

**JZ4760**

**Mobile Application Processor**

Data Sheet

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北京君正集成电路股份有限公司  
Ingenic Semiconductor Co.,Ltd.

# **JZ4760 Mobile Application Processor**

## **Data Sheet**

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### **Ingenic Semiconductor Co., Ltd.**

**Room 108, Building A, Information Center, Zhongguancun Software Park**

**8 Dongbeiwang West Road, Haidian District, Beijing, China,**

**Tel: 86-10-82826661**

**Fax: 86-10-82825845**

**Http: //www.ingenic.cn**

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# 1 Overview

JZ4760 is a mobile application processor targeting for multimedia rich and mobile devices like smartphone, tablet computer, mobile digital TV, and GPS. This SOC introduces innovative dual-core architecture to fulfill both high performance mobile computing and high quality video decoding requirements addressed by mobile multimedia devices.

The CPU (Central Processing Unit) core, equipped with 16K instruction cache and 16K data cache operating at 528~600MHz, and full feature MMU function performs OS related tasks. At the heart of the CPU core is XBurst processor engine. XBurst is an industry leading microprocessor core which delivers superior high performance and best-in-class low power consumption. A hardware floating-point unit which compatible with IEEE754 is also included.

The VPU (Video Processing Unit) core is powered with another XBurst processor engine. The SIMD instruction set implemented by XBurst engine, in together with the on chip video accelerating engine and post processing unit, delivers doubled video performance comparing with the single core implementation.

The memory interface supports a variety of memory types that allow flexible design requirements, including glueless connection to SLC NAND flash memory or 4-bit/8-bit/12-bit/16-bit/24-bit ECC MLC/TLC NAND flash memory for cost sensitive applications.

On-chip modules such as audio CODEC, multi-channel SAR-ADC, AC97/I2S controller and camera interface offer designers a rich suite of peripherals for multimedia application. TV encoder unit 10-bits DAC provide composite TV signal output in PAL or NTSC format. The LCD controller support up to 1280x720 output, as well as external HDMI transmitter. WLAN, Bluetooth and expansion options are supported through high-speed SPI and MMC/SD/SDIO host controllers. The TS (Transport stream) interface provides enough bandwidth to connect to an external mobile digital TV demodulator. Other peripherals such as USB OTG and USB 1.1 host, UART and SPI as well as general system resources provide enough computing and connectivity capability for many applications.

### 1.1 Block Diagram

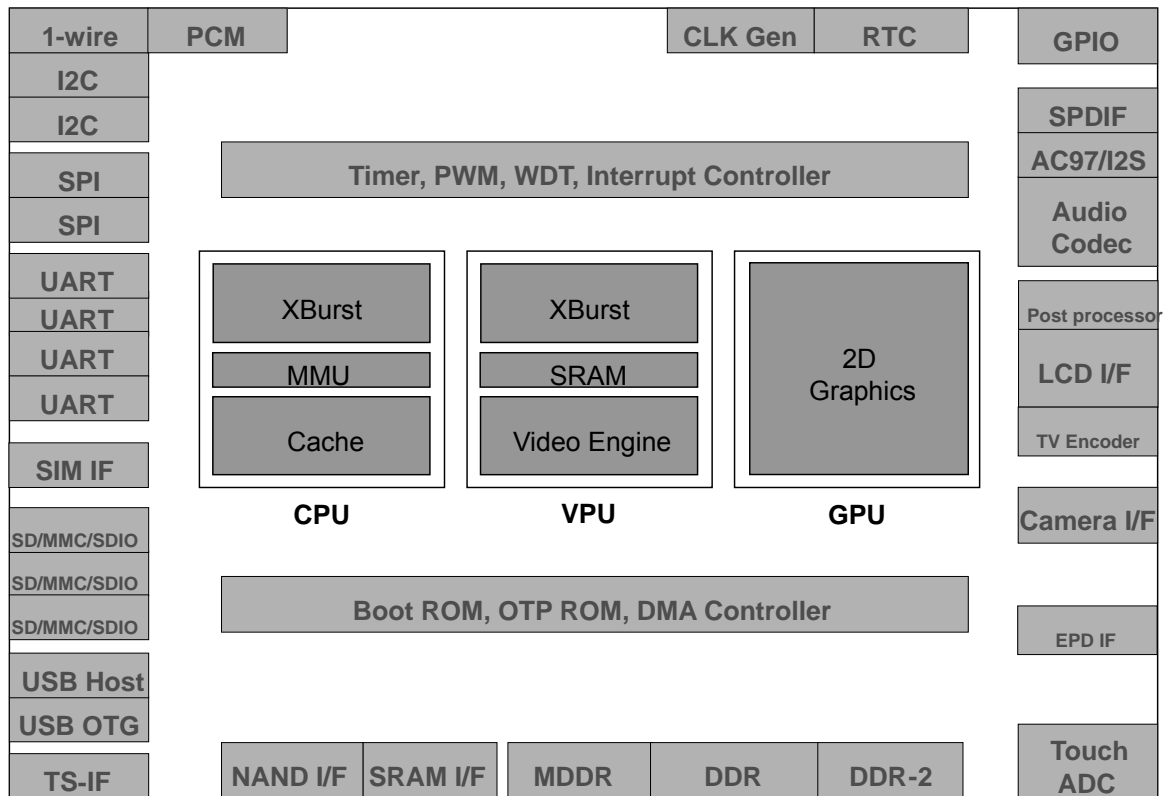


Figure 1-1 JZ4760 Diagram

## 1.2 Features

### 1.2.1 CPU Core

- XBurst CPU
  - XBurst<sup>®</sup> RISC instruction set
  - XBurst<sup>®</sup> SIMD instruction set
  - XBurst<sup>®</sup> FPU instruction set supporting both single and double floating point format which are IEEE745 compatible
  - XBurst<sup>®</sup> 8-stage pipeline micro-architecture up to 600MHz
- MMU
  - 32-entry joint-TLB
  - 4 entry Instruction TLB
  - 4 entry data TLB
- L1 Cache
  - 16K instruction cache
  - 16K data cache
- Hardware debug support
- 16kB tight coupled memory

### 1.2.2 VPU Core

- XBurst CPU for video processing
  - XBurst<sup>®</sup> RISC instruction set
  - XBurst<sup>®</sup> SIMD instruction set
  - XBurst<sup>®</sup> 8-stage pipeline micro-architecture up to 600MHz
- Video acceleration engine
  - Motion compensation
  - Motion estimation
  - De-block
  - DCT/IDCT for 4x4 block
  - Parser
- 48kB tight coupled memory
- 32kB scratch RAM

### 1.2.3 GPU Core

- 2D graphic
  - Up to 100M pix/s
  - Up to 1080P
  - Line/Rectangle
  - ROP4/Alpha blending/Filter
  - Rotation (90/180/270 degree)/Mirror
  - 1 Rectangle Clip

## 1.2.4 Memory Sub-systems

- DDR Controller
  - Support DDR2, DDR, mobile DDR (LPDDR) memory
  - Support x16 and x32 external DDR data width
  - Support clock frequency ratio – (BUS clock) : (DDR clock) = 2:1
  - Support clock frequency ratio – (BUS clock) : (DDR clock) = 1:1
  - Support clock-stop mode
  - Support auto-refresh and self-refresh
  - Support power-down mode and deep-power-down mode
  - Programmable DDR timing parameters
  - Programmable DDR row and column address width
- Static memory interface
  - Direct interface to SRAM, ROM, Burst ROM, and NOR Flash
  - Six chip-select pins for static memory, each can be configured separately
  - Support 8 or 16 bits data width
  - 6 bits address
- NAND flash interface
  - Support 4-bit/8-bit/12-bit/16-bit/24-bit MLC/TLC NAND as well as SLC NAND
  - Support all 8-bit/16-bit NAND Flash devices regardless of density and organization
  - Support automatic boot up from NAND Flash devices
- Separate static memory data bus from DRAM one
- BCH Controller
  - Implement 4-bit/8-bit/12-bit/16-bit/20-bit/24-bit data ECC encoding and decoding
- Direct memory access controllers
  - BDMA controller
    - Support up to 3 independent DMA channels
    - Support data transfer between normal memory (NAND, SRAM, etc. ) / BCH and system memory (DDR)
  - MDMA controller
    - Support up to 2 independent DMA channels
    - Support data transfer in system memory (DDR)
  - General purpose DMA
    - Support up to 10 independent DMA channels
    - Support data transfer between On-chip Peripherals (for example: I2C, MSC.etc.) and system memory (DDR)
    - APB bus bridge
  - Common features
    - Descriptor or No-Descriptor Transfer
    - Transfer data units: byte, 2-byte (half word), 4-byte (word), 16-byte, 32-byte or 64-byte
    - Transfer number of data unit: 1 ~ 224
    - Independent source and target port width: 8-bit, 16-bit, 32-bit
- The XBurst processor system supports little endian only



### 1.2.5 AHB Bus Arbiter

- Provide a fair chance for each AHB master to possess the AHB bus
- Fulfill the back-to-back feature of AHB protocol
- Divide two master groups with different privileges supports two arbitrating methods: Round-robin possession for masters in the same group, Preemptive possession for masters with higher privileges

### 1.2.6 System Devices

- Clock generation and power management
  - On-chip oscillator circuit for an 32768Hz clock and an 12MHz clock
  - On-chip phase-locked loops (PLL) with programmable multiple-ratio. Internal counter are used to ensure PLL stabilize time
  - PLL on/off is programmable by software
  - ICLK, PCLK, HCLK, HHCLK, MCLK and LCLK frequency can be changed separately for software by setting division ratio
  - Supports six low-power modes and function: NORMAL mode; DOZE mode; IDLE mode; SLEEP mode; HIBERNATE mode; and MODULE-STOP function
  - Support module power-down
- RTC (Real Time Clock)
  - 32-bit second counter
  - 1Hz from 32768hz
  - Alarm interrupt
  - Independent power
  - A 32-bits scratch register used to indicate whether power down happens for RTC power
- Interrupt controller
  - Total 32 maskable interrupt sources from on-chip peripherals and external request through GPIO ports
  - Interrupt source and pending registers for software handling
  - Unmasked interrupts can wake up the chip in sleep or standby mode
- Timer and counter unit with PWM output and/or input edge counter
  - Provide eight separate channels, Six of them have input signal transition edge counter
  - 16-bit A counter and 16-bit B counter with auto-reload function every channel
  - Support interrupt generation when the A counter underflows
  - Three clock sources: RTCLK (real time clock), EXCLK (external clock input), PCLK (APB Bus clock) selected with 1, 4, 16, 64, 256 and 1024 clock dividing selected
  - Every channel has PWM output
- OS timer
  - One channel
  - 32-bit counter and 32-bit compare register
  - Support interrupt generation when the counter matches the compare register
  - Three clock sources: RTCLK (real time clock), EXCLK (external clock input), PCLK (APB Bus clock) selected with 1, 4, 16, 64, 256 and 1024 clock dividing selected

- Watchdog timer
  - 16-bit counter in RTC clock with 1, 4, 16, 64, 256 and 1024 clock dividing selected
  - Generate power-on reset

## 1.2.7 Audio/Display/UI Interfaces

- LCD controller
  - Single-panel display in active mode, and single- or dual-panel displays in passive mode
  - 2, 4, 16 greyscales and up to 4096 colors in STN mode
  - 2, 4, 16, 256, 4K, 32K, 64K, 256K and 16M colors in TFT mode
  - 24-bit data bus
  - Support 1,2,4,8 pins STN panel, 16bit, 18bit and 24bit TFT and 8bit I/F TFT
  - Display size up to 1280×720 pixels
  - 256×16 bits internal palette RAM
  - Support ITU601/656 data format
  - Support smart LCD (SRAM-like interface LCD module)
  - Support delta RGB
  - One single color background and two foreground OSD
- TV encoder
  - Support NTSC or PAL
  - Support CVBS signal
  - 10 bits DAC
- EPD controller
  - Supports Electro-Phoretic Display and compatible devices
  - Supports different size of display panel
  - Supports different width of pixel data
  - Supports internal DMA operation and register operation
- Image post processor
  - Video frame resize
  - Color space conversion: 420/444/422 YUV to RGB convert
  - Bi-cubic algorithm supported
- Camera interface module
  - Input image size up to 4096×4096 pixels
  - Supports CCIR656 data format
  - YCbCr 4:2:2 and YCbCr 4:4:4 data format
  - Raw data input
  - 64×32 image data receive FIFO with DMA support
- On-chip audio CODEC
  - 24-bit DAC, SNR: 95dB
  - 24-bit ADC, SNR: 90dB
  - Sample rate: 8/9.6/11.025/12/16/22.05/24/32/44.1/48/96kHz
  - L/R channels line input
  - 2 MICs input, differential or single-ended

- L/R channels headphone output amplifier support up to 16ohm load
- Capacitor-coupled
- Mono differential line out
- Mono 450mW amplifier for speaker out for 8ohm load
- AC97/I2S/SPDIF controller
  - Supports 8, 16, 18, 20 and 24 bit for sample for AC-link and I2S/MSB-Justified format
  - Support 2/4/6/8 channels data out for I2S
  - Support compress data format for SPDIF
  - DMA transfer mode support
  - Support variable sample rate mode for AC-link format
  - Power down mode and two wake-up mode support for AC-link format
  - Programmable Interrupt function support
  - Support the on-chip CODEC
  - Support off-chip CODEC
  - Support off-chip HDMI transmitter audio
- PCM interface
  - Data starts with the frame PCMSYN or one PCMCLK later
  - Support three modes of operation for PCM: Short frame sync mode, Long frame sync mode, Multi-slot mode
  - Data is transferred and received with the MSB first
  - Support master mode and slave mode
  - The PCM serial output data, PCMDOUT, is clocked out using the rising edge of the PCMSCLK
  - The PCM serial input data, PCMDIN, is clocked in on the falling edge of the PCMSCLK.
  - 8/16 bit sample data sizes supported
  - DMA transfer mode supported
  - Two FIFOs for transmit and receive respectively with 16 samples capacity in every direction
- SADC
  - 12-bit, 1Msps/200ksps
  - XP/XN, YP/YN inputs for touch screen
  - Battery voltage inputs for internal/external resistor divider respectively
  - 2 generic input channels
  - 5mW@1Msps, 2.2mW@200ksps

