJ1 | Video 8 input 1 / MCU GPIO | 5V tolerance even when power-off |
| V8_2 | IO | AJ2 | Video 8 input 2 / MCU GPIO | 5V tolerance even when power-off |
| V8_3 | IO | AK3 | Video 8 input 3 / MCU GPIO | 5V tolerance even when power-off |
| V8_4 | IO | AK2 | Video 8 input 4 / MCU GPIO | 5V tolerance even when power-off |
| V8_5 | IO | AL3 | Video 8 input 5 / MCU GPIO | 5V tolerance even when power-off |
| V8_6 | IO | AL2 | Video 8 input 6 / MCU GPIO | 5V tolerance even when power-off |
| V8_7 | IO | AL1 | Video 8 input 7 / MCU GPIO | 5V tolerance even when power-off |
| VCLK | IO | AM1 | Video 8 Clock / MCU GPIO | 5V tolerance even when power-off |
| AVS | I | AM6 | ADC vertical sync input | 5V tolerance even when power-off |
| AHS | I | AL6 | ADC horizontal sync input | 5V tolerance even when power-off |
| B- | AI | AK6 | Negatice Blue analog input (Pb-) | 3.3V tolerance |
| B+ | AI | AL7 | Positive Blue analog input (Pb+) | 3.3V tolerance |
| G- | AI | AK7 | Negatice Green analog input (Y-) | 3.3V tolerance |
| G+ | AI | AL8 | Positive Green analog input (Y+) | 3.3V tolerance |
| SOG | AI | AM8 | Sync-On-Green | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| R- | AI | AK8 | Negative RED analog input (Pr-) | 3.3V tolerance |
| R+ | AI | AK9 | Positive RED analog input (Pr+) | 3.3V tolerance |
| DDCSDA_VGA | IO | AK5 | DDC(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSCL_VGA | IO | AL5 | DDC(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| MY_DP_SWITCH_0 | IO | AM4 | My DP Switch 0 / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| MY_DP_SWITCH_1 | IO | AL4 | My DP Switch 1 / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| V8_PD | IO | AK4 | Video8 Power Down / PWM / TCON / INT / MCU GPIO | 5V tolerance even when power-off |
| VGA_CAB_DET_0 | IO | AJ5 | VGA Cable Detect 0 / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| PANEL_POWER_CTL | IO | AM3 | Panel Power Control / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| KEY_POWER_CTL | IO | AM2 | Key Power Control / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| IICSDA_1 | IO | AG9 | IIC BUS / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| IICSCL_1 | IO | AG8 | IIC BUS / PWM / TCON / MCU GPIO | 5V tolerance even when power-off |
| DP_HOT_PLUG_0 | IO | AH5 | Hot Plug Detect 0 / MCU GPIO | 5V tolerance even when power-off |
| DP_HOT_PLUG_1 | IO | AH6 | Hot Plug Detect 1 / MCU GPIO | 5V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | | even when power-off |
| MHL_SEL_2 | IO | AH7 | HDMI_MHL_SEL_2 / MCU GPIO | 5V tolerance even when power-off |
| MHL_SEL_3 | IO | AG7 | HDMI_MHL_SEL_3 / MCU GPIO | 5V tolerance even when power-off |
| MHL_SEL_4 | IO | AF6 | HDMI_MHL_SEL_4 / MCU GPIO | 5V tolerance even when power-off |
| MHL_SEL_5 | IO | AF7 | HDMI_MHL_SEL_5 / MCU GPIO | 5V tolerance even when power-off |
| HDMI_CAB_DET0 | IO | AJ4 | HDMI Cable Detect 0 / MCU GPIO | 5V tolerance even when power-off |
| DPTX_HPD | IO | AG6 | DP Hot Plug Detect / MCU GPIO | 5V tolerance even when power-off |
| A-ADC0 | IO | AH9 | 8-bit MCU ADC Input / INT /MCU GPIO | 5V tolerance even when power-on |
| A-ADC1 | IO | AH8 | 8-bit MCU ADC Input / INT /MCU GPIO | 5V tolerance even when power-on |
| A-ADC2 | IO | AJ9 | 8-bit MCU ADC Input / MCU GPIO | 5V tolerance even when power-on |
| A-ADC3 | IO | AJ8 | 8-bit MCU ADC Input / MCU GPIO | 5V tolerance even when power-on |
| XI | AI | AK16 | Crystal Input | 3.3V tolerance |
| XO | AO | AJ16 | Crystal Output | 3.3V tolerance |
| LINE_INL | AI | AJ18 | LINE-IN / IIS-WS / MCU GPIO | 3.3V tolerance |
| LINE_INR | AI | AK18 | LINE-IN / IIS-SCK / MCU GPIO | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| AUDIO_REF | I | AE20 | Audio Reference Resustance / IIS-MCK / MCU GPIO | 3.3V tolerance |
| AUDIO_SOUTL | AO | AL18 | Audio Speaker Output / IIS-SD0 / SPDIF 0 / MCU GPIO | 3.3V tolerance |
| AUDIO_SOUTR | AO | AM18 | Audio Speaker Output / IIS-SD1 / SPDIF 1 / MCU GPIO | 3.3V tolerance |
| AUDIO_HOUTL | AO | AL19 | Audio Headphone Output / IIS-SD2 / SPDIF 2 / MCU GPIO | 3.3V tolerance |
| AUDIO_HOUTR | AO | AM19 | Audio Headphone Output / IIS-SD3 / SPDIF 3 / MCU GPIO | 3.3V tolerance |
| SPI_SI | IO | AM20 | SPI flash serial data input | 3.3V tolerance |
| SPI_CLK | IO | AL20 | SPI flash serial clock | 3.3V tolerance |
| SPI_CEB | IO | AK20 | SPI flash chip enable bar | 3.3V tolerance |
| SPI_SO | IO | AM21 | SPI flash serial data output | 3.3V tolerance |
