IDO-SBC3588-V1B Linux系统使用手册

IDO-SBC3588-Ubuntu系统

1 调试

- 1.1 串口调试
- 1.2 ADB调试
- 1.3 ssh调试
- 2 串口

3 USB

3.1 电源控制

3.2 U盘的挂载

4 Micro SD

5 Ethernet

5.1 查看IP地址

5.2 设置临时IP地址

5.3 设置永久静态IP地址

6 WiFi

6.1 连接WiFi热点

6.1.1 在桌面上操作

6.1.2 使用命令行操作

6.2 测试WiFi网络上网

7 蓝牙

7.1 连接蓝牙设备

7.1.1 在桌面上操作

7.1.2 使用命令行操作

8 指示灯

9 按键

10 4G/5G

11 M.2

12 SATA

13 音频

13.1 扬声器

13.1.1 调节播放音量

13.1.2 静音

13.2 耳机/Line Out

13.2.1 调节播放音量

13.2.2 静音

13.3 MIC

14 RTC

14.1 读取RTC时间

14.2 设置RTC时间

15 IR

16 摄像头

16.1 测试

17 HDMI-IN

IDO-SBC3588-Debian系统

1 调试

1.1 串口调试

1.2 ADB调试

1.3 ssh调试

2 串口

3 USB

3.1 电源控制

3.2 U盘的挂载

4 Micro SD

5 Ethernet

5.1 查看IP地址

5.2 设置临时IP地址

5.3 设置永久静态IP地址

6 WiFi

6.1 连接WiFi热点

6.1.1 在桌面上操作

6.1.2 使用命令行操作

7 蓝牙

7.1 查看蓝牙控制器

7.2 连接蓝牙设备

7.2.1 在桌面上操作

7.2.2 使用命令行操作

8 指示灯

9 按键

10 4G/5G

11 M.2

12 SATA

13 音频

13.1 扬声器

13.1.1 播放音频

13.1.2 调节播放音量

13.2 耳机/Line Out

13.2.1 播放音频

13.2.2 调节播放音量

13.3 MIC

14 RTC

14.1 读取RTC时间

14.2 设置RTC时间

15 IR

16 摄像头

16.1 测试

17 HDMI-IN

IDO-SBC3588-Buildroot系统

1 调试

1.1 串口调试

1.2 ADB 调试

1.3 ssh调试

2 串口

3 USB

3.1 电源控制

3.2 U盘的挂载

4 SD

4.1 SD卡的挂载

5 以太网网口

5.1 查看IP地址

5.2 设置临时IP地址

5.3 设置永久静态IP地址

6 WiFi

6.1 连接WiFi热点

7 蓝牙

7.1 查看蓝牙控制器

7.2 连接蓝牙设备

8 指示灯

9 按键

10 4G/5G

11 M.2

12 SATA

13 音频

13.1 扬声器

13.2 耳机/Line Out

13.2.1 播放音频

13.2.2 调节播放音量

13.3 MIC

14 RTC

14.1 读取RTC时间

14.2 设置RTC时间

15 IR

16 摄像头

16.1 测试

17 HDMI-IN

文档修订历史

版本	修订内容	修订	审核	日期
V1.0	创建文档	谭文学		2024/03/22
V1.1	补充5G模块网络节点说明	谭文学		2024/03/22
V1.2	优化文档	FAE		2024/06/20

IDO-SBC3588-Ubuntu系统

1 调试

1.1 串口调试

主板调试串口位于板子背面(J37),建议使用配套的usb转串口工具,如下图所示:



1. 打开MobaXterm, 下载链接如下:

链接: https://pan.baidu.com/s/1EY5Dces19B3c2oblq0rlfA?pwd=1234

提取码: 1234



2. 选择session为【Serial】,如下图所示:

sion set	tings														
SSH	Teinet	Rsh	Xdmcp	The second secon	VNC	S FTP	SFTP2	serial	ing File	Shell	8 Browser	Nosh	Aws 53	WSL	
					4		hoose a	sessio	in type.						
					0	ОK		O Can	cel						

- 3. 将Serial port修改为在设备管理器中找到的COM端口
- 4. 设置Speed(bsp)为1500000
- 5. 点击【OK】按钮,如下图所示:

SSH	Teinet	Rsh Xdmcp	RDP	VNC	8 9TP	8 SFTP	Serial	File	Shell	8 Browser	Mosh	Aws S3	WSL
a Basi	c Serial settin	gs											
3	Serial port *	COM7 (USB-SE	RIAL CH	340 (COM7))	~]	4	Speed (b)	ps)* 150	~ 0000			
Adva	anced Serial s	ettings 🖪 Te	minal set	tings 🔺	Bookma	ark setting	5						
		-	-										
		Serial engine:	PuTTY	(allows ma	nual COI	I port sett	ng)			~			
		Data bits	8	~	F va	uneed to tr	ansfer files	ie n. mute	er.				
		Stop bits	1	~	conf	iguration file	e), you can	use Mobal	(lerm				X
		Parity	None	~	territo	ecologi i Pi	P 343 VIS					- 0	<u> </u>
		Flow control	Xon/Xoff	~	"Se	overs" wir	>	TETP	erver				· ·
							10.011						
		Reset	defaults										
		Reset Execute macr	defaults to at sessi	ion start:	none>		v						

默认以用户industio登录,登录密码为industio。或选择以用户root登录,登录密码为industio。

1.2 ADB调试

ADB调试端口位于(J39)(TYPEC-0,与烧录端口一致),使用USB-C,连接主板和电脑即可在电脑 上使用ADB调试,如下图所示:



进入ADB调试命令如下:

•										Shell
1 2 3 4 5 6 7 8 9	D:\>a * dae * dae root@ ls bin boot data root@	db she mon no mon st Indust dev etc home Indust	<pre>filt for the second secon</pre>	tartin sfully mnt opt proc	g it n * root run sbin	ow on po sdcard snap srv	rt 5037 sys system tmp	* udisk usr var	vendor	

1.3 ssh调试

系统支持ssh远程调试,默认登录账号密码为: industio@ industio。 ssh调试,如下图所示:



2 串口

主板共配置7路串口(不包括调试串口),其中4路RS232,2路RS485和1路TTL串口,如下图所示:



设备节点信息如下表所示:

序号	接口位置	类型	编号	设备节点
1	J65	RS232	RS232-1	/dev/ttyS6
2	J60	RS232	RS232-2	/dev/ttyS0
3	J67	RS232	RS232-3	/dev/ttyS7
4	J64	RS232	RS232-4	/dev/ttyS3

5	J57	RS485	RS485–1	/dev/ttyS5
6	J66	RS485	RS485-2	/dev/ttyS4
7	J84	TTL	TTL-1	/dev/ttyS8

使用microcom可以进行串口收发测试,命令如下:

▼	Shell	
<pre>1 industio@Industio:~\$ sudo apt-get update 2 industio@Industio:~\$ sudo apt-get install microcom 3 industio@Industio:~\$ microcom -s 115200 -p /dev/ttyS4 4 [754.636312] of_dma_request_slave_channel: dma-names property of erial@fdd50000' missing or empty 5 [754.636443] ttyS4 - failed to request DMA, use interrupt mode 6 connected to /dev/ttyS4 7 Escape character: Ctrl-\ 8 Type the escape character to get to the prompt.</pre>	node	'/s

注意:测试完成,按Ctrl+x退出。

3 USB

主板共配置11路USB接口,其中4路为TYPE-A接口,速率为USB3.0,这里以USB1、USB2、USB3和USB4标记;另外7路为PH2.0接口,速率为USB2.0,以USB5-USB11标记,如下图所示:



USB节点信息如下表所示:

编号	位置	速率
USB1	TYPE-A-1, 上	usb3.0
USB2	TYPE-A-1, 下	usb3.0
USB3	TYPE-A-2, 上	usb3.0
USB4	TYPE-A-2, 下	usb3.0
USB5	5	usb2.0
USB6	6	usb2.0
USB7	7	usb2.0
USB8	8	usb2.0
USB9	9	usb2.0
USB10	10	usb2.0
USB11	11	usb2.0

3.1 电源控制

主板默认11路USB电源默认是开启的,同时提供方法控制USB电源开启或关闭,如下表所示:

编号	控制节点
USB1	/sys/class/leds/usb_host2_pwr/brightness
USB2	/sys/class/leds/usb_host1_pwr/brightness
USB3	/sys/class/leds/usb_host4_pwr/brightness
USB4	/sys/class/leds/usb_host3_pwr/brightness
USB5	/sys/class/leds/host_J52/brightness
USB6	/sys/class/leds/host_J90/brightness
USB7	/sys/class/leds/host_J54/brightness
USB8	/sys/class/leds/host_J56/brightness
USB9	/sys/class/leds/host_J55/brightness
USB10	/sys/class/leds/host_J91/brightness
USB11	/sys/class/leds/host_J53/brightness

以USB1为例(其他USB类似),命令如下:

Shell
 //关闭USB1的电源
 root@Industio:~\$ echo 0 > /sys/class/leds/usb_host2_pwr/brightness
 //开启USB1的电源
 root@Industio:~\$ echo 255 > /sys/class/leds/usb_host2_pwr/brightness

3.2 U盘的挂载

系统默认自动挂载U盘到 /mnt/udisk/xxx 目录下, 命令如下:

```
Shell
industio@Industio:~$ mount
/dev/mmcblk0p8 on / type ext4 (rw,relatime)
...
/dev/sda1 on /mnt/udisk/KINGSTON type vfat (rw,relatime,sync,fmask=0022,dma
sk=0022,codepage=936,iocharset=utf8,shortname=mixed,errors=remount-ro)
```

4 Micro SD

主板配置一路SD接口,位于主板背面,如下图所示:



插入SD卡后,默认挂载到/mnt/sdcard目录,如果未自动挂载可以手动挂载SD卡,命令如下:



5 Ethernet

主板配置2路1000M以太网接口,位于(J37),系统中对应的网络节点为eth0和eth1,如下图所示:



5.1 查看IP地址

```
Shell
 1
     root@Industio:~$ ifconfig eth0
 2
     eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
 3
             inet 192.168.1.149 netmask 255.255.255.0 broadcast 192.168.1.255
             inet6 fe80::1840:cd30:4000:e037 prefixlen 64 scopeid 0x20<link>
 4
 5
            ether e2:49:6c:fe:b2:24 txqueuelen 1000 (Ethernet)
            RX packets 51 bytes 5804 (5.6 KiB)
 6
            RX errors 0 dropped 0 overruns 0 frame 0
7
            TX packets 60 bytes 5895 (5.7 KiB)
8
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
9
10
            device interrupt 156 base 0xd000
11
     root@Industio:~$ ifconfig eth1
12
              Link encap:Ethernet HWaddr AA:70:FD:B5:5B:AE
13
     eth1
               inet addr:192.168.1.166 Bcast:192.168.1.255 Mask:255.255.255.0
14
15
               inet6 addr: fe80::91b0:6438:ad82:7a8f/64 Scope:Link
              UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
16
              RX packets:5 errors:0 dropped:0 overruns:0 frame:0
17
              TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
18
19
              collisions:0 txqueuelen:1000
              RX bytes:971 (971.0 B) TX bytes:1438 (1.4 KiB)
20
21
               Interrupt:90
```

5.2 设置临时IP地址

设置临时IP地址命令如下:

```
• Shell
1 root@Industio:~$ ifconfig eth0 192.168.1.100
2 root@Industio:~$ ifconfig eth1 192.168.0.10
```

5.3 设置永久静态IP地址

修改/etc/network/interfaces内容如下:

Shell

```
1
     # interface file auto-generated by buildroot
 2
 3
     auto lo
 4
    iface lo inet loopback
 5
 6
     auto eth0
 7
             iface eth0 inet static
 8
             address 192.168.0.123
             netmask 255.255.255.0
9
             gateway 192.168.0.1
10
             nameserver 192.168.0.1
11
12
13
     auto eth1
14
             iface eth1 inet static
             address 192.168.1.123
15
             netmask 255.255.255.0
16
17
             gateway 192.168.1.1
18
             nameserver 192.168.1.1
19
```

立即生效命令如下:

•		Shell
1	<pre>sudo systemctl restart networking</pre>	

设备断电重启,此静态IP设置仍然生效。

6 WiFi

主板配置一路2.4G/5G双频wifi,型号为AP6275S,如下图所示:



系统启动会默认打开WiFi,对应的网络节点为wlan0,命令如下:

```
Shell
```

```
1 root@Industio:~$ ifconfig wlan0
2 wlan0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
3 ether 10:bb:f3:55:cf:24 txqueuelen 1000 (Ethernet)
4 RX packets 0 bytes 0 (0.0 B)
5 RX errors 0 dropped 0 overruns 0 frame 0
6 TX packets 0 bytes 0 (0.0 B)
7 TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

6.1 连接WiFi热点

连接热点可以在桌面上操作,也可以使用命令行操作。

6.1.1 在桌面上操作

点击桌面右上角的【下拉】选项按钮,如下图所示:



弹出的列表中点击【Wi-Fi Settings】,如下图所示:



弹出WiFi热点列表,点击要连接的热点名称,如下图所示:

Q Settings Wint Image: Winter information of the set of the s		
 Wi-Fi Airplane Mode Disables Wi-Fi, Bluetooth and mobile broadband Bluetooth Visible Networks O TP-LINK_SG_BBTA TP-LINK_BBTA BLINK_SDID 	ê	
Network Bluetooth Bluetooth Wisible Networks © Packground Packg	ê	
Bluetooth Background Appearance Notifications Plunk_B87A BallNK_SOLD	e ê	
Background TP-LINK_SG_B87A Appearance TP-LINK_B87A ANOtifications Background TP-LINK_STA Data Data Data Data Data Data Data Da	8 8	
Appearance Appearance TP-LINK_B87A A Notifications Builty: 5510	•	
Notifications PLINK_507A RUNK_501D		
BELINK SDID	0	
Q Search		
	8	
Privacy	•	
○ Online Accounts	8	
	Đ	
	8	
① Power	â	
➡ Displays ▼ factory-test-SG	•	
⑦ Mouse & Touchpad ♥ ChinaNet-21EA	8	
G Printers ♥ MERCURY_836C44		

弹出密码输入框,使用键盘输入密码,如下图所示:

	wlan0 p2p0	
ৃ Wi-Fi	Aimlane Mode	
Network	Disables Wi-Fi, Bluetooth and mobile broadband	
Background	Visible Networks O	
Appearance	TP-LINK_B87A	ê
A Notifications		A O
Q Search		A
III Applications	access the wireless network "TP-LINK_SG_B87A".	-
Privacy		•
 Online Accounts 	Cancel Connect	a
Sharing	▼ Xiaomi_7FA5	£
Power	▼ factory-test-5G	A
😡 Displays	Xiaomi_7FA5_5G	â
🖱 Mouse & Touchpad	Meorient-SZ-GUEST	â
Keyboard Shortcuts	ChinaNet-MvDm	
Printers	✓ Meorient-SZ	

如果热点名称后面有"√"标记,表示连接成功,如下图所示:

ି Wi-Fi			
③ Network		Airplane Mode Disables Wi-Fi, Bluetooth and mobile broadband	
Bluetooth			
Background		Visible Networks	
		TP-LINK_B87A	8
A		TP-LINK_1BAA	8
ų notirications		B-LINK_5D1D	8
Q Search		Factory-test-2.4G	9
iii Applications	>		
🔒 Privacy	>	Industio_5.8	
 Online Accounts 		▼ Industio_2.4	
≪ Sharing		TP-LINK_5G_B87A	
e sharing		▼ Xiaomi_7FA5	8
JJ Sound		factory-test-5G	8
 Power 			0
😡 Displays		▼ Alaomi_/FA5_5G	
() Mouse & Touchpad		❤ Meorient-SZ-GUEST	â
Keyboard Shortcut:	s	ChinaNet-MvDm	•

通过ifconfig 命令查看wlan0的IP地址确认,命令如下:

Shell

1	industio@Industio:~\$ ifconfig wlan0
2	wlan0: flags=4163 <up,broadcast,running,multicast></up,broadcast,running,multicast>
3	inet 192.168.1.170 netmask 255.255.255.0 broadcast 192.168.1.255
4	inet6 fe80::636b:35e9:63df:e09a
5	inet6 fe80::174c:5956:620a:b2c9 prefixlen 64 scopeid 0x20 <link/>
6	ether 10:bb:f3:55:cf:25 txqueuelen 1000 (Ethernet)
7	RX packets 0 bytes 1464623 (1.4 MB)
8	RX errors 0 dropped 0 overruns 0 frame 0
9	TX packets 2225 bytes 203231 (203.2 KB)
10	TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

6.1.2 使用命令行操作

 \mathbf{v}

命令行可以使用nmcli工具连接wifi热点,命令如下:

•	Shell
1	industio@Industio:~ <mark>\$ sudo</mark> nmcli dev wifi connect TP-LINK_B87A password 1234 5678
2	<pre>Device 'p2p0' successfully activated with '625bea9c-1a64-469e-8024-5c3c82c7 976d'.</pre>

查看p2p0的IP地址,确认连接成功,命令如下:

Shell

```
1
    industio@Industio:~$ ifconfig p2p0
2
    p2p0: flags=4163<UP, BROADCAST, RUNNING, MULTICAST> mtu 1500
3
            inet 192.168.1.118 netmask 255.255.255.0 broadcast 192.168.1.255
           inet6 fe80::c81a:b213:d6fd:8a06 prefixlen 64 scopeid 0x20<link>
4
5
           ether 12:bb:f3:55:cf:25 txqueuelen 1000 (Ethernet)
6
           RX packets 0 bytes 7120 (7.1 KB)
           RX errors 0 dropped 0 overruns 0 frame 0
7
           TX packets 81 bytes 9389 (9.3 KB)
8
9
           TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

6.2 测试WiFi网络上网

WiFi连接成功后,点击桌面左上角的【浏览器】打开浏览器,如下图所示:



能够打开网页,说明WiFi网络功能正常,如下图所示:



使用ping工具测试上网功能,命令如下:

1	industio@Industio:~ <mark>\$ ping</mark> www.baidu.com -I wlan0
2	PING www.a.shifen.com (14.119.104.189) from 192.168.1.171 p2p0: 56(84) byte
	s of data.
3	64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=1 ttl=54 time=10.0
	ms
4	64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=2 ttl=54 time=15.3
	ms
5	64 bytes from 14.119.104.189 (14.119.104.189): icmp_seq=3 ttl=54 time=10.3
	ms

7 蓝牙

主板配置1路蓝牙模块(型号为AP6275S),如下图所示:



查看蓝牙节点命令如下:

•	Shell
1	industio@Industio:~\$ hciconfig
2	hci0: Type: Primary Bus: UART
3	BD Address: 10:BB:F3:56:44:55 ACL MTU: 1021:6 SC0 MTU: 255:12
4	UP RUNNING
5	RX bytes:1772 acl:0 sco:0 events:61 errors:0
6	TX bytes:4739 acl:0 sco:0 commands:61 errors:0
7	
8	industio@Industio:~\$

7.1 连接蓝牙设备

连接蓝牙设备可以在桌面上操作,也可以使用命令行操作。

7.1.1 在桌面上操作

点击桌面右上角的【下拉选项】,如下图所示:



弹出的列表中点击【蓝牙】,继续点击【Bluetooth Setting】,如下图所示:



弹出蓝牙扫描列表,点击要连接的蓝牙设备名称,连接蓝牙设备,如下图所示:

Q Settings ≡	Bluetooth	8
ি Wi-Fi	Unknown	Not Set Up
⑦ Network	Unknown	Not Set Up
Bluetooth		
🙄 Background	Unknown	Not Set Up
Appearance	Unknown	Not Set Up
	Unknown	Not Set Up
Q Search	AirPods - Find My	Not Set Up
III Applications		not set op
Privacy >	Unknown	Not Set Up
 Online Accounts 	Unknown	Not Set Up
8 -1 -1		

设备名称后面提示"Connected",表示该设备已连接成功,如下图所示:

Q Settings		Bluetoot	h 💽 – 🗆 😫
ङ Wi-Fi		Unknown	Not Set Up
③ Network		Unknown	Not Set Up
8 Bluetooth		Unknown	Not Set Up
🖓 Background			
Appearance		Unknown	Not Set Up
D Notifications		Unknown	Not Set Up
Q Search		Unknown	Not Set Up
iii Applications	>		
🖻 Privacy	>	Unknown	Not Set Up
 Online Accounts 		AirPods - Find My	Connected
\propto_0° Sharing		Unknown	Not Set Up
□ Sound			
• Power		Unknown	Not Set Up

7.1.2 使用命令行操作

扫描蓝牙设备,命令如下:

Shell

	1	industio@Industio:~ <mark>\$ hciconfig</mark> hci0 iscan
	2	industio@Industio:~\$ bluetoothctl
	3	Agent registered
	4 -	[CHG] Controller 10:BB:F3:56:44:55 Pairable: yes
	5 -	[bluetooth]# scan on
	6	Discovery started
	7 -	[CHG] Controller 10:BB:F3:56:44:55 Discovering: yes
	8 -	[CHG] Device 24:4C:AB:09:98:A6 RSSI: -92
	9	
1	.0 -	[NEW] Device 7C:C1:80:09:DD:6C AirPods - Find My
1	1	
1	2	

通过mac配对蓝牙设备,命令如下:

•	Shell
1 -	<pre>[bluetooth]# trust 7C:C1:80:09:DD:6C</pre>
2 📼	<pre>[CHG] Device 7C:C1:80:09:DD:6C Trusted: yes</pre>
3	Changing 7C:C1:80:09:DD:6C trust succeeded
4 =	<pre>[bluetooth]# pair 7C:C1:80:09:DD:6C</pre>
5	Attempting to pair with 7C:C1:80:09:DD:6C
6 =	<pre>[CHG] Device 7C:C1:80:09:DD:6C Connected: yes</pre>
7 -	<pre>[CHG] Device 7C:C1:80:09:DD:6C Name: AirPods</pre>
8 🖛	<pre>[CHG] Device 7C:C1:80:09:DD:6C Alias: AirPods</pre>
9 📼	<pre>[CHG] Device 7C:C1:80:09:DD:6C Modalias: bluetooth:v004Cp2013dB087</pre>
10 -	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 00001000-0000-1000-8000-00805f9b34fb
11 -	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 0000110b-0000-1000-8000-00805f9b34fb
12 📼	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 0000110c-0000-1000-8000-00805f9b34fb
13 🖛	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 0000110e-0000-1000-8000-00805f9b34fb
14 📼	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 0000111e-0000-1000-8000-00805f9b34fb
15 📼	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 00001200-0000-1000-8000-00805f9b34fb
16 📼	[CHG] Device 7C:C1:80:09:DD:6C UUIDs: 74ec2172-0bad-4d01-8f77-997b2be0722a
17 -	<pre>[CHG] Device 7C:C1:80:09:DD:6C ServicesResolved: yes</pre>
18 📼	<pre>[CHG] Device 7C:C1:80:09:DD:6C Paired: yes</pre>
19	Pairing successful
20 -	[AirPods - Find My]# exit

8 指示灯

主板共配置1个系统运行指示灯,系统正常运行时,该LED闪烁,如下图所示:



9 按键

主板共配置3个按键,如下图所示:



各个按键的说明如下表所示:

编号	名称	说明
1	RECOVERY	电源按键,用于开机/关机;
5	RESET	复位按键,用于硬件复位;
6	POWER	烧录按键,用于烧录,或系统启动后,按下上报 KEY_VOLUMEUP;

10 4G/5G

默认支持EC20(4G)模块和RG200U(5G)模块。

安装好4G/5G模块及SIM卡,系统启动后,执行quectel-CM拨号,命令如下:

Shell
1 industio:~\$ quectel-CM &

当wwan0(4G)或usb0(5G)网络节点获取到IP,说明拨号成功,命令如下:

```
1
    industio@Industio:~$ ifconfig wwan0
    wwan0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
2
3
           inet 10.252.248.35 netmask 255.255.255.248 destination 10.252.24
    8.35
           inet6 fe80::ecdc:1a63:2957:e7c7 prefixlen 64 scopeid 0x20<link>
4
5
           n 1000 (UNSPEC)
           RX packets 46 bytes 4308 (4.2 KiB)
6
7
           RX errors 0 dropped 0 overruns 0 frame 0
8
           TX packets 66 bytes 7054 (6.8 KiB)
9
           TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10
11
```

测试4G/5G上网功能是否正常,命令如下:

•	Shell
1	industio@Industio:~ <mark>\$ ping 114.114.114.114 -I</mark> wwan0
2	PING 114.114.114.114 (114.114.114) from 10.252.248.35 wwan0: 56(84) by
	tes of data.
3	64 bytes from 114.114.114.114: icmp_seq=1 ttl=91 time=184 ms
4	64 bytes from 114.114.114.114: icmp_seq=2 ttl=79 time=83.8 ms
5	64 bytes from 114.114.114.114: icmp_seq=3 ttl=67 time=91.6 ms
6	64 bytes from 114.114.114.114: icmp_seq=4 ttl=63 time=77.9 ms
7	64 bytes from 114.114.114.114: icmp_seq=5 ttl=93 time=79.6 ms
8	64 bytes from 114.114.114.114: icmp_seq=6 ttl=83 time=86.7 ms
9	64 bytes from 114.114.114.114: icmp_seq=7 ttl=68 time=84.8 ms
10	64 bytes from 114.114.114.114: icmp_seq=8 ttl=80 time=88.8 ms

11 M.2

主板配置了一路M.2接口,可接PCIE固态硬盘使用,如下图所示:



接入PCIE固态硬盘后,使用fdisk工具查看该设备,命令如下:

```
Shell
1 root@Industio:~$ fdisk -l
2 .....
3 .....
4 Device Boot Start End Sectors Size Id Type
5 /dev/nvme0n1p1 2048 250069646 250067599 119.2G c W95 FAT32 (LBA)
```

使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

•					Shell		
1	1 root@Industio:~ <mark>\$ mount</mark> /dev/nvme0n1p1 /mnt						
2 =	[239. 607381]	FAT-fs	(nvme	0n1p1):	utf8 is not a recommended IO charset fo		
	r FAT filesyste	ems, fi	lesyst	em will	be case sensitive!		
3 🖛	[239.608734]	FAT-fs	(nvme	0n1p1):	Volume was not properly unmounted. Som		
	e data may be c	orrupt	. Plea	se run	fsck.		
4	root@Industio:~	∕\$ df -	h				
5	文件系统	容量 E	別用可	用 已用%	挂载点		
6	/dev/root	14G	<mark>3</mark> .3G	11G	25% /		
7	devtmpfs	<mark>3</mark> .9G	<mark>8</mark> .0K	<mark>3</mark> .9G	1% /dev		
8	tmpfs	<mark>3</mark> .9G	0	<mark>3</mark> .9G	0% /dev/shm		
9	tmpfs	1. 6G	1. 7M	1. 6G	1% /run		
10	tmpfs	<mark>5</mark> .0M	4. 0K	<mark>5</mark> .0M	1% /run/lock		
11	tmpfs	<mark>3</mark> .9G	16K	<mark>3</mark> .9G	1% /tmp		
12	/dev/mmcblk0p7	127M	12M	109M	10% /oem		
13	/dev/mmcblk0p8	43G	44K	41G	1% /userdata		
14	tmpfs	793M	44K	793M	1% /run/user/1000		
15	tmpfs	793M	32K	793M	1% /run/user/0		
16	/dev/nvme0n1p1	120G	67M	120G	1% /mnt		

