

# A31s

## Datasheet

Revision 1.5

Apr 20, 2015

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## Revision History

| Version | Date         | Author | Description                                  |
|---------|--------------|--------|--|
| 1.0     | Jan 30, 2013 |        | Initial Version                              |
| 1.1     | Mar 21, 2013 |        | Revise the company logo                      |
| 1.2     | Oct 16, 2013 |        | Add the VCC_HDMI max value                   |
| 1.3     | Oct 20, 2013 |        | Modify the electrical characteristic section |
| 1.4     | Feb 14, 2014 |        | Add EMAC function description                |
| 1.5     | Apr 20, 2015 |        | Modify Detailed Pin/Signal Description       |

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# 1 OVERVIEW

The Allwinner A31s processor is a quad-core phablet processor designed for the phablet market. The phablet is a product category that combines the functionalities of a smartphone with that of a tablet, and its size usually falls somewhere in between a smartphone and a tablet.

The A31s processor is based on quad-core Cortex-A7 CPU, which is the most power efficient processor developed by ARM. It also comes with SGX544MP2 GPU with eight logic core to enable powerful 3D computing capability as well as excellent UI experience, especially when it comes to the smoothness of screens with large size.

More importantly, A31s processor integrates a robust Audio Codec that includes two sets of I2S/PCM interface for Baseband and Bluetooth, two integrated differential analog MIC for headset and phone, as well as a digital MIC. It is capable of 3G, 2G, LTE, WiFi, Bluetooth, FM, GPS, AGPS, NFC and other voice and data wireless transmission technology with a minimum of external components.

Additionally, A31s processor provides a wide range of peripheral interfaces. For example, it integrates display interfaces such as HDMI, RGB LCD and LVDS, image input interfaces such as CSI, and data interfaces such as USB DRD, USB EHCI/OHCI, SDC, SPI, UART, etc.

When it comes to power efficiency, AXP221s is specially designed for the power optimization of A31s. A31s processor also supports a smart Power Consumption Management System to dynamically adjust CPU frequency and voltage, supports DRAM Dynamic Frequency Scaling technology to dynamically adjust DRAM frequency based on bandwidth requirements, and also supports Super Standby Mode to lower the system power consumption during system standby.

# 2 FEATURES

## CPU Architecture

- Quad Cortex-A7
  - ARMv7 ISA standard ARM instruction set plus Thumb2, Jazeller RCT
  - NEON SIMD coprocessor and VFPv4 for each CPU
  - TrustZone security technology
  - Hardware virtualization
  - Large Physical Address Extensions(LPAE)
  - Debug and trace features
  - One general timer for an individual CPU
  - 32KB instruction and 32KB data L1 cache for an individual CPU
  - Shared 1MB L2 cache
- CPUS
  - Support 4KB I-cache
  - Support 64KB SRAM (instruction space)
  - Support 64KB secure SRAM (data space)

## GRAPHIC ENGINE

- 3D
  - PowerVR SGX544MP2 GPU
  - Support OpenGL ES 2.0, OpenVG 1.1, OpenCL 1.1, and DX 9.3 standards
- 2D
  - Support BLT and ROP2/3/4, scaling function with 4x4 taps and 32 phases
  - Support 90/180/270 degree rotation
  - Support mirror/alpha (plane and pixel alpha)/color key
  - Format conversion: ARGB 8888/4444/1555, RGB565, Mono 1/2/4/8 bpp, Palette 1/2/4/8 bpp (input only), YUV 444/422/420
  - Support command queue

## SYSTEM RESOURCES

- Timer
  - 6 timers: clock source can be switched over 24M/32K for all timers, and external signals can function as clock source for timer4/5
  - 33-bit AVS counter
  - 4 watchdogs to generate reset signal or interrupts

## ■ GIC

- Support 16 SGIs, 16 PPIs, and 128 SPIs
- Support ARM architecture security extensions
- Support ARM architecture virtualization extensions
- Support uniprocessor and multiprocessor environments

## ■ HS-Timer

- 4 channels
- Clock source fixed to AHB, and pre-scale ranges from 1 to 16
- 56-bit counter that can be separated to 24-bit high register and 32-bit low register

## ■ DMA

- 16 channels
- Support data width of 8/16/32 bits
- Support linear and IO address modes
- DMA channels can be paused during data transfer if necessary

## ■ RTC

- Real time registers for second, minute, hour, day, month and year
- Two alarms based on seconds and weeks
- 16 general purpose registers

## ■ CCU

- programmable PLLs

## MEMORY SUBSYSTEM

### ■ Internal Boot ROM

- Support system boot from 8-bit NAND Flash, SPI Nor Flash (SPI0) and SD/TF/8-bit eMMC (SDC0/2)
- Support system code download via USB DRD (USB0)

### ■ DRAM

- Support DDR3/DDR3L/LPDDR2
- Support 32-bit bus width

## ■ NAND FLASH

- Comply to ONFI 2.3 and toggle 1.0
- Support 64-bit ECC per 512 bytes or 1024 bytes
- Support 8-bit data bus width
- Support up to 4 CE and 2 RB
- Support system boot from NAND flash
- Support SLC/MLC/TLC NAND and EF-NAND
- Support SDR/DDR NAND interface

## ■ SD/MMC

- Comply to eMMC standard specification v4.5
- Comply to SD physical layer specification v3.0
- Comply to SDIO card specification v2.0
- Support 1/4/8-bit bus width
- Support HS/DS/SDR12/SDR25/SDR50 /HS200/DDR50 bus mode
- Support eMMC mandatory and alternative boot operations
- Support transmit clock up to 100MHz
- Support four independent SD/MMC/SDIO controllers
- Support SDSC/SDHC/SDXC/UHS-I/MMC/RS-MMC Card
- Support eMMC/iNand Flash
- Support 1GB/2GB/4GB/8GB/16GB/32GB/ 64GB /128GB SD/MMC card
- Support SDIO interrupt detection
- Support build-in 64-byte FIFO for buffered read or write operations
- Support descriptor-based internal DMA controller for efficient scatter and gather operations

## IMAGE SIGNAL PROCESSOR

- Support image mirror flip and rotation
- Support thumb image generation
- Support two channels output
- Support valid picture size up to 4096x4096
- Support speed up to 250M pixel/s
- ISP for YCbCr input
  - YCbCr gain and offset control
  - DRC(dynamic range compression)
  - Anti-flick detection statistics
  - Histogram statistics
- ISP for RAW RGB input
  - Black clamp with horizontal/vertical offset compensation
  - Window capture
  - Static/dynamic defect pixel correction
  - Super lens shading correction
  - Super lens flare correction
  - Color dependent gain and offset control
  - Anisotropic non-linear bayer interpolation with false color suppression
  - Programmable color correction
  - Programmable gamma correction
  - DRC(dynamic range compression)
  - RGB2YCbCr

- Non-linear 2D sharpening
- Advanced contrast enhancement
- Advanced spatial (2D) de-noise filter
- Zone-based AE/AF/AWB statistics
- Anti-flick detection statistics
- Histogram statistics

## VIDEO ENGINE

- Decoder and encoder can work at the same time
- Video decoding
  - Picture size up to 4096x2304
  - Decoding speed up to 1920x1080@60fps
  - Support multiple video formats: Mpeg1/2, Mpeg4 SP/ASP GMC, H.263 including Sorenson Spark, H.264 BP/MP/HP, VP6/8, AVS jizun, JPEG/MJPEG
  - Support tiled/YUV/YUV output format
- Video Encoding
  - H.264 HP: picture size up to 3840x2160
  - H.264 HP: speed up to 1920x1080@30fps
  - H.264 HP: cyclic intra refresh
  - H.264 HP: ROI windows
  - JPEG baseline: picture size up to 8192x8192
  - Alpha blending
  - Thumb generation
  - 4x2 scaling ratio: from 1/16 to 64 arbitrary non-integer ratio

## DISPLAY ENGINE

- Support dual display paths
  - Each path supports 4 movable and size-adjustable layers
  - Layer size up to 8192x8192 pixels
- Ultra-scaling Engine
  - 8 taps in horizontal and 4 taps in vertical
  - Source image size from 8x4 to 8192x8192
  - Destination image size from 8x4 to 8192x8192
- Support multiple image input formats
  - Mono 1/2/4/8 bpp
  - Palette 1/2/4/8 bpp
  - 16/24/32 bpp color
  - YUV444/420/422/411
- Support alpha blending/color key/gamma/hardware cursor
- Support video post processing
  - De-interlacing
  - Detail enhancement
  - Dynamic range control
  - Color management
- 3D input/output format conversion and display

## VIDEO OUTPUT

- Support HDMI 1.4 1080p@60fps
- LVDS/RGB/CPU LCD interface 1280x800

## VIDEO INPUT

- Support parallel 12-bit CSI

- Support 0V ~2V voltage input

## **ANALOG AUDIO INPUT**

- Support two audio ADC channels
  - 96dBA SNR for ADC recording
  - 8KHz~ 48KHz ADC sample rate
- Analog low-power loop from line-in/mic-in/ phone-in to headphone/speaker/ earpiece outputs
- Accessory button press detection
- Four analog audio inputs
  - Two differential microphone inputs
  - Differential phone-in input
  - Stereo line-in input
- Support low-noise digital MIC interface
- Flexible digital audio process for ADC
  - High pass filter and low latency decimation filter for class voice
  - Automatic gain control (AGC)

## **ANALOG AUDIO OUTPUT**

- Two-channel audio DAC
- Stereo capless headphone drivers
  - Up to 100dBA SNR for DAC playback
  - 8KHz~192KHz DAC sample rate
- Support analog/digital volume control
- Two low-noise analog microphone bias
- Dedicated headphone/speaker/earpiece outputs, single-ended or differential
- Support differential phone-out
- Support two mixers for different applications
  - Output mixer for LINEINL/R, PHONEP/N, MIC1P/N, MIC2P/N and stereo DAC output
  - ADC record mixer for LINEINL/R, PHONEP/N, MIC1P/N, MIC2P/N, stereo DAC output
- Flexible digital audio process for DAC
  - Pop suppression control
  - Individual high pass filter/De-emphasis filter
  - Support EQ equalization
  - Soft volume control and soft mute

## **CONNECTIVITY**

### ■ **USB2.0 DRD**

- Support High-Speed (HS, 480-Mbps), Full-Speed (FS, 12-Mbps), and Low-Speed (LS, 1.5-Mbps) in Host mode
- Support High-Speed (HS, 480-Mbps), Full-Speed (FS, 12-Mbps) in Device mode
- Support up to 10 user-configurable endpoints for bulk , isochronous, control and interrupt bi-directional transfers

### ■ **USB EHCI/OHCI**

- Two EHCI/OHCI-compliant Hosts

### ■ **LRADC**

- Support sample rate up to 250Hz
- Up to 6-bit resolution

### ■ **Digital Audio Interface**

- Comply to industry standard I2S/PCM specification
- Two sets I2S/PCM interfaces for baseband and Bluetooth
- Support Master/Slave mode and full-duplex operation
- Support 8KHz ~192KHz audio sample rate
- Support MCLK output for CODEC chips
- Support standard I2S, left-justified, right-justified, 8/16-bit linear sample, 8-bit u-law and a-law companded sample

### ■ **PWM**

- 4 PWM outputs
- Support cycle mode and pulse mode
- The pre-scale ranges from 1 to 64

### ■ **Transport Stream**

- Support both SPI and SSI
- Support 64 channels PID filter
- Support hardware PCR packet detection
- Speed up to 150Mbps for both SPI and SSI interface

### ■ **EMAC**

- Comply to IEEE 802.3-2002 standard
- Options for automatic Pad/CRC stripping on receive frames
- Programmable frame length to support standard or Jumbo Ethernet frames with size up to 16KB
- Support 10/100/1000-Mbps transfer rates
- IEEE 802.3-compliant GMII/MII interface to communicate with an external Gigabit/Fast Ethernet PHY
- Support 10/100/1000-Mbps data transfer rates R GMII interface to communicate with an external Gigabit PHY

### ■ **CIR**

- A flexible receiver for IR remote controller

### ■ **UART**

- Comply to industry-standard 16450/16550 UART specification
- Support 16-bit programmable baud rate and dynamic modification
- Support 2-wire serial communication
- Support 4-wire auto data flow communication
- Support 8-wire modem(data carrier equipment, DCE) or data set
- Support up to 7 UART controllers