| USB_SPI_CLK | IO | AH21 | Serial clock / CLKO /MCU GPIO | 5V tolerance even when power-off |
| FLASH_WP | IO | AL21 | FLASH Write Protect / MCU GPIO | 3.3V tolerance |
| USB_SPI_SO | IO | AJ21 | Serial data output / INT /MCU GPIO | 5V tolerance even when power-off |
| USB_SPI_SI | IO | AK21 | Serial data input / INT / MCU GPIO | 5V tolerance even when power-off |
| USB_SPI_CEB1 | IO | AH20 | SPI chip enable bar 1 /T2EX/ MCU GPIO | 5V tolerance even when power-off |
| USB_SPI_CEB0 | IO | AJ20 | SPI chip enable bar 0 /IRQB / MCU GPIO | 5V tolerance even when power-off |
| RESETB | I | AJ23 | Chip reset bar | 3.3V tolerance |
| HDMI_CAB_DET2 | IO | AJ24 | HDMI Cable Detect 2/ IIS-SCK / MCU GPIO | 5V tolerance even when power-off |
| HDMI_CAB_DET1 | IO | AG27 | HDMI Cable Detect 1 / IIS-WS / MCU | 5V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | GPIO | even when power-off |
| DP_CAB_DET1_0 | IO | AH24 | DP Cable Detect 1_0/ TCON / MCU GPIO | 5V tolerance even when power-off |
| HDMI_CAB_DET3 | IO | AF27 | HDMI Cable Detect 3/ IIS-MCK / MCU GPIO | 5V tolerance even when power-off |
| DP_CAB_DET1_2 | IO | AJ25 | DP Cable Detect 1_2 / IIS-SD1 / SPDIF1 / TCON / MCU GPIO | 5V tolerance even when power-off |
| DP_CAB_DET1_1 | IO | AG28 | DP Cable Detect 1_1 / IIS-SD0 / SPDIF0 / TCON / MCU GPIO | 5V tolerance even when power-off |
| DP_CAB_DET0_1 | IO | AH25 | DP_CAB_DET0_1 / SD3 / SPDIF3 / TCON / MCU GPIO | 5V tolerance even when power-off |
| DP_CAB_DET0_0 | IO | AF29 | DP_CAB_DET0_0 / SD2 / SPDIF2 / TCON / MCU GPIO | 5V tolerance even when power-off |
| UART_TX | IO | AJ27 | UART TX / TCON / MCU GPIO | 5V tolerance even when power-off |
| DP_CAB_DET0_2 | IO | AG29 | DP_CAB_DET0_2/ TCON / MCU GPIO / Test4b | 5V tolerance even when power-off |
| PWM0_1 | IO | AG24 | PWM / TCON / MCU GPIO / PCB Power Down | 5V tolerance even when power-off |
| UART_RX | IO | AE28 | UART RX / TCON/ MCU GPIO | 5V tolerance even when power-off |
| PWM2_1 | IO | AJ26 | PWM / TCON / IR Receiver / MCU GPIO | 5V tolerance even when power-off |
| PWM1_1 | IO | AF28 | PWM / TCON / MCU GPIO | 5V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | | even when power-off |
| PWM4_1 | IO | AH26 | PWM / TCON / T1 / MCU GPIO | 5V tolerance even when power-off |
| PWM3_1 | IO | AG26 | PWM / TCON / T2/ MCU GPIO | 5V tolerance even when power-off |
| PWM5_0 | IO | AJ28 | PWM / XTAL_CLK_OUT / TCON / MCU GPIO | 5V tolerance even when power-off |
| PWM5_1 | IO | AG25 | PWM / TCON / T0 / MCU GPIO | 5V tolerance even when power-off |
| IICSDA_0 | IO | AH27 | IIC BUS / TCON / MCU GPIO | 5V tolerance even when power-off |
| IICSCL_0 | IO | AD28 | IIC BUS / TCON / MCU GPIO | 5V tolerance even when power-off |
| VTX_HPD | IO | AA28 | V-by-One Hot Plug Detect / DPTX Hot Plug Detect 1 / MCU GPIO | 5V tolerance even when power-off |
| VTX_PLL_LOCK | IO | AA29 | V-by-One PLL Lock / DPTX Hot Plug Detect 2 / MCU GPIO | 5V tolerance even when power-off |
| USB_D- | IO | AL23 | USB Data- | 3.3V tolerance |
| USB_D+ | IO | AM23 | USB Data+ | 3.3V tolerance |
| TXD4P | IO | AK24 | NC | 3.3V tolerance |
| TXD4N | IO | AM24 | NC | 3.3V tolerance |
| TXD3P | IO | AL24 | NC | 3.3V tolerance |
| TXD3N | IO | AK25 | NC | 3.3V tolerance |
| TXDCP | IO | AL25 | NC | 3.3V tolerance |
| TXDCN | IO | AK26 | NC | 3.3V tolerance |
| TXD2P | IO | AL26 | NC | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| TXD2N | IO | AM26 | NC | 3.3V tolerance |
| TXD1P | IO | AK27 | NC | 3.3V tolerance |
| TXD1N | IO | AM27 | NC | 3.3V tolerance |
| TXD0P | IO | AL27 | NC | 3.3V tolerance |
| TXD0N | IO | AK28 | NC | 3.3V tolerance |
| TXC4P | IO | AL28 | NC | 3.3V tolerance |
| TXC4N | IO | AK29 | NC | 3.3V tolerance |
| TXC3P | IO | AL29 | NC | 3.3V tolerance |
| TXC3N | IO | AM29 | NC | 3.3V tolerance |
| TXCCP | IO | AM30 | NC | 3.3V tolerance |
| TXCCN | IO | AM32 | NC | 3.3V tolerance |
| TXC2P | IO | AM31 | NC | 3.3V tolerance |
| TXC2N | IO | AL30 | NC | 3.3V tolerance |
| TXC1P | IO | AL31 | NC | 3.3V tolerance |
| TXC1N | IO | AK30 | NC | 3.3V tolerance |
| TXC0P | IO | AK31 | NC | 3.3V tolerance |
| TXC0N | IO | AK32 | NC | 3.3V tolerance |
| TXB4P | IO | AJ30 | NC | 3.3V tolerance |
| TXB4N | IO | AJ32 | NC | 3.3V tolerance |
| TXB3P | IO | AJ31 | NC | 3.3V tolerance |
| TXB3N | IO | AH30 | NC | 3.3V tolerance |
| TXBCP | IO | AH31 | NC | 3.3V tolerance |
| TXBCN | IO | AG30 | NC | 3.3V tolerance |
| TXB2P | IO | AG31 | NC | 3.3V tolerance |
| TXB2N | IO | AG32 | NC | 3.3V tolerance |