12 SATA

主板配置了一路SATA接口,可接SATA固态硬盘使用,如下图所示:



接入SATA固态硬盘后,使用fdisk工具查看该设备,命令如下:

```
Shell
```

```
root@Industio:~$ fdisk -l
1
   Disk /dev/sda: 466 GB, 500107862016 bytes, 976773168 sectors
2
   60801 cylinders, 255 heads, 63 sectors/track
3
4
   Units: sectors of 1 * 512 = 512 bytes
5
6
   Device Boot StartCHS
                            EndCHS
                                          StartLBA
                                                       EndLBA
                                                                 Sectors Siz
   e Id Type
   /dev/sda1
                            1023,254,63
                                              2048 976773134 976771087 465
7
                0,32,33
   G c Win95 FAT32 (LBA)
8
    . . .
```

使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

•							Shell
1	root@Indust	io:~\$ mkdir	/m2				
2	root@Industio:~ <mark>\$ mount</mark> /dev/sda1 /m2						
3 📼	<pre>~ [2754.142417] FAT-fs (sda1): utf8 is not a recommended IO charset for FAT</pre>						
	filesystems, filesystem will be case sensitive!						
4 =	[2754.1448	15] FAT-fs	(sda1): Vo	lume was	not properly u	inmounted. So	me data
	may be corrupt. Please run fsck.						
5	root@Industio:~ <mark>\$ ls</mark> /m2						
6	Alarms	DCIM	Download	Movies	Notifications	Podcasts	Rington
	es						
7	Audiobooks	Documents	LOST.DIR	Music	Pictures	Recordings	sata.im
	g						

13 音频

•

主板共配置3个声卡设备(包含dp0、hdmi0和es8388)。

使用aplay/arecord工具可以查看系统所有声卡设备,命令如下:

```
Shell
```

- 1 industio@Industio:~\$ aplay -l
 2 **** List of PLAYBACK Hardware Devices ****
- 3 card 0: rockchipdp0 [rockchip,dp0], device 0: rockchip,dp0 spdif-hifi-0 [r ockchip,dp0 spdif-hifi-0]
- 4 Subdevices: 1/1
- 5 Subdevice #0: subdevice #0
- 6 card 2: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-0 [rockchip-hdmi0 i2s-hifi-0]
- 7 Subdevices: 1/1
- 8 Subdevice #0: subdevice #0
- 9 card 3: rockchipes8388 [rockchip-es8388], device 0: dailink-multicodecs ES
 8323.5-0011-0 [dailink-multicodecs ES8323.5-0011-0]
- 10 Subdevices: 1/1

```
11 Subdevice #0: subdevice #0
```

13.1 扬声器

主板配置了一路双声道扬声器接口,位于(J79),如下图所示:



接上扬声器,拔出耳机,播放音频命令如下:



13.1.1 调节播放音量

点击桌面右上角的【音量】图标,如下图所示:



通过滑动音量进度条来调节音量大小,如下图所示:

	● U ▼
ੱ Ethernet Unmanaged	•
☐ Mobile Broadband Off	• •
₿ Off	•
© Settings	
🔒 Lock	
U Power Off / Log Out	

13.1.2 静音

点击桌面右上角的【音量】图标,点击【静音】按钮来静音,如下图所示:



13.2 耳机/Line Out

主板配置了一路耳机接口,位于(J21),如下图所示:



播放音频命令如下:

•		Shell
1 2	<pre>industio@Industio:~\$ aplay /usr/share/sounds/alsa/Front_Center.wav Playing WAVE '/usr/share/sounds/alsa/Front_Center.wav' : Signed 16 le Endian, Rate 48000 Hz, Mono</pre>	bit Litt

13.2.1 调节播放音量

点击桌面右上角的【音量】图标,如下图所示:



通过滑动音量进度条来调节音量大小,如下图所示:



13.2.2 静音

点击桌面右上角的【音量】图标,通过点击【静音】按钮来控制音量,如下图所示:

		🔊 🕛 👻
	😪 Ethernet Unmanaged	•
	🖉 🖉 Mobile Broadband Off	•
1	8 Off	+
	Ø Settings	
	🔒 Lock	
	U Power Off / Log Out	•
T /		

13.3 MIC

主板配置了一路MIC,位于(J1),如下图所示:



录音测试命令如下:

```
Shell
```

```
1 industio@Industio:~$ arecord -D hw:3,0 -r 48000 -c 2 -f S16_LE test.wav
2 Recording WAVE 'test.wav' : Signed 16 bit Little Endian, Rate 48000 Hz, Ste
reo
```

3 ^CAborted by signal Interrupt...

录音完后播放测试命令如下:

Shell

```
1 industio@Industio:~$ aplay ./test.wav
```

```
2 Playing WAVE './test.wav' : Signed 16 bit Little Endian, Rate 48000 Hz, Ste reo
```

14 RTC

主板共配置1路RTC(HYM8563),对应的设备节点为rtc0。

14.1 读取RTC时间

读取RTC时间命令如下:

```
    industio@Industio:~$ hwclock
    Wed Apr 26 17:38:28 2023 0.000000 seconds
    3
```

14.2 设置RTC时间

设置RTC时间命令如下:

```
    root@Industio:~$ date -s '2023-4-26 17:38:00'
    Wed Apr 26 17:38:00 UTC 2023
    root@Industio:~$ hwclock -w
    root@Industio:~$ hwclock
    Wed Apr 26 17:38:08 2023 0.000000 seconds
```

主板配置了一路红外接口,如下图所示:



支持NEC编码遥控器,默认适配的遥控器型号为HTR-A07,如下图所示:



HTR-A07的键值如下表所示:

编号	按键	键值	编号	按键	键值
1	电源	KEY_POWER	21	1	KEY_1
2	TV	KEY_SCREEN	22	2	KEY_2
3	橙色	KEY_F1	23	3	KEY_3
4	绿色	KEY_F2	24	4	KEY_4
5	黄色	KEY_F3	25	5	KEY_5
6	紫色	KEY_F4	26	6	KEY_6
7	音量+	KEY_VOLUMEUP	27	7	KEY_7
8	吝量−	KEY_VOLUMEDOWN	28	8	KEY_8
9	屏显	KEY_DISPLAY_OFF	29	9	KEY_9

10	静音	KEY_MUTE	30	TVNOW	KEY_DOT
11	上一节目	KEY_VIDEO_PREV	31	0	KEY_0
12	下一节目	KEY_VIDEO_NEXT	32	截屏	KEY_PRINT
13	上	KEY_UP	33	/	/
14	左	KEY_LEFT	34	/	/
15	下	KEY_DOWN	35	/	/
16	右	KEY_RIGHT	36	/	/
17	确认	KEY_ENTER	37	/	/
18	返回	KEY_BACK	38	/	/
19	主页	KEY_HOME	39	/	/
20	菜单	KEY_MENU	40	/	/

注意:调试串口打印按键的键值命令如下:

•	Bas	sh
1	<pre>root@Industio:~\$ echo 1 > /sys/module/rockchip_pwm_remotectl/parameters e_print</pre>	s/cod

使用evtest工具可以查看按键上报键值,命令如下:

```
Shell
```

```
root@Industio:~$ evtest
 1
 2
     No device specified, trying to scan all of /dev/input/event*
 3
     Available devices:
 4
    /dev/input/event0:
                              febd0030.pwm
 5
                              rockchip-hdmi0 rockchip-hdmi0
    /dev/input/event1:
 6
                              rockchip-hdmi1 rockchip-hdmi1
    /dev/input/event2:
7
                              rockchip,dp0 rockchip,dp0
    /dev/input/event3:
 8
    /dev/input/event4:
                              rk805 pwrkey
9
     /dev/input/event5:
                              adc-keys
10
     /dev/input/event6:
                              headset-kevs
11
    /dev/input/event7:
                              rockchip-es8388 Headset
12
     /dev/input/event8:
                              USB OPTICAL MOUSE
13 = Select the device event number [0-8]: 0
14
     Input driver version is 1.0.1
15
     Input device ID: bus 0x19 vendor 0x524b product 0x6 version 0x100
     Input device name: "febd0030.pwm"
16
17
     Supported events:
18
       Event type 0 (EV SYN)
       Event type 1 (EV_KEY)
19
20
         Event code 2 (KEY 1)
21
         Event code 3 (KEY 2)
22
         Event code 4 (KEY 3)
23
         Event code 5 (KEY 4)
24
         Event code 6 (KEY 5)
25
         Event code 7 (KEY 6)
26
         Event code 8 (KEY 7)
27
         Event code 9 (KEY 8)
28
         Event code 10 (KEY 9)
         Event code 11 (KEY 0)
29
30
         Event code 14 (KEY_BACKSPACE)
31
         Event code 28 (KEY ENTER)
32
         Event code 52 (KEY DOT)
33
         Event code 61 (KEY_F3)
34
         Event code 102 (KEY HOME)
35
         Event code 103 (KEY UP)
36
         Event code 104 (KEY PAGEUP)
37
         Event code 105 (KEY_LEFT)
38
         Event code 106 (KEY RIGHT)
39
         Event code 108 (KEY DOWN)
40
         Event code 109 (KEY PAGEDOWN)
         Event code 113 (KEY MUTE)
41
42
         Event code 114 (KEY_VOLUMEDOWN)
43
         Event code 115 (KEY VOLUMEUP)
44
         Event code 116 (KEY_POWER)
45
         Event code 139 (KEY MENU)
```
```
46
        Event code 143 (KEY_WAKEUP)
        Event code 158 (KEY_BACK)
48
        Event code 183 (KEY F13)
49
        Event code 184 (KEY F14)
50
        Event code 185 (KEY_F15)
51
        Event code 186 (KEY F16)
52
        Event code 217 (KEY_SEARCH)
53
        Event code 232 (KEY_REPLY)
54
        Event code 241 (KEY_VIDEO_NEXT)
55
        Event code 242 (KEY VIDEO PREV)
56
        Event code 245 (KEY DISPLAY OFF)
57
        Event code 248 (KEY_MICMUTE)
58
        Event code 338 (?)
59
        Event code 373 (KEY MODE)
60
        Event code 375 (KEY SCREEN)
61
        Event code 388 (KEY TEXT)
62
        Event code 400 (KEY YELLOW)
63
        Event code 401 (KEY BLUE)
64
        Event code 402 (KEY_CHANNELUP)
65
    Properties:
66
    Testing ... (interrupt to exit)
67 -
    [ 4237.196132] USERCODE=0x1818
68 -
    [ 4237.223070] RMC_GETDATA=ff
69
    Event: time 1682532011.417156, type 1 (EV_KEY), code 2 (KEY_1), value 1
70
    Event: time 1682532011.417156, ----- SYN REPORT -----
71
    Event: time 1682532011.475441, type 1 (EV KEY), code 2 (KEY 1), value 0
72
    Event: time 1682532011.475441, ----- SYN REPORT -----
73 -
    [ 4237.866797] USERCODE=0x1818
74 -
    [ 4237.893797] RMC GETDATA=fe
75
    Event: time 1682532012.087855, type 1 (EV_KEY), code 3 (KEY_2), value 1
76
    Event: time 1682532012.087855, ----- SYN REPORT -----
77
    Event: time 1682532012.178638, type 1 (EV KEY), code 3 (KEY 2), value 0
78
    Event: time 1682532012.178638, ----- SYN REPORT -----
79 -
    [ 4238.370395] USERCODE=0x1818
80 -
    [ 4238.397454] RMC GETDATA=fd
81
    Event: time 1682532012.591469, type 1 (EV_KEY), code 4 (KEY_3), value 1
82
    Event: time 1682532012.591469, ----- SYN REPORT ------
83
    Event: time 1682532012.682093, type 1 (EV_KEY), code 4 (KEY_3), value 0
84
    Event: time 1682532012.682093, ----- SYN REPORT -----
85 -
    [ 4239.209857] USERCODE=0x1818
86 -
    [ 4239.236861] RMC_GETDATA=fc
87
    Event: time 1682532013.430863, type 1 (EV_KEY), code 5 (KEY_4), value 1
88
    Event: time 1682532013.430863, ----- SYN REPORT ------
89
    Event: time 1682532013.521980, type 1 (EV KEY), code 5 (KEY 4), value 0
90
    Event: time 1682532013.521980, ----- SYN_REPORT -----
91
```

16 摄像头

主板共配置2路摄像头,型号均为OV13855,最高分辨率支持1200万像素。

16.1 测试

使用gst-launcher工具可以预览摄像头画面,命令如下:



17 HDMI–IN

主板配置了1路HDMI-IN接口,如下图所示:



查看输入hdmi信号格式命令如下:

```
Shell
```

```
root@Industio:~$ v4l2-ctl -d /dev/video40 --query-dv-timings
 1
 2
             Active width: 1920
 3
             Active height: 1080
 4
             Total width: 2200
 5
             Total height: 1125
 6
             Frame format: progressive
7
             Polarities: -vsync -hsync
             Pixelclock: 148500000 Hz (60.00 frames per second)
 8
             Horizontal frontporch: 84
9
             Horizontal sync: 48
10
             Horizontal backporch: 148
11
             Vertical frontporch: 4
12
13
             Vertical sync: 5
             Vertical backporch: 36
14
15
             Standards:
16
             Flags:
     root@Industio:~$ v4l2-ctl -d /dev/video40 --get-fmt-video
17
18
     Format Video Capture Multiplanar:
19
             Width/Height
                               : 1920/1080
20
             Pixel Format
                               : 'NV24' (Y/CbCr 4:4:4)
21
             Field
                               : None
22
             Number of planes : 1
23
                               : premultiplied-alpha, 0x000000fe
             Flags
                               : Unknown (0x1003b8d4)
24
             Colorspace
             Transfer Function : Unknown (0x00000b8)
25
26
             YCbCr/HSV Encoding: Unknown (0x00000ff)
27
             Ouantization
                               : Default
28
             Plane 0
                               2.
29
                Bytes per Line : 1920
30
                Size Image
                            : 6220800
31
```