### ■ **SPI**

- Master/Slave configurable
- Up to 4 independent SPI controllers



- Support dual input and dual output operation

#### ■ TWI

- Up to 5 TWIs compliant with I2C protocol
- Support SCCB protocol

#### ■ P2WI (Push-Pull TWI)

- Support speed up to 12MHz

#### ■ One Wire Interface

- Support both standard One Wire protocol and simple HDQ protocol

### SECURITY SYSTEM

- Support AES, DES, 3DES, SHA-1, MD5
- Support ECB, CBC modes for AES/DES/3DES
- Support 128-bit, 192-bit and 256-bit key size for AES
- 160-bit hardware PRNG with 192-bit seed
- Security JTAG

### DRM SYSTEM

- The security access permission of each address region are programmable
- Data transfer between master and slave is permitted only when AXI transaction access permission status matches the access permission settings of the memory region it addresses
- The write access of various registers can be prevented after the assertion of `secure_boot_lock`
- Support SMTA (secure memory touch arbiter) to program some memory areas as secure or non-secure
- Support 64KB secure SRAM size

- Support DRAMC with firewall to configure the security attribute of different masters, such as DMA
- Can only be accessed by CPUS

### POWER MANAGEMENT

- Flexible PLL clock generator and 32768Hz OSC
- Flexible clock gate and module reset
- Support DVFS for CPU frequency and voltage adjustment
- Support dynamic frequency adjustment for external DRAM controller
- Support standby mode

### PACKAGE

- FBGA 460 balls, 0.8mm ball pitch, 18mm x18mm

# 3 BLOCK DIAGRAM

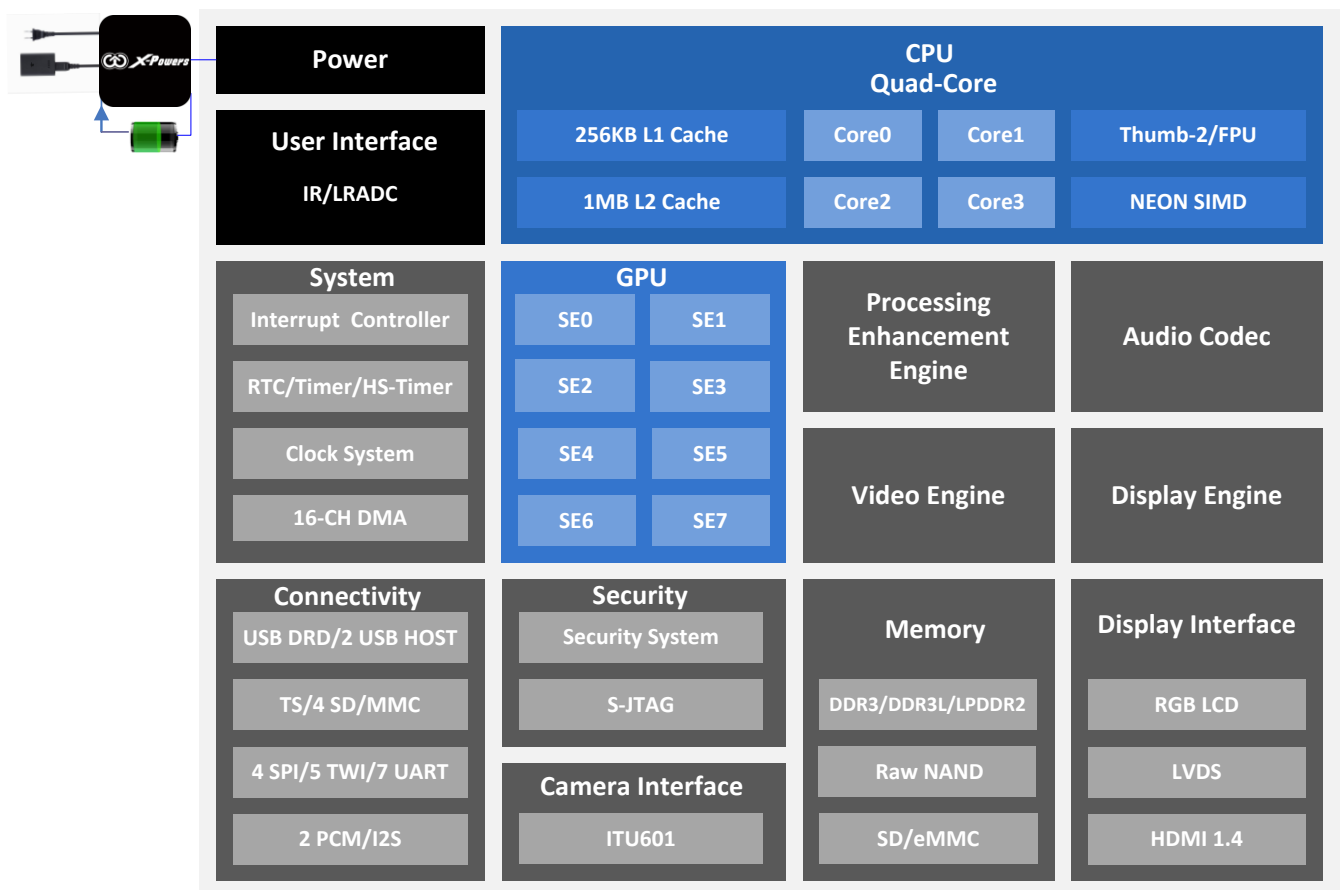


Figure 3-1. A31s Block Diagram

# 4 PIN DESCRIPTION

## 4.1. PIN CHARACTERISTICS

Following table describes the A31s pin characteristics.

### Notes

- 1) **Pin Name** defines the names of pins. Note that a group of pins with similar meaning may be expressed in the form of [x:0];
- 2) **Default Function** defines the default function of each pin;
- 3) **Type** defines the signal direction: I (Input), O (Output), I/O (Input / Output), A (Analog), P (Power), G (Ground);
- 4) **Default IO State** defines the default IO state of each pin: DIS means *disable*;
- 5) **Default Pull Up/Down** defines the presence of an internal pull up or pull down resistor. Unless otherwise specified, the pin is default to be floating, and can be configured as pull up or pull down; Note that the NMI and RESET pins require no additional pull-up resistors;
- 6) **Buffer Strength** defines drive strength of the associated output buffer. It is tested in the condition that VCC= 3.3V, strength=MAX;
- 7) P[A:M] in Table 4-1 stands for GPIO [A:M]. For detailed auxiliary functions of each GPIO, please go to Section 4.2 GPIO Multiplexing Functions section.

| Ball#  | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|--|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| <b>DRAM</b>  |                       |                               |                   |                               |                                   |                                   | VCC_DRAM     |
| Y9, Y6, AA8, AA6, AA9, Y7, AB8, AB6, AA4, AA1, AB5, AA2, AA5, AB1, Y5, AB2, T2, N2, P3, P1, R3, N3, U1, P2, M1, J2, L3, K2, M2, J1, M3, K3 | SDQ[31:0]             | DRAM                          | I/O               | DIS                           | Z                                 | -                                 |              |
| AA7, AA3, R1, L1,  | SDQS[3:0]             | DRAM                          | I/O               | DIS                           | Z                                 | -                                 |              |
| Y8, AB3, R2, L2  | SDQSB[3:0]            | DRAM                          | I/O               | DIS                           | Z                                 | -                                 |              |
| AB9, Y4, P4, L4  | SDQM[3:0]             | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| V3   | SCK                   | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| W3   | SCKB                  | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| Y3, T5   | SCKE[1:0]             | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| V4, W8, Y2, W6, V10, U5, Y1, V8, W2, V9, V2, W9, T3, R5, W4, U3  | SA[15:0]              | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| V1   | SWE                   | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| N5   | SCAS                  | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| L5   | SRAS                  | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| N4, R4   | SCS[1:0]              | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| T4, V5, U2   | SBA[2:0]              | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| M5, M4   | SODT[1:0]             | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| U4   | SRST                  | DRAM                          | O                 | DIS                           | Z                                 | -                                 |              |
| K4   | SZQ                   | DRAM                          | A                 | -                             | -                                 | -                                 |              |

| Ball#                              | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|------------------------------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| W5                                 | SVREF                 | DRAM                          | P                 | -                             | -                                 | -                                 |              |
| P6,R6,T6,T7,U6,U7,U8,<br>V6,V7,W7, | VCC-DRAM (10)         | DRAM                          | P                 | -                             | -                                 | -                                 |              |
| U9                                 | VDD-DLL               | DRAM                          | P                 | -                             | -                                 | -                                 |              |
| GPIO A <sup>7</sup>                |                       |                               |                   |                               |                                   |                                   |              |
| F18                                | PA0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PA       |
| E19                                | PA1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| G18                                | PA2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F19                                | PA3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D20                                | PA4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H18                                | PA5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J18                                | PA6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C20                                | PA7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C21                                | PA8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C22                                | PA9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J19                                | PA10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H19                                | PA11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| G19                                | PA12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D21                                | PA13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E20                                | PA14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| G20                                | PA15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F20                                | PA16                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E21                                | PA17                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E22                                | PA18                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F21                                | PA19                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F22                                | PA20                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H20                                | PA21                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| G21                                | PA22                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H21                                | PA23                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J21                                | PA24                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J20                                | PA25                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H22                                | PA26                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J22                                | PA27                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| M17,N17                            | VCC-PA                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO B <sup>7</sup>                |                       |                               |                   |                               |                                   |                                   |              |
| B19                                | PB0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PB       |
| C19                                | PB1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A20                                | PB2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B20                                | PB3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A21                                | PB4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B21                                | PB5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A22                                | PB6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |

| Ball#               | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|---------------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| BAA                 | PB7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D19                 | VCC-PB                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO C <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| G2                  | PC0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PC       |
| H3                  | PC1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H4                  | PC2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H5                  | PC3                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| F1                  | PC4                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| G3                  | PC5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| G4                  | PC6                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| G5                  | PC7                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| F2                  | PC8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F3                  | PC9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E2                  | PC10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D3                  | PC11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F4                  | PC12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F5                  | PC13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E5                  | PC14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E4                  | PC15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D4                  | PC24                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H6                  | PC25                  | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| C2                  | PC26                  | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| C3                  | PC27                  | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| E8,F8               | VCC-PC                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO D <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| W18                 | PD0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PD       |
| V18                 | PD1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W17                 | PD2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V17                 | PD3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W16                 | PD4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V16                 | PD5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W15                 | PD6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V15                 | PD7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W14                 | PD8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V14                 | PD9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y18                 | PD10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AA19                | PD11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AB18                | PD12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AA18                | PD13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AB17                | PD14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AA17                | PD15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |

| Ball#               | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|---------------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| AA15                | PD16                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AB15                | PD17                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| AA16                | PD18                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y16                 | PD19                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y15                 | PD20                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y17                 | PD21                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W13                 | PD22                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V13                 | PD23                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W12                 | PD24                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V12                 | PD25                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W11                 | PD26                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V11                 | PD27                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| R16,R17,P16         | VCC-PD                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO E <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| B10                 | PE0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PE       |
| A11                 | PE1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C11                 | PE2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B11                 | PE3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D12                 | PE4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E12                 | PE5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D13                 | PE6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D14                 | PE7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A12                 | PE8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B12                 | PE9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C12                 | PE10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B13                 | PE11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C13                 | PE12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A14                 | PE13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B14                 | PE14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C14                 | PE15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E13                 | VCC-PE                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO F <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| D5                  | PF0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PF       |
| J3                  | PF1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J4                  | PF2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| J5                  | PF3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H1                  | PF4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| H2                  | PF5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E7                  | VCC-PF                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO G <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| A15                 | PG0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PG       |
| B15                 | PG1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |

| Ball#               | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|---------------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| C15                 | PG2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B16                 | PG3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C16                 | PG4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A17                 | PG5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D15                 | PG6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E15                 | PG7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D16                 | PG8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E16                 | PG9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B17                 | PG10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C17                 | PG11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D17                 | PG12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E17                 | PG13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A18                 | PG14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B18                 | PG15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C18                 | PG16                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D18                 | PG17                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E18                 | PG18                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E14                 | VCC-PG                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO H <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| C5                  | PH9                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PH       |
| B5                  | PH10                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A5                  | PH11                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E6                  | PH12                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D6                  | PH13                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C6                  | PH14                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B6                  | PH15                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A6                  | PH16                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B7                  | PH17                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C7                  | PH18                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D7                  | PH19                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A8                  | PH20                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B8                  | PH21                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C8                  | PH22                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| E9                  | PH23                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| A9                  | PH24                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| B9                  | PH25                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| C9                  | PH26                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D8                  | PH27                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| D9                  | PH28                  | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| F9,F10              | VCC-PH                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| GPIO L <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |

| Ball#               | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|---------------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| U21                 | PL0                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                | VCC-RTC      |
| AB20                | PL1                   | GPIO                          | I/O               | DIS                           | Pull-up                           | 20                                |              |
| W21                 | PL2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| U20                 | PL3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y20                 | PL4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| U19                 | PL5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| Y19                 | PL6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| W20                 | PL7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| V20                 | PL8                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| GPIO M <sup>7</sup> |                       |                               |                   |                               |                                   |                                   |              |
| R19                 | PM0                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                | VCC-PM       |
| R18                 | PM1                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| R20                 | PM2                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| T18                 | PM3                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| R21                 | PM4                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| T20                 | PM5                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| T19                 | PM6                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| T21                 | PM7                   | GPIO                          | I/O               | DIS                           | Z                                 | 20                                |              |
| U18                 | VCC-PM                | POWER                         | P                 | -                             | -                                 | -                                 |              |
| System Control      |                       |                               |                   |                               |                                   |                                   |              |
| E10                 | UBOOT                 | -                             | I                 | -                             | Pull-up                           | -                                 | VCC_PH       |
| E11,D11             | JTAG_SEL              | -                             | I                 | -                             | Pull-up                           | -                                 | VCC_PH       |
| G9,G10              | BOOT_SEL              | -                             | I                 | -                             | Pull-up                           | -                                 | VCC_PH       |
| W19                 | NMI                   | -                             | I                 | I                             | Z                                 | -                                 | VCC_RTC      |
| U22                 | RESET                 | -                             | I                 | I                             | Z                                 | -                                 | VCC_RTC      |
| HDMI                |                       |                               |                   |                               |                                   |                                   |              |
| AA12                | HTX0P                 | -                             | A                 | -                             | -                                 | -                                 | VCC-HDMI     |
| AB12                | HTX0N                 | -                             | A                 | -                             | -                                 | -                                 |              |
| AA13                | HTX1P                 | -                             | A                 | -                             | -                                 | -                                 |              |
| Y12                 | HTX1N                 | -                             | A                 | -                             | -                                 | -                                 |              |
| AA14                | HTX2P                 | -                             | A                 | -                             | -                                 | -                                 |              |
| Y14                 | HTX2N                 | -                             | A                 | -                             | -                                 | -                                 |              |
| AB11                | HTXCP                 | -                             | A                 | -                             | -                                 | -                                 |              |
| AA11                | HTXCN                 | -                             | A                 | -                             | -                                 | -                                 |              |
| U17                 | VCC-HDMI              | -                             | P                 | -                             | -                                 | -                                 |              |
| AB14                | HSCL                  | -                             | A                 | -                             | -                                 | -                                 |              |
| Y13                 | HSDA                  | -                             | A                 | -                             | -                                 | -                                 |              |
| Y11                 | HHPD                  | -                             | A                 | -                             | -                                 | -                                 |              |
| USB                 |                       |                               |                   |                               |                                   |                                   |              |
| Y21                 | DM0                   | -                             | A                 | -                             | -                                 | -                                 | VCC-USB      |
| Y22                 | DP0                   | -                             | A                 | -                             | -                                 | -                                 |              |
| AA21                | DM1                   | -                             | A                 | -                             | -                                 | -                                 |              |



| Ball#       | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|-------------|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| AA22        | DP1                   | -                             | A                 | -                             | -                                 | -                                 |              |
| T17         | VCC-USB               | -                             | P                 | -                             | -                                 | -                                 |              |
| AB21        | DM2                   | -                             | A                 | -                             | -                                 | -                                 |              |
| AB22        | DP2                   | -                             | A                 | -                             | -                                 | -                                 |              |
| Audio Codec |                       |                               |                   |                               |                                   |                                   |              |
| P18         | PHOUTN                | -                             | A                 | -                             | -                                 | -                                 | AVCC         |
| P19         | PHOUTP                | -                             | A                 | -                             | -                                 | -                                 |              |
| L21         | PHINP                 | -                             | A                 | -                             | -                                 | -                                 |              |
| L22         | PHINN                 | -                             | A                 | -                             | -                                 | -                                 |              |
| P20         | HBIAS                 | -                             | A                 | -                             | -                                 | -                                 |              |
| N20         | MBIAS                 | -                             | A                 | -                             | -                                 | -                                 |              |
| M22         | MIC2N                 | -                             | A                 | -                             | -                                 | -                                 |              |
| M21         | MIC2P                 | -                             | A                 | -                             | -                                 | -                                 |              |
| M20         | MIC1N                 | -                             | A                 | -                             | -                                 | -                                 |              |
| L20         | MIC1P                 | -                             | A                 | -                             | -                                 | -                                 |              |
| K19         | VRA1                  | -                             | A                 | -                             | -                                 | -                                 |              |
| K20         | VRA2                  | -                             | A                 | -                             | -                                 | -                                 |              |
| L18         | AVCC                  | -                             | P                 | -                             | -                                 | -                                 |              |
| K18         | VRP                   | -                             | A                 | -                             | -                                 | -                                 |              |
| P21         | LINEOUTR              | -                             | A                 | -                             | -                                 | -                                 |              |
| P22         | LINEOUTL              | -                             | A                 | -                             | -                                 | -                                 |              |
| N19         | LINEINR               | -                             | A                 | -                             | -                                 | -                                 |              |
| M19         | LINEINL               | -                             | A                 | -                             | -                                 | -                                 |              |
| N16         | AGND                  | -                             | G                 | -                             | -                                 | -                                 |              |
| K21         | HPOUTR                | -                             | A                 | -                             | -                                 | -                                 |              |
| L19         | HPOUTL                | -                             | A                 | -                             | -                                 | -                                 |              |
| M18         | HPCOMFB               | -                             | A                 | -                             | -                                 | -                                 |              |
| N18         | HPCOM                 | -                             | A                 | -                             | -                                 | -                                 |              |
| N21         | HPBP                  | -                             | A                 | -                             | -                                 | -                                 |              |
| P17         | VCC-HP                | -                             | P                 | -                             | -                                 | -                                 |              |
| LRADC       |                       |                               |                   |                               |                                   |                                   |              |
| R22         | LRADC0                | -                             | A                 | -                             | -                                 | -                                 | AVCC         |
| RTC         |                       |                               |                   |                               |                                   |                                   |              |
| AA10        | X24MI                 | -                             | A                 | -                             | -                                 | -                                 | VCC-RTC      |
| Y10         | X24MO                 | -                             | A                 | -                             | -                                 | -                                 |              |
| AA20        | VIO-RTC               | -                             | P                 | -                             | -                                 | -                                 |              |
| V19         | VCC-RTC               | -                             | P                 | -                             | -                                 | -                                 |              |
| Clock       |                       |                               |                   |                               |                                   |                                   |              |
| V22         | X32KI                 | -                             | A                 | -                             | -                                 | -                                 | VCC-PLL      |
| V21         | X32KO                 | -                             | A                 | -                             | -                                 | -                                 |              |
| Power       |                       |                               |                   |                               |                                   |                                   |              |

| Ball#  | Pin Name <sup>1</sup> | Default Function <sup>2</sup> | Type <sup>3</sup> | Default IO State <sup>4</sup> | Default Pull Up/Down <sup>5</sup> | Buffer Strength <sup>6</sup> (mA) | Power Supply |
|--|-----------------------|-------------------------------|-------------------|-------------------------------|-----------------------------------|-----------------------------------|--------------|
| L16,L17  | VDD-CPUS              | -                             | P                 | -                             | -                                 | -                                 | -            |
| F11,F12,F13,F14,F15,F16,G11,G12,G13,G14,G15,G16,G17,H12,H13,H14,H15,H16,H17,J16,J17,K16,K17  | VDD-CPU (23)          | -                             | P                 | -                             | -                                 | -                                 | -            |
| F17  | CPU-VDDFB             | -                             |                   | -                             | -                                 | -                                 | -            |
| J6,J7,K5,K6,K7,L6,L7,M6,M7,N6,N7,P5  | VDD-GPU (12)          | -                             | P                 | -                             | -                                 | -                                 | -            |
| T12,T13,T14,T15,T16,U10,U11,U12,U13,U14,U15,U16  | VDD-SYS (12)          | -                             | P                 | -                             | -                                 | -                                 | -            |
| W10,G8,H8,H9,H10,H11,J8,J9,J10,J11,J12,J13,J14,J15,K8,K9,K10,K11,K12,K13,K14,K15,L8,L9,L10,L11,L12,L13,L14,L15,M8,M9,M10,M11,M12,M13,M14,M15,M16,N8,N9,N10,N11,N12,N13,N14,N15,P7,P8,P9,P10,P11,P12,P13,P14,P15,R7,R8,R9,R10,R11,R12,R13,R14,R15,T8,T9,T10,T11 | GND(69)               | -                             | G                 | -                             | -                                 | -                                 | -            |
| <b>Others</b>  |                       |                               |                   |                               |                                   |                                   |              |
| A1,A2,A3,B1,B2,B3,B4,C1,C4,D2,E1,E3,F6,F7,G6,G7,H7,C10.D10   | NC                    | -                             | -                 | -                             | -                                 | -                                 | -            |

Table 4-1 Pin Characteristics

## 4.2. GPIO MULTIPLEXING FUNCTIONS

The following table provides a description of the A31s GPIO multiplexing functions.

| Pin Name | Default Function | IO Type | Default IO State | Default Pull-up/down | Function2 | Function 3 | Function 4 | Function 5 | Function 6 |
|----------|------------------|---------|------------------|----------------------|-----------|------------|------------|------------|------------|
| PA0      | GPIO             | I/O     | DIS              | Z                    | ETXD0     | -          | UART1_DTR  | -          | PA_EINT0   |
| PA1      |                  | I/O     | DIS              | Z                    | ETXD1     | -          | UART1_DSR  | -          | PA_EINT1   |
| PA2      |                  | I/O     | DIS              | Z                    | ETXD2     | -          | UART1_DCD  | -          | PA_EINT2   |
| PA3      |                  | I/O     | DIS              | Z                    | ETXD3     | -          | UART1_RING | -          | PA_EINT3   |
| PA4      |                  | I/O     | DIS              | Z                    | ETXD4     | -          | UART1_TX   | -          | PA_EINT4   |
| PA5      |                  | I/O     | DIS              | Z                    | ETXD5     | -          | UART1_RX   | -          | PA_EINT5   |
| PA6      |                  | I/O     | DIS              | Z                    | ETXD6     | -          | UART1_RTS  | -          | PA_EINT6   |
| PA7      |                  | I/O     | DIS              | Z                    | ETXD7     | -          | UART1_CTS  | -          | PA_EINT7   |
| PA8      |                  | I/O     | DIS              | Z                    | ETXCLK    | -          |            | -          | PA_EINT8   |
| PA9      |                  | I/O     | DIS              | Z                    | ETXEN     | -          | SDC3_CMD   | SDC2_CMD   | PA_EINT9   |
| PA10     |                  | I/O     | DIS              | Z                    | EGTXCLK   | -          | SDC3_CLK   | SDC2_CLK   | PA_EINT10  |
| PA11     |                  | I/O     | DIS              | Z                    | ERXD0     | -          | SDC3_D0    | SDC2_D0    | PA_EINT11  |
| PA12     |                  | I/O     | DIS              | Z                    | ERXD1     | -          | SDC3_D1    | SDC2_D1    | PA_EINT12  |
| PA13     |                  | I/O     | DIS              | Z                    | ERXD2     | -          | SDC3_D2    | SDC2_D2    | PA_EINT13  |
| PA14     |                  | I/O     | DIS              | Z                    | ERXD3     | -          | SDC3_D3    | SDC2_D3    | PA_EINT14  |
| PA15     |                  | I/O     | DIS              | Z                    | ERXD4     | -          | CLKA_OUT   | -          | PA_EINT15  |
| PA16     |                  | I/O     | DIS              | Z                    | ERXD5     | -          | DMIC_CLK   | -          | PA_EINT16  |