| TXB1P | IO | AF30 | NC | 3.3V tolerance |
| TXB1N | IO | AF32 | NC | 3.3V tolerance |
| TXB0P | IO | AF31 | NC | 3.3V tolerance |
| TXB0N | IO | AE30 | NC | 3.3V tolerance |
| TXA4P | IO | AE31 | NC | 3.3V tolerance |
| TXA4N | IO | AD30 | NC | 3.3V tolerance |
| TXA3P | IO | AD31 | NC | 3.3V tolerance |
| TXA3N | IO | AD32 | NC | 3.3V tolerance |
| TXACP | IO | AC30 | NC | 3.3V tolerance |
| TXACN | IO | AC32 | NC | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| TXA2P | IO | AC31 | NC | 3.3V tolerance |
| TXA2N | IO | AB30 | NC | 3.3V tolerance |
| TXA1P | IO | AB31 | NC | 3.3V tolerance |
| TXA1N | IO | AA30 | NC | 3.3V tolerance |
| TXA0P | IO | AA31 | NC | 3.3V tolerance |
| TXA0N | IO | AA32 | NC | 3.3V tolerance |
| VTX_TX7N | AO | W31 | V-by-One Output : 7N / DP Output :LANE3N | 3.3V tolerance |
| VTX_TX7P | AO | W32 | V-by-One Output : 7P / DP Output :LANE3P | 3.3V tolerance |
| VTX_TX6N | AO | V32 | V-by-One Output : 6N / DP Output :LANE2N | 3.3V tolerance |
| VTX_TX6P | AO | V31 | V-by-One Output : 6P / DP Output :LANE2P | 3.3V tolerance |
| VTX_TX5N | AO | T31 | V-by-One Output : 5N / DP Output :LANE1N | 3.3V tolerance |
| VTX_TX5P | AO | T32 | V-by-One Output : 5P / DP Output :LANE1P | 3.3V tolerance |
| VTX_TX4N | AO | R32 | V-by-One Output : 4N / DP Output :LANE0N | 3.3V tolerance |
| VTX_TX4P | AO | R31 | V-by-One Output : 4P / DP Output :LANE0P | 3.3V tolerance |
| VTX_TX3N | AO | N31 | V-by-One Output : 3N / DP Output :LANE3N | 3.3V tolerance |
| VTX_TX3P | AO | N32 | V-by-One Output : 3P / DP Output :LANE3P | 3.3V tolerance |
| VTX_TX2N | AO | M32 | V-by-One Output : 2N / DP Output :LANE2N | 3.3V tolerance |
| VTX_TX2P | AO | M31 | V-by-One Output : 2P / DP Output :LANE2P | 3.3V tolerance |
| VTX_TX1N | AO | K31 | V-by-One Output : 1N / DP Output :LANE1N | 3.3V tolerance |
| VTX_TX1P | AO | K32 | V-by-One Output : 1P / DP Output :LANE1P | 3.3V tolerance |
| VTX_TX0N | AO | J32 | V-by-One Output : 0N / DP | 3.3V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | Output :LANE0N | |
| VTX_TX0P | AO | J31 | V-by-One Output : 0P / DP<br>Output :LANE0P | 3.3V tolerance |
| WS | IO | N27 | IIS-WS / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| SCK | IO | K27 | IIS-SCK / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| MCK | IO | M27 | IIS-MCK / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| SPDIF0 | IO | K29 | SPDIF0 / IIS-SD0 / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| SPDIF1 | IO | J28 | SPDIF1 / IIS-SD1 / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| SPDIF2 | IO | J27 | SPDIF2 / IIS-SD2 / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| SPDIF3 | IO | K28 | SPDIF3 / IIS-SD2 / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| PWM4_0 | IO | J29 | PWM / DVS / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| PWM0_0 | IO | N29 | PWM / DPTX AUX-CH / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| PWM1_0 | IO | N28 | PWM / DPTX AUX-CH / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| PWM2_0 | IO | M29 | PWM / DPTX AUX-CH / TCON / MCU | 5V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | GPIO<br>(This pin can not work when power saving & power Down.) | even when power-off |
| PWM3_0 | IO | M28 | PWM / DPTX AUX-CH / TCON / MCU GPIO<br>(This pin can not work when power saving & power Down.) | 5V tolerance even when power-off |
| D_VREF | I | E14 | Reference Voltage | |
| A_BA0 | IO | E17 | Bank Address Input | |
| A_BA1 | IO | E23 | Bank Address Input | |
| A_BA2 | IO | D15 | Bank Address Input | |
| A_A0 | IO | D19 | Address Input | |
| A_A1 | IO | E21 | Address Input | |
| A_A2 | IO | D18 | Address Input | |
| A_A3 | IO | D16 | Address Input | |
| A_A4 | IO | C14 | Address Input | |
| A_A5 | IO | D12 | Address Input | |
| A_A6 | IO | D20 | Address Input | |
| A_A7 | IO | E18 | Address Input | |
| A_A8 | IO | D21 | Address Input | |
| A_A9 | IO | C12 | Address Input | |
| A_A10 | IO | C15 | Address Input | |
| A_A11 | IO | B13 | Address Input | |
| A_A12 | IO | E22 | Address Input | |
| A_A13 | IO | B12 | Address Input | |
| A_A14 | IO | B14 | Address Input | |
| A_DM0 | IO | C19 | Input Data Mask | |
| A_DM1 | IO | B23 | Input Data Mask | |
| A_DM2 | IO | D28 | Input Data Mask | |
| A_DM3 | IO | B30 | Input Data Mask | |
| A_DQ0 | IO | D26 | Data Input / Output | |
| A_DQ1 | IO | D22 | Data Input / Output | |
| A_DQ2 | IO | D27 | Data Input / Output | |
| A_DQ3 | IO | D23 | Data Input / Output | |
| A_DQ4 | IO | C24 | Data Input / Output | |

