Ingenic® RD4760_LEPUS Development Board

Hardware Manual

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Ingenic RD4760_LEPUS Development Board

Hardware Manual

Release history

Date	Revision	Change
2010.7	1.1	First release
2010.7	1.2	1、Adjust JZ4760 package, support CVBS only
		2、Delete VGA circuit and adjust CVBS circuit
		3、Add insert detection circuit
		4、Adjust five direction key circuit
2010.12	1.3	1、Adjust Ethernet address line
2013.9	1.4	1、Change the company address and etc

Disclaimer

Content

1   Overview

    JZ4760 is a multimedia application processor, which has a very high performance and low power 32-bit RISC engine. JZ4760 integrates various peripherals for embedded application, such as memory controller, USB1.1 host and USB OTG 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 RD4760_LEPUS is a reference design with JZ4760 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 Android(default), Linux, WinCE and MiniOS.

1.1   Functions of RD4760_LEPUS

- CPU: 600MHZ supports Android(default), Linux and MiniOS.
- DDR2 SDRAM: H5PS1G63EFRx2, 256MB.
- FLASH: NAND FLASH extended card, K9GAG08 (MLC),support up to two dual chips
  with 2-CS signal or one chip with 4-CS signal, SPI FLASH S25FL064(optional).
- LCD: 800x480 5.0inch TFT with touch panel and support EPD panel.
- Multimedia: Support every multimedia software De/Encoder. Video can support CVBS output.
- FM module(option).
- 8 keys can provide soft power on/off and extended application etc.
- USB1.1 Host / USB OTG interface.
- TS interface: High speed SPI interface can extend DTV module.
- UART: 2-wire RS232, GPS+GSM module extension.
- Camera interface: Compatible 8-bit ITU656 camera.
- MMC/SD TF extended interface can support SDIO interface.
- Backlight control with PWM.
- Advanced power manager: Lithium battery charge; support RTC alarm and power up; very low power consumption; battery charging status indicator and battery voltage monitor.

1.2 RD4760_LEPUS System Architecture
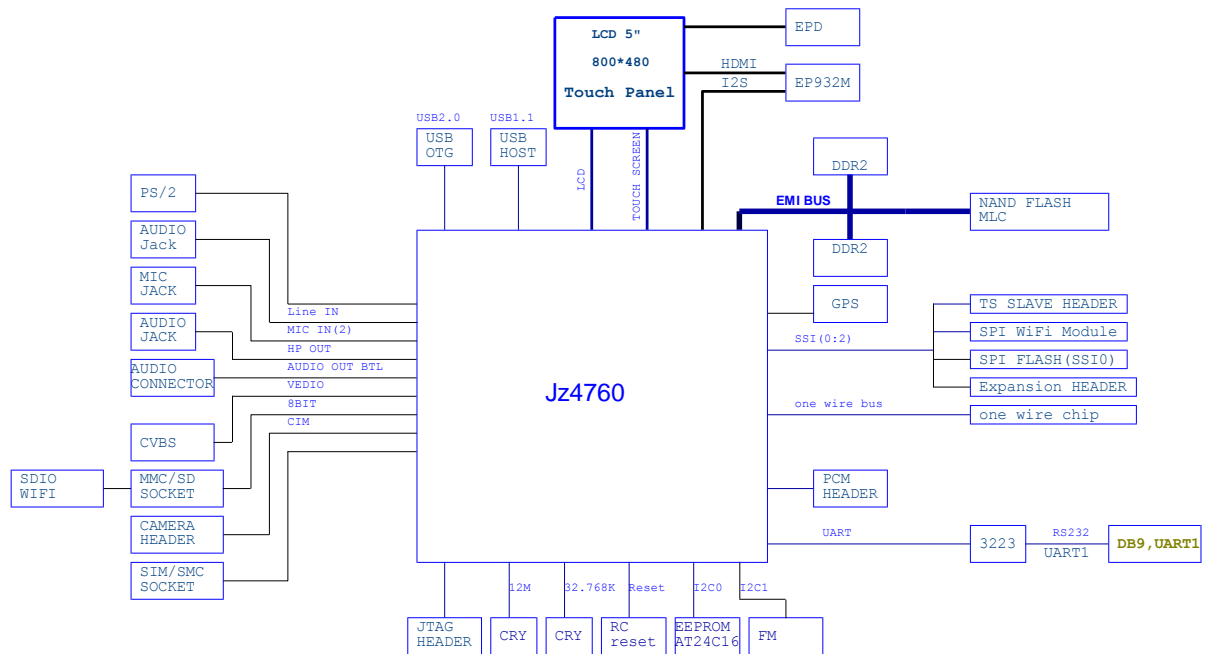
Figure 1-1 RD4760_LEPUS System Architecture