| Pin Name | Default Function | IO Type | Default IO State | Default Pull-up/down | Function2 | Function 3 | Function 4 | Function 5 | Function 6 |
|----------|------------------|---------|------------------|----------------------|-----------|------------|------------|------------|------------|
| PA17     |                  | I/O     | DIS              | Z                    | ERXD6     | -          | DMIC_DIN   | -          | PA_EINT17  |
| PA18     |                  | I/O     | DIS              | Z                    | ERXD7     | -          | CLKB_OUT   | -          | PA_EINT18  |
| PA19     |                  | I/O     | DIS              | Z                    | ERXDV     | -          | PWM3_P     | -          | PA_EINT19  |
| PA20     |                  | I/O     | DIS              | Z                    | ERXCLK    | -          | PWM3_N     | -          | PA_EINT20  |
| PA21     |                  | I/O     | DIS              | Z                    | ETXERR    | -          | SPI3_CS0   | -          | PA_EINT21  |
| PA22     |                  | I/O     | DIS              | Z                    | ERXERR    | -          | SPI3_CLK   | -          | PA_EINT22  |
| PA23     |                  | I/O     | DIS              | Z                    | ECOL      | -          | SPI3_MOSI  | -          | PA_EINT23  |
| PA24     |                  | I/O     | DIS              | Z                    | ECRS      | -          | SPI3_MISO  | -          | PA_EINT24  |
| PA25     |                  | I/O     | DIS              | Z                    | ECLKIN    | -          | SPI3_CS1   | -          | PA_EINT25  |
| PA26     |                  | I/O     | DIS              | Z                    | EMDC      | -          | CLKC_OUT   | -          | PA_EINT26  |
| PA27     |                  | I/O     | DIS              | Z                    | EMDIO     | -          |            | -          | PA_EINT27  |
| PB0      | GPIO             | I/O     | DIS              | Z                    | I2S0_MCLK | UART3_CTS  | -          | -          | PB_EINT0   |
| PB1      |                  | I/O     | DIS              | Z                    | I2S0_BCLK | -          | -          | -          | PB_EINT1   |
| PB2      |                  | I/O     | DIS              | Z                    | I2S0_LRCK | -          | -          | -          | PB_EINT2   |
| PB3      |                  | I/O     | DIS              | Z                    | I2S0_DO0  | -          | -          | -          | PB_EINT3   |
| PB4      |                  | I/O     | DIS              | Z                    | I2S0_DO1  | UART3_RTS  | TWI3-SCK   | -          | PB_EINT4   |
| PB5      |                  | I/O     | DIS              | Z                    | I2S0_DO2  | UART3_TX   | TWI3-SDA   | -          | PB_EINT5   |
| PB6      |                  | I/O     | DIS              | Z                    | I2S0_DO3  | UART3_RX   | -          | -          | PB_EINT6   |
| PB7      |                  | I/O     | DIS              | Z                    | I2S0_DI   | -          | -          | -          | PB_EINT7   |
| PC0      |                  | I/O     | DIS              | Z                    | NAND_WE   | SPI0_MOSI  | -          | -          | -          |
| PC1      |                  | I/O     | DIS              | Z                    | NAND_ALE  | SPI0_MISO  | -          | -          | -          |
| PC2      |                  | I/O     | DIS              | Z                    | NAND_CLE  | SPI0_CLK   | -          | -          | -          |
| PC3      |                  | I/O     | DIS              | Pull-up              | NAND_CE1  | -          | -          | -          | -          |
| PC4      |                  | I/O     | DIS              | Pull-up              | NAND_CE0  | -          | -          | -          | -          |
| PC5      |                  | I/O     | DIS              | Z                    | NAND_RE   | -          | -          | -          | -          |
| PC6      |                  | I/O     | DIS              | Pull-up              | NAND_RB0  | SDC2_CMD   | SDC3_CMD   | -          | -          |
| PC7      |                  | I/O     | DIS              | Pull-up              | NAND_RB1  | SDC2_CLK   | SDC3_CLK   | -          | -          |
| PC8      |                  | I/O     | DIS              | Z                    | NAND_DQ0  | SDC2_D0    | SDC3_D0    | -          | -          |
| PC9      |                  | I/O     | DIS              | Z                    | NAND_DQ1  | SDC2_D1    | SDC3_D1    | -          | -          |
| PC10     |                  | I/O     | DIS              | Z                    | NAND_DQ2  | SDC2_D2    | SDC3_D2    | -          | -          |
| PC11     |                  | I/O     | DIS              | Z                    | NAND_DQ3  | SDC2_D3    | SDC3_D3    | -          | -          |
| PC12     |                  | I/O     | DIS              | Z                    | NAND_DQ4  | SDC2_D4    | SDC3_D4    | -          | -          |
| PC13     |                  | I/O     | DIS              | Z                    | NAND_DQ5  | SDC2_D5    | SDC3_D5    | -          | -          |
| PC14     |                  | I/O     | DIS              | Z                    | NAND_DQ6  | SDC2_D6    | SDC3_D6    | -          | -          |
| PC15     |                  | I/O     | DIS              | Z                    | NAND_DQ7  | SDC2_D7    | SDC3_D7    | -          | -          |
| PC24     |                  | I/O     | DIS              | Z                    | NAND_DQS  | SDC2_RST   | SDC3_RST   | -          | -          |
| PC25     |                  | I/O     | DIS              | Pull-up              | NAND_CE2  | -          | -          | -          | -          |
| PC26     |                  | I/O     | DIS              | Pull-up              | NAND_CE3  | -          | -          | -          | -          |
| PC27     | GPIO             | I/O     | DIS              | Pull-up              | -         | SPI0_CS0   | -          | -          | -          |
| PD0      | GPIO             | I/O     | DIS              | Z                    | LCD_D0    | LVDS_VP0   | -          | -          | -          |
| PD1      |                  | I/O     | DIS              | Z                    | LCD_D1    | LVDS_VN0   | -          | -          | -          |

| Pin Name | Default Function | IO Type | Default IO State | Default Pull-up/down | Function2 | Function 3 | Function 4 | Function 5 | Function 6 |
|----------|------------------|---------|------------------|----------------------|-----------|------------|------------|------------|------------|
| PD2      |                  | I/O     | DIS              | Z                    | LCD_D2    | LVDS_VP1   | -          | -          | -          |
| PD3      |                  | I/O     | DIS              | Z                    | LCD_D3    | LVDS_VN1   | -          | -          | -          |
| PD4      |                  | I/O     | DIS              | Z                    | LCD_D4    | LVDS_VP2   | -          | -          | -          |
| PD5      |                  | I/O     | DIS              | Z                    | LCD_D5    | LVDS_VN2   | -          | -          | -          |
| PD6      |                  | I/O     | DIS              | Z                    | LCD_D6    | LVDS_VPC   | -          | -          | -          |
| PD7      |                  | I/O     | DIS              | Z                    | LCD_D7    | LVDS_VNC   | -          | -          | -          |
| PD8      |                  | I/O     | DIS              | Z                    | LCD_D8    | LVDS_VP3   | -          | -          | -          |
| PD9      |                  | I/O     | DIS              | Z                    | LCD_D9    | LVDS_VN3   | -          | -          | -          |
| PD10     |                  | I/O     | DIS              | Z                    | LCD_D10   | -          | -          | -          | -          |
| PD11     |                  | I/O     | DIS              | Z                    | LCD_D11   | -          | -          | -          | -          |
| PD12     |                  | I/O     | DIS              | Z                    | LCD_D12   | -          | -          | -          | -          |
| PD13     |                  | I/O     | DIS              | Z                    | LCD_D13   | -          | -          | -          | -          |
| PD14     |                  | I/O     | DIS              | Z                    | LCD_D14   | -          | -          | -          | -          |
| PD15     |                  | I/O     | DIS              | Z                    | LCD_D15   | -          | -          | -          | -          |
| PD16     |                  | I/O     | DIS              | Z                    | LCD_D16   | -          | -          | -          | -          |
| PD17     |                  | I/O     | DIS              | Z                    | LCD_D17   | -          | -          | -          | -          |
| PD18     |                  | I/O     | DIS              | Z                    | LCD_D18   | -          | -          | -          | -          |
| PD19     |                  | I/O     | DIS              | Z                    | LCD_D19   | -          | -          | -          | -          |
| PD20     |                  | I/O     | DIS              | Z                    | LCD_D20   | -          | -          | -          | -          |
| PD21     |                  | I/O     | DIS              | Z                    | LCD_D21   | -          | -          | -          | -          |
| PD22     |                  | I/O     | DIS              | Z                    | LCD_D22   | -          | -          | -          | -          |
| PD23     |                  | I/O     | DIS              | Z                    | LCD_D23   | -          | -          | -          | -          |
| PD24     |                  | I/O     | DIS              | Z                    | LCD_CLK   | -          | -          | -          | -          |
| PD25     |                  | I/O     | DIS              | Z                    | LCD_DE    | -          | -          | -          | -          |
| PD26     |                  | I/O     | DIS              | Z                    | LCD_HSYNC | -          | -          | -          | -          |
| PD27     |                  | I/O     | DIS              | Z                    | LCD_VSYNC | -          | -          | -          | -          |
| PE0      | GPIO             | I/O     | DIS              | Z                    | CSI_PCLK  | TS_CLK     | -          | -          | PE_EINT0   |
| PE1      |                  | I/O     | DIS              | Z                    | CSI_MCLK  | TS_ERR     | -          | -          | PE_EINT1   |
| PE2      |                  | I/O     | DIS              | Z                    | CSI_HSYNC | TS_SYNC    | -          | -          | PE_EINT2   |
| PE3      |                  | I/O     | DIS              | Z                    | CSI_VSYNC | TS_DVLD    | -          | -          | PE_EINT3   |
| PE4      |                  | I/O     | DIS              | Z                    | CSI_D0    | UART5_TX   | -          | -          | PE_EINT4   |
| PE5      |                  | I/O     | DIS              | Z                    | CSI_D1    | UART5_RX   | -          | -          | PE_EINT5   |
| PE6      |                  | I/O     | DIS              | Z                    | CSI_D2    | UART5_RTS  | -          | -          | PE_EINT6   |
| PE7      |                  | I/O     | DIS              | Z                    | CSI_D3    | UART5_CTS  | -          | -          | PE_EINT7   |
| PE8      |                  | I/O     | DIS              | Z                    | CSI_D4    | TS_D0      | -          | -          | PE_EINT8   |
| PE9      |                  | I/O     | DIS              | Z                    | CSI_D5    | TS_D1      | -          | -          | PE_EINT9   |
| PE10     |                  | I/O     | DIS              | Z                    | CSI_D6    | TS_D2      | -          | -          | PE_EINT10  |
| PE11     |                  | I/O     | DIS              | Z                    | CSI_D7    | TS_D3      | -          | -          | PE_EINT11  |
| PE12     |                  | I/O     | DIS              | Z                    | CSI_D8    | TS_D4      | -          | -          | PE_EINT12  |
| PE13     |                  | I/O     | DIS              | Z                    | CSI_D9    | TS_D5      | -          | -          | PE_EINT13  |
| PE14     |                  | I/O     | DIS              | Z                    | CSI_D10   | TS_D6      | -          | -          | PE_EINT14  |
| PE15     |                  | I/O     | DIS              | Z                    | CSI_D11   | TS_D7      | -          | -          | PE_EINT15  |