| | | | | |
|---|---|---|---|---|
| A_DQ5 | IO | C18 | Data Input / Output | |
| A_DQ6 | IO | B24 | Data Input / Output | |
| A_DQ7 | IO | B19 | Data Input / Output | |
| A_DQ8 | IO | A20 | Data Input / Output | |
| A_DQ9 | IO | D25 | Data Input / Output | |
| A_DQ10 | IO | E24 | Data Input / Output | |
| A_DQ11 | IO | A23 | Data Input / Output | |
| A_DQ12 | IO | D24 | Data Input / Output | |
| A_DQ13 | IO | E27 | Data Input / Output | |
| A_DQ14 | IO | E25 | Data Input / Output | |
| A_DQ15 | IO | E26 | Data Input / Output | |
| A_DQ16 | IO | B31 | Data Input / Output | |
| A_DQ17 | IO | E28 | Data Input / Output | |
| A_DQ18 | IO | A31 | Data Input / Output | |
| A_DQ19 | IO | E29 | Data Input / Output | |
| A_DQ20 | IO | B32 | Data Input / Output | |
| A_DQ21 | IO | A25 | Data Input / Output | |
| A_DQ22 | IO | A32 | Data Input / Output | |
| A_DQ23 | IO | C25 | Data Input / Output | |
| A_DQ24 | IO | D29 | Data Input / Output | |
| A_DQ25 | IO | D31 | Data Input / Output | |
| A_DQ26 | IO | E30 | Data Input / Output | |
| A_DQ27 | IO | C29 | Data Input / Output | |
| A_DQ28 | IO | D30 | Data Input / Output | |
| A_DQ29 | IO | A29 | Data Input / Output | |
| A_DQ30 | IO | E31 | Data Input / Output | |
| A_DQ31 | IO | C28 | Data Input / Output | |
| A_DQS0 | IO | A22 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS0B | IO | B22 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS1 | IO | B21 | Data strobe : Output with read data. Edge-aligned with read data. Input with | |