2 Hardware Description

In this section, we describe every hardware module of the board. Please refer to the user's guide of JZ4760 first. For the other components, please refer to relative datasheet. For the details of the board, please refer to RD4760_LEPUS schematic design.

2.1 RD4760_LEPUS board picture

Figure 2-1shows the picture of the main components and connectors.
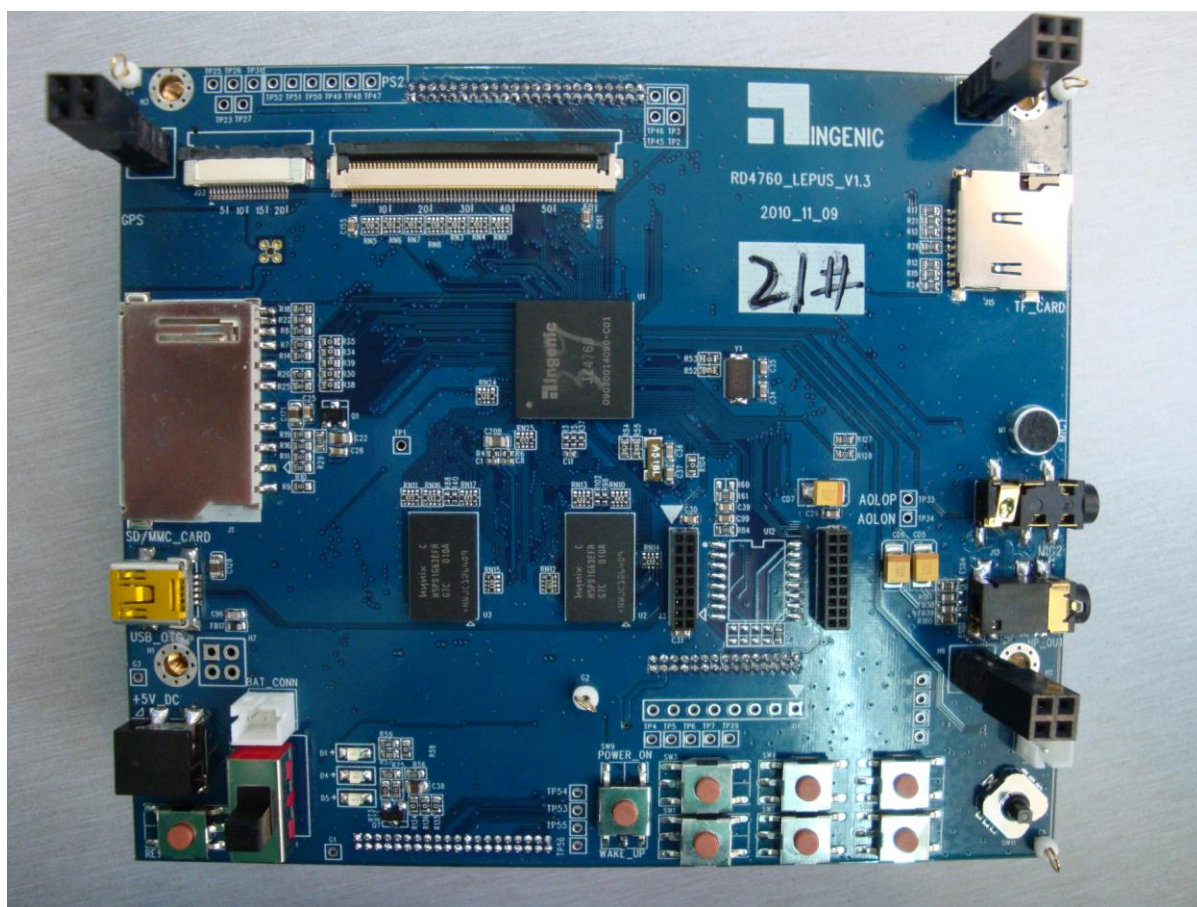
Figure 2-1 RD4760_LEPUS board

2.2 Power

The RD4760_LEPUS board is powered by 5V adapter or USB. K1 is power on/off switch. SW9 is hibernate/wakeup key. It also can be powered by Lithium Battery.

When power is on and system is running, push SW9 for several secends. It will assert an interrupt to CPU, and CPU will set PW_ON low to power off the board. When long push SW9 again PW_ON is high and power is on (software on/off).

The main power chip-U7, U8, U10 (RT8008) which is Buck Step-down can support +3.3V,

3

+1.8V and +1.2V. LED-D4 indicates +3.3V power. U9 (S1206B) and U11 (RT9169) is RTC power that support +1.8V and +1.2V.

J7 is external power supply jack. It should be connected with 5V-2A DC adapter that power system and charge up battery. Adapter charge current can be programmed up to 1A. LED D5 indicates the charge status when charging. CPU can realize charge state across CHARGE_STATE pin.

This board also can be powered and charged the battery by USB. Charge current is 500mA or 100mA . But should prevent over current. The PRI is adaptor, USB port and Li battery.

2.3 System Reset

When power on, RC circuit can provide system reset signal to CPU, extended card and debug card. SW10 is the manual reset button.

2.4 System boot mode

RD4760_LEPUS has four boot modes:

- USB
- Nand Flash (default)
- SPI Flash
- SD/MMC (MSC0)

Remove R30, R34, R35 and connect R89, R90, R147 when boot from SD/MMC card.

Connect R171, R172, R173 when boot from SPI Flash.

Table 2-1 describes the setting of boot start:

Table 2-1   BOOT SETUP

Hold Push Key	Boot status
SW7	SPI Boot
None	Nand Boot （Power on Default）
SW8	USB Boot
SW7+SW8	SD/MMC card Boot

2.5 SYSTEM MEMORY(DDR2 SDRAM)

RD4760_LEPUS has two chips, 32bit bus width, 8Banks X 64M X 1GBit, 256MByte DDR2 SDRAM.

2.6 NAND extended card

J2, J3 are NAND Flash extended slot, which can support up to two chips, dual chip select nand flash or one chip, four chip select nand flash.

2.7 LCD interface and Expansion card

2.7.1 LCD interface definition

J20 is the LCD interface, which can directly connect to LCD Expansion card. RD4760_LEPUS can support serial/parallel interface(ITU656/601), 18/24bit RGB TFT panel; delta RGB TFT panel; smart LCD and STN panel. It also contains I2C and SPI interface for suitable use.

Table 2-2 LCD Interface（J20）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 are some special signals: 1-LCD_SPL; 2-LCD_CLS; 3-LCD_PS; 4-LCD_REV. For details please refer to JZ4760 datasheet.

LEPUS Development Board for JZ4760, Revision 1.4

2.7.2   LCD Expansion card

RD4760_LEPUS_LCD_BOARD_V1.1 is the LCD expansion card. J1 is the connector with 60 pin FPC to motherboard. J2 is LCD slot which connected KD50G9-40NM LCD panel default.

Backlight circuit is RT9293 (U1).Please attend drive current when use other LCD panel(refer to RT9293 datasheet). Adjust R2 can get suitable drive current. Backlight of LCD panel can be adjusted by software of PWM.

2.8   USB Interface

RD4760_LEPUS support USB OTG. There are one MiniAB USB port on main board (J8). It contains insert detect circuit. A USB 1.1 host port is on debug board, which can support 500mA current.

2.9   Audio System

2.9.1   Headphone

JZ4760 provides an internal I2S/AC97 audio CODEC and 24bits DAC/ADC. User can connect other external CODEC. The audio system use internal CODEC to implement the input and output of audio. J12 is 3.5mm standard headphone jack. The chip can support up to 16 ohm load.

2.9.2   MIC

M1 is capacitive mic and J13 is mic jack.

2.9.3   Speaker

SPK1 is audio power connector which can support stereo speaker. 450mW output for 8 ohm load.

2.9.4   I2S Expansion slot

J14 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 JZ4760 includes dual 10bit Video digital to analog converters (DAC) that can produce CVBS signal on J12.

2.11 Keypad Interface

There are six keys reserved for extending accessorial application by software control(SW1, SW3, SW4, SW6, SW7,SW8). SW11 is five directional key contains interrupt signal.

2.12 MMC/SD TF card

J1 is the MMC/SD card socket for extension memory, supports MMC or SD card. J15 is the TF card socket. The power on both socket can be turn off by software.

2.13 Debug Board Interface

In order to make the system debugging facility, there is a debug board connecting to the main

board through head J26 and J27. It provides JTAG port, UART port (DB9,2-wire RS-232) and 10/100MBASE Ethernet port (RJ45).

2.14 System Status LED

There are 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. It is control by I2C signal.

2.16 OWI bus

On the RD4760_LEPUS board provides U4: DS2401 (optional), the 48-bit series number chip, compatible with the 1-wire protocol.

2.17 TS interface

J21 is TS interface, which can support PID filtering.

2.18 SPI interface

The high speed SPI interface supports 54MHz, 17Bit serial data. It is coupled with J21 and can be connected Bluetooth, Wifi of ADDA converter.

Table 2-3 TS interface (J21) 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	SCC_CD_N
21	SCC_DATA	22	SCC_CLK
23	SCC_RST_N	24	NC
25	NC	26	TS_INT0
27	NC	28	TS_INT1
29	TSFAIL	30	TSCLK
31	TSSTR	32	TSFRM
33	TSDI7	34	TSDI6

35	TSDI5	36	TSDI4
37	TSDI3	38	TSDI2
39	TSDI1	40	TSDI0

2.19 CIM interface

RD4760_LEPUS camera interface can support CMOS and CCD Decoder(CCIR656 data format, RGB/YCbCr color).It is coupled with TS connector.

Table 2-4 CIM interface (J21) Signals Definition

Pin Number	Signal	Pin Number	Signal
40	CIM_D0	39	CIM_D1
38	CIM_D2	37	CIM_D3
36	CIM_D4	35	CIM_D5
34	CIM_D6	33	CIM_D7
31	CIM_VSYNC	32	CIM_HSYNC
29	CIM_MCLK	30	CIM_PCLK
7	I2C_SCK	9	I2C_SDA
13	VCC3.3V	14	GND
26	CIM_RST_N	28	CIM_PD_N

2.20 GPS interface

GPS module also can be connected through UART port on RD4760_LEPUS. JZ4760G has a GPS baseband controller, which can connect GPS chip. For detail, please refer to JZ4760G datasheet.

2.21 EPD interface

JZ4760 has a EPD controller, support most EPD panel. J23 and J20 are EPD connecters, which can be connect EPD board-RD4760_LEPUS_EPD_V1.0 through 60 pin FPC. J20 is also LCD connecter, but can not connect both boards.