### 1.2.8 On-chip Peripherals

- General-Purpose I/O ports
  - Total GPIO pin number is 166, where 8 are dedicated and all others are shared
  - Each pin can be configured as general-purpose input or output or multiplexed with internal chip functions
  - Each pin can act as a interrupt source and has configurable rising/falling edge or high/low level detect manner, and can be masked independently

- Each pin can be configured as open-drain when output
- Each pin can be configured as internal resistor pull-up
- Two I2C bus interfaces
  - Only supports single master mode
  - Supports I2C standard-mode and F/S-mode up to 400 kHz
  - Double-buffered for receiver and transmitter
  - Supports general call address and START byte format after START condition
- Two Synchronous serial interfaces (SSI0, SSI1)
  - Up to 50MHz speed
  - Supports three formats: TI's SSP, National Microwire, and Motorola's SPI
  - Configurable 2 - 17 (or multiples of them) bits data transfer
  - Full-duplex/transmit-only/receive-only operation
  - Supports normal transfer mode or Interval transfer mode
  - Programmable transfer order: MSB first or LSB first
  - 17-bit width, 128-level deep transmit-FIFO and receive-FIFO
  - Programmable divider/prescaler for SSI clock
  - Back-to-back character transmission/reception mode
- One-wire bus interface
  - Overdrive and regular speed
  - Master only
  - LSB first
  - Bit or byte operate modes
- USB 1.1 host interface
  - Open Host Controller Interface (OHCI)-compatible and USB Revision 1.1-compatible
  - Full speed and low speed
  - Embedded USB 1.1 PHY
- USB 2.0 OTG interface
  - Compliant with USB protocol revision 2.0 OTG
  - High speed and full speed supported for device role
  - High speed, full speed and low speed supported for host role
  - Embedded USB OTG PHY
- Three MMC/SD/SDIO controllers (MSC0, MSC1, MSC2)
  - Support automatic boot up from MSC0, which has 4-bit data bus
  - MSC1 with 4-bit data bus
  - Compliant with "The MultiMediaCard System Specification version 4.2"
  - Compliant with "SD Memory Card Specification version 2.0" and "SDIO Card Specification version 1.0" with 1 command channel and 4 data channels
  - Up to 320 Mbps data rate in MSC0
  - Up to 320 Mbps data rate in MSC1
  - Supports up to 10 cards (including one SD card)
  - Maskable hardware interrupt for SD I/O interrupt, internal status, and FIFO status
- Four UARTs (UART0, UART1, UART2, UART3)
  - 5, 6, 7 or 8 data bit operation with 1 or 1.5 or 2 stop bits, programmable parity (even, odd,

- or none)
- 32x8bit FIFO for transmit and 32x11bit FIFO for receive data
- Interrupt support for transmit, receive (data ready or timeout), and line status
- Supports DMA transfer mode
- Provide complete serial port signal for modem control functions
- Support slow infrared asynchronous interface (IrDA)
- IrDA function up to 115200bps baudrate
- UART function up to 3.7Mbps baudrate
- Hardware flow control
- SIM IF
  - Supports normal card and UIM card
  - 8-bit, 16-level receive-/transmit- FIFO
  - Supports asynchronous character (T=0) communication modes
  - Supports asynchronous block (T=1) communication modes
  - Supports setting of clock-rate conversion factor F (372, 512, 558, etc.), and bit-rate adjustment factor D (1, 2, 4, 8, 16, 32, 12, 20, etc.)
  - Supports extra guard time waiting
  - Auto-error detection in T=0 receive mode
  - Auto-character repeat in T=0 transmit mode
  - Transforms inverted format to regular format and vice versa
  - Support stop clock function in some power consuming sensitive applications
- Transport stream slave interface
  - 8-bit or 1-bit data bus selectable
  - Support PID filtering

### 1.2.9 Bootrom

- 8kB Boot ROM memory

### 1.3 Characteristic

Item	Characteristic
Process Technology	0.13um CMOS
Power supply voltage	General purpose I/O: $3.3 \pm 0.3V$ DDR I/O for mDDR: $1.8V \pm 0.2V$ DDR I/O for DDR: $2.5V \pm 0.2V$ DDR I/O for DDR2: $1.8V \pm 0.2V$ NAND/SRAM I/O: $1.62V \sim 3.6V$ RTC I/O: $1.8V \pm 0.1V$ Core: $1.2 - 0.1/+0.2 V$
Package	BGA345 14mm x 14mm x 1.1mm, 0.65mm pitch
Operating frequency	528~600MHz

## 2 Packaging and Pinout Information

### 2.1 Overview

JZ4760 processor is offered in 345-pin LFBGA package, which is 14mm x 14mm x 1.1mm outline, 21 x 21 matrix ball grid array and 0.65mm ball pitch, show in Figure 2-1. The JZ4760 pin to ball assignment is show in Figure 2-2.

The detailed pin description is listed in Table2-1~Table2-26.

### 2.2 Solder Process

JZ4760 package is lead-free. It's reflow profile follows the IPC/JEDEC lead-free reflow profile as contained in [J-STD-020C](#).

### 2.3 Moisture Sensitivity Level

JZ4760 package moisture sensitivity is level 3.

## 2.4 JZ4760 Package

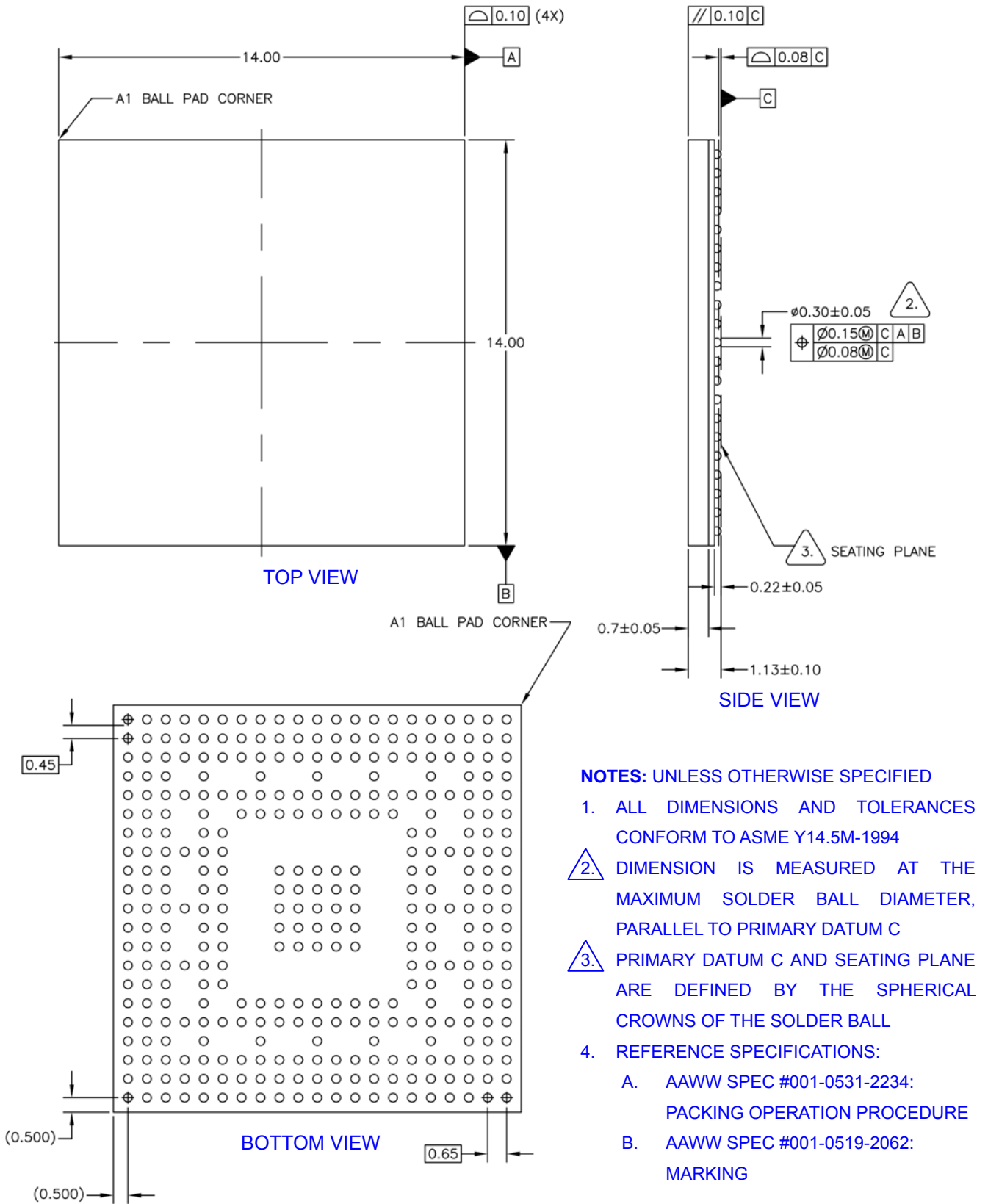


Figure 2-1 JZ4760 package outline drawing





## 2.5 Pin Description <sup>[1][2]</sup>

### 2.5.1 DDR

Table 2-1 DDR(mDDR, DDR2, DDR) Pins (66)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
D0	IO	A2	Bi-dir, Single-end	D0: DDR data bus bit 0 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D1	IO	A3	Bi-dir, Single-end	D1: DDR data bus bit 1 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D2	IO	B5	Bi-dir, Single-end	D2: DDR data bus bit 2 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D3	IO	C6	Bi-dir, Single-end	D3: DDR data bus bit 3 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D4	IO	C7	Bi-dir, Single-end	D4: DDR data bus bit 4 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D5	IO	D8	Bi-dir, Single-end	D5: DDR data bus bit 5 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D6	IO	C5	Bi-dir, Single-end	D6: DDR data bus bit 6 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D7	IO	B4	Bi-dir, Single-end	D7: DDR data bus bit 7 in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
D8	IO	B1	Bi-dir, Single-end	D8: DDR data bus bit 8 in 32-bit data bus	VDD <sub>MEM</sub>
D9	IO	B2	Bi-dir, Single-end	D9: DDR data bus bit 9 in 32-bit data bus	VDD <sub>MEM</sub>
D10	IO	C3	Bi-dir, Single-end	D10: DDR data bus bit 10 in 32-bit data bus	VDD <sub>MEM</sub>
D11	IO	D3	Bi-dir, Single-end	D11: DDR data bus bit 11 in 32-bit data bus	VDD <sub>MEM</sub>
D12	IO	C4	Bi-dir, Single-end	D12: DDR data bus bit 12 in 32-bit data bus	VDD <sub>MEM</sub>
D13	IO	D5	Bi-dir, Single-end	D13: DDR data bus bit 13 in 32-bit data bus	VDD <sub>MEM</sub>
D14	IO	E4	Bi-dir, Single-end	D14: DDR data bus bit 14 in 32-bit data bus	VDD <sub>MEM</sub>
D15	IO	E5	Bi-dir, Single-end	D15: DDR data bus bit 15 in 32-bit data bus	VDD <sub>MEM</sub>
D16	IO	D1	Bi-dir, Single-end	D16: DDR data bus bit 16 in 32-bit data bus	VDD <sub>MEM</sub>
D17	IO	E2	Bi-dir, Single-end	D17: DDR data bus bit 17 in 32-bit data bus	VDD <sub>MEM</sub>
D18	IO	F3	Bi-dir, Single-end	D18: DDR data bus bit 18 in 32-bit data bus	VDD <sub>MEM</sub>
D19	IO	E1	Bi-dir, Single-end	D19: DDR data bus bit 19 in 32-bit data bus	VDD <sub>MEM</sub>
D20	IO	F2	Bi-dir, Single-end	D20: DDR data bus bit 20 in 32-bit data bus	VDD <sub>MEM</sub>
D21	IO	F1	Bi-dir, Single-end	D21: DDR data bus bit 21 in 32-bit data bus	VDD <sub>MEM</sub>
D22	IO	G3	Bi-dir, Single-end	D22: DDR data bus bit 22 in 32-bit data bus	VDD <sub>MEM</sub>
D23	IO	G2	Bi-dir, Single-end	D23: DDR data bus bit 23 in 32-bit data bus	VDD <sub>MEM</sub>
D24 D8	IO	H3	Bi-dir, Single-end	D24: DDR data bus bit 24 in 32-bit data bus D8: DDR data bus bit 8 in 16-bit data bus	VDD <sub>MEM</sub>
D25 D9	IO	H2	Bi-dir, Single-end	D25: DDR data bus bit 25 in 32-bit data bus D9: DDR data bus bit 9 in 16-bit data bus	VDD <sub>MEM</sub>
D26 D10	IO	H1	Bi-dir, Single-end	D26: DDR data bus bit 26 in 32-bit data bus D10: DDR data bus bit 10 in 16-bit data bus	VDD <sub>MEM</sub>
D27 D11	IO	J1	Bi-dir, Single-end	D27: DDR data bus bit 27 in 32-bit data bus D11: DDR data bus bit 11 in 16-bit data bus	VDD <sub>MEM</sub>
D28 D12	IO	J3	Bi-dir, Single-end	D28: DDR data bus bit 28 in 32-bit data bus D12: DDR data bus bit 12 in 16-bit data bus	VDD <sub>MEM</sub>
D29 D13	IO	J2	Bi-dir, Single-end	D29: DDR data bus bit 29 in 32-bit data bus D13: DDR data bus bit 13 in 16-bit data bus	VDD <sub>MEM</sub>
D30 D14	IO	L4	Bi-dir, Single-end	D30: DDR data bus bit 30 in 32-bit data bus D14: DDR data bus bit 14 in 16-bit data bus	VDD <sub>MEM</sub>
D31 D15	IO	K3	Bi-dir, Single-end	D31: DDR data bus bit 31 in 32-bit data bus D15: DDR data bus bit 15 in 16-bit data bus	VDD <sub>MEM</sub>
DA0	O	B10	Output, Single-end	DA0: DDR address bus bit 0	VDD <sub>MEM</sub>
DA1	O	C8	Output, Single-end	DA1: DDR address bus bit 1	VDD <sub>MEM</sub>
DA2	O	A8	Output, Single-end	DA2: DDR address bus bit 2	VDD <sub>MEM</sub>