| Pin Name | Default Function | IO Type | Default IO State | Default Pull-up/down | Function2 | Function 3 | Function 4 | Function 5 | Function 6 |
|----------|------------------|---------|------------------|----------------------|-----------|------------|------------|------------|------------|
| PF0      | GPIO             | I/O     | DIS              | Z                    | SDC0_D1   | -          | JTAG_MS1   | -          | -          |
| PF1      |                  | I/O     | DIS              | Z                    | SDC0_D0   | -          | JTAG_DI1   | -          | -          |
| PF2      |                  | I/O     | DIS              | Z                    | SDC0_CLK  | -          | UART0_TX   | -          | -          |
| PF3      |                  | I/O     | DIS              | Z                    | SDC0_CMD  | -          | JTAG_DO1   | -          | -          |
| PF4      |                  | I/O     | DIS              | Z                    | SDC0_D3   | -          | UART0_RX   | -          | -          |
| PF5      |                  | I/O     | DIS              | Z                    | SDC0_D2   | -          | JTAG_CK1   | -          | -          |
| PG0      | GPIO             | I/O     | DIS              | Z                    | SDC1_CLK  | -          | -          | -          | PG_EINT0   |
| PG1      |                  | I/O     | DIS              | Z                    | SDC1_CMD  | -          | -          | -          | PG_EINT1   |
| PG2      |                  | I/O     | DIS              | Z                    | SDC1_D0   | -          | -          | -          | PG_EINT2   |
| PG3      |                  | I/O     | DIS              | Z                    | SDC1_D1   | -          | -          | -          | PG_EINT3   |
| PG4      |                  | I/O     | DIS              | Z                    | SDC1_D2   | -          | -          | -          | PG_EINT4   |
| PG5      |                  | I/O     | DIS              | Z                    | SDC1_D3   | -          | -          | -          | PG_EINT5   |
| PG6      |                  | I/O     | DIS              | Z                    | UART2_TX  | -          | -          | -          | PG_EINT6   |
| PG7      |                  | I/O     | DIS              | Z                    | UART2_RX  | -          | -          | -          | PG_EINT7   |
| PG8      |                  | I/O     | DIS              | Z                    | UART2_RTS | -          | -          | -          | PG_EINT8   |
| PG9      |                  | I/O     | DIS              | Z                    | UART2_CTS | -          | -          | -          | PG_EINT9   |
| PG10     |                  | I/O     | DIS              | Z                    | TWI3_SCK  | -          | -          | -          | PG_EINT10  |
| PG11     |                  | I/O     | DIS              | Z                    | TWI3_SDA  | -          | -          | -          | PG_EINT11  |
| PG12     |                  | I/O     | DIS              | Z                    | SPI1_CS1  | I2S1_MCLK  | -          | -          | PG_EINT12  |
| PG13     |                  | I/O     | DIS              | Z                    | SPI1_CS0  | I2S1_BCLK  | -          | -          | PG_EINT13  |
| PG14     |                  | I/O     | DIS              | Z                    | SPI1_CLK  | I2S1_LRCK  | -          | -          | PG_EINT14  |
| PG15     |                  | I/O     | DIS              | Z                    | SPI1_MOSI | I2S1_DIN   | -          | -          | PG_EINT15  |
| PG16     |                  | I/O     | DIS              | Z                    | SPI1_MISO | I2S1_DOUT  | -          | -          | PG_EINT16  |
| PG17     |                  | I/O     | DIS              | Z                    | UART4_TX  | -          | -          | -          | PG_EINT17  |
| PG18     |                  | I/O     | DIS              | Z                    | UART4_RX  | -          | -          | -          | PG_EINT18  |
| PH9      | GPIO             | I/O     | DIS              | Z                    | SPI2_CS0  | JTAG_MS0   | PWM1_P     | -          | -          |
| PH10     |                  | I/O     | DIS              | Z                    | SPI2_CLK  | JTAG_CK0   | PWM1_N     | -          | -          |
| PH11     |                  | I/O     | DIS              | Z                    | SPI2_MOSI | JTAG_DO0   | PWM2_P     | -          | -          |
| PH12     |                  | I/O     | DIS              | Z                    | SPI2_MISO | JTAG_DI0   | PWM2_N     | -          | -          |
| PH13     |                  | I/O     | DIS              | Z                    | PWM0      | -          | -          | -          | -          |
| PH14     |                  | I/O     | DIS              | Z                    | TWI0_SCK  | -          | -          | -          | -          |
| PH15     |                  | I/O     | DIS              | Z                    | TWI0_SDA  | -          | -          | -          | -          |
| PH16     |                  | I/O     | DIS              | Z                    | TWI1_SCK  | -          | -          | -          | -          |
| PH17     |                  | I/O     | DIS              | Z                    | TWI1_SDA  | -          | -          | -          | -          |
| PH18     |                  | I/O     | DIS              | Z                    | TWI2_SCK  | -          | -          | -          | -          |
| PH19     |                  | I/O     | DIS              | Z                    | TWI2_SDA  | -          | -          | -          | -          |
| PH20     |                  | I/O     | DIS              | Z                    | UART0_TX  | -          | -          | -          | -          |
| PH21     |                  | I/O     | DIS              | Z                    | UART0_RX  | -          | -          | -          | -          |
| PH22     |                  | I/O     | DIS              | Z                    | -         | -          | -          | -          | -          |
| PH23     |                  | I/O     | DIS              | Z                    | -         | -          | -          | -          | -          |
| PH24     |                  | I/O     | DIS              | Z                    | -         | -          | -          | -          | -          |

| Pin Name | Default Function | IO Type | Default IO State | Default Pull-up/down | Function2  | Function 3 | Function 4 | Function 5 | Function 6 |
|----------|------------------|---------|------------------|----------------------|------------|------------|------------|------------|------------|
| PH25     |                  | I/O     | DIS              | Z                    | -          | -          | -          | -          | -          |
| PH26     |                  | I/O     | DIS              | Z                    | -          | -          | -          | -          | -          |
| PH27     |                  | I/O     | DIS              | Z                    | -          | -          | -          | -          | -          |
| PH28     |                  | I/O     | DIS              | Z                    | -          | -          | -          | -          | -          |
| PL0      | GPIO             | I/O     | DIS              | Pull-up              | S_TWI_SCK  | S_P2WI_SCK | -          | -          | -          |
| PL1      |                  | I/O     | DIS              | Pull-up              | S_TWI_SDA  | S_P2WI_SDA | -          | -          | -          |
| PL2      |                  | I/O     | DIS              | Z                    | S_UART_TX  | -          | -          | -          | -          |
| PL3      |                  | I/O     | DIS              | Z                    | S_UART_RX  | -          | -          | -          | -          |
| PL4      |                  | I/O     | DIS              | Z                    | S_IR_RX    | -          | -          | -          | -          |
| PL5      |                  | I/O     | DIS              | Z                    | S_PL_EINT0 | S_JTAG_MS  | -          | -          | -          |
| PL6      |                  | I/O     | DIS              | Z                    | S_PL_EINT1 | S_JTAG_CK  | -          | -          | -          |
| PL7      |                  | I/O     | DIS              | Z                    | S_PL_EINT2 | S_JTAG_DO  | -          | -          | -          |
| PL8      |                  | I/O     | DIS              | Z                    | S_PL_EINT3 | S_JTAG_DI  | -          | -          | -          |
| PM0      |                  | I/O     | DIS              | Z                    | S_PM_EINT0 | -          | -          | -          | -          |
| PM1      | GPIO             | I/O     | DIS              | Z                    | S_PM_EINT1 | -          | -          | -          | -          |
| PM2      |                  | I/O     | DIS              | Z                    | S_PM_EINT2 | 1WIRE      | -          | -          | -          |
| PM3      |                  | I/O     | DIS              | Z                    | S_PM_EINT3 | -          | -          | -          | -          |
| PM4      |                  | I/O     | DIS              | Z                    | S_PM_EINT4 | -          | -          | -          | -          |
| PM5      |                  | I/O     | DIS              | Z                    | S_PM_EINT5 | -          | -          | -          | -          |
| PM6      |                  | I/O     | DIS              | Z                    | S_PM_EINT6 | -          | -          | -          | -          |
| PM7      |                  | I/O     | DIS              | Z                    | S_PM_EINT7 | RTC_CLKO   | -          | -          | -          |

Table 4-2 Multiplexing Functions

### 4.3. DETAILED PIN/SIGNAL DESCRIPTION

Following table describes A31s pins.

| Pin/Signal Name | Description                    | Type |
|-----------------|--------------------------------|------|
| <b>DRAM</b>     |                                |      |
| SDQ[31:0]       | DRAM Data Input/Output[31:0]   | I/O  |
| SDQS[3:0]       | DRAM Data Strobe[3:0]          | I/O  |
| SDQSB[3:0]      | DRAM Data Strobe Negative[3:0] | I/O  |
| SDQM[3:0]       | DRAM DQ Mask [3:0]             | O    |
| SCK             | DRAM Clock Positive            | O    |
| SCKB            | DRAM Clock Negative            | O    |
| SCKE[1:0]       | DRAM Clock Enable [1:0]        | O    |
| SA[15:0]        | DRAM data Address [15:0]       | O    |
| SWE             | DRAM Write Enable              | O    |
| SCAS            | DRAM Column Address Strobe     | O    |
| SRAS            | DRAM Row Address Strobe        | O    |
| SCS[1:0]        | DRAM Chip Select [1:0]         | O    |
| SBA[2:0]        | DRAM Bank Address [2:0]        | O    |

| Pin/Signal Name       | Description                  | Type |
|-----------------------|------------------------------|------|
| SODT[1:0]             | DRAM On Die Termination[1:0] | O    |
| SRST                  | DRAM Reset                   | O    |
| SZQ                   | DRAM ZQ Calibration          | A    |
| SVREF                 | DRAM Reference Input         | P    |
| VCC-DRAM              | DRAM Power Supply            | P    |
| VDD-DLL               | DLL Power Supply             | P    |
| <b>GPIO</b>           |                              |      |
| PA[27:0]              | GPIO A Bit [27:0]            | I/O  |
| VCC-PA                | GPIO A Power Supply          | P    |
| PB[7:0]               | GPIO B Bit [7:0]             | I/O  |
| VCC-PB                | GPIO B Power Supply          | P    |
| PC[27:0]              | GPIO C Bit [27:0]            | I/O  |
| VCC-PC                | GPIO C Power Supply          | P    |
| PD[27:0]              | GPIO D Bit [27:0]            | I/O  |
| VCC-PD                | GPIO D Power Supply          | P    |
| PE[15:0]              | GPIO E Bit [16:0]            | I/O  |
| VCC-PE                | GPIO E Power Supply          | P    |
| PF[5:0]               | GPIO F Bit [5:0]             | I/O  |
| VCC-PF                | GPIO F Power Supply          | P    |
| PG[18:0]              | GPIO G Bit [18:0]            | I/O  |
| VCC-PG                | GPIO G Power Supply          | P    |
| PH[30:0]              | GPIO H Bit[30:0]             | I/O  |
| VCC-PH                | GPIO H Power Supply          | P    |
| PL[8:0]               | GPIO L Bit [8:0]             | I/O  |
| PM[7:0]               | GPIO M Bit [7:0]             | I/O  |
| VCC-PM                | GPIO M Power Supply          | P    |
| <b>System Control</b> |                              |      |
| UBOOT                 | UBOOT                        | I    |
| JTAG_SEL              | JTAG Mode Select             | I    |
| BOOT_SEL              | BOOT Mode Select             | I    |
| NMI                   | Non-Maskable Interrupt       | I    |
| RESET                 | RESET Signal                 | I    |
| <b>HDMI</b>           |                              |      |
| HTX0P                 | TMDS Data 0 Positive         | A    |
| HTX0N                 | TMDS Data 0 Negative         | A    |
| HTX1P                 | TMDS Data 1 Positive         | A    |
| HTX1N                 | TMDS Data 1 Negative         | A    |
| HTX2P                 | TMDS Data 2 Positive         | A    |
| HTX2N                 | TMDS Data 2 Negative         | A    |
| HTXCP                 | TMDS Clock Positive          | A    |
| HTXCN                 | TMDS Clock Negative          | A    |
| VCC-HDMI              | HDMI Power Supply            | P    |

