Rockchip
瑞芯微电子

Rockchip RK3288
EVB 2.0 User Guide

Release Version:V1.0

Date:2018.02.01

Foreword

Summarize

This document mainly describes the basic functions and hardware features of RK3288 EVB, provides information for software debug operations. The purpose of this document helps developers to use RK3288 EVB more quickly and accurately, to be familiar with RK3288 SOC solutions.

Product version

Corresponding product versions of this document as following:：

Product name	Product version
RK3288 EVB main board	RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012SQJ
eDP Display Board (panel resolution:1536 x 2048, the same as iPADmini2)	RK_EVB_ExtBoard_eDPDisplay_V10_20171013J

Target user

Target user as followings: technical support engineer, hardware development engineer, embedded software development engineer and test engineer.

Revision History

Document edition record the note of each update. Latest edition of this document contains the updates of all previous editions.

Date	History	Author	Modification description
2017-12-28	v1.0	HXS，YJH	Initial edition

Acronym

Acronym include the short name of common phrases in this document.

Acronym	English Description	中文描述
eDP	Embedded DisplayPort	嵌入式数码音视讯传输接口
HDMI	High Definition Multimedia Interface	高清晰度多媒体接口
I^2C	Inter-Integrated Circuit	内部整合电路(两线式串行通讯总线)
JTAG	Joint Test Action Group	联合测试行为组织定义的一种国际标准测试协议（IEEE 1149.1 兼容）
LDO	Low Drop Out Linear Regulator	低压差线性稳压器
MIPI	Mobile Industry Processor Interface	移动产业处理器接口
CIF	Common Intermediate Format	通用影像传输格式
PMIC	Power Management IC	电源管理芯片
PMU	Power Management Unit	电源管理单元
RK	Rockchip Electronics Co.,Ltd.	瑞芯微电子股份有限公司
SD Card	Secure Digital Memory Card	安全数码卡
SPDIF	Sony/Philips Digital Interface Format	SONY、PHILIPS 数字音频接口
TF Card	Micro SD Card(Trans-flash Card)	外置记忆卡
USB 2.0	Universal Serial Bus	通用串行总线

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1 System Overview

1.1 Overview

RK3288 EVB with rich periphenal interfaces is designed for product and software development,peripheral debugging.

RK3288 is a low power, high performance processor for tablet PC, notebook, personal mobile internet device and other digital multimedia applications, and it's one of the most powerful 4Kx2K television box solutions.

RK3288 is a quad-core Cortex-A17 processor with integrated NEON and NFU coprocessors, based on 28nm manufacturing technology. Two channels 32bits DDR3/LPDDR2/LPDDR3 controllers provide high bandwidth for high performance and high resolution applications. Integrated ARM Mali-T764 GPU core support high resolution display and mainstream game perfectly.

RK3288 support OpenGL ES1.1/2.0/3.0, OpenCL 1.1 and DirectX 11 with integrated 2D/3D GPU accelerator, especially a significant promotion in 3D effect comparing to other product. RK3288 supports all mainstream video format; includeH.265 decoder by 2160p@60fps, H.264 decoder by 2160p@24fps, also support H.264/MVC/VP8 encoder by 1080p@30fps, high-quality JPEG encoder/decoder, and image preprocessor and postprocessor. It has various high-performance port, makes the display output with flexible solution, such as binary channels LVDS, binary channels MIPI-DSI, eDP1.1, HDMI 2.0 and etc. support two channels MIPI-CSI port which could process 13 mega-pixel ISP.

After connected to computer through USB or Ethernet, RK3288 development board can work as a basic develop system, or implement more complete development system or demo environment, then need to connect following devise or component:

- Television or monitor
- JTAG emulator
- USB flash disk, TF card, SD card
- Earphone or loudspeaker box
- Camera module
- Keyboard or mouse with USB port

1.2 System block diagram

1.2.1 RK3288 SOC block diagram

The RK3288 SOC block diagram illustrates the function and quantity of all modules (e.g., UART X5 represents a total of five UART signals for the RK3288 SOC). Please refer to RK3288 datasheet for detail information of each module.

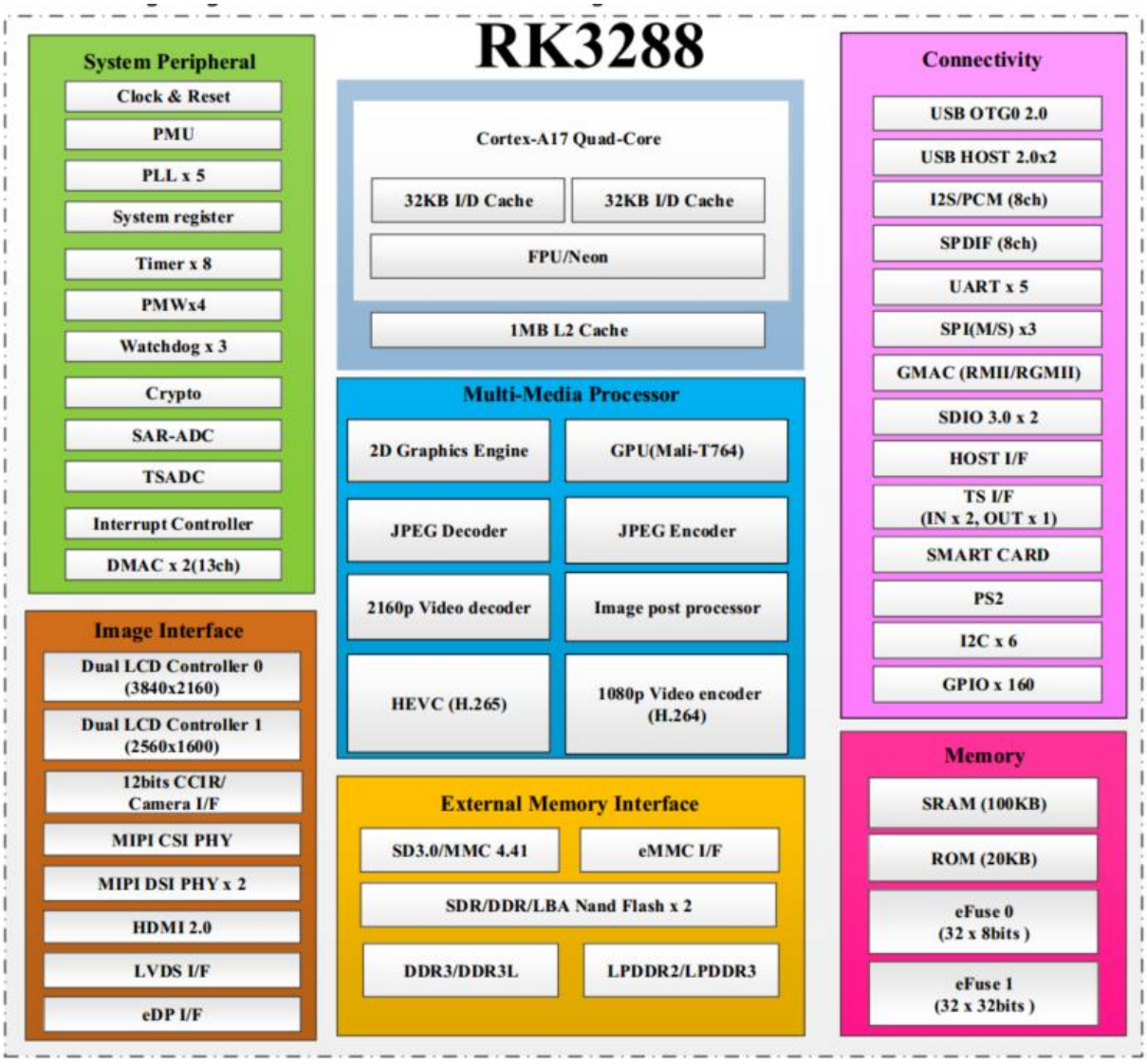


Figure 1-1 RK3288 SOC block diagram

1.2.2 RK3288 EVB system chart

RK3288 EVB is based on RK3288 processer. Power supply system consists of PMIC RK 808, peripheral bucks, LDOs. LPDDR3, EMMC and related functional peripherals constitutes a stable mass production solution. Detailed block diagram as below:

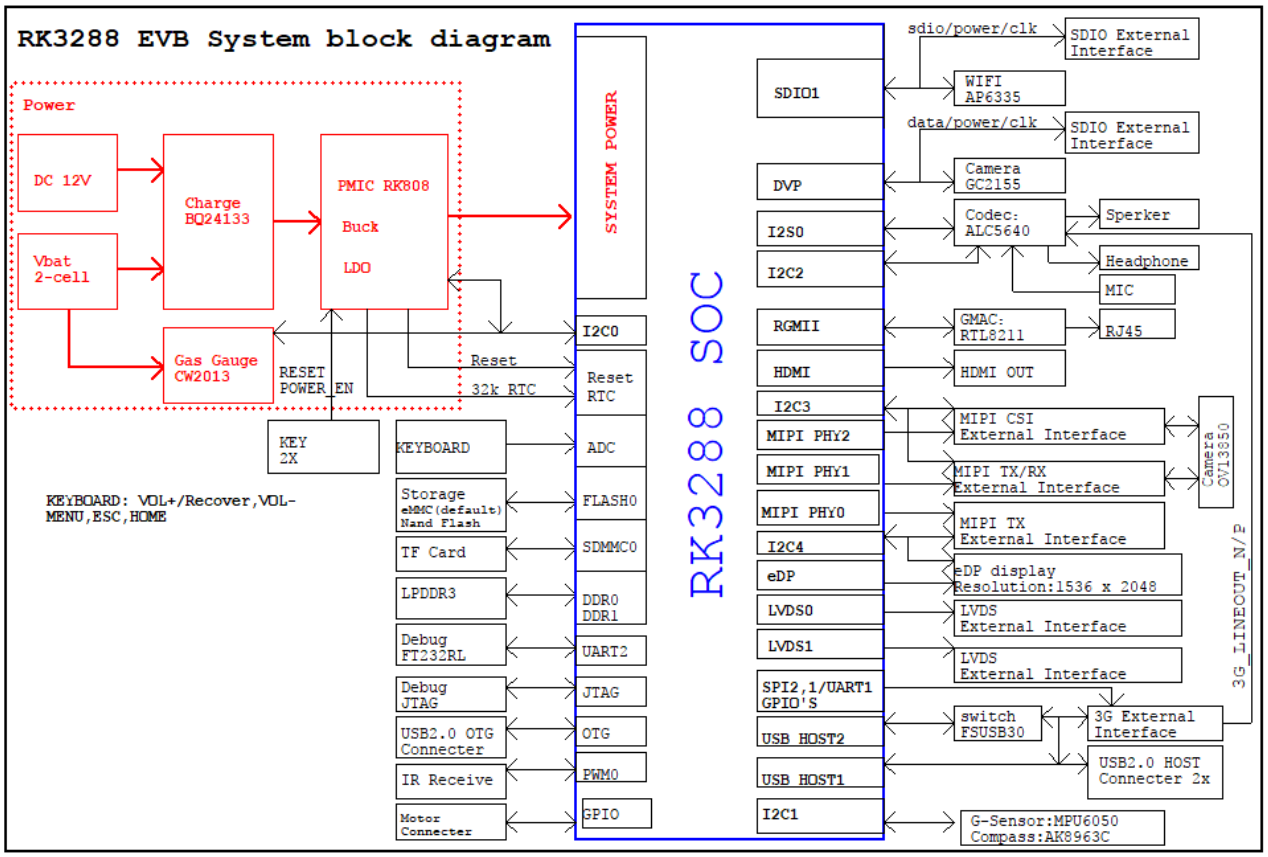


Figure 1-2 RK3288 EVB 2.0 system chart

1.3 General function

RK3288 EVB contains following functions：

- ✧ RK808+BQ24133+CW2013： main power supply and charge management system, and battery detection function
- ✧ Memory： 2CH 32bit LPDDR3， 2G memory capacity in total
- ✧ eMMC： default storage capacity 8G
- ✧ TF Card： support for external extended storage capacity
- ✧ USB 2.0 HOST： two ports in combo USB connector
- ✧ USB 2.0 Device： for system upgrade, also support Host function
- ✧ eDP 1.3： eDP display is standard
- ✧ HDMI OUT： support 4K display
- ✧ System key：Power、Menu、Esc、VOL+、VOL-、Home、Reset、Maskrom
- ✧ RGMII：（RTL8211E-VB-CG） Gigabit Ethernet
- ✧ SDIO WiFi：（AP6335） wireless internet access
- ✧ Voice： supports headphones, speakers, recording
- ✧ UART debug： for software debug
- ✧ Sensor： G-sensor MPU6050、Compass AK8963C
- ✧ CIF camera： default configuration GC 2155,200w pixels
- ✧ MIPI camera， default configuration ov13850,1200w pixels
- ✧ extended interface： JTAG、MIPI_TX、MIPI_TX/RX、MIPI_RX、LVDS、CIF、SDIO

