Junzheng®Halley6Development Kit

Hardware Manual

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北京君正集成电路股份有限公司

Ingenic Semiconductor Co., Ltd.

JunzhengHalley6Development kit

Hardware Manual

Release history

Date	Revision	Change
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Disclaimer

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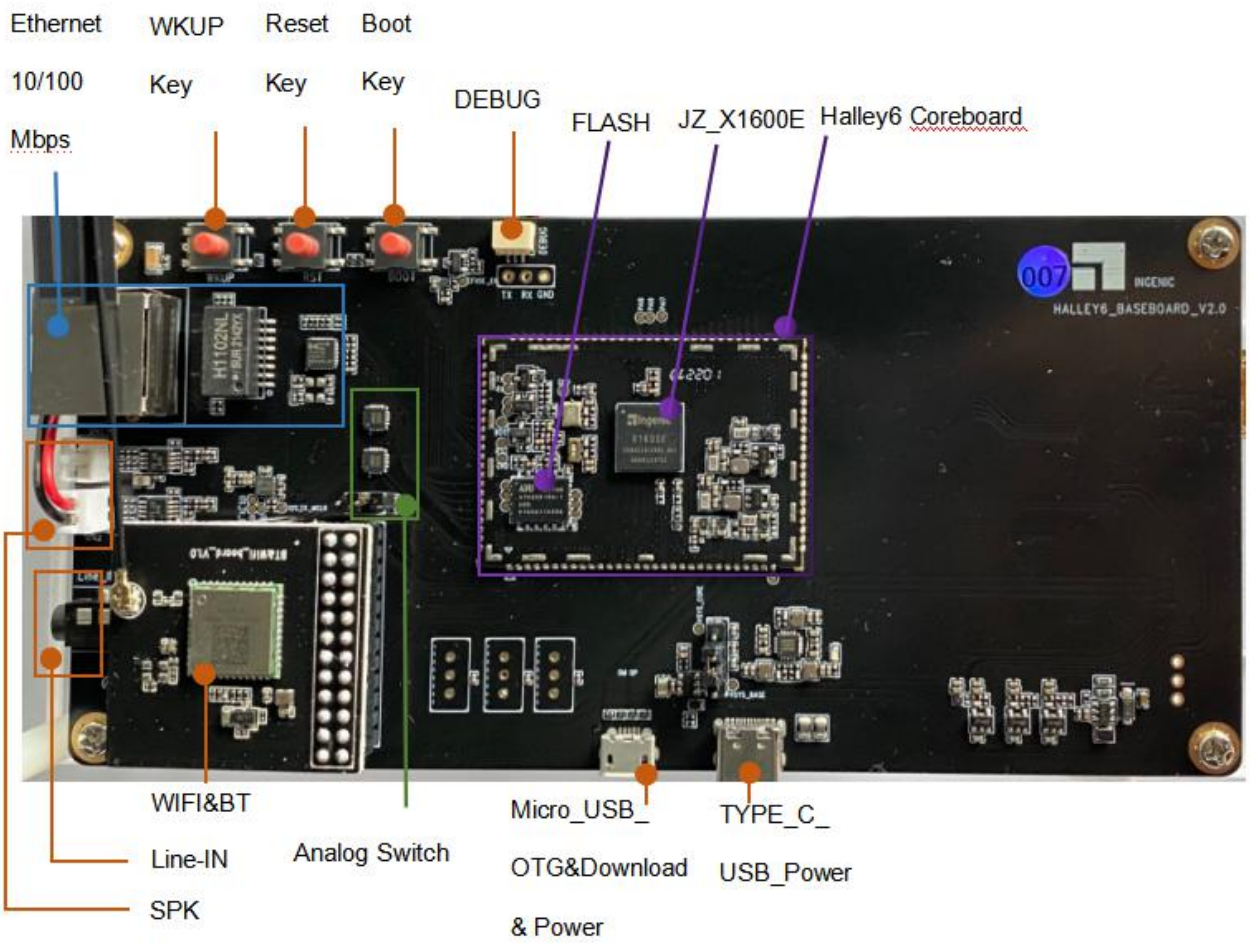
content

1Overview

Halley6It is the Internet of Things (IoT) launched by Beijing Junzheng.IoTThis device development kit can be used for prototyping and demonstrating IoT and smart hardware. The kit provides an out-of-the-box smart hardware solution, facilitating developers to verify and develop their own software and functions. It enables devices to quickly and securely connect to cloud service platforms and mobile devices, shortening product development cycles and accelerating time-to-market.

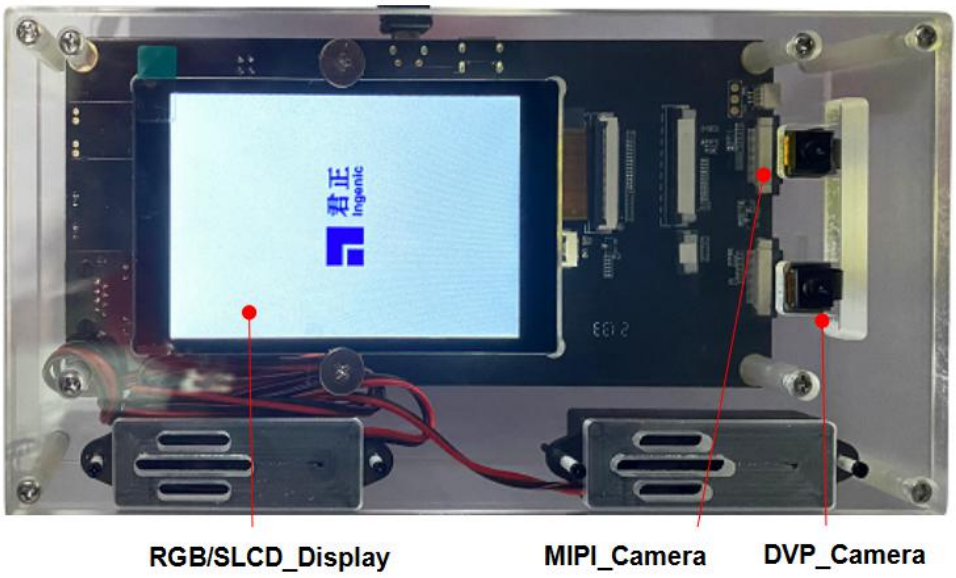


picture1-1 Halley6Development kit front

Halley6Adopting Ingenic's latest dedicated processor for IoT devicesX1600/X1600ESingle coreMIPSStructure, highest operating frequency 1.0GHzSupports high-performance hardware floating-point units (FPU),SIMDAcceleration commands; supports various image recognition algorithms. Halley6The development kit also supports Wi-Fi 2.4GHz IEEE 802.11 b/g/n,Bluetooth 5.0andBluetooth Low EnergyConfiguration1Gbit SPI FlashIt also has rich extension interfaces and is scalable.Ethernet, Display, Audio, Camera, SD card, USB, UART, I2C, PWM, ADC,GPIOwait.