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
DA3	O	A9	Output, Single-end	DA3: DDR address bus bit 3	VDD <sub>MEM</sub>
DA4	O	M3	Output, Single-end	DA4: DDR address bus bit 4	VDD <sub>MEM</sub>
DA5	O	N1	Output, Single-end	DA5: DDR address bus bit 5	VDD <sub>MEM</sub>
DA6	O	M1	Output, Single-end	DA6: DDR address bus bit 6	VDD <sub>MEM</sub>
DA7	O	N2	Output, Single-end	DA7: DDR address bus bit 7	VDD <sub>MEM</sub>
DA8	O	M2	Output, Single-end	DA8: DDR address bus bit 8	VDD <sub>MEM</sub>
DA9	O	N3	Output, Single-end	DA9: DDR address bus bit 9	VDD <sub>MEM</sub>
DA10	O	B9	Output, Single-end	DA10: DDR address bus bit 10	VDD <sub>MEM</sub>
DA11	O	L2	Output, Single-end	DA11: DDR address bus bit 11	VDD <sub>MEM</sub>
DA12	O	L1	Output, Single-end	DA12: DDR address bus bit 12	VDD <sub>MEM</sub>
DA13	O	C10	Output, Single-end	DA13: DDR address bus bit 13	VDD <sub>MEM</sub>
DA14	O	B8	Output, Single-end	DA14: DDR address bus bit 14	VDD <sub>MEM</sub>
DA15	O	A7	Output, Single-end	DA15: DDR address bus bit 15	VDD <sub>MEM</sub>
DA16	O	A4	Output, Single-end	DA16: DDR address bus bit 16	VDD <sub>MEM</sub>
DCS0_	O	C9	Output, Single-end	DCS0_: DDR chip select 0	VDD <sub>MEM</sub>
DCS1_	O	B6	Output, Single-end	DCS1_: DDR chip select 1	VDD <sub>MEM</sub>
RAS_	O	A6	Output, Single-end	RAS_: DDR row address strobe	VDD <sub>MEM</sub>
CAS_	O	B7	Output, Single-end	CAS_: DDR column address strobe	VDD <sub>MEM</sub>
DWE_	O	A5	Output, Single-end	DWE_: DDR write enable	VDD <sub>MEM</sub>
DQS0	IO	B3	Bi-dir, Single-end	DQS0: DDR data byte 0 strobe in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
DQS1	IO	C2	Bi-dir, Single-end	DQS1: DDR data byte 1 strobe in 32-bit data bus	VDD <sub>MEM</sub>
DQS2	IO	C1	Bi-dir, Single-end	DQS2: DDR data byte 2 strobe in 32-bit data bus	VDD <sub>MEM</sub>
DQS3 DQS1	IO	H4	Bi-dir, Single-end	DQS3: DDR data byte 3 strobe in 32-bit data bus DQS1: DDR data byte 1 strobe in 16-bit data bus	VDD <sub>MEM</sub>
DM0	O	A1	Output, Single-end	DM0: DDR data byte 0 mask in 32-bit and 16-bit data bus	VDD <sub>MEM</sub>
DM1	O	E3	Output, Single-end	DM1: DDR data byte 1 mask in 32-bit data bus	VDD <sub>MEM</sub>
DM2	O	D2	Output, Single-end	DM2: DDR data byte 2 mask in 32-bit data bus	VDD <sub>MEM</sub>
DM3 DM1	O	G1	Output, Single-end	DM3: DDR data byte 3 mask in 32-bit data bus DM1: DDR data byte 1 mask in 16-bit data bus	VDD <sub>MEM</sub>
CKO	O	K2	Output, Differential	CKO: DDR clock output	VDD <sub>MEM</sub>
CKO_	O	K1		CKO_: DDR inverse clock output	VDD <sub>MEM</sub>
CKE	O	L3	Output, Single-end	CKE: DDR clock enable	VDD <sub>MEM</sub>
VREFmem	AI	G5		VREFmem: DDR/DDR2 input reference voltage	VDD <sub>MEM</sub>

## 2.5.2 BOOT and storage

**Table 2-2 Static-Memory/MSC0/SPI0/DMA/1WIRE Pins (36; all GPIO shared: PA0~29, PB0~5)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
SD0 PA0	IO IO	AA4	4mA, pullup-pe	SD0: Static memory data bus bit 0 PA0: GPIO group A bit 0	VDDIO <sub>n</sub>
SD1 PA1	IO IO	AA5	4mA, pullup-pe	SD1: Static memory data bus bit 1 PA1: GPIO group A bit 1	VDDIO <sub>n</sub>
SD2 PA2	IO IO	W7	4mA, pullup-pe	SD2: Static memory data bus bit 2 PA2: GPIO group A bit 2	VDDIO <sub>n</sub>
SD3 PA3	IO IO	Y6	4mA, pullup-pe	SD3: Static memory data bus bit 3 PA3: GPIO group A bit 3	VDDIO <sub>n</sub>
SD4 PA4	IO IO	AA6	4mA, pullup-pe	SD4: Static memory data bus bit 4 PA4: GPIO group A bit 4	VDDIO <sub>n</sub>
SD5 PA5	IO IO	Y7	4mA, pullup-pe	SD5: Static memory data bus bit 5 PA5: GPIO group A bit 5	VDDIO <sub>n</sub>
SD6 PA6	IO IO	AA7	4mA, pullup-pe	SD6: Static memory data bus bit 6 PA6: GPIO group A bit 6	VDDIO <sub>n</sub>
SD7 PA7	IO IO	W8	4mA, pullup-pe	SD7: Static memory data bus bit 7 PA7: GPIO group A bit 7	VDDIO <sub>n</sub>
SD8 PA8	IO IO	W4	4mA, pullup-pe	SD8: Static memory data bus bit 8 PA8: GPIO group A bit 8	VDDIO <sub>n</sub>
SD9 PA9	IO IO	Y3	4mA, pullup-pe	SD9: Static memory data bus bit 9 PA9: GPIO group A bit 9	VDDIO <sub>n</sub>
SD10 PA10	IO IO	W5	4mA, pullup-pe	SD10: Static memory data bus bit 10 PA10: GPIO group A bit 10	VDDIO <sub>n</sub>
SD11 PA11	IO IO	AA2	4mA, pullup-pe	SD11: Static memory data bus bit 11 PA11: GPIO group A bit 11	VDDIO <sub>n</sub>
SD12 PA12	IO IO	Y4	4mA, pullup-pe	SD12: Static memory data bus bit 12 PA12: GPIO group A bit 12	VDDIO <sub>n</sub>
SD13 PA13	IO IO	AA3	4mA, pullup-pe	SD13: Static memory data bus bit 13 PA13: GPIO group A bit 13	VDDIO <sub>n</sub>
SD14 PA14	IO IO	W6	4mA, pullup-pe	SD14: Static memory data bus bit 14 PA14: GPIO group A bit 14	VDDIO <sub>n</sub>
SD15 PA15	IO IO	Y5	4mA, pullup-pe	SD15: Static memory data bus bit 15 PA15: GPIO group A bit 15	VDDIO <sub>n</sub>
SA0 (CL) PB0	O IO	U6	4mA, pullup-pe	SA0: Static memory address bus bit 0 If NAND flash is used, this pin is used as NAND CL (command latch) pin PB0: GPIO group B bit 0	VDDIO <sub>n</sub>
SA1 (AL) PB1	O IO	T7	4mA, pullup-pe	SA1: Static memory address bus bit 1 If NAND flash is used, this pin is used as NAND AL (address latch) pin PB1: GPIO group B bit 1	VDDIO <sub>n</sub>
SA2 PB2	O IO	U7	2mA, pullup-pe	SA2: Static memory address bus bit 2 PB2: GPIO group B bit 2	VDDIO <sub>n</sub>
SA3 PB3	O IO	T8	2mA, pullup-pe	SA3: Static memory address bus bit 3 PB3: GPIO group B bit 3	VDDIO <sub>n</sub>
SA4 DREQ1 PB4	O IO	R19	2mA, pullup-pe	SA4: Static memory address bus bit 4 DREQ1: External DMA request input 1 PB4: GPIO group B bit 4	VDDIO
SA5 DACK1 PB5	O IO	T19	2mA, pullup-pe	SA5: Static memory address bus bit 5 DACK1: External DMA acknowledge output 1 PB5: GPIO group B bit 5	VDDIO
RD_ PA16	O IO	U8	2mA, pullup-pe	RD_: Static memory read strobe PA16: GPIO group A bit 16	VDDIO <sub>n</sub>
WE_ PA17	O IO	V8	2mA, pullup-pe	WE_: Static memory write strobe PA17: GPIO group A bit 17	VDDIO <sub>n</sub>

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
FRE_ MSC0_CLK SSI0_CLK PA18	O O O IO	T9	4mA, pullup-pe	FRE_: NAND read enable MSC0_CLK: MSC (MMC/SD) 0 clock output SSI0_CLK: SSI 0 clock output PA18: GPIO group A bit 18	VDDIO <sub>on</sub>
FWE_ MSC0_CMD SSI0_CEO_ PA19	O IO O IO	U9	4mA, pullup-pe	FWE_: NAND write enable MSC0_CMD: MSC (MMC/SD) 0 command SSI0_CEO_: SSI 0 chip enable 0 PA19: GPIO group A bit 19	VDDIO <sub>on</sub>
MSC0_D0 SSI0_DR PA20 (FRB)	IO I IO I	U10	4mA, pullup-pe	MSC0_D0: MSC (MMC/SD) 0 data bit 0 SSI0_DR: SSI 0 data input PA20: GPIO group A bit 20. If NAND flash is used, this pin should be used as NAND FRB (NAND flash ready/busy) input	VDDIO <sub>on</sub>
CS1_ MSC0_D1 SSI0_DT PA21	O IO O IO	W3	4mA, pullup-pe	CS1_: NAND/NOR/SRAM chip select 1 MSC0_D1: MSC (MMC/SD) 0 data bit 1 SSI0_DT: SSI 0 data output PA21: GPIO group A bit 21	VDDIO <sub>on</sub>
CS2_ MSC0_D2 PA22	O IO IO	Y2	4mA, pullup-pe	CS2_: NAND/NOR/SRAM chip select 2 MSC0_D2: MSC (MMC/SD) 0 data bit 2 PA22: GPIO group A bit 22	VDDIO <sub>on</sub>
CS3_ MSC0_D3 PA23	O IO IO	AA1	4mA, pullup-pe	CS3_: NAND/NOR/SRAM chip select 3 MSC0_D3: MSC (MMC/SD) 0 data bit 3 PA23: GPIO group A bit 23	VDDIO <sub>on</sub>
CS4_ PA24	O IO	U21	2mA, pullup-pe	CS4_: NAND/NOR/SRAM chip select 4 PA24: GPIO group A bit 24	VDDIO
CS5_ PA25	O IO	T20	2mA, pullup-pe	CS5_: NAND/NOR/SRAM chip select 5 PA25: GPIO group A bit 25	VDDIO
CS6_ PA26	O IO	V21	2mA, pullup-pe	CS6_: NAND/NOR/SRAM chip select 6 PA26: GPIO group A bit 26	VDDIO
WAIT_ PA27	I IO	U20	2mA, pullup-pe	WAIT_: Slow static memory/device wait signal PA27: GPIO group A bit 27	VDDIO
DREQ0 PA28	I IO	W21	2mA, pullup-pe	DREQ0: External DMA request input 0 PA28: GPIO group A bit 28	VDDIO
DACK0 OWI PA29	O IO IO	Y21	2mA, pullup-pe	DACK0: External DMA acknowledge output 0 OWI: One wire interface PA29: GPIO group A bit 29	VDDIO

