Ingenic® RD4750_APUS Reference Design

Hardware Manual

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Release history

Date	Revision	Change
Nov. 2008	1.0	First release
Mar. 2009	1.1.2	1. Modified D4 indicates that +3.3V power is normal. 2. Remove about LED D7 indicates the “NO BAT” status. 3. Modified FM antenna’s path, changed to virtual GND.
Sep. 2009	1.2	1. Change Jz4750 package.

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Content

1 Overview

JZ4750 is a multimedia application processor, which has a very high performance and low power 32-bit RISC engine. JZ4750 integrates various peripherals for embedded application, such as memory controller, USB1.1 host and USB2.0 device interface, On-chip audio CODEC, multi-channel SAR-ADC, , LCD controller, CMOS sensor interface, MMC/SD controller, SSI interface, I2C interface, Camera interface, TS interface, TV OUT, UART, IrDA, 1-wire, GPIO, and so on.

The RD4750_APUS is a reference design with JZ4750 addressing to consumer electronic equipment that help engineer to quickly develop their own products in hardware and software. This design also provides flexible interface to extend other module.

With this reference design, there have richness development package include supporting Linux™ and RTOS.

1.1 Functions of RD4750_APUS

- High-performance processor JZ4750 running up to 384MHZ supports Linux and MINIOS.
- SDRAM: HY57V561620x2 ， 64MB. Can be extended to 128MB.
- FLASH: NOR FLASH S29GL064M(16Bit); SPI FLASH S25FL064(optional); NAND FLASH extended card, K9GAG08(MLC),support up to two dual chips with 2-CS signal or one chip with 4-CS signal.
- LCD: 480X272　4.3inch TFT with touch panel。
- Multimedia: Support every multimedia software De/Encoder FM Module can receive FM radio; Video can support CVBS and S-video output.
- 8 keys can provide sound-button and soft power on/off, reset, etc.
- USB1.1 Host / USB2.0 Device interface.
- TS interface: can extend DTV module.
- 4-UART: support GPS+GSM module extension.
- Camera interface, compatible 8-bit ITU656 camera.
- MMC/SD extend interface.
- Backlight control with PWM.
- Advanced power manager: Lithium-Ion battery charge; support RTC alarm and power up; very low power consumption: less than 200MA in normal condition; battery charging status indicator, and battery voltage monitor.

