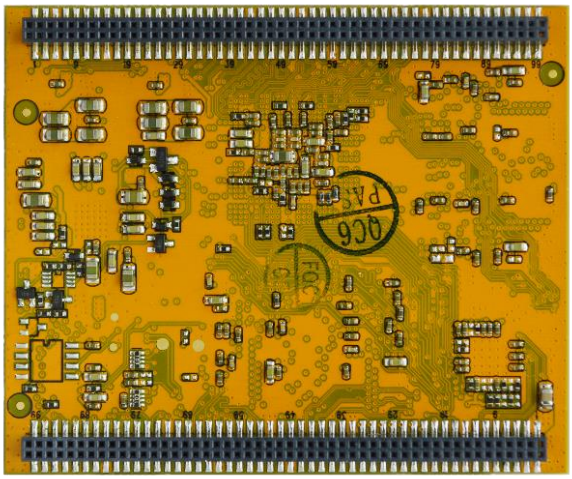
MINI3288 Reference User Manual

V4



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 products.

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 MINI3288 Introduction

1.1 Summary

MINI3288 is System on Module (SOM) based on the RK3288. The module has all pins function of RK3288, low cost and high-performance. Compatible with MINI3288.

RK3288 Integrate quad-core Cortex-A17 with separately Neon and FPU coprocessor, also shared 1MB L2 Cache. More than 32bits address will support up to 8GB access space.

Currently, latest generation and most powerful GPU is embedded to support smoothly high-resolution (3840x2160) display and mainstream game. Support OpenVG1.1, OpenGL ES1.1/2.0/3.0, OpenCL1.1, RenderScript and DirectX11 etc. Full-format video decoder, including 4Kx2K multi-format decoder.

Lots of high-performance interface to get very flexible solution, such as multi-pipe display with dual-channel LVDS, MIPI-DSI or MIPI-CSI option, HDMI2.0, dual-channel ISP embedded.

Dual-Channel 64bits DDR3/LPDDR2/LPDDR3 provide demanding memory bandwidths for high-performance and high-resolution application.

The single board computer has complete electronic documentation, schematics, demo applications, and third-party industry-standard C compilers and embedded development environments for evaluation. We are sure to have the right single board computer for your applications.

1.2 RK3288 Features

•CPU

− Quad-Core Cortex-A17 Separately Integrated Neon and FPU per CPU 32KB/32KB L1 ICache/DCache per CPU Unified 1MB L2 Cache

− LPAE (Large Physical Address Extensions) , Support up to 8GB address space Virtualization Extensions Support

•GPU

− Quad-Core Mali-T7 series, latest powerful graphics processor Architected for GPU computing

− Support OpenGL ES1.1/2.0/3.0, OpenVG1.1, OpenCL1.1 and Renderscript, Directx11

•VPU

–Support MPEG-2, MPEG-4, AVS, VC-1, VP8, MVC with up to 1080p@60fps

–Support multi-format video decoder with up to 4Kx2K

–Support muti-format video encoder with up to 1080p@30fps

•Video Interface

–Video Input: MIPI CSI, DVP

–Video display: RGB/ 8/10bits LVDS, HDMI2.0 to support maximum 4Kx2K display

•Memory Interface

–Nand Flash Interface

–eMMC Interface

–DDR interface

•Rich Connectivity

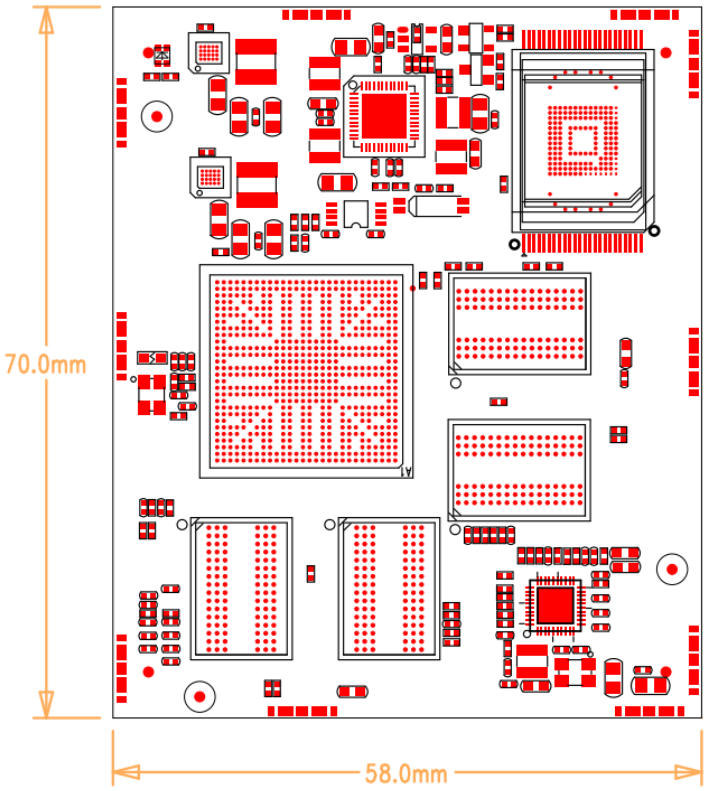
–3 SD/MMC/SDIO interface, compatible with SD3.0, SDIO3.0 and MMC4.5

–One 8-channels I2S/PCM interface, One 8-channels SPDIF interface
–One USB2.0 OTG, Two USB2.0 Host
–100M/1000M RMII/RGMII Ethernet interface
–Dual channel TS stream interface, descramble and demux support
–Smart Card interface
–4-CH UART, 2-CH SPI (option), 6-CH I2C(up to 4Mbps), 2-CH PWM（option）
–PS/2 master interface
–HSIC interface
–3-CH ADC input

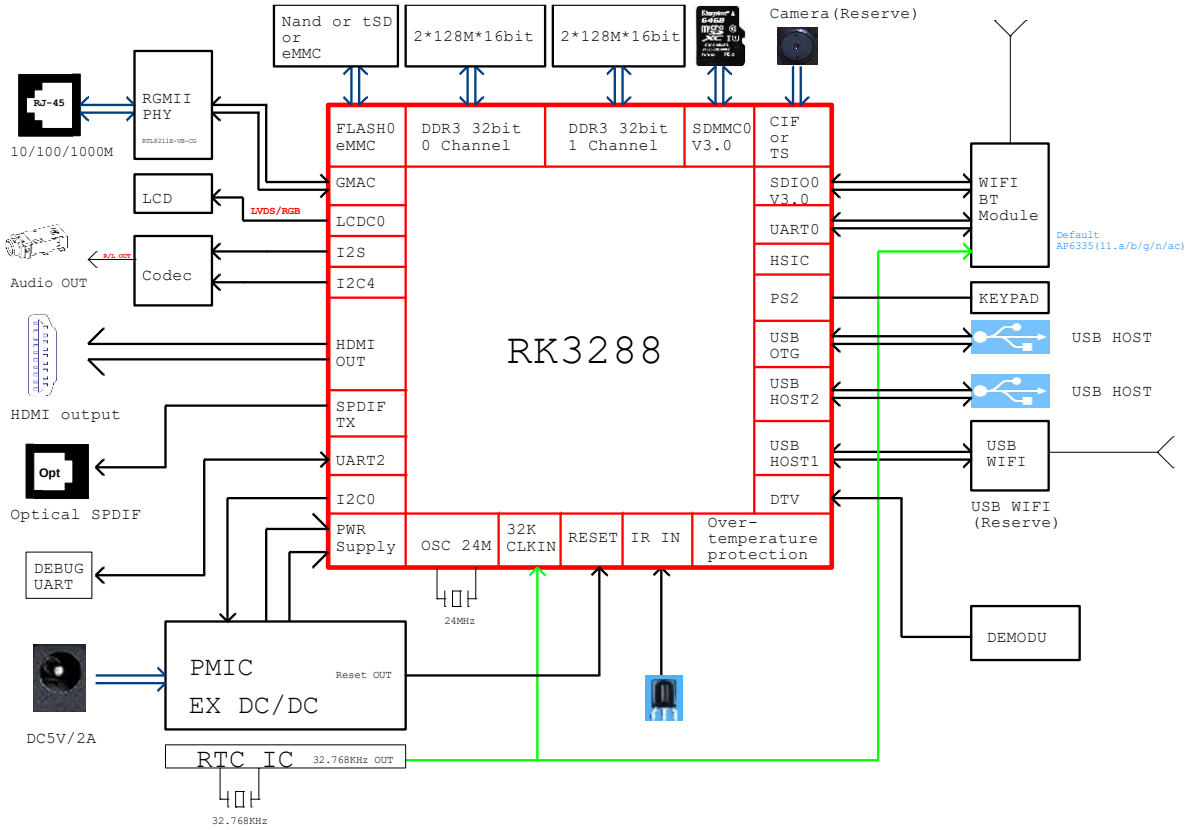
1.3 MINI3288 Features

Feature	Specifications
CPU	RK3288 Quad-core ARM Cortex-A17 MPCore processor
Memory	Default 512MB DDR3L
NAND Flash	8GB eMMC Flash
Power	DC 3.6V-5V power supply
PMU	ACT8846
UART	4-CH (up to 5-CH, option by SPI0)
RGB	24-bit
LVDS	1-CH 10bit Dul-LVDS
Ethernet	1 Gigabit (RTL8211 on board)
USB	2-CH USB2.0 Host, 1-CH USB2.0 OTG
SPDF	1-CH
CIF	1-CH DVP 8-bit and MIPI CSI
HDMI	1-CH
PS2	1-CH
ADC	3-CH
PWM	2-CH (up to 4-CH, option by UART2)
IIC	5-CH
AUDIO IF	1-CH
SPI	2-CH
HSMMC/SD	2-CH
Dimension	70 x 58 mm

