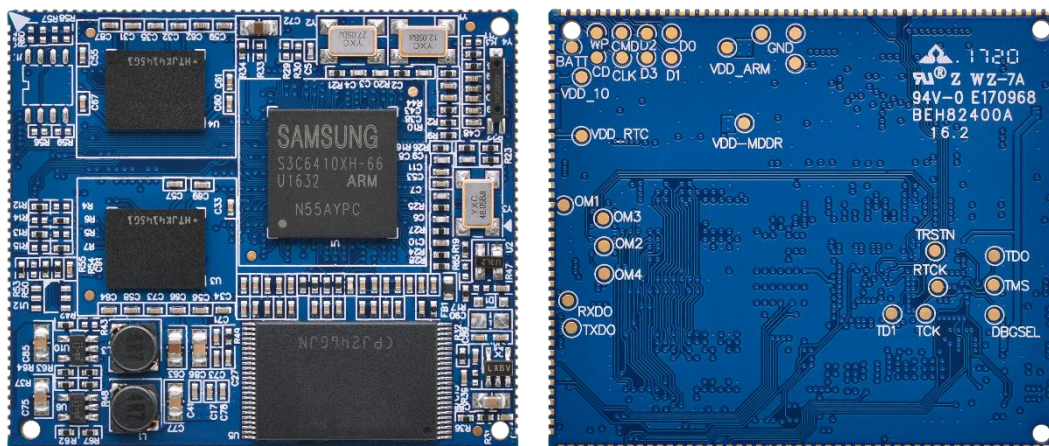


MNI6410 Reference User Manual

V2.202609



Boardcon Embedded Design

www.armdesigner.com

1. Introduction

1.1. About this Manual

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

1.2. Feedback and Update to this Manual

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website (www.boardcon.com , www.armdesigner.com).

These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new!

When we are prioritizing work on these updated resources, feedback from customers is the number one influence, If you have questions, comments, or concerns about your product or project, please no hesitate to contact us at support@armdesigner.com.

1.3. Limited Warranty

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon. This limited warranty does not cover damages resulting from lighting or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit. In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this product.

Repairs make after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.

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1 MINI6410 Introduction

1.1 Brief introduction

MINI6410 is a System-on-Module (SOM) based on Samsung's S3C6410XH-53 RISC microprocessor with an ARM11 core. Powerful 3D acceleration and hardware multimedia enable faster graphics performance at lower power consumption. The 8-layer PCB design provides more stable performance. It delivers stable electrical performance and has been successfully mass-produced. It is applicable to PDAs, POS terminals, PNDs, and terminal controllers.