| | | | | |
|---|---|---|---|---|
| | | | write data. Center-aligned to write data | |
| A_DQS1B | IO | C20 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS2 | IO | B28 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS2B | IO | C27 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS3 | IO | C26 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_DQS3B | IO | B26 | Data strobe : Output with read data. Edge-aligned with read data. Input with write data. Center-aligned to write data | |
| A_CASZ | IO | A13 | Command inputs : A_RASZ, A_CASZ, and A_WEZ (along with A_CS#) define the command being entered and are referenced to VREFCA. | |
| A_CKE | IO | B16 | Clock enable | |
| A_CS# | IO | C16 | Chip select | |
| A_MCLK | IO | C17 | Clock : A_ MCLK and A_ MCLKZ are differential clock inputs. All address and control input signals are sampled on the crossing of the positive edge of A_MCLK and negative edge of A_MCLKZ. | |
| A_MCLKZ | IO | B17 | Clock : A_ MCLK and A_ MCLKZ are differential clock inputs. All address and control input signals are sampled on the crossing of the positive edge of A_MCLK and negative edge of A_MCLKZ. | |
| A_ODT | IO | D17 | On-die termination : ODT enables | |

| | | | | |
|---|---|---|---|---|
| | | | (registered HIGH) and disables (registered LOW) termination resistance internal to the DDR3 SDRAM. | |
| A_RASZ | IO | E20 | Command inputs : A_RASZ, A_CASZ, and A_WEZ (along with A_CS#) define the command being entered and are referenced to VREFCA. | |
| A_RESET | IO | E19 | Reset : A_RESET is an active LOW CMOS input referenced to VSS. | |
| A_WEZ | IO | A12 | Command inputs : A_RASZ, A_CASZ, and A_WEZ (along with A_CS#) define the command being entered and are referenced to VREFCA. | |
| D_ZQ | I | E13 | External reference ball for output drive calibration: This ball is tied to an external 240Ω resistor (1%), which is tied to VSSQ. | |
| GPIO | IO | H7 | MCU GPIO | 5V tolerance even when power-off |
| CEC0 | IO | K7 | CEC 0 / MCU GPIO | 5V tolerance even when power-off |
| EEWD | IO | G7 | EEWD / PWM / Tcon / MCU GPIO | 3.3V tolerance |
| EEI2CSCL | IO | J7 | EEI2CSCL / PWM / TCON / MCU GPIO | 3.3V tolerance |
| EEI2CSDA | IO | H6 | EEI2CSDA / PWM / TCON / MCU GPIO | 3.3V tolerance |
| SCAN_MODE_N | IO | H5 | When AC power is turned on, this ball must be pull “High”. | 3.3V tolerance |
| DDCSCL5 | IO | J6 | DDC5(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSDA5 | IO | J5 | DDC5(Open drain I/O) / MCU GPIO | 5V tolerance |