1.4 PCB Dimension



1.5 Block Diagram



1.6 CPU Module Introduction

1.6.1 Electric property

◆ ***Dissipation***

Symbol	Parameter	Min	Typ	Max	Unit
SYS_POWER	System Supply Voltage Input	3.6	5	5	V
VCC_IO	IO Supply Voltage Output		3.3		V
VCCA_18	RK1000-S		1.8		V
VCCA_33	LCDC/I2S Controller		3.3		V
VCC_18	RK3288 SAR-ADC/ RK3288 USB PHY		1.8		V
VCC_LAN	LAN PHY		3.3		V
VCC_RTC	RTC Battery Voltage	2.5	3	3.6	V
Isys_power	System Supply Max Current		1.1	1.5	A
Imax(VCC_IO)	VCC_IO Max Current		600	800	mA
Ivcca_18	VCCA_18 Max Current			250	mA
Ivcca_33	VCCA_33 Max Current			350	mA
Ivcc_18	VCC_18 Max Current			350	mA

Irtc	RTC Input Current			10	uA

◆ ***CPU Temperature***

Test Conditions	Environment Temperature	Min	Typ	Max	Unit
Standby	20		43	45	℃
Play the video	20		45	48	℃
Full power	20		80	85	℃

1.6.2 Pin Definition

Pin (J1)	Signal name	Fuction 1	Fuction 2	IO Type
1	TX_C-	HDMI TMDS Clock-		O
2	TX_0-	HDMI TMDS Data0-		O
3	TX_C+	HDMI TMDS Clock+		O
4	TX_0+	HDMI TMDS Data0+		O
5	GND	Power Ground		P
6	GND	Power Ground		P
7	TX_1-	HDMI TMDS Data1-		O
8	TX_2-	HDMI TMDS Data2-		O
9	TX_1+	HDMI TMDS Data1+		O
10	TX_2+	HDMI TMDS Data2+		O
11	HDMI_HPD	HDMI Hot Plug Detection		I
12	HDMI_CEC	HDMI Consumer Electronics Control	GPIO7_C0_u	I/O
13	I2C5_SDA_HDMI	I2C5 Bus Data	GPIO7_C3_u	I/O
14	I2C5_SCL_HDMI	I2C5 Bus Clock	GPIO7_C4_u	I/O
15	GND	Power Ground		P
16	LCD_VSYNC	LCD Vertical Synchronization	GPIO1_D1_d	I/O
17	LCD_HSYNC	LCD Horizontal Synchronization	GPIO1_D0_d	I/O
18	LCD_CLK	LCD Clock	GPIO1_D3_d	I/O
19	LCD_DEN	LCD Enable	GPIO1_D2_d	I/O
20	LCD_D0_LD0P	LCD Data0 or LVDS Differential Data0+		I/O
21	LCD_D1_LD0N	LCD Data1 or LVDS Differential Data0-		I/O
22	LCD_D2_LD1P	LCD Data2 or LVDS Differential Data1+		I/O
23	LCD_D3_LD1N	LCD Data3 or LVDS Differential Data1-		I/O
24	LCD_D4_LD2P	LCD Data4 or LVDS Differential Data2+		I/O
25	LCD_D5_LD2N	LCD Data5 or LVDS Differential Data2-		I/O
26	LCD_D6_LD3P	LCD Data6 or LVDS Differential Data3+		I/O
27	LCD_D7_LD3N	LCD Data7 or LVDS Differential Data3-		I/O
28	LCD_D8_LD4P	LCD Data8 or LVDS Differential Data4+		I/O

Pin (J1)	Signal name	Fuction 1	Fuction 2	IO Type
29	LCD_D9_LD4N	LCD Data9 or LVDS Differential Data4-		I/O
30	LCD_D10_LCK0P	LCD Data10 or LVDS Differential Clock0+		I/O
31	LCD_D11_LCK0N	LCD Data11 or LVDS Differential Clock0-		I/O
32	LCD_D12_LD5P	LCD Data12 or LVDS Differential Data5+		I/O
33	LCD_D13_LD5N	LCD Data13 or LVDS Differential Data5-		I/O
34	LCD_D14_LD6P	LCD Data14 or LVDS Differential Data6+		I/O
35	LCD_D15_LD6N	LCD Data15 or LVDS Differential Data6-		I/O
36	LCD_D16_LD7P	LCD Data16 or LVDS Differential Data7+		I/O
37	LCD_D17_LD7N	LCD Data17 or LVDS Differential Data7-		I/O
38	LCD_D18_LD8P	LCD Data18 or LVDS Differential Data8+		I/O
39	LCD_D19_LD8N	LCD Data19 or LVDS Differential Data8-		I/O
40	LCD_D20_LD9P	LCD Data20 or LVDS Differential Data9-		I/O
41	LCD_D21_LD9N	LCD Data21 or LVDS Differential Data9+		I/O
42	LCD_D22_LCK1P	LCD Data22 or LVDS Differential Clock1+		I/O
43	LCD_D23_LCK1N	LCD Data23 or LVDS Differential Clock1-		I/O
44	GND	Power Ground		P
45	MIPI_TX/RX_CLKN	MIPI Clock negative signal input		I/O
46	MIPI_TX/RX_D0P	MIPI data pair 0 positive signal input		I/O
47	MIPI_TX/RX_CLKP	MIPI Clock positive signal input		I/O
48	MIPI_TX/RX_D0N	MIPI data pair 0 negative signal input		I/O
49	MIPI_TX/RX_D2N	MIPI data pair 2 negative signal input		I/O
50	MIPI_TX/RX_D1N	MIPI data pair 1 negative signal input		I/O
51	MIPI_TX/RX_D2P	MIPI data pair 2 positive signal input		I/O
52	MIPI_TX/RX_D1P	MIPI data pair 1 positive signal input		I/O
53	MIPI_TX/RX_D3P	MIPI data pair 3 positive signal input		I/O
54	GND	Power Ground		P
55	MIPI_TX/RX_D3N	MIPI data pair 3 negative signal input		I/O
56	DVP_PWR		GPIO0_C1_d	I/O
57	HSIC_STROBE	HSIC_STROBE		
58	HSIC_DATA	HSIC_DATA		
59	GND	Power Ground		P
60	CIF_D1		GPIO2_B5_d	I/O
61	CIF_D0		GPIO2_B4_d	I/O
62	CIF_D3	HOST_D1 or TS_D1	GPIO2_A1_d	I/O
63	CIF_D2	HOST_D0 or TS_D0	GPIO2_A0_d	I/O
64	CIF_D5	HOST_D3 or TS_D3	GPIO2_A3_d	I/O
65	CIF_D4	HOST_D2 or TS_D2	GPIO2_A2_d	I/O
66	CIF_D7	HOST_CKINN or TS_D5	GPIO2_A5_d	I/O
67	CIF_D6	HOST_CKINP or TS_D4	GPIO2_A4_d	I/O

