Ingenic® RD4780_GRUS Development Board

Hardware Manual

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Ingenic RD4780_GRUS Development Board

Hardware Manual

Release history

Date	Revision	Change
2012.11	1.0	First release

Disclaimer

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Content

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1   Overview

JZ4780 is a multimedia application processor, which has a very high performance and low power 32-bit RISC engine. JZ4780 integrates various peripherals for embedded application, such as memory controller, USB2.0 host and USB OTG interface, On-chip audio CODEC, multi-channel SAR-ADC,LCD controller, CMOS sensor interface, MMC/SD controller, GPS baseband controller ,SSI interface, I2C interface, Camera interface, TS interface, UART, LVDS, HDMI interface, 1-wire, OTP,GPIO, and so on.

The RD4780_GRUS is a reference design with JZ4780 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, Linux, WinCE and MiniOS.

1.1   Functions of RD4780_GRUS

- CPU: 1.2GHZ supports Android, Linux, WinCE and MiniOS.
- DDR3 SDRAM: H5TQ2G83CFR-H8C x 4, 1GB.
- NAND FLASH: FLASH extended card, SAMSUNG K9GAG08U0D, 2GB .
- LCD: 800x480 5.0inch TFT with touch panel.
- Multimedia: Support every multimedia software De/Encoder.
- LVDS interface：LVDS panel
- 7 keys can provide soft power on/off and extended application etc.
- USB2.0 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.

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1.2   RD4770_PISCES System Architecture
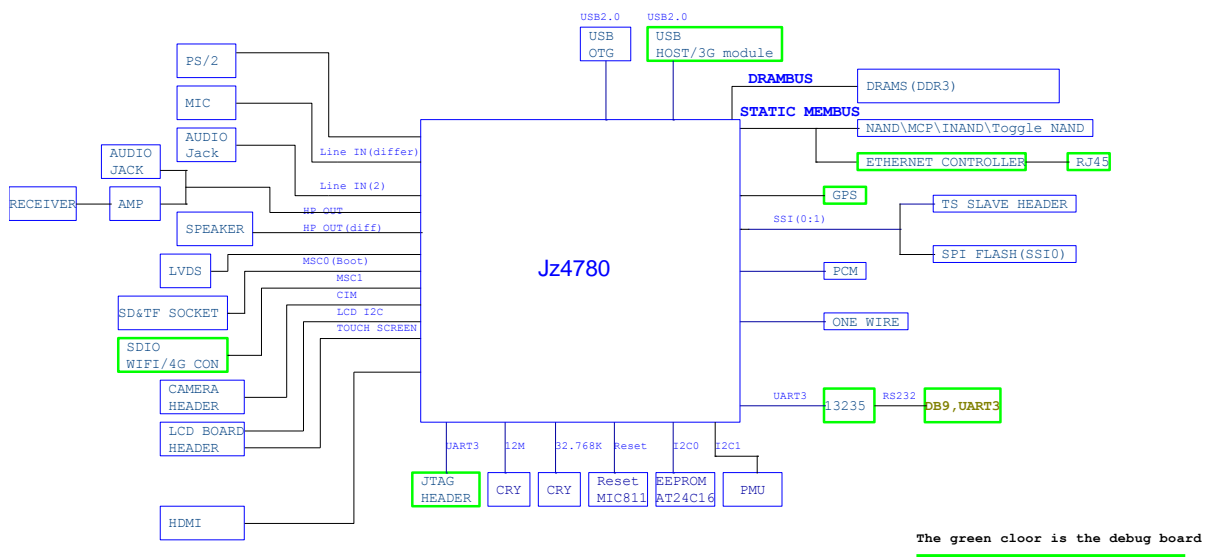
Figure 1-1 RD4780_GRUS System Architecture

2   Hardware Description

In this section, we describe every hardware module of the board. Please refer to the user's guide of JZ4780 first. For the other components, please refer to relative datasheet. For the details of the board, please refer to RD4780_GRUS schematic design.