预览hdmi输入图像命令如下:

Shell
1 gst-launch-1.0 v4l2src device=/dev/video40 ! video/x-raw,width=1920,height=
1080,framerate=30/1 ! videoconvert ! autovideosink

抓图hdmi输入图像命令如下:

```
Shell
```

```
v4l2-ctl --verbose -d /dev/video40 \
 --set-fmt-video=width=1920,height=1080,pixelformat='NV12' \
 --stream-mmap=4 --stream-skip=3 \
 --stream-to=/hdmirx-1920x1080.yuv \
 --stream-count=1 --stream-poll
```

抓取的图像在电脑上通过YUView或7yuv工具查看,如下图所示:



所有接口如下表所示:

序号	名称	描述	设备节点	
1	内核版本	Linux 5.10.110	/	
2	系统版本	Debian11	/	
3	内存	LPDDR4, 8GB	/	
4	存储	eMMC, 64GB	/	
5	供电	默认12V/2A供电	/	
	显示	1x HDMI2.1接口,支持(8K/60fps或 4K/120fps)输出		
6		1x MIPI DSI接口,支持4k@60fps输出 1x 双LVDS接口,支持1920x1080@60fps 输出	响凸 60fps /	
		1xEDP 接口,支持 1920x1080@60fps 输 出		
7	USB OTG	/	/	

8	USB HOST	USB3.0 HOST(Type–A) X 4 USB2.0 HOST(PH2.0–4A) X 7 TYPEC3.0 X 1	/
9	TF Card	TF Card x 1	/
10	以太网	千兆以太网 × 2	eth0、eth1
11	WIFI/BT	AP6275S	wlan0 、hci0
12	扬声器	/	/
13	耳机	3.5mm 国标	/
14	line_in	3.5mm 国标	/
15	Camera	OV13855 X 2	/
16	串口	RS232 x 4 RS485 x 1	/
17	调试串口	TTL x 1	/
18	RTC	HYM8563S	/
19	LED	系统运行指示灯 x 1	/
20	4G/5G	EC20/RG200U	/
21	CAN	CAN x 1	/
22	按键	Recovery按键、Power–on按键、Reset按 键	/
23	MIC	/	/
24	HDMI–IN	支持4K/60fps,HDCP2.3	/
25	M2.0 SSD	SSD x 1	/
26	SATA	SATA3.0 x 1	/

IDO-SBC3588-Debian系统

1 调试

1.1 串口调试

主板调试串口位于板子背面(J37),电平类型为TTL电平,建议使用配套的usb转串口工具,如下图所示:



1. 打开MobaXterm, 下载链接如下:

链接: https://pan.baidu.com/s/1EY5Dces19B3c2oblq0rlfA?pwd=1234

提取码: 1234



2. 选择session为【Serial】,如下图所示:

ision set	tings														2
SSH	Teinet	Rsh	Xdmcp	4 RDP	VNC	S FTP	SFTP2	serial	Tile	Shell	8 Browser	X Mosh	Aws 53	WSL	
						0	hoose a	sessio	n type.						
					0	OK		Can	el						

- 3. 将Serial port修改为在设备管理器中找到的COM端口
- 4. 设置Speed(bsp)为1500000
- 5. 点击【OK】按钮,如下图所示:

Basic Serial settings Serial port * COM7 (USB-SERIAL CH340 (COM7)) V Speed (bps) * 1500000 V Serial settings Terminal settings Bookmark settings Serial engine: PuTTY (allows manual COM port setting) Data bits 8 V Stop bits 1 V Parity None Parity None V	S3 WSL	sh	N	Browser	Shell	File	Serial	8 SFTP	8 पान	VNC	RDP	Xdmcp	Rsh	C. Teinet	SSH
3 Serial port * COM7 (USB-SERIAL CH340 (COM7)) 4 Speed (bps) * 1500000 4 Speed (bps) * 1500000 5 Advanced Serial settings 5 Bookmark settings 5 Serial engine: PuTTY (allows manual COM port setting) 5 Data bits 6 5 top bits 1 7 Parity None F you need to transfer files (e.g. router configuration file), you can use Moba/term embedded TFTP server													ttings	c Serial se	a Basi
Advanced Serial settings Errminal settings Serial engine: PuTTY (allows manual COM port setting) Data bits 8 Stop bits 1 Parity None Parity None				~ 0000	s)* 1500	Speed (bp	4	~]	7))	340 (COM	RIAL CH	7 (USB-SE	t* COM	Serial por	3
Advanced Serial settings Terminal settings Bookmark settings Serial engine: PuTTY (allows manual COM port setting) Data bits 8 Stop bits 1 Parity None Parity None															
Serial engine: PuTTY (allows manual COM port setting) ~ Data bits 8 ~								irk setting:	Bookn	tings 🔒	rminal set	is 🖪 Te	al setting	anced Seri	Adva
Serial engine: PuTTY (allows manual COM port setting) ~ Data bits 8 ~ Stop bits 1 ~ Parity None embedded TFTP server											_				
Data bits 8 ~ Stop bits 1 ~ Parity None ~				~			ng)	I port sett	anual CC	(allows ma	PuTTY	rial engine:	Ser		
Stop bits 1 ✓ If you need to transfer files (e.g. router configuration file), you can use MobaXterm embedded TFTP server Parity None ✓ embedded TFTP server										Ŷ	8	Data bits			
Parity None V embedded TFTP server	100			If you need to transfer files (e.g. router configuration file), you can use MobaXterm				If y	~	1	Stop bits				
	XX.						P server	edded TFT	em	~	None	Parity			
Flow control Xon/Xoff ~	100									~	Xon/Xof	low control	F		
Reset defaults					erver	TFTP s	dow>	wers" wir	*S		defaults	Reset			
Execute macro at session start. «none»							v		<none></none>	ion start.	ro at sess	ecute mac	Ð		

默认以root用户登录,没有登录密码。

1.2 ADB调试

ADB调试端口位于(J39)(TYPEC-0,与烧录端口一致),使用USB-C,连接主板和电脑即可在电脑 上使用ADB调试,如下图所示:



进入ADB调试命令如下:

Z:\mi □?20 1s	sc>adb shell 04hroot®lina	ro-alip:/# ls			
bin boot data dev etc □]?20	home lib lost+found media mnt 04hroot@lina	oem opt proc rockchip-test root ro-alip:/# _	run sbin sdcard sha256sum.README sha256sum.txt	srv sys system tmp udisk	userdata usr var vendor

1.3 ssh调试

主板支持ssh远程调试,默认登录账号密码为: linaro @ linaro。

2 串口

主板共配置7路串口(不包括调试串口),其中4路RS232,2路RS485和1路TTL串口,如下图所示:



序号	接口位置	类型	编号	设备节点
1	J65	RS232	RS232-1	/dev/ttyS6
2	J60	RS232	RS232-2	/dev/ttyS0
3	J67	RS232	RS232-3	/dev/ttyS7
4	J64	RS232	RS232-4	/dev/ttyS3
5	J57	RS485	RS485-1	/dev/ttyS5
6	J66	RS485	RS485-2	/dev/ttyS4
7	J84	TTL	TTL-1	/dev/ttyS8

使用microcom可以进行收发测试,命令如下:

▼	Shell
<pre>1 root@linaro-alip:~# microcom -s 115200 -p /dev/ttyS4 2 = [754.636312] of_dma_request_slave_channel: dma-names property or erial@fdd50000' missing or empty 3 = [754.636443] ttyS4 - failed to request DMA, use interrupt mode 4 connected to /dev/ttyS4 5 Escape character: Ctrl-\ 6 Type the escape character to get to the prompt.</pre>	f node '/s

注意:测试完成,按Ctrl+x退出。

3 USB

主板共配置11路USB接口,其中4路为TYPE-A接口,速率为USB3.0,这里以USB1、USB2、USB3 和USB4标记;另外7路为PH2.0接口,速率为USB2.0,以USB5-USB11标记,如下图所示:



USB节点信息如下表所示:

编号	位置	速率
USB1	TYPE-A-1, 上	usb3.0
USB2	TYPE-A-1, 下	usb3.0
USB3	TYPE-A-2, 上	usb3.0
USB4	TYPE-A-2, 下	usb3.0
USB5	5	usb2.0
USB6	6	usb2.0
USB7	7	usb2.0
USB8	8	usb2.0
USB9	9	usb2.0
USB10	10	usb2.0
USB11	11	usb2.0

3.1 电源控制

主板默认11路USB电源默认是开启的,同时提供方法控制USB电源开启或关闭,如下表所示:

编号	控制节点
USB1	/sys/class/leds/usb_host2_pwr/brightness
USB2	/sys/class/leds/usb_host1_pwr/brightness
USB3	/sys/class/leds/usb_host4_pwr/brightness
USB4	/sys/class/leds/usb_host3_pwr/brightness
USB5	/sys/class/leds/host_J52/brightness
USB6	/sys/class/leds/host_J90/brightness
USB7	/sys/class/leds/host_J54/brightness
USB8	/sys/class/leds/host_J56/brightness
USB9	/sys/class/leds/host_J55/brightness
USB10	/sys/class/leds/host_J91/brightness
USB11	/sys/class/leds/host_J53/brightness

以USB1为例(其他USB类似),命令如下:

✓
 //关闭USB1的电源
 2 root@Industio:~\$ echo 0 > /sys/class/leds/usb_host2_pwr/brightness
 3
 4 //开启USB1的电源
 5 root@Industio:~\$ echo 255 > /sys/class/leds/usb_host2_pwr/brightness

3.2 U盘的挂载

系统默认自动挂载U盘到 /mnt/udisk/xxx 目录下, 命令如下:

```
Shell
```

```
1 root@linaro-alip:~# mount
2 ...
3 /dev/sda1 on /mnt/udisk type vfat (rw,nodev,noexec,noatime,nodiratime,fmask
=0022,dmask=0022,c
4 ...
```

4 Micro SD

主板配置一路SD接口,位于主板背面,如下图所示:



插入SD卡后,默认挂载到/mnt/sdcard目录,如果未自动挂载可以手动挂载SD卡,命令如下:

Shell 1 root@linaro-alip:~# mount 2 . . . /dev/mmcblk1p1 on /mnt/sdcard type ext3 (rw,nodev,noexec,noatime,nodiratim 3 e) 4 . . .

5 Ethernet

主板配置2路1000M以太网接口,位于(J37),系统中对应的网络节点为eth0和eth1,如下图所示:



5.1 查看IP地址

•	Shell
1	<pre>root@linaro-alip:~# ifconfig enP4p65s0</pre>
2	enP4p65s0: <pre>flags=4163<up,br0adcast,running,multicast> mtu 1500</up,br0adcast,running,multicast></pre>
3	inet 192.168.1.149 netmask 255.255.255.0 broadcast 192.168.1.255
4	<pre>inet6 fe80::1840:cd30:4000:e037 prefixlen 64 scopeid 0x20<link/></pre>
5	ether e2:49:6c:fe:b2:24 txqueuelen 1000 (Ethernet)
6	RX packets 51 bytes 5804 (5.6 KiB)
7	RX errors 0 dropped 0 overruns 0 frame 0
8	TX packets 60 bytes 5895 (5.7 KiB)
9	TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10	device interrupt 156 base 0xd000
11	
12	root@linaro-alip:~# ifconfig eth0
13	eth0 Link encap:Ethernet HWaddr AA:70:FD:B5:5B:AE
14	inet addr:192.168.1.166 Bcast:192.168.1.255 Mask:255.255.255.0
15	inet6 addr: fe80::91b0:6438:ad82:7a8f/64 Scope:Link
16	UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
17	RX packets:5 errors:0 dropped:0 overruns:0 frame:0
18	<pre>TX packets:13 errors:0 dropped:0 overruns:0 carrier:0</pre>
19	collisions:0 txqueuelen:1000
20	RX bytes:971 (971.0 B) TX bytes:1438 (1.4 KiB)
21	Interrupt:90

5.2 设置临时IP地址

设置临时IP地址命令如下:

```
Shell
1 root@linaro-alip:~# ifconfig enP4p65s0 192.168.1.100
2 root@linaro-alip:~# ifconfig eth0 192.168.0.10
```

5.3 设置永久静态IP地址

修改/etc/network/interfaces,内容如下:

```
1
     # interface file auto-generated by buildroot
 2
 3
     auto lo
 4
    iface lo inet loopback
 5
 6
     auto enP4p65s0
 7
             iface enP4p65s0 inet static
 8
             address 192.168.0.123
             netmask 255.255.255.0
9
             gateway 192.168.0.1
10
             nameserver 192.168.0.1
11
12
13
     auto eth0
14
             iface eth0 inet static
             address 192.168.1.123
15
             netmask 255.255.255.0
16
17
             gateway 192.168.1.1
18
             nameserver 192.168.1.1
19
```

立即生效命令如下:

•		Shell
1	systemctl restart networking	

设备断电重启,此静态IP设置仍然生效。

6 WiFi

主板配置一路2.4G/5G双频wifi,型号为AP6275S,如下图所示:



系统启动会默认打开WiFi,对应的网络节点为wlan0,命令如下:

```
Shell
```

```
root@linaro-alip:~# ifconfig wlan0
1
2
   wlan0: flags=4099<UP, BROADCAST, MULTICAST> mtu 1500
3
            ether 10:bb:f3:55:cf:24 txqueuelen 1000 (Ethernet)
4
           RX packets 0 bytes 0 (0.0 B)
5
           RX errors 0 dropped 0 overruns 0 frame 0
6
           TX packets 0 bytes 0 (0.0 B)
7
           TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
8
9
    root@linaro-alip:~#
```

6.1 连接WiFi热点

-

连接热点可以在桌面上操作,也可以使用命令行操作。

6.1.1 在桌面上操作

点击桌面右上角的【网络】按钮,弹出的列表中选择要连接的热点,如下图所示:



弹出密码输入框,使用键盘输入密码(如果没有接键盘,可以使用软键盘Onboard),如下图所示:

斧 所有应用程序	○ 需要 Wi-Fi 网络认证					
🔍 运行程序						
> 终端模拟器						
🚽 文件管理器						
🗟 邮件阅读器						
🕜 网络浏览器						
1999 设置						
13 多媒体 ▶		_				
🐱 附件 🔹 🕨	₩ 截图					
🕟 互联网 🔹 🕨	💡 批量重命名					
系统	■ 文件					
🔶 关于 Xfce	🔍 应用程序查找器					
② 注销	LightDM 桌面管理器 (GTK+ 界面) 设置					
	🚦 Onboard					
	😵 Onboard 设置					
	Ţ Thunar 文件管理器					
	🖉 Vim		~~)	需要 WI-FI 网络认证	^ _ ×	
					1	
				WIFI网络安尔沃里		
				访问 Wi-Fi 网络 TP-LINK_5G_B87A 需要	密码或加密密钥。	
			Wi-Fi 适配器(a)	wlan0	-	₹
			密码(P)		44	
				显示密码(W)		
				問語(〇)	漆摔(0)	
				ACH (C)	1±19(0)	
		1				

输入密码后,点击【连接】按钮连接热点,如下图所示:

	1								Y					/ '		
~0 0		ស ថា	/ i-Fi P	sey Wi- 网络要 : ii 网络 T	FI 网络 求认证 'P-LINF	UNIE E <_5G_	B87A #	需要密码	马或加密	^ _ 密钥。	×					
Wi-	Fi 适配斜 密码	器(a) 马(P)	wlan0		•											
			显示的	204(W)	1 -		取消(C)) ن	接(O)						
	W	e d	r f	t t	y h	u i	i k	0	р р	[]	لک لک				
< Vin	Z	x	c	v	b	n	m	, Alt G	·	/ 1 →	\ ↑	Ļ	123			
				de	bi	ar	1					4				

通过再次点击桌面右上角网络按钮确认是否连接成功,如下图所示:



或通过ifconfig 命令查看wlan0的IP地址确认, 命令如下:

-	Shell
1	<pre>root@linaro-alip:~# ifconfig wlan0</pre>
2	wlan0: flags=4163 <up,broadcast,running,multicast></up,broadcast,running,multicast>
3	inet 192.168.1.169 netmask 255.255.255.0 broadcast 192.168.1.255
4	inet6 fe80::29fd:b151:6f76:1e95
5	ether 10:bb:f3:55:cf:24 txqueuelen 1000 (Ethernet)
6	RX packets 0 bytes 2608 (2.5 KiB)
7	RX errors 0 dropped 0 overruns 0 frame 0
8	TX packets 28 bytes 2761 (2.6 KiB)
9	TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10	

6.1.2 使用命令行操作

命令行可以使用nmcli工具连接wifi热点,命令如下:

•	Shell
1	root@linaro-alip:~# nmcli dev wifi connect TP-LINK_B87A password 12345678
2 =	[1775.457756] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
3	成功用 "wlan00d0e9d4a-1c1e-4a18-a33f-f3ff49e6b63c" 激活了设备 ""。

查看wlan0的IP地址,确认连接成功,命令如下:

```
root@linaro-alip:~# ifconfig wlan0
1
   wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>
2
                                                      mtu 1500
3
           inet 192.168.1.169 netmask 255.255.255.0 broadcast 192.168.1.255
4
           inet6 fe80::29fd:b151:6f76:1e95 prefixlen 64 scopeid 0x20<link>
5
           ether 10:bb:f3:55:cf:24 txqueuelen 1000 (Ethernet)
6
           RX packets 0 bytes 2608 (2.5 KiB)
7
           RX errors 0 dropped 0 overruns 0 frame 0
           TX packets 28 bytes 2761 (2.6 KiB)
8
           TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
9
```

7 蓝牙

主板配置1路蓝牙模块(型号为AP6275S),如下图所示:



7.1 查看蓝牙控制器

查看蓝牙节点命令如下:

Shell 1 root@linaro-alip:~# hciconfig 2 hci0: Type: Primary Bus: UART BD Address: 10:BB:F3:56:44:54 ACL MTU: 1021:6 SC0 MTU: 255:12 3 UP RUNNING 4 5 RX bytes:1862 acl:0 sco:0 events:65 errors:0 6 TX bytes:10206 acl:0 sco:0 commands:302 errors:0 7 8 root@linaro-alip:~#

7.2 连接蓝牙设备

连接蓝牙设备可以在桌面上操作,也可以使用命令行操作。

7.2.1 在桌面上操作

系统开机默认会打开蓝牙,点击桌面右上角的【蓝牙】按钮,然后点击【设备】,如下图所示:



弹出询问是否启动蓝牙,选择【Yes】,如下图所示:



继续点击【查找】按钮,扫描附件的蓝牙设备,如下图所示:



7.2.2 使用命令行操作

扫描蓝牙设备,命令如下:

root@linaro-alip:~# hciconfig hci0 iscan
 root@linaro-alip:~# bluetoothctl
 [bluetooth]# scan on

配对蓝牙设备和退出,命令如下:

Shell
1 - [bluetooth]# trust 7C:C1:80:09:DD:6C
2 - [bluetooth]# pair 7C:C1:80:09:DD:6C
3 - [cainiaocl]# exit

8 指示灯

主板共配置1个系统运行指示灯,系统正常运行时,该LED闪烁,如下图所示:



9 按键

主板共配置3个按键,如下图所示:



各个按键的说明如下表所示:

编号	名称	说明
1	RECOVERY	电源按键,用于开机/关机;
5	RESET	复位按键,用于硬件复位;
6	POWER	烧录按键,用于烧录,或系统启动后,按下上报 KEY_VOLUMEUP;

10 4G/5G

默认支持EC20(4G)模块和RG200U(5G)模块。

安装好 4G/5G模块及SIM卡,系统启动后,执行quectel-CM拨号,命令如下:

```
    Shell
    1 root@linaro-alip:~# quectel-CM &
```

当wwan0(4G)或usb0(5G)网络节点获取到IP,说明拨号成功,命令如下:

1 2	root@li wwan0:	<pre>naro-alip:~# ifconfig wwan0 flags=4305<up,pointopoint,running,noarp,multicast> mtu 1500 isst 10 252 240 25 mstmask 255 255 240 destination 10 252 24</up,pointopoint,running,noarp,multicast></pre>
3	8.35	inet 10.252.248.35 netmask 255.255.255.248 destination 10.252.24
4		<pre>inet6 fe80::ecdc:1a63:2957:e7c7 prefixlen 64 scopeid 0x20<link/></pre>
5		unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-
	n 1000	(UNSPEC)
6		RX packets 46 bytes 4308 (4.2 KiB)
7		RX errors 0 dropped 0 overruns 0 frame 0
8		TX packets 66 bytes 7054 (6.8 KiB)
9		TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10		
11		
5 7 8 9 10 11	n 1000	unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-

测试4G/5G上网功能是否正常,命令如下:

•	Shell
1	root@linaro-alip:~# ping 114.114.114.114 -I wwan0
2	PING 114.114.114.114 (114.114.114) from 10.252.248.35 wwan0: 56(84) by
	tes of data.
3	64 bytes from 114.114.114.114: icmp_seq=1 ttl=91 time=184 ms
4	64 bytes from 114.114.114.114: icmp_seq=2 ttl=79 time=83.8 ms
5	64 bytes from 114.114.114.114: icmp_seq=3 ttl=67 time=91.6 ms
6	64 bytes from 114.114.114.114: icmp_seq=4 ttl=63 time=77.9 ms
7	64 bytes from 114.114.114.114: icmp_seq=5 ttl=93 time=79.6 ms
8	64 bytes from 114.114.114.114: icmp_seq=6 ttl=83 time=86.7 ms
9	64 bytes from 114.114.114.114: icmp_seq=7 ttl=68 time=84.8 ms
10	64 bytes from 114.114.114.114: icmp_seq=8 ttl=80 time=88.8 ms

11 M.2

主板配置了一路M.2接口,可接PCIE固态硬盘使用,如下图所示:



接入PCIE固态硬盘后,使用fdisk工具查看该设备,命令如下:

```
Shell
1 root@linaro-alip:~# fdisk -l
2 .....
3 .....
4 Device Boot Start End Sectors Size Id Type
5 /dev/nvme@n1p1 2048 250069646 250067599 119.2G c W95 FAT32 (LBA)
```

使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

•					Shell				
1 2 -	root@linaro-ali [239.607381] r FAT filesyste	p:∼# m FAT-fs	ount / (nvme	dev/nvm 0n1p1): em_will	<pre>me0n1p1 /mnt : utf8 is not a recommended IO charset fo l be case sensitive!</pre>				
3 -	[239.608734] FAT-fs (nvme0n1p1): Volume was not properly unmounted. Som								
	e data may be c	orrupt	. Plea	se run	fsck.				
4	root@linaro-ali	p:~# d	f —h						
5	文件系统	容量 E	四月 可	用 已用%	8 挂载点				
6	/dev/root	14G	<mark>3</mark> .3G	11G	25% /				
7	devtmpfs	<mark>3</mark> .9G	<mark>8</mark> .0K	<mark>3</mark> .9G	1% /dev				
8	tmpfs	<mark>3</mark> .9G	0	<mark>3</mark> .9G	0% /dev/shm				
9	tmpfs	1. 6G	1. 7M	1. 6G	1% /run				
10	tmpfs	<mark>5</mark> .0M	4. 0K	5.0M	1% /run/lock				
11	tmpfs	<mark>3</mark> .9G	16K	<mark>3</mark> .9G	1% /tmp				
12	/dev/mmcblk0p7	127M	12M	109M	10% /oem				
13	/dev/mmcblk0p8	43G	44K	41G	1% /userdata				
14	tmpfs	793M	44K	793M	1% /run/user/1000				
15	tmpfs	793M	32K	793M	1% /run/user/0				
16	/dev/nvme0n1p1	120G	67M	120G	1% /mnt				
17	root@linaro–ali	p:~#							

12 SATA

主板配置了一路SATA接口,可接SATA固态硬盘使用,如下图所示:



接入SATA固态硬盘后,使用fdisk工具查看该设备,命令如下:

```
•
    root@linaro-alip:~# fdisk -l
1
   Disk /dev/sda: 466 GB, 500107862016 bytes, 976773168 sectors
2
   60801 cylinders, 255 heads, 63 sectors/track
3
4
   Units: sectors of 1 * 512 = 512 bytes
5
6
   Device Boot StartCHS
                            EndCHS
                                          StartLBA
                                                       EndLBA
                                                                 Sectors Siz
   e Id Type
   /dev/sda1
                            1023,254,63
                                              2048 976773134 976771087 465
7
                0,32,33
   G c Win95 FAT32 (LBA)
8
    . . .
```

使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

•							Shell	
1	root@linaro	-alip:~# mk	dir /m2					
2	root@linaro-alip:~# mount /dev/sda1 /m2							
3 📼	[2754.1424	17] FAT-fs	(sda1): ut	f8 is no	t a recommended	IO charset	for FAT	
	filesystems	, filesyste	m will be	case sen	sitive!			
4 =	[2754.1448	15] FAT-fs	(sda1): Vo	lume was	not properly u	inmounted. So	me data	
	may be corr	upt. Please	run fsck.					
5	root@rk3588	:/# ls /m2						
6	Alarms	DCIM	Download	Movies	Notifications	Podcasts	Rington	
	es							
7	Audiobooks	Documents	LOST.DIR	Music	Pictures	Recordings	sata.im	
	g							

13 音频

主板共配置3个声卡设备(包含dp0、hdmi0和es8388)。

使用aplay/arecord工具可以查看系统所有声卡设备,命令如下:

61

```
root@linaro-alip:~# aplay -l
 1
    **** List of PLAYBACK Hardware Devices ****
 2
 3 • card 0: rockchipdp0 [rockchip,dp0], device 0: rockchip,dp0 spdif-hifi-0 [r
     ockchip,dp0 spdif-hifi-0]
       Subdevices: 1/1
4
 5
       Subdevice #0: subdevice #0
 6 • card 2: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-
     0 [rockchip-hdmi0 i2s-hifi-0]
7
       Subdevices: 1/1
       Subdevice #0: subdevice #0
8
 9 • card 3: rockchipes8388 [rockchip-es8388], device 0: dailink-multicodecs ES
     8323.5-0011-0 [dailink-multicodecs ES8323.5-0011-0]
       Subdevices: 1/1
10
```

```
11 Subdevice #0: subdevice #0
```

13.1 扬声器

主板配置了一路双声道扬声器接口,位于(J79),如下图所示:



13.1.1 播放音频

接上扬声器,拔出耳机,播放音频命令如下:

```
Shell
1 root@linaro-alip:~# aplay -D hw:3,0 ./root/8k16bpsStereo.wav
```