## 2.5.3 LCD

**Table 2-3 LCDC Pins (28; all GPIO shared: PC0~27)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
LCD_B0 LCD_REV PC0	O O IO	K17	8mA, pullup-pe	LCD_B0: LCD Blue data bit 0 LCD_REV: LCD REV output for special TFT PC0: GPIO group C bit 0	VDDIO
LCD_B1 LCD_PS PC1	O O IO	K16	8mA, pullup-pe	LCD_B1: LCD Blue data bit 1 LCD_PS: LCD PS output for special TFT PC1: GPIO group C bit 1	VDDIO
LCD_B2 PC2	O IO	L16	8mA, pullup-pe	LCD_B2: LCD Blue data bit 2 PC2: GPIO group C bit 2	VDDIO
LCD_B3 PC3	O IO	L17	8mA, pullup-pe	LCD_B3: LCD Blue data bit 3 PC3: GPIO group C bit 3	VDDIO
LCD_B4 PC4	O IO	L20	8mA, pullup-pe	LCD_B4: LCD Blue data bit 4 PC4: GPIO group C bit 4	VDDIO
LCD_B5 PC5	O IO	L19	8mA, pullup-pe	LCD_B5: LCD Blue data bit 5 PC5: GPIO group C bit 5	VDDIO
LCD_B6 PC6	O IO	L18	8mA, pullup-pe	LCD_B6: LCD Blue data bit 6 PC6: GPIO group C bit 6	VDDIO
LCD_B7 PC7	O IO	M16	8mA, pullup-pe	LCD_B7: LCD Blue data bit 7 PC7: GPIO group C bit 7	VDDIO
LCD_PCLK PC8	O IO	M21	12mA, pullup-pe	LCD_PCLK: LCD pixel clock PC8: GPIO group C bit 8	VDDIO
LCD_DE PC9	O IO	M20	8mA, pullup-pe	LCD_DE: STN AC bias drive/non-STN data enable PC9: GPIO group C bit 9	VDDIO
LCD_G0 LCD_SPL PC10	O O IO	N21	8mA, pullup-pe	LCD_G0: LCD Green data bit 0 LCD_SPL: LCD SPL output PC10: GPIO group C bit 10	VDDIO
LCD_G1 PC11	O IO	P21	8mA, pullup-pe	LCD_G1: LCD Green data bit 1 PC11: GPIO group C bit 11	VDDIO
LCD_G2 PC12	O IO	M17	8mA, pullup-pe	LCD_G2: LCD Green data bit 2 PC12: GPIO group C bit 12	VDDIO
LCD_G3 PC13	O IO	N20	8mA, pullup-pe	LCD_G3: LCD Green data bit 3 PC13: GPIO group C bit 13	VDDIO
LCD_G4 PC14	O IO	M19	8mA, pullup-pe	LCD_G4: LCD Green data bit 4 PC14: GPIO group C bit 14	VDDIO
LCD_G5 PC15	O IO	R21	8mA, pullup-pe	LCD_G5: LCD Green data bit 5 PC15: GPIO group C bit 15	VDDIO
LCD_G6 PC16	O IO	N16	8mA, pullup-pe	LCD_G6: LCD Green data bit 6 PC16: GPIO group C bit 16	VDDIO
LCD_G7 PC17	O IO	N17	8mA, pullup-pe	LCD_G7: LCD Green data bit 7 PC17: GPIO group C bit 17	VDDIO
LCD_HSYN PC18	IO IO	P20	8mA, pullup-pe	LCD_HSYN: LCD line clock/horizontal sync PC18: GPIO group C bit 18	VDDIO
LCD_VSYN PC19	IO IO	T21	8mA, pullup-pe	LCD_VSYN: LCD frame clock/vertical sync PC19: GPIO group C bit 19	VDDIO
LCD_R0 LCD_CLS PC20	O O IO	R20	8mA, pullup-pe	LCD_R0: LCD Red data bit 0 LCD_CLS: LCD CLS output PC20: GPIO group C bit 20	VDDIO
LCD_R1 PC21	O IO	N19	8mA, pullup-pe	LCD_R1: LCD Red data bit 1 PC21: GPIO group C bit 21	VDDIO
LCD_R2 PC22	O IO	P19	8mA, pullup-pe	LCD_R2: LCD Red data bit 2 PC22: GPIO group C bit 22	VDDIO
LCD_R3 PC23	O IO	P16	8mA, pullup-pe	LCD_R3: LCD Red data bit 3 PC23: GPIO group C bit 23	VDDIO

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
LCD_R4 PC24	O IO	P17	8mA, pullup-pe	LCD_R4: LCD Red data bit 4 PC24: GPIO group C bit 24	VDDIO
LCD_R5 PC25	O IO	R16	8mA, pullup-pe	LCD_R5: LCD Red data bit 5 PC25: GPIO group C bit 25	VDDIO
LCD_R6 PC26	O IO	R17	8mA, pullup-pe	LCD_R6: LCD Red data bit 6 PC26: GPIO group C bit 26	VDDIO
LCD_R7 PC27	O IO	P18	8mA, pullup-pe	LCD_R7: LCD Red data bit 7 PC27: GPIO group C bit 27	VDDIO

## 2.5.4 CIM

**Table 2-4 CIM/TSSI/SSI1/MSC2/EPD Pins (12; all GPIO shared: PB6~17)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
CIM_PCLK TSCLK SSI1_DR MSC2_D0 PB6	I I I IO IO	C14	4mA, pullup-pe	CIM_PCLK: CIM pixel clock input TSCLK: TS interface clock input SSI1_DR: SSI 1 data input MSC2_D0: MSC (MMC/SD) 2 data bit 0 PB6: GPIO group B bit 6	VDDIO <sup>[3]</sup>
CIM_HSYN TSFRM SSI1_CLK MSC2_CLK PB7	I I O O IO	A15	4mA, pullup-pe	CIM_HSYN: CIM horizontal sync input TSFRM: TS interface frame valid input SSI1_CLK: SSI 1 clock output MSC2_CLK: MSC (MMC/SD) 2 clock output PB7: GPIO group B bit 7	VDDIO <sup>[3]</sup>
CIM_VSYN TSSTR SSI1_CE0_ MSC2_CMD PB8	I I O IO IO	B15	4mA, pullup-pe	CIM_VSYN: CIM vertical sync input TSSTR: TS interface frame start input SSI1_CE0_: SSI 1 chip enable 0 MSC2_CMD: MSC (MMC/SD) 2 command PB8: GPIO group B bit 8	VDDIO <sup>[3]</sup>
CIM_MCLK TSFAIL SSI1_DT EPD_PWC PB9	O I O O IO	A16	4mA, pullup-pe	CIM_MCLK: CIM master clock output TSFAIL: TS interface error package indicator input SSI1_DT: SSI 1 data output EPD_PWC: EPD power control common PB9: GPIO group B bit 9	VDDIO <sup>[3]</sup>
CIM_D0 TSD0 EPD_PWR0 PB10	I I O IO	B16	2mA, pulldown-pe	CIM_D0: CIM data input bit 0 TSD0: TS interface input data bus bit 0 EPD_PWR0: EPD power control bit 0 PB10: GPIO group B bit 10	VDDIO <sup>[3]</sup>
CIM_D1 TSD1 EPD_PWR1 PB11	I I O IO	C15	2mA, pulldown-pe	CIM_D1: CIM data input bit 1 TSD1: TS interface input data bus bit 1 EPD_PWR1: EPD power control bit 1 PB11: GPIO group B bit 11	VDDIO <sup>[3]</sup>
CIM_D2 TSD2 EPD_SCE2_ PB12	I I O IO	A17	2mA, pullup-pe	CIM_D2: CIM data input bit 2 TSD2: TS interface input data bus bit 2 EPD_SCE2_: EPD source driver chip select 2 PB12: GPIO group B bit 12	VDDIO <sup>[3]</sup>
CIM_D3 TSD3 EPD_SCE3_ PB13	I I O IO	A18	2mA, pullup-pe	CIM_D3: CIM data input bit 3 TSD3: TS interface input data bus bit 3 EPD_SCE3_: EPD source driver chip select 3 PB13: GPIO group B bit 13	VDDIO <sup>[3]</sup>
CIM_D4 TSD4 EPD_SCE4_ PB14	I I O IO	B17	2mA, pullup-pe	CIM_D4: CIM data input bit 4 TSD4: TS interface input data bus bit 4 EPD_SCE4_: EPD source driver chip select 4 PB14: GPIO group B bit 14	VDDIO <sup>[3]</sup>

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
CIM_D5 TSD5 EPD_SCE5_ PB15	I I O IO	A19	2mA, pullup-pe	CIM_D5: CIM data input bit 5 TSD5: TS interface input data bus bit 5 EPD_SCE5_ : EPD source driver chip select 5 PB15: GPIO group B bit 15	VDDIO <sup>[3]</sup>
CIM_D6 TSD6 EPD_PWR2 PB16	I I O IO	B18	2mA, pulldown-pe	CIM_D6: CIM data input bit 6 TSD6: TS interface input data bus bit 6 EPD_PWR2: EPD power control bit 2 PB16: GPIO group B bit 16	VDDIO <sup>[3]</sup>
CIM_D7 TSD7 EPD_PWR3 PB17	I I O IO	C16	2mA, pulldown-pe	CIM_D7: CIM data input bit 7 TSD7: TS interface input data bus bit 7 EPD_PWR3: EPD power control bit 3 PB17: GPIO group B bit 17	VDDIO <sup>[3]</sup>



## 2.5.5 TSSI/SSI/MSC/UART/I2C

**Table 2-5 TSSI/MSC2/SSI Pins (12; all GPIO shared: PB20~31)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
MSC2_D0 SSI0_DR SSI1_DR TSD0 PB20	I I I I IO	J16	4mA, pullup-pe	MSC2_D0: MSC (MMC/SD) 2 data bit 0 SSI0_DR: SSI 0 data input SSI1_DR: SSI 1 data input TSD0: TS slave interface input data bus bit 0 PB20: GPIO group B bit 20	VDDIO
MSC2_D1 SSI0_DT SSI1_DT TSD1 PB21	IO O O I IO	J17	4mA, pullup-pe	MSC2_D1: MSC (MMC/SD) 2 data bit 1 SSI0_DT: SSI 0 data output SSI1_DT: SSI 1 data output TSD1: TS interface input data bus bit 1 PB21: GPIO group B bit 21	VDDIO
TSD2 PB22	I IO	H19	2mA, pullup-pe	TSD2: TS interface input data bus bit 2 PB22: GPIO group B bit 22	VDDIO
TSD3 PB23	I IO	H20	2mA, pullup-pe	TSD3: TS interface input data bus bit 3 PB23: GPIO group B bit 23	VDDIO
TSD4 PB24	I IO	H21	2mA, pullup-pe	TSD4: TS interface input data bus bit 4 PB24: GPIO group B bit 24	VDDIO
TSD5 PB25	I IO	J21	2mA, pullup-pe	TSD5: TS interface input data bus bit 5 PB25: GPIO group B bit 25	VDDIO
TSD6 PB26	I IO	J20	2mA, pullup-pe	TSD6: TS interface input data bus bit 6 PB26: GPIO group B bit 26	VDDIO
TSD7 PB27	I IO	J19	2mA, pullup-pe	TSD7: TS interface input data bus bit 7 PB27: GPIO group B bit 27	VDDIO
MSC2_CLK SSI0_CLK SSI1_CLK TSCLK PB28	O O O I IO	K21	4mA, pullup-pe	MSC2_CLK: MSC (MMC/SD) 2 clock output SSI0_CLK: SSI 0 clock output SSI1_CLK: SSI 1 clock output TSCLK: TS interface clock input PB28: GPIO group B bit 28	VDDIO
MSC2_CMD SSI0_CE0_ SSI1_CE0_ TSSTR PB29	IO O O I IO	K20	4mA, pullup-pe	MSC2_CMD: MSC (MMC/SD) 2 command SSI0_CE0_: SSI 0 chip enable 0 SSI1_CE0_: SSI 1 chip enable 0 TSSTR: TS interface frame start input PB29: GPIO group B bit 29	VDDIO
MSC2_D2 SSI0_GPC SSI1_GPC TSFAIL PB30	IO O O I IO	L21	4mA, pullup-pe	MSC2_D2: MSC (MMC/SD) 2 data bit 2 SSI0_GPC: SSI 0 general-purpose control signal SSI1_GPC: SSI 1 general-purpose control signal TSFAIL: TS interface error package indicator input PB30: GPIO group B bit 30	VDDIO
MSC2_D3 SSI0_CE1_ SSI1_CE1_ TSFRM PB31	IO O O I IO	K19	4mA, pullup-pe	MSC2_D3: MSC (MMC/SD) 2 data bit 3 SSI0_CE1_: SSI 0 chip enable 1 SSI1_CE1_: SSI 1 chip enable 1 TSFRM: TS interface frame valid input PB31: GPIO group B bit 31	VDDIO

**Table 2-6 UART0/SSI1/MSC2 Pins (4; all GPIO shared: PF0~3)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
UART0_RxD SSI1_DR MSC2_D0 PF0	I I IO IO	G17	4mA, pullup-pe	UART0_RxD: UART 0 Receiving data SSI1DR: SSI 1 data input MSC2_D0: MSC (MMC/SD) 2 data bit 0 PF0: GPIO group F bit 0	VDDIO

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
UART0_CTS _SS11_CE0 MSC2_CMD PF1	I O IO IO	G16	4mA, pullup-pe	UART0_CTS_: UART 0 CTS_ input SS11_CE0_: SSI 1 chip enable 0 MSC2_CMD: MSC (MMC/SD) 2 command PF1: GPIO group F bit 1	VDDIO
UART0_RTS _SS11_CLK MSC2_CLK PF2	O O O IO	E17	4mA, pullup-pe	UART0_RTS_: UART 0 RTS_ output SS11_CLK: SSI 1 clock output MSC2_CLK: MSC (MMC/SD) 2 clock output PF2: GPIO group F bit 2	VDDIO <sup>[3]</sup>
UART0_TxD SS11_DT PF3	O O IO	E18	4mA, pullup-pe	UART0_TxD: UART 0 transmitting data SS11_DT: SSI 1 data output PF3: GPIO group F bit 3	VDDIO <sup>[3]</sup>

Table 2-7 MSC1/SSI, Pins (6; all GPIO shared: PD20~25)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
MSC1_D0 SSI0_DR SSI1_DR PD20	IO I I IO	V20	4mA, pullup-pe	MSC1_D0: MSC (MMC/SD) 1 data bit 0 SSI0_DR: SSI 0 data input SSI1_DR: SSI 1 data input PD20: GPIO group D bit 20	VDDIO
MSC1_D1 SSI0_DT SSI1_DT PD21	IO O O IO	U19	4mA, pullup-pe	MSC1_D1: MSC (MMC/SD) 1 data bit 1 SSI0_DT: SSI 0 data output SSI1_DT: SSI 1 data output PD21: GPIO group D bit 21	VDDIO
MSC1_D2 SSI0_GPC SSI1_GPC PD22	IO O O IO	W20	4mA, pullup-pe	MSC1_D2: MSC (MMC/SD) 1 data bit 2 SSI0_GPC: SSI 0 general-purpose control signal SSI1_GPC: SSI 1 general-purpose control signal PD22: GPIO group D bit 22	VDDIO
MSC1_D3 SSI0_CE1_ SSI1_CE1_ PD23	IO O O IO	AA21	4mA, pullup-pe	MSC1_D3: MSC (MMC/SD) 1 data bit 3 SSI0_CE1_: SSI 0 chip enable 1 SSI1_CE1_: SSI 1 chip enable 1 PD23: GPIO group D bit 23	VDDIO
MSC1_CLK SSI0_CLK SSI1_CLK PD24	O O O IO	Y20	4mA, pullup-pe	MSC1_CLK: MSC (MMC/SD) 1 clock output SSI0_CLK: SSI 0 clock output SSI1_CLK: SSI 1 clock output PD24: GPIO group D bit 24	VDDIO
MSC1_CMD SSI0_CE0_ SSI1_CE0_ PD25	IO O O IO	V19	4mA, pullup-pe	MSC1_CMD: MSC (MMC/SD) 1 command SSI0_CE0_: SSI 0 chip enable 0 SSI1_CE0_: SSI 1 chip enable 0 PD25: GPIO group D bit 25	VDDIO

Table 2-8 UART1 Pins (4; all GPIO shared: PD26~29)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
UART1_RxD PD26	I IO	E12	2mA, pullup-pe	UART1_RxD: UART 1 Receiving data PD26: GPIO group D bit 26	VDDIO <sup>[3]</sup>
UART1_CTS _PD27	I IO	F12	2mA, pullup-pe	UART1_CTS_: UART 1 CTS_ input PD27: GPIO group D bit 27	VDDIO <sup>[3]</sup>
UART1_TxD PD28	O IO	E13	2mA, pullup-pe	UART1_TxD: UART 1 transmitting data PD28: GPIO group D bit 28	VDDIO <sup>[3]</sup>
UART1_RTS _PD29	O IO	F13	2mA, pullup-pe	UART1_RTS_: UART 1 RTS_ output PD29: GPIO group D bit 29	VDDIO <sup>[3]</sup>

**Table 2-9 UART2 Pins (0/4/4; all GPIO shared: PC28~31)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
UART2_RxD PC28	I IO	F14	2mA, pullup-pe	UART2_RxD: UART 2 Receiving data PC28: GPIO group C bit 28	VDDIO <sup>[3]</sup>
UART2_CTS_ PC29	I IO	E14	2mA, pullup-pe	UART2_CTS_: UART 2 CTS_ input PC29: GPIO group C bit 29	VDDIO <sup>[3]</sup>
UART2_TxD PC30	O IO	D14	2mA, pullup-pe	UART2_TxD: UART 2 transmitting data PC30: GPIO group C bit 30	VDDIO <sup>[3]</sup>
UART2_RTS_ PC31	O IO	F15	2mA, pullup-pe	UART2_RTS_: UART 2 RTS_ output PC31: GPIO group C bit 31	VDDIO <sup>[3]</sup>

**Table 2-10 I2C0/I2C1 Pins (4; all GPIO shared: PD30~31, PE30~31)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
I2C0_SDA PD30	IO IO	Y8	4mA, pullup-pe	I2C0_SDA: I2C 0 serial data PD30: GPIO group D bit 30	VDDIO
I2C0_SCK PD31	IO IO	AA8	4mA, pullup-pe	I2C0_SCK: I2C 0 serial clock PD31: GPIO group D bit 31	VDDIO
I2C1_SDA PE30	IO IO	T15	4mA, pullup-pe	I2C1_SDA: I2C 1 serial data PE30: GPIO group E bit 30	VDDIO
I2C1_SCK PE31	IO IO	T17	4mA, pullup-pe	I2C1_SCK: I2C 1 serial clock PE31: GPIO group E bit 31	VDDIO

**Table 2-11 MSC0/MSC1/MSC2 Pins (10; all GPIO shared: PE20~29)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
MSC0_CLK MSC1_CLK MSC2_CLK PE28	O O O IO	C20	4mA, pullup-pe	MSC0_CLK: MSC (MMC/SD) 0 clock output MSC1_CLK: MSC (MMC/SD) 1 clock output MSC2_CLK: MSC (MMC/SD) 2 clock output PE28: GPIO group E bit 28	VDDIO <sup>[3]</sup>
MSC0_CMD MSC1_CMD MSC2_CMD PE29	IO IO IO IO	C21	4mA, pullup-pe	MSC0_CMD: MSC (MMC/SD) 0 command MSC1_CMD: MSC (MMC/SD) 1 command MSC2_CMD: MSC (MMC/SD) 2 command PE29: GPIO group E bit 29	VDDIO <sup>[3]</sup>
MSC0_D0 MSC1_D0 MSC2_D0 PE20	IO IO IO IO	A20	4mA, pullup-pe	MSC0_D0: MSC (MMC/SD) 0 data bit 0 MSC1_D0: MSC (MMC/SD) 1 data bit 0 MSC2_D0: MSC (MMC/SD) 2 data bit 0 PE20: GPIO group E bit 20	VDDIO <sup>[3]</sup>
MSC0_D1 MSC1_D1 MSC2_D1 PE21	IO IO IO IO	A21	4mA, pullup-pe	MSC0_D1: MSC (MMC/SD) 0 data bit 1 MSC1_D1: MSC (MMC/SD) 1 data bit 1 MSC2_D1: MSC (MMC/SD) 2 data bit 1 PE21: GPIO group E bit 21	VDDIO <sup>[3]</sup>
MSC0_D2 MSC1_D2 MSC2_D2 PE22	IO IO IO IO	B19	4mA, pullup-pe	MSC0_D2: MSC (MMC/SD) 0 data bit 2 MSC1_D2: MSC (MMC/SD) 1 data bit 2 MSC2_D2: MSC (MMC/SD) 2 data bit 2 PE22: GPIO group E bit 22	VDDIO <sup>[3]</sup>
MSC0_D3 MSC1_D3 MSC2_D3 PE23	IO IO IO IO	C17	4mA, pullup-pe	MSC0_D3: MSC (MMC/SD) 0 data bit 3 MSC1_D3: MSC (MMC/SD) 1 data bit 3 MSC2_D3: MSC (MMC/SD) 2 data bit 3 PE23: GPIO group E bit 23	VDDIO <sup>[3]</sup>

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
MSC0_D4 MSC1_D4 MSC2_D4 PE24	IO IO IO IO	B20	4mA, pullup-pe	MSC0_D4: MSC (MMC/SD) 0 data bit 4 MSC1_D4: MSC (MMC/SD) 1 data bit 4 MSC2_D4: MSC (MMC/SD) 2 data bit 4 PE24: GPIO group E bit 24	VDDIO <sup>[3]</sup>
MSC0_D5 MSC1_D5 MSC2_D5 PE25	IO IO IO IO	C18	4mA, pullup-pe	MSC0_D5: MSC (MMC/SD) 0 data bit 5 MSC1_D5: MSC (MMC/SD) 1 data bit 5 MSC2_D5: MSC (MMC/SD) 2 data bit 5 PE25: GPIO group E bit 25	VDDIO <sup>[3]</sup>
MSC0_D6 MSC1_D6 MSC2_D6 PE26	IO IO IO IO	B21	4mA, pullup-pe	MSC0_D6: MSC (MMC/SD) 0 data bit 6 MSC1_D6: MSC (MMC/SD) 1 data bit 6 MSC2_D6: MSC (MMC/SD) 2 data bit 6 PE26: GPIO group E bit 26	VDDIO <sup>[3]</sup>
MSC0_D7 MSC1_D7 MSC2_D7 PE27	IO IO IO IO	C19	4mA, pullup-pe	MSC0_D7: MSC (MMC/SD) 0 data bit 7 MSC1_D7: MSC (MMC/SD) 1 data bit 7 MSC2_D7: MSC (MMC/SD) 2 data bit 7 PE27: GPIO group E bit 27	VDDIO <sup>[3]</sup>

Table 2-12 SSI0/SSI1 Pins (6; all GPIO shared: PE14~19)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
SSI0_DR SSI1_DR PE14	I I IO	B12	4mA, pullup-pe	SSI0_DR: SSI 0 data input SSI1_DR: SSI 1 data input PE14: GPIO group E bit 14	VDDIO <sup>[3]</sup>
SSI0_CLK SSI1_CLK PE15	O O IO	A13	4mA, pullup-pe	SSI0_CLK: SSI 0 clock output SSI1_CLK: SSI 1 clock output PE15: GPIO group E bit 15	VDDIO <sup>[3]</sup>
SSI0_CE0_ SSI1_CE0_ PE16	O O IO	B13	4mA, pullup-pe	SSI0_CE0_: SSI 0 chip enable 0 SSI1_CE0_: SSI 1 chip enable 0 PE16: GPIO group E bit 16	VDDIO <sup>[3]</sup>
SSI0_DT SSI1_DT PE17	O O IO	A14	4mA, pullup-pe	SSI0_DT: SSI 0 data output SSI1_DT: SSI 1 data output PE17: GPIO group E bit 17	VDDIO <sup>[3]</sup>
SSI0_CE1_ SSI1_CE1_ PE18	O O IO	C13	4mA, pullup-pe	SSI0_CE1_: SSI 0 chip enable 1 SSI1_CE1_: SSI 1 chip enable 1 PE18: GPIO group E bit 18	VDDIO <sup>[3]</sup>
SSI0_GPC SSI1_GPC PE19	O O IO	B14	4mA, pullup-pe	SSI0_GPC: SSI 0 general-purpose control signal SSI1_GPC: SSI 1 general-purpose control signal PE19: GPIO group E bit 19	VDDIO <sup>[3]</sup>

## 2.5.6 PCM/PS2/SCC/PWM/AIC/UART

**Table 2-13 PCM/PS2/SCC Pins (10; all GPIO shared: PD0~9)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
PCM_DO PD0	O IO	G21	2mA, pullup-pe	PCM_DO: PCM data out PD0: GPIO group D bit 0	VDDIO
PCM_CLK PD1	IO IO	H18	2mA, pullup-pe	PCM_CLK: PCM clock PD1: GPIO group D bit 1	VDDIO
PCM_SYN PD2	IO IO	H17	2mA, pullup-pe	PCM_SYN: PCM sync PD2: GPIO group D bit 2	VDDIO
PCM_DI PD3	I IO	H16	2mA, pullup-pe	PCM_DI: PCM data in PD3: GPIO group D bit 3	VDDIO
PS2_MCLK PD4	IO IO	F19	2mA, pullup-pe	PS2_MCLK: PS/2 mouse clock PD4: GPIO group D bit 4	VDDIO
PS2_MDATA PD5	IO IO	F20	2mA, pullup-pe	PS2_MDATA: PS/2 mouse data PD5: GPIO group D bit 5	VDDIO
PS2_KCLK PD6	IO IO	F21	2mA, pullup-pe	PS2_KCLK: PS/2 keyboard clock PD6: GPIO group D bit 6	VDDIO
PS2_KDATA PD7	IO IO	G20	2mA, pullup-pe	PS2_KDATA: PS/2 keyboard data PD7: GPIO group D bit 7	VDDIO
SCC_DATA PD8	IO IO	F17	4mA, pullup-pe	SCC_DATA: Smartcard controller (7816-3) data PD8: GPIO group D bit 8	VDDIO <sup>[3]</sup>
SCC_CLK PD9	O IO	G19	4mA, pullup-pe	SCC_CLK: Smartcard controller (7816-3) clock PD9: GPIO group D bit 9	VDDIO

**Table 2-14 UART3/AIC/PWM/EPD Pins (17; all GPIO shared: PE0~9, 11~13, PD10~13)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
PWM0 PE0	IO IO	E16	2mA, pulldown-pe	PWM0: PWM output or pulse input 0 PE0: GPIO group E bit 0. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PWM1 PE1	O IO	D21	2mA, pulldown-pe	PWM1: PWM 1 output. This PWM can run in sleep mode in RTCLK clock PE1: GPIO group E bit 1. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PWM2 PE2	O IO	D17	2mA, pullup-pe	PWM2: PWM 2 output. This PWM can run in sleep mode in RTCLK clock PE2: GPIO group E bit 2. Pull-up not enabled at and after reset	VDDIO <sup>[3]</sup>
PWM3 PE3	IO IO	D19	2mA, pullup-pe	PWM3: PWM output or pulse input 3 PE3: GPIO group E bit 3. Pull-up not enabled at and after reset	VDDIO <sup>[3]</sup>
PWM4 PE4	IO IO	E21	2mA, pullup-pe	PWM4: PWM output or pulse input 4 PE4: GPIO group E bit 4	VDDIO <sup>[3]</sup>
PWM5 UART3_TxD SCLK_RSTN PE5	IO O O IO	E20	2mA, pullup-pe	PWM5: PWM output or pulse input 5 UART3_TxD: UART 3 transmitting data SCLK_RSTN: AIC I2S system clock output or AC97 reset output PE5: GPIO group E bit 5	VDDIO <sup>[3]</sup>
PWM6 PD10	IO IO	E19	2mA, pullup-pe	PWM6: PWM output or pulse input 6 PD10: GPIO group D bit 10	VDDIO <sup>[3]</sup>
PWM7 PD11	IO IO	D20	2mA, pullup-pe	PWM7: PWM output or pulse input 7 PD11: GPIO group D bit 11	VDDIO <sup>[3]</sup>
UART3_RxD BCLK SSI1_DT EPD_PWR4 PD12	I IO O O IO	AA20	4mA, pulldown-pe	UART3_RxD: UART 3 Receiving data BCLK: AIC AC97/I2S bit clock SSI1_DT: SSI 1 data output EPD_PWR4: EPD power control bit 4 PD12: GPIO group D bit 12	VDDIO

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
SYNC MSC2_D0 SSI1_DR EPD_PWR5 PD13	IO IO I O IO	W19	4mA, pulldown-pe	SYNC: AC97/I2S frame SYNC or I2S Left/Right MSC2_D0: MSC (MMC/SD) 2 data bit 0 SSI1_DR: SSI 1 data input EPD_PWR5: EPD power control bit 5 PD13: GPIO group D bit 13	VDDIO
SDAT1 MSC2_CMD SSI1_CE0_ EPD_PWR6 PE6	I IO O O IO	AA18	4mA, pullup-pe	SDAT1: AC97/I2S serial data input MSC2_CMD: MSC (MMC/SD) 2 command SSI1_CE0_: SSI 1 chip enable 0 EPD_PWR6: EPD power control bit 6 PE6: GPIO group E bit 6	VDDIO
SDATO MSC2_CLK SSI1_CLK EPD_PWR7 PE7	O O O O IO	Y19	4mA, pulldown-pe	SDATO: AC97/I2S serial data output or SPDIF output MSC2_CLK: MSC (MMC/SD) 2 clock output SSI1_CLK: SSI 1 clock output EPD_PWR7: EPD power control bit 7 PE7: GPIO group E bit 7	VDDIO
UART3_CTS _PE8	I IO	T13	2mA, pullup-pe	UART3_CTS_: UART 3 CTS_input PE8: GPIO group E bit 8	VDDIO
UART3_RTS _PE9	O O	T14	2mA, pullup-pe	UART3_RTS_: UART 3 RTS_output PE9: GPIO group E bit 9	VDDIO
SDATO1 PE11	O IO	AA19	2mA, pullup-pe	SDATO1: AIC I2S serial data output 1 PE11: GPIO group E bit 11	VDDIO
SDATO2 PE12	O IO	W18	2mA, pullup-pe	SDATO2: AIC I2S serial data output 2 PE12: GPIO group E bit 12	VDDIO
SDATO3 PE13	O IO	Y18	2mA, pullup-pe	SDATO3: AIC I2S serial data output 3 PE13: GPIO group E bit 13	VDDIO

## 2.5.7 System/JTAG/UART3/OTG/GPIO

**Table 2-15 GPIO Pins (8, GPIO PF04~11)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
PF4	IO	C11	2mA, pull-down-p e	PF4: GPIO group F bit 4. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF5	IO	A10	2mA, pull-down-p e	PF5: GPIO group F bit 5. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF6	IO	B11	2mA, pull-down-p e	PF6: GPIO group F bit 6. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF7	IO	A11	2mA, pull-down-p e	PF7: GPIO group F bit 7. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF8	IO	A12	2mA, pull-down-p e	PF8: GPIO group F bit 8. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF9	IO	D11	2mA, pull-down-p e	PF9: GPIO group F bit 9. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF10	IO	E11	2mA, pull-down-p e	PF10: GPIO group F bit 10. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>
PF11	IO	F11	2mA, pull-down-p e	PF11: GPIO group F bit 11. Pull-down not enabled at and after reset	VDDIO <sup>[3]</sup>

**Table 2-16 JTAG/UART3/PS2 Pins (5, GPIO PA03~31 are used to control)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
TRST_	I	V17	Schmitt, pull-down	TRST_: JTAG reset	VDDIO
TCK UART3_RTS_	I O	U16	4mA, Schmitt, pull-down	TCK: JTAG clock UART3_RTS_: UART 3 RTS_ output, PA31 is used to select between JTAG and UART PS2_MCLK: PS/2 mouse clock, PA30 is used to select between JTAG and PS2	VDDIO
PS2_MCLK	IO				
TMS UART3_CTS_	I I	W17	4mA, Schmitt, pull-up	TMS: JTAG mode select UART3_CTS_: UART 3 CTS_ input, PA31 is used to select between JTAG and UART PS2_MDATA: PS/2 mouse data, PA30 is used to select between JTAG and PS2	VDDIO
PS2_MDATA	IO				
TDI UART3_RxD	I I	U15	4mA, Schmitt, pull-up	TDI: JTAG serial data input UART3_RxD: UART 3 Receiving data, PA31 is used to select between JTAG and UART PS2_KCLK: PS/2 keyboard clock, PA30 is used to select between JTAG and PS2	VDDIO
PS2_KCLK	IO				
TDO UART3_TxD	O O	U17	4mA, Schmitt, pull-up	TDO: JTAG serial data output UART3_TxD: UART 3 transmitting data, PA31 is used to select between JTAG and UART PS2_KDATA: PS/2 keyboard data, PA30 is used to select between JTAG and PS2	VDDIO
PS2_KDATA	IO				

Table 2-17 System Pins (3, all GPIO shared: PD17~19)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
PD17 (BOOT_SEL0)	I IO	W9	2mA, pullup-pe	PD17: GPIO group D bit 17 It is taken as BOOT select bit 0 by Boot ROM code	VDDIO
PD18 (BOOT_SEL1)	I IO	W10	2mA, pullup-pe	PD18: GPIO group D bit 18 It is taken as BOOT select bit 1 by Boot ROM code	VDDIO
PD19 (BOOT_SEL2)	I IO	U18	2mA, pullup-pe	PD19: GPIO group D bit 19 It is taken as BOOT select bit 2 by Boot ROM code	VDDIO

Table 2-18 USB OTG Digital Pins (0/1/1, all GPIO shared: PE10)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
DRVVBUS PE10	O IO	E15	2mA, pulldown-pe	DRVVBUS: USB OTG VBUS driver control signal PE10: GPIO group E bit 10	VDDIO <sup>[3]</sup>

## 2.5.8 Digital power/ground

Table 2-19 IO/Core power supplies for FBGA-345 package (46)

Pin Names	IO	Loc	Pin Description	Power
VDDmem	P	E6 E7 E8 E9 E10 F5 H5 J5 K5 L5	VDDmem: 10 IO digital power for DDR, 1.8V~2.5V	-
VSSmem	P	F7 F8 F9 F10 G6 H6 J6 K6 L6 M6	VSSmem: 10 IO digital ground for DDR, 0V	-
VDDIO <sub>n</sub>	P	T10	VDDIO <sub>n</sub> : (or VDDIO <sub>nand</sub> ) 1 IO digital power for NAND power domain, 1.8V~3.3V	-
VDDIO	P	L13 M13 N12 N13	VDDIO: 4 IO digital power for none DDR/NAND, 3.3V	-
VSS	P	J9 K9 K10 K11 K12 L9 L10 L11 L12 M10 M11 M12 N11	VSS: 13 IO digital ground for none DDR and CORE digital ground, 0V	-
VDDcore	P	J10 J11 J12 J13 K13 M9 N9 N10	VDDcore: 8 CORE digital power, 1.2V	-



## 2.5.9 Analog

**Table 2-20 Audio CODEC Pins (21)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
AOHPL	AO	Y13		AOHPL: Left headphone out	AVD <sub>CDC</sub>
AOHPR	AO	AA14		AOHPR: Right headphone out	AVD <sub>CDC</sub>
AOBTLP	AO	Y12		AOBTLP: BTL out positive	AVD <sub>CDC</sub>
AOBTLN	AO	AA12		AOBTLN: BTL out negative	AVD <sub>CDC</sub>
AOLP	AO	U12		AOLP: Line out positive	AVD <sub>CDC</sub>
AOLN	AO	U13		AOLN: Line out negative	AVD <sub>CDC</sub>
MICP1	AI	AA17		MICP1: Microphone 1 input or input positive	AVD <sub>CDC</sub>
MICN1	AI	Y17		MICN1: Microphone 1 input negative. This pin should be floating if MIC1 is used as single ended MIC input	AVD <sub>CDC</sub>
MICP2	AI	V14		MICP2: Microphone 2 input positive	AVD <sub>CDC</sub>
MICN2	AI	U14		MICN2: Microphone 2 input negative. This pin should be floating if MIC2 is used as single ended MIC input	AVD <sub>CDC</sub>
MICBIAS	AO	W16		MICBIAS: Microphone bias	AVD <sub>CDC</sub>
AIL	AI	AA16		AIL: Left line input	AVD <sub>CDC</sub>
AIR	AI	Y16		AIR: Right line input	AVD <sub>CDC</sub>
VCAP	AO	AA15		VCAP: Voltage Reference Output. An electrolytic capacitor more than 10 $\mu$ F in parallel with a 0.1 $\mu$ F ceramic capacitor attached from this pin to AVSCDC eliminates the effects of high frequency noise?	AVD <sub>CDC</sub>
HPSENSE	AI	W14		HPSENSE: Sense of headphone jack insertion	AVD <sub>CDC</sub>
AVDCDC	P	Y15		AVDCDC: CODEC analog power, 3.3V (VDDA + VREFP)	-
AVSCDC	P	W15		AVSCDC: CODEC analog ground (VSSA + VREFN)	-
AVDHP	P	AA13		AVDHP: Headphone amplifier power, 3.3V (VDDAO, double PAD)	-
AVSHP	P	Y14		AVSHP: Headphone amplifier ground (VSSAO, double PAD)	-
AVDBTL	P	W12		AVDBTL: BTL amplifier power, 3.3V (VDDAO, double PAD)	-
AVSBTL	P	W13		AVSBTL: BTL amplifier ground (VSSAO, double PAD)	-

**Table 2-21 USB 2.0 OTG, USB 1.1 host (9)**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
OTG_DP	AIO	U2		OTG_DP: USB OTG data plus	AVD <sub>OTG</sub> <sup>[3]</sup>
OTG_DM	AIO	U1		OTG_DM: USB OTG data minus	AVD <sub>OTG</sub> <sup>[3]</sup>
VBUS	AIO	T3		VBUS: USB 5-V power supply pin for USB OTG. An external charge pump must provide power to this pin	AVD <sub>OTG</sub> <sup>[3]</sup>
OTG_ID	AI	V1		OTG_ID: USB mini-receptacle identifier. It differentiates a mini-A from a mini-B plug. If this signal is not used, internal resistance pulls the signal's voltage level to AVDOTG.	AVD <sub>OTG</sub>
TXR_RKL	AIO	R3		TXR_RKL: Transmitter resistor tune. It connects to an external resistor of 44.2 $\Omega$ with 1% tolerance to analog ground AVSOTG, that adjusts the USB 2.0 high-speed source impedance	AVD <sub>OTG</sub>
AVDOTG	P	R5		AVDOTG: USB OTG analog power, 3.3V	-
AVSOTG	P	P6		AVSOTG: USB OTG analog ground	-
USB_DP	AIO	T1		USB_DP: USB 1.1 host data plus	AVD <sub>USB</sub>
USB_DM	AIO	T2		USB_DM: USB 1.1 host data minus	AVD <sub>USB</sub>
AVDUSB	P	P4		AVDUSB: USB 1.1 host analog power, 3.3V	-

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
AVSUSB	P	P5		AVSUSB: USB 1.1 host analog ground	-

Table 2-22 SAR ADC Pins (10) <sup>[3]</sup>

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
XP	AI	W1		XP: Touch screen X+ input	AVD <sub>AD</sub>
XM	AI	Y1		XM: Touch screen X- input	AVD <sub>AD</sub>
YP	AI	V2		YP: Touch screen Y+ input	AVD <sub>AD</sub>
YM	AI	V3		YM: Touch screen Y- input. It is recommended to connect YM to top, YP to bottom, XM to left and XP to right.	AVD <sub>AD</sub>
VBAT_IR	AI	R6		VBAT_IR: Battery voltage input with internal resistance divider	AVD <sub>AD</sub>
AUX0	AI	T5		AUX0: ADC general purpose input 0, high speed ADC	AVD <sub>AD</sub>
AUX1	AI	W2		AUX1: ADC general purpose input 1	AVD <sub>AD</sub>
VBAT_ER	AI	U3		VBAT_ER: ADC general purpose input 2 or battery voltage input with external resistance divider	AVD <sub>AD</sub>
AVDAD	P	U4		AVDAD: ADC analog power, 3.3 V	-
AVSAD	P	V5		AVDAD: ADC analog ground	-

Table 2-23 EFUSE Pins (1)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
VPEFUSE	P	U5		VPEFUSE: EFUSE programming power, 0V/3.3V. Please reference to related APP notes for the voltage connection of 0V or 3.3V	AVD <sub>AD</sub>

Table 2-24 Video DAC Pins (5)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
LUMA	AO	T11		LUMA: DAC analog output for CVBS or luminance of S-Video	AVD <sub>DA</sub>
AVDDA	P	Y11		AVDDA: Power supply for LUMA output, 3.3 V (IO1:AVD33R, IO2:AVD33G, IO3:AVDD, VDWELL)	-
AVSDA	P	W11		AVSDA: Ground for LUMA output (IO1/IO2: AVS33R, AVS33G, AVSS, VSSUB)	-
REXT	AO	T12		REXT: For external resistor. $REXT(\text{ohm}) = VREFIN(V) * 7.31 / IOFS(A)$	AVD <sub>DA</sub>
COMP	AIO	AA11		COMP: Compensation pin. This pin should be connected with 0.01uf ceramic cap parallel with a 10uf tantalum cap to AVDDAO externally	AVD <sub>DA</sub>

Table 2-25 CPM Pins (4)

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
EXCLK	AI	Y9	2~30 MHz Oscillator, OSC on/off	EXCLK: OSC input or 12MHz clock input	VDDIO
EXCLKO	AO	AA9		EXCLKO: OSC output	VDDIO
VDDPLL	P	AA10		VDDPLL: PLL analog power, 1.2V	-
VSSPLL	P	Y10		VSSPLL: PLL analog ground	-

**Table 2-26 RTC Pins (8, 1 with GPIO input: PA30)<sup>[3]</sup>**

Pin Names	IO	Loc	IO Cell Char.	Pin Description	Power
RTCLK	AI	R1	32768Hz Oscillator	RTCLK: OSC input	VDD <sub>RTC</sub>
RTCLKO	AO	R2		RTCLKO: OSC output or 32768Hz clock input	VDD <sub>RTC</sub>
PWRON	O	N6	2mA	PWRON: Power on/off control of main power	VDD <sub>RTC</sub>
WKUP PA30	I I	P2	Schmitt	WKUP: Wakeup signal after main power down PA30: GPIO group A bit 30, input/interrupt only	VDD <sub>RTC</sub>
PPRST_	I	P1	Schmitt	PPRST_: RTC power on reset and RESET-KEY reset input	VDD <sub>RTC</sub>
VDDRTC	P	P3		VDDRTC: 1.8V power for RTC and hibernating mode controlling that never power down	-
VDDRTC12	P	M5		VDDRTC12: 1.2V power for RTC and hibernating mode controlling that never power down	-
TEST_E	I	N5	Schmitt, pull-down	TEST_E: Manufacture test enable, program readable	VDD <sub>RTC</sub>

**NOTES:**

- 1 The meaning of phases in IO cell characteristics are:
  - a Bi-dir, Single-end: bi-direction and single-ended DDR IO are used.
  - b Output, Single-end: output and single-ended DDR IO are used.
  - c Output, Differential: output and differential signal DDR IO are used.
  - d 2/4/8/12mA out: The IO cell's output driving strength is about 2/4/8/12Ma.
  - e Pull-up: The IO cell contains a pull-up resistor.
  - f Pull-down: The IO cell contains a pull-down resistor.
  - g Pullup-pe: The IO cell contains a pull-up resistor and the pull-up resistor can be enabled or disabled by setting corresponding register.
  - h Pulldown-pe: The IO cell contains a pull-down resistor and the pull-down resistor can be enabled or disabled by setting corresponding register.
  - i Schmitt: The IO cell is Schmitt trig input.
  
- 2 Except following pins, all GPIO shared pins are reset to GPIO input with internal pull-up or pull-down enabled. The following GPIO shared pins are reset to GPIO input with internal pull-up or pull-down disabled:  
 PWM0/PE0, PWM1/PE1, PWM2/PE2, PWM3/PE3, PF4~PF11.
  
- 3 These IO are 5V input tolerance.

## 3 Electrical Specifications

### 3.1 Absolute Maximum Ratings

The absolute maximum ratings for the processors are listed in Table 3-1. Do not exceed these parameters or the part may be damaged permanently. Operation at absolute maximum ratings is not guaranteed.

**Table 3-1 Absolute Maximum Ratings**

Parameter	Min	Max	Unit
Storage Temperature	-65	150	°C
Operation Temperature	-40	125	°C
VDDmem power supplies voltage	-0.5	4.6	V
VDDIO power supplies voltage	-0.5	4.6	V
VDDIO <sub>on</sub> power supplies voltage	-0.5	4.6	V
VDDRTC power supplies voltage	-0.5	4.6	V
VDDRTC12 power supplies voltage	-0.2	2.2	V
AVDOTG power supplies voltage	-0.5	4.6	V
AVDUSB power supplies voltage	-0.5	4.6	V
AVDAD power supplies voltage	-0.5	4.6	V
VPEFUSE power supplies voltage	-0.5	4.6	V
VDDcore power supplies voltage	-0.2	2.2	V
VDDPLL power supplies voltage	-0.5	2.5	V
AVDDA power supplies voltage	-0.5	4.6	V
AVDCDC power supplies voltage	-0.5	4.6	V
AVDHP power supplies voltage	-0.5	4.6	V
AVDBTL power supplies voltage	-0.5	4.6	V
Input voltage to VDDmem supplied non-supply pins	-0.3	4.6	V
Input voltage to VDDIO supplied non-supply pins with 5V tolerance	-0.5	6	V
Input voltage to VDDIO supplied non-supply pins without 5V tolerance	-0.5	4.6	V
Input voltage to VDDIO <sub>on</sub> supplied non-supply pins	-0.5	4.6	V
Input voltage to VDDRTC supplied non-supply pins	-0.5	6	V
Input voltage to AVDOTG supplied non-supply pins	-0.5	5.25	V
Input voltage to AVDUSB supplied non-supply pins	-0.5	6	V
Input voltage to AVDAD supplied non-supply pins	-0.5	6	V
Input voltage to AVDDA supplied non-supply pins	-0.5	4.6	V
Input voltage to AVDCDC supplied non-supply pins	-0.5	4.6	V
Output voltage from VDDmem supplied non-supply pins	-0.5	4.6	V
Output voltage from VDDIO supplied non-supply pins	-0.5	4.6	V
Output voltage from VDDIO <sub>on</sub> supplied non-supply pins	-0.5	4.6	V

Output voltage from VDDRTC supplied non-supply pins	-0.5	4.6	V
Output voltage from AVDOTG supplied non-supply pins	-0.5	4.6	V
Output voltage from AVDUSB supplied non-supply pins	-0.5	4.6	V
Output voltage from AVDAD supplied non-supply pins	-0.5	4.6	V
Output voltage from AVDDA supplied non-supply pins	-0.5	4.6	V
Output voltage from AVDCDC supplied non-supply pins	-0.5	4.6	V
Maximum ESD stress voltage, Human Body Model; Any pin to any supply pin, either polarity, or Any pin to all non-supply pins together, either polarity. Three stresses maximum.		2000	V

### 3.2 Recommended operating conditions

**Table 3-2 Recommended operating conditions for power supplies**

Symbol	Description	Min	Typical	Max	Unit
V <sub>MEM</sub>	VDDmem voltage for SSTL18	1.7	1.8	1.9	V
	VDDmem voltage for SSTL2	2.3	2.5	2.7	V
	VDDmem voltage for LPDDR	1.7	1.8	1.9	V
V <sub>IO</sub>	VDDIO voltage	2.97	3.3	3.63	V
V <sub>ION</sub>	VDDION voltage for 1.8V NAND	1.62	1.8	1.98	V
	VDDION voltage for 2.5V NAND	2.25	2.5	2.75	V
	VDDION voltage for 3.3V NAND	2.97	3.3	3.63	V
V <sub>RTC</sub>	VDDRTC voltage	1.7	1.8	1.9	V
V <sub>RTC12</sub>	VDDRTC12 voltage	1.08	1.2	1.40	V
V <sub>OTG</sub>	AVDOTG voltage	3.07	3.3	3.63	V
V <sub>USB</sub>	AVDUSB voltage	3.0	–	3.6	V
V <sub>ADC</sub>	AVDAD voltage	2.7	3.3	3.6	V
V <sub>EFUSE</sub>	VPEFUSE voltage	2.97	3.3	–	V
V <sub>CORE</sub>	VDDcore voltage	1.08	1.2	1.40	V
V <sub>PLL</sub>	VDDPLL analog voltage	1.08	1.2	1.40	V
V <sub>DAC</sub>	AVDDA voltage	2.97	3.3	3.63	V
V <sub>CDC</sub>	AVDCDC voltage	2.7	–	3.6	V
V <sub>HP</sub>	AVDHP voltage				V
V <sub>BTL</sub>	AVDBTL voltage				V

**Table 3-3 Recommended operating conditions for VDDmem supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
V <sub>I18</sub>	Input voltage for SSTL18/LPDDR signal	0		1.9	V
V <sub>O18</sub>	Output voltage for SSTL18/LPDDR signal	0		1.9	V
V <sub>I25</sub>	Input voltage for SSTL2 signal	0		2.7	V
V <sub>O25</sub>	Output voltage for SSTL2 signal	0		2.7	V
V <sub>REFMEM</sub>	Reference voltage supply for SSTL18/SSTL2	0.49	0.5	0.51	V <sub>MEM</sub>

**Table 3-4 Recommended operating conditions for VDDIO supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
V <sub>IH5</sub>	Input high voltage with 5V tolerance	1.7		5.5	V
V <sub>IL5</sub>	Input low voltage with 5V tolerance	-0.3		0.7	V
V <sub>IH3</sub>	Input high voltage without 5V tolerance	2.0		V <sub>IO</sub> +0.3	V
V <sub>IL3</sub>	Input low voltage without 5V tolerance	-0.3		0.8	V

**Table 3-5 Recommended operating conditions for VDDIO<sub>n</sub> supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
V <sub>IH18</sub>	Input high voltage for 1.8V I/O application	V <sub>ION</sub> * 0.65		V <sub>ION</sub> + 0.3	V
V <sub>IL18</sub>	Input low voltage for 1.8V I/O application	-0.3		V <sub>ION</sub> * 0.35	V
V <sub>IH25</sub>	Input high voltage for 2.5V I/O application	1.7		V <sub>ION</sub> + 0.3	V
V <sub>IL25</sub>	Input low voltage for 2.5V I/O application	-0.3		0.7	V
V <sub>IH33</sub>	Input high voltage for 3.3V I/O application	2.0		V <sub>ION</sub> + 0.3	V
V <sub>IL33</sub>	Input low voltage for 3.3V I/O application	-0.3		0.8	V

**Table 3-6 Recommended operating conditions for VDDR<sub>TC</sub> supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
V <sub>IHRTC</sub>	Input high voltage	V <sub>RTC</sub> * 0.65		V <sub>RTC</sub> + 0.3	V
V <sub>ILRTC</sub>	Input low voltage	-0.3		0.7	V

**Table 3-7 Recommended operating conditions for USB 2.0 OTG pins**

Symbol	Description	Min	Typical	Max	Unit
V <sub>IVBUS</sub>	Input voltage range VBUS	0		5.25	V
V <sub>ID</sub>	Input voltage range for all other pins	0		V <sub>OTG</sub>	V

**Table 3-8 Recommended operating conditions for USB 1.1 host DP/DM pins**

Symbol	Description	Min	Typical	Max	Unit
V <sub>IUSB</sub>	Input voltage range for DP/DM pins	0		V <sub>USB</sub>	V

**Table 3-9 Recommended operating conditions for ADC pins**

Symbol	Description	Min	Typical	Max	Unit
V <sub>I-VBAT_IR</sub>	VBAT_IR input voltage range	0		5.5	V
V <sub>I-VBAT_ER</sub>	VBAT_ER input voltage range	0		2.5	V
V <sub>IADC</sub>	AUX0/AUX1/XM/XP/YM/YP input voltage range	0		V <sub>ADC</sub>	V

**Table 3-10 Recommended operating conditions for AVDCDC supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
V <sub>ILH-CDC</sub>	Input voltage range	0		V <sub>CDC</sub>	V

**Table 3-11 Recommended operating conditions for others**

<b>Symbol</b>	<b>Description</b>	<b>Min</b>	<b>Typical</b>	<b>Max</b>	<b>Unit</b>
T <sub>A</sub>	Ambient temperature	0		85	°C



### 3.3 DC Specifications

The DC characteristics for each pin include input-sense levels and output-drive levels and currents. These parameters can be used to determine maximum DC loading, and also to determine maximum transition times for a given load. All DC specification values are valid for the entire temperature range of the device.

**Table 3-12 DC characteristics for VDDmem supplied pins in LVTTTL application**

Symbol	Parameter	Min	Typical	Max	Unit	
$V_T$	Threshold point	1.52	1.66	1.83	V	
$V_{T+}$	Schmitt trig low to high threshold point	1.75	1.90	2.08	V	
$V_{T-}$	Schmitt trig high to low threshold point	1.25	1.37	1.52	V	
$I_L$	Input Leakage Current			$\pm 10$	$\mu A$	
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 10$	$\mu A$	
$R_{PU}$	Pull-up Resistor	35	50	70	k $\Omega$	
$R_{PD}$	Pull-down Resistor	68	140	230	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=12, 16, 24, 30mA$			0.4	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=12, 16, 24, 30mA$	2.4			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.4V$ for cells of	12mA	13.2	20.5	27.3	mA
		16mA	17.6	27.3	36.5	mA
		24mA	24.3	37.7	50.2	mA
		30mA	30.8	47.8	63.8	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = 2.4V$ for cells of	12mA	17.9	36.5	60.3	mA
		16mA	23.9	48.6	80.3	mA
		24mA	32.9	66.9	110.5	mA
		30mA	41.8	85.1	140.6	mA

**Table 3-13 DC characteristics for VDDIO supplied pins with 5V tolerance**

Symbol	Parameter	Min	Typical	Max	Unit	
$V_T$	Threshold point	1.30	1.41	1.53	V	
$V_{T+}$	Schmitt trig low to high threshold point	1.53	1.64	1.73	V	
$V_{T-}$	Schmitt trig high to low threshold point	0.95	1.02	1.09	V	
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$	
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$	
$R_{PU}$	Pull-up Resistor	62	77	112	k $\Omega$	
$R_{PD}$	Pull-down Resistor	48	85	174	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=2, 4mA$			0.4	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=2, 4mA$	2.4			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.4V$ for cells of	2mA	2.2	3.5	4.2	mA
		4mA	4.4	6.9	8.4	mA
$I_{OH-IO}$	High level output current	2mA	2.8	5.8	9.2	mA

	@ $V_{OH-IO} = 2.4V$ for cells of	4mA	5.5	11.6	18.3	mA
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Table 3-14 DC characteristics for VDDIO supplied pins without 5V tolerance