| Pin/Signal Name    | Description                         | Type |
|--------------------|-------------------------------------|------|
| HSCL               | HDMI DDC Clock                      | A    |
| HSDA               | HDMI DDC Data                       | A    |
| HHPD               | HDMI Hot Plug Detection signal      | A    |
| <b>USB</b>         |                                     |      |
| USB_DM0            | USB DM0 Signal                      | A    |
| USB_DP0            | USB DP0 Signal                      | A    |
| USB_DM1            | USB DM1 Signal                      | A    |
| USB_DP1            | USB DP1 Signal                      | A    |
| VCC-USB            | USB Power Supply                    | P    |
| USB_DM2            | USB DM2 Signal                      | A    |
| USB_DP2            | USB DP2 Signal                      | A    |
| <b>Audio Codec</b> |                                     |      |
| PHOUTN             | Phone Negative Output               | A    |
| PHOUTP             | Phone Positive Output               | A    |
| PHINP              | Phone Positive Input                | A    |
| PHINN              | Phone Negative Input                | A    |
| HBIAS              | Headphone Microphone Bias           | A    |
| MBIAS              | Master Analog Microphone Bias       | A    |
| MIC2N              | MIC Negative Input 2                | A    |
| MIC2P              | MIC Positive Input 2                | A    |
| MIC1N              | MIC Negative Input 1                | A    |
| MIC1P              | MIC Positive Input 1                | A    |
| VRA1               | Reference Voltage                   | A    |
| VRA2               | Reference Voltage                   | A    |
| AVCC               | Analog Power Supply                 | P    |
| VRP                | Reference Voltage                   | A    |
| LINEOUTR           | LINE-OUT Right Channel Output       | A    |
| LINEOUTL           | LINE-OUT Left Channel Output        | A    |
| LINEINR            | LINE-IN Right Channel Input         | A    |
| LINEINL            | LINE-IN Left Channel Input          | A    |
| AGND               | Analog Ground                       | G    |
| HPOUTR             | Headphone Right Channel Output      | A    |
| HPCOMFB            | Headphone Common Reference Feedback | A    |
| HPCOM              | Headphone Common Reference          | A    |
| HPBP               | Headphone Bypass Output             | A    |
| VCC-HP             | Headphone Power Supply              | A    |
| HPOUTL             | Headphone Left Channel Output       | A    |
| <b>LRADC</b>       |                                     |      |
| LRADC0             | LRADC Input0                        | A    |
| <b>Clock</b>       |                                     |      |
| RTC-VIO            | RTC Power                           | P    |
| VCC-RTC            | RTC Power Supply                    | P    |
| X24MI              | Clock Input Of 24MHz Crystal        | A    |



| Pin/Signal Name      | Description                     | Type |
|----------------------|---------------------------------|------|
| X24MO                | Clock Output Of 24MHz Crystal   | A    |
| X32KI                | Clock Input Of 32768Hz Crystal  | A    |
| X32KO                | Clock Output Of 32768Hz Crystal | A    |
| <b>SD (x=[3:0])</b>  |                                 |      |
| SDCx_CMD             | SDx/MMCx/SDIOx Command Signal   | I/O  |
| SDCx_CLK             | SDx/MMCx/SDIOx Clock            | O    |
| SDC0_D[3:0]          | SD0/MMC0/SDIO0 Data [3:0]       | I/O  |
| SDC1_D[3:0]          | SD1/MMC1/SDIO1 Data [3:0]       | I/O  |
| SDC2_D[7:0]          | SD2/MMC2/SDIO2 Data [7:0]       | I/O  |
| SDC3_D[7:0]          | SD3/MMC3/SDIO3 Data [7:0]       | I/O  |
| SDC2_RST             | SD2/MMC2/SDIO2 Reset Signal     | I/O  |
| SDC3_RST             | SD3/MMC3/SDIO3 Reset Signal     | I/O  |
| <b>NAND</b>          |                                 |      |
| NAND_DQ[7:0]         | NAND Flash Data Bit [7:0]       | I/O  |
| NAND_DQS             | NAND Flash Data Strobe          | I/O  |
| NAND_WE              | NAND Flash Write Enable         | O    |
| NAND_RE              | NAND Flash chip Read Enable     | O    |
| NAND_ALE             | NAND Flash Address Latch Enable | O    |
| NAND_CLE             | NAND Command Latch Enable       | O    |
| NAND_CE[3:0]         | NAND Flash Chip Select [3:0]    | O    |
| NAND_RB[1:0]         | NAND Flash Ready/Busy Bit       | I    |
| <b>JTAG</b>          |                                 |      |
| S_JTAG_MS            | N/A                             | I/O  |
| S_JTAG_CK            | N/A                             | I/O  |
| S_JTAG_DO            | N/A                             | I/O  |
| S_JTAG_DI            | N/A                             | I/O  |
| JTAG_MS[1:0]         | N/A                             | I/O  |
| JTAG_CK[1:0]         | N/A                             | I/O  |
| JTAG_DO[1:0]         | N/A                             | I/O  |
| JTAG_DI[1:0]         | N/A                             | I/O  |
| <b>Interrupt</b>     |                                 |      |
| PA_EINT[27:0]        | GPIO A Interrupt                | I    |
| PB_EINT[7:0]         | GPIO B Interrupt                | I    |
| PE_EINT[15:0]        | GPIO E Interrupt                | I    |
| S_PL_EINT[3:0]       | GPIO L Interrupt                | I    |
| S_PM_EINT[7:0]       | GPIO M Interrupt                | I    |
| <b>PWM (x=[3:1])</b> |                                 |      |
| PWMx_P               | PWM Output Positive             | O    |
| PWMx_N               | PWM Output Negative             | O    |
| PWM0                 | PWM 0                           | O    |
| <b>IR</b>            |                                 |      |
| S_IR_RX              | IR Data Receive                 | I    |

| Pin/Signal Name      | Description                             | Type |
|----------------------|---|------|
| <b>LCD</b>           |   |      |
| LCD_D[23:0]          | LCD Data Bit [23:0]                     | O    |
| LCD_CLK              | LCD Clock signal                        | O    |
| LCD_DE               | LCD Data Enable                         | O    |
| LCD_HSYNC            | LCD Horizontal SYNC                     | O    |
| LCD_VSYNC            | LCD Vertical SYNC                       | O    |
| <b>LVDS</b>          |   |      |
| LVDS_VP[3:0]         | LVDS Data Positive Signal Output[3:0]   | A    |
| LVDS_VN[3:0]         | LVDS Data Negative Signal Output[3:0]   | A    |
| LVDS_VPC             | LVDS Clock Positive Signal Output       | A    |
| LVDS_VNC             | LVDS Clock Negative Signal Output       | A    |
| <b>I2S (x=[1:0])</b> |   |      |
| I2Sx_MCLK            | I2S Master Clock (system clock)         | O    |
| I2Sx_BCLK            | I2S Bit Clock                           | I/O  |
| I2Sx_LRCK            | I2S Left/Right Channel Select Clock     | I/O  |
| I2S1_DIN             | I2S1 Data Input                         | I    |
| I2S1_DOUT            | I2S1 Data Output                        | O    |
| I2S0_DO[3:0]         | I2S0 Data Output                        | O    |
| I2S0_DI              | I2S0 Data Input                         | I    |
| <b>CSI</b>           |   |      |
| CSI_PCLK             | CSI Pixel Clock                         | I    |
| CSI_MCLK             | CSI Master Clock                        | O    |
| CSI_HSYNC            | CSI Horizontal SYNC                     | I    |
| CSI_VSYNC            | CSI Vertical SYNC                       | I    |
| CSI_D[11:0]          | CSI Data bit [11:0]                     | I    |
| <b>TS</b>            |   |      |
| TS_CLK               | Transport Stream Clock                  | I    |
| TS_ERR               | Transport Stream Error Indicate         | I    |
| TS_SYNC              | Transport Stream SYNC                   | I    |
| TS_DVLD              | Transport Stream Valid Signal           | I    |
| TS_D[7:0]            | Transport Stream Data                   | I    |
| <b>EMAC</b>          |   |      |
| ETXD[7:0]            | EMAC Transmit Data Nibble Data Bit[7:0] | O    |
| ETXCLK               | EMAC Transmit Clock                     | O    |
| ETXEN                | EMAC Transmit Enable                    | O    |
| EGTXCLK              | EMAC GMII/RGMII Transmit Clock          | O    |
| ERXD[7:0]            | EMAC Receive Data Nibble Data Bit[7:0]  | I    |
| ERXDV                | EMAC Receive Data Valid                 | I    |
| ERXCLK               | EMAC Receive Clock                      | I    |
| ETXERR               | EMAC Transmit Error                     | O    |
| ERXERR               | EMAC Receive Error                      | I    |
| ECOL                 | EMAC Collision Detect                   | I    |
| ECRS                 | EMAC Carrier Sense                      | I    |

| Pin/Signal Name       | Description                        | Type |
|-----------------------|------------------------------------|------|
| ECLKIN                | EMAC Clock Input                   | I    |
| EMDC                  | EMAC Management Data Clock         | O    |
| EMDIO                 | EMAC Management Data Input/Output  | I/O  |
| <b>SPI (x=[3:0])</b>  |                                    |      |
| SPI0_CS0              | SPI0 Chip Select signal 0          | I/O  |
| SPI1_CS[1:0]          | SPI1 Chip Select signal[1:0]       | I/O  |
| SPI2_CS0              | SPI2 Chip Select signal 0          | I/O  |
| SPI3_CS[1:0]          | SPI3 Chip Select signal [1:0]      | I/O  |
| SPIx_CLK              | SPI Clock signal                   | I/O  |
| SPIx_MOSI             | SPI Master data Out, Slave data In | I/O  |
| SPIx_MISO             | SPI Master data In, Slave data Out | I/O  |
| <b>UART (x=[5:0])</b> |                                    |      |
| UART1_DTR             | UART Data Terminal Ready           | O    |
| UART1_DSR             | UART Data Set Ready                | I    |
| UART1_DCD             | UART Data Carrier Detect           | I    |
| UART1_RING            | UART RING indicator                | I    |
| UARTx_CTS             | UART Data Clear To Send            | I    |
| UARTx_RTS             | UART Data Request To Send          | O    |
| UARTx_TX[5:0]         | UART Data Transmit                 | O    |
| UARTx_RX[5:0]         | UART Data Receive                  | I    |
| S_UART_TX             | UART Data Transmit                 | O    |
| S_UART_RX             | UART Data Receive                  | I    |
| <b>TWI (x=[3:0])</b>  |                                    |      |
| TWlx_SCK              | TWI Serial Clock Signal            | I/O  |
| TWlx_SDA              | TWI Serial Data Signal             | I/O  |
| S_TWI_SCK             | TWI Serial Clock Signal            | I/O  |
| S_TWI_SDA             | TWI Serial Data Signal             | I/O  |
| S_P2WI_SCK            | P2WI Serial Clock Signal           | I/O  |
| S_P2WI_SDA            | P2WI Serial Data Signal            | I/O  |
| <b>One Wire</b>       |                                    |      |
| 1WIRE                 | One WIRE signal                    | I/O  |
| <b>Clock</b>          |                                    |      |
| CLKA_OUT              | CLOCK OUT A                        | O    |
| CLKB_OUT              | CLOCK OUT B                        | O    |
| CLKC_OUT              | CLOCK OUT C                        | O    |
| CK32KO                | 32K Crystal Clock Output           | O    |
| RTC_CLKO              | RTC Clock Output                   | O    |

Table 4-3 Detailed Pin Description

## 4.4. POWER/GND SIGNAL DESCRIPTION



## Note

- 1) VRP/VRA1/VRA2 are output type, and are not for third party development use.