| | | | | |
|---|---|---|---|---|
| | | | | even when power-off |
| DDCSCL4 | IO | K6 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSDA4 | IO | K5 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSCL3 | IO | L6 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSDA3 | IO | L5 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSCL2 | IO | M6 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| DDCSDA2 | IO | M5 | DDC4(Open drain I/O) / MCU GPIO | 5V tolerance even when power-off |
| MHL_CABLE_DET2 | IO | N5 | MHL Cable Detect 2 / MCU GPIO | 5V tolerance even when power-off |
| MHL_CABLE_DET3 | IO | N6 | MHL Cable Detect 3 / MCU GPIO | 5V tolerance even when power-off |

Power / Ground Pin Assigment

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

Total : 322 balls

**Table 2. Power / Ground Pin Assignment of EDHS BGA**

| P/G Pin Name | I/O | Pin # | Description | Note |
|---|---|---|---|---|
| GDI_VDD33 | AP | N10, N11, Y9, Y10, Y11, AC14, AD14 | 3.3V Analog Power | 7 balls |
| GDI_VDD11 | AP | U8, U9, U10, U11, V8, V9, V10, V11 | 1.1V Analog Power | 8 balls |
| MHL_VDD33 | AP | R8, R9, R10, R11, T13, U13, M9, M10, R13 | 3.3V Analog Power | 9 balls |

| | | | | |
|---|---|---|---|---|
| ADC_VDD33 | AP | AD12, AD13 | 3.3V ADC Power | 2 balls |
| ADC_GND | AG | AJ7, AE11, AF11, AE10, AF10, AE12, AF12, AE13, AF13 | ADC Gound | 9 balls |
| DPTX_VDD11 | AP | AD16, AD17 | 1.1V DPTx Power | 2 balls |
| DPTX_VDD33 | AG | AC16, AC17 | 3.3V DPTx Power | 2 balls |
| AUDIO_VDD33 | AP | AC19, AD19 | 3.3V Audio Power | 2 balls |
| AUDIO_GND | AG | AC18, AD18, AH18 | Audio Gound | 3 balls |
| AUDIO HP _VDD33 | AP | AC21, AD21 | 3.3V Audio HP Power | 2 balls |
| AUDIO HP_GND | AG | AC22, AD22 | Audio HP Ground | 2 balls |
| USB11 | AP | AD23 | USB 1.1V | 1 ball |
| USB33 | AP | AE23 | USB 3.3V | 1 ball |
| VTX_VDD11 | AP | R23, T23, T24, T25 | 1.1V Analog Power | 4 balls |
| VTX_VDD33 | AP | R24, R25 | 3.3V Analog Power | 2 balls |
| PVCC | P | U25, V24, V25, W24, U24, W25, Y24, Y25, AA24, AA25 | Pad Power | 10 balls |
| 1.5V_DDR | P | A10, B10, C10, D10, E9, E10, F9, F10, L15, L16, L17, L18, L19, L20, M16, M17, M18, L21, L22, L23 | 1.5V DDR3 Power | 20 balls |
| VCCK_ON | P | AA18, AA17, AA16, AA13, Y13, W13, P13, N14, N13, P14, V13, AA14, AA15, AA19, AA20 | 1.1V Core Power | 15 balls |
| VCCK_OFF | P | L24, M21, M19, M20, K24, K25, K16, K18, J15, J16, J21, J24, J25, N23, N24, N25, U22, U23, V22, V23, W22, W23, Y22, Y23, AA22, AA23, AB23, AB24, AB25 | 1.1V Core Power | 29 balls |
| DDRPLL_VDD11 | P | F12 | 1.1V DDR PLL Power | 1 ball |
| DDR PLL GND | G | F11 | DDR PLL Ground | 1 ball |
| DGND | G | A14, A16, A17, A19, A26, A28, B15, B18, B20, B25, B27, B29, C13, C21, C22, C23, C30, C31, C32, D11, D14, E11, E12, E15, E16, F17, F18, F19, F20, F21, F22, F23, F25, F26, F27, F28, G17, G18, G20, G21, G22, G23, G24, G25, G26, G27, G28, H3, J3, J30, T8, T9, T10, T11, U3, U4, U5, V14, V15, V16, V17, V18, V19, V20, V21, W14, W15, W16, W17, W18, W19, W20, W21, W28, W29, Y14, Y15, Y16, Y17, Y18, Y19, Y20, Y21, AA3, AA4, | Digital Ground | 190 balls |

| | | | | |
|---|---|---|---|---|
| | | AA8, AA9, AA10, AA11, AA21, N20, P3, P4, P5, P10, P11, P15, P16, P17, P18, P20, P21, R3, R4, R14, R15, P19, R5, R16, B3, C7, E5, E6, E7, F3, F5, F6, F7, F24, F29, F30, F31, F32, G19, G29, G30, G31, G32, K30, L3, M3, M30, N15, N16, N17, N18, N19, N30, R17, R18, R19, R20, R21, R28, R29, R30, T14, T15, T16, T17, T18, T19, T20, T21, T28, T29, T30, U14, U15, U16, U17, U18, U19, U20, U21, V3, V4, V5, V29, V30, W8, W9, W10, W11, W30, Y3, Y4, AB10, AB11, AC3, AD3, AF3, AG3, AH16, AK11, AK12, AK13, AK14, AK15, N21 | | |

# 7. Electrical Specifications

**EDHS BGA DC Characteristics**

## *7.1. Recommended Operating Conditions*

**Table 3. Recommended Operating Conditions of EDHS BGA**

| 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 | 1.5V_DDR | 1.43 | 1.5 | 1.57 | 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) | $\theta_{JA}$ | | 13.85 | | ºC/W |
| Thermal Resistance (Junction to Case) | $\theta_{JC}$ | | 5.07 | | ºC/W |
| Junction Acceptable Temperature | $T_j$ | | | 125 | ºC |

## *7.2. Absolute Maximum Ratings*

**Table 4. Absolute Maximum Ratings of EDHS BGA**

| 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 5. Reset Period of EDHS BGA**

| 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)

## 7.4. Recommended Operating Conditions

**Table 6. Recommended Operating Conditions of PBGA**

| 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 | 1.5V_DDR | 1.43 | 1.5 | 1.57 | 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) | $\theta_{JA}$ | | 16.32 | | ºC/W |
| Thermal Resistance (Junction to Case) | $\theta_{JC}$ | | 5.52 | | ºC/W |
| Junction Acceptable Temperature | $T_j$ | | | 125 | ºC |