Functional module layout as following：

Top Layer：

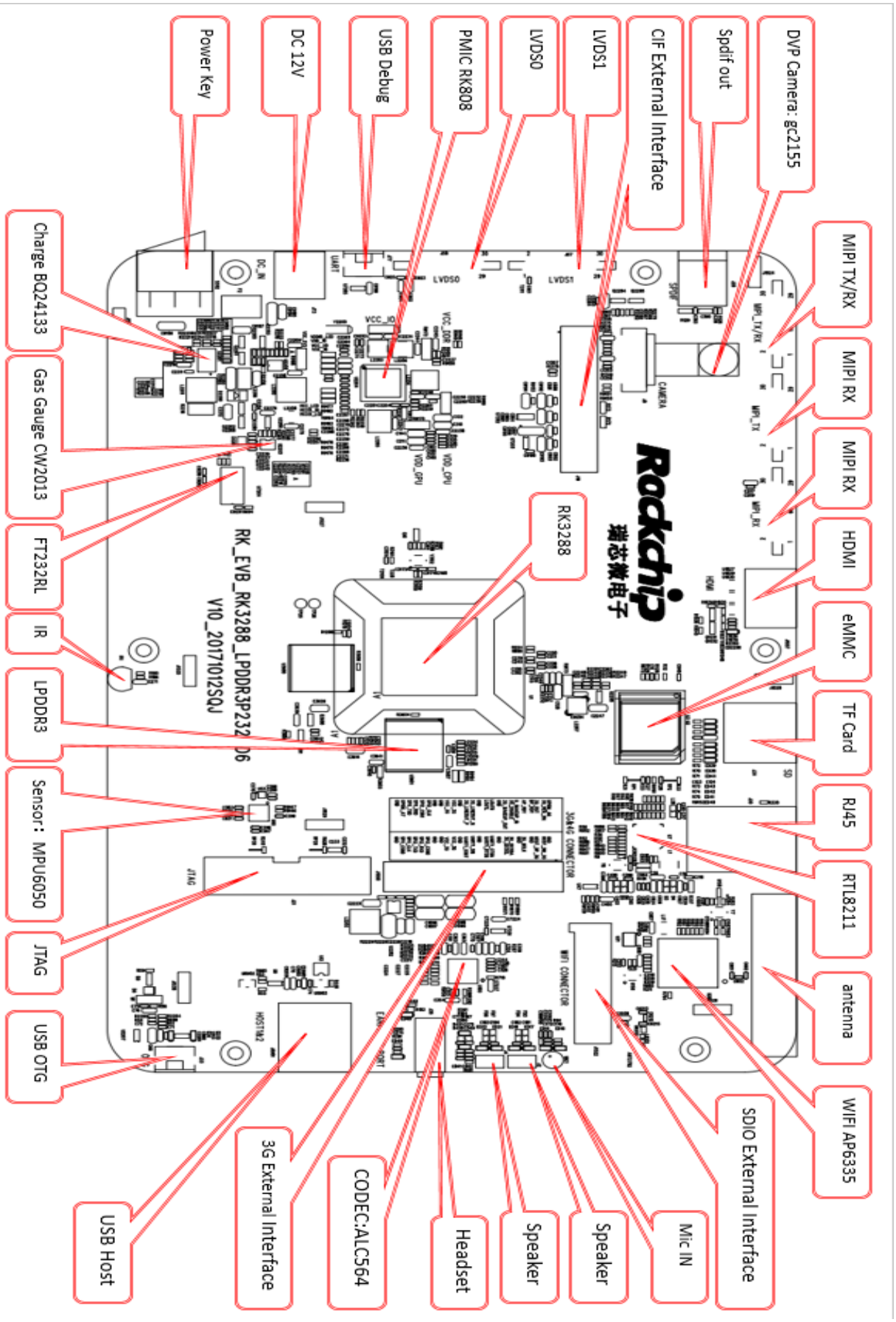


Figure 1-3 RK3288 EVB 2.0 PCB top layer

Bottom Layer：

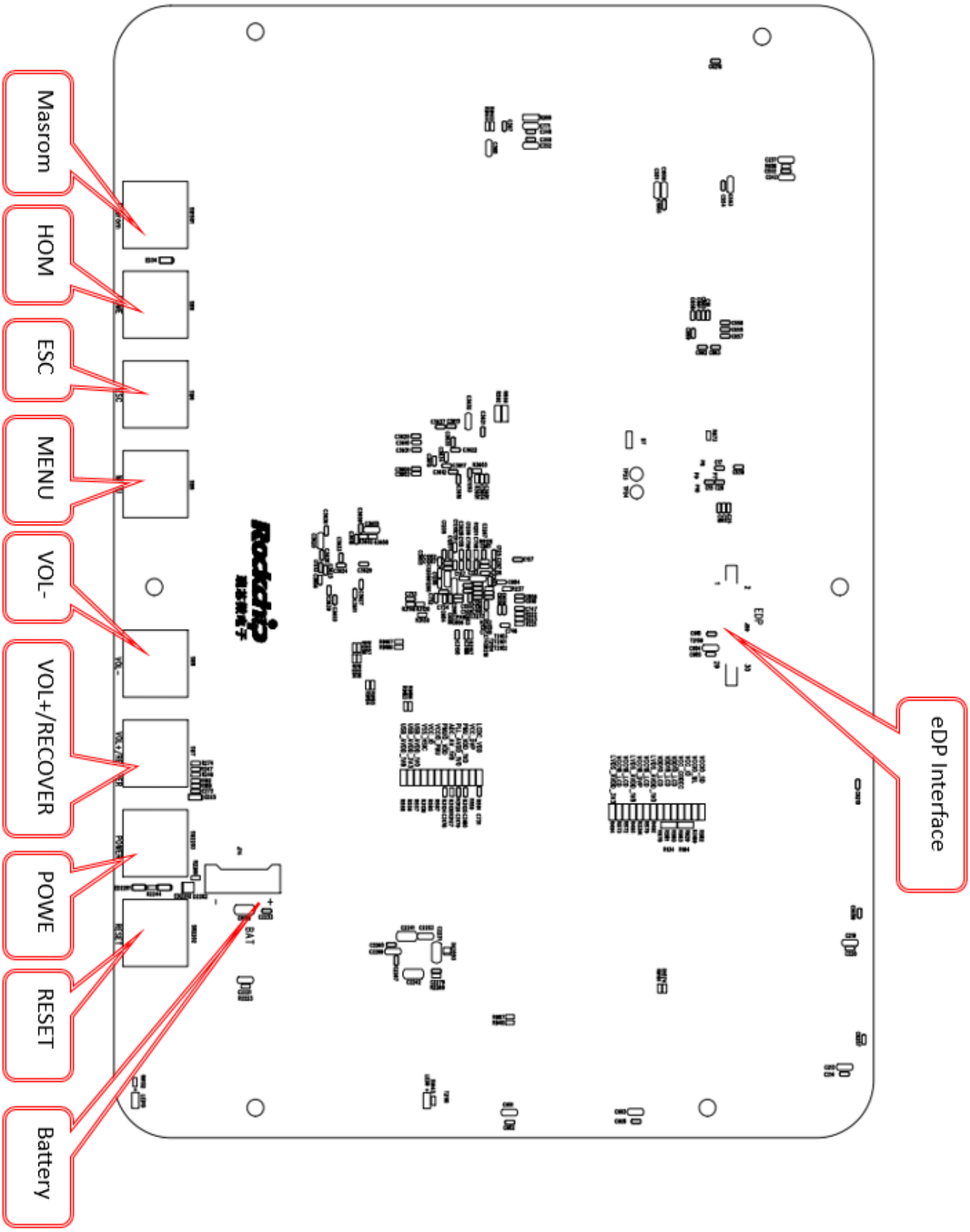


Figure 1-4 RK3288 EVB 2.0 PCB bottom layer

1.4 EVB default function

EVB has firmware downloaded by default, include below functions:

Category	Function	Description
Charge	PMIC-RK808-B BQ24133	Dual-cell battery can be charged and power gauge is normal.
Memory	DDR LPDDR3	The capacity is 2G.
	eMMC	The capacity is 8G.
	TF Card	SD Card identification normal.
USB	USB OTG	eMMC can be recognized and firmware can be downloaded. Mouse and USB disk connection normal.
	USB HOST1	Mouse and USB disk connection normal.
	USB HOST2	Mouse and USB disk connection normal.
Camera	MIPI RX	MIPI camera works well to take photos and preview.
	MIPI TX/RX	
	CIF	CIF camera works well to take photos and preview.
Display	eDP&TP	eDP display and touch pad function normal.
	HDMI	TV display normal, support 4K.
Audio	Audio codec	Headphone play/speaker normal, switching between them is OK.
Sensor	G-Sensor	MPU6050 function normal.
	Compass	AK8963C function normal.
Keyboard	KEY BAORD	All keys function normal.
Network	RGMIII	RTL8211E-VB-CG, GigaLAN network normal.
	WIFI/BT	2.4G/5G network normal, BT function normal.
Debug	UART2	Serial port input and output are normal.

Table 1-1 RK3288 EVB default function

1.5 EVB development board assembly

The development board kit is as below:

1、RK3288 main board
2、eDP display and touchpad board
3、MIPI camera (optional, not standard kit)
4、Power supply specification: input 100 V AC ~ 240 V AC, 50 Hz; Output 12V DC, 2A

1.6 EVB edition difference

Now there are two editions of RK3288 EVB:

The first edition（EVB V1.0） Consists of three parts: PMIC power board, main board,

RK3288 core board. PMIC power board is compatible with RK818 and ACT8846, and the driver can be compatible with all PMIC models.

Refer to the user guide：RK3288 SDK 开发板用户指南 V10.pdf

Board Name	Board Information	Note
Power board	RK32XX_POWER_RK818_V21_20150403_final	The board editions are different for upgrades, but they are compatible
	RK32xx_POWER_ACT8846_V04_20140928hxs	
Main board	RK32XX_SDK_MAIN_V10_20140121.pcb	
	RK32XX_SDK_MAIN_V20_20140516hxs.pcb	
	RK32XX_SDK_MAIN_V30_20140928hxs	
	RK32XX_SDK_MAIN_V40_20150416hxs_final （v40 is sheep）	
Core board	RK3288-LPDDR3-SDK-V02-20140928hxs	
Display board	eDP IpadMini2， touchpad IC model:gsl3673,ct363	
	MIPI display， touchpad IC model:W816	

Table 1-2 RK3288 Board information for first edition EVB

1.EVB V1.0 full view：

Figure 1-5 EVB V1.0 full view

2. EVB V2.0 integrated board design: PMIC power board and RK3288 core board compose one board. PMIC model is rk808. The various interfaces descriptions in this document is applicable for this design.

Figure 1-6 EVB V2.0 full view

1.7 EVB Power ON / OFF and standby

EVB startup and shutdown methods are described below:

1、Power ON：

Connect the DC 12v power supply: turn on the main power switch to boot

Two battery power supply: need to press the boot button 2s to boot.

2、Power OFF：

Press the start button over 8s to shut down the system. EVB will automatically reboot if DC 12V power supply plugged, and it is normal.

Press the start button over 8s to shut down the system. EVB won't reboot for dual-battery power supply scene.

3、Standby：

Click the power on button and the system will enter level-1 standby state. If USB OTG is not connected, the system will turn to level-2 standby state from level-1 without any operation.

1.8 EVB USB drive installation

EVB drivers need to be installed before upgrading,

Tool path: Sdk \ rktools \ windows \ release _ driver assistant. Open driver install. exe, Then click "drive installation". Later the hint of drive installation success will show.

The driver in files basically supports all prevail operating systems.

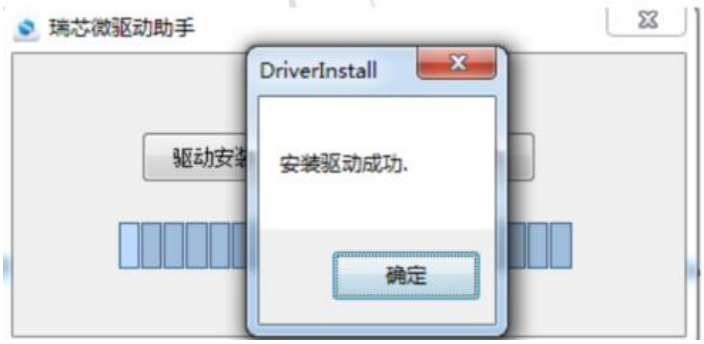


Figure 1-7 Driver installation successful schematic

Two method for RK3288 EVB upgrade：

A. Maskrom upgrade mode:

Steps as below:

1. Connect USB OTG to computer, press and hold the Maskrom button on main board.
2. Power ON EVB with external 12v, or press the RESET button if powered on already.
3. Download tool will indicate the discovery of Maskrom device later, and then release Maskrom button. Be noted that corresponding Loader must be selected for upgrade under Maskrom state.
4. Select loader, parameter, misc, kernel, resource, system and other corresponding files.
5. Click the execution menu to enter upgrade state. Check the right part of tool bar for download and verification process bar.

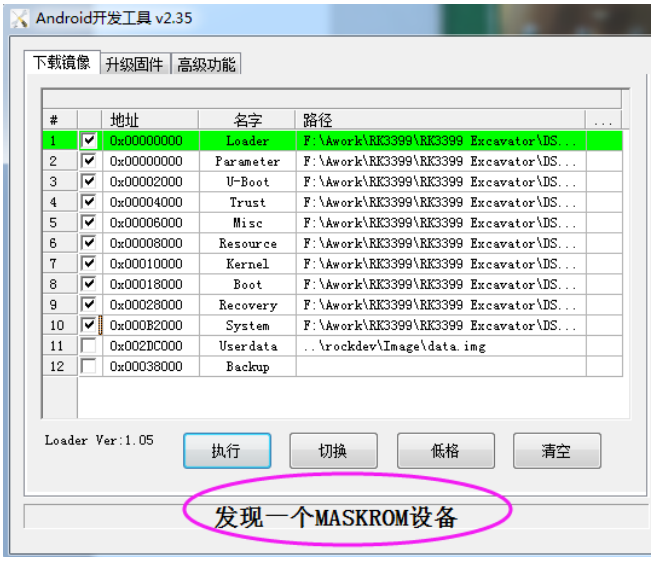


Figure 1-8 Maskrom upgrade mode schematic

B. Loader upgrade mode:

Steps as following:

1. Connect USB OTG to computer, press and hold VOL + /RECOVERY key of main board.

2. Power ON EVB 12v, press the RESET button if boot already.

3. Download tool indicate the discovery of loader device later. Then release vol + / recover button.

4. Select loader, parameter, misc, kernel, resource, system and other files corresponding to the download tool.

5. Click the execution menu to enter upgrade state. Check the right part of tool bar for download and verification process bar.

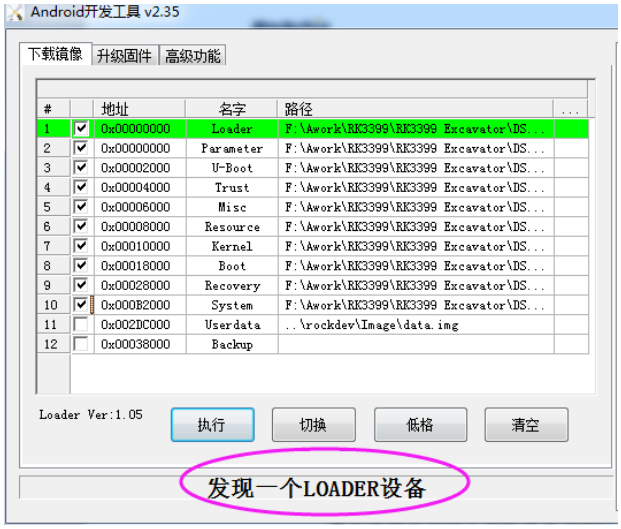


Figure 1-9 Loader upgrade mode schematic

1.9 Debug interface

1.9.1 SecureCRT serial port tool

Connect EVB USB debug port to computer; get com number in device manager.

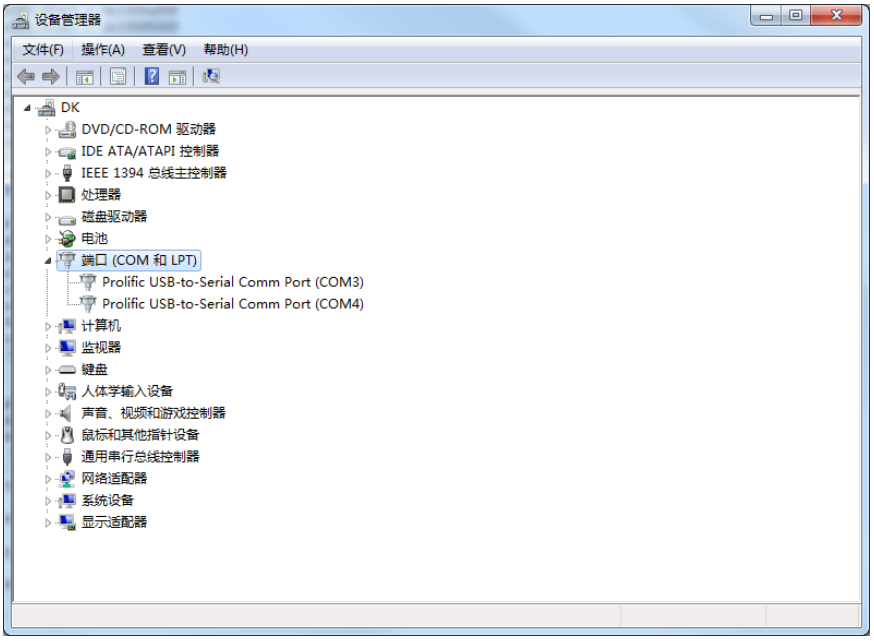


Figure 1-10 Gets the current port com number

Open serial port tool SecurCRT and click the "fast connect" button.