Pin (J1)	Signal name	Fuction 1	Fuction 2	IO Type
68	CIF_D9	HOST_D5 or TS_D7	GPIO2_A7_d	I/O
69	CIF_D8	HOST_D4 or TS_D6	GPIO2_A6_d	I/O
70	CIF_PDN0		GPIO2_B7_d	I/O
71	CIF_D10		GPIO2_B6_d	I/O
72	CIF_HREF	HOST_D7 or TS_VALID	GPIO2_B1_d	I/O
73	CIF_VSYNC	HOST_D6 or TS_SYNC	GPIO2_B0_d	I/O
74	CIF_CLKOUT	HOST_WKREQ or TS_FAIL	GPIO2_B3_d	I/O
75	CIF_CLKIN	HOST_WKACK or GPS_CLK or TS_CLKOUT	GPIO2_B2_d	I/O
76	I2C3_SCL		GPIO2_C0_u	I/O
77	I2C3_SDA		GPIO2_C1_u	I/O
78	GND	Power Ground		P
79	GPIO0_B2_D	OTP_OUT	GPIO0_B2_d	I/O
80	GPIO7_A3_D		GPIO7_A3_d	I/O
81	GPIO7_A6_U		GPIO7_A6_u	I/O
82	GPIO0_A6_U		GPIO0_A6_u	I/O
83	LED0_AD0	PHYAD0		
84	LED1_AD1	PHYAD1		
85	VCC_LAN	Ethernet Power Supply 3.3V		
86	PS2_DATA	PS2 Data	GPIO8_A1_u	I/O
87	PS2_CLK	PS2 Clock	GPIO8_A0_u	I/O
88	ADC0_IN			I
89	GPIO0_A7_U		PMUGPIO0_A7_u	I/O
90	ADC1_IN	RECOVER		I
91	VCCIO_SD	SD Card power Supply 3.3V		
92	ADC2_IN			I
93	VCC_CAM	Power 1.8V		
94	VCCA_33	Power 3.3V		
95	VCC_18	Power 1.8V		
96	VCC_RTC	Real-Time Clock Power Supply		
97	VCC_IO	3.3V		
98	GND	Power Ground		P
99	VCC_IO	3.3V		
100	GND	Power Ground		P

Pin (J2)	Signal name	Fuction 1	Fuction 2	IO Type
1	VCC_SYS	System Power Supply 3.6~5V		
2	GND	Power Ground		
3	VCC_SYS	System Power Supply 3.6~5V		
4	GND	Power Ground		

Pin (J2)	Signal name	Fuction 1	Fuction 2	IO Type
5	nRESET	System Reset		I
6	MDI0+	100M/1G Ethernet MDI0+		
7	MDI1+	100M/1G Ethernet MDI1+		
8	MDI0-	100M/1G Ethernet MDI0-		
9	MDI1-	100M/1G Ethernet MDI1-		
10	IR_INT	PWM CH0	GPIO7_A0_d	I/O
11	MDI2+	100M/1G Ethernet MDI2+		
12	MDI3+	100M/1G Ethernet MDI3+		
13	MDI2-	100M/1G Ethernet MDI2-		
14	MDI3-	100M/1G Ethernet MDI3-		
15	GND	Power Ground		P
16	RST_KEY	System Reset		I
17	SDIO0_CMD		GPIO4_D0_u	I/O
18	SDIO0_D0		GPIO4_C4_u	I/O
19	SDIO0_D1		GPIO4_C5_u	I/O
20	SDIO0_D2		GPIO4_C6_u	I/O
21	SDIO0_D3		GPIO4_C7_u	I/O
22	SDIO0_CLK		GPIO4_D1_d	I/O
23	BT_WAKE	SDIO0_DET	GPIO4_D2_u	I/O
24	SDIO0_WP		GPIO4_D3_d	I/O
25	WIFI_REG_ON	SDIO0_PWR	GPIO4_D4_d	I/O
26	BT_HOST_WAKE		GPIO4_D7_u	I/O
27	WIFI_HOST_WAKE	SDIO0_INTn	GPIO4_D6_u	I/O
28	BT_RST	SDIO0_BKPWR	GPIO4_D5_d	I/O
29	SPI2_CLK	SC_IO_T1	GPIO8_A6_d	I/O
30	SPI2_CSn0	SC_DET_T1	GPIO8_A7_u	I/O
31	SPI2_RXD	SC_RST_T1	GPIO8_B0_d	I/O
32	SPI2_TXD	SC_CLK_T1	GPIO8_B1_d	I/O
33	OTG_VBUS_DRV		GPIO0_B4_d	I/O
34	HOST_VBUS_DRV		GPIO0_B6_d	I/O
35	UART0_RX		GPIO4_C0_u	I/O
36	UART0_TX		GPIO4_C1_d	I/O
37	GND	Power Ground		P
38	UART0_CTS		GPIO4_C2_u	I/O
39	OTG_DM			
40	UART0_RTS		GPIO4_C3_u	I/O
41	OTG_DP			
42	OTG_ID			
43	HOST1_DM	USB host port 1 negative data		

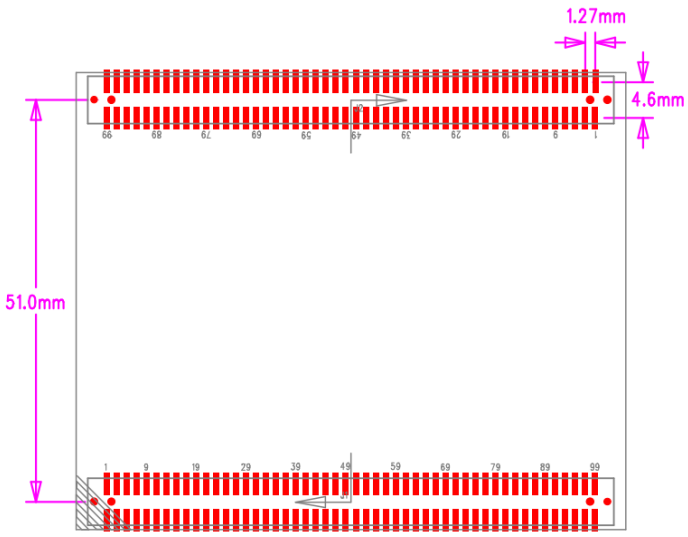
Pin (J2)	Signal name	Fuction 1	Fuction 2	IO Type
44	OTG_DET			
45	HOST1_DP	USB host port 1 positive data		
46	HOST2_DM	USB host port 2 negative data		
47	SPI0_CSn0	UART4_RTSn or TS0_D5	GPIO5_B5_u	I/O
48	HOST2_DP	USB host port 2 positive data		
49	SPI0_CLK	UART4_CTSn or TS0_D4	GPIO5_B4_u	I/O
50	GND	Power Ground		P
51	SPI0_UART4_RXD	UART4_RX or TS0_D7	GPIO5_B7_u	I/O
52	SPI0_UART4_TXD	UART4_TX or TS0_D6	GPIO5_B6_d	I/O
53	GND	Power Ground		P
54	TS0_SYNC	SPI0_CSn1	GPIO5_C0_u	I/O
55	UART1_CTSn	TS0_D2	GPIO5_B2_u	I/O
56	UART1_RTSn	TS0_D3	GPIO5_B3_u	I/O
57	UART1_RX_TS0_D0	TS0_D0	GPIO5_B0_u	I/O
58	UART1_TX	TS0_D1	GPIO5_B1_d	I/O
59	TS0_CLK		GPIO5_C2_d	I/O
60	TS0_VALID		GPIO5_C1_d	I/O
61	TS0_ERR		GPIO5_C3_d	I/O
62	GPIO7_B4_U	ISP_SHUTTEREN or SPI1_CLK	GPIO7_B4_u	I/O
63	SDMMC_CLK	JTAG_TDO	GPIO6_C4_d	I/O
64	GND	Power Ground		P
65	SDMMC_D0	JTAG_TMS	GPIO6_C0_u	I/O
66	SDMMC_CMD		GPIO6_C5_u	I/O
67	SDMMC_D2	JTAG_TDI	GPIO6_C2_u	I/O
68	SDMMC_D1	JTAG_TRSTN	GPIO6_C1_u	I/O
69	SDMMC_DET		GPIO6_C6_u	I/O
70	SDMMC_D3	JTAG_TCK	GPIO6_C3_u	I/O
71	SDMMC_PWR	eDP_HOTPLUG	GPIO7_B3_d	I/O
72	GPIO0_B5_D	General IO		I/O
73	GND	Power Ground		P
74	GPIO7_B7_U	ISP_SHUTTERTRIG	GPIO7_B7_u	I/O
75	I2S_SDI		GPIO6_A3_d	I/O
76	I2S_MCLK		GPIO6_B0_d	I/O
77	I2S_SCLK		GPIO6_A0_d	I/O
78	I2S_LRCK_RX		GPIO6_A1_d	I/O
79	I2S_LRCK_TX		GPIO6_A2_d	I/O
80	I2S_SDO0		GPIO6_A4_d	I/O
81	I2S_SDO1		GPIO6_A5_d	I/O
82	I2S_SDO2		GPIO6_A6_d	I/O