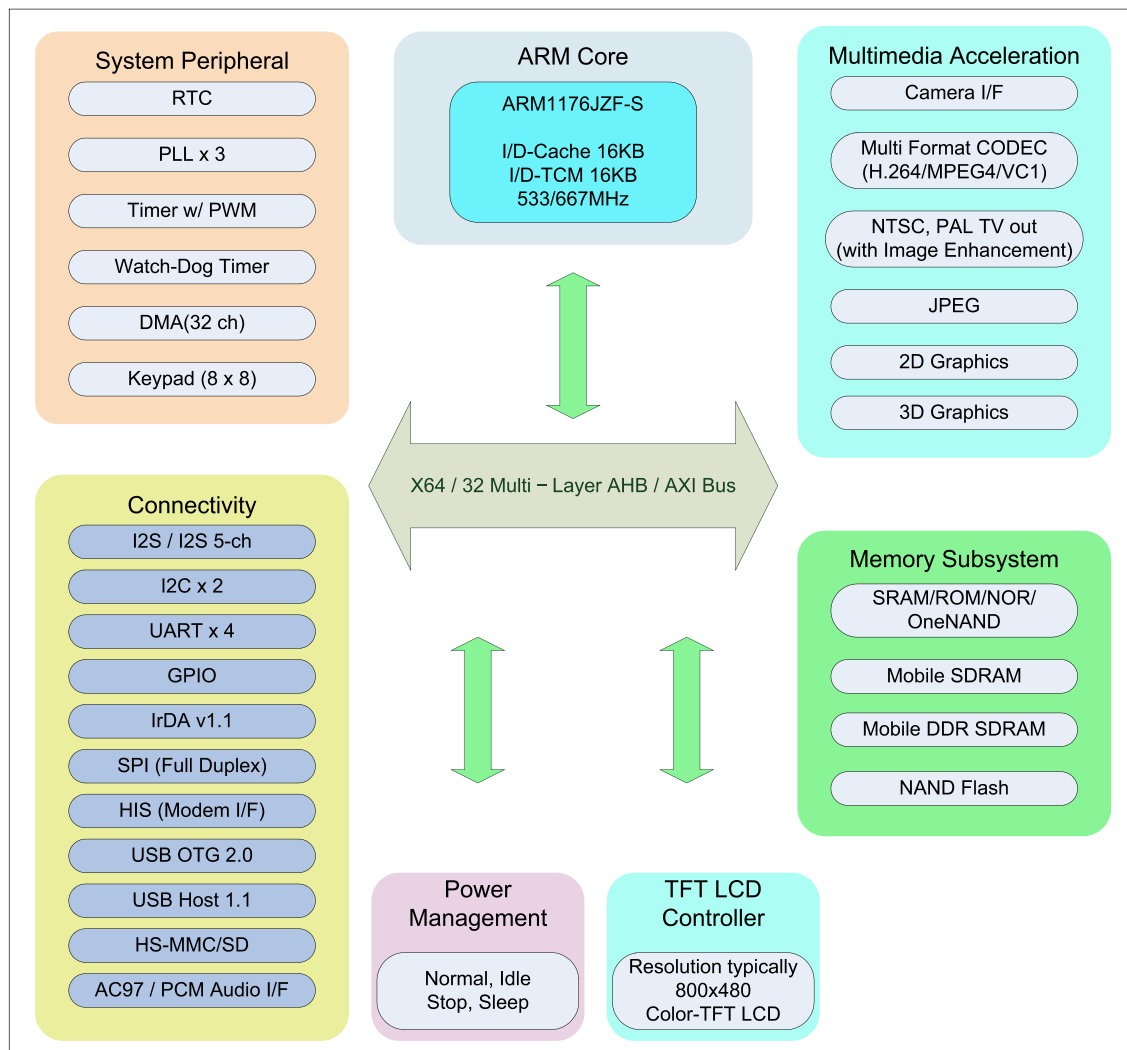
1.2 Features and Functionality

- ◆ CPU
 - Samsung S3C6410XH, 533MHz(up to 667M), ARM1176 Core
 - Mult-standard video codec(MPEG4, H.264, VC-1)
- ◆ RAM
 - On-board 128MB or 256MB Mobile DDR2-RAM
 - 32bit data bus
 - DDR clock frequency as high as 133MHz
- ◆ ROM
 - On-board SLC or MLC 256MB Nand Flash
 - Up to 4GB
- ◆ POWER
 - 5V & 3.3V power input(can combine single 3.3V)
 - Dual high-efficiency DC-DC converter
- ◆ RTC
- ◆ JTAG
- ◆ Support 6*6 key matrix
- ◆ 2 Stereo Audio interface
 - Support PCM / AC97 or I2S
- ◆ Watchdog
- ◆ 4 UART
 - 2 Five line and 2 Three line
 - Support IrDA
- ◆ 2 IIC interface(option uart1)
- ◆ 2 SPI interface
- ◆ 2 SDIO interface(boot in SD0)
- ◆ 6 12bit ADIN or 2 ADIN and 4 wire RES-touch panel interface
- ◆ 14 interrupt sources
- ◆ 2 USB interface
 - Host 1.1 and OTG 2.0
- ◆ 2 32bit PWM Timer out

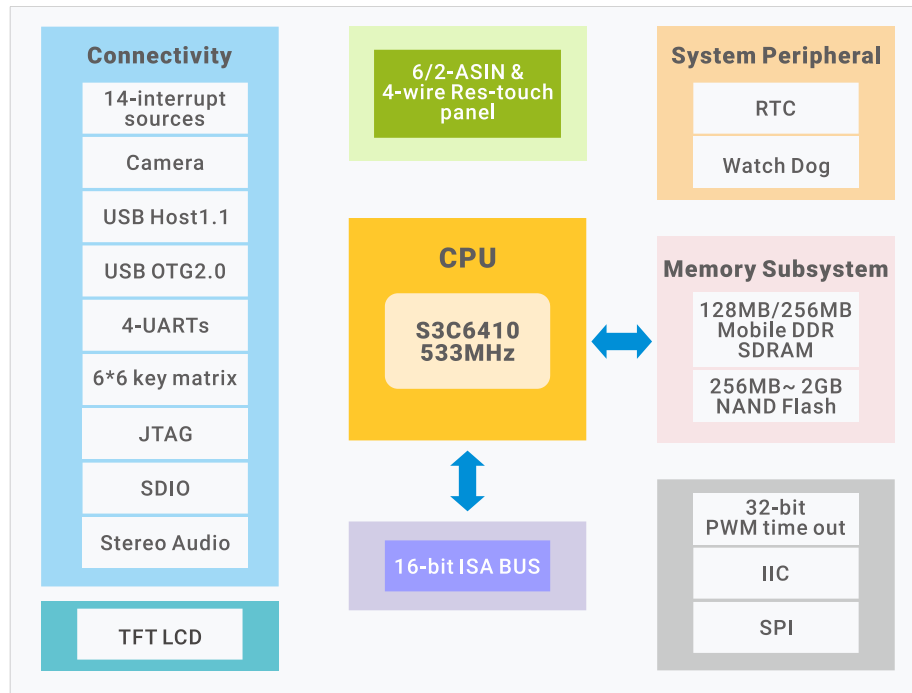


- ◆ 1 Camera interface
 - Max 4096 x 4096 pixels input
 - ITU601/656 8bit support
- ◆ TFT LCD BUS
 - 24BPP RGB parallel output
 - V601 video out support
- ◆ 16bit ISA BUS

1.3 Block Diagram



S3C6410X Block Diagram



MINI6410 Block Diagram

1.4 Module Pinout

Pin	Signal name	Function	Description	IO Type
1	GPE4	PcmSO/I2sDO/GPE4	For USB HUB reset	I/O
2	GPE3	PcmSI/I2sDI/GPE3	Option for SD power control	I/O
3	GPE2	PcmFS/I2sLRCK/GPE2	For SDIO WIFI PDn	I/O
4	GPE1	PcmECK/I2sCDCK/GPE1	For SDIO WIFI reset	I/O
5	GPE0	PcmDCK/I2sSCLK/GPE0		I/O
6	GPH8	SD1_DATA6/GPH8		I/O
7	GPH7	SD1_DATA5/GPH7		I/O
8	GPH6	SD1_DATA4/GPH6		I/O
9	RXD3	UART RXD CH3	IrRXD or I2CSCL1	I/O
10	RXD2	UART RXD CH2	IrRXD or GPB0	I/O
11	CTSn1	UART CTS CH1	Uart clear to send input signal or GPA6	I/O
12	RXD1	UART RXD CH1	Uart receives data input or GPA4	I/O
13	CTSn0	UART CTS CH0	Uart clear to send input signal or GPA2	I/O
14	RXD0	UART RXD CH0	Uart receives data input or GPA0	I/O
15	TXD3	UART TXD CH3	IrTXD or I2CSDA1	I/O
16	TXD2	UART TXD CH2	IrTXD or GPB1	I/O
17	RTSn1	UART RTS CH1	Uart request to send output signal or GPA7	I/O
18	TXD1	UART TXD CH1	Uart transmits data output or GPA5	I/O