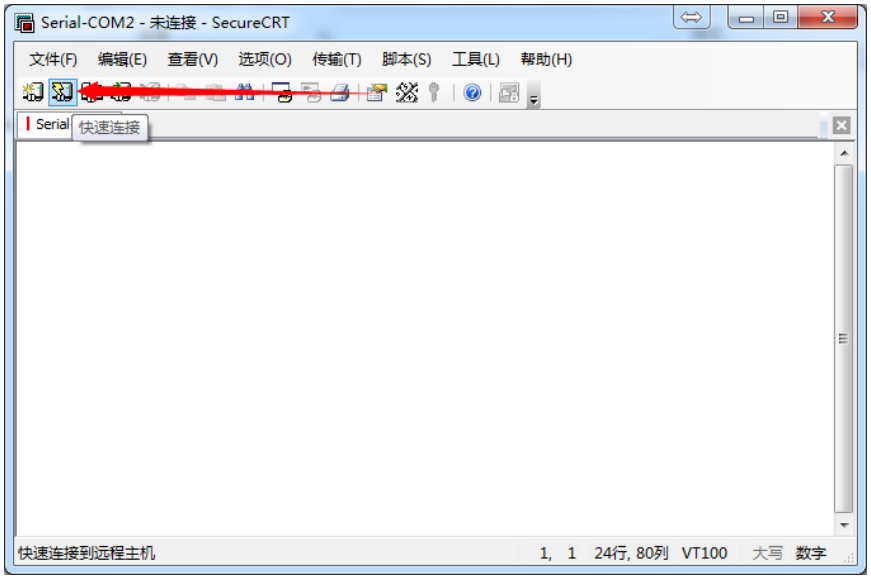


Figure 1-11 Serial port tool SecureCRT interface

Configure the serial port, and select COM number of EVB (do not select RTS/CTS).

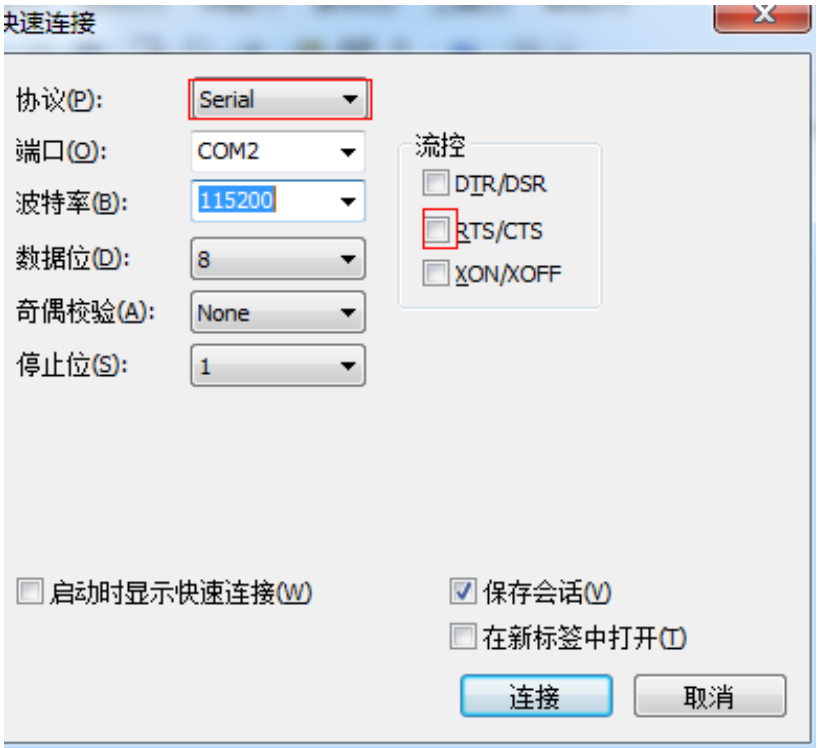


Figure 1-12 Configure serial port

Click "connection" button, and device will connect successfully. In convenience of debug, session options can be configured. Click "session options" button on toolbar, set rollback buffer larger, then more log information is available.

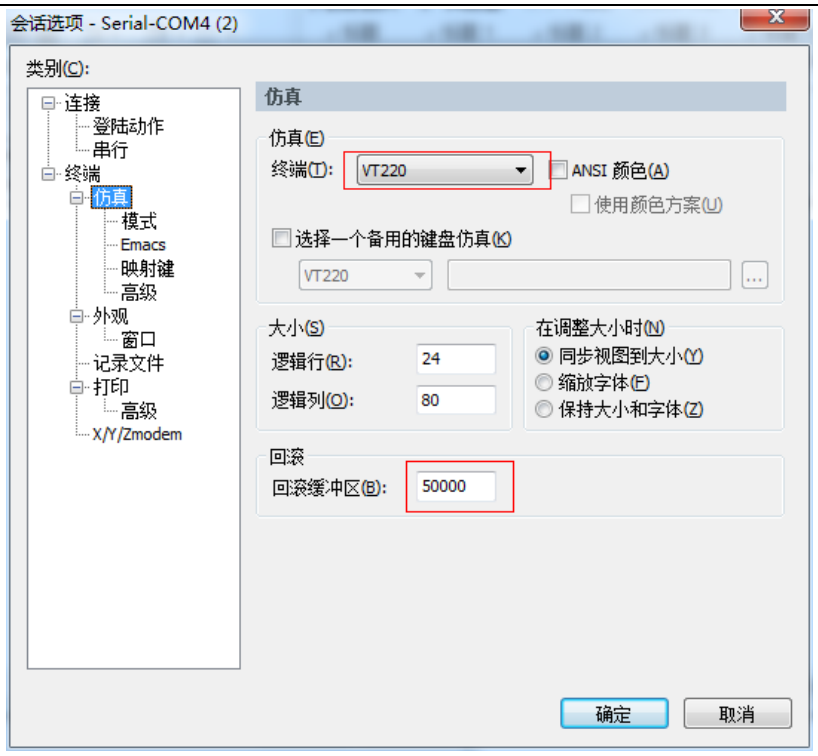


Figure 1-13 Configure serial port tool options

1.9.2 ADB debug

1. Ensure the driver installation success, connect EVB USB OTG port to computer;

2. Power on EVB, boot into system, and then enter the setting, select "developer options" and "USB debugging". For BOX, select "setting - USB - connect to PC "again;

3. Follow the process of "start - run – cmd" on computer, enter the ADB.exe tool directory, enter "ADB devices". Connection is ready if connecting device can be inquired;

4. Enter "ADB shell" and enter ADB debugging.

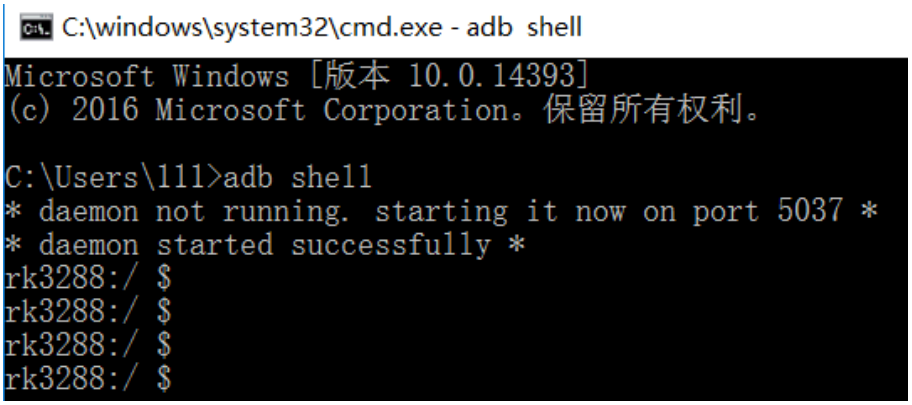


Figure 1-14 ADB connection success

2 hardware introduction

7.85 inch eDP panel and touch panel are precisely and firmly bonded together by aluminum alloy middle frame, eDP display board and main board are firmly combined by positioning column, and the back is protected by acrylic to avoid the loss of electronic components. Physical drawing and assembly drawing as below:

2.1 Overall physical drawing

2.1.1 RK3288 main board drawing：

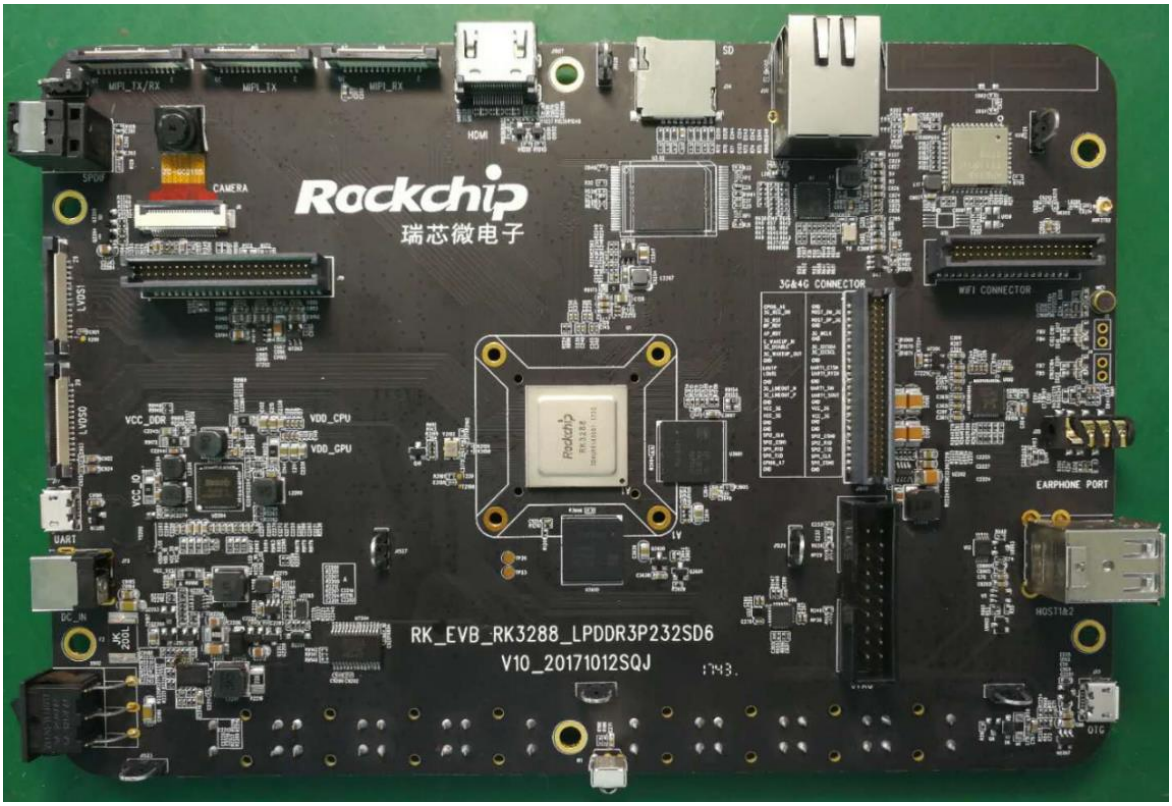


Figure 2-1 RK3288 main board front view

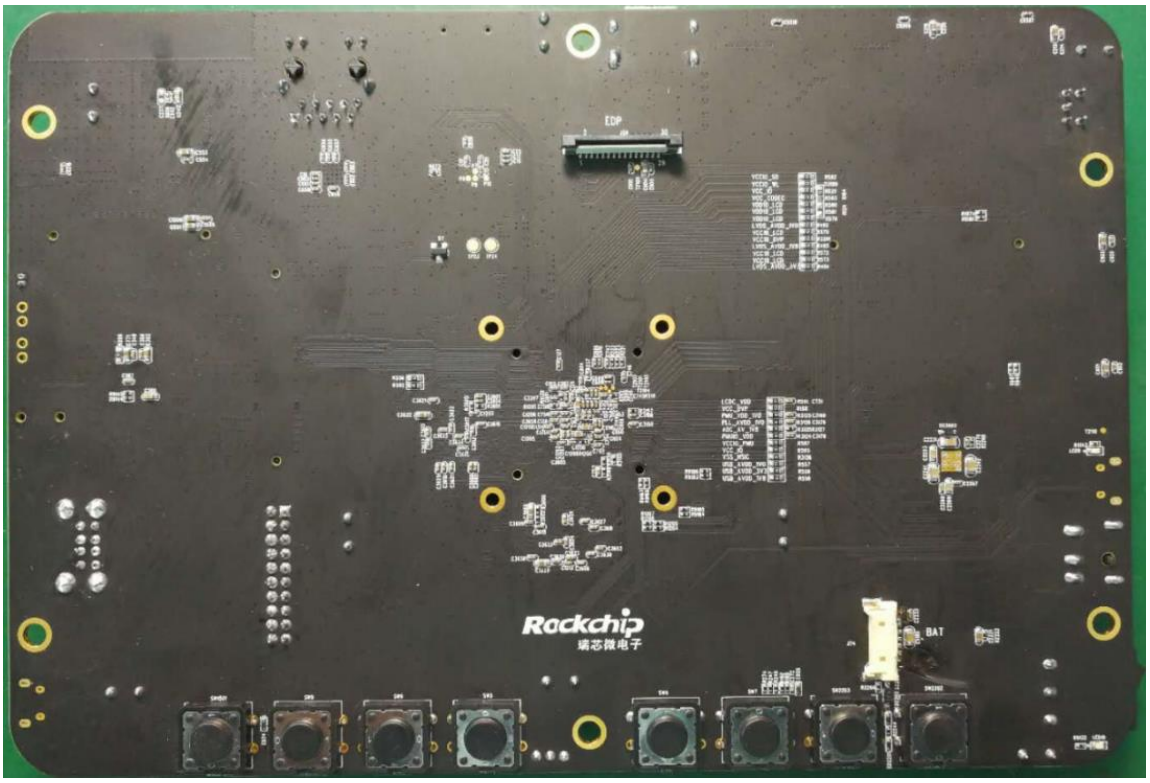


Figure 2-2 RK3288 main board back view

2.1.2 eDP board and panel drawing:

eDP panel and touchpad are connected to eDP board that has all circuitry required for function. eDP board connects main board by a 30 pin FPC, enhancing the flexibility of display parts' renewal and main board parts' maintenance.

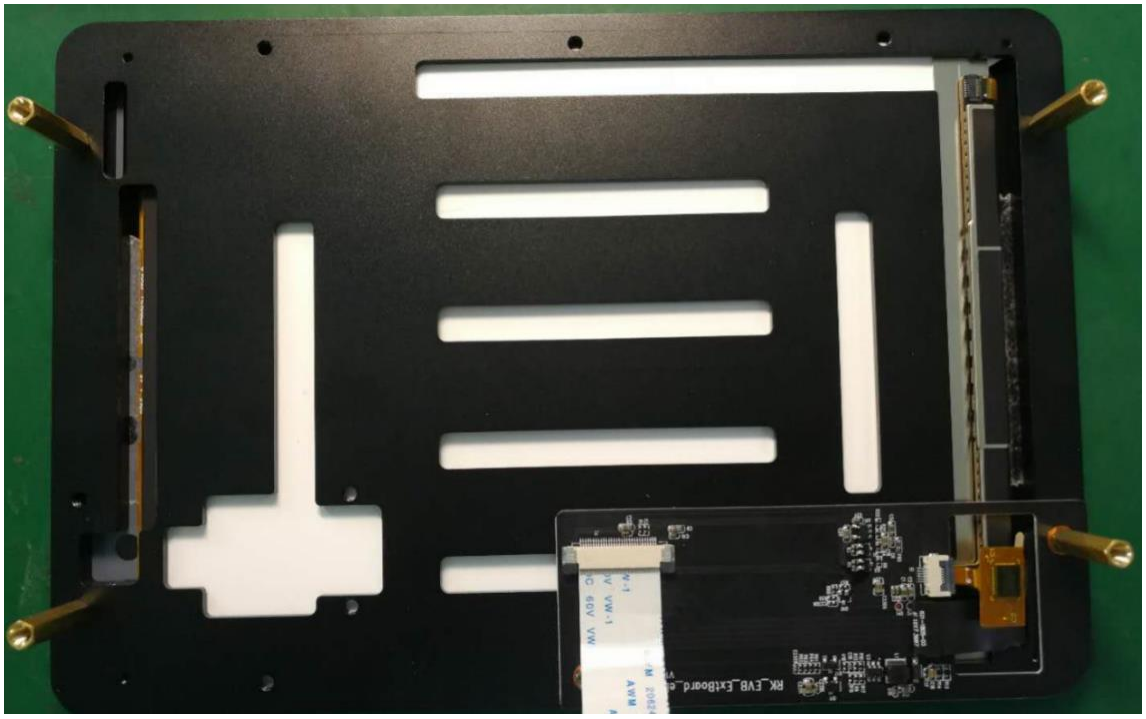


Figure 2-3 eDP board and panel full view

2.1.3 Acrylic assembly drawing

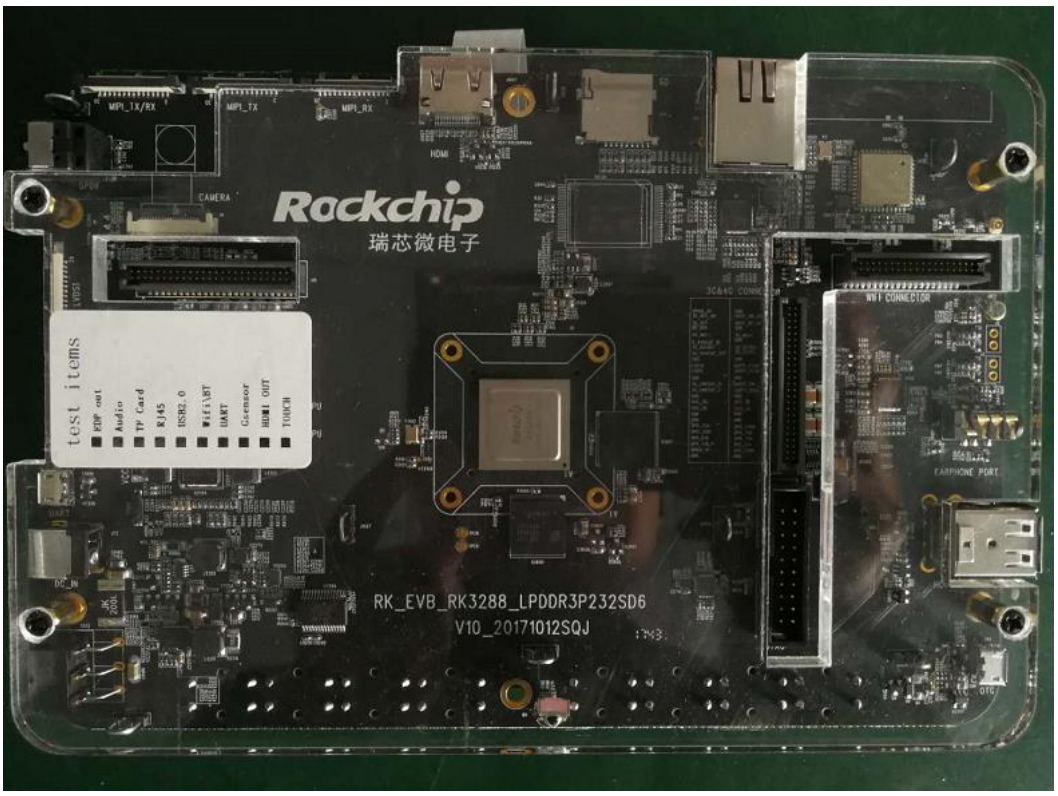


Figure 2-4 EVB full view with acrylic frame

2.2 I2C Address：

The development board reserves plenty peripheral interfaces. Debugging the I2C peripherals involves I2C channel multiplexing setting, so the address and voltage of existing devices on EVB are given here to avoid address conflict and voltage mismatch.

I2C Channel	equipment	I2C address	Power
I2C0	PMIC:RK808-B	0x36	VCCIO:3.3V
	Gas Gauge:CW2013	0xc4	VCCIO:3.3V
I2C1	G-Sensor:MPU6050	0xd0	VCCIO:3.3V
	Compass:AK8963C	0x1a	VCCIO:3.3V
I2C2	Audio：ALC5640	0x3a	VCCIO_CODEC:3.3V
I2C3	Camera：GC2155	0x78	VCC18_DVP:1.8V
	MIPI_CSI:OV13850	0x6c	VCC18_DVP:1.8V

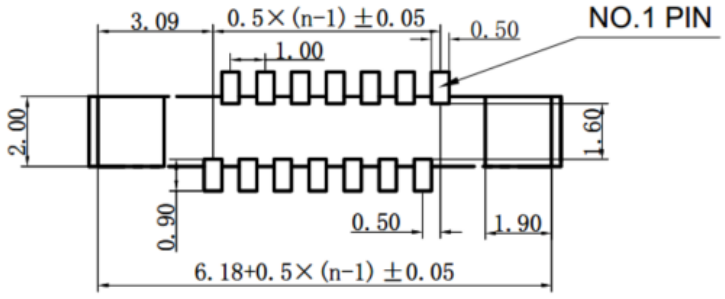
Table 2-1 I2C Channel mounted peripheral address and io level

Note: when using the expansion board, ensure that the I2C address not conflict.

2.3 Extension socket information

J57，J58，J59，J60，J63,J68 0.5 mm upright dual-row 30 pin, size as below:

P数	A	B	C	D	P数	A	B	C	D
4	1.500	2.570	8.400	4.650	35	17.000	18.070	23.900	5.150
5	2.000	3.070	8.900	4.650	36	17.500	18.570	24.400	5.150
6	2.500	3.570	9.400	4.650	37	18.000	19.070	24.900	5.150
7	3.000	4.070	9.900	4.650	38	18.500	19.570	25.400	5.150
8	3.500	4.570	10.400	4.650	39	19.000	20.070	25.900	5.150
9	4.000	5.070	10.900	4.650	40	19.500	20.570	26.400	5.150
10	4.500	5.570	11.400	4.650	41	20.000	21.070	26.900	5.150
11	5.000	6.070	11.900	4.650	42	20.500	21.570	27.400	5.150
12	5.500	6.570	12.400	4.650	43	21.000	22.070	27.900	5.150
13	6.000	7.070	12.900	4.650	44	21.500	22.570	28.400	5.150
14	6.500	7.570	13.400	4.650	45	22.000	23.070	28.900	5.150
15	7.000	8.070	13.900	4.650	46	22.500	23.570	29.400	5.150
16	7.500	8.570	14.400	4.650	47	23.000	24.070	29.900	5.150
17	8.000	9.070	14.900	4.650	48	23.500	24.570	30.400	5.150
18	8.500	9.570	15.400	4.650	49	24.000	25.070	30.900	5.150
19	9.000	10.070	15.900	4.650	50	24.500	25.570	31.400	5.150
20	9.500	10.570	16.400	4.650	51	25.000	26.070	31.900	5.150
21	10.000	11.070	16.900	4.650	52	25.500	26.570	32.400	5.150
22	10.500	11.570	17.400	4.650	53	26.000	27.070	32.900	5.150
23	11.000	12.070	17.900	4.650	54	26.500	27.570	33.400	5.150
24	11.500	12.570	18.400	4.650	55	27.000	28.070	33.900	5.150
25	12.000	13.070	18.900	4.650	56	27.500	28.570	34.400	5.150
26	12.500	13.570	19.400	4.650	57	28.000	29.070	34.900	5.150
27	13.000	14.070	19.900	4.650	58	28.500	29.570	35.400	5.150
28	13.500	14.570	20.400	4.650	59	29.000	30.070	35.900	5.150
29	14.000	15.070	20.900	4.650	60	29.500	30.570	36.400	5.150
30	14.500	15.570	21.400	5.150	61	30.000	31.070	36.900	5.150



PC BOARD LAYOUT

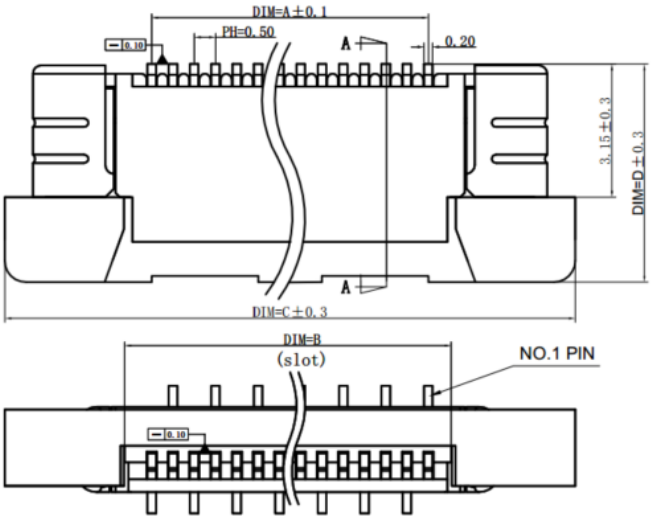


Figure 2-5 0.5mm pitch 30pin PCB package diagram

2、dual-row 50pin J19, 50 dual-row 50pin J10, dual-row 40pin J1522, all pitch is 1.27 mm. PCB package increase or decrease with the same pitch for different pin number.

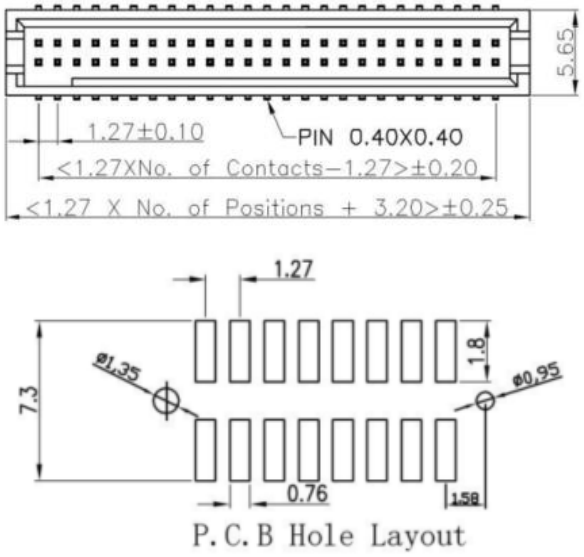


Figure 2-6 PCB package drawing

2.4 EVB reference drawing

Please refer to below corresponding EVB PCB.

1、RK3288 main board ：

RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012.DSN

RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012.pcb

2、eDP display board：

RK_EVB_ExtBoard_eDPDisplay_V10_20171013.DSN

RK_EVB_ExtBoard_eDPDisplay_V10_20171013.pcb

3 Brief introduction

3.1 Power input

1. External adapter power supply: The system starts up by default with external 12V DC input, and power button click is unnecessary.

2. Dual-cell battery power supply: With battery supply only, the system is off by default. Pressing the power button can power up the system.

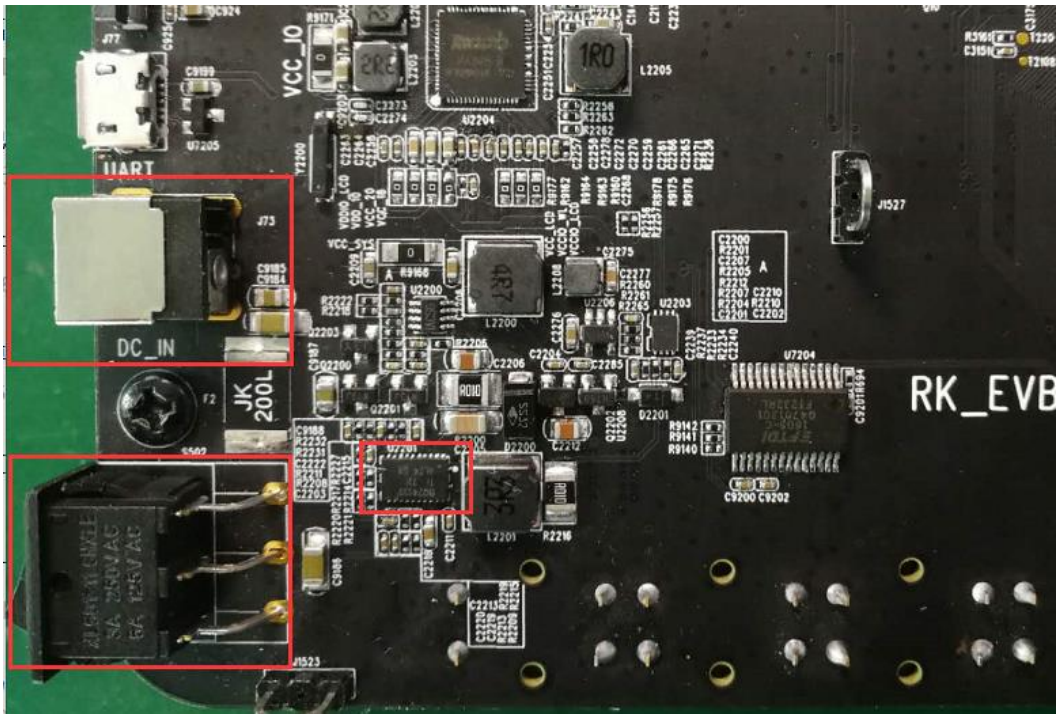


Figure 3-1 DC jack/DC power switch/charger

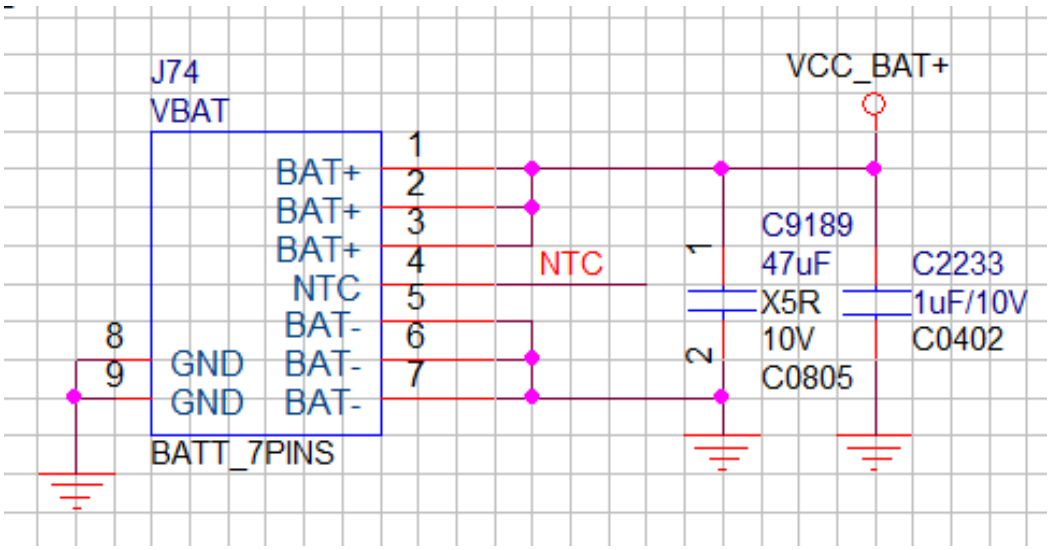


Figure 3-2 7-pin battery connector schematic

For PCB polarity of dual-cell battery, please refer to PCB silk.

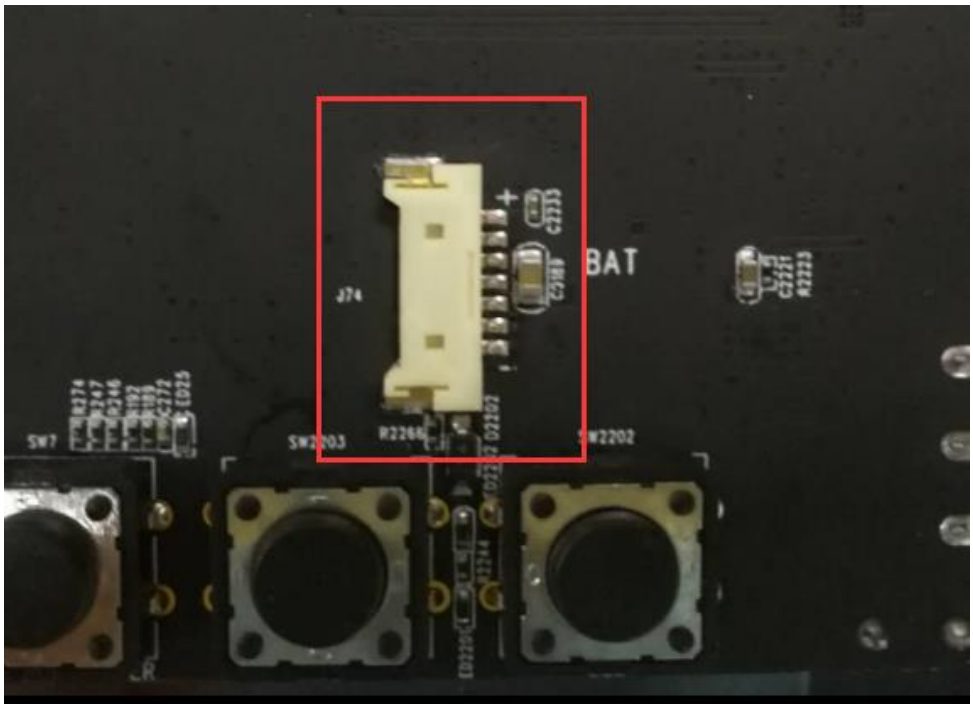


Figure 3-3 Battery Connector

3.2 Memory devices

3.2.1 EMMC：

1. Volume of default eMMC FLASH on EVB is 8G.

2. Maskrom button makes EVB firmware update easier. Press Maskrom key after connecting computer by USB, then power on EVB (or press the RESET button if powered up already), the EVB will enter Maskrom download mode.

Location of Maskrom key：

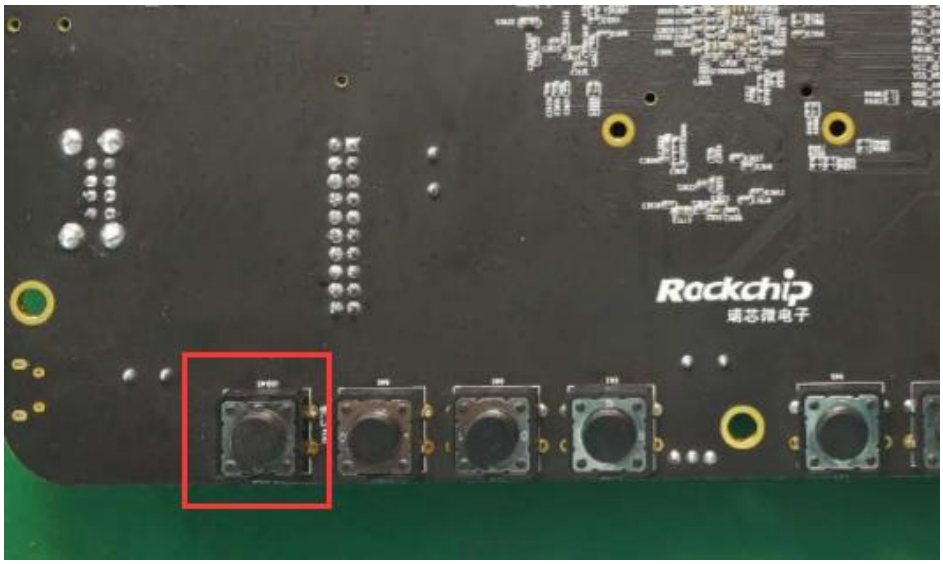


Figure 3-4 Maskrom Key

3.2.2 DDR

RK3288 supports dual-channel DDR. Total volume of 2 pcs 32bit LPDDR3 on EVB is 2G by default.

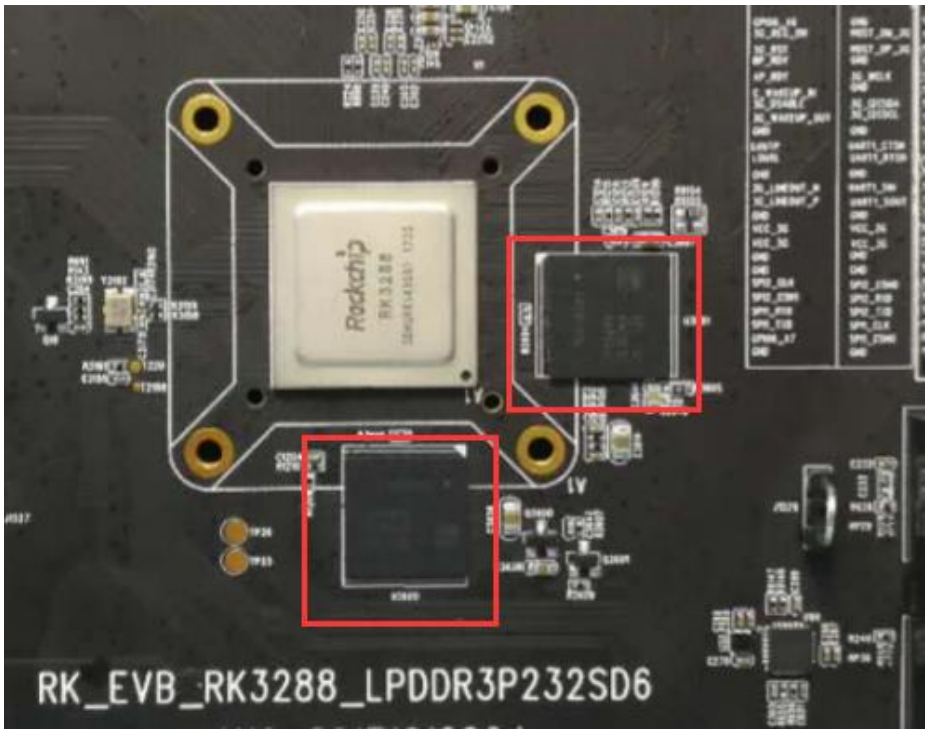


Figure 3-5 LPDDR3 entity and location on PCB

3.3 Keyboard

1. EVB provides ADC for keyboard application. ADC_IN1 of RK3288 is used as detecting port with 10 bit resolution.

2. Common function keys such as VOL+/VOL-/MENU/ESC/HOME are defined on EVB and they can be re-defined according to user application.

4. Power on EVB with VOL+/Recovery button pressed (or reset EVB) after USB is connected, EVB will enter Loader download mode.

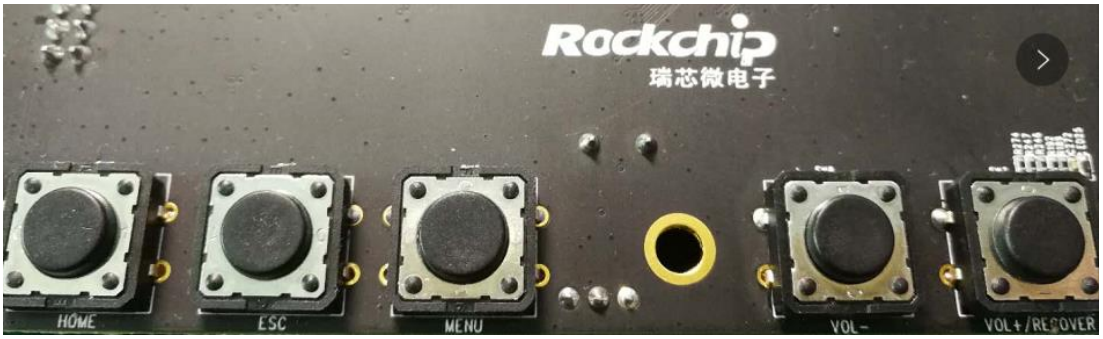


Figure 3-6 System Keys

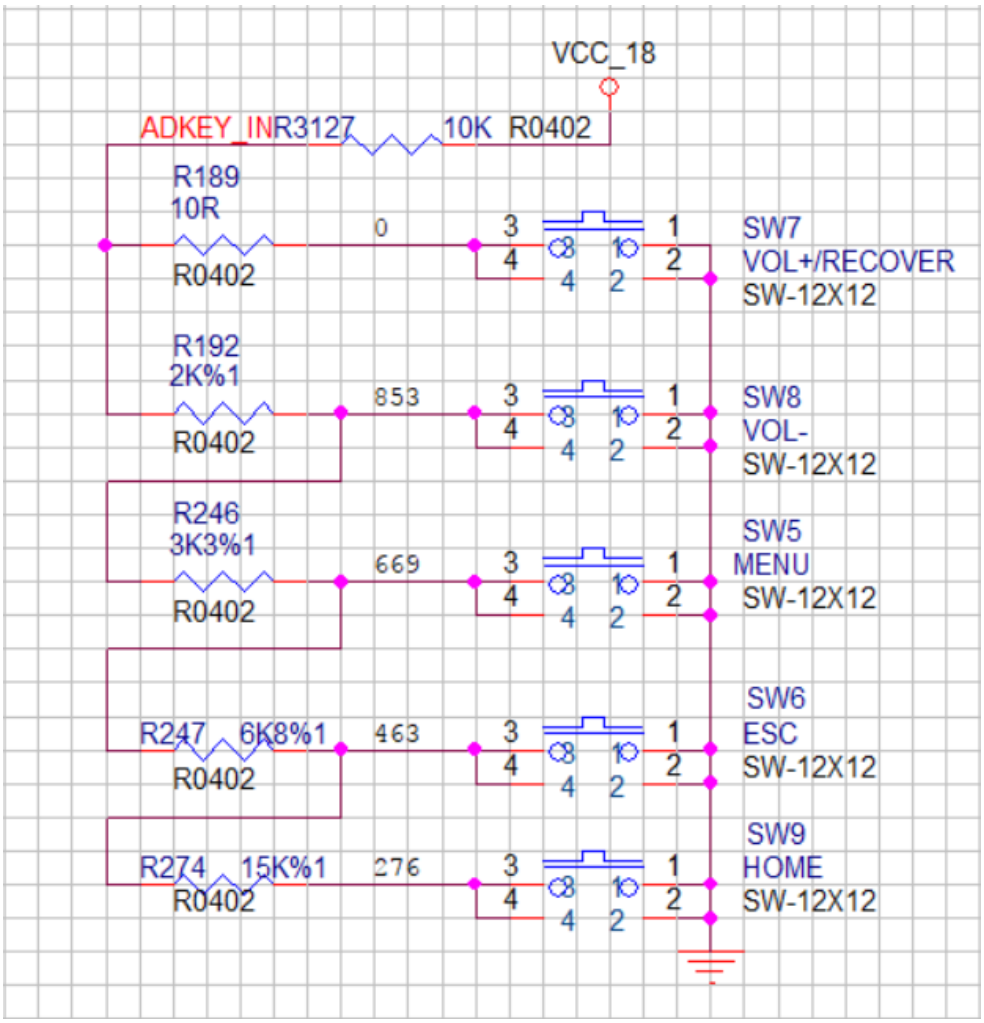


Figure 3-7 voltage division circuit of key by resistor combination

3.4 Infra-red receiver

The small-size infra-red receiver on EVB is a common part of FT-009 series with 38 KHz center frequency.

Figure 3-8 IR receiver

3.5 Gravity sensor

The gravity sensor on EVB is MPU6500, which is a combination of 3-axial digital accelerator and 3-axial gyroscope. It communicates with host by I2C.

3.6 E-Compass

The e-compass on EVB is AK8963C. It communicates with host by I2C.

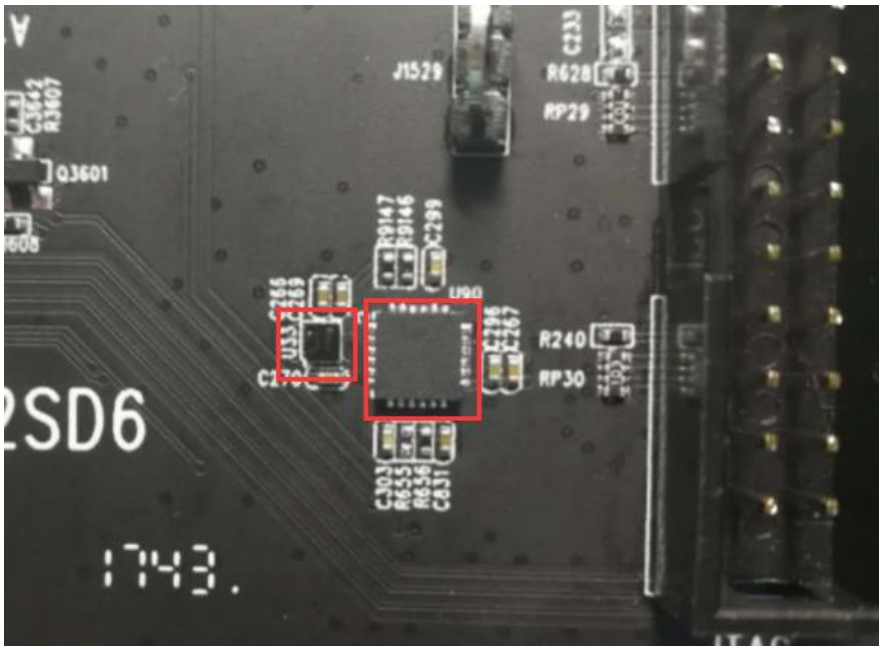


Figure 3-9 G-Sensor and Compass

3.7 Video output interface

EVB supports different video output interfaces：

eDP output: EVB panel supports by default.

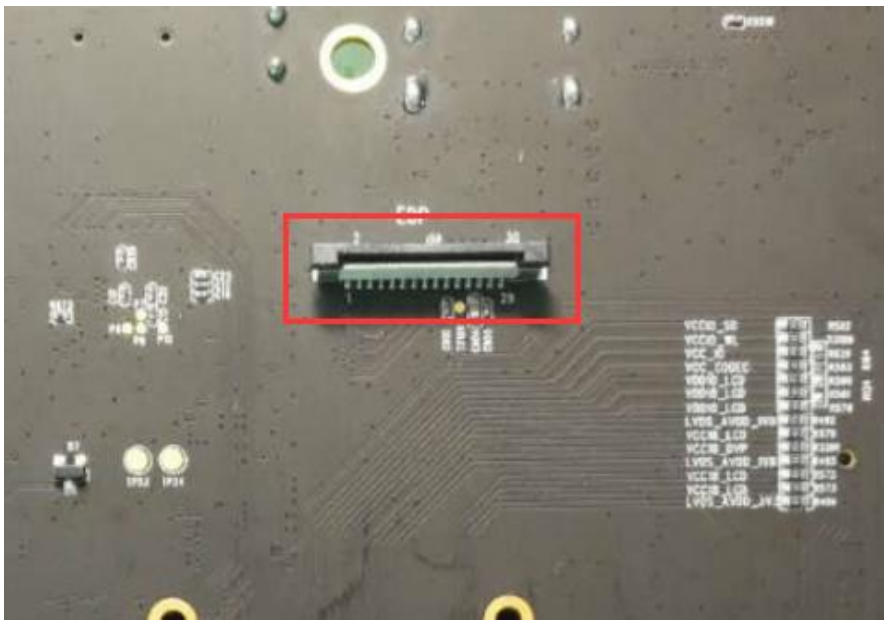


Figure 3-10 eDP Interface

Single MIPI output/dual MIPI output: below detail information of pin definition can simplify your tuning work.

Be careful with the split-screen display. MIPI_TX is for the left part of panel, MIPI_TX/RX for the right. Swapped connection is prohibited.

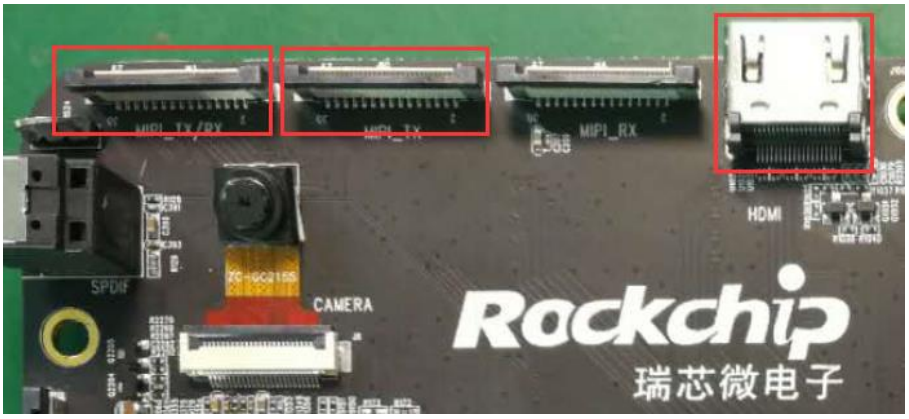


Figure 3-11 MIPI_TX, MIPI_TX/RX Interface

Single LVDS/dual LVDS output: below detail information of pin define can simplify your tuning work.

LVDS0 channel must be used for single LVDS display panel rather than LVDS1 channel. For dual-LVDS display panel, group LVDS0 and LVDS1 to connect.

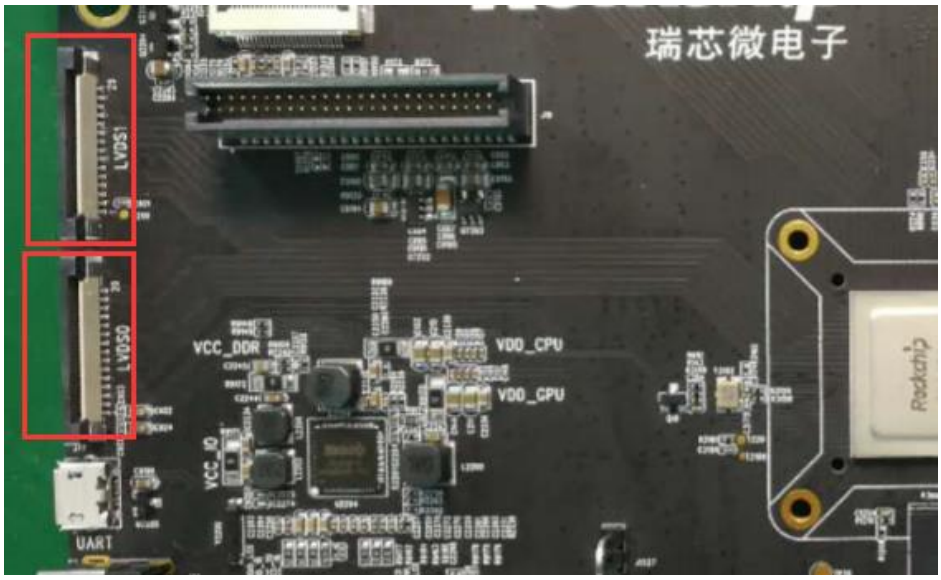


Figure 3-12 LVDS0/LVDS1 Interface

LVDS connector is upright with 0.5mm pitch.

Signals are defined as below according to the connector silk information of 1/2 and 29/30：

Pin definition of MIPI_TX and MIPI_TX/RX signals：

MIPI_TX Signals		
1	GND	
2		MIPI_TX_D3N
3	MIPI_TX_D3P	
4		GND
5	MIPI_TX_D2N	
6		MIPI_TX_D2P
7	GND	
8		MIPI_TX_CLKN
9	MIPI_TX_CLKP	
10		GND
11	MIPI_TX_D1N	
12		MIPI_TX_D1P
13	GND	
14		MIPI_TX_D0N
15	MIPI_TX_D0P	
16		GND
17	LCDC_BL	
18		NC
19	VCC_IO	
20		LCD_EN
21	LCD_CS	
22		BL_EN
23	I2C4_SCL_TP	
24		I2C4_SDA_TP
25	TOUCH_INT	
26		TOUCH_RST
27	GND	
28		VCC_SYS
29	VCC_SYS	
30		VCC_SYS

MIPI_TX/RX Signals		
1	GND	
2		MIPI_TX/RX_D3N
3	MIPI_TX/RX_D3P	
4		GND
5	MIPI_TX/RX_D2N	
6		MIPI_TX/RX_D2P
7	GND	
8		MIPI_TX/RX_CLKN
9	MIPI_TX/RX_CLKP	
10		GND
11	MIPI_TX/RX_D1N	
12		MIPI_TX/RX_D1P
13	GND	
14		MIPI_TX/RX_D0N
15	MIPI_TX/RX_D0P	
16		GND
17	LCDC_BL	
18		MIPI_MCLK
19	VCC_IO	
20		LCD_EN
21	LCD_CS	
22		BL_EN
23	I2C3_SCL_TP	
24		I2C3_SDA_TP
25	TOUCH_INT	
26		TOUCH_RST
27	GND	
28		VCC_SYS
29	VCC_SYS	
30		VCC_SYS

Table 3-1 MIPI_TX and MIPI_TX/RX signals

Pin definition of eDP signals：

eDP Signals		
1	GND	
2		eDP_TX0N
3	eDP_TX0P	
4		GND
5	eDP_TX1N	
6		eDP_TX1P
7	GND	
8		EDP_AUXN
9	EDP_AUXP	
10		GND
11	eDP_TX2N	
12		eDP_TX2P
13	GND	
14		EDP_TX3N
15	EDP_TX3P	
16		GND
17	LCDC_BL	
18		GND
19	VCC_IO	
20		LCD_CS
21	CABC_EN	
22		BL_EN
23	I2C4_SCL_TP	
24		I2C4_SDA_TP
25	TOUCH_INT	
26		TOUCH_RST
27	GND	
28		VCC_SYS
29	VCC_SYS	
30		VCC_SYS

Table 3-2 eDP signals

Pin definition of LVDS signals：

LVDS0 Signals				LVDS1 Signals		
1	CABC_EN0			1	CABC_EN1	
2		VCC_LCD		2		VCC_LCD
3	VCC_LCD			3	VCC_LCD	
4		VCC_TP		4		GND
5	LCDC_BL			5	LVDS_D4N	
6		LCD_CS		6		LVDS_D4P
7	BL_EN			7	GND	
8		LVDS_D0N		8		LVDS_D5N
9	LVDS_D0P			9	LVDS_D5P	
10		GND		10		GND
11	LVDS_D1N			11	LVDS_D6N	
12		LVDS_D1P		12		LVDS_D6P
13	GND			13	GND	
14		LVDS_D2N		14		LVDS_D7N
15	LVDS_D2P			15	LVDS_D7P	
16		GND		16		GND
17	LVDS_CLK0N			17	LVDS_D8N	
18		LVDS_CLK0P		18		LVDS_D8P
19	GND			19	GND	
20		LVDS_D3N		20		LVDS_D9N
21	LVDS_D3P			21	LVDS_D9P	
22		GND		22		GND
23	GND			23	GND	
24		VCC50_LED		24		VCC50_LED
25	VCC50_LED			25	VCC50_LED	
26		VCC50_LED		26		VCC50_LED
27	I2C4_SCL_TP			27	GND	
28		I2C4_SDA_TP		28		LVDS_CLK1N
29	TOUCH_INT			29	LVDS_CLK1P	
30		TOUCH_RST		30		GND

Table 3-3 LVDS signals

3.8 MIPI CSI

EVB supports MIPI camera module and the default camera module is OV13850. Matching camera board is buyable if you need. Both MIPI CSI port and MIPI TX/RX port are compatible with camera board. With either port connected, camera function could be available with slight software modification (MIPI_RX by default).

Pin definition of MIPI CSI signal：

MIPI_RX Signals		
1	GND	
2		MIPI_RX_D3N
3	MIPI_RX_D3P	
4		GND
5	MIPI_RX_D2N	
6		MIPI_RX_D2P
7	GND	
8		MIPI_RX_CLKN
9	MIPI_RX_CLKP	
10		GND
11	MIPI_RX_D1N	
12		MIPI_RX_D1P
13	GND	
14		MIPI_RX_D0N
15	MIPI_RX_D0P	
16		GND
17		
18		MIPI_MCLK
19	VCC_IO	
20		flash_GPIO7_B4
21	MIPI_PDN	
22		flash_TRIGOUT
23	I2C3_SCL_CAM	
24		I2C3_SDA_CAM
25	flash_EN	
26		MIPI_RST
27	GND	
28		VCC_SYS
29	VCC_SYS	
30		VCC_SYS

Table 3-4 MIPI_CSI signals

Two camera boards designed for OV4689 and OV13850 module differ in module connector location and EVB connector location. A 30-pin 0.5mm pitch FPC is used for connecting camera board and EVB：

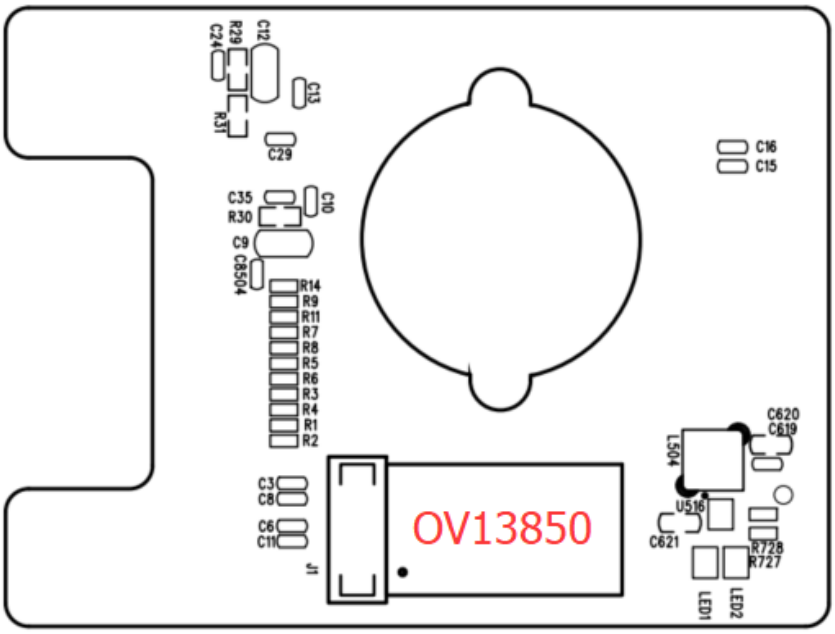


Figure 3-13 OV13850 camera module connector location

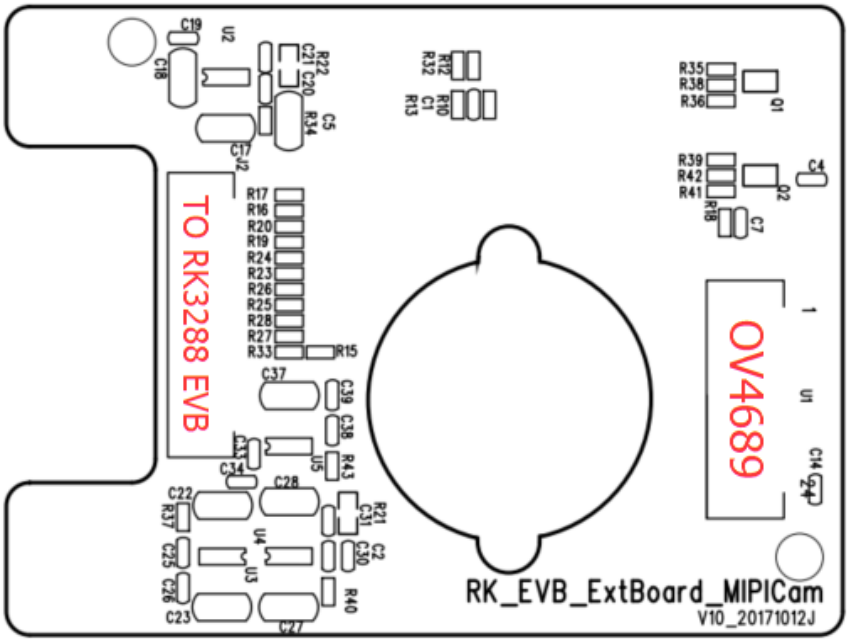


Figure 3-14 OV4689 camera module connector location

Connection between RK3288 EVB and OV13850 camera board：

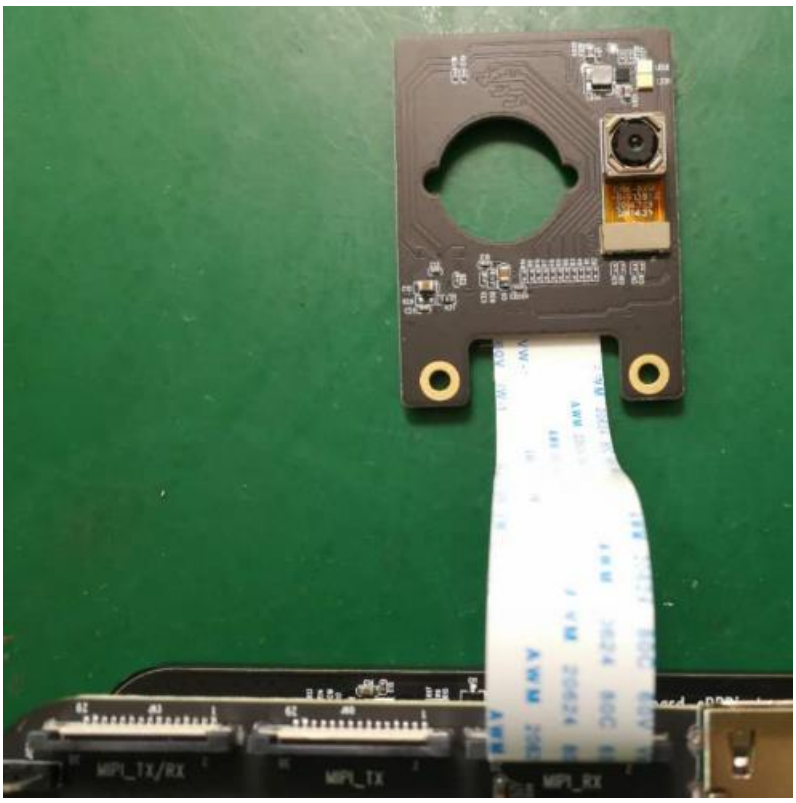


Figure 3-15 camera board and EVB connection

MIPI Camera module specification::

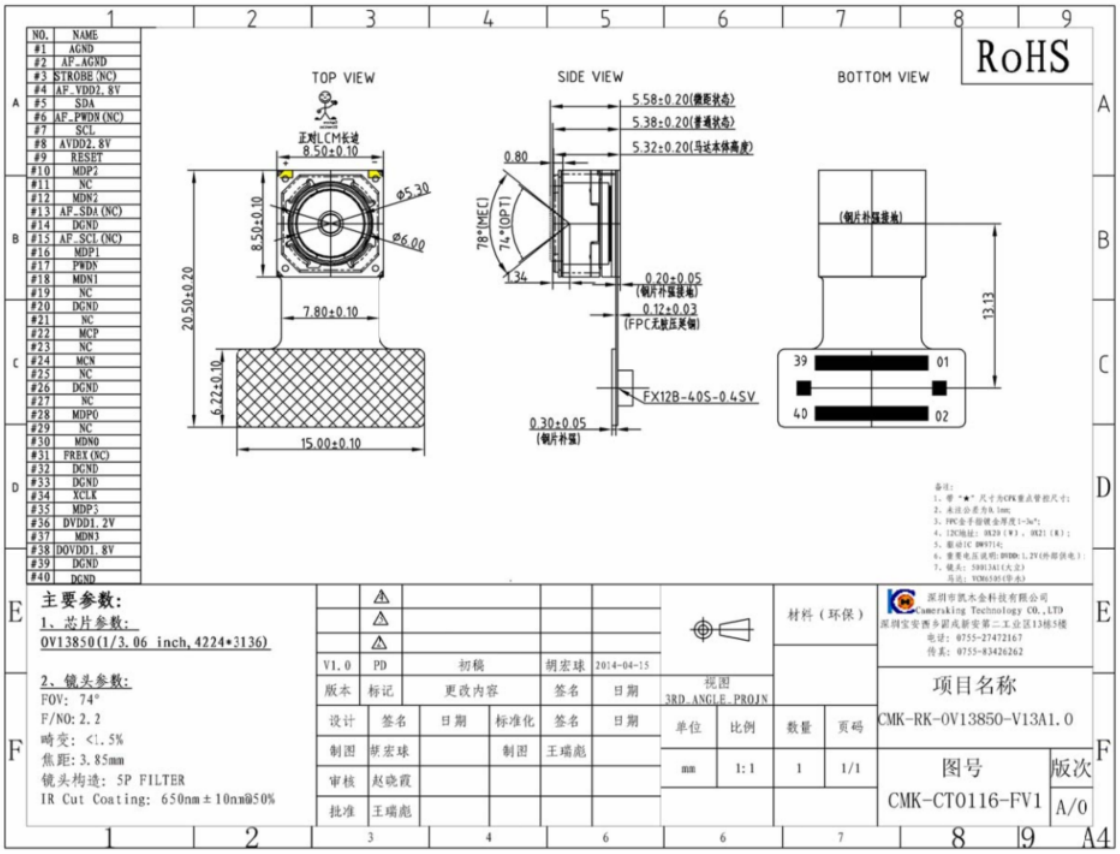


Figure 3-16 camera module

OV13850 MIPI_RX Signals			
1	AGND	21	NC
2	AF_AGND	22	MCP
3	STROBE(NC)	23	NC
4	AF_VDD2.8V	24	MCN
5	SDA	25	NC
6	AF_PWDN(NC)	26	DGND
7	SCL	27	NC
8	AVDD2.8V	28	MDP0
9	RESET	29	NC
10	MDP2	30	MDN0
11	NC	31	FRBX(NC)
12	MDN2	32	DGND
13	AF_SDA(NC)	33	DGND
14	DGND	34	XCLK
15	AF_SCL(NC)	35	MDP3
16	MDP1	36	DVDD1.2V
17	PWDN	37	MDN3
18	MDN1	38	DOVDD1.8V
19	NC	39	DGND
20	DGND	40	DGND

Table 3-5 OV13850 MIPI_CSI signals

3.9 CIF Camera

EVB supports CIF camera. It can be used in dual-camera application together with MIPI CSI camera. GC2155 is chose by default.

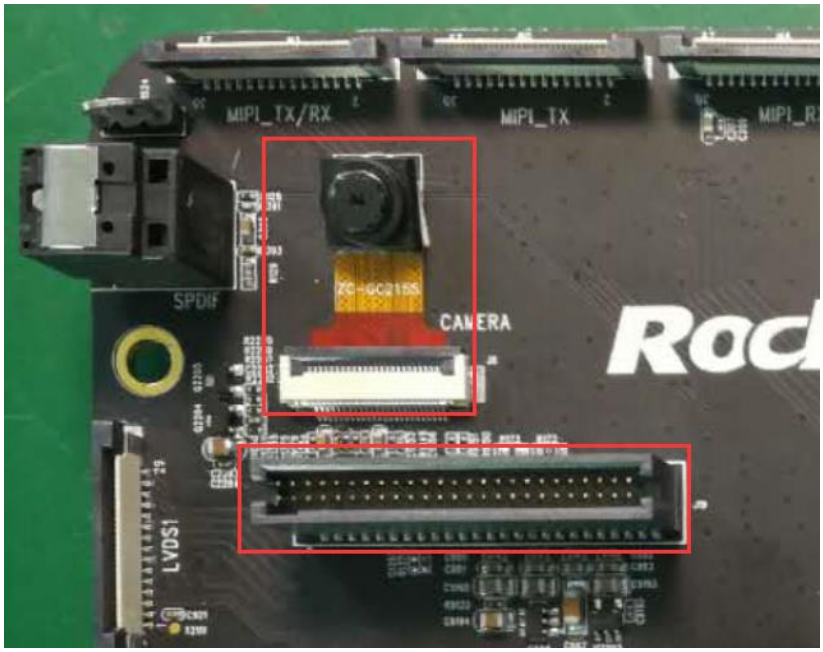


Figure 3-17 camera module and extension Interface

Related signals are reserved on connector for user convenience of camera tuning（Figure above）.

Pin definition of CIF on PCB：

CIF Signals			
1	GND	GND	2
3	CIF_D0	CIF_D1	4
5	CIF_D2	CIF_D3	6
7	CIF_D4	CIF_D5	8
9	CIF_D6	CIF_D7	10
11	CIF_D8	CIF_D9	12
13	NC	NC	14
15	CIF_CLKIN	CIF_CLKOUT	16
17	CIF_VSYNC	CIF_HREF	18
19	CIF_PDN0	CIF_PDN1	20
21	I2C3_SDA_CAM	I2C3_SCL_CAM	22
23	NC	NC	24
25	NC	NC	26
27	VCC28_DVP	VCC28_DVP	28
29	GND	NC	30
31	NC	NC	32
33	GND	GND	34
35	VCC18_DVP	VCC18_DVP	36
37	GND	GND	38
39	VCC_SYS	VCC_SYS	40
41	VCC15_DVP	VCC15_DVP	42
43	DVP_PWR	NC	44
45	NC	NC	46
47	NC	NC	48
49	GND	GND	50

Table 3-6 CIF extension connector signals

3.10 HDMI output

EVB supports HDMI out with type A connector. Thus you can set up dual displays together with other display interface.

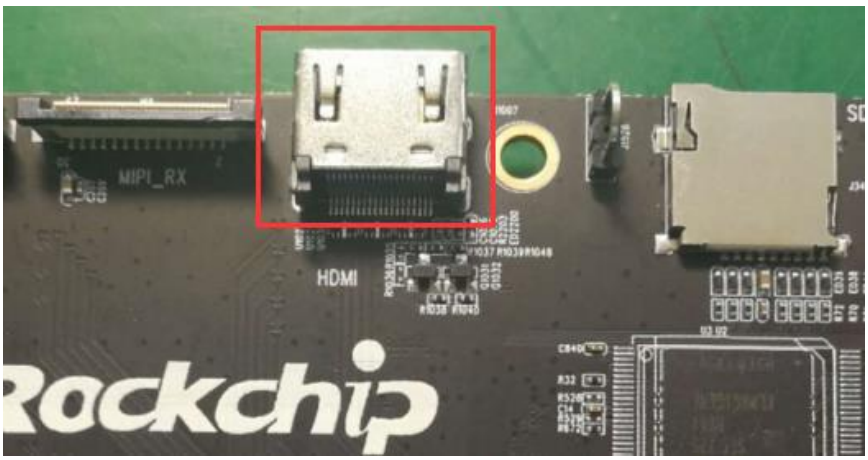


Figure 3-18 HDMI connector

3.11 Audio input and output

The codec of EVB is Realtek ALC5640 with features below：

Stereo Cap-Free headphone amplifier with ultra low power consumption for playback.

Two digital microphone interface support.

Speaker amplifier DC term self-test function for speaker protection.

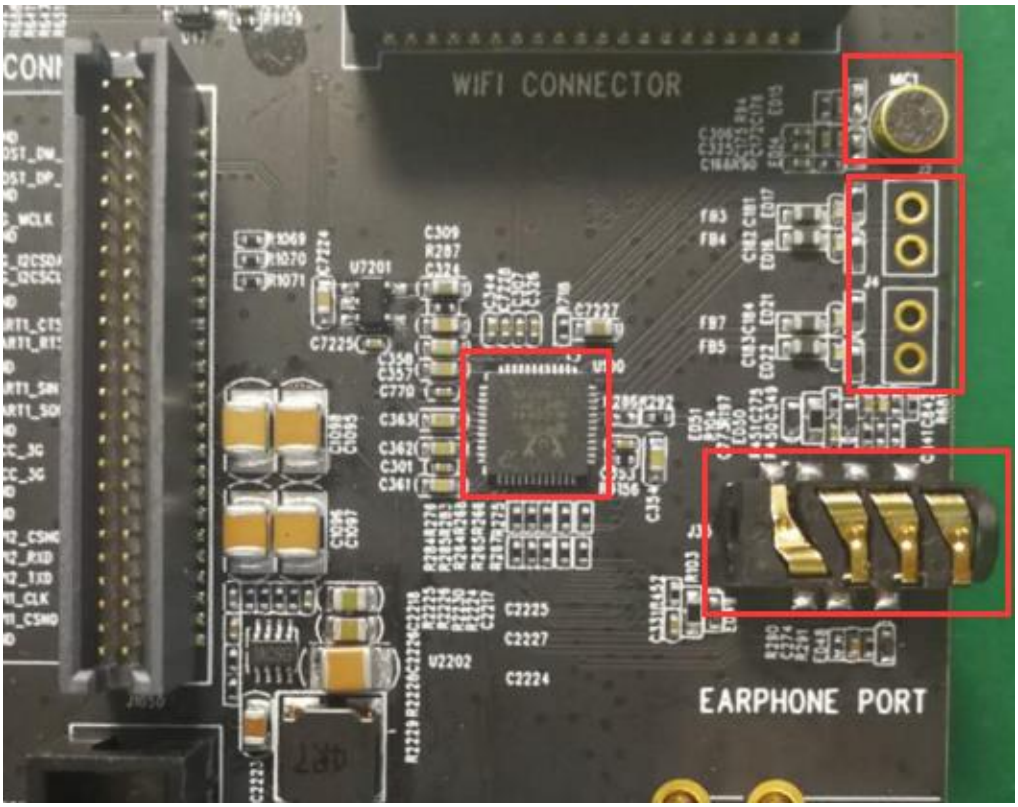


Figure 3-19 Codec and Speaker/Mic/earphone Interface

3. 12 USB OTG/HOST interface

RK3288 has two types of USB interfaces: USB host and USB OTG.

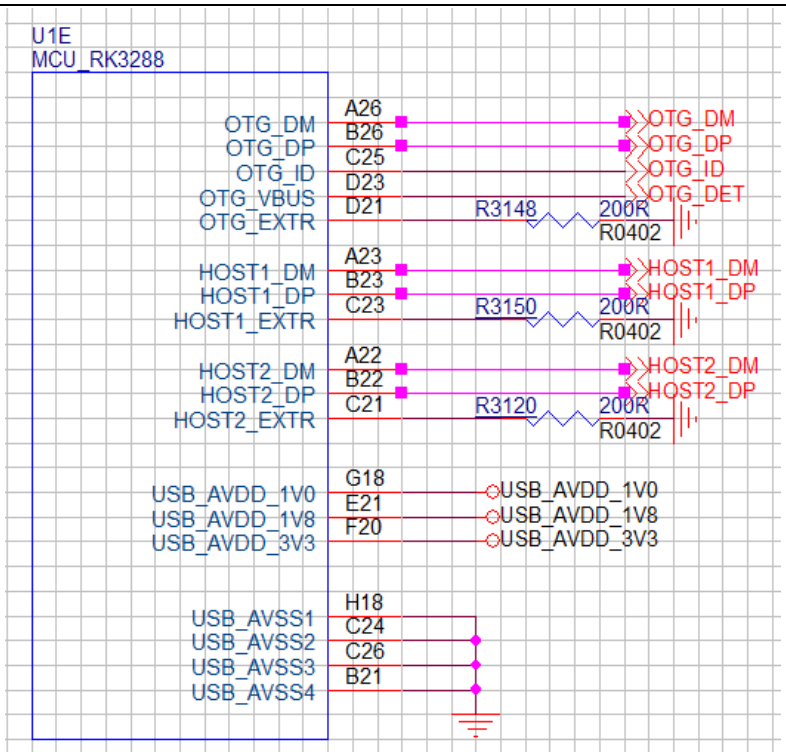


Figure 3-20 USB OTG/HOST schematic

HOST0 and HOST1 utilize Combo USB connector to minimize PCB, supplying different machine and human interfaces such as USB disk、USB mouse、keyboard.

USB OTG interface is used in system firmware update for communication or file/video copy with PC.

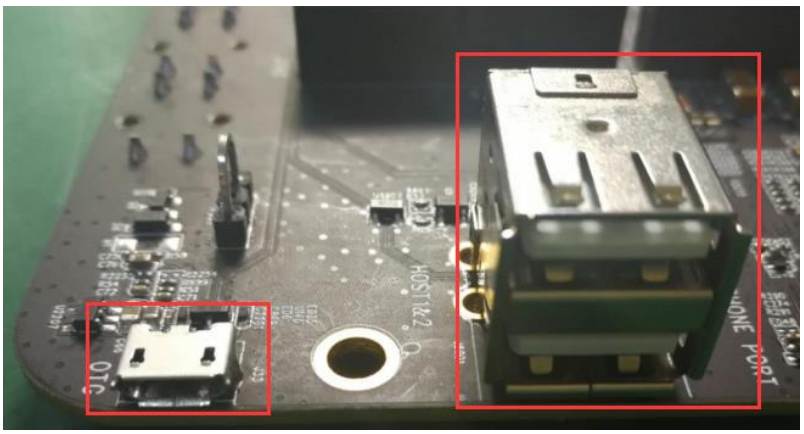


Figure 3-21 USB OTG/HOST Interface

3.13 Ethernet

RJ45 jack on EVB offering Ethernet connection capable of GigaLAN. The features of chose PHY RTL8211E-VB-CG:

- Compliance with IEE802.3 standard, support duplex and half-duplex mode, support cross detection and self-adaption
- 10/100/1000Base-T capable.

- RJ45 jack with LED indicator and isolated transformer

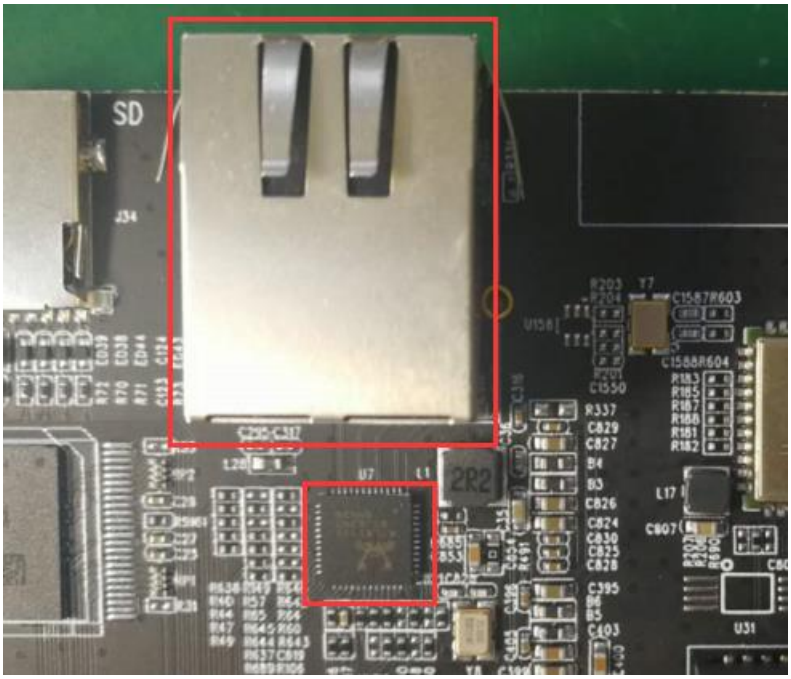


Figure 3-22 Ethernet RJ45 jack Interface

3.14 TF/SD Card interface

The 4-bits SDMMC0 interface of RK3288 makes it simple to play video or utilize local data file for user.

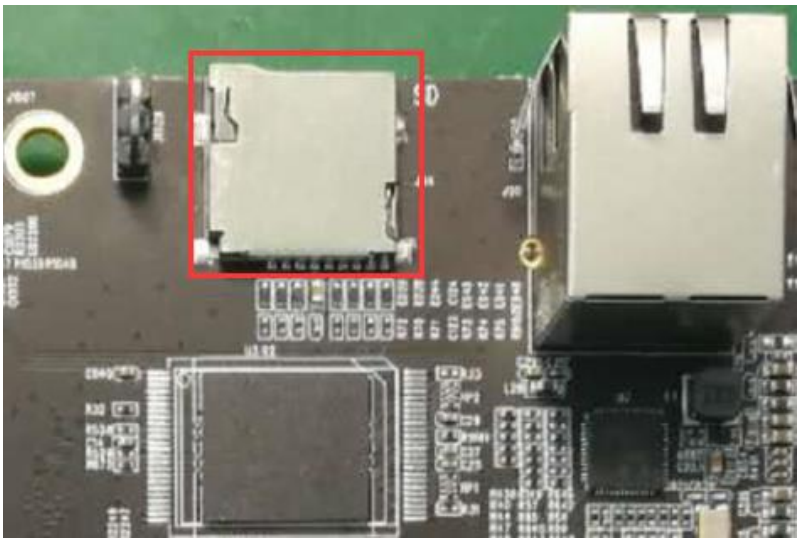


Figure 3-23 TF card Interface

3.15 WIFI+BT module

WiFi+BT module on EVB is AP6335 from AMPAK. Features as below：

- Support WiFi (2.4G and 5G, 802.11 ac), BT4.1
- BT data by UART.
- BT audio by PCM.

- WiFi data in 4-bits SDIO

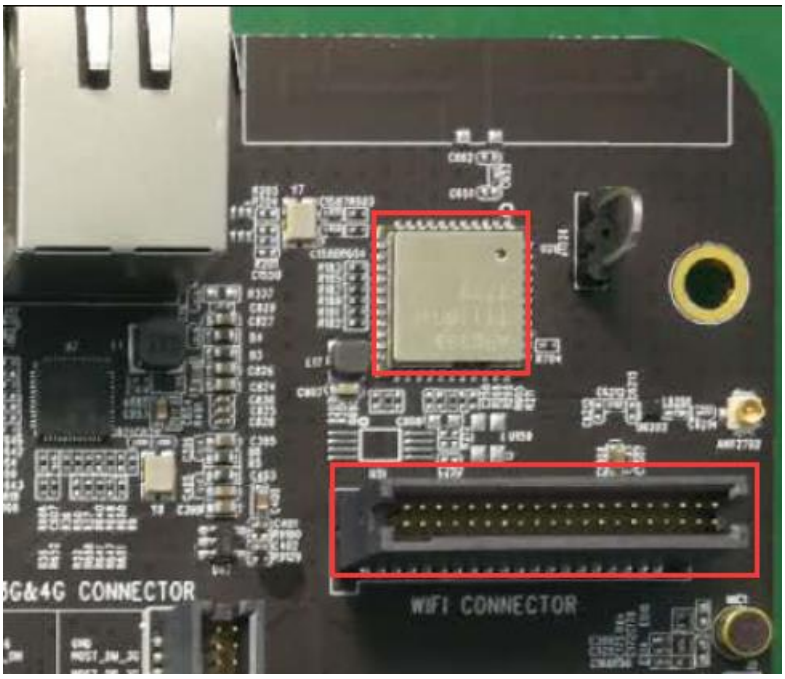


Figure 3-24 WiFi module/extension Interface

More SDIO related signals are reserved on connector for more modules tuning.

Pin definition of extension connector on PCB

SDIO Signals			
1	VCC_SYS	VCC_SYS	2
3	GND	GND	4
5	NC	NC	6
7	NC	NC	8
9	NC	NC	10
11	GND	GND	12
13	RTC_CLKOUT2	WIFI_HOST_WAKE	14
15	WIFI_D0	WIFI_D1	16
17	WIFI_D2	WIFI_D3	18
19	WIFI_CLK	WIFI_CMD	20
21	WIFI_REG_ON	BT_REG_ON	22
23	BT_RST	BT_WAKE	24
25	BT_HOST_WAKE	WIFI_PWR	26
27	UART0_RXD	UART0_TXD	28
29	UART0_CTS	UART0_RTS	30
31	NC	NC	32
33	GND	GND	34
35	VCCIO_WL	VCCIO_WL	36
37	GND	GND	38
39	NC	NC	40

Table 3-7 WiFi SDIO extension Interface signals

3.16 UART debug socket

EVB choose UART2 for debugging by default with a highly-integrated RS232-USB chip FT232RL, supporting baud rate 115200 of RK3288.

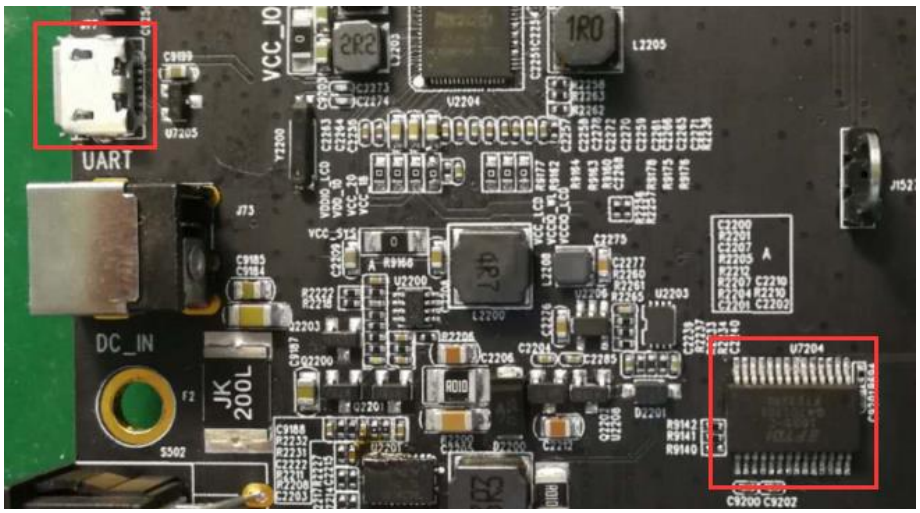


Figure 3-25 UART2 debug IC/USB Interface

3.17 Reserved 3G communication module interface

EVB reserves socket location on PCB for necessary 3G communication module signals such as USB/I2S and low speed signals (I2C/UART/SPI). According to application, user can set up 3G communication module for evaluation and verification in early stage on EVB.

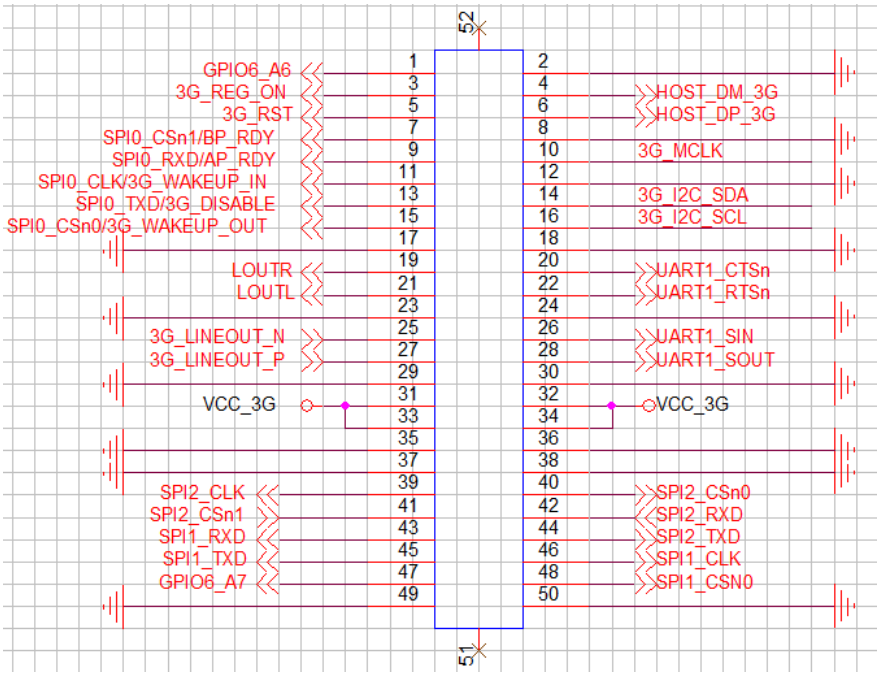


Figure 3-26 3G communication module signals

Socket location on PCB as below, silk mark in the rectangle is corresponding signals：

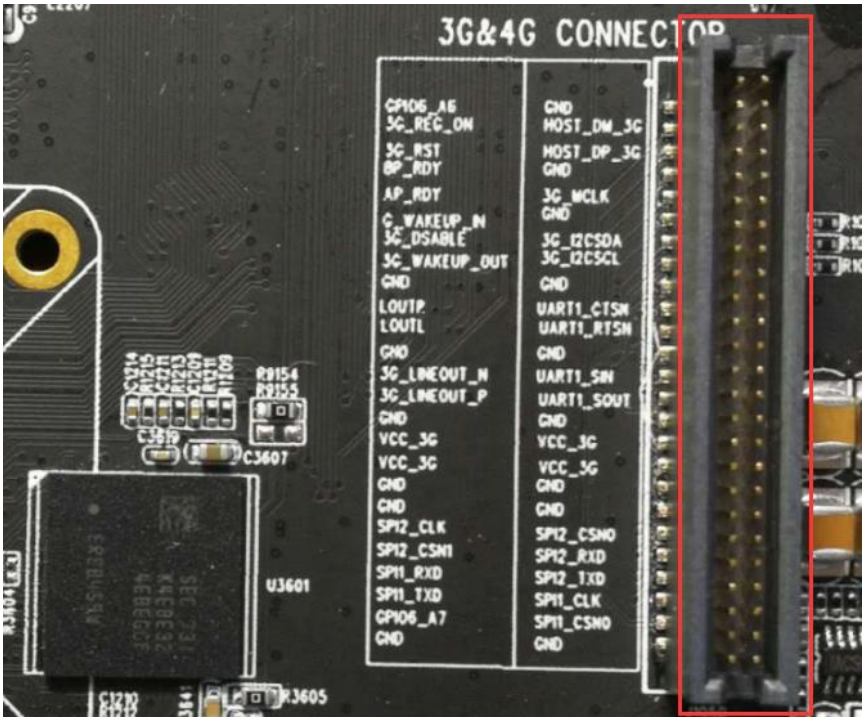


Figure 3-27 3G communication module extension Interface

4 Attention

4.1 Attention

RK3288 EVB is suitable for the laboratory or engineering development environment. Before starting the operation, please read the following notes first:

- ✧ In no circumstances can the power board, the development board and screen interface expansion board hot swap operation.
- ✧ The purpose of packaging and installation before unpacking development board, in order to avoid electrostatic discharge (ESD) damage to the hardware development board, please take the anti-static measures necessary.
- ✧ The purpose of holding development board please take the edge of the development board, do not touch the bare metal part of the development board, so as to avoid damage caused by static electricity on the development board.
- ✧ Please reply to the development board placed on the dry surface, to keep them away from the heat source, the source of electromagnetic interference and electromagnetic radiation source, radiation sensitive equipment (such as: medical equipment etc.).