Pin (J2)	Signal name	Fuction 1	Fuction 2	IO Type
83	I2S_SDO3		GPIO6_A7_d	I/O
84	SPDIF_TX		GPIO6_B3_d	I/O
85	I2C2_SDA		GPIO6_B1_u	I/O
86	GND	Power Ground		P
87	I2C1_SDA	SC_RST	GPIO8_A4_u	I/O
88	I2C2_SCL		GPIO6_B2_u	I/O
89	I2C4_SDA		GPIO7_C1_u	I/O
90	I2C1_SCL	SC_CLK	GPIO8_A5_u	I/O
91	UART2_RX	IR_RX or PWM2	GPIO7_C6_u	I/O
92	I2C4_SCL		GPIO7_C2_u	I/O
93	UART3_RX	GPS_MAG or HSADC_D0_T1	GPIO7_A7_u	I/O
94	UART2_TX	IR_TX or PWM3 or EDPHDMI_CEC	GPIO7_C7_u	I/O
95	UART3_RTSn		GPIO7_B2_u	I/O
96	UART3_TX	GPS_SIG or HSADC_D1_T1	GPIO7_B0_d	I/O
97	PWM1		GPIO7_A1_d	I/O
98	UART3_CTSn	GPS_RFCLK or GPS_CLK_T1	GPIO7_B1_u	I/O
99	PWR_KEY			I
100	GPIO7_C5_D		GPIO7_C5_d	I/O