2.1   RD4780_GRUS board picture

Figure 2-1shows the picture of the main components and connectors.(125mm X 105mm)
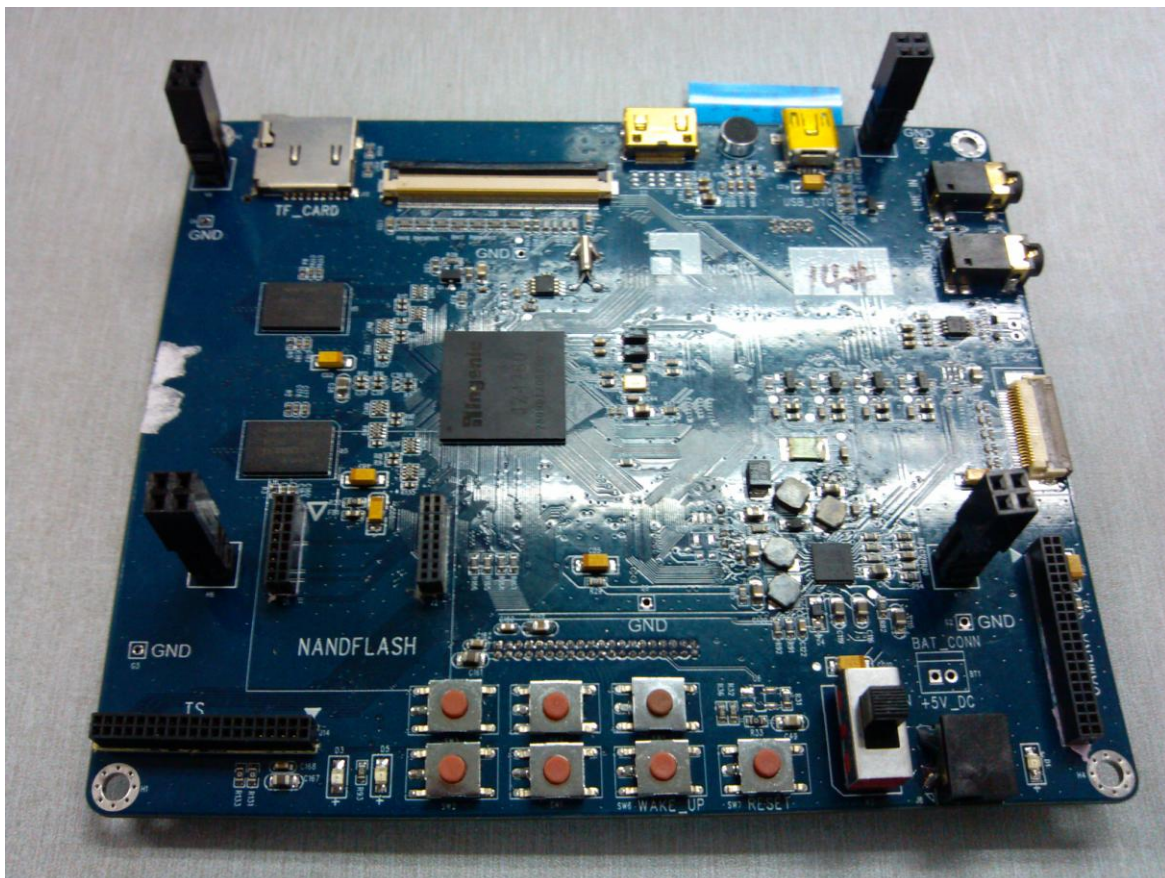
Figure 2-1 RD4780_GRUS board

2.2   Power

The RD4780_GRUS board is powered by 5V adapter or USB. K2 is power on/off switch. SW6 is hibernate/wakeup key. It also can be powered by Lithium Battery.

When power is on and system is running, push SW6 for several seconds. It will assert an interrupt to CPU, and CPU will set PW_ON low to power off the board. When long push SW6 again PW_ON is high and power is on (software on/off).

The main power chip PMU (ACT8600) which is power manage unit can support +3.3V, +1.5V and +1.1V. LED-D5 indicates +3.3V power. PMU out9 is RTC power that support +3.3V and out10

+1.1V.

J8 is external power supply jack. It should be connected with 5V-2A DC adapter that power system and charge up battery. Adapter supply current limit is 2A. LED D3 indicates the charge status when charging. CPU can realize charge state through I2C access PMU's register.

This board also can be powered and charged the battery by USB. Supply current limit is 450mA .The PRI is adaptor, USB port and Li battery.

2.3　System Reset

When power on, PMU can provide system reset signal to CPU, extended card and debug card. SW7 is the manual reset button.

2.4　System boot mode

RD4780_GRUS has five boot modes:

- USB
- Nand Flash
- SPI Flash
- SD/MMC (MSC0, MSC1)
- eNAND

Table 2-1 describes the setting of boot start:

Table 2-1　BOOT SETUP

Hold push key	Boot From
SW5+SW7	USB Boot
None	Nand Boot (default)
SW4+SW5+SW7	MSC0 Boot
SW3+SW4+SW7	SPI Boot
SW4+SW7	MSC1 Boot
SW3+SW5+SW7	eMMC Boot(for special eMMC nand boot)

2.5　SYSTEM MEMORY(DDR3 SDRAM)

RD4780_GRUS has 4 chips, 32bit bus width, 1GMByte DDR3 SDRAM.

2.6　NAND extended card

J1, J2 are NAND Flash extended slot, default configuration SAMSUNG NAND K9GAG08U0D , 2GB.

2.7　LCD interface and Expansion card

2.7.1　LCD interface definition

J9 is the LCD interface, which can directly connect to LCD Expansion card. RD4780_GRUS 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（J9）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 JZ4780 datasheet.

2.7.2 LCD Expansion card

RD4770_PISCES_LCD_BOARD_V1.0 is the LCD expansion card. J9 is the connector with 60 pin FPC to motherboard. J2 is LCD slot which connected BM8766U 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.

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2.8   USB Interface

RD4780_GRUS support USB OTG. There are one MiniAB USB port on main board (J13). It contains insert detect circuit. The USB2.0 host port is on debug board, which can support 500mA current.

2.9   Audio System

2.9.1   Headphone

JZ4780 provides an internal AC97/I2S 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. J5 is a 3.5mm standard headphone jack. The chip can support up to 16 ohm load.

2.9.2   MIC

M1 is capacitive microphone.

2.9.3   Speaker

SPK1 is audio power connector which can support stereo speaker. 1W output for 8 ohm load.

2.10   HDMI video out

The JZ4780 includes internal HDMI controller, which provide HDMI signal from J7.

2.11   LVDS video out

The JZ4780 includes internal LVDS controller, which provide LVDS signal from J10.

2.12   Keypad Interface

There are five keys reserved for extending accessorial application by software control (SW1, SW3, SW5, SW6, SW7).

2.13   MMC/SD TF card

J11 is the MMC/SD card socket for extension memory, supports MMC or SD card（Hardware changes, it can boot from SD）. J12 is the TF card socket. The power on both socket can be turn off by software.

2.14   Debug Board Interface

In order to make the system debugging facility, there is a debug board connecting to the main board through head J15 and J16. It provides USB port, JTAG port, UART port (DB9,2-wire RS-232) and 10/100MBASE Ethernet port (RJ45). It also contains a WIFI module IW8101/IW8103/IW8103B and a GPS receiver circuit.

2.15   System Status LED

There are three LEDs for system status indicator:
● LED D5 indicates the +3.3V power status.
● LED D1 indicates system reset status.
● LED D3 indicates the charge status that light when charging.

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2.16 TS interface

J14 is TS interface, which can support PID filtering.

2.17 SPI interface

The high speed SPI interface supports 54MHz, 17Bit serial data. It is coupled with J14 and can be connected Bluetooth, WIFI of ADDA converter.

Table 2-3 TS interface (J14) 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	TSDI7	34	TSDI6
35	TSDI5	36	TSDI4
37	TSDI3	38	TSDI2
39	TSDI1	40	TSDI0

2.18 CIM interface

J3 is RD4780_GRUS camera interface can support CMOS and CCD Decoder(CCIR656 data format, RGB/YCbCr color).

Table 2-4 CIM interface (J3) 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
27	CIM_D10	28	CIM_PD_N
25	CIM_D9	26	CIM_RST_N
23	SCC_RST_N	24	CIM_D8
21	SCC_DATA	22	SCC_CLK
19	GND	20	SCC_CD_N
17	NC	18	NC
15	NC	16	NC
13	3.3V	14	GND
11	GND	12	3.3V
9	2C0_SDA	10	1.2V
7	I2C0_SCK	8	3.3V
5	NC	6	CIM_D11
3	NC	4	1.8V
1	GND	2	1.8V

2.19 GPS interface

GPS module also can be connected through UART port on RD4780_GRUS. JZ4780 has a GPS baseband controller, which can connect GPS chip. For detail, please refer to JZ4780 datasheet.

2.20 PS2 interface

Test point(TP9~TP11) is ps2 interface, users can connect ps2 device such as keyboard and mouse. For detail, please refer to JZ4780 datasheet.

2.21 EFUSE

JZ4780 provide EFUSE function, users can program as needed EFUSE. AVDEFUSE pin should be kept 0V except during programming. Maximum accumulative time for AVDEFUSE pin exposed under 2.5V should be less than 1 sec. For detail, please refer to JZ4780 datasheet.

3   Quick start RD4780_GRUS board

When you get the RD4780_GRUS board, it has been initialized with Linux 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：

- SW6:   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.
- SW7：system reset manual.

Start Linux system:

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

in Number	Default Port Name	Name for Real Size	Direction	Active	Function
A1	CS5_N/SSI0_CE0_N/PA25	DMIC_LR	Output	Low	DMIC right/left selection
M5	SSI0_GPC/SSI1_GPC/PE19	ETHERNET_INT	Input	High	ETHERNET interrupt
V10	PD8	WL_PW_EN	Output	High	WIFI Power Enable
W11	PD9	WL_WAKE	Output	High	WIFI Wake Up
U9	PF4	BT_REG_ON	Output	High	BT REG ON
U10	PF5	BT_WAKE	Output	High	BT Wake Up
U11	PF6	BT_INT	Input	High	BT interrupt
U12	PF7	WL_REG_ON	Output	High	WL REG ON
R10	PF8	BT_RST_N	Output	Low	BT Reset
R4	PF11	CIM_RSR_N	Output	Low	CIM Reset
N5	PF12	USB_DETE	Input	High	USB detect
U13	PF13	TS_INT1	Input	High	TS Interrupt1
R12	PF14	CIM2_PD	Output	High	Camera2 power down
R11	PF15	CIM_PD	Output	High	Camera power down
U10	PF18	ETHERNET_RST	Output	High	ETHERNET reset
P2	PF19	SD0_VCC_EN_N	Output	Low	SD Power enable
N3	PF20	SD0_CD_N	Input	Low	SD CD detect
N2	PF21	SD0_WP_N	Input	Low	SD Write protect
M3	PF22	TS_INT0	Input	High	TS Interrupt0
W14	PD15	USB_PW_EN	Output	High	USB power enable
L18	PF30	RTC_IRQ_INT	Input	High	RTC Interrupt
N17	PWM0/PE0	LCD_PWM	Output	Low	LCD PWM
N18	PWM1/PE1	HDMI_DETE_N	Input	Low	HDMI INPUT DETE
V14	PWM2/PE2	ID	Input	Low	USB OTG ID
L3	PWM3/I2C4_SDA/PE3	VSD18_EN	Output	High	SD18 POWER ENABLE
K7	PWM4/I2C4_SCK/PE4	AVDEFUSE_EN_N	Output	Low	AVDEFUSE ENABLE
M1	PWM6/I2C3_SDA/PD10	LCD_RESET_N	Output	Low	LCD RESET
L2	PWM7/I2C3_SCK/PD11	LCD_DISP_N	Output	Low	LCD DISPLAY
R17	PWM5/UART3_TXD/SCLK_RSTN/PE5	GPS_PWR_EN	Output	High	GPS POWER ENABLE
R18	UART3_RXD/BCLK0/PD12	GPS_OSC_EN	Output	High	GPS OSC ENABLE
P18	UART3_CTS_N/BCLK_AD/PE8	LCD_INT	Input	High	LCD INTRRUPT
P17	UART3_RTS_N/LRCLK_AD/PE9	LCD_PW_EN	Output	High	LCD POWER ENABLE
U19	AIC0_SDATI/PE6	ETHERNET_CMD	Output	High	ETHERNET CMMMEND
T19	AIC0_SDATO/PE7	JD	Input	High	AUDIO INPUT DETECT
T18	LRCLK0/PD13	TS_RST_N	Output	Low	TS RESET