| Signal Name        | Description              | Ball#  |
|--------------------|--------------------------|--|
| <b>HDMI</b>        |                          |  |
| VCC-HDMI           | HDMI Power Supply        | U17  |
| <b>USB Power</b>   |                          |  |
| VCC-USB            | USB Power Supply         | T17  |
| <b>IO Power</b>    |                          |  |
| VCC-PA             | Power Supply for GPIO A  | M17,N17  |
| VCC-PB             | Power Supply for GPIO B  | D19  |
| VCC-PC             | Power Supply for GPIO C  | E8,F8  |
| VCC-PD             | Power Supply for GPIO D  | P16,R16,R17  |
| VCC-PE             | Power Supply for GPIO E  | E13  |
| VCC-PF             | Power Supply for GPIO F  | E7   |
| VCC-PG             | Power Supply for GPIO G  | E14  |
| VCC-PH             | Power Supply for GPIO H  | F9,F10   |
| VCC-PM             | Power Supply for GPIO M  | U18  |
| <b>RTC</b>         |                          |  |
| VCC_RTC            | RTC Power Supply         | V19  |
| <b>DRAM Power</b>  |                          |  |
| VCC-DRAM           | DRAM Power Supply        | P6,R6,T6,T7,U6,U7,U8,V6,V7,W7  |
| VDD-DLL            | DLL Power Supply         | U9   |
| <b>Audio Codec</b> |                          |  |
| AVCC               | Analog Power Supply      | L18  |
| AGND               | Analog Ground            | N16  |
| VRP                | Reference Voltage Output | K18  |
| VRA1               | Reference Voltage Output | K19  |
| VRA2               | Reference Voltage Output | K20  |
| VCC-HP             | Headphone Power Supply   | P17  |
| <b>CPU&amp;GPU</b> |                          |  |
| VDD-CPU            | CPU Power Supply         | F11,F12,F13,F14,F15,F16,G11,G12,G13,G14,G15,G16,G17,H12,H13,H14,H15,H16,H17,J16,J17,K16,K17  |
| VDD-GPU            | GPU Power Supply         | J6,J7,K5,K6,K7,L6,L7,M6,M7,N6,N7,P5  |
| <b>System</b>      |                          |  |
| VDD-SYS            | System Power Supply      | T12,T13,T14,T15,T16,U10,U11,U12,U13,U14,U15,U16  |
| VDD-CPUS           | System Power Supply      | L16,L17  |
| <b>Ground</b>      |                          |  |
| GND                | Ground                   | W10,G8,H8,H9,H10,H11,J8,J9,J10,J11,J12,J13,J14,J15,K8,K9,K10,K11,K12,K13,K14,K15,L8,L9,L10,L11,L12,L13,L14,L15,M8,M9,M10,M11,M12,M13,M14,M15,M16,N8,N9,N10,N11,N12,N13,N14,N15,P7,P8,P9,P10,P11,P12,P13,P14,P15,R7,R8,R9,R10,R11,R12,R13,R14,R15,T8,T9,T10,T11 |

Table 4-4 A31s Power/Ground Signal Description

# 5 ELECTRICAL CHARACTERISTICS

## 5.1. ABSOLUTE MAXIMUM RATINGS

Prolonged exposure to absolute maximum ratings (as shown in Table 5-1) may reduce device reliability. Functional operation at these maximum ratings is not implied.

| Symbol           | Parameter                               |                          | Min  | Max  | Unit             |
|------------------|---|--------------------------|------|------|------------------|
| I <sub>I/O</sub> | In/Out current for input and output     |                          | -40  | 40   | mA               |
| V <sub>ESD</sub> | ESD stress voltage                      | HBM(human body mode)     | -4K  | 4K   | V <sub>ESD</sub> |
|                  |   | CDM(charged device mode) | -250 | 250  | V                |
| VCC              | Power supply for I/O                    |                          | -0.3 | 3.6  | V                |
| VDD              | Power supply for Internal Digital Logic |                          | -0.3 | 1.4  | V                |
| AVCC             | Power supply for Analog Part            |                          | -0.3 | 3.6  | V                |
| VCC-DRAM         | Power supply for DRAM Part              |                          | -0.3 | 1.98 | V                |
| VCC-USB          | Power supply for USB PHY                |                          | -0.3 | 3.6  | V                |
| VDD-DLL          | Power supply for DLL                    |                          | -0.3 | 1.4  | V                |
| VDD-CPU          | Power supply for CPU                    |                          | -0.3 | 1.4  | V                |
| VDD-GPU          | Power supply for GPU                    |                          | -0.3 | 1.4  | V                |
| VCC-HDMI         | Power supply for HDMI                   |                          | -0.3 | 3.6  | V                |
| T <sub>STG</sub> | Storage temperature                     |                          | -40  | 125  | °C               |

Table 5-1 Absolute Maximum Ratings

## 5.2. RECOMMENDED OPERATING CONDITIONS

All A31s modules are strongly recommended to be used under the Operating Conditions given in following Table 5-2.

| Symbol         | Parameter                                 | Min  | Typ     | Max  | Unit |
|----------------|---|------|---------|------|------|
| T <sub>a</sub> | Ambient operating temperature(Commercial) | -20  | /       | +70  | °C   |
| VCC            | Power supply for the IO                   | 1.7  | 1.8~3.3 | 3.6  | V    |
| AVCC           | Power supply For analog part              | 2.7  | 3.0     | 3.3  | V    |
| VCC-DRAM       | Power supply For DRAMC                    | 1.14 | /       | 1.98 | V    |
| VCC-USB        | Power supply For USB PHY                  | 2.8  | 3.0     | 3.45 | V    |
| VDD-DLL        | Power supply For DLL                      | 0.7  | 1.1     | 1.32 | V    |
| VCC-RTC        | Power supply For RTCLDO/LOSC/RCOSC        | 2.8  | 3.0     | 3.3  | V    |
| VDD-SYS        | Power supply for VDD_SYS                  | 0.7  | 1.1     | 1.32 | V    |
| VDD-CPU        | Power supply for CPU                      | 0.7  | 1.1     | 1.32 | V    |
| VDD-GPU        | Power supply for GPU                      | 0.7  | 1.1     | 1.32 | V    |
| VCC-HDMI       | Power supply for HDMI                     | 2.7  | 3.0     | 3.3  | V    |

Table 5-2 Recommended Operating Conditions

### 5.3. DC ELECTRICAL CHARACTERISTICS

Table 5-3 summarizes the DC electrical characteristics of A31s.

| Symbol | Parameter                        | Min     | Typ | Max     | Unit |
|--------|----------------------------------|---------|-----|---------|------|
| VIH    | High-Level Input Voltage         | 0.7*VCC | /   | VCC+0.3 | V    |
| VIL    | Low-Level Input Voltage          | -0.3    | 0   | 0.3*VCC | V    |
| RPU    | Input pull-up resistance         | 50      | 100 | 150     | KΩ   |
| RPD    | Input pull-down resistance       | 50      | 100 | 150     | KΩ   |
| IIH    | High-Level Input Current         | /       | 10  | /       | uA   |
| IIL    | Low-Level Input Current          | /       | 10  | /       | uA   |
| VOH    | High-Level Output Voltage        | VCC-0.2 | /   | /       | V    |
| VOL    | Low-Level Output Voltage         | /       | /   | 0.2     | V    |
| IOZ    | Tri-State Output Leakage Current | -10     | /   | 10      | uA   |
| CIN    | Input Capacitance                | /       | /   | 5       | pF   |
| COUT   | Output Capacitance               | /       | /   | 5       | pF   |

Table 5-3 DC Electrical Characteristics

### 5.4. OSCILLATOR ELECTRICAL CHARACTERISTICS

The A31s clock control module includes 10PLLs, a main oscillator, an on-chip RC oscillator of 466.9KHz ~867.1KHz, and a 32768Hz low power oscillator.

The 24.000MHz frequency is used to generate the main source clock for PLL and the main digital blocks, and the 32768Hz oscillator is used only to provide a low power accurate reference for RTC.

#### 24MHz Oscillator Characteristics

Table 5-4 lists the 24MHz crystal specifications.

| Symbol      | Parameter                             | Min         | Typ    | Max | Unit |
|-------------|---------------------------------------|-------------|--------|-----|------|
| 1/(tCPMAIN) | Crystal Oscillator Frequency Range    | -           | 24.000 | -   | MHz  |
| tST         | Startup Time                          | -           | -      | -   | ms   |
|             | Frequency Tolerance at 25 °C          | -40         | -      | +40 | ppm  |
|             | Oscillation Mode                      | Fundamental |        |     | -    |
|             | Maximum change over temperature range | -50         | -      | +50 | ppm  |
| PON         | Drive level                           | -           | -      | 50  | uW   |
| CL          | Equivalent Load capacitance           | -           |        | -   | pF   |
| RS          | Series Resistance(ESR)                | -           |        | -   | Ω    |
|             | Duty Cycle                            | 30          | 50     | 70  | %    |
| CM          | Motional capacitance                  | -           | -      |     | pF   |
| CSHUT       | Shunt capacitance                     | -           | -      |     | pF   |
| RBIAS       | Internal bias resistor                |             |        |     | MΩ   |

Table 5-4 24MHz Oscillator Characteristics

### 32768Hz Oscillator Characteristics

The 32768Hz crystal is connected between the LOSCI (amplifier input) and LOSCO (amplifier output). Table 5-5 lists the 32768Hz crystal specifications.

| Symbol      | Parameter                             | Min         | Typ    | Max | Unit |
|-------------|---------------------------------------|-------------|--------|-----|------|
| 1/(tCPMAIN) | Crystal Oscillator Frequency Range    |             | 32.768 |     | kHz  |
| tST         | Startup Time                          | –           | –      |     | ms   |
|             | Frequency Tolerance at 25 °C          | -40         | –      | +40 | ppm  |
|             | Oscillation Mode                      | Fundamental |        |     | –    |
|             | Maximum change over temperature range | -50         | –      | +50 | ppm  |
| PON         | Drive level                           | –           | –      | 50  | uW   |
| CL          | Equivalent Load capacitance           | –           |        | –   | pF   |
| RS          | Series Resistance(ESR)                | –           |        | –   | Ω    |
|             | Duty Cycle                            | 30          | 50     | 70  | %    |
| CM          | Motional capacitance                  | –           | –      |     | pF   |
| CSHUT       | Shunt capacitance                     | –           | –      |     | pF   |
| RBIAS       | Internal bias resistor                |             |        |     | MΩ   |

Table 5-5 32768Hz Oscillator Characteristics

## 5.5. POWER UP AND POWER DOWN SEQUENCE

A31s supports four working modes: active mode, idle mode, super standby mode, and power-off mode.