## 7.5. Absolute Maximum Ratings

**Table 7. Absolute Maximum Ratings of PBGA**

| 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.**

## 7.6. Reset Period

**Table 8. Reset Period of PBGA**

| 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

EDHS BGA

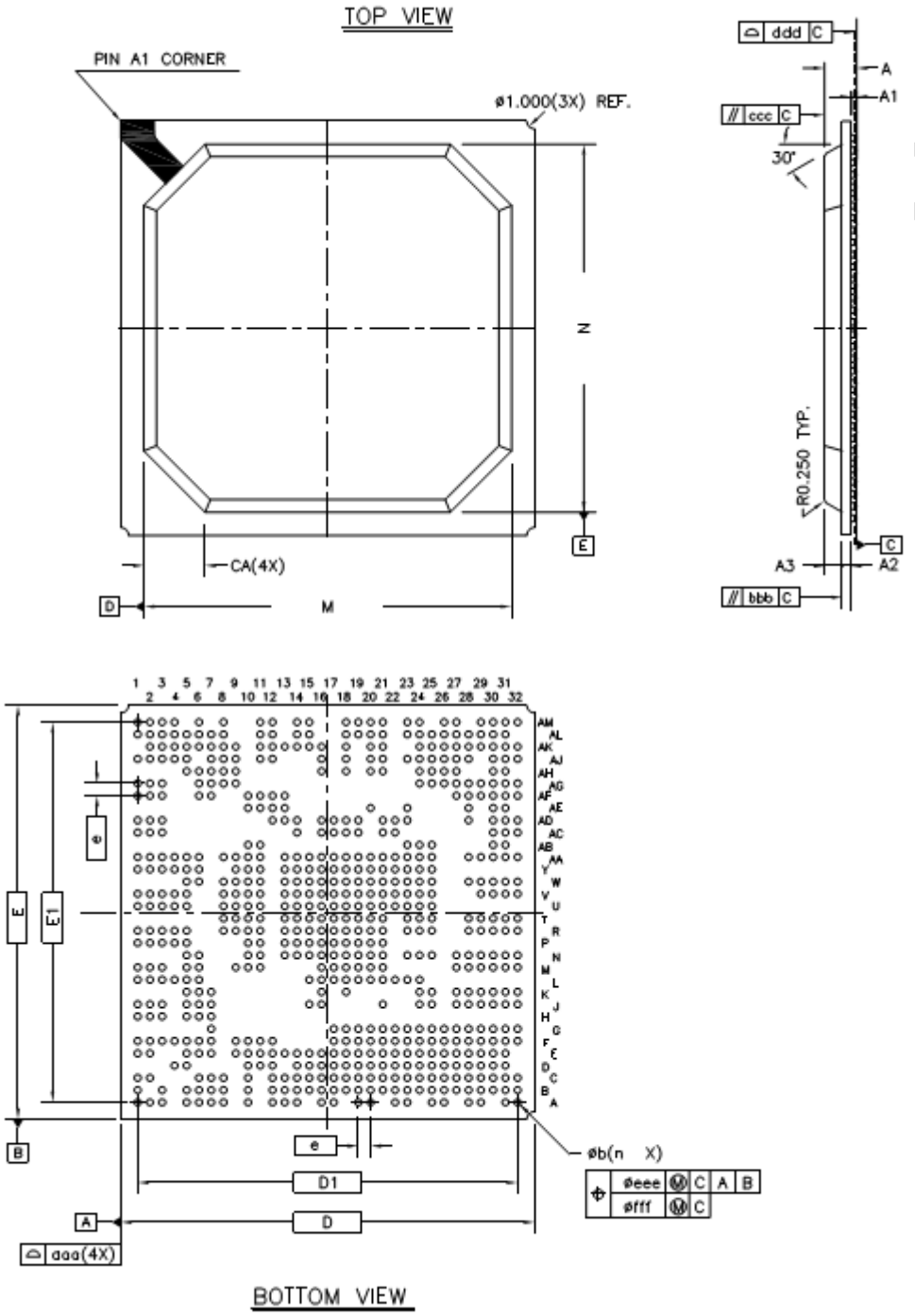


**Figure 3. Mechanical Specification of EDHS BGA (1)**

| | | Symbol | Common Dimensions | | |
|---|---|---|---|---|---|
| | | | MIN. | NOM. | MAX. |
| Package : | | | HS FBGA | | |
| Body Size: | X | D | 27.000 | | |
| | Y | E | 27.000 | | |
| Ball Pitch : | | e | 0.800 | | |
| Total Thickness : | | A | 1.982 | 2.100 | 2.218 |
| Mold Thickness : | | A3 | 1.170 Ref. | | |
| Substrate Thickness : | | A2 | 0.560 Ref. | | |
| Ball Diameter : | | | 0.450 | | |
| Stand Off : | | A1 | 0.320 | – | 0.420 |
| Ball Width : | | b | 0.375 | – | 0.525 |
| Mold Area : | X | M | 24.000 | | |
| | Y | N | 24.000 | | |
| H/S Exposed Size: | | P | 19 ~ 20 | | |
| H/S Flatness | | Q | 0.100 | | |
| H/S Shift With Substrate Edge: | | R | 0.300 | | |
| H/S Shift With Mold Area: | | S | 0.500 | | |
| Chamfer | | CA | 4.000 Ref. | | |
| Package Edge Tolerance : | | aaa | 0.150 | | |
| Substrate Parallelism : | | bbb | 0.100 | | |
| Mold Parallelism : | | ccc | 0.200 | | |
| Coplanarity: | | ddd | 0.150 | | |
| Ball Offset (Package) : | | eee | 0.150 | | |
| Ball Offset (Ball) : | | fff | 0.080 | | |
| Ball Count : | | n | 640 | | |
| Edge Ball Center to Center : | X | D1 | 24.800 | | |
| | Y | E1 | 24.800 | | |

**Figure 4. Mechanical Specification of EDHS BGA (2)**

# 9. Ordering Information

**Table 9. Ordering Information**

| Part No. | Max. Resolution / Timing | Input: VGA | Input: HDMI2.0 | Input DP1.2 HBR2 | Input: DHMI1.4/ MHL2/DVI | Output: DP1.2 MST out | Output: Vx1/eDP HBR/eDP HBR2/LVDS | PIP/ PBP | 4P | FRC | OD | Max number of DDR3 support | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RTD2797P-CG | 4096x2160 @60Hz | ● | 2 Port | 2 Port | 2 Port | | ● | ● | ● | ● | ● | 2 | 640-ball PBGA |



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