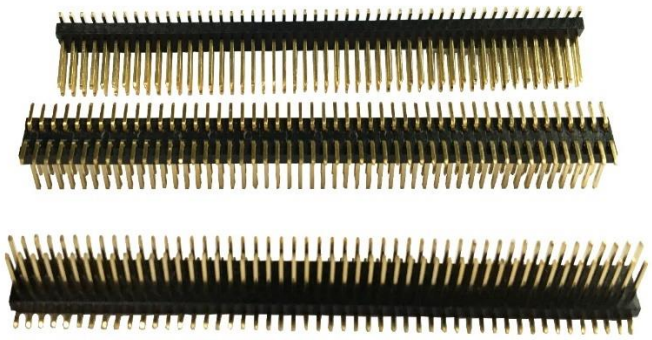
How to use the MINI3288 module

2.1 Connectors

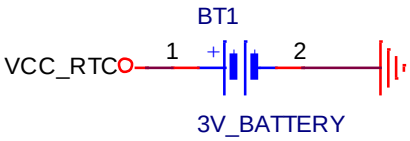
◆ ***PCB dimension of the connectors***



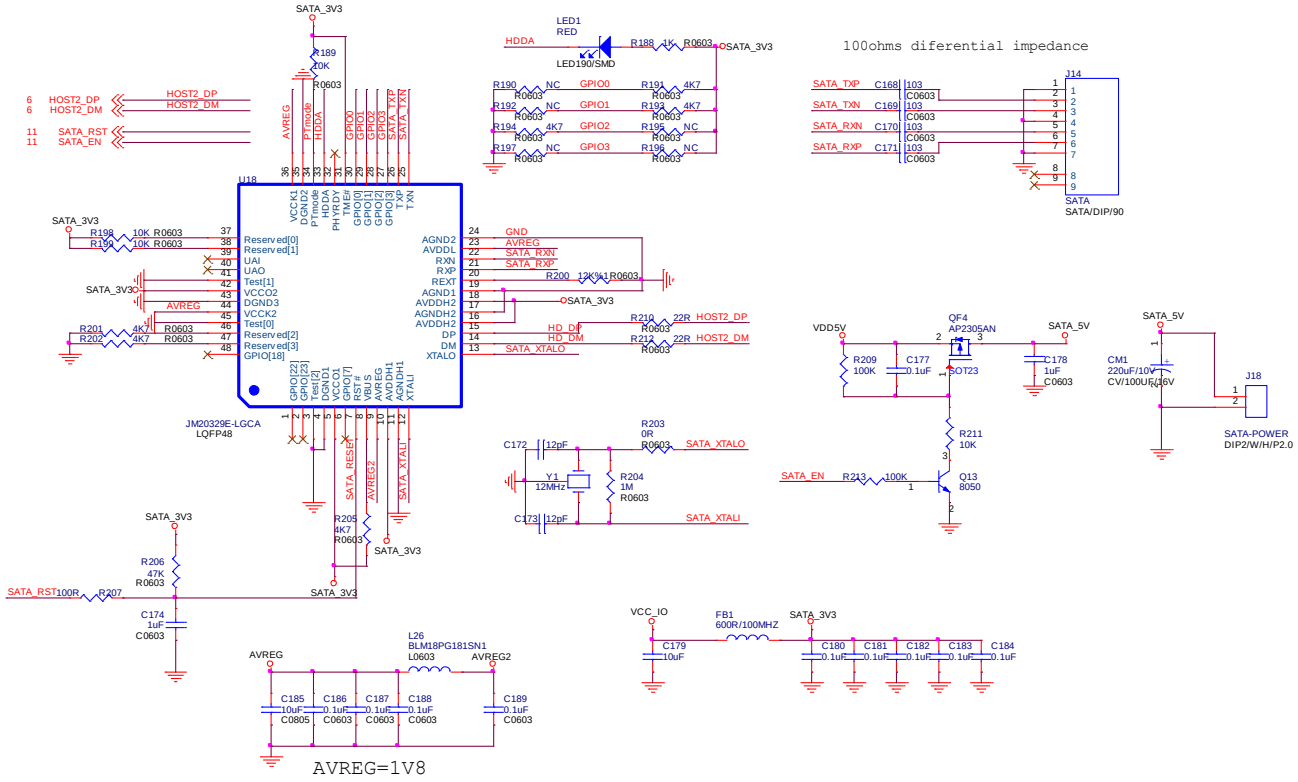
◆ ***The picture of the connectors***



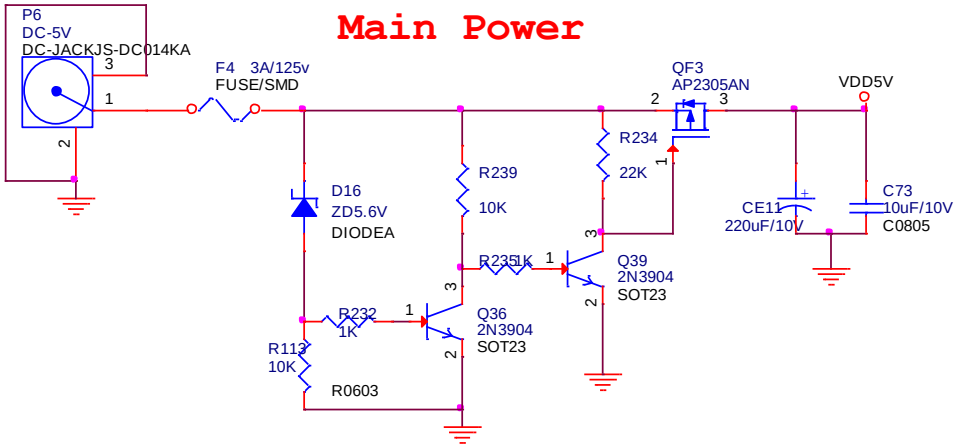
2.2 RTC Battery Circuit



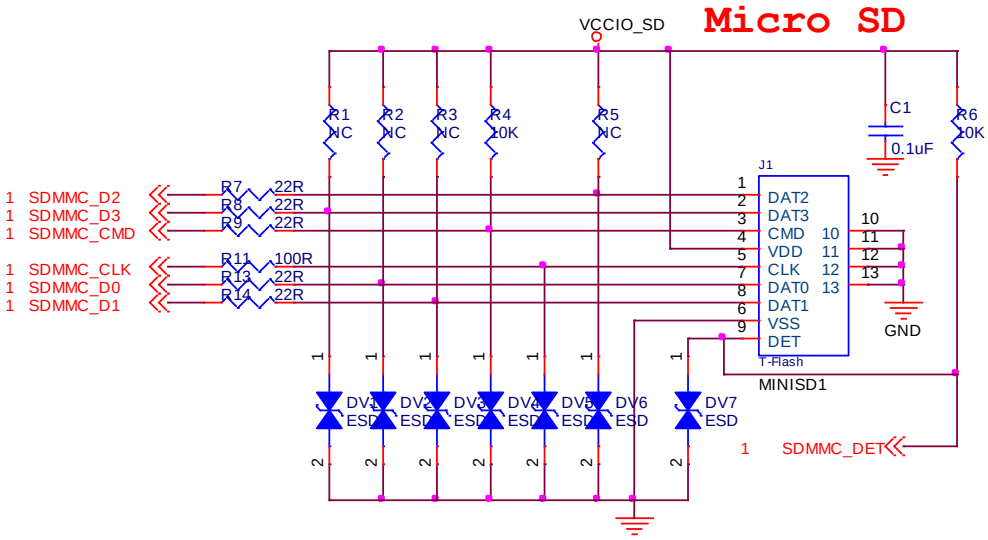
2.3 SATA Circuit



2.4 Power Circuit

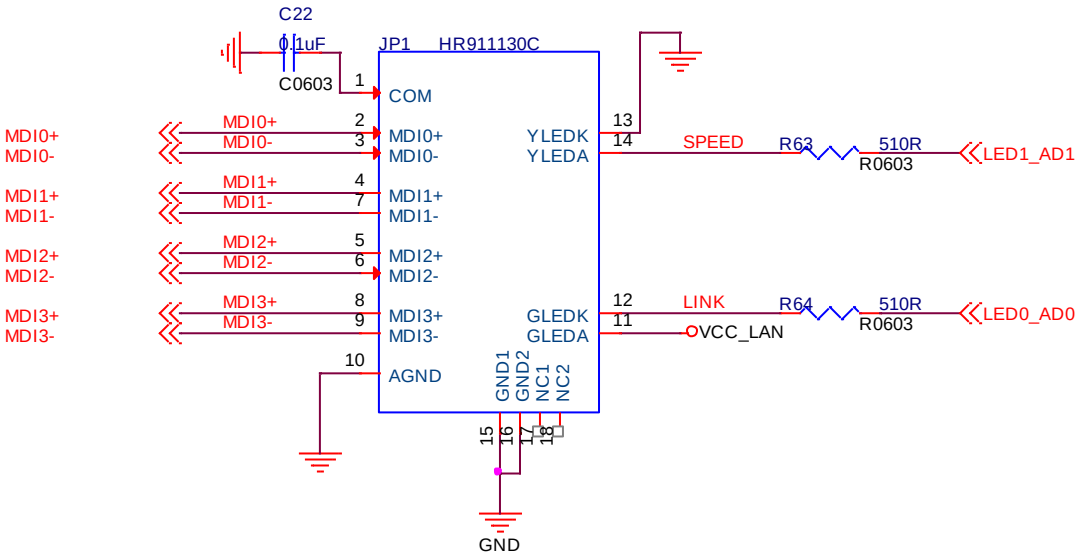


2.5 SD Interface Circuit

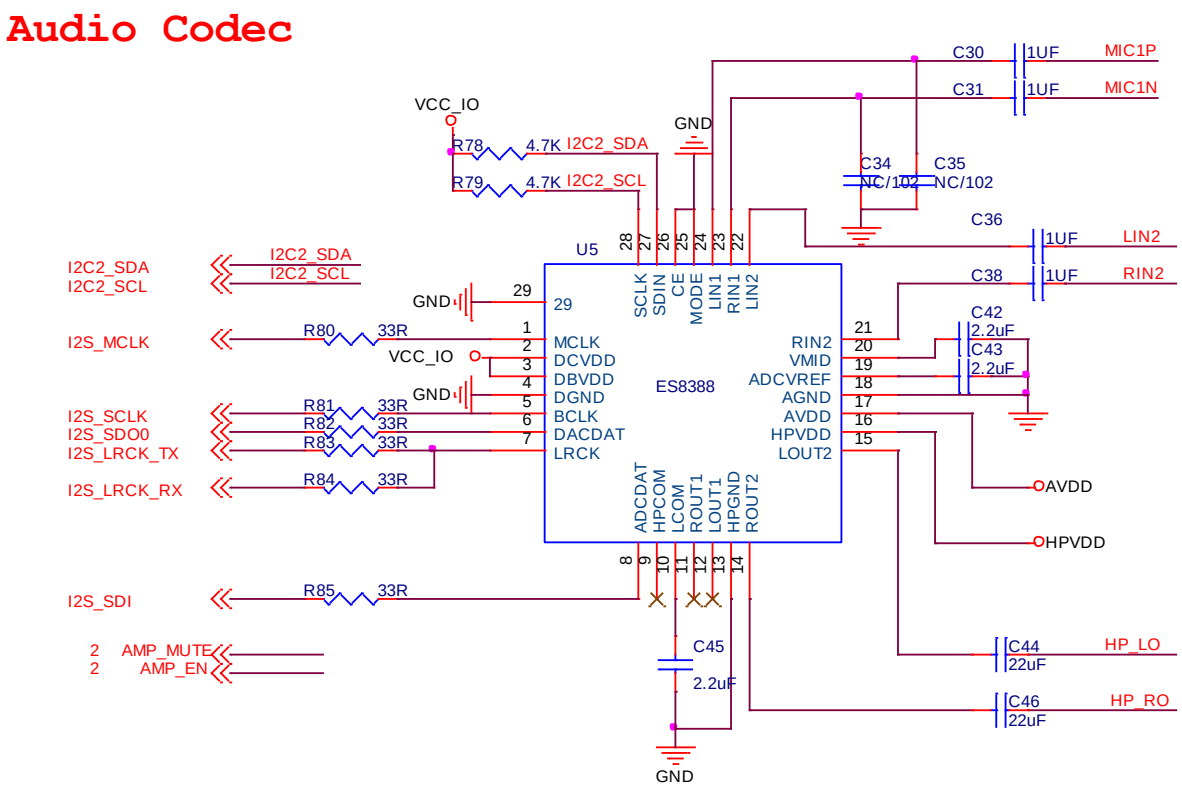


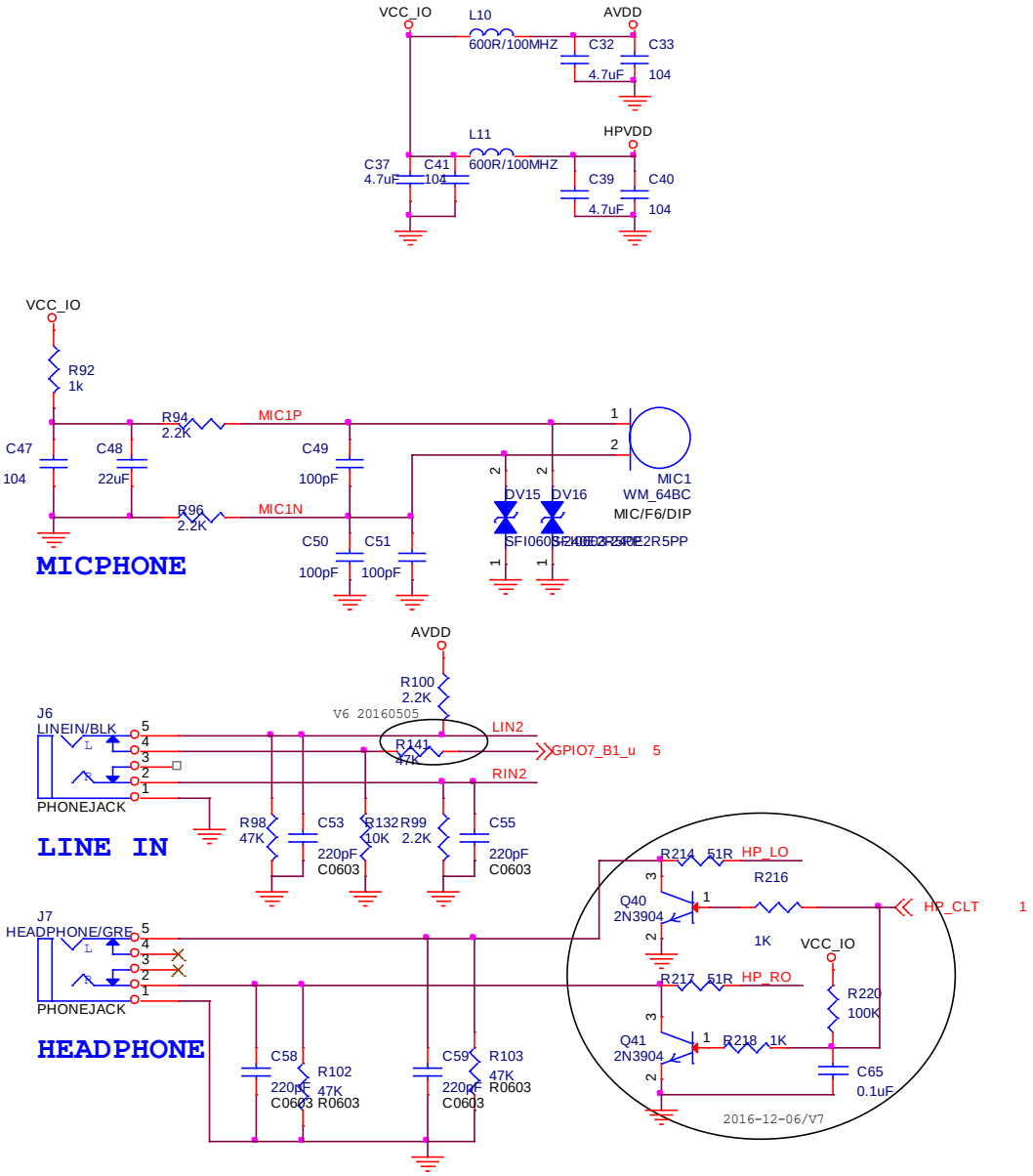
SD (Security Digital) card is a kind of widely applied card. A specified interface circuit on platform supports reading and writing function of SD card.