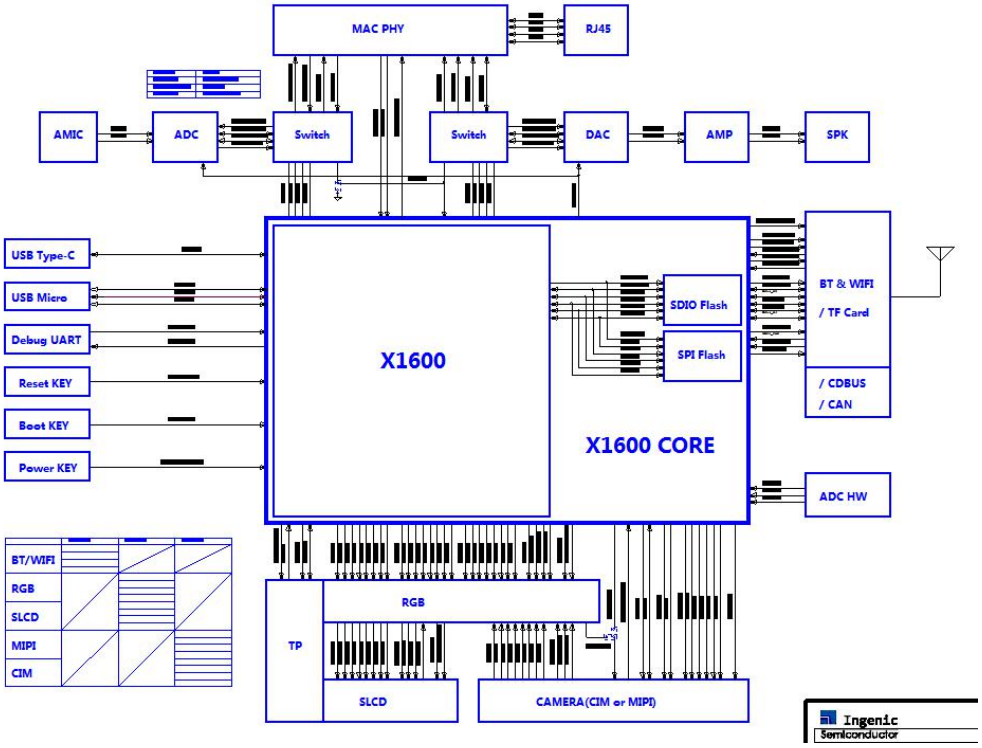
Halley6Support StandardsLinuxsystem,Linux SDKThe source code is completely open source, making it easy for customers to perform secondary development.

1.1Hardware Structure



picture1-2 Halley6Development kit

Halley6The development kit uses a multi-board stack-up structure: including a core board (Core) + base plate (Base) + Display screen (RGB/SLCD) +Camera(DVP&MIPI) +WIFIBTAdapter board. The core board mainly includes...X1600/X1600EProcessor +1Gbit SPI NAND FlashIt extends out in the form of four stamp-shaped perforations; the base plate includes power input and some peripheral expansion interfaces, debugging interfaces, etc.CameraExpansion board support2 laneofMIPIInterface and8-bit DVPThe interface camera. A functional block diagram is shown below:



picture1-3 Halley6Hardware functional block diagram

2Core Board Details

2.1Core board main components

- CPU: Using JunzhengX1600/X1600EProcessor, single coreMIPSStructure, highest1.0GHzClock speed, supports hardware floating-point,SIMD Acceleration command.
- FLASHConfiguration1Gbit SPI NAND FlashSimultaneously compatibleSPI NOR Flash,SDIO NAND FLASHPower supply chip:
- uses discrete components.2*DCDC+4*LDOIt is small in size and highly efficient.

2.2Core board hardware functional circuit

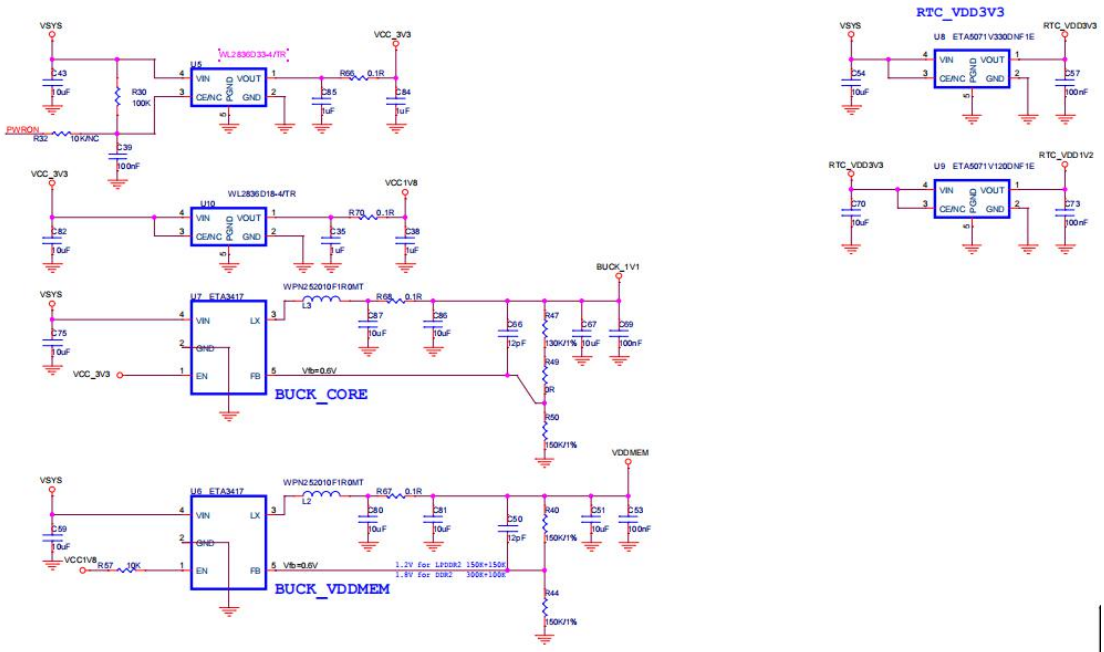
2.2.1Power supply function circuit

Halley6The power supply to the core board is provided by the base plate.The base plate provides a core plate with5VDC power input, Core board passedLDO U8, U9Will5VDC power input to output conversion3.3V,1.2VforX1600ofRTCPower supply; viaLDO U5Conversion output 3.3VforX1600 ofVDDIO,CSI_VCCA33,SADC_AVDD,DDR_PLLVCCA,PLL_AVDD,USB_AVD33Power supply; viaLDO U10 Conversion output1.8VforX1600ofDDR_VDD,VDDIOPower supply; viaDCDC U6,U7Conversion output1.2V,1.1VVoltage isX1600ofVDDMEM,VDDCORE,PLL_VDD,USB_AVD11,CSI_VCCA11powered by.

DCDC ETA3417for2.6V~7VDC voltage input,3MHzSwitching frequency, maximum output current3AIts output voltage is adjustable, and it is packaged as...SOT23-5L.

LDO ETA5071for -0.3V~7VDC voltage input, Maximum output current300mA, Maximum static current1uAEncapsulated asDFN1*1-4.

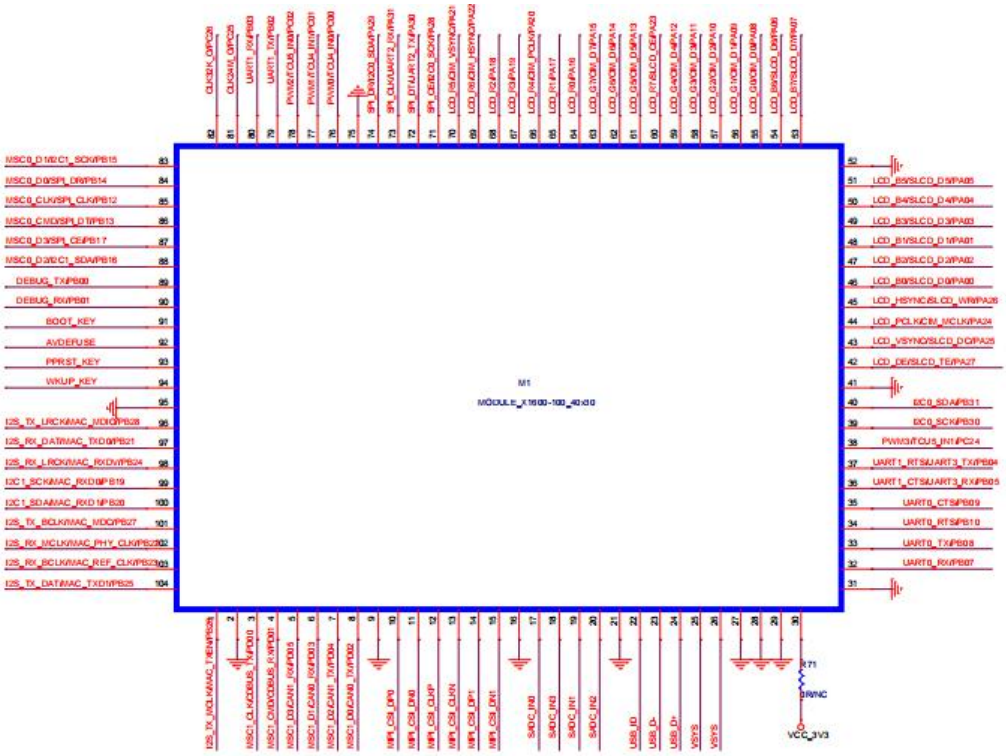
LDO WL2836Dfor -0.3V~7VDC voltage input, maximum output current300mAEncapsulated asDFN1*1-4.



picture2-1Core board power supply function circuit

2.2.2External interface circuit

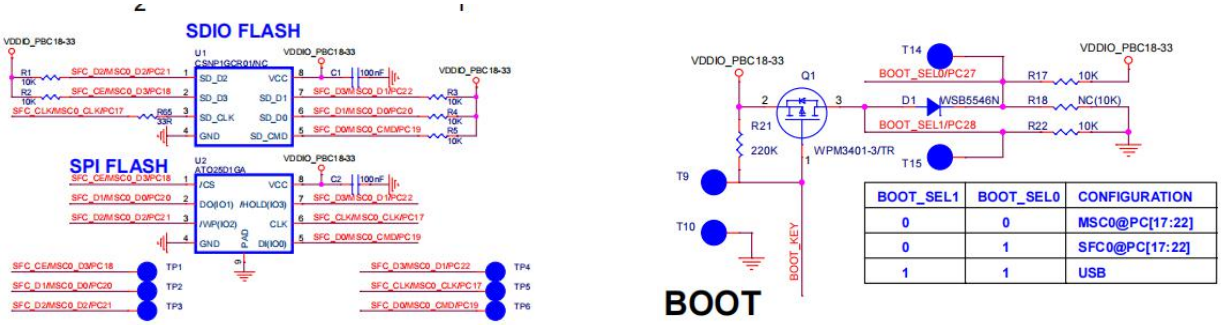
Halley6Core board design104It features a four-sided perforated design. The interface is feature-rich and supports various functional expansions. Display: (RGB, SLCD),I2S,Ethernet MAC,CAM_DVP,MIPI_CSI,SPI,UART,I2C,SDAC,USB.



picture2-2External interface circuit

2.2.3 FlashFunctional circuit

The schematic diagram of the storage circuit is shown below, with the default configuration.1Gbit SPI NAND Flash,compatibleSPI NOR FlashandSDIO FLASH.Halley6 Core board defaultSFC_SPI NAND FLASHStart; if usingSDIO FLASH,Need to be changedBOOTmodel.



picture2-3 FLASHFunctional circuit

3Base Plate Details

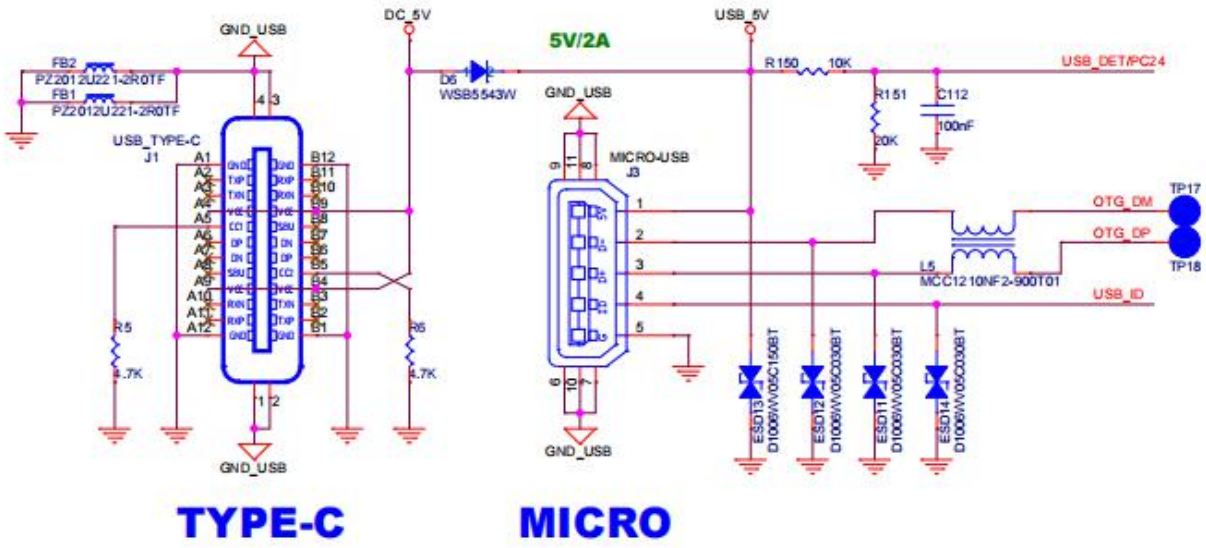
3.1Main functions of the base plate

- Micro USB & Type-Cport:USB Download OTG(J3),USB OTG Power Supply(J1) OVP&Power
- supply circuit
- I2S & MACSwitching circuit
- AUDIO_ADC,AUDIO_DAC,SPKcircuit RJ45
- Ethernet circuit
- button
- Displayinterface
- Camerainterface
- BT/WIFIinterface
- BT/WIFIFunctional circuit

3.2Baseboard hardware functional circuit

3.2.1Burning/OTGFunctional circuit

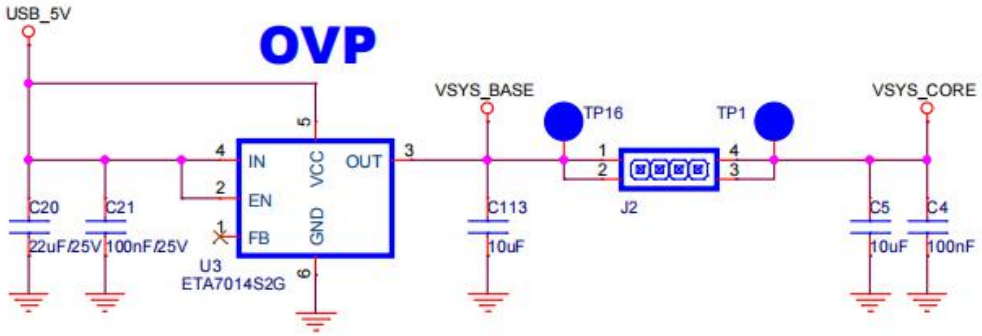
Halley6base plateJ1,J3All ports can be used as power inputs;J3 Micro USBThis is a firmware flashing port, and can also be used as...USB OTGFunction. WhenJ3forOTG HOSTWhen the function is available, it can be generated byTYPE-CinterfaceJ1powered by.



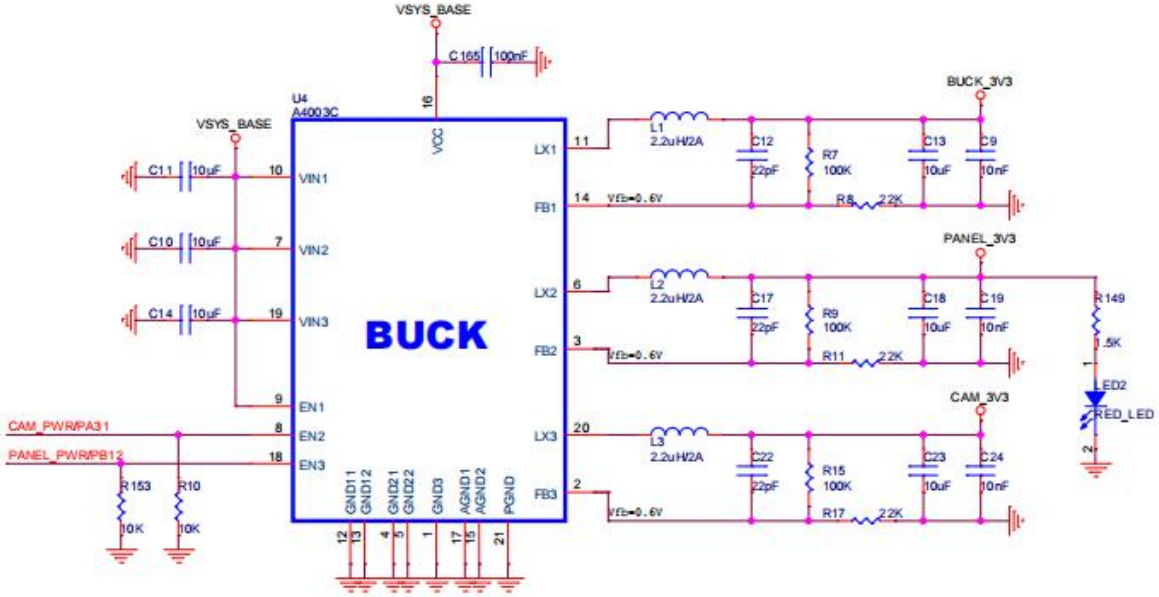
picture3-1Burning &OTGcircuit

3.2.2 OVP & PMICFunctional circuit

Halley6Base plate power supply includesOVPcircuits andPMIC A4003CCircuit,A4003CEach of the functional circuits is powered. A4003C for2.7V~5.5VDC voltage input, internal three-way (CH1,CH2,CH3)BUCKPower output,1.5MHzThe switching frequency and maximum output current are respectively1.2A, 1.5A,1.2A.



picture3-2 OVPcircuit

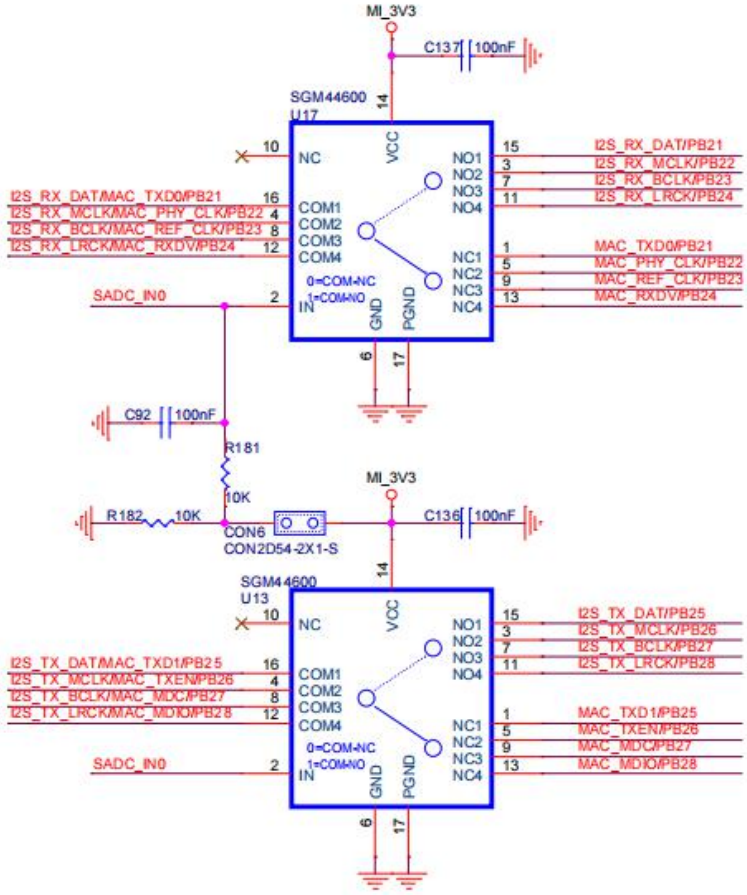


picture3-3 PMICFunctional circuit

3.2.3 I2S & MACFunction switching circuit

X1600processorI2SDigital audio &MACThe controllers share the same interface and useAnalog SwitchIt can be doneI2SFunctions andMACFunction switching.

picture3-4forI2SFunctions andMACFunction switching circuit.U13,U17forAnalog Switch,when2.54pinsCON6The jumper cap is hanging in the air.U13,U17of2foot(IN() is low level, internalCOMChannels andNCChannel is open, forMACFunction; when2.54 pinsCON6Jumper cap connection,U13,U17of2foot(IN() is high level, internalCOMChannels andNOChannel is open, forI2S Function.

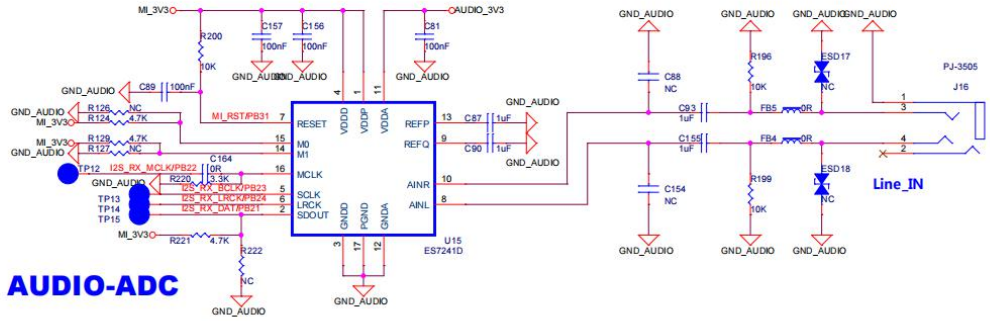


picture3-4 I2C & MACFunction switching circuit

3.2.4 AUDIOFunctional circuit

X1600Processor support12SDigital audio interface, whenU13,U17of2foot(IN() is a high level1At this time, it isI2SFunctions. The following images are respectively:Halley6Development boardAUDIO_ADCCircuit,AUDIO_DACCircuit,SPKCircuit.U15For audioADCchip, U16For audioDAC chip,U18, U21It is an audio amplifier chip.

M1:M0	DESCRIPTION	SAMPLING	MCLK/LRCLK RATIO	
00	Single speed (Master-CLK)	8-50KHz	256	256,384,512,768,1024
01	Double speed (Master-CLK)	50-100KHz	128	128,192
10	Quad speed (Master-CLK)	100-200KHz	64	64
11	All speed (Slave-CLK)			



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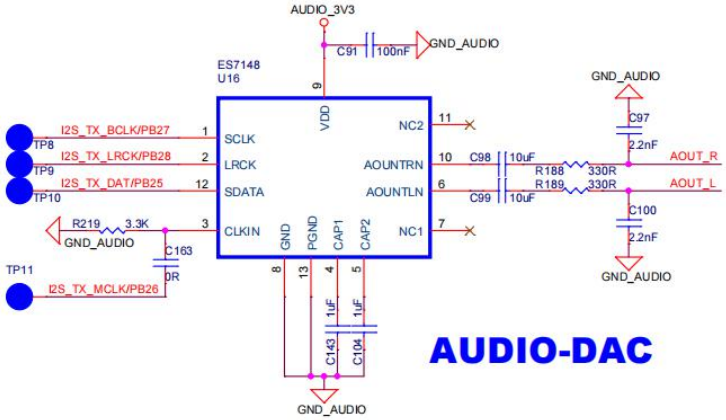
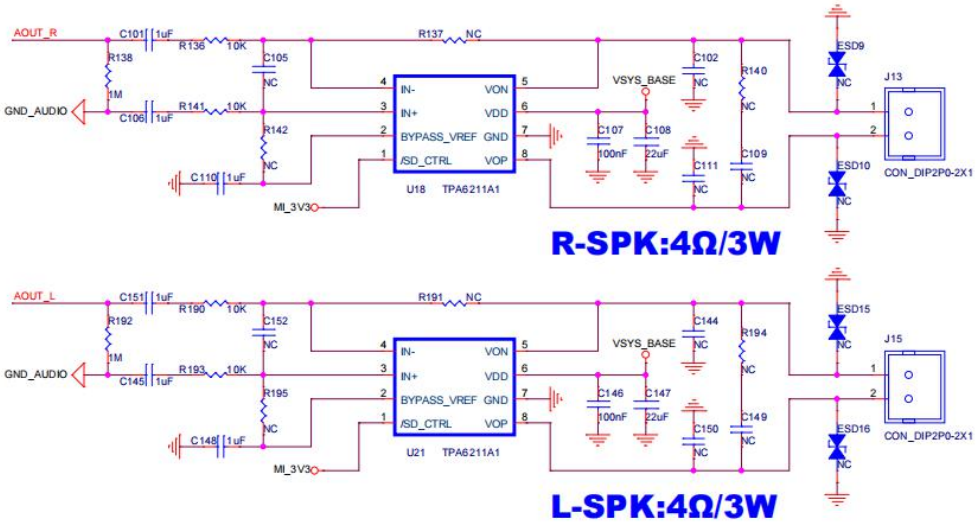
picture3-5 AUDIO_ADCcircuit



picture3-6 AUDIO_DACcircuit



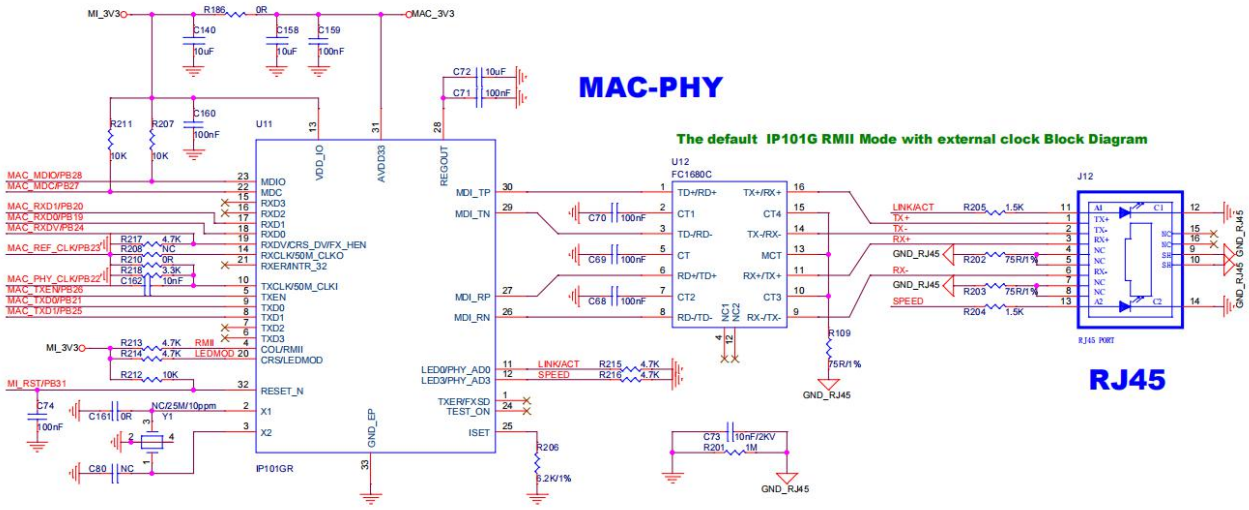
picture3-7 SPKcircuit

3.2.5 EthernetFunctional circuit

whenU13,U17of2foot(IN() is low level0At this time, it isMACFunction.

X1600Processor integration1roadMACThe controller supports a transmission speed of10/100Mbps,supportRMII PHYinterface.Halley6Development board with external physical layer processing chipIP101GR,IP101GRThe clock signal is by default fromX1600The controller's internal output clock can also be provided by an external clock. 25MHzCrystal provided.

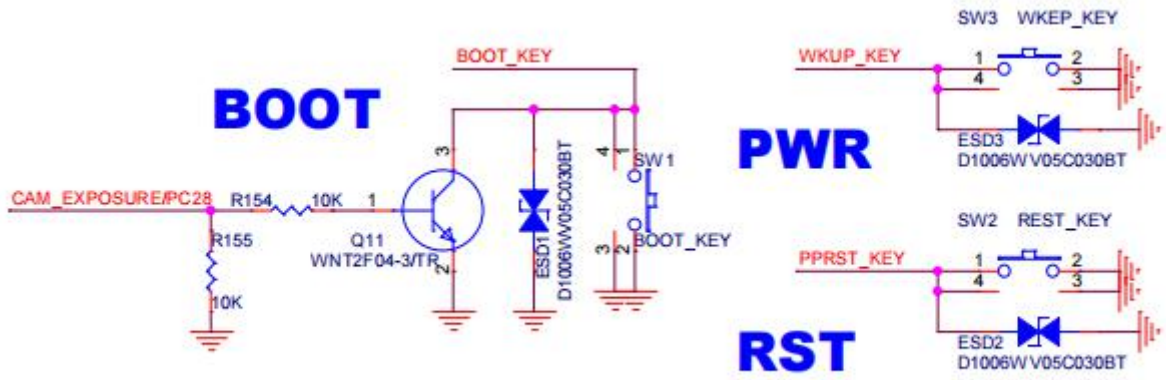
picture3-8forHalley6Ethernet development boardPHYChip Reference Design



picture3-8100Mbps Ethernet transceiver circuit

3.2.6Key function circuit

Halley6Development board design3Each button has a corresponding number of buttons.BOOTbutton,PPRSTbutton,WKUPbutton.SW2This is a hardware system reset button.SW3forWKUPThe button allows the system to wake up from hibernation after powering on. When usedUSBWhen burning the program, you need to press...BOOT_KEY(SW1), core boardQ1Conductive,BOOT_SEL1for1,EnterUSB BOOTBurning mode. After the system boots up,PC28(boot-sel1)Can be used as a regularIO Use, connect toSENSOR_CAM_EXPOSUREinterface.

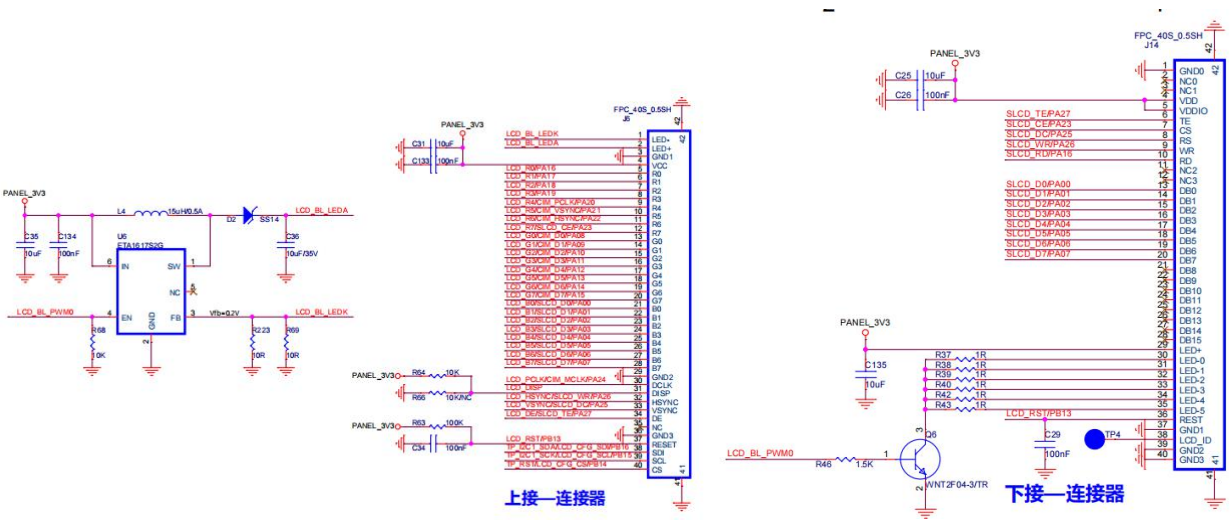


picture3-9Button circuit

3.2.7 DisplayInterface circuit

X1600Platform supportRGBinterface/SLCDinterface;RGBsupportRGB888, RGB565, RGB555Format, maximum display size 1280*720@60Hz; SLCDsupport8bitMaximum display size can reach640*480@60Hz.

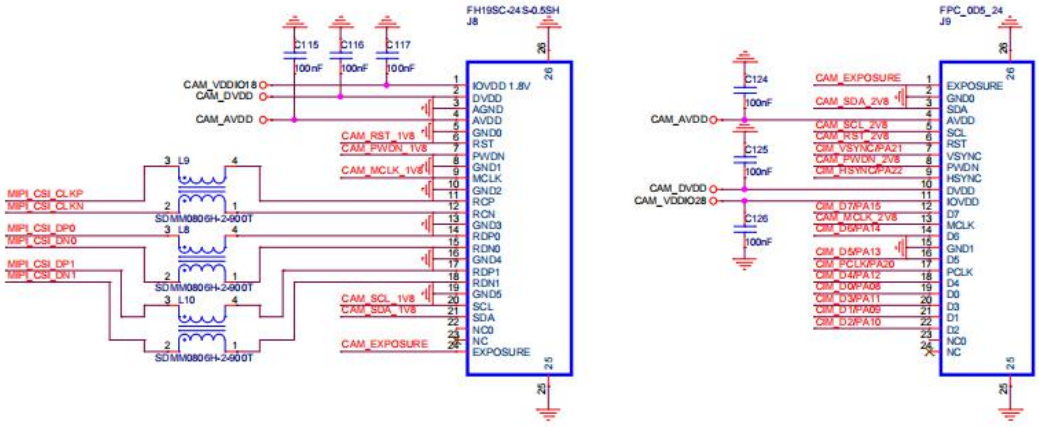
Halley6Development board compatible designRGBandSLCDDisplay screen.



picture3-10 DisplayInterface circuit (left figure)RGBInterface, shown in the right figureSLCDinterface)

3.2.8 Camerainterface

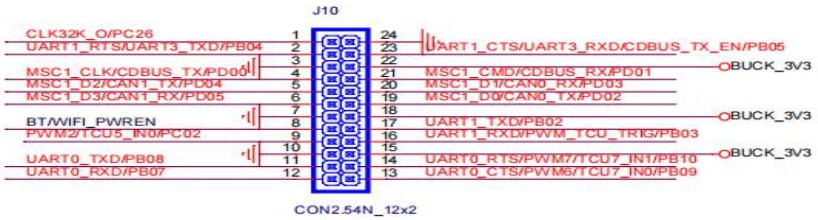
The X1600 platform supports MIPI_CSI and CIM interfaces. The MIPI_CSI interface has a maximum resolution of 1280*1080@60fps, while the CIM interface supports DVP 8-bit input with a maximum resolution of 640*480@60fps. It supports RGB888, RGB565, YCbCr 4:2:2, and Raw RGB data formats. The Halley6 development board uses the SC031GS_DVP/MIPI_Sensor by default.



picture3-11 CameraInterface circuit (left figure)MIPIInterface, shown in the right figureCIMinterface)

3.2.9 BT/WIFIinterface

J10for2.54The Halley6 development board features a dual-row pin header expansion interface with rich functionality, allowing for external expansion with BT/WIFI/TF card/CAN/CDBUS capabilities. The default connector is the AW_NM372SM BT/WIFI module.J10The interface can be externally connected.SDCard(MSC1)



BT/WIFI(UART_MSC_CDBUS_CAN_PWM_TCU)

2.2.4. GPIO Group D

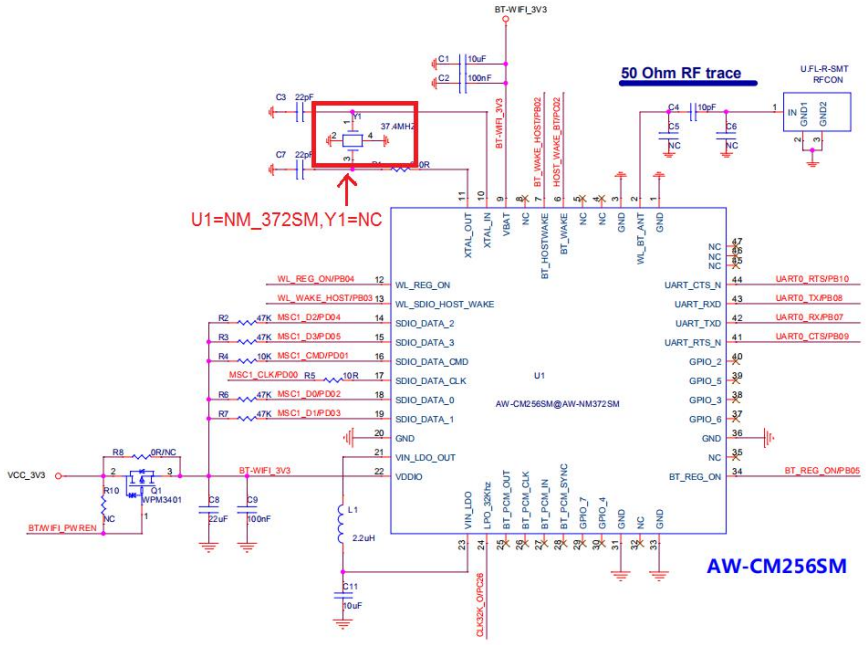
Ball No.	Ball Name	In/Out	Pull	Slew Rate	Schmitt	GPIO	Func0	Func1	Func2	Func3	Power
M4	MSC1_CLK_CDBUS_TX_PD00	IO	PU	No	No	GPD[0]	MSC1_CLK	CDBUS_TX			VDDIO_CAN
N5	MSC1_CMD_CDBUS_RX_PD01	IO	PU	Yes	No	GPD[1]	MSC1_CMD	CDBUS_RX			VDDIO_CAN
M6	MSC1_D0_CAN0_TX_PD02	IO	PU	Yes	No	GPD[2]	MSC1_D0	CAN0_TX			VDDIO_CAN
N6	MSC1_D1_CAN0_RX_PD03	IO	PU	Yes	No	GPD[3]	MSC1_D1	CAN0_RX			VDDIO_CAN
P6	MSC1_D2_CAN1_TX_UART3_TXD_PD04	IO	PU	Yes	No	GPD[4]	MSC1_D2	CAN1_TX	UART3_TXD		VDDIO_CAN
M5	MSC1_D3_CAN1_RX_UART3_RXD_PD05	IO	PU	Yes	No	GPD[5]	MSC1_D3	CAN1_RX	UART3_RXD		VDDIO_CAN

picture3-12BTWIFI/TF/CAN/CDBUS**Interface circuit**

3.2.10 BT/WIFIFunctional circuit

Halley6default design of the development boardAW-CM372SMModule (compatible)AW-CM2563SM) AW-CM372SMsupportWi-Fi 2.4GHz IEEE 802.11 b/g/n,Bluetooth 2.1External dimensions12mm*12mm*1.5mm.

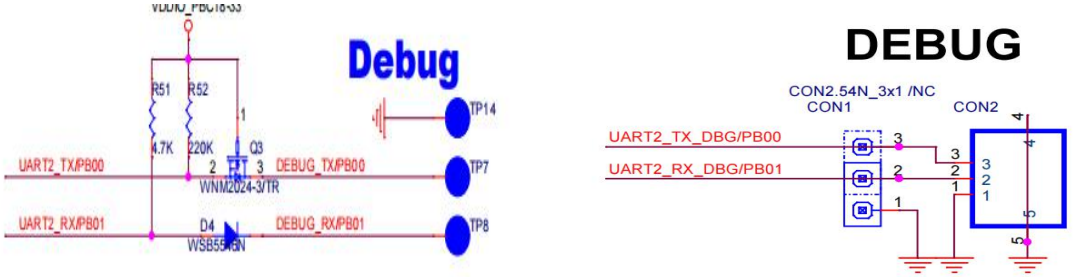
antennaPCBThe wiring section needs to be done50ΩImpedance matching.AW-CM372SMThe module contains a crystal.Y1 = NC.



picture3-13BTWIFI**Functional circuit**

3.2.11 DEBUGInterface circuit

Halley6development board defaultDebugDebug serial portUART2,After the system boots upPCThe serial terminal will output debugging information during system startup.

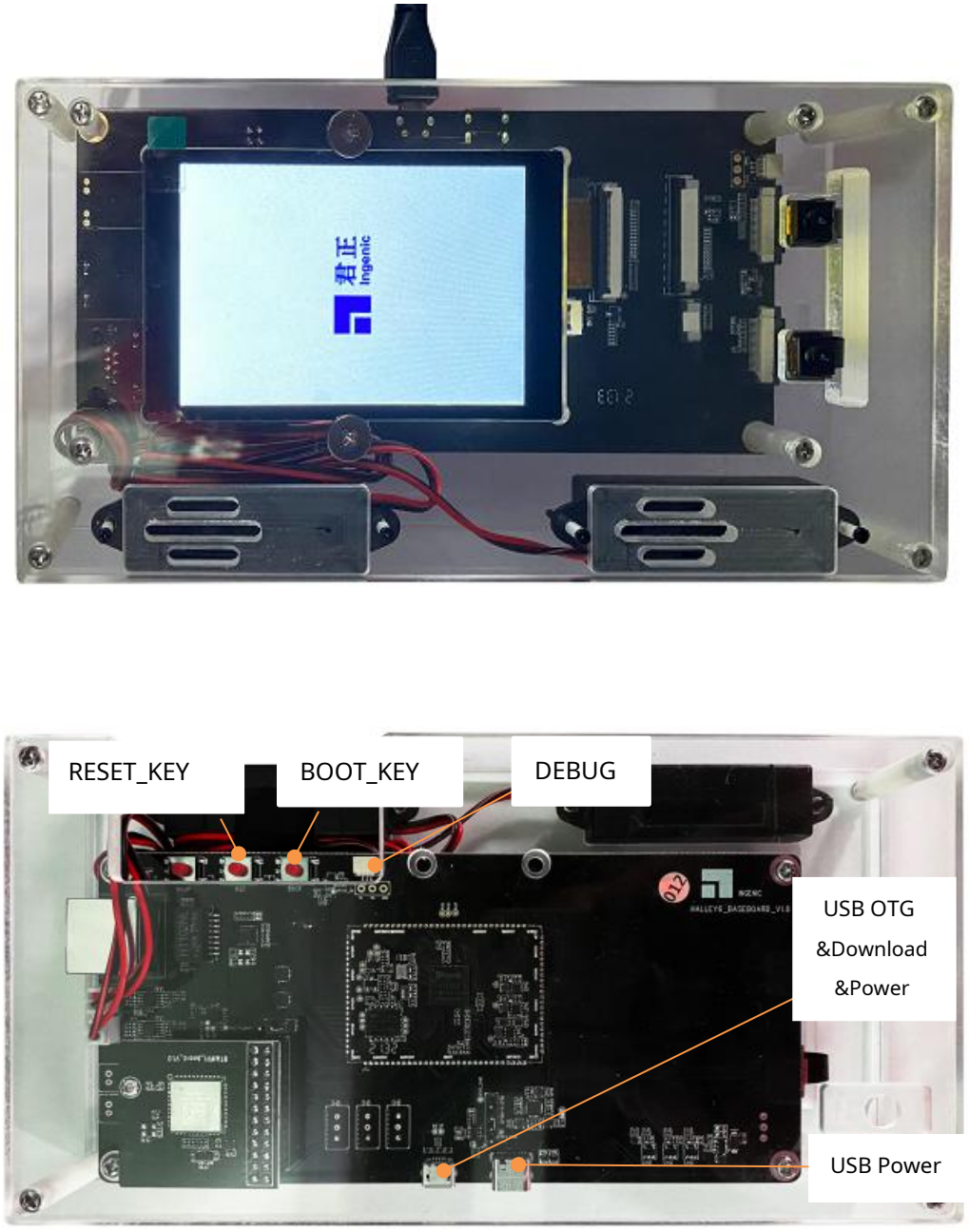


picture3-14DEBUG**Functional circuit**

4Quick UseHalley6Development kit

4.1Hardware connection

- Power port (J1 & J3This port can be provided by the system.USB_5VVoltage. USB_Downloadport(J3This port can be used for firmware
- flashing andUSB OTGFunction. CON1 & CON2For debuggingDEBUGThe interface needs to be accessed through an external...USB
- Convert to serial port motherboard, connect toPCend.



picture4-1 Halley6Development kit interface diagram

4.2Normal startup of the development board

When starting the development board for the first time, connectUSB_5Vpower supply.Halley6The development kit has been burned.Linuxsystem.PCConfigure the serial port parameters as follows 115200bps-8N1.PCConnect via serial port boardDebugAfter the port is powered on, the system will boot directly by default after the motherboard is powered on.PCThe serial terminal will output debugging information during system startup. Alternatively, you can directly press...ResetPress the key to reset and start the development board.

4.3Startup and enter burning mode

The following two methods can be used to boot the development board into firmware flashing mode (see the flashing tool user manual for detailed flashing instructions): Method 1: Prepare a...MICRO_USBCable, InsertJ3Interface, press and holdBOOT1key(SW1), and thenUSBCable connectionPCAt this time, the development board passesUSBPower on and start USB BOOTBurning mode. You can release the button after entering burning mode.BOOTkey.

Method 2: Prepare aMICRO_USBCable, InsertJ3Interface, and thenUSBCable connectionPCThe motherboard is now powered on. Press and hold...BOOT key(SW1), and then triggerResetkey(SW2(Press and hold for a moment, then release), at which point the development board will boot up and enter...USB BOOTBurning mode. You can release the button after entering burning mode.BOOTkey.