Pin	Signal name	Function	Description	IO Type
19	RTSn0	UART RTS CH0	Uart request to send out or GPA3	I/O
20	TXD0	UART TXD CH0	Uart transmits data output or GPA1	I/O
21	OM4	Boot mode set 4	OM1: H OM2:H OM3:L OM4:L Nand Boot mode OM1: H OM2:H OM3:H OM4:H Boot in SD0	I
22	OM2	Boot mode set 3		I
23	OM3	Boot mode set 2		I
24	OM1	Boot mode set 1		I
25	GND	Ground		P
26	GND	Ground		P
27	GND	Ground		P
28	GND	Ground		P
29	GND	Ground		P
30	GND	Ground		P
31	VDD_RTC	RTC Power In	1.7V ~ 3.3V, must be connect 3.3V if don't use.	P
32	VDD_ARM	NC		P
33	VDD_ARM	NC		P
34	VDD_ARM	NC		P
35	VDD_ARM	NC		P
36	VDD33V	3.3V Power In		P
37	VDD33V	3.3V Power In		P
38	VDD_MDDR	NC		P
39	VDD_MDDR	NC		P
40	VDD5V	5V or 3.3V Power In		P
41	VDD5V	5V or 3.3V Power In		P
42	VDD5V	5V or 3.3V Power In		P
43	SD0_WPn	EINT21/GPL13	SD0 write protection	I/O
44	SD0_CDn	SD0CDn/GPG6	Can define for SD1_CDn	I/O
45	SD0_CLK	SD0 clock		I/O
46	SD0_CMD	SD0 CMD/GPG1		I/O
47	SD0_D3	SD0 data3	SD0 Data3 or GPG5	I/O
48	SD0_D2	SD0 data2	SD0 Data2 or GPG4	I/O
49	SD0_D1	SD0 data1	SD0 Data1 or GPG3	I/O
50	SD0_D0	SD0 data0	SD0 Data0 or GPG2	I/O
51	SD1_WPn	EINT22/GPL14	SD1 write protection	I/O
52	SD1_CDn	EINT10/GPN10		I/O
53	SD1_CLK	SD1 clock	SD1 CLK or GPH0	I/O
54	SD1_CMD	SD1 CMD/GPH1		I/O
55	SD1_D3	SD1 data3	SD1 Data3 or GPH5	I/O
56	SD1_D2	SD1 data2	SD1 Data2 or GPH4	I/O
57	SD1_D1	SD1 data1	SD1 Data1 or GPH3	I/O
58	SD1_D0	SD1 data0	SD1 Data0 or GPH2	I/O
59	AC97SYNC	PcmSN/I2sLRCK/GPD2	Audio interface 0 or GPIO	I/O



Pin	Signal name	Function	Description	IO Type
60	AC97SDO	PcmSO/I2sDO/GPD4	Audio interface 0 or GPIO	I/O
61	AC97BCLK	PcmDCK/I2sBCK/GPD0	Audio interface 0 or GPIO	I/O
62	AC97SDI	PcmSI/I2sDI/GPD3	Audio interface 0 or GPIO	I/O
63	AC97RSTn	PcmECK/I2sLRCK/GPD1	Audio interface 0 or GPIO	I/O
64	OTGID	OTG device ID line		I/O
65	USBDN	USB Host DN	USB DATA(-) host 1.1	I/O
66	USBDP	USB Host DP	USB DATA(+) host 1.1	I/O
67	VBUS	OTG bus power		I
68	OTGDM	USB OTG DM	USB DATA(-) OTG 2.0	I/O
69	OTGDP	USB OTG DP	USB DATA(+) OTG 2.0	I/O
70	nBATF	Battery fault indication	L enable	I
71	ADCIN1	AIN1		I
72	ADCIN0	AIN0		I
73	EINT8	EINT8/GPN8		I/O
74	EINT6	EINT6/KP_ROW6/GPN6		I/O
75	EINT5	EINT5/KP_ROW5/GPN5		I/O
76	EINT3	EINT3/KP_ROW3/GPN3		I/O
77	EINT1	EINT1/KP_ROW0/GPN0		I/O
78	EINT12	EIN12/GPN12		I/O
79	EINT9	EINT9/GPN9		I/O
80	EINT4	EIN4/KP_ROW4/GPN4		I/O
81	KP_ROW5	KP_ROW5/GPK13		I/O
82	KP_ROW4	KP_ROW4/GPK12		I/O
83	KP_ROW3	KP_ROW3/GPK11		I/O
84	KP_ROW2	KP_ROW2/GPK10		I/O
85	KP_ROW1	KP_ROW1/GPK9		I/O
86	KP_ROW0	KP_ROW0/GPK8		I/O
87	KP_COL5	KP_COL5/GPL5		I/O
88	KP_COL4	KP_COL4/GPL4		I/O
89	KP_COL3	KP_COL3/GPL3		I/O
90	KP_COL2	KP_COL2/GPL2		I/O
91	KP_COL1	KP_COL1/GPL1		I/O
92	KP_COL0	KP_COL0/GPL0		I/O
93	GPO2	Xm0_CSn4/GPO2		I/O
94	PWRON	PWRRGTON	Sleep/Wake up power control	O
95	RST_KEY	Reset Key	Connect to reset button	I
96	nRESET	Reset output		O
97	ADDR2	Xm0_ADDR2	Memory port 0 address bus	O
98	ADDR0	Xm0_ADDR0	Memory port 0 address bus	O
99	ADDR1	Xm0_ADDR1	Memory port 0 address bus	O
100	IRQ_LAN	EINT7/KP_ROW7/GPN7	Define for LAN interrupt	I/O
101	CSn1	Xm0_CSn1	Define for LAN Chip Select	O