1.2 RD4750_APUS System Architecture

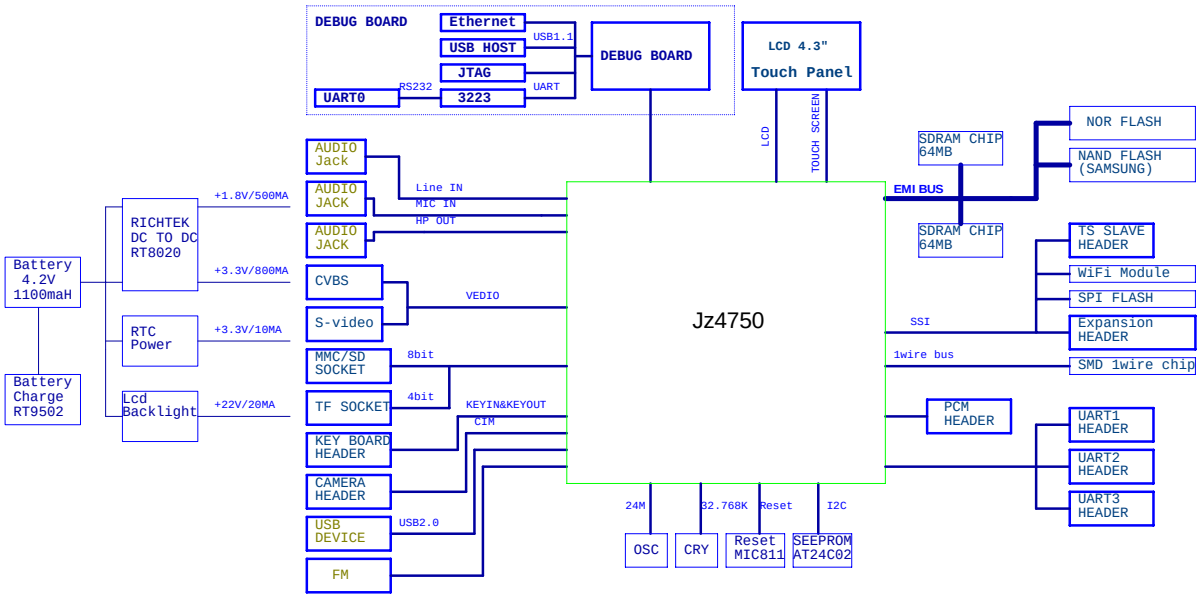

Figure 1-1 RD4750_APUS System Architecture

2 Hardware Description

In this section, will describe every hardware module of this design, please refer to the user's manual of JZ4750 first. For the other components, please refer to relative datasheet. For the details of the design, please refer to the schematic design.

2.1 RD4750_APUS Layout

Figure 2-1shows the layout of main components and connectors.

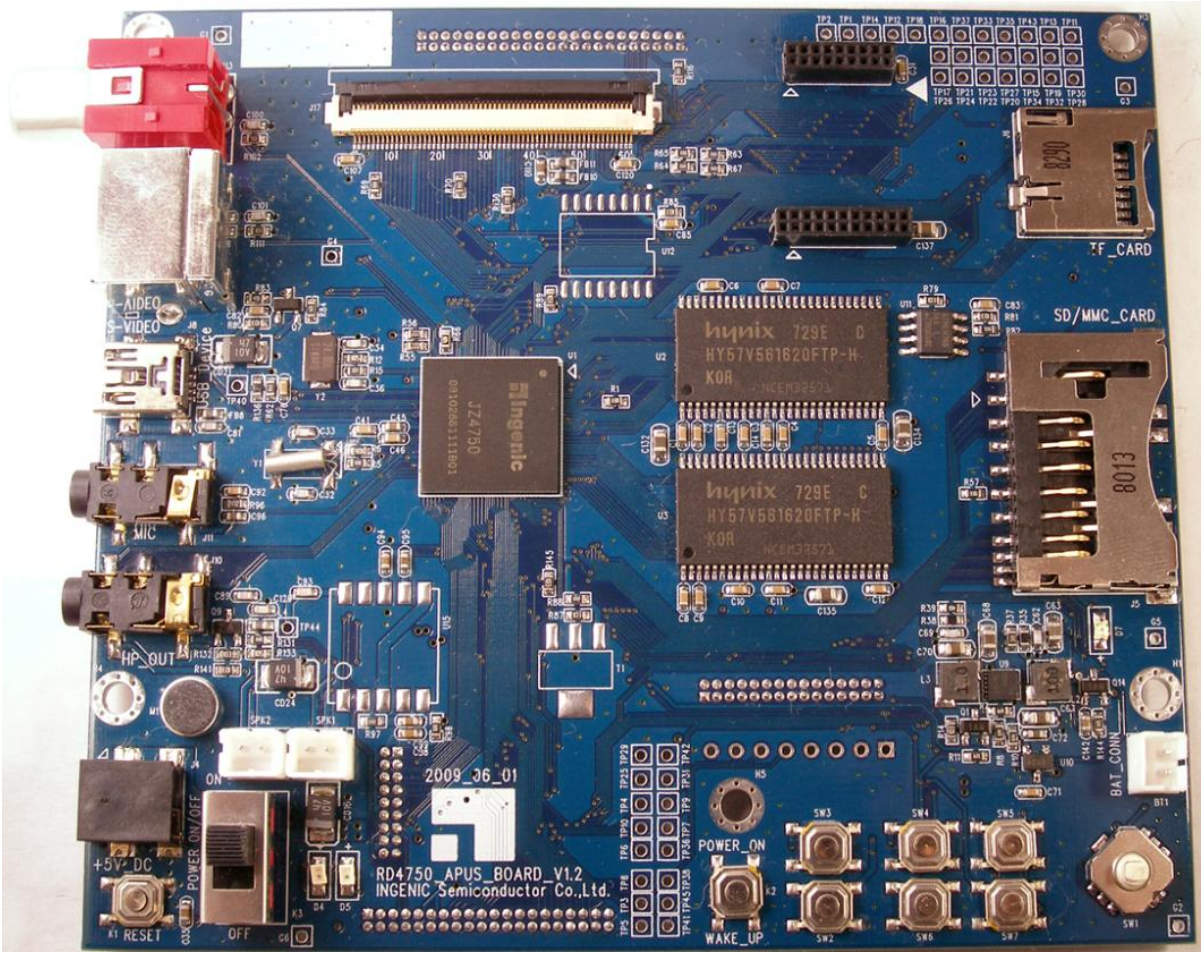

Figure 2-1 RD4750_APUS Layout

2.2 Power

The RD4750_APUS board is powered by 3.7V Lithium-Ion battery, via header BT1. The button K2 is power on/off switch. Either adaptor, USB or Battery supply for the board the first, system can power on. As the system is running, long push K2 will assert an interrupt to CPU, and then the hardware in IC can set PW_ON_N port 1 to power off the board after associated processing. And when long push K2 again will power on the board and the CPU should output 0 on PW_ON_N port

in order to turn on the power.

The main power chip is U9-RT8020, +3.3V, and +1.8V power supply. The LED D4 indicates that +3.3V power is normal.

U6 – XC6206 provides +3.3V power for RTC.

J2 is the external power supply jack, should connect with 5V 2A DC power adapter, together for battery charge. LED D7 indicates the charge status that light when charging, and inform to CPU. The charge current is 500mA.

This board also can be powered with USB device port when connect to PC, and charge the battery together. PW_ON_N status can adjust the charge circuit that is different in power on (500mA) and off (100mA) status.

2.3 System Reset

RC circuit can provide the hardware system reset signal to all components when power on. K1 is the manual reset button.

2.4 System boot mode

RD4750_APUS has four modes of boot start:

- USB
- Nand Flash (default)
- SPI or NOR Flash
- SD/MMC

Table 2-1 describes the setting of boot start:

Table 2-1 BOOT SETUP

Hold Push Key	Boot status
SW7	SPI or NOR Flash Boot
None	Nand Flash Boot （Power on Default）
SW6	USB Boot
SW6+SW7	SD card Boot

For details about boot select setting, please refer to the Jz4750 Hardware Manual.

2.5 SDRAM

This board has 64MB SDRAM, consist of two chips – U2 and U3, 4Banks X 4M X 16Bit. The memory can be extended to 128MB through using another two chips – U4 and U5.

2.6 NAND extended card

J2-J3 is the NANDFlash extended slot, can support up to two dual chips with 2 CS signal or one chip with 4 CS signal.

2.7 LCD interface and Expansion card

2.7.1 LCD interface definition

J17 is the LCD interface, which can directly connect to LCD Expansion card. Table 2-1 lists the signals definition of J17.

Table 2-2 LCD Interface（J17）Signals Definition

Pin Number	Signal	Pin Number	Signal
1	GND	2	GND
3	+3.3V	4	+3.3V
5	GND	6	LCD_D_R0
7	LCD_CLS	8	LCD_D12
9	LCD_D13	10	LCD_D14
11	LCD_D15	12	LCD_D16
13	LCD_D16	14	GND
15	LCD_SPL	16	LCD_PS
17	LCD_D6	18	LCD_D7
19	LCD_D8	20	LCD_D9
21	LCD_D10	22	LCD_D11
23	GND	24	LCD_D_B0
25	LCD_REV	26	LCD_D0
27	LCD_D1	28	LCD_D2
29	LCD_D3	30	LCD_D4
31	LCD_D5	32	GND
33	LCD_D_PCLK	34	GND
35	LCD_HSYNC	36	LCD_VSYNC
37	LCD_DE	38	GND
39	VDD_TP	40	XP
41	YN	42	XN

43	YP	44	VSS_TP
45	GND	46	I2C_SDA
47	I2C_SCK	48	GND
49	SSI1_DT	50	SSI1_CLK
51	SSI1_CE0_N	52	GND
53	LCD_DISP_N	54	LCD_RESET_N
55	LCD_INT	56	PWM4/BL_EN_N
57	BAT-V	58	BAT-V
59	GND	60	GND

There have some special control signals for some LCD panel: 1-LCD_SPL; 2-LCD_CLS; 3-LCD_PS; 4-LCD_REV. For details please refer to JZ4750 User's Manual

2.7.2 LCD Expansion card

RD4750_APUS_LCD_Board_V1.3 is the LCD expansion card. J1 is the connector of expansion board and mother board. J2 is LCD slot which connected AUO043/INNOLUX043 LCD panel default.

2.8 USB Interface

There have one USB 1.1 host port on debug board, one MiniUSB device port on main board (J8) furthermore.

2.9 Audio System

JZ4750 provides an internal CODEC that is I2S/AC97 audio CODEC with 24 bits DAC and 24 bits ADC. The audio system of this design makes use of the internal CODEC to implement the input and output of audio. It consists of MIC-in jack J11, headphone jack J10, FM module U15 (optional), an amplifier for external speaker connecting to the header SPK1 and SPK2. When plug a headphone in J10, the amplifier will be off.

J9 is a 4-pin synchronized I2S interface with PCM form, 8/16 bit data, used for connects with blue tooth module.

2.10 Video out

The JZ4750 includes dual 10-bit Video digital to analog converter (DAC) that can produce standard analog signal TV output with color demodulation of NTSC or PAL. J14 supports composite Video output (CVBS); J13 supports Y/C Video output (S-video).

2.11 Keypad Interface

There have six keys reserved for extending accessorial application by software control

2.12 MMC/SD TF card

J5 is the MMC/SD card socket for extension memory, supports MMC or SD card. J6 is the TF card socket.

2.13 Debug Board Interface

In order to make the system debugging facility, there has a debug board –PAVO_DEBUG, connecting to the main board through head J1 and J7. It provides JTAG port, UART port (DB9, RS-232) , and Ethernet port (RJ45) .

2.14 System Status LED

There have three LEDs for system status indicator:

- LED D4 indicates the +3.3V power status.
- LED D5 indicates system reset status.
- LED D7 indicates the charge status that light when charging.

2.15 FM Module

There has FM Module on board which can receive FM radio signal and play back though internal Codec.

2.16 OWI bus

On the RD4750_APUS board provides T1: DS2401 (optional), the 48-bit series number chip, compatible with the 1-wire protocol.

2.17 TS interface

J12 is TS interface, can support PID filtering

2.18 SPI interface

The high speed SPI interface supports 54MHz, 17Bit serial data, J2 is SPI connection.

Table 2-3 TS interface (J2) Signals Definition

Pin Number	Signal	Pin Number	Signal
1	GND	2	VCC1.8V
3	RESET_N(global)	4	VCC1.8V
5	NC	6	NC
7	I2C_SCK	8	VCC3.3V
9	I2C_SDA	10	VCC1.2V
11	GND	12	VCC3.3V
13	VCC3.3V	14	GND
15	SSI0_DT	16	SSI0_CLK
17	SSI0_CE1_N	18	SSI0_DR
19	GND	20	NC
21	NC	22	NC
23	NC	24	NC
25	NC	26	TS_INT0
27	NC	28	TS_INT1
29	TSFAIL	30	TSCLK
31	TSSTR	32	TSFRM
33	SD15	34	SD14
35	SD13	36	SD12
37	SD11	38	SD10
39	SD9	40	SD8

2.19 CIM interface

J16 is camera interface, which can support CCIR656 data format.

Table 2-4 CIM interface (J16) Signals Definition

Pin Number	Signal	Pin Number	Signal
1	CIM_D0	2	CIM_D1
3	CIM_D2	4	CIM_D3
5	CIM_D4	6	CIM_D5
7	CIM_D6	8	CIM_D7
9	CIM_VSYNC	10	CIM_HSYNC
11	CIM_MCLK	12	CIM_PCLK

13	I2C_SCK	14	I2C_SDA
15	VCC3.3V	16	GND
17	CIM_RST_N	18	CIM_PD_N

3 Quick start RD4750_APUS

When you get the RD4750_APUS board, it has been initialized with U-Boot, Linux kernel and file system on the main board. Before power on the board, you should do the following step:

- Connecting the debug board;
- Connecting serial port – UART to a host PC as console，the configuration is 57600-8N1;
- Connecting to your LAN;
- Connecting a battery to BT1, or use external DC power (5V, 2A)

Keys introduction：

- K2: system power on/off and wakeup manual. Long pushing it will switch on the board, long pushing will switch off then. When in sleep mode, long pushing it will wake up the system.
- K1：system reset manual.

Start Linux system (default):
After power on the board, there will be output on the console via serial port and LCD panel. After a moment, the demo application will be launched, letting you into a rich and colorful multimedia world.

Note: It is same as with Linux system to start the board which programmed with WINCE system. After power on the board, there will be output on the console via serial port and LCD panel. After a moment, the WINCE application will be launched.

4 Appendix: GPIO Definition

Pin Number	Default Port Name	Name for Real Size	Direction	Active	Function
D17	SD7	AMP_EN_N	Input	Low	Headphone Jack plug-in detect & Audio Amplifier Power down control
M9	SSI0_GPC	KEY_INT	Input	High	Navigation switch ADC trigger INT
F4	SSI1_CE1_	LCD_VCC_EN	Output	High	LCD panel power supply control
N14	PWM2 SCLK_RSTN	LCD_INT/ SCLK_RSTN	Output	High	LCD panel Interrupt
M14	PWM3 BCLK	LCD_REST_N / BCLK	Output	Low	LCD reset
M15	PWM4 SYNC	PWM4/BL_EN_N/ SYNC	Output	Low	LCD backlight bright trimming
M16	PWM5 OWI	LCD_DISP_N/ OWI	Output	Low	LCD panel internal power enable 1-wire bus
R3	UART1_RxD	CIM_RST_N	Output	Low	Camera reset
R2	UART1_TxD	CIM_PD_N	Output	Low	Camera power control
D16	SD6	EXT_INT	Output	High	peripheral equipment reset
D17	PA17	AMP_EN_N	Output	Low	Speaker power amplifier enable
J13	SD8 TSDI0	DC_DETE_N	Input	Low	DC-adapter plug-in detection
M12	SDATO UART2_TxD	SDATO / TS_INT0	Input	High	TS Interface Interrupt 0
M11	SDATI UART2_RxD	SDATI / TS_INT1	Input	High	TS Interface Interrupt 1
H17	SD9 TSDI1	CHARG_DET_N	Input	Low	Battery Charge state indicate
H16	SD10 TSDI2	SD0_VCC_EN_N	Output	Low	SD card power control
H15	SD11 TSDI3	SD0_CD_N	Input	Low	SD card plug-in detection
H14	SD12 TSDI4	SD0_WP_N	Input	Low	SD card write protection
H13	SD13 TSDI5	SD1_VCC_EN_N	Output	Low	TF card power control