Table 2-5 EPD interface (J20) Signals Definition

Pin Number	Signal	Pin Number	Signal
1	GND	2	GND
3	+3.3V	4	+3.3V
5	GND	6	NC
7	NC	8	NC
9	NC	10	NC
11	NC	12	NC
13	NC	14	GND
15	SDCE_L0	16	SDCE_L1

17	SDDO4	18	SDDO5
19	SDDO6	20	SDDO7
21	NC	22	NC
23	GND	24	GDRL
25	GDSP	26	GDOE
27	SDSHR	28	SDDO0
29	SDDO1	30	SDDO2
31	SDDO3	32	GND
33	SDCLK	34	GND
35	SDLE	36	GDCLK
37	SDOE	38	GND
39	NC	40	NC
41	NC	42	NC
43	NC	44	GND
45	GND	46	I2C_SDA
47	I2C_SCK	48	GND
49	NC	50	NC
51	NC	52	GND
53	NC	54	NC
55	NC	56	NC
57	BAT-V	58	BAT-V
59	GND	60	GND

Table 2-6 EPD interface (J23) Signals Definition

Pin Number	Signal	Pin Number	Signal
1	NC	2	GND
3	PWR0	4	PWR1
5	PWR2	6	NC
7	NC	8	NC
9	NC	10	NC
11	SDCE_L2	12	NC
13	NC	14	NC
15	PWRCON	16	NC
17	NC	18	NC
19	GND	20	AUX

2.22   PS2 interface

Test point(TP47~TP52) is ps2 interface, user can connect ps2 device such as keyboard and mouse. For detail, please refer to JZ4760 datasheet.

3   Quick start RD4760_LEPUS board

When you get the RD4760_LEPUS board, it has been initialized with Android system. Before power on the board, please do the following step:

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

Keys introduction：
● SW9:   system power on/off and wakeup manual. Long pushing will turn on the board, once again will turn it off. When in sleep mode, long pushing will wake up the system.
● SW10：system reset manual.

Start Android 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, you will go into a rich and colorful multimedia world.

4 Appendix: GPIO Definition

Pin Number	Default Port Name	Name for Real Size	Direction	Active	Function
L21	MSC2_D2/TSFAIL SSI0/1_GPC/PB30	PCM_RST_N	Output	Low	PCM reset
T13	UART3_CTS_N PE8	KEY_INT	Input	High	Navigation switch ADC trigger INT
K19	SSI1_CE1_	LCD_VCC_EN	Output	High	LCD panel power supply control
J16	MSC2_D0/SSI0/1_DR TSD0/PB20	LCD_INT	Output	High	LCD panel Interrupt
E11	PF10	LCD_REST_N	Output	Low	LCD reset
D21	PWM1 PE1	LCD_PWM1	Output	Low	LCD backlight bright trimming
B11	PF6	LCD_DISP_N/ OWI	Output	Low	LCD panel internal power enable 1-wire bus
H20	TSD3 PB23	NET_RST	Output	High	Net reset
H21	TSD4 PB24	GPS_OSC_EN	Output	High	GPS_OSC enable
A10	PF5	INTRQ0	Output	High	peripheral equipment reset
J21	TSD5 PB25	TS_RST_N	Output	Low	TS reset
F11	PF11	DC_DETE_N	Input	Low	DC-adapter plug-in detection
J20	TSD6 PB26	CIM_RST_N/ TS_INT0	Input	High	TS Interface Interrupt 0
J19	TSD7 PB27	CIM_PD_N/ TS_INT1	Input	High	TS Interface Interrupt 1
F13	UART1_RTS_N PD29	CHARG_DET_N	Input	Low	Battery Charge state indicate
D11	PF9	SD0_VCC_EN_N	Output	Low	SD card power control
H19	TDS2 PB22	SD0_CD_N	Input	Low	SD card plug-in detection
C11	PF4	SD0_WP_N	Input	Low	SD card write protection
T14	UART3_RTS_N PE9	SD1_VCC_EN_N	Output	Low	TF card power control
W21	DREQ0/PA28	SD1_CD_N	Output	Low	TF card plug-in detection
D20	PWM7/PD11	JD	Input	Low	Headphone insert detection
B14	SSI0/1_GPC PE19	USB_DETE	Input	High	USB insert detection