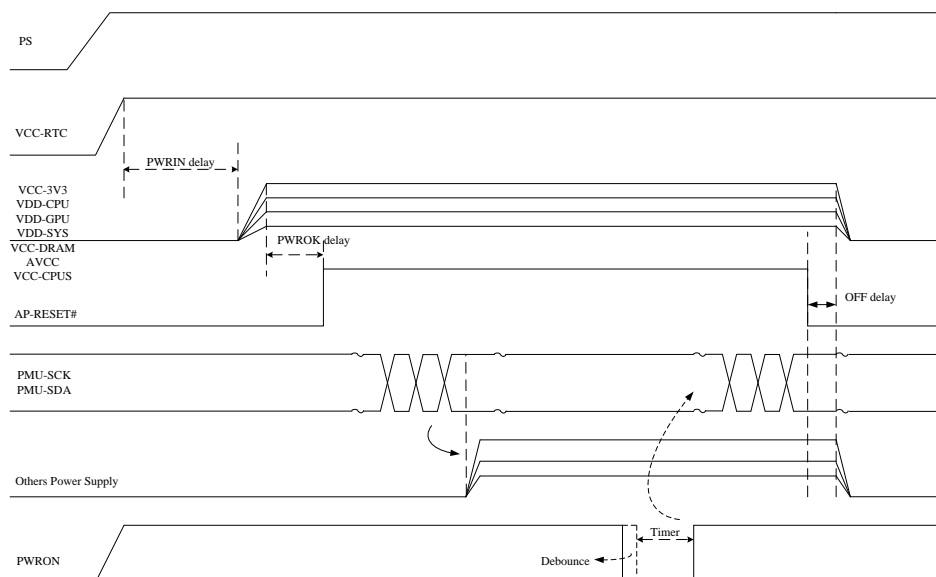


Figure 5-1 A31s Power Up/Down Sequence

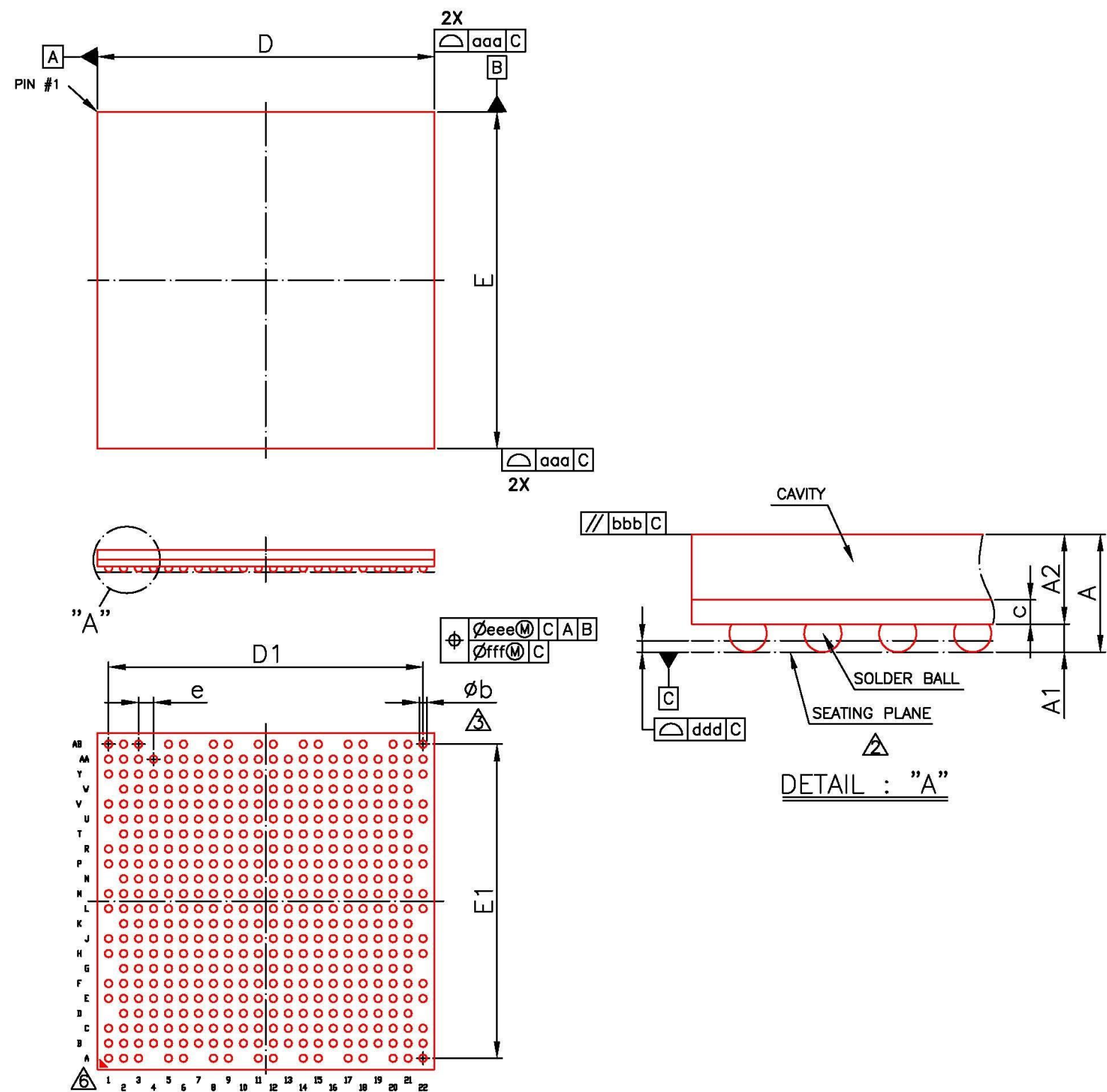


# 6 PIN ASSIGNMENT

## 6.1. BALL MAP

|    | 1     | 2      | 3      | 4     | 5       | 6        | 7        | 8        | 9        | 10       | 11       | 12      | 13      | 14      | 15      | 16       | 17        | 18      | 19      | 20      | 21       | 22       |    |
|----|-------|--------|--------|-------|---------|----------|----------|----------|----------|----------|----------|---------|---------|---------|---------|----------|-----------|---------|---------|---------|----------|----------|----|
| A  | NC    | NC     | NC     |       | PH11    | PH16     |          | PH20     | PH24     |          | PE1      | PE8     |         | PE13    | PG0     |          | PG5       | PG14    |         | PB2     | PB4      | PB6      | A  |
| B  | NC    | NC     | NC     | NC    | PH10    | PH15     | PH17     | PH21     | PH25     | PE0      | PE3      | PE9     | PE11    | PE14    | PG1     | PG3      | PG10      | PG15    | PB0     | PB3     | PB5      | PB7      | B  |
| C  | NC    | PC26   | PC27   | NC    | PH9     | PH14     | PH18     | PH22     | PH26     | NC       | PE2      | PE10    | PE12    | PE15    | PG2     | PG4      | PG11      | PG16    | PB1     | PA7     | PA8      | PA9      | C  |
| D  |       | NC     | PC11   | PC24  | PF0     | PH13     | PH19     | PH27     | PH28     | NC       | JTAGSEL1 | PE4     | PE6     | PE7     | PG6     | PG8      | PG12      | PG17    | VCC-PB  | PA4     | PA13     |          | D  |
| E  | NC    | PC10   | NC     | PC15  | PC14    | PH12     | VCC-PF   | VCC-PC   | PH23     | UBOOT    | JTAGSEL0 | PE5     | VCC-PE  | VCC-PG  | PG7     | PG9      | PG13      | PG18    | PA1     | PA14    | PA17     | PA18     | E  |
| F  | PC4   | PC8    | PC9    | PC12  | PC13    | NC       | NC       | VCC-PC   | VCC-PH   | VCC-PH   | VDD-CPU  | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU  | CPU-VDDFB | PA0     | PA3     | PA16    | PA19     | PA20     | F  |
| G  |       | PC0    | PC5    | PC6   | PC7     | NC       | NC       | GND      | BOOTSEL1 | BOOTSEL0 | VDD-CPU  | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU  | VDD-CPU   | PA2     | PA12    | PA15    | PA22     |          | G  |
| H  | PF4   | PF5    | PC1    | PC2   | PC3     | PC25     | NC       | GND      | GND      | GND      | GND      | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU | VDD-CPU  | VDD-CPU   | PA5     | PA11    | PA21    | PA23     | PA26     | H  |
| J  | SDQ2  | SDQ6   | PF1    | PF2   | PF3     | VDD-GPU  | VDD-GPU  | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | VDD-CPU  | VDD-CPU   | PA6     | PA10    | PA25    | PA24     | PA27     | J  |
| K  |       | SDQ4   | SDQ0   | SZQ   | VDD-GPU | VDD-GPU  | VDD-GPU  | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | VDD-CPU  | VDD-CPU   | VRP     | VRA1    | VRA2    | HPOUTR   |          | K  |
| L  | SDQS0 | SDQS0B | SDQ5   | SDQM0 | SRAS    | VDD-GPU  | VDD-GPU  | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | VDD-CPUS | VDD-CPUS  | AVCC    | HPOUTL  | MIC1P   | PHINP    | PHINN    | L  |
| M  | SDQ7  | SDQ3   | SDQ1   | SODT  | SODT1   | VDD-GPU  | VDD-GPU  | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | GND      | VCC-PA    | HPCOMFB | LINEINL | MIC1N   | MIC2P    | MIC2N    | M  |
| N  |       | SDQ14  | SDQ10  | SCS1  | SCAS    | VDD-GPU  | VDD-GPU  | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | AGND     | VCC-PA    | HPCOM   | LINEINR | MBIAS   | HPBP     |          | N  |
| P  | SDQ12 | SDQ8   | SDQ13  | SDQM1 | VDD-GPU | VCC-DRAM | GND      | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | VCC-PD   | VCC-HP    | PHOUTN  | PHOUTP  | HBIAS   | LINEOUTR | LINEOUTL | P  |
| R  | SDQS1 | SDQS1B | SDQ11  | SCS   | SA2     | VCC-DRAM | GND      | GND      | GND      | GND      | GND      | GND     | GND     | GND     | GND     | VCC-PD   | VCC-PD    | PM1     | PM0     | PM2     | PM4      | LRADC0   | R  |
| T  |       | SDQ15  | SA3    | SBA2  | SCKE    | VCC-DRAM | VCC-DRAM | GND      | GND      | GND      | GND      | VDD-SYS | VDD-SYS | VDD-SYS | VDD-SYS | VDD-SYS  | VCC-USB   | PM3     | PM6     | PM5     | PM7      |          | T  |
| U  | SDQ9  | SBA0   | SA0    | SRST  | SA10    | VCC-DRAM | VCC-DRAM | VCC-DRAM | VDD-DLL  | VDD-SYS  | VDD-SYS  | VDD-SYS | VDD-SYS | VDD-SYS | VDD-SYS | VDD-SYS  | VCC-HDMI  | VCC-PM  | PL5     | PL3     | PL0      | RESET    | U  |
| V  | SWE   | SA5    | SCK    | SA15  | SBA1    | VCC-DRAM | VCC-DRAM | SA8      | SA6      | SA11     | PD27     | PD25    | PD23    | PD9     | PD7     | PD5      | PD3       | PD1     | VCC-RTC | PL8     | X32KO    | X32KI    | V  |
| W  |       | SA7    | SCKB   | SA1   | SVREF   | SA12     | VCC-DRAM | SA14     | SA4      | GND      | PD26     | PD24    | PD22    | PD8     | PD6     | PD4      | PD2       | PD0     | NMI     | PL7     | PL2      |          | W  |
| Y  | SA9   | SA13   | SCKE1  | SDQM2 | SDQ17   | SDQ30    | SDQ26    | SDQS3B   | SDQ31    | X24MO    | HHPD     | HTX1N   | HSDA    | HTX2N   | PD20    | PD19     | PD21      | PD10    | PL6     | PL4     | DM0      | DP0      | Y  |
| AA | SDQ22 | SDQ20  | SDQS2  | SDQ23 | SDQ19   | SDQ28    | SDQS3    | SDQ29    | SDQ27    | X24MI    | HTXCN    | HTX0P   | HTX1P   | HTX2P   | PD16    | PD18     | PD15      | PD13    | PD11    | VIO-RTC | DM1      | DP1      | AA |
| AB | SDQ18 | SDQ16  | SDQS2B |       | SDQ21   | SDQ24    |          | SDQ25    | SDQM3    |          | HTXCP    | HTX0N   |         | HSCL    | PD17    |          | PD14      | PD12    |         | PL1     | DM2      | DP2      | AB |
|    | 1     | 2      | 3      | 4     | 5       | 6        | 7        | 8        | 9        | 10       | 11       | 12      | 13      | 14      | 15      | 16       | 17        | 18      | 19      | 20      | 21       | 22       |    |

6.2. PIN DIMENSION



| Symbol | Dimension in mm |       |       | Dimension in inch |       |       |
|--------|-----------------|-------|-------|-------------------|-------|-------|
|        | MIN             | NOM   | MAX   | MIN               | NOM   | MAX   |
| A      | ---             | ---   | 1.40  | ---               | ---   | 0.055 |
| A1     | 0.25            | 0.30  | 0.35  | 0.010             | 0.012 | 0.014 |
| A2     | 0.84            | 0.89  | 0.94  | 0.033             | 0.035 | 0.037 |
| c      | 0.32            | 0.36  | 0.40  | 0.013             | 0.014 | 0.016 |
| D      | 17.90           | 18.00 | 18.10 | 0.705             | 0.709 | 0.713 |
| E      | 17.90           | 18.00 | 18.10 | 0.705             | 0.709 | 0.713 |
| D1     | ---             | 16.80 | ---   | ---               | 0.661 | ---   |
| E1     | ---             | 16.80 | ---   | ---               | 0.661 | ---   |
| e      | ---             | 0.80  | ---   | ---               | 0.031 | ---   |
| b      | 0.35            | 0.40  | 0.45  | 0.014             | 0.016 | 0.018 |
| aaa    | 0.15            |       |       | 0.006             |       |       |
| bbb    | 0.15            |       |       | 0.006             |       |       |
| ddd    | 0.13            |       |       | 0.005             |       |       |
| eee    | 0.15            |       |       | 0.006             |       |       |
| fff    | 0.08            |       |       | 0.003             |       |       |
| MD/ME  | 22/22           |       |       | 22/22             |       |       |

- NOTE :
1. CONTROLLING DIMENSION : MILLIMETER.
  2. PRIMARY DATUM C AND SEATING PLANE ARE DEFINED BY THE SPHERICAL CROWNS OF THE SOLDER BALLS.
  3. DIMENSION b IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER, PARALLEL TO PRIMARY DATUM C.
  4. REFERENCE DOCUMENT : JEDEC PUBLICATION 95 DESIGN GUIDE 4.5
  5. SPECIAL CHARACTERISTICS C CLASS: bbb, ddd (SPIL STANDARD.)
  6. THE PATTERN OF PIN 1 FIDUCIAL IS FOR REFERENCE ONLY .