Symbol	Parameter	Min	Typical	Max	Unit	
$V_T$	Threshold point	1.30	1.41	1.53	V	
$V_{T+}$	Schmitt trig low to high threshold point	1.54	1.65	1.74	V	
$V_{T-}$	Schmitt trig high to low threshold point	0.95	1.02	1.09	V	
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$	
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$	
$R_{PU}$	Pull-up Resistor	62	77	112	k $\Omega$	
$R_{PD}$	Pull-down Resistor	58	81	156	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=2, 4, 8, 12mA$			0.4	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=2, 4, 8, 12mA$	2.4			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.4V$ for cells of	2mA	2.1	3.3	4.1	mA
		4mA	4.2	6.6	8.1	mA
		8mA	8.4	13.3	16.3	mA
		12mA	12.6	19.9	24.4	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = 2.4V$ for cells of	2mA	2.4	4.8	7.5	mA
		4mA	4.7	9.6	14.9	mA
		8mA	9.4	19.2	29.9	mA
		12mA	14.2	28.9	44.8	mA

Table 3-15 DC characteristics for VDDIO supplied pins for 1.8V I/O application

Symbol	Parameter	Min	Typical	Max	Unit	
$V_T$	Threshold point	0.76	0.82	0.87	V	
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$	
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$	
$R_{PU}$	Pull-up Resistor	123	174	276	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=2, 4mA$			0.45	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=2, 4mA$	$V_{IO} - 0.45$			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.45V$ for cells of	2mA	1.0	1.8	2.6	mA
		4mA	2.0	3.7	5.3	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = VDD_{IO} - 0.45V$ for cells of	2mA	0.9	1.5	2.1	mA
		4mA	1.8	3.0	4.2	mA

Table 3-16 DC characteristics for VDDIO supplied pins for 2.5V I/O application

Symbol	Parameter	Min	Typical	Max	Unit
$V_T$	Threshold point	1.01	1.08	1.17	V
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$

$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$	
$R_{PU}$	Pull-up Resistor	74	105	177	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=2, 4mA$			0.5	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=2, 4mA$	1.8			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.5V$ for cells of	2mA	1.7	3.1	4.1	mA
		4mA	3.5	6.0	8.0	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = 1.8V$ for cells of	2mA	1.4	3.1	5.2	mA
		4mA	2.8	6.2	10.4	mA

**Table 3-17 DC characteristics for VDDIO<sub>n</sub> supplied pins for 3.3V I/O application**

Symbol	Parameter	Min	Typical	Max	Unit	
$V_T$	Threshold point	1.30	1.41	1.53	V	
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$	
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$	
$R_{PU}$	Pull-up Resistor	62	77	112	k $\Omega$	
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO}=2, 4mA$			0.4	V	
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO}=2, 4mA$	2.4			V	
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.4V$ for cells of	2mA	2.1	3.3	4.1	mA
		4mA	4.2	6.6	8.1	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = 2.4V$ for cells of	2mA	2.4	4.8	7.5	mA
		4mA	4.7	9.6	14.9	mA

**Table 3-18 DC characteristics for VDDRTC<sub>n</sub> supplied pins**

Symbol	Parameter	Min	Typical	Max	Unit
$V_T$	Threshold point	0.76	0.82	0.87	V
$V_{T+}$	Schmitt trig low to high threshold point	0.94	1.04	1.08	V
$V_{T-}$	Schmitt trig high to low threshold point	0.55	0.59	0.62	V
$I_L$	Input Leakage Current			$\pm 1$	$\mu A$
$I_{OZ-IO}$	Tri-State output leakage current			$\pm 1$	$\mu A$
$R_{PD}$	Pull-down Resistor	126	202	416	k $\Omega$
$V_{OL-IO}$	Output low voltage @ $I_{OL-IO} = 2, 4mA$			0.4	V
$V_{OH-IO}$	Output high voltage @ $I_{OH-IO} = 2, 4mA$	2.4			V
$I_{OL-IO}$	Low level output current @ $V_{OL-IO} = 0.45V$	1.0	1.9	2.6	mA
$I_{OH-IO}$	High level output current @ $V_{OH-IO} = VDDRTC - 0.45V$	1.0	1.8	2.5	mA

Table 3-19 DC characteristics for AVDUSB supplied pins

Symbol	Description	Min	Typical	Max	Unit
$V_{O-USB}$	Output voltage range	0		$V_{USB}$	V
$V_{DIS}$	Differential input sensitivity	0.2			V
$V_{CM}$	Differential common mode range	0.8		2.5	V
$V_{SE}$	Single ended receiver threshold	0.8		2.0	V
$I_{OZ-USB}$	Tri-State leakage current			$\pm 10$	$\mu A$
$Z_{DRV}$	Driver output resistance, including damping resistor	24		44	$\Omega$
$V_{OL-USB}$	Static output low voltage			0.3	V
$V_{OH-USB}$	Static output high voltage	2.8			V

### 3.4 Power On, Reset and BOOT

#### 3.4.1 Power-On Timing

The external voltage regulator and other power-on devices must provide the JZ4760 processor with a specific sequence of power and resets to ensure proper operation. Figure 3-1 shows this sequence and Table 3-20 gives the timing parameters. Following are the name of the power.

- VDDRTC
- VDDRTC12
- AVDAUD: AVDCDC, AVDHP
- VDD33: all other digital 3.3V or DDR power supplies, include VDDMEM, VDDIO, VDDION
- AVD33: all other analog 3.3V power supplies, include AVDAD, AVDDA, AVDOTG, AVDUSB, AVDBTL
- VDD12: all 1.2V power supplies, include VDDCORE, VDDPLL
- VPEFUSE

**Table 3-20 Power-On Timing Parameters**

Symbol	Parameter	Min	Max	Unit
$t_{R\_VDDRTC}$	VDDRTC rise time <sup>[1]</sup>	0	5	ms
$t_{R\_VDDRTC12}$	VDDRTC12 rise time <sup>[1]</sup>	0	5	ms
$t_{D\_RTC-12}$	Delay between VDDRTC arriving 50% (or 90%) to VDDRTC12 arriving 50% (or 90%)	0	1	ms
$t_{R\_VDD33}$	VDD33 rise time <sup>[1]</sup>	0	5	ms
$t_{D\_VDD33}$	Delay between VDDRTC arriving 50% (or 90%) to VDD33 arriving 50% (or 90%)	0	–	ms
$t_{R\_VDD12}$	VDD12 rise time <sup>[1]</sup>	0	5	ms
$t_{D\_33-12}$	Delay between VDD33 arriving 50% (or 90%) to VDD12 arriving 50% (or 90%)	0	1	ms
$t_{R\_AVDAUD}$	AVDAUD rise time <sup>[1]</sup>	0	5	ms
$t_{D\_AVDAUD}$	Delay between VDD12 arriving 50% (or 90%) to AVDAUD arriving 50% (or 90%)	0.01	1	ms
$t_{R\_AVD33}$	AVD33 rise time <sup>[1]</sup>	0	5	ms
$t_{D\_AVDA33}$	Delay between VDD33 arriving 50% to AVD33 arriving 50%	-1	1	ms
$t_{D\_PPRST\_}$	Delay between VDDAUD stable and PPRST_ deasserted	0	–	ms <sup>[2]</sup>
$t_{D\_VPEFUSE}$	Delay between PPRST_ finished and E-fuse programming power apply	0	–	ms

#### NOTES:

- 1 The power rise time is defined as 10% to 90%.
- 2 The PPRST\_ must be kept at least 100us. After PPRST\_ is deasserted, the corresponding chip reset will be extended at least 40ms.

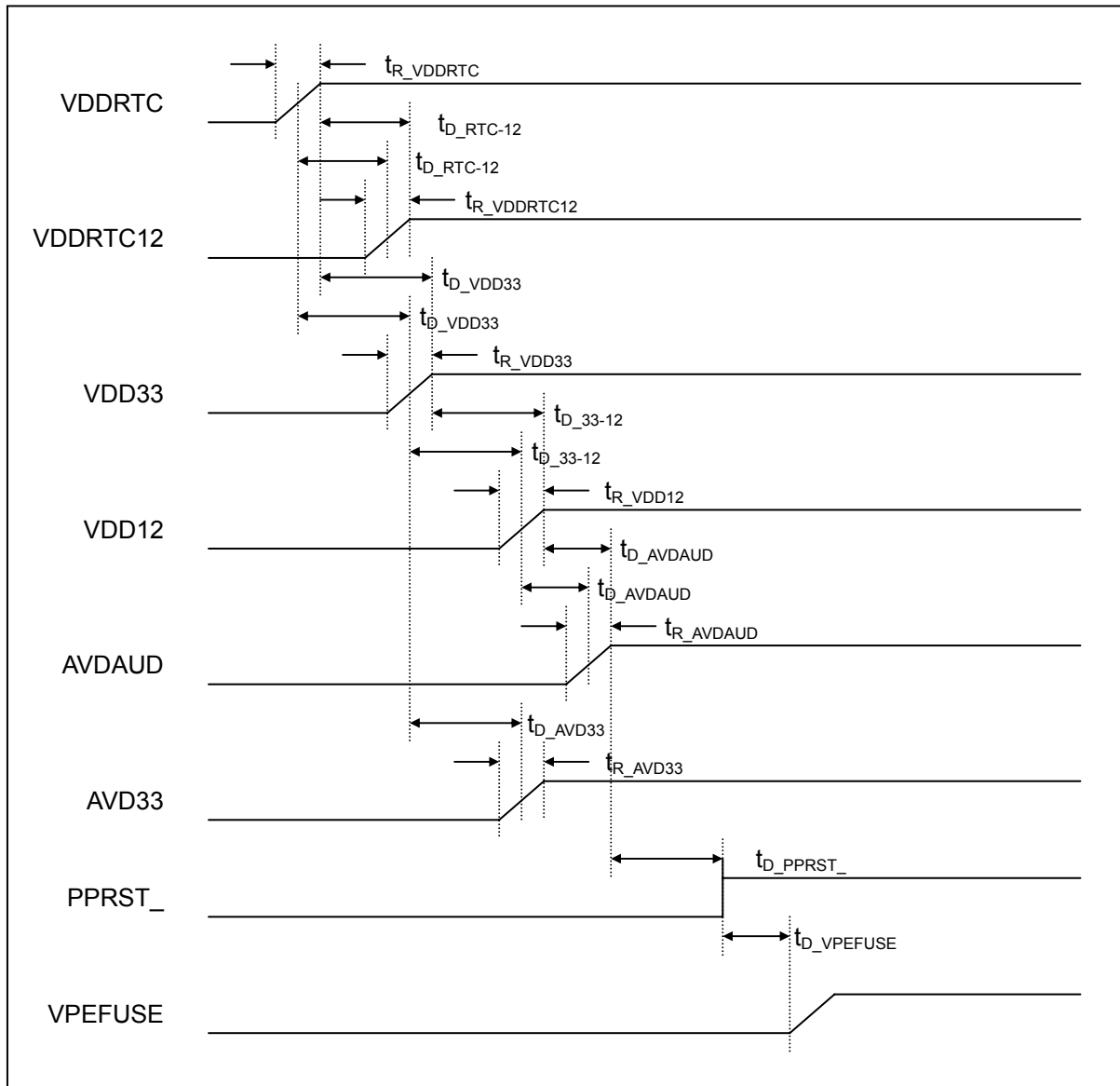


Figure 3-1 Power-On Timing Diagram

### 3.4.2 Reset procedure

There 3 reset sources: 1 PPRST\_ pin reset; 2 WDT timeout reset; and 3 hibernating reset when exiting hibernating mode. After reset, program start from boot.

#### 1 PPRST\_ pin reset.

This reset is triggered when PPRST\_ pin is put to logic 0. It happens in power on RTC power and RESET-KEY pressed to reset the chip from unknown dead state. The reset end time is about 1M EXCLK cycles after rising edge of PPRST\_.

#### 2 WDT reset.

This reset happens in case of WDT timeout. The reset keeps for about a few RTCLK cycles.

### 3 Hibernating reset.

This reset happens in case of wakeup the main power from power down. The reset keeps for about 1ms ~ 125ms programable, plus 1M EXCLK cycles, start after WKUP\_ signal is recognized.

After reset, all GPIO shared pins are put to GPIO input function and most of their internal pull-up/down resistor are set to on, see “0 Pin<sup>Description[1][2]</sup>” for details. The PWRON is output 1. The oscillators are on. The USB 2.0 OTG PHY and USB 1.1 PHY, the audio CODEC DAC/ADC, the SAR-ADCs and the video DAC are put in suspend mode.

### 3.4.3 BOOT

JZ4760 supports 5 different boot sources depending on BOOT\_SEL0, BOOT\_SEL1 and BOOT\_SEL2 pins values. Table 3-21 lists them.

**Table 3-21 Boot from 3 boot sources**

BOOT_SEL2	BOOT_SEL1	BOOT_SEL0	Boot From
1	1	1	NAND flash at CS1
1	0	0	SD card: MSC0
1	0	1	SPI: SPI0/CE0
0	1	1	NOR flash at CS4
1	1	0	USB2.0 OTG as device with EXCLK = 12MHz
0	0	0	USB2.0 OTG as device with EXCLK = 13MHz
0	0	1	USB2.0 OTG as device with EXCLK = 26MHz
0	1	0	USB2.0 OTG as device with EXCLK = 19.2MHz

The boot procedure is showed in the following flow chart:

- In case of NAND/SDcard/SPI boot, if it fails, enter USB-12MHz boot.
- In case of USB boot, if it cannot connect to USB host within 10 seconds, restart the boot procedure.
- In case of NOR boot, if it fails, restart the boot procedure.
- If the boot procedure has been repeated more than 10 times, enter hibernating mode.