2.6 Ethernet Interface Circuit

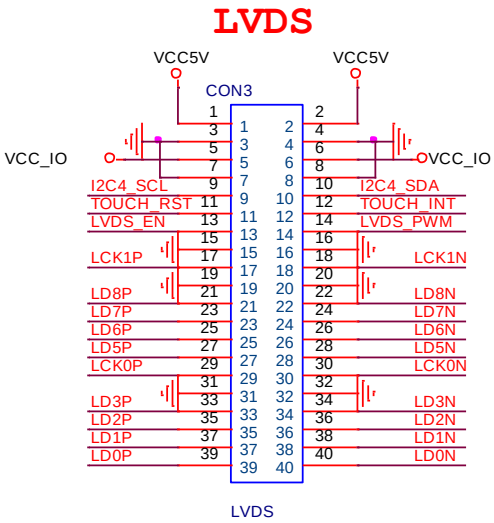


2.7 Audio Codec Circuit

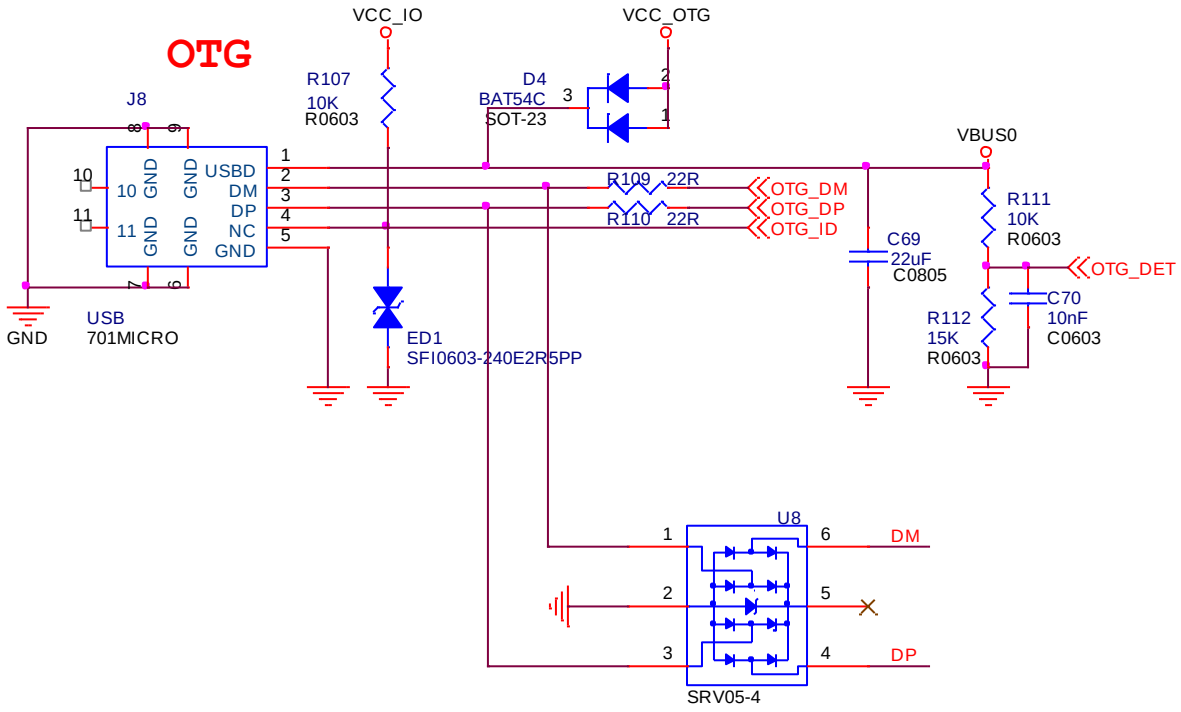


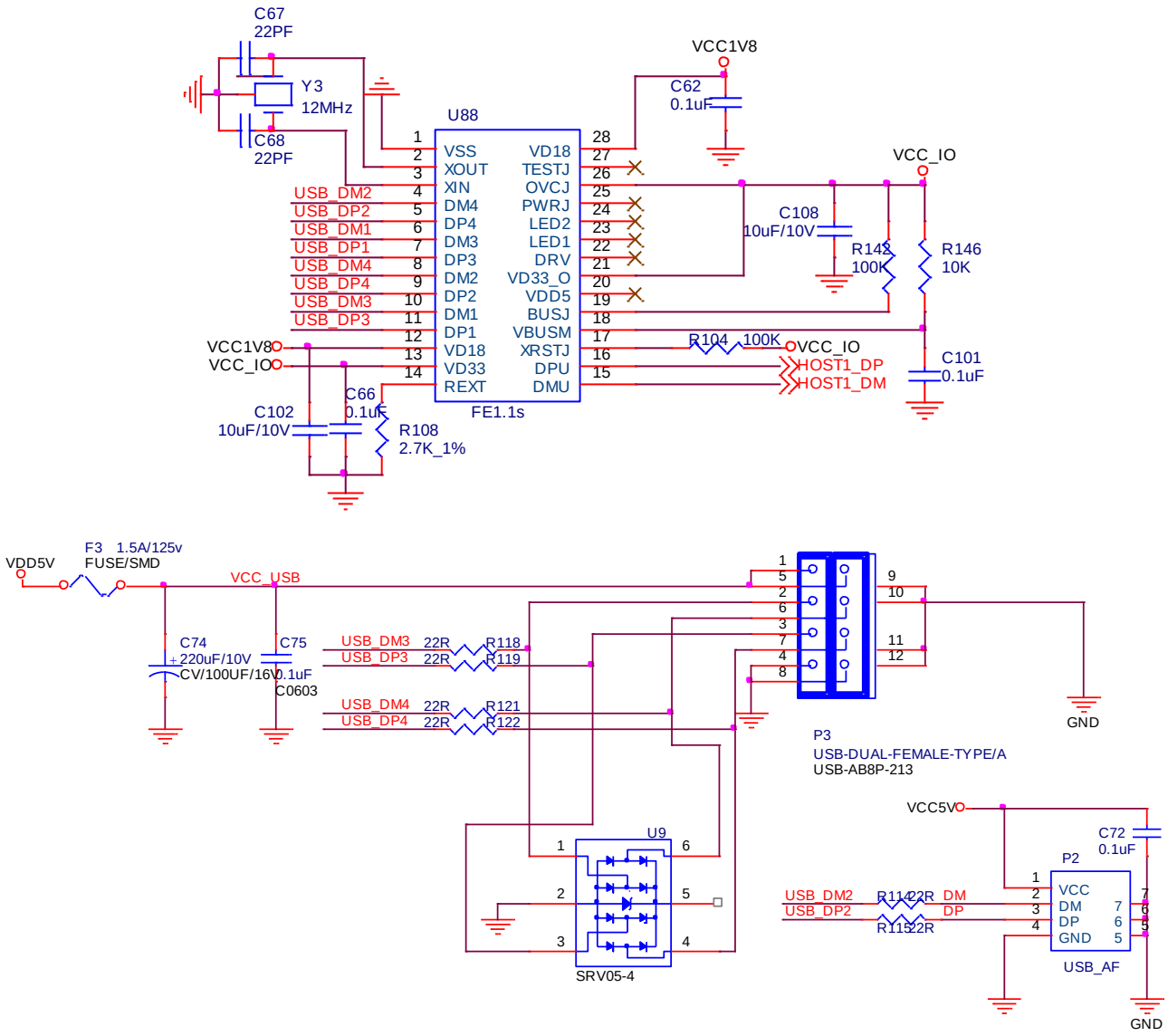

VCC_IO
L10
600R/100MHZ
AVDD
C32
4.7uF
C33
104
L11
HPVDD
C37
4.7uF
C41
104
600R/100MHZ
C39
4.7uF
C40
104
VCC_IO
R92
1k
R94
2.2K
MIC1P
C47
104
C48
22uF
C49
100pF
R96
2.2K
MIC1N
C50
100pF
C51
100pF
DV15
DV16
MIC1
WM_64BC
MIC/F6/DIP
MICPHONE
AVDD
R100
2.2K
V6 20160505
J6
LINEIN/BLK
R141
47K
LIN2
RIN2
GPIO7_B1_u
5
PHONEJACK
LINE IN
R98
47K
C53
220pF
C0603
R132
10K
R99
2.2K
C55
220pF
C0603
J7
HEADPHONE/GRE
PHONEJACK
HEADPHONE
C58
220pF
C0603
R102
47K
R0603
C59
220pF
C0603
R103
47K
R0603
R214
51R
HP_LO
R216
Q40
2N3904
1K
HP_CLT
1
VCC_IO
R217
51R
HP_RO
R220
100K
Q41
2N3904
R218
1K
C65
0.1uF
2016-12-06/V7