13.1.2 调节播放音量

调节播放音量,命令如下:

Shell

1 root@linaro-alip:~# amixer -c 2 cset numid=21,iface=MIXER,name='PCM Volum
e' 140,140

注意: 音量调节范围为0-192。

13.2 耳机/Line Out

板配置了一路耳机接口,位于(J21),如下图所示:



13.2.1 播放音频

插入耳机,执行以下命令播放音频,命令如下:



13.2.2 调节播放音量

调节播放音量,命令如下:

•		Shell
1	<pre>root@linaro-alip:~# amixer -c 2 cset numid=21,iface=MIXER,name='PCM e' 140,140</pre>	Volum

注意:音量调节范围为0-192。

13.3 MIC

主板配置了一路MIC,位于(J1),如下图所示:



录音测试命令如下:

-	Shell
1	<pre>root@linaro-alip:~# arecord -D hw:2,0 -r 48000 -c 2 -f S16_LE test.wav</pre>
录音疗	2后播放测试命令如下:
•	Shell
1	root@linaro-alip:~# aplay -D hw:2,0 ./test.wav

14 RTC

主板共配置1路RTC(HYM8563),对应的设备节点为rtc0。

14.1 读取RTC时间

读取RTC时间命令如下:

```
    root@linaro-alip:~# hwclock
    Wed Apr 26 17:38:28 2023 0.000000 seconds
3
```

14.2 设置RTC时间

设置RTC时间命令如下:

Shell

```
Shell
```

```
1 root@linaro-alip:~# date -s '2023-4-26 17:38:00'
2 Wed Apr 26 17:38:00 UTC 2023
3 root@rk3588:/# hwclock -w
4 root@rk3588:/# hwclock
5 Wed Apr 26 17:38:08 2023 0.000000 seconds
6
```

15 IR

•

主板配置了一路红外接口,如下图所示:



支持NEC编码遥控器,默认适配的遥控器型号为HTR-A07,如下图所示:



HTR-A07的键值如下表所示:

编号	按键	键值	编号	按键	键值
1	电源	KEY_POWER	21	1	KEY_1
2	ΤV	KEY_SCREEN	22	2	KEY_2
3	橙色	KEY_F1	23	3	KEY_3

4	绿色	KEY_F2	24	4	KEY_4
5	黄色	KEY_F3	25	5	KEY_5
6	紫色	KEY_F4	26	6	KEY_6
7	音量+	KEY_VOLUMEUP	27	7	KEY_7
8	音量-	KEY_VOLUMEDOWN	28	8	KEY_8
9	屏显	KEY_DISPLAY_OFF	29	9	KEY_9
10	静音	KEY_MUTE	30	TVNOW	KEY_DOT
11	上一节目	KEY_VIDEO_PREV	31	0	KEY_0
12	下一节目	KEY_VIDEO_NEXT	32	截屏	KEY_PRINT
13	上	KEY_UP	33	/	/
14	左	KEY_LEFT	34	/	/
15	下	KEY_DOWN	35	/	/
16	右	KEY_RIGHT	36	/	/
17	确认	KEY_ENTER	37	/	/
18	返回	KEY_BACK	38	/	/
19	主页	KEY_HOME	39	/	/
20	菜单	KEY_MENU	40	/	/

注意:调试串口打印按键的键值命令如下:

•		Bash
1	<pre>echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print</pre>	

使用evtest工具可以查看按键上报键值,命令如下:

```
Shell
```

```
root@linaro-alip:~# evtest
 1
 2
     No device specified, trying to scan all of /dev/input/event*
 3
     Available devices:
 4
    /dev/input/event0:
                              febd0030.pwm
 5
                              rockchip-hdmi0 rockchip-hdmi0
    /dev/input/event1:
 6
                              rockchip-hdmi1 rockchip-hdmi1
    /dev/input/event2:
7
                              rockchip,dp0 rockchip,dp0
    /dev/input/event3:
 8
     /dev/input/event4:
                              rk805 pwrkey
9
     /dev/input/event5:
                              adc-keys
10
     /dev/input/event6:
                              headset-kevs
11
     /dev/input/event7:
                              rockchip-es8388 Headset
12
     /dev/input/event8:
                              USB OPTICAL MOUSE
13 = Select the device event number [0-8]: 0
14
     Input driver version is 1.0.1
15
     Input device ID: bus 0x19 vendor 0x524b product 0x6 version 0x100
     Input device name: "febd0030.pwm"
16
17
     Supported events:
18
       Event type 0 (EV SYN)
19
       Event type 1 (EV_KEY)
20
         Event code 2 (KEY 1)
21
         Event code 3 (KEY 2)
22
         Event code 4 (KEY 3)
23
         Event code 5 (KEY 4)
24
         Event code 6 (KEY 5)
25
         Event code 7 (KEY 6)
26
         Event code 8 (KEY 7)
27
         Event code 9 (KEY 8)
28
         Event code 10 (KEY 9)
         Event code 11 (KEY 0)
29
30
         Event code 14 (KEY_BACKSPACE)
31
         Event code 28 (KEY ENTER)
32
         Event code 52 (KEY DOT)
33
         Event code 61 (KEY_F3)
34
         Event code 102 (KEY HOME)
35
         Event code 103 (KEY UP)
36
         Event code 104 (KEY PAGEUP)
37
         Event code 105 (KEY_LEFT)
38
         Event code 106 (KEY RIGHT)
39
         Event code 108 (KEY DOWN)
40
         Event code 109 (KEY PAGEDOWN)
41
         Event code 113 (KEY MUTE)
42
         Event code 114 (KEY_VOLUMEDOWN)
43
         Event code 115 (KEY VOLUMEUP)
44
         Event code 116 (KEY_POWER)
45
         Event code 139 (KEY MENU)
```

```
46
        Event code 143 (KEY_WAKEUP)
        Event code 158 (KEY_BACK)
48
        Event code 183 (KEY F13)
49
        Event code 184 (KEY F14)
50
        Event code 185 (KEY_F15)
51
        Event code 186 (KEY F16)
52
        Event code 217 (KEY_SEARCH)
53
        Event code 232 (KEY_REPLY)
54
        Event code 241 (KEY_VIDEO_NEXT)
55
        Event code 242 (KEY VIDEO PREV)
56
        Event code 245 (KEY DISPLAY OFF)
57
        Event code 248 (KEY_MICMUTE)
58
        Event code 338 (?)
59
        Event code 373 (KEY MODE)
60
        Event code 375 (KEY SCREEN)
61
        Event code 388 (KEY TEXT)
62
        Event code 400 (KEY YELLOW)
63
        Event code 401 (KEY BLUE)
64
        Event code 402 (KEY_CHANNELUP)
65
    Properties:
66
    Testing ... (interrupt to exit)
67 -
    [ 4237.196132] USERCODE=0x1818
68 -
    [ 4237.223070] RMC_GETDATA=ff
69
    Event: time 1682532011.417156, type 1 (EV_KEY), code 2 (KEY_1), value 1
70
    Event: time 1682532011.417156, ----- SYN REPORT -----
71
    Event: time 1682532011.475441, type 1 (EV KEY), code 2 (KEY 1), value 0
72
    Event: time 1682532011.475441, ----- SYN REPORT -----
73 -
    [ 4237.866797] USERCODE=0x1818
74 -
    [ 4237.893797] RMC GETDATA=fe
75
    Event: time 1682532012.087855, type 1 (EV_KEY), code 3 (KEY_2), value 1
76
    Event: time 1682532012.087855, ----- SYN REPORT -----
77
    Event: time 1682532012.178638, type 1 (EV KEY), code 3 (KEY 2), value 0
78
    Event: time 1682532012.178638, ----- SYN REPORT -----
79 -
    [ 4238.370395] USERCODE=0x1818
80 -
    [ 4238.397454] RMC GETDATA=fd
81
    Event: time 1682532012.591469, type 1 (EV_KEY), code 4 (KEY_3), value 1
82
    Event: time 1682532012.591469, ----- SYN REPORT ------
83
    Event: time 1682532012.682093, type 1 (EV_KEY), code 4 (KEY_3), value 0
84
    Event: time 1682532012.682093, ----- SYN REPORT -----
85 -
    [ 4239.209857] USERCODE=0x1818
86 -
    [ 4239.236861] RMC_GETDATA=fc
87
    Event: time 1682532013.430863, type 1 (EV_KEY), code 5 (KEY_4), value 1
88
    Event: time 1682532013.430863, ----- SYN REPORT ------
89
    Event: time 1682532013.521980, type 1 (EV KEY), code 5 (KEY 4), value 0
90
    Event: time 1682532013.521980, ----- SYN_REPORT -----
91
```

16 摄像头

主板工配置2路摄像头,型号均为OV13855,最高分辨率支持1200万像素。

16.1 测试

使用gst-launcher工具可以预览摄像头画面,命令如下:



17 HDMI–IN

主板配置了1路HDMI-IN接口,如下图所示:



查看输入hdmi信号格式,命令如下:

```
Shell
```

```
root@linaro-alip:~# v4l2-ctl -d /dev/video40 --query-dv-timings
 1
 2
             Active width: 1920
 3
             Active height: 1080
 4
             Total width: 2200
 5
             Total height: 1125
 6
             Frame format: progressive
7
             Polarities: -vsync -hsync
             Pixelclock: 148500000 Hz (60.00 frames per second)
 8
             Horizontal frontporch: 84
9
             Horizontal sync: 48
10
             Horizontal backporch: 148
11
             Vertical frontporch: 4
12
13
             Vertical sync: 5
             Vertical backporch: 36
14
15
             Standards:
16
             Flags:
17
     root@linaro-alip:~# v4l2-ctl -d /dev/video40 --get-fmt-video
     Format Video Capture Multiplanar:
18
19
             Width/Height
                               : 1920/1080
20
             Pixel Format
                               : 'NV24' (Y/CbCr 4:4:4)
21
             Field
                               : None
22
             Number of planes : 1
23
                               : premultiplied-alpha, 0x00000fe
             Flags
                               : Unknown (0x1003b8d4)
24
             Colorspace
             Transfer Function : Unknown (0x00000b8)
25
26
             YCbCr/HSV Encoding: Unknown (0x00000ff)
27
             Ouantization
                               : Default
28
             Plane 0
                               2.
29
                Bytes per Line : 1920
30
                Size Image
                            : 6220800
31
```

预览hdmi输入图像,命令如下:

Shell
1 gst-launch-1.0 v4l2src device=/dev/video40 ! video/x-raw,width=1920,height=
1080,framerate=30/1 ! videoconvert ! autovideosink

抓图hdmi输入图像,命令如下:

```
Shell
```

```
v4l2-ctl --verbose -d /dev/video40 \
 --set-fmt-video=width=1920,height=1080,pixelformat='NV12' \
 --stream-mmap=4 --stream-skip=3 \
 --stream-to=/hdmirx-1920x1080.yuv \
 --stream-count=1 --stream-poll
```

抓取的图像在电脑上通过YUView或7yuv工具查看,如下图所示:



IDO-SBC3588-Buildroot系统

1 调试

1.1 串口调试

调试串口位于(J37), 电平类型为TTL电平, 通信参数为1500000 8 N 1。如下图所示:



1. 打开MobaXterm, 下载链接如下:

链接: https://pan.baidu.com/s/1EY5Dces19B3c2oblq0rlfA?pwd=1234

提取码: 1234

如下图所示:

mk-image.sh	2023-04-11 20:38	sh文件	950B
DiskTool_v1.69.zip	2023-07-14 16:25	zip文件	467KB
ido-pack-tools.tar.gz	2023-04-11 20:38	gz文件	1.89MB
RKDevTool_Release_v2.95.zip	2023-04-11 20:38	zip文件	2.30MB
RKDevInfoWriteTool_Setup_V1.1.4_210527.7z	2023-04-11 20:38	7z文件	3.50MB
DriverAssitant_v5.11.zip	2023-04-11 20:38	zip文件	9.36MB
DebaXterm_Portable_v23.6.zip	2024-05-22 16:55	zip文件	39.99MB
C 🧧 RKTools-for-mac.zip	2023-06-21 14:07	zip文件	58.94MB

2. 选择session为【Serial】,如下图所示:

Session set	tings													×
SSH	C Teinet	Rsh	Xdmcp	RDP	VNC	• FTP	SFTP 2	iggi File	Shell	() Browser) Mosh	Aws 53	WSL	
					4		Choose a sess	ion type	-0					
					0	OK	0 G	incel						

- 3. 将Serial port修改为在设备管理器中找到的COM端口
- 4. 设置Speed(bsp)为1500000
- 5. 点击【OK】按钮,如下图所示:

SSH 1				1.0			19	100	· .	8	N		
	ielnet F	Rsh Xdmcp	RDP	VNC	FTP	SFTP	Serial	File	Shell	Browser	Mosh	Aws S3	WSL
F Basic S	Serial setting	gs											
3 5	erial port *	COM7 (USB-SE	RIAL CH	340 (COM	7))	~	4	Speed (b)	ps)* 150	~ 0000			
_													
Advance	ed Serial s	ettings 🔳 Te	rminal set	tings 🔒	Bookm	ark settings	5						
		Serial engine:	PuTTY	(allows ma	inual CO	M port setti	ng)			~			
		Data bits	8	Ŷ	_					_			
		Stop bits	1	v	If you conf	u need to tra	ansfer files	(e.g. route use Mobal	r Germ				-
		Parity	None	~	emb	edded TFT	P server						X
		Flow control	Xon/Xof	- V								- 24	
		C Reset	defaults		"Se	rvers" wir	ndow>	TFTP	server				
		Execute mac	ro at sess	ion start.	<none></none>		¥						