Pin	Signal name	Function	Description	IO Type
102	OEn	Xm0_OEn	Memory port 0 Output Enable	O
103	WEn	Xm0_WEn	Memory port 0 Write Enable	O
104	DATA15	Xm0_DATA15	Memory port 0 Data bus	I/O
105	DATA14	Xm0_DATA14	Memory port 0 Data bus	I/O
106	DATA13	Xm0_DATA13	Memory port 0 Data bus	I/O
107	DATA12	Xm0_DATA12	Memory port 0 Data bus	I/O
108	DATA11	Xm0_DATA11	Memory port 0 Data bus	I/O
109	DATA10	Xm0_DATA10	Memory port 0 Data bus	I/O
110	DATA9	Xm0_DATA9	Memory port 0 Data bus	I/O
111	DATA8	Xm0_DATA8	Memory port 0 Data bus	I/O
112	DATA7	Xm0_DATA7	Memory port 0 Data bus	I/O
113	DATA6	Xm0_DATA6	Memory port 0 Data bus	I/O
114	DATA5	Xm0_DATA5	Memory port 0 Data bus	I/O
115	DATA4	Xm0_DATA4	Memory port 0 Data bus	I/O
116	DATA3	Xm0_DATA3	Memory port 0 Data bus	I/O
117	DATA2	Xm0_DATA2	Memory port 0 Data bus	I/O
118	DATA1	Xm0_DATA1	Memory port 0 Data bus	I/O
119	DATA0	Xm0_DATA0	Memory port 0 Data bus	I/O
120	I2CSCL0	I2C_SCL/GPB5		I/O
121	I2CSDA0	I2C_SDA/GPB6		I/O
122	CAMXD7	CAM_DATA7/GPF12	Camera port Data bus	I
123	CAMXD6	CAM_DATA6/GPF11	Camera port Data bus	I
124	CAMXD5	CAM_DATA5/GPF10	Camera port Data bus	I
125	CAMXD4	CAM_DATA4/GPF9	Camera port Data bus	I
126	CAMXD3	CAM_DATA3/GPF8	Camera port Data bus	I
127	CAMXD2	CAM_DATA2/GPF7	Camera port Data bus	I
128	CAMXD1	CAM_DATA1/GPF6	Camera port Data bus	I
129	CAMXD0	CAM_DATA0/GPF5	Camera port Data bus	I
130	CAMPCLK	CAM_PCLK/GPF2	Camera pixel clock in	I
131	CAMVSYNC	CAM_VSYNC/GPF4	Camera vertical sync in	I
132	CAMMCLK	CAM_CLK/GPF0	Master clock to camera	O
133	CAMHREF	CAM_HREF/GPF1	Camera horizontal sync in	I
134	CAMRSTn	CAM_RST/GPF3	Reset to the camera	O
135	HSYNC	RGB_HSYNC/GPJ8	LCD horizontal sync or V601 HSYNC	I/O
136	VSYNC	RGB_VSYNC/GPJ9	LCD vertical sync or V601 VSYNC	I/O
137	VCLK	RGB_VCLK/GPJ11	LCD Pixel clock or V601 CLK	I/O
138	VDEN	RGB_VDEN/GPJ10	LCD data enable or V601 HREF	I/O
139	VD0	RGB_DATA0/GPI0	Or V601 data 0	I/O
140	VD1	RGB_DATA1/GPI1	Or V601 data 1	I/O
141	VD2	RGB_DATA2/GPI2	Or V601 data 2	I/O
142	VD3	RGB_DATA3/GPI3	Or V601 data 3	I/O
143	VD4	RGB_DATA4/GPI4	Or V601 data 4	I/O



Pin	Signal name	Function	Description	IO Type
144	VD5	RGB_DATA5/GPI5	Or V601 data 5	I/O
145	VD6	RGB_DATA6/GPI6	Or V601 data 6	I/O
146	VD7	RGB_DATA7/GPI7	Or V601 data 7	I/O
147	VD8	RGB_DATA8/GPI8		I/O
148	VD9	RGB_DATA9/GPI9		I/O
149	VD10	RGB_DATA10/GPI10		I/O
150	VD11	RGB_DATA11/GPI11		I/O
151	VD12	RGB_DATA12/GPI12		I/O
152	VD13	RGB_DATA13/GPI13		I/O
153	VD14	RGB_DATA14/GPI14		I/O
154	VD15	RGB_DATA15/GPI15		I/O
155	VD16	RGB_DATA16/GPJ0		I/O
156	VD17	RGB_DATA17/GPJ1		I/O
157	VD18	RGB_DATA18/GPJ2		I/O
158	VD19	RGB_DATA19/GPJ3		I/O
159	VD20	RGB_DATA20/GPJ4		I/O
160	VD21	RGB_DATA21/GPJ5		I/O
161	VD22	RGB_DATA22/GPJ6		I/O
162	VD23	RGB_DATA23/GPJ7	V601 FIELD	I/O
163	TOUT1	PWM_TOUT1/GPF15		I/O
164	EINT11	EINT11/GPN11		I/O
165	DACOUT0	DACOUT0	TV out	O
166	GPH9	SD1_data7/GPH9		I/O
167	EINT0	EINT0/KP_ROW0/GPN0		I/O
168	EINT2	EINT2/KP_ROW2/GPN2		I/O
169	CLK_OUT0	TOUT0/CLKOUT/GPF14		I/O
170	GPQ0	GPQ0		I/O
171	OTG_VBUS	OTG DRV_VBUS	Drive Vbus for off-chip charge pump	O
172	GPO3	Xm0_CSn5/GPO3		I/O
173	SPICS0	SPI0_CS/GPC3		I/O
174	SPIMISO0	SPI0_MISO/GPC0		I/O
175	SPICLK0	SPI0_CLK/GPC1		I/O
176	SPIMOSI0	SPI0_MOSI/GPC2		I/O
177	GPC7	SPI1_CS/GPC7		I/O
178	GPC4	SPI1_MISO/GPC4		I/O
179	GPC5	SPI1_CLK/GPC5		I/O
180	GPC6	SPI1_MOSI/GPC6		I/O
181	TSYP	ADCIN5		I
182	TSXP	ADCIN7	If don't use, ADCTSC register must be setting to 0xd3	I
183	TSYM	ADCIN4		I
184	TSXM	ADCIN6		I



1.5 Multiplexed GPIO

Pin	Signal name	Function 1	Function 2	Function 3
163	TOUT1	TOUT1	GPF15	
169	CLK_OUT0	TOUT0	GPF14	XCLKOUT
<i>Pin163 is 32bit PWM timer output, use for LCD backlight brightness control.</i>				
Pin	Signal name	Function 1	Function 2	Function 3
43	SD0_WPn	EINT21	GPL13	
51	SD1_WPn	EINT22	GPL14	
93	GPO2	Xm0_CSn4	GPO2	
100	IRQ_LAN	EINT7	GPN7	KP_ROW7
170	GPQ0	GPQ0	Xm0_ADD18	
172	GPO3	Xm0_CSn5	GPO3	

UART ports					
Pin	Signal name	Function 1	Function 2	Function 3	Function 4
9	RXD3	RXD3	GPB2	IrRXD	I2C_SCL1
10	RXD2	RXD2	GPB0	IrRXD	
11	CTS _n 1	nCTS1	GPA6		
12	RXD1	RXD1	GPA4		
13	CTS _n 0	nCTS0	GPA2		
14	RXD0	RXD0	GPA0		
15	TXD3	TXD3	GPB3	IrTXD	I2C_SDA
16	TXD2	TXD2	GPB1	IrTXD	
17	RTS _n 1	nRTS1	GPA7		
18	TXD1	TXD1	GPA5		
19	RTS _n 0	nRTS0	GPA3		
20	TXD0	TXD0	GPA1		

I2C bus				
Pin	Signal name	Function 1	Function 2	Function 3
120	I2CSCL0	I2C0_SCL	GPB5	
121	I2CSDA0	I2C0_SDA	GPB6	

SDIO interface						
Pin	Signal name	Function 1	Function 2	Function 3	Function 4	Function 5
44	SD0_CDn	SD0_CDn		GPG6	SD1_CDn	
45	SD0_CLK	SD0_CLK		GPG0		
46	SD0_CMD	SD0_CMD		GPG1		
47	SD0_D3	SD0_D3		GPG5		
48	SD0_D2	SD0_D2		GPG4		
49	SD0_D1	SD0_D1		GPG3		



50	SD0_D0	SD0_D0		GPG2		
52	SD1_CDn	EINT10		GPN10		
53	SD1_CLK	SD1_CLK		GPH0	KP_COL0	
54	SD1_CMD	SD1_CMD		GPH1	KP_COL1	
55	SD1_D3	SD1_D3		GPH5	KP_COL5	
56	SD1_D2	SD1_D2		GPH4	KP_COL4	
57	SD1_D1	SD1_D1		GPH3	KP_COL3	
58	SD1_D0	SD1_D0		GPH2	KP_COL2	
6	GPH8	SD1_D6	SD2_D2	GPH8		I2sMulti_LRCK
7	GPH7	SD1_D5	SD2_D1	GPH7	KP_COL7	I2sMulti_CDCK
8	GPH6	SD1_D4	SD2_D0	GPH6	KP_COL6	I2sMulti_BCLK
166	GPH9	SD1_D7	SD2_D3	GPH9		I2sMulti_DI

SPI interface					
Pin	Signal name	Function 1	Function 2	Function 3	Function 4
173	SPICS0	SPICS0	GPC3		
174	SPIMISO0	SPIMISO0	GPC0		
175	SPICLK0	SPICLK0	GPC1		
176	SPIMOSI0	SPIMOSI0	GPC2		
177	GPC7	SPICS1	GPC7		I2sMulti_DO2
178	GPC4	SPIMISO1	GPC4	SD2_CMD	I2sMulti_DO0
179	GPC5	SPICLK1	GPC5	SD2_CLK	I2sMulti_DO1
180	GPC6	SPIMOSI1	GPC6		

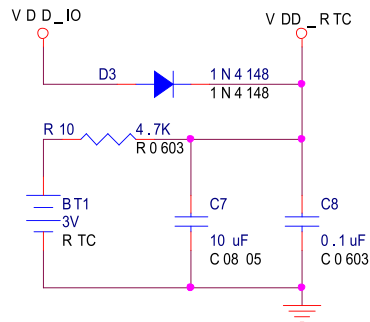
Audio interface					
Pin	Signal name	Function 1	Function 2	Function 3	Function 4
1	GPE4	PCM1_SO	I2S1_DO	AC97_SDO1	GPE4
2	GPE3	PCM1_SIN	I2S1_DI	AC97_SDI1	GPE3
3	GPE2	PCM1_FSYNC	I2S1_LRCK	AC97_SYNC1	GPE2
4	GPE1	PCM1_EXTCK	I2S1_CDCLK	AC97_RESETn1	GPE1
5	GPE0	PCM1_DCLK	I2S1_CLK	AC97_BITCK1	GPE0
59	AC97SYNC	PCM0_FSYNC	I2S0_LRCK	AC97SYNC0	GPD2
60	AC97SDO	PCM0_SO	I2S0_DO	AC97SDO0	GPD4
61	AC97BCLK	PCM0_DCLK	I2S0_CLK	AC97BCLK0	GPD0
62	AC97SDI	PCM0_SIN	I2S0_DI	AC97SDI0	GPD3
63	AC97RSTn	PCM0_EXTCK	I2S0_CDCLK	AC97RSTn0	GPD1



2 MINI6410 Operation

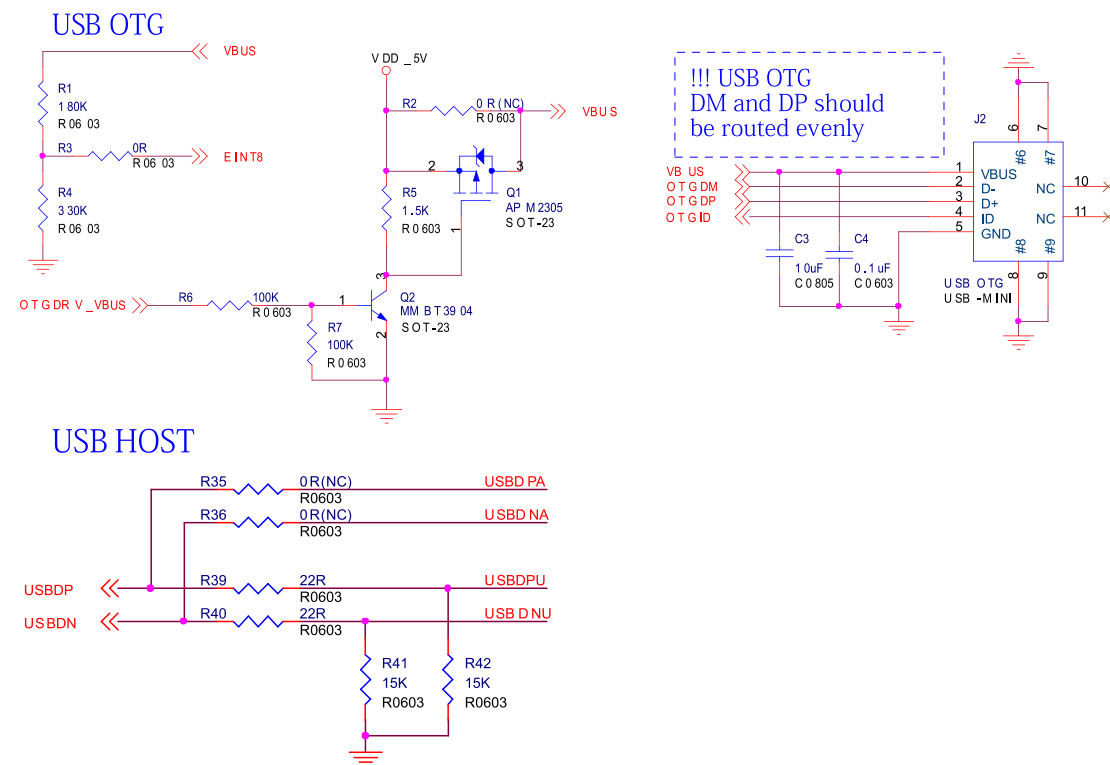
2.1 Peripheral Circuit Reference

2.1.1 RTC Battery Circuit



Note: If not used, it must be connected to 3.3V

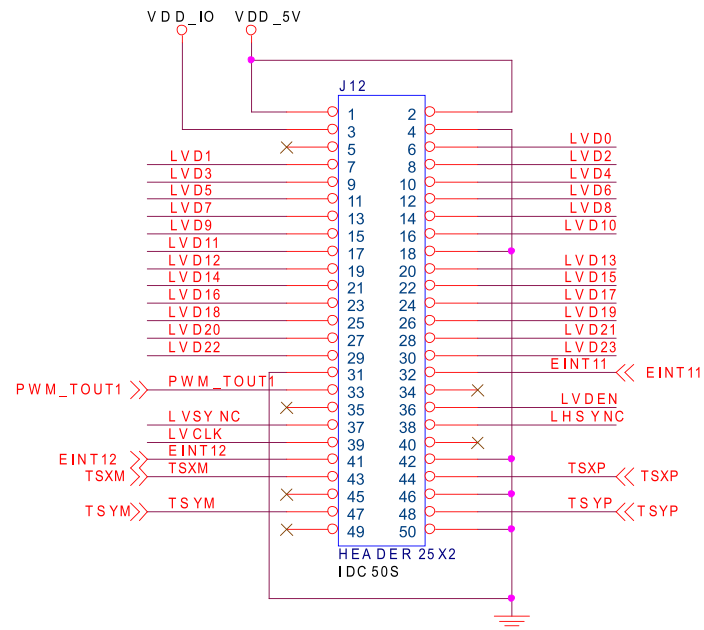
2.1.2 USB Interface Circuit



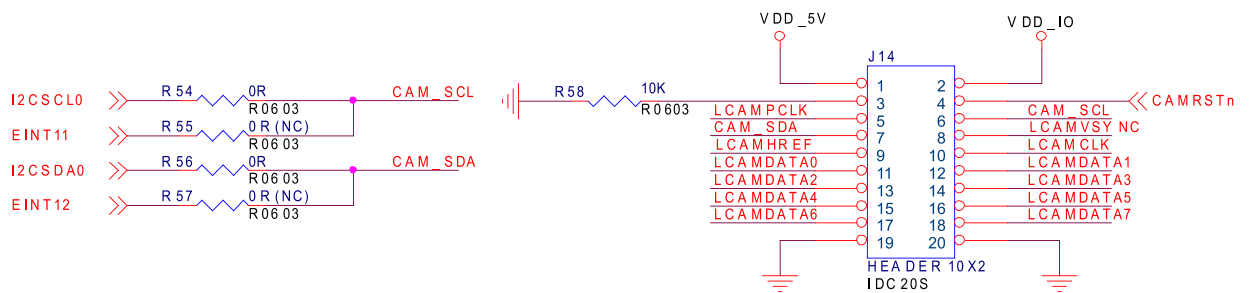
USB host is 1.1, and must be pull down 15K resistor. USB OTG is 2.0.



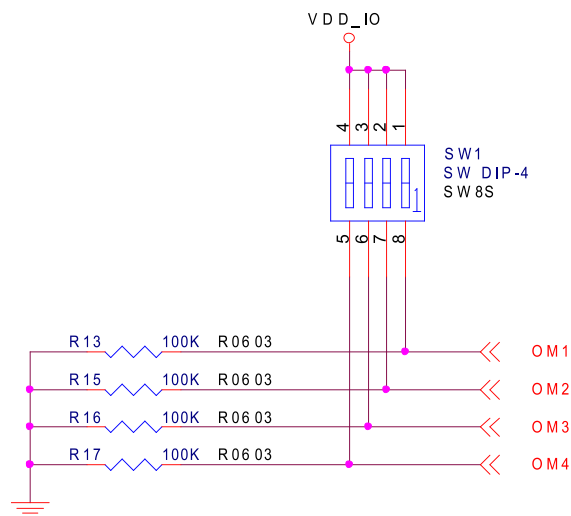
2.1.3 LCD Interface Circuit



2.1.4 Camera Interface Circuit

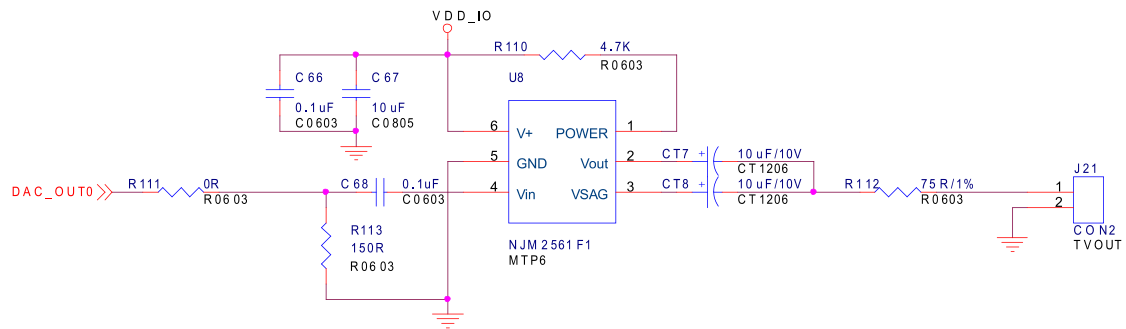


2.1.5 OM Setting Circuit

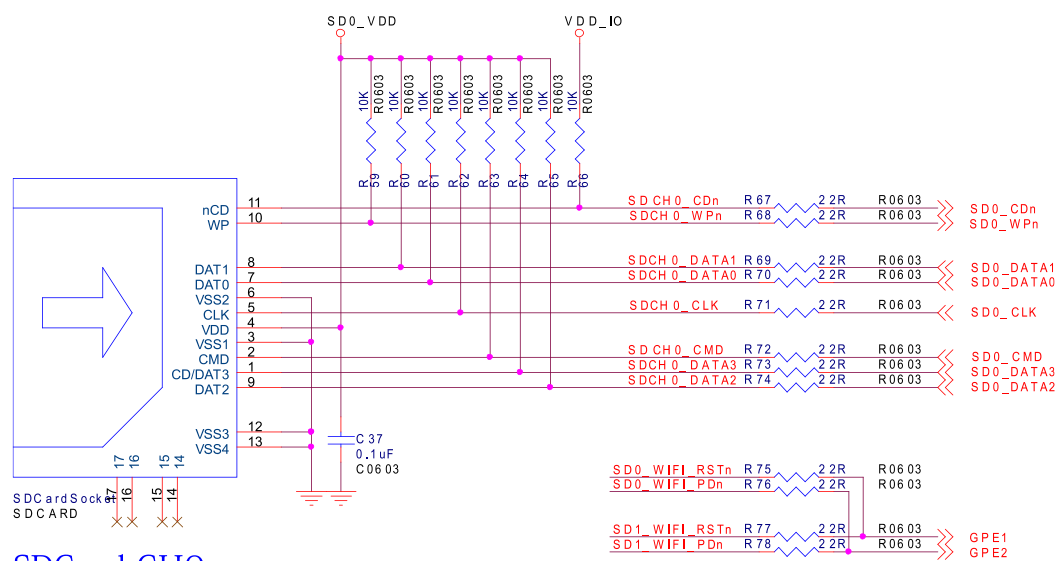




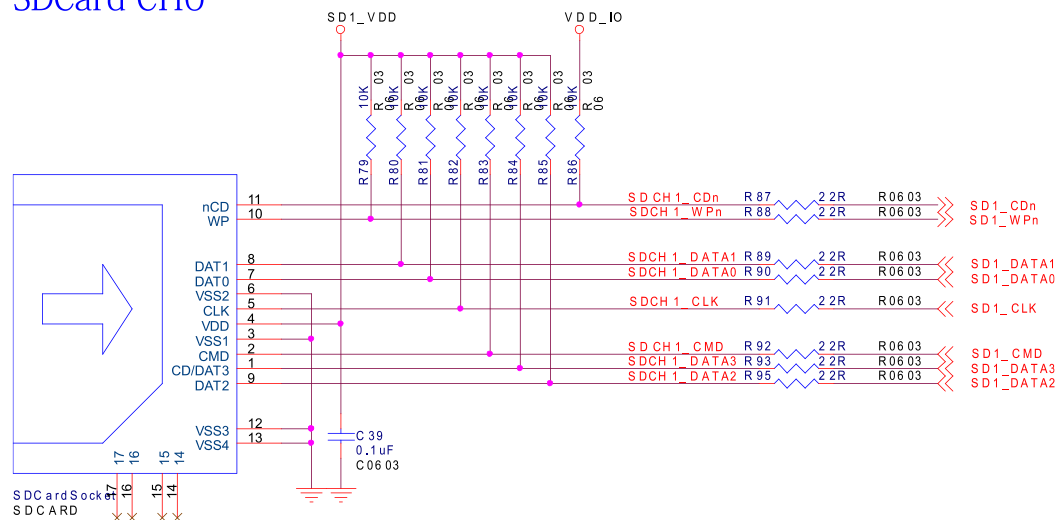
2.1.8 TV Out Circuit



2.1.9 SD Circuit



SDCard CH0



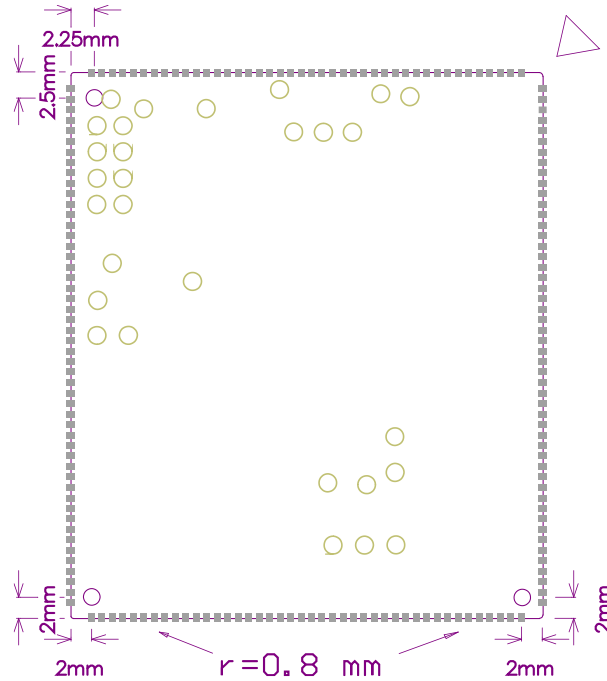
SDCard CH1

Boot in SD CH0

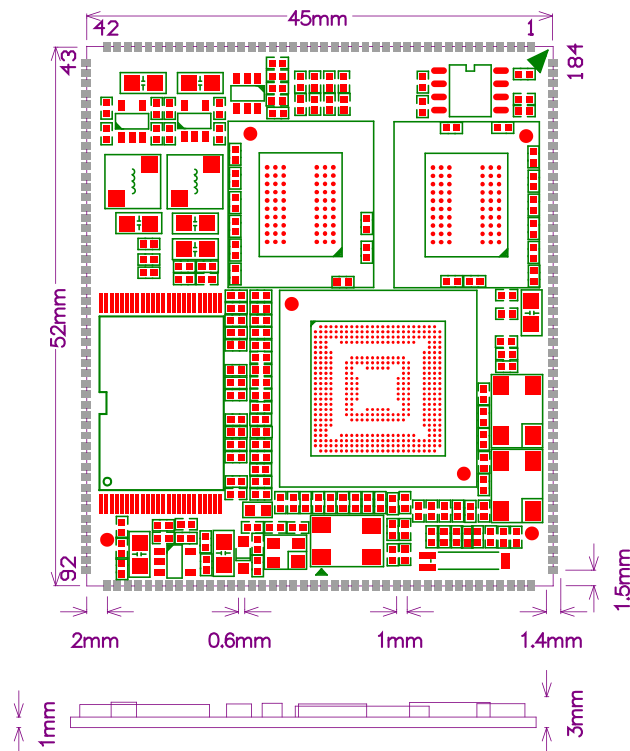


2.2 Dimensions and Footprint

2.2.1 Hole Specifications



2.2.2 PCB Footprint





3 Electric Property

3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VDD33V	Module Supply Voltage1	3.3-5%	3.3	3.3+5%	V
VDD5V	Module Supply Voltage2	3.3	5	5.5	V
Vrv	Max ripple Voltage			0.2	V
I _{max33V}	VDD33V Input Current		23	30	mA
I _{max5V}	VDD5V Input Current		130	150	mA
I _{maxCOMB}	Single 3.3V in Current		210	230	mA
VCC_RTC	RTC Battery Voltage	1.7	3	3.3	V
I _{rtc}	RTC Input Current			1	mA
T _a	Operating Temperature	-20		70	°C
T _{stg}	Storage Temperature	-40		85	°C

3. 2 Reliability of Test

High Temperature Operating Test		
Contents	Operating 8 h in high temperature	55°C+/-2°C
Result	Pass	

Operating life Test		
Contents	Operating in room	120h
Result	Pass	