2.8 Display Circuit

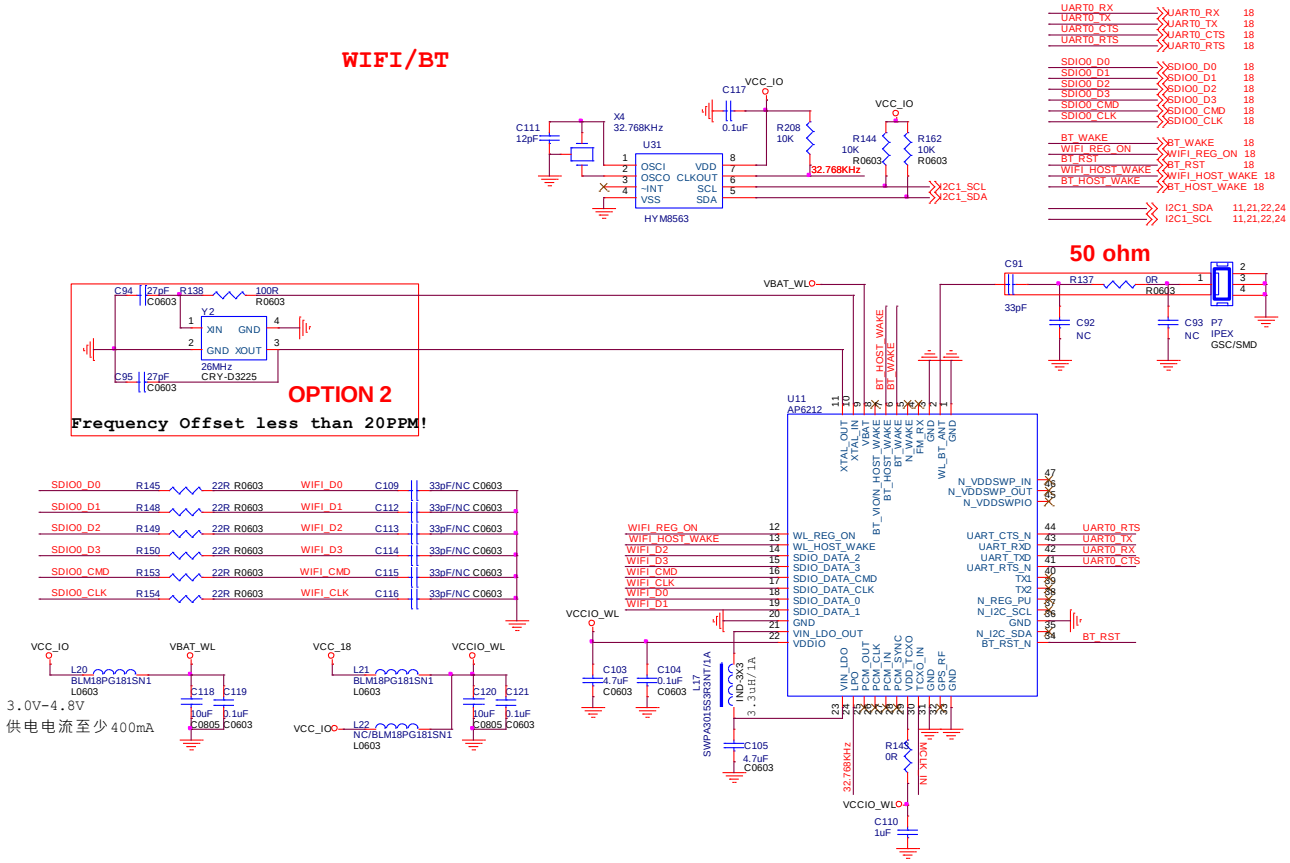


2.9 USB Interface Circuit

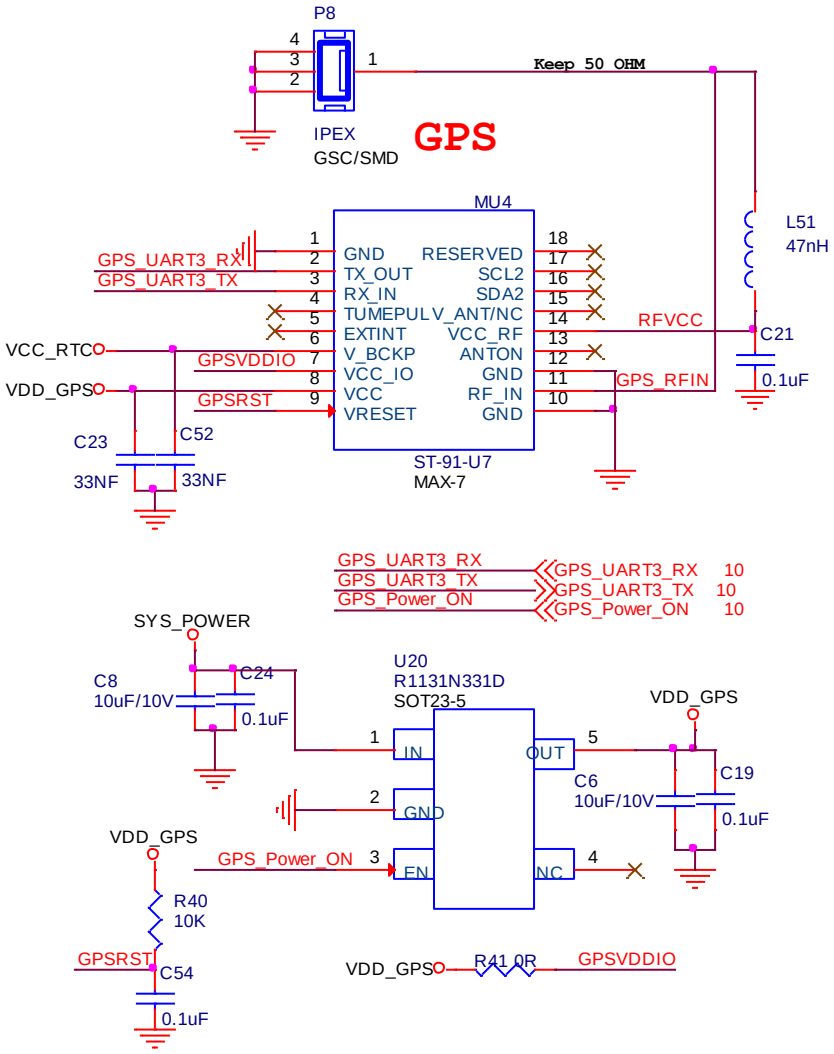



C67
22PF
Y3
12MHz
C68
22PF
U88
VSS
XOUT
XIN
DM4
DP4
DM3
DP3
DM2
DP2
DM1
DP1
VD18
VD33
REXT
VD18
TESTJ
OVCJ
PWRJ
LED2
LED1
DRV
VD33_O
VDD5
BUSJ
VBUSM
XRSTJ
DPU
DMU
FE1.1s
USB_DM2
USB_DP2
USB_DM1
USB_DP1
USB_DM4
USB_DP4
USB_DM3
USB_DP3
VCC1V8
VCC_IO
C62
0.1uF
C108
10uF/10V
R142
100K
R146
10K
R104
100K
HOST1_DP
HOST1_DM
C101
0.1uF
C66
0.1uF
C102
10uF/10V
R108
2.7K_1%
F3
1.5A/125v
FUSE/SMD
VDD5V
VCC_USB
C74
220uF/10V
CV/100UF/16V
C75
0.1uF
C0603
USB_DM3
USB_DP3
USB_DM4
USB_DP4
22R
R118
R119
R121
R122
P3
USB-DUAL-FEMALE-TYPE/A
USB-AB8P-213
GND
U9
SRV05-4
VCC5V
C72
0.1uF
P2
VCC
DM
DP
GND
USB_AF
R115
R116
DM
DP

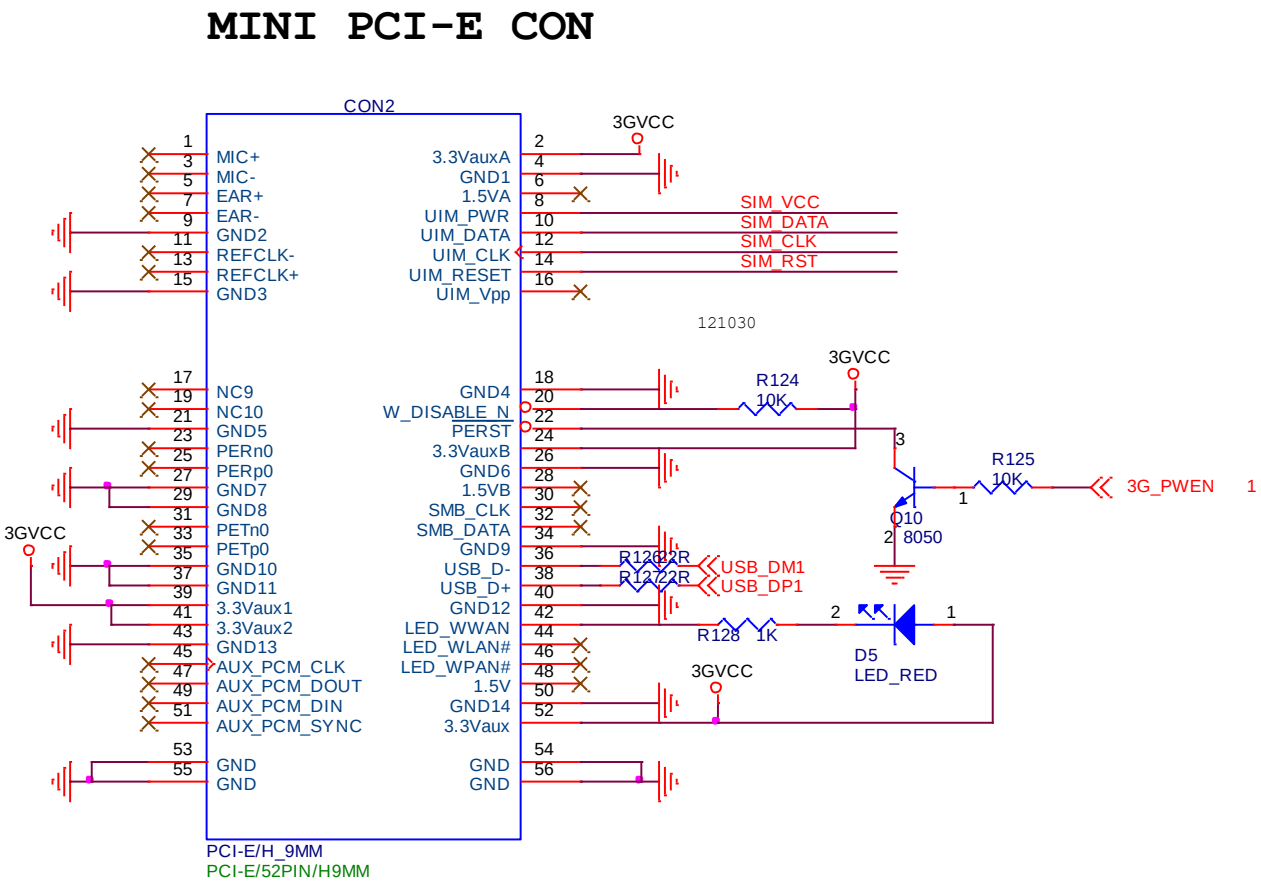
2.10 WiFi/BT Circuit

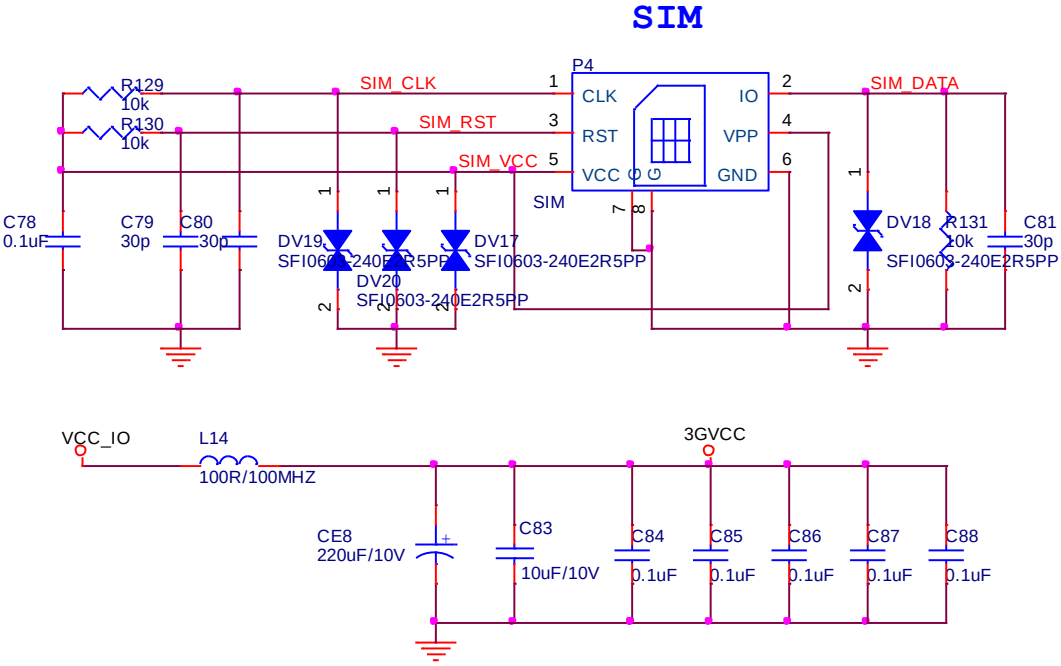


2.11 GPS Circuit

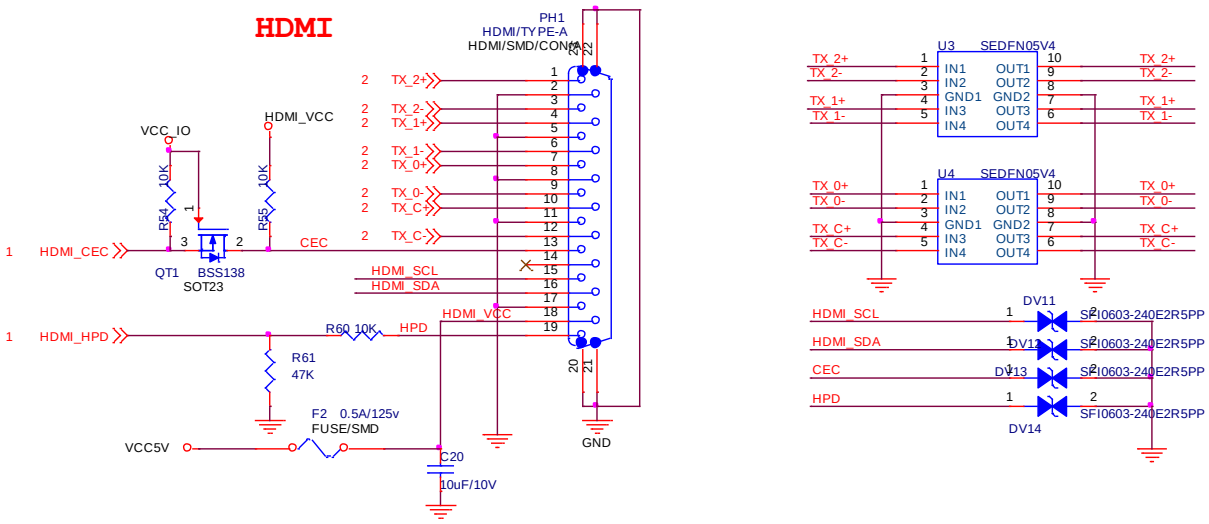


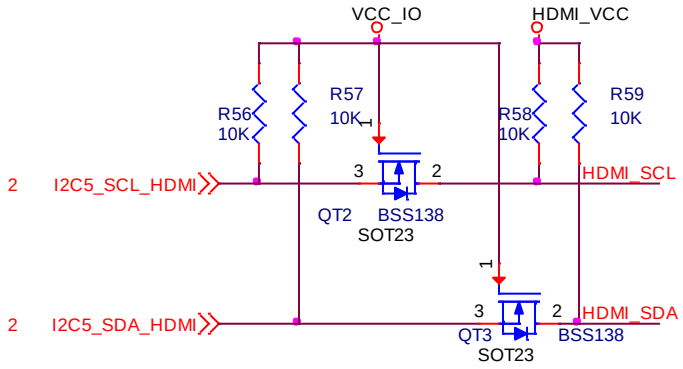
2.12 4G Circuit





2.13 HDMI Circuit





I2C Level Shift