默认以root用户登录,没有登录密码。如下图所示:

root@rk3588:/# 1s										
bin	info	media	proc	sdcard	userdata					
busybox.fragment	lib	misc	rockchip-test	sys	usr					
data	lib64	mnt	root	system	var					
dev	linuxrc	oem	run	tmp	vendor					
etc	lost+found	opt	sbin	udisk						
root@rk3588:/#										

1.2 ADB 调试

ADB 调试接口,如下图所示:


ADB调试端口位于(J39)(TYPEC-0,与烧录端口一致),进入ADB调试命令如下:

•									C++
1 2 3 4 5 6 7 8 9	D:\>adb * daemor * daemor root@Inc ls bin de boot et data ho root@Inc	<pre>shell n not running. s n started succes dustio:/# ls ev lib cc lost+found ome media dustio:/#</pre>	mnt opt proc	g it n * root run sbin	ow on po sdcard snap srv	rt 5037 sys system tmp	* udisk usr var	vendor	

1.3 ssh调试

主板支持ssh远程调试,默认登录账号密码为: root @ rockchip。

2 串口

主板共配置7路串口(不包括调试串口),其中4路RS232,2路RS485和1路TTL串口,如下图所示:



串口设备节点信息,如下表所示:

编号	设备节点	类型
RS232-1	/dev/ttyS6	RS232
RS232-2	/dev/ttyS0	RS232
RS232-3	/dev/ttyS7	RS232
RS232-4	/dev/ttyS3	RS232
RS485-1	/dev/ttyS5	RS485
RS485-2	/dev/ttyS4	RS485
TTL-1	/dev/ttyS8	TTL

使用microcom可以进行收发测试,命令如下:

```
    Shell
    root@rk3588:/# microcom -s 115200 /dev/ttyS4
    [ 104.544856] of_dma_request_slave_channel: dma-names property of node '/s erial@feb70000' missing or empty
    [ 104.544912] dw-apb-uart feb70000.serial: failed to request DMA, use interrupt mode
```

注意:microcom测试完成,按ctrl+x退出。

3 USB

主板共配置11路USB接口,其中4路为TYPE-A接口,速率为USB3.0,这里以USB1、USB2、USB3 和USB4标记;另外7路为PH2.0接口,速率为USB2.0,以USB5-USB11标记,如下图所示:



USB节点信息如下表所示:

编号	位置	速率
USB1	TYPE-A-1, 上	usb3.0
USB2	TYPE-A-1, 下	usb3.0
USB3	TYPE-A-2, 上	usb3.0
USB4	TYPE-A-2, 下	usb3.0
USB5	5	usb2.0
USB6	6	usb2.0
USB7	7	usb2.0
USB8	8	usb2.0
USB9	9	usb2.0
USB10	10	usb2.0
USB11	11	usb2.0

3.1 电源控制

主板默认11路USB电源默认是开启的,同时提供方法控制USB电源开启或关闭,如下表所示:

编号	控制节点
USB1	/sys/class/leds/usb_host2_pwr/brightness
USB2	/sys/class/leds/usb_host1_pwr/brightness
USB3	/sys/class/leds/usb_host4_pwr/brightness
USB4	/sys/class/leds/usb_host3_pwr/brightness
USB5	/sys/class/leds/host_J52/brightness
USB6	/sys/class/leds/host_J90/brightness
USB7	/sys/class/leds/host_J54/brightness
USB8	/sys/class/leds/host_J56/brightness
USB9	/sys/class/leds/host_J55/brightness
USB10	/sys/class/leds/host_J91/brightness
USB11	/sys/class/leds/host_J53/brightness

以USB1为例(其他USB类似)命令如下:

Shell
 //关闭USB1的电源
 root@rk3588:/# echo 0 > /sys/class/leds/usb_host2_pwr/brightness
 //开启USB1的电源
 root@rk3588:/# echo 255 > /sys/class/leds/usb_host2_pwr/brightness

3.2 U盘的挂载

系统默认自动挂载U盘到/mnt/udisk目录下。命令如下:

```
Shell
1 root@rk3588:/# mount
2 ...
3 /dev/sda1 on /mnt/udisk type vfat (rw,nodev,noexec,noatime,nodiratime,fmask
=0022,dmask=0022,c
4 ...
```

4 SD

主板配置一路SD接口,位于主板背面。如下图所示:



4.1 SD卡的挂载

系统默认自动挂载U盘到/mnt/sdcard目录下,命令如下:



5 以太网网口

主板配置2路1000M以太网接口,位于J37,系统中对应的网络节点为enP4p65s0和eth1,如下图所示:



5.1 查看IP地址

查看IP地址命令如下:

•	Shell
1	<pre>root@rk3588:/# ifconfig enP4p65s0</pre>
2	enP4p65s0: flags=4163 <up,broadcast,running,multicast></up,broadcast,running,multicast>
3	inet 192.168.1.149 netmask 255.255.255.0 broadcast 192.168.1.255
4	inet6 fe80::1840:cd30:4000:e037
5	ether e2:49:6c:fe:b2:24 txqueuelen 1000 (Ethernet)
6	RX packets 51 bytes 5804 (5.6 KiB)
7	RX errors 0 dropped 0 overruns 0 frame 0
8	TX packets 60 bytes 5895 (5.7 KiB)
9	TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10	device interrupt 156 base 0xd000
11	
12	root@rk3588:/# ifconfig eth0
13	eth0 Link encap:Ethernet HWaddr AA:70:FD:B5:5B:AE
14	inet addr:192.168.1.166
15	inet6 addr: fe80::91b0:6438:ad82:7a8f/64 Scope:Link
16	UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
17	RX packets:5 errors:0 dropped:0 overruns:0 frame:0
18	<pre>TX packets:13 errors:0 dropped:0 overruns:0 carrier:0</pre>
19	collisions:0 txqueuelen:1000
20	RX bytes:971 (971.0 B) TX bytes:1438 (1.4 KiB)
21	Interrupt:90

5.2 设置临时IP地址

设置临时IP地址命令如下:

•		Shell
1 2	root@rk3588:/# ifconfig enP4p65s0 192.168.1.100 root@rk3588:/# ifconfig eth0 192.168.0.10	

5.3 设置永久静态IP地址

修改/etc/network/interfaces内容如下:

```
1
     # interface file auto-generated by buildroot
 2
 3
     auto lo
 4
    iface lo inet loopback
 5
 6
     auto enP4p65s0
 7
             iface enP4p65s0 inet static
 8
             address 192.168.0.123
             netmask 255.255.255.0
9
             gateway 192.168.0.1
10
             nameserver 192.168.0.1
11
12
13
     auto eth0
14
             iface eth0 inet static
             address 192.168.1.123
15
             netmask 255.255.255.0
16
17
             gateway 192.168.1.1
18
             nameserver 192.168.1.1
19
```

立即生效命令如下:

•		Shell
1	<pre>root@rk3588:/# /etc/init.d/S40network restart</pre>	

设备断电重启,此静态IP设置仍然生效。

6 WiFi

主板配置一路2.4G/5G双频wifi,型号为AP6275S。如下图所示:



系统启动会默认打开WiFi,对应的网络节点为wlan0:命令如下:

Shell

```
root@rk3588:/# ifconfig wlan0
1
2
   wlan0: flags=4099<UP, BROADCAST, MULTICAST> mtu 1500
3
           ether 10:bb:f3:55:cf:24 txqueuelen 1000 (Ethernet)
4
           RX packets 0 bytes 0 (0.0 B)
5
           RX errors 0 dropped 0 overruns 0 frame 0
           TX packets 0 bytes 0 (0.0 B)
6
7
           TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
8
9
   root@rk3588:/#
```

6.1 连接WiFi热点

系统提供了连接WiFi热点的脚本,位于/usr/bin/wifi_start.sh,使用方法如下:

Shell
 1 /usr/bin/wifi_start.sh AP_SSID AP_PASSWD
 以连接热点TP-LINK_B87A (密码12345678) 为例,命令如下:

7 蓝牙

主板配置1路蓝牙模块(型号为AP6275S)。

7.1 查看蓝牙控制器

查看蓝牙控制器,命令如下:

•	Shell
1	<pre>root@rk3588:/# hciconfig</pre>
2	hci0: Type: Primary Bus: UART
3	BD Address: 10:BB:F3:56:44:77 ACL MTU: 1021:6 SC0 MTU: 255:12
4	UP RUNNING
5	RX bytes:1750 acl:0 sco:0 events:60 errors:0
6	TX bytes:4256 acl:0 sco:0 commands:60 errors:0

7.2 连接蓝牙设备

•

扫描蓝牙设备,命令如下:

Shell

- 1 root@rk3588:/# hciconfig hci0 iscan
- 2 root@rk3588:/# bluetoothctl
- 3 [bluetooth]# scan on

配对蓝牙设备,命令如下:

Shell
 1 - [bluetooth]# trust 7C:C1:80:09:DD:6C
 2 - [bluetooth]# pair 7C:C1:80:09:DD:6C

退出,命令如下:

Shell

```
1 = [cainiaocl]# exit
```

8 指示灯

主板共配置1个系统运行指示灯,系统正常运行时,该LED闪烁,如下图所示:



9 按键

主板共配置3个按键,如下图所示:



各个按键的说明见下表:

编号	名称	说明
1	RECOVERY	电源按键,用于开机/关机;
5	RESET	复位按键,用于硬件复位;
6	POWER	烧录按键,用于烧录,或系统启动后,按下上报 KEY_VOLUMEUP;

10 4G/5G

默认支持EC20(4G)模块和RG200U(5G)模块。

安装好4G/5G模块及SIM卡,系统启动后,执行quectel-CM拨号,命令如下:

•		Shell
1	root@rk3588:/# quectel-CM &	

当wwan0(4G)或usb0(5G)网络节点获取到IP,说明拨号成功,命令如下:

•		Shell
1	root@rk3	3588:/# ifconfig wwan0
2	wwan0:	<pre>flags=4305<up,pointopoint,running,noarp,multicast> mtu 1500</up,pointopoint,running,noarp,multicast></pre>
3		inet 10.252.248.35 netmask 255.255.255.248 destination 10.252.24
	8.35	
4		<pre>inet6 fe80::ecdc:1a63:2957:e7c7 prefixlen 64 scopeid 0x20<link/></pre>
5		unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-
	n 1000	(UNSPEC)
6		RX packets 46 bytes 4308 (4.2 KiB)
7		RX errors 0 dropped 0 overruns 0 frame 0
8		TX packets 66 bytes 7054 (6.8 KiB)
9		TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
10		
11		

测试4G/5G上网功能是否正常,命令如下:

```
root@rk3588:/# ping 114.114.114.114 -I wwan0
 1
    PING 114.114.114.114 (114.114.114) from 10.252.248.35 wwan0: 56(84) by
 2
    tes of data.
 3
    64 bytes from 114.114.114.114: icmp_seq=1 ttl=91 time=184 ms
    64 bytes from 114.114.114.114: icmp_seq=2 ttl=79 time=83.8 ms
4
    64 bytes from 114.114.114.114: icmp_seq=3 ttl=67 time=91.6 ms
 5
    64 bytes from 114.114.114.114: icmp seg=4 ttl=63 time=77.9 ms
 6
    64 bytes from 114.114.114.114: icmp_seq=5 ttl=93 time=79.6 ms
7
    64 bytes from 114.114.114.114: icmp_seq=6 ttl=83 time=86.7 ms
8
    64 bytes from 114.114.114.114: icmp seg=7 ttl=68 time=84.8 ms
9
   64 bytes from 114.114.114.114: icmp_seq=8 ttl=80 time=88.8 ms
10
```

11 M.2

主板配置了一路M.2接口,可接PCIE固态硬盘使用,如下图所示:



接入PCIE固态硬盘后,使用fdisk工具查看该设备,命令如下:



使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

```
root@rk3588:/# mount /dev/nvme0n1p1 /mnt
 1
 2 • [ 239.607381] FAT-fs (nvme0n1p1): utf8 is not a recommended IO charset fo
     r FAT filesystems, filesystem will be case sensitive!
 3 • [ 239.608734] FAT-fs (nvme0n1p1): Volume was not properly unmounted. Som
     e data may be corrupt. Please run fsck.
     root@rk3588:/# df -h
4
    文件系统
5
                   容量 已用 可用 已用% 挂载点
    /dev/root
                         <mark>3</mark>.3G
                                       25% /
 6
                     14G
                                 11G
                                        1% /dev
7
    devtmpfs
                    3.9G 8.0K 3.9G
                             0 3.9G
8
    tmpfs
                    3.9G
                                        0% /dev/shm
9
    tmpfs
                    1.6G
                          1.7M 1.6G
                                       1% /run
    tmpfs
                                      1% /run/lock
10
                    5.0M
                          4.0K 5.0M
    tmpfs
                           16K 3.9G
11
                    3.9G
                                       1% /tmp
    /dev/mmcblk0p7
12
                    127M
                           12M 109M
                                       10% /oem
13
    /dev/mmcblk0p8
                     43G
                           44K
                               41G
                                       1% /userdata
    tmpfs
                           44K 793M
                                        1% /run/user/1000
14
                    793M
15
    tmpfs
                    793M
                           32K 793M
                                        1% /run/user/0
16
    /dev/nvme0n1p1 120G
                           67M 120G
                                        1% /mnt
17
     root@rk3588:/#
```

12 SATA

主板配置了一路SATA接口,可接SATA固态硬盘使用,如下图所示:



接入SATA固态硬盘后,使用fdisk工具查看该设备,命令如下:

```
•
    root@rk3588:/# fdisk -l
1
   Disk /dev/sda: 466 GB, 500107862016 bytes, 976773168 sectors
2
   60801 cylinders, 255 heads, 63 sectors/track
3
4
   Units: sectors of 1 * 512 = 512 bytes
5
6
   Device Boot StartCHS
                            EndCHS
                                          StartLBA
                                                       EndLBA
                                                                 Sectors Siz
   e Id Type
   /dev/sda1
                            1023,254,63
                                              2048 976773134 976771087 465
7
                0,32,33
   G c Win95 FAT32 (LBA)
8
    . . .
```

使用mount工具挂载到指定目录,即可使用该硬盘,命令如下:

•							Shell
1 2 - 3 - 4	root@rk3588 [2754.1424 filesystems [2754.1448 may be corr root@rk3588	:/# mount / 17] FAT-fs , filesyste 15] FAT-fs upt. Please :/# ls /m2	dev/sda1 / (sda1): ut m will be (sda1): Vo run fsck.	m2 f8 is no case sen lume was	t a recommended sitive! not properly u	IO charset	<mark>for</mark> FAT me data
5	Alarms es	DCIM	Download	Movies	Notifications	Podcasts	Rington
6	Audiobooks g	Documents	LOST.DIR	Music	Pictures	Recordings	sata.im

13 音频

主板共配置3个声卡设备(包含dp0、hdmi0和es8388)。

使用aplay/arecord工具可以查看系统所有声卡设备,命令如下:

```
root@rk3588:/# aplay -l
 1
    **** List of PLAYBACK Hardware Devices ****
 2
 3 • card 0: rockchipdp0 [rockchip,dp0], device 0: rockchip,dp0 spdif-hifi-0 [r
     ockchip,dp0 spdif-hifi-0]
       Subdevices: 1/1
4
 5
       Subdevice #0: subdevice #0
 6 • card 2: rockchiphdmi0 [rockchip-hdmi0], device 0: rockchip-hdmi0 i2s-hifi-
     0 [rockchip-hdmi0 i2s-hifi-0]
7
       Subdevices: 1/1
       Subdevice #0: subdevice #0
8
 9 • card 3: rockchipes8388 [rockchip-es8388], device 0: dailink-multicodecs ES
     8323.5-0011-0 [dailink-multicodecs ES8323.5-0011-0]
       Subdevices: 1/1
10
```

```
11 Subdevice #0: subdevice #0
```

13.1 扬声器

主板配置了一路双声道扬声器接口,位于(J79),如下图所示:



播放音频

接上扬声器,拔出耳机,执行以下命令播放音频,命令如下:



调节播放音量

命令如下:

•		She	9
1	<pre>root@rk3588:/# amixer -c 2 cset numid=21,iface=MIXER,name='PCM Volu 140</pre>	ıme'	140,

注意: 音量调节范围为0-192。

13.2 耳机/Line Out

主板配置了一路耳机接口,位于(J21),如下图所示:



13.2.1 播放音频

插入耳机,执行以下命令播放音频,命令如下:



13.2.2 调节播放音量

点击桌面右上角的【音量】图标,如下图所示:



注意: 音量调节范围为0-192。

13.3 MIC

主板配置了一路MIC,位于(J1),如下图所示:



录音测试命令如下:

•		Shell
1	<pre>root@rk3588:/# arecord -D hw:2,0 -r 48000 -c 2 -f S16_LE test.wav</pre>	
录音穿	完后播放测试命令如下:	
•		Shell
1	<pre>root@rk3588:/# aplay -D hw:2,0 ./test.wav</pre>	

14 RTC

主板共配置1路RTC(HYM8563),对应的设备节点为rtc0。

14.1 读取RTC时间

读取RTC时间命令如下:

```
    root@rk3588:/# hwclock
    Wed Apr 26 17:38:28 2023 0.000000 seconds
    3
```

14.2 设置RTC时间

设置RTC时间命令如下:

```
Shell
```

```
1 root@rk3588:/# date -s '2023-4-26 17:38:00'
2 Wed Apr 26 17:38:00 UTC 2023
3 root@rk3588:/# hwclock -w
4 root@rk3588:/# hwclock
5 Wed Apr 26 17:38:08 2023 0.000000 seconds
6
```

15 IR

•

主板配置了一路红外接口,如下图所示:



支持NEC编码遥控器,默认适配的遥控器型号为HTR-A07,如下图所示:



HTR-A07的键值表如下:

编号 按键 键值 编号 按键 键值	
---	--

1	电源	KEY_POWER	21	1	KEY_1
2	TV	KEY_SCREEN	22	2	KEY_2
3	橙色	KEY_F1	23	3	KEY_3
4	绿色	KEY_F2	24	4	KEY_4
5	黄色	KEY_F3	25	5	KEY_5
6	紫色	KEY_F4	26	6	KEY_6
7	音量+	KEY_VOLUMEUP	27	7	KEY_7
8	音量-	KEY_VOLUMEDOWN	28	8	KEY_8
9	屏显	KEY_DISPLAY_OFF	29	9	KEY_9
10	静音	KEY_MUTE	30	TVNOW	KEY_DOT
11	上一节目	KEY_VIDEO_PREV	31	0	KEY_0
12	下一节目	KEY_VIDEO_NEXT	32	截屏	KEY_PRINT
13	上	KEY_UP	33		
14	左	KEY_LEFT	34		
15	下	KEY_DOWN	35		
16	右	KEY_RIGHT	36		
17	确认	KEY_ENTER	37		
18	返回	KEY_BACK	38		
19	主页	KEY_HOME	39		
20	菜单	KEY_MENU	40		

使用以下命令可以从调试串口打印按键的键值,命令如下:

Bash
l echo 1 > /sys/module/rockchip_pwm_remotectl/parameters/code_print

使用evtest工具可以查看按键上报键值,命令如下:

```
Shell
```

```
1
     root@rk3588:/# evtest
 2
     No device specified, trying to scan all of /dev/input/event*
 3
     Available devices:
 4
    /dev/input/event0:
                              febd0030.pwm
 5
                              rockchip-hdmi0 rockchip-hdmi0
    /dev/input/event1:
 6
                              rockchip-hdmi1 rockchip-hdmi1
    /dev/input/event2:
7
                              rockchip,dp0 rockchip,dp0
    /dev/input/event3:
 8
     /dev/input/event4:
                              rk805 pwrkey
9
                              adc-keys
     /dev/input/event5:
10
     /dev/input/event6:
                              headset-kevs
11
     /dev/input/event7:
                              rockchip-es8388 Headset
                              USB OPTICAL MOUSE
12
     /dev/input/event8:
13 = Select the device event number [0-8]: 0
14
     Input driver version is 1.0.1
15
     Input device ID: bus 0x19 vendor 0x524b product 0x6 version 0x100
     Input device name: "febd0030.pwm"
16
17
     Supported events:
18
       Event type 0 (EV SYN)
       Event type 1 (EV_KEY)
19
20
         Event code 2 (KEY 1)
21
         Event code 3 (KEY 2)
22
         Event code 4 (KEY 3)
23
         Event code 5 (KEY 4)
24
         Event code 6 (KEY 5)
25
         Event code 7 (KEY 6)
26
         Event code 8 (KEY 7)
27
         Event code 9 (KEY 8)
28
         Event code 10 (KEY 9)
         Event code 11 (KEY 0)
29
30
         Event code 14 (KEY_BACKSPACE)
31
         Event code 28 (KEY ENTER)
32
         Event code 52 (KEY DOT)
33
         Event code 61 (KEY_F3)
34
         Event code 102 (KEY HOME)
35
         Event code 103 (KEY UP)
36
         Event code 104 (KEY PAGEUP)
37
         Event code 105 (KEY_LEFT)
38
         Event code 106 (KEY RIGHT)
39
         Event code 108 (KEY DOWN)
40
         Event code 109 (KEY PAGEDOWN)
         Event code 113 (KEY MUTE)
41
42
         Event code 114 (KEY_VOLUMEDOWN)
43
         Event code 115 (KEY VOLUMEUP)
44
         Event code 116 (KEY_POWER)
45
         Event code 139 (KEY MENU)
```

```
46
        Event code 143 (KEY_WAKEUP)
        Event code 158 (KEY_BACK)
48
        Event code 183 (KEY F13)
49
        Event code 184 (KEY F14)
50
        Event code 185 (KEY_F15)
51
        Event code 186 (KEY F16)
52
        Event code 217 (KEY_SEARCH)
53
        Event code 232 (KEY_REPLY)
54
        Event code 241 (KEY_VIDEO_NEXT)
55
        Event code 242 (KEY VIDEO PREV)
56
        Event code 245 (KEY DISPLAY OFF)
57
        Event code 248 (KEY_MICMUTE)
58
        Event code 338 (?)
59
        Event code 373 (KEY MODE)
60
        Event code 375 (KEY SCREEN)
61
        Event code 388 (KEY TEXT)
62
        Event code 400 (KEY YELLOW)
63
        Event code 401 (KEY BLUE)
64
        Event code 402 (KEY_CHANNELUP)
65
    Properties:
66
    Testing ... (interrupt to exit)
67 -
    [ 4237.196132] USERCODE=0x1818
68 -
    [ 4237.223070] RMC_GETDATA=ff
69
    Event: time 1682532011.417156, type 1 (EV_KEY), code 2 (KEY_1), value 1
70
    Event: time 1682532011.417156, ----- SYN REPORT -----
71
    Event: time 1682532011.475441, type 1 (EV KEY), code 2 (KEY 1), value 0
72
    Event: time 1682532011.475441, ----- SYN REPORT -----
73 -
    [ 4237.866797] USERCODE=0x1818
74 -
    [ 4237.893797] RMC GETDATA=fe
75
    Event: time 1682532012.087855, type 1 (EV_KEY), code 3 (KEY_2), value 1
76
    Event: time 1682532012.087855, ----- SYN REPORT -----
77
    Event: time 1682532012.178638, type 1 (EV KEY), code 3 (KEY 2), value 0
78
    Event: time 1682532012.178638, ----- SYN REPORT -----
79 -
    [ 4238.370395] USERCODE=0x1818
80 -
    [ 4238.397454] RMC GETDATA=fd
81
    Event: time 1682532012.591469, type 1 (EV_KEY), code 4 (KEY_3), value 1
82
    Event: time 1682532012.591469, ----- SYN REPORT ------
83
    Event: time 1682532012.682093, type 1 (EV_KEY), code 4 (KEY_3), value 0
84
    Event: time 1682532012.682093, ----- SYN REPORT -----
85 -
    [ 4239.209857] USERCODE=0x1818
86 -
    [ 4239.236861] RMC_GETDATA=fc
87
    Event: time 1682532013.430863, type 1 (EV_KEY), code 5 (KEY_4), value 1
88
    Event: time 1682532013.430863, ----- SYN REPORT ------
89
    Event: time 1682532013.521980, type 1 (EV KEY), code 5 (KEY 4), value 0
90
    Event: time 1682532013.521980, ----- SYN_REPORT -----
91
```

16 摄像头

主板工配置2路摄像头,型号均为OV13855,最高分辨率支持1200万像素。

16.1 测试

使用gst-launcher工具可以预览摄像头画面,命令如下:

•	Bash
1	//预览摄像头1(MIPI-CSI0)的画面
2	<pre>gst-launch-1.0 v4l2src device=/dev/video22 ! video/x-raw,format=NV12,width=</pre>
	1920,height=1080, framerate=30/1 ! waylandsink
3	
4	//预览摄像头2(MIPI–CSI1)的画面
5	<pre>gst-launch-1.0 v4l2src device=/dev/video31 ! video/x-raw,format=NV12,width=</pre>
	1920,height=1080, framerate=30/1 ! waylandsink

17 HDMI–IN

主板配置了1路HDMI-IN接口,如下图所示:



查看输入hdmi信号格式,命令如下:

```
Shell
```

```
root@rk3588:/# v4l2-ctl -d /dev/video40 --query-dv-timings
 1
 2
             Active width: 1920
 3
            Active height: 1080
 4
             Total width: 2200
 5
             Total height: 1125
 6
            Frame format: progressive
7
             Polarities: -vsync -hsync
             Pixelclock: 148500000 Hz (60.00 frames per second)
8
9
             Horizontal frontporch: 84
             Horizontal sync: 48
10
             Horizontal backporch: 148
11
             Vertical frontporch: 4
12
13
            Vertical sync: 5
             Vertical backporch: 36
14
15
             Standards:
16
             Flags:
17
     root@rk3588:/# v4l2-ctl -d /dev/video40 --get-fmt-video
     Format Video Capture Multiplanar:
18
19
             Width/Height
                              : 1920/1080
20
            Pixel Format
                               : 'NV24' (Y/CbCr 4:4:4)
21
             Field
                              : None
22
             Number of planes : 1
23
                               : premultiplied-alpha, 0x000000fe
            Flags
                               : Unknown (0x1003b8d4)
24
             Colorspace
            Transfer Function : Unknown (0x00000b8)
25
26
             YCbCr/HSV Encoding: Unknown (0x00000ff)
27
            Ouantization
                              : Default
28
            Plane 0
                               2.
29
                Bytes per Line : 1920
30
                Size Image
                            : 6220800
31
```

预览hdmi输入图像,命令如下:

Bash
1 gst-launch-1.0 v4l2src device=/dev/video40 ! video/x-raw,width=1920,height=
1080,framerate=30/1 ! videoconvert ! waylandsink

抓图hdmi输入图像,命令如下:

```
Shell
```

```
v4l2-ctl --verbose -d /dev/video40 \
 --set-fmt-video=width=1920,height=1080,pixelformat='NV12' \
 --stream-mmap=4 --stream-skip=3 \
 --stream-to=/hdmirx-1920x1080.yuv \
 --stream-count=1 --stream-poll
```

抓取的图像在电脑上通过YUView或7yuv工具查看,如下图所示:

