WT-EDKSOM6ULX Hardware User Manual

Revise history:

Version	Date	Log
V1.0	2019/07/08	Create

Contents

一、 Description

WT-EDK6ULX is a multi-interface IoT gateway device, it integrated the 4G industrial router, 4GDTU and HMI functions. Based on NXP I.MX6ULL ARM7 SOC open source platform, adopt open source ARM-Linux development platform, it can be applied to various industrial IoT gateways and industrial control devices.

二、 Technical parameters

2.1 hardware parameters reference table 1

Table 1 Hardware parameters

Hardware parameters	Description
CPU	NXP i.MX6ULL ARM 800MHZ，-40~105℃ Industrial grade temperature
DDR3	256MB/512MB optional， default 256MB
FLASH/EMMC	NAND FLASH : 128MB/256MB ~ 8GB optional. Or EMMC : 4GB~32GB optional Default 256MB NAND FLASH
LAN	2 x 10M/100Mbps adaptive ETH
USB	2 x USB 2.0 Host , 1x USB device, 1x micro USB to UART（for Linux debug）
4G	LTE B1/B3/B38/B39/B 40/B41 3G B1/B34/39/BC0 GSM/EDGE B3/8 Support main antenna, diversity antenna, GPS antenna Standard drawer-type SIM card holder, eSIM optional
SIM card holder	x1，support standard SIM card. Reserv eSIM card SMD position，support eSIM
RS485	2x RS485 with interface protection， isolate RS485 optional
RS232	2x RS232 with interface protection
CAN	1x can with interface protection, isolate CAN optional.
Audio output	1 x headphone header(4 OMTP standard 3.5mm)， support recording One two-channel 8ohm 1W speaker header（PH2.0 4Pin）
TF card	Micro SD card standard
LCD	Support a variety of common LCD screens, up to 1366 * 768 resolution. One 40Pin 0.5mm FPC header，Supports universal 4.3 inch and 5 inch LCD One 50Pin 0.5mm FPC header，Supports universal 7 inch and10.1

	inch LCD One 18bit LVDS interface，Support for larger size LVDS interface LCD.
LVDS backlight interface	x1，support 5V or 12V LVDS backlight power，PWM dimming output.
Resistive touchpad	Four-wire resistive touch (integrated in 40Pin LCD cable interface), External expansion through the XH4P connector
Reset key	x1
Power key	Long press to shut down，short press to start up.
WIFI/BLE	Support RT8723BU WIFI/BT model
Extension interface	Extend 20 CPU pins，can configure to GPIO/ I2C/ SPI/ SDIO/ UART/ CAN，reference pin configuration
RTC	Independent RTC clock chip，rechargeable battery，maintenance free.
LED	x6 2 for 4G indicator light，1 for power，1 for system，2 for user customize.
Power input	9~30V DC @1A Standard 5.5*2.1 DC header Can be changed to terminal block，2Pin 3.81mm spacing.

2.2 Electrical parameters

Table 2. Electrical parameters table

Power range	9V~28V DC ，rated voltage 12V DC If LVDS screen need 12V for backlight，must provide 12V power
Rated power	<5W（not include screen）
Power protection	Lighting surge ± 2KV, group pulse ± 2KV
Interface protection (RS485,RS232,CAN)	Lighting surge ± 2KV ，group pulse ± 2KV，ESD air 12KV, contact 8KV
EMC standard	EN61000-6-2-2005 EN61000-6-4:2007
Environment protection	RoHS

2.3 Use environment parameters

Table 3. Use environment parameters table

Working temperature	-10~70℃（Commercial grade，default configuration） -40~70℃（Industrial grade）

Storage temperature	-40~85℃
Environment humidity	10~90%RH（non-condensing）
Shock resistance	10~25HZ（X/Y/Z direction 2G/30minutes）

三、 Interface description

3.1 Physical interface annotation

1. PCB front interface annotation

GPS ANT

WiFi/BT ANT

4G ANT（Div）

4G ANT（Main）

LAN1

LAN0

TF Card（TOP）
SIM Card（Bottom）

USB x2

MicroUSB

Resistive TP

RS232 x2

LCD 40P (RGB)

LVDS (18bit)

CAN x1

LVDS BackLight

RS485 x2

HeadPhone

DC Power

LED x6

Speaker
L+R 8Ω1W

Power
Button

RESET
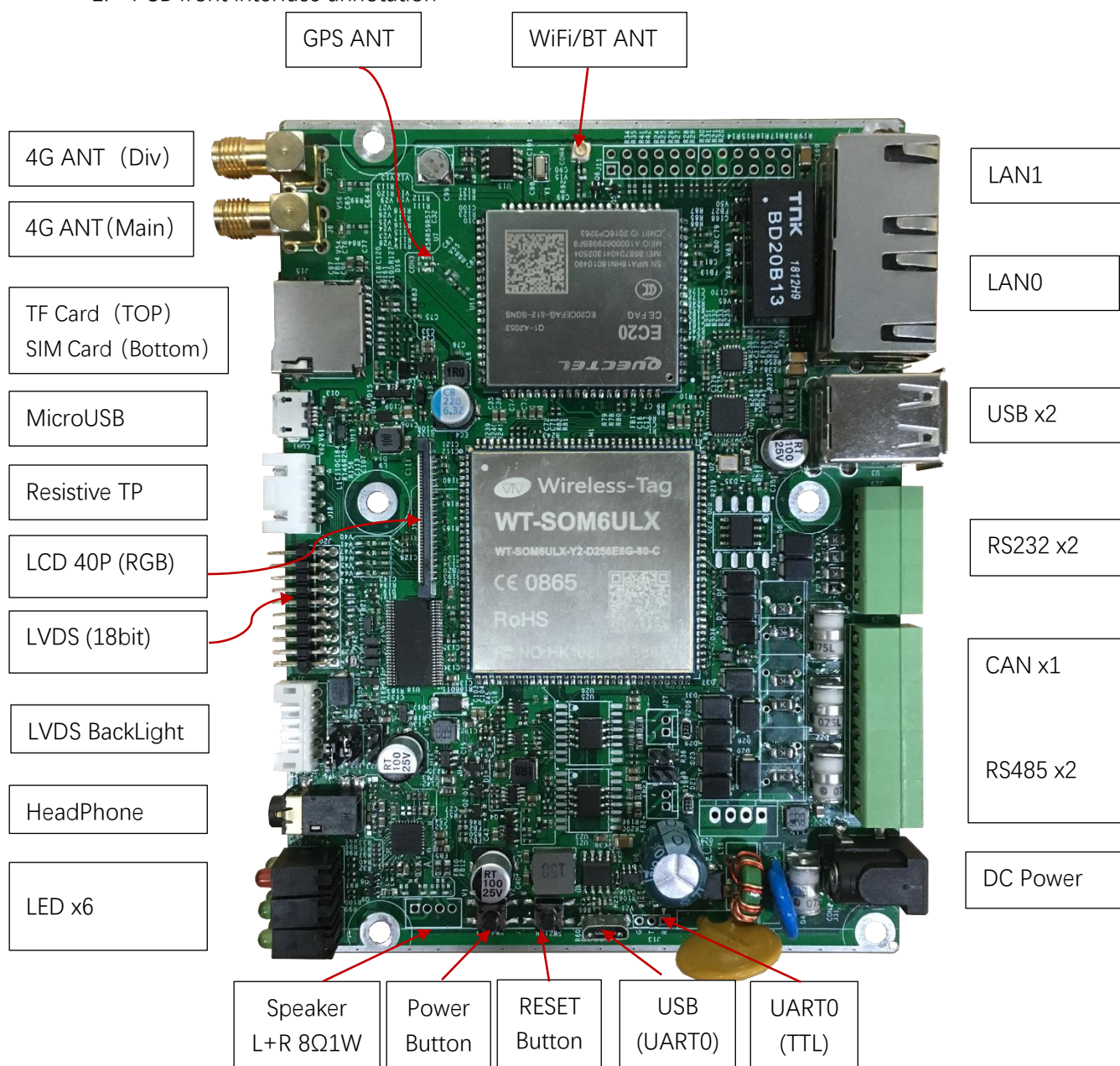Button

USB
(UART0)

UART0
(TTL)

Figure 1. PCB front interface annotation
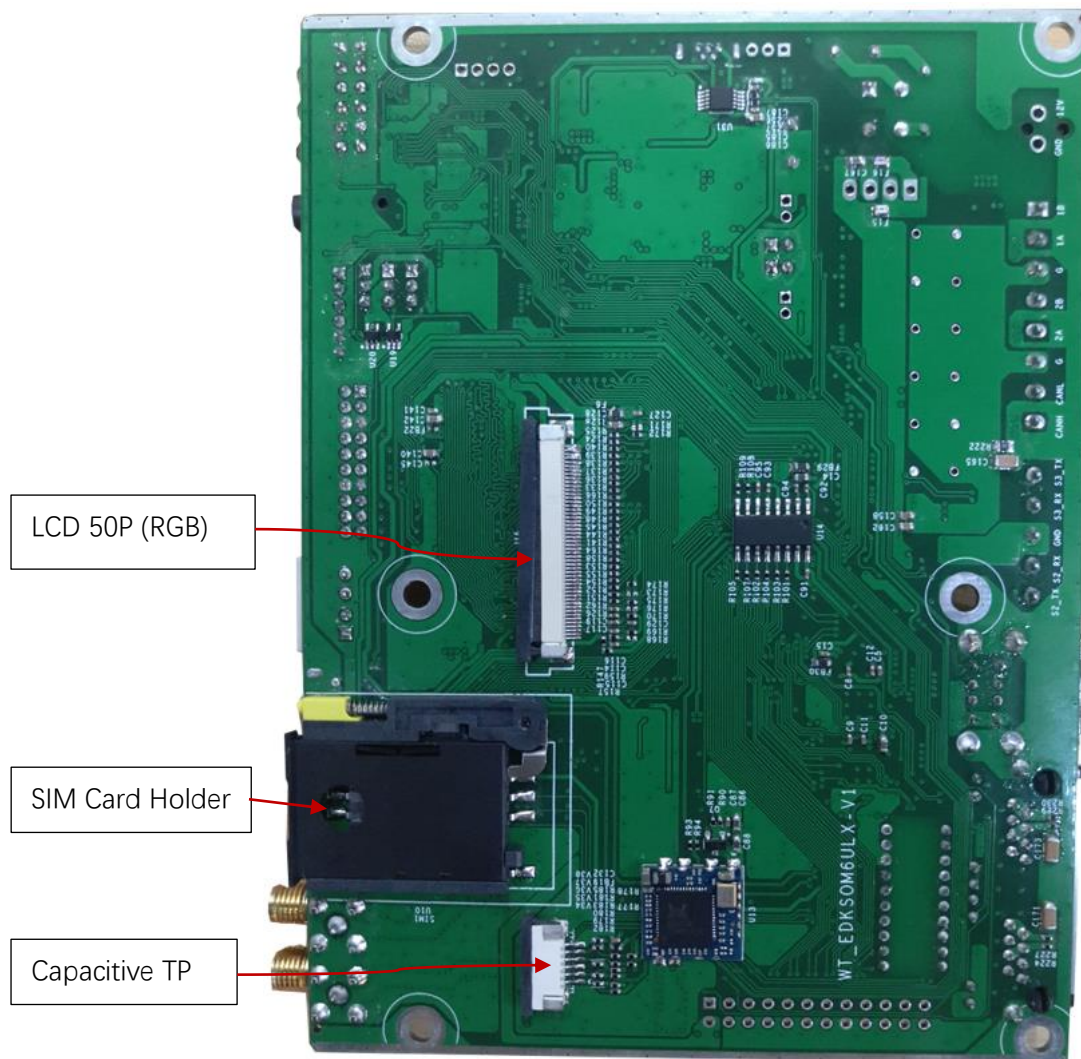
2. PCB back interface annotation

Figure 2. PCB back interface annotation

3. Metal shell equipment interface silk screen（front，back）

Figure 3. Metal shell front silk screen

Figure 4. Metal shell back silk screen

3.2 Power interface

The default supply voltage is 12V@2A. Use standard 5.5x2.1mm DC socket, and the phoenix 3.81mm pitch 2P terminal block connector is reserved.

If the LVDS backlight needs to supply 12V power, the power interface should provide DC 12V. In other cases, the power supply voltage range is DC 9V ~ 30V.

3.3 TF card interface

Support standard MicroSD storage card, support FAT, EXT file system , Maximum support to 32GB.

If there is no bootable application in NAND FLASH or EMMC, EDK will boot from SD/TF card default.

3.4 USB interface

Support 2 USB2.0, support devices such as standard USB storage disks, can supply 5V@1A power output. USB interface expands four channels through USB2514 USB HUB chip, two of them connect to an external USB plug-and-play device via a USB HOST. The other two USB interfaces are used to connect the 4G module and the WIFI/BT module respectively

3.5 Ethernet interface

Support two 10M/100Mbps adaptive ethernet interfaces. The SOM connects to the LAN8720A to extend the network through the ENET1 RMII interface. The backplane connects to the LAN8720A through the ENET2 interface to connect another network.

3.6 RS485 and CAN bus interface

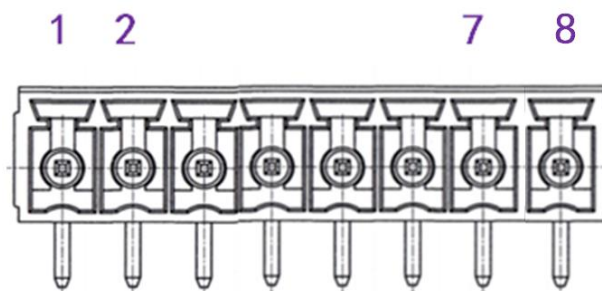RS485 and CAN bus interface use 3.81mm 15DGE terminal block connector, the pin defined as follow.

Figure 5. RS485/CAN pin definition

Table 4. RS485/CAN interface pin definition table

Pin num	Pin definition	Description
1	B1	RS485 1. Isolated transceiver optional , non-isolated transceiver default. Automatic control of sending and receiving directions(by default), baud rate up to 115200.
2	A1	
3	G	RS485 / CAN GND , 2000V isolated power ground optional
4	B2	RS485 2 : Isolated transceiver optional , non-isolated transceiver default. Automatic control of sending and receiving directions(by default), baud rate up to 115200.
5	A2	
6	G	RS485 / CAN GND, 2000V isolated power ground optional
7	L	CAN 1 Isolated transceiver optional
8	H	

RS485 1 (A1/B1) use i.MX6ULL UART4 , device name is /dev/ttymxc3 in Linux system.

RS485 2 (A2/B2) use i.MX6ULL UART5 , device name is /dev/ttymxc4 in Linux system.
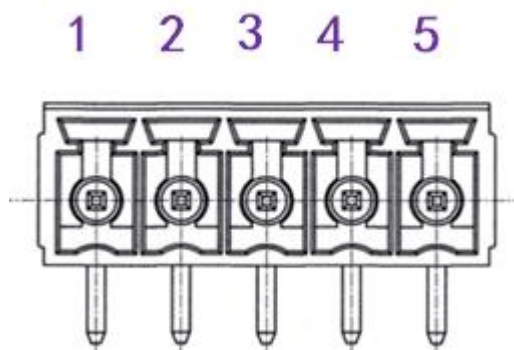
3.7 RS232 interface

Figure 6. RS232 interface pin definition

Table 5. RS232 interface pin definition table

Pin num	Pin definition	Description
1	S3_TXD	/dev/ttymxc2 TXD
2	S3_RXD	/dev/ttymxc2 RXD
3	GND	Power GND
4	S2_TXD	/dev/ttymxc1 TXD
5	S2_RXD	/dev/ttymxc1 RXD

3.8 LCD interface

EDK use RGB666（18bit）color depth to drive 4.3', 5', 7', 10.1' conventional size LCD screens and LVDS screens.
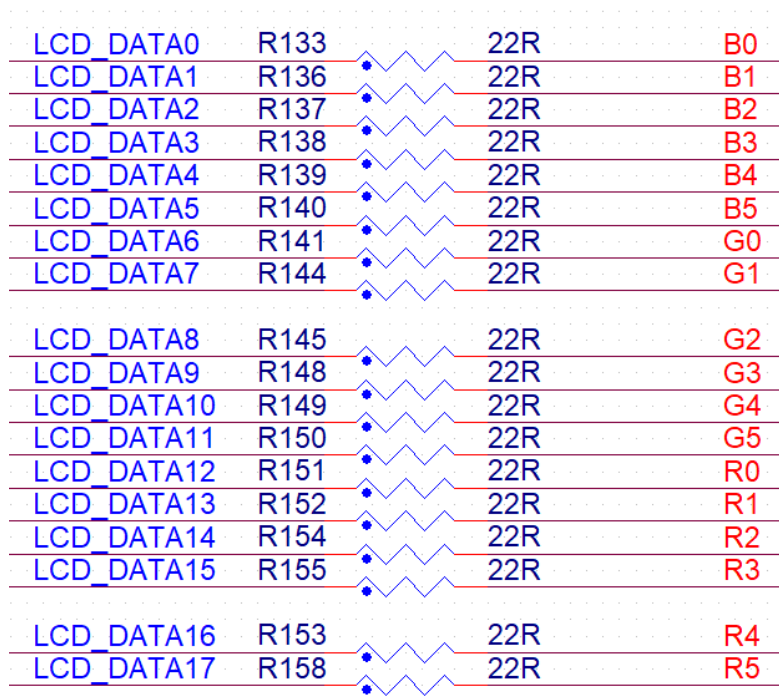
LCD signal	Resistor	Value	RGB
LCD_DATA0	R133	22R	B0
LCD_DATA1	R136	22R	B1
LCD_DATA2	R137	22R	B2
LCD_DATA3	R138	22R	B3
LCD_DATA4	R139	22R	B4
LCD_DATA5	R140	22R	B5
LCD_DATA6	R141	22R	G0
LCD_DATA7	R144	22R	G1
LCD_DATA8	R145	22R	G2
LCD_DATA9	R148	22R	G3
LCD_DATA10	R149	22R	G4
LCD_DATA11	R150	22R	G5
LCD_DATA12	R151	22R	R0
LCD_DATA13	R152	22R	R1
LCD_DATA14	R154	22R	R2
LCD_DATA15	R155	22R	R3
LCD_DATA16	R153	22R	R4
LCD_DATA17	R158	22R	R5

Figure 6. i.MX6ULL LCD signal and RGB666 mapping schematic

3.9 40Pin LCD interface

J17 40Pin RGB LCD interface use vertical patch type FPC connector，can connect to most of the 4.3' and 5' LCD screens. In addition to the LCD signal, the pin definition also includes the signal of the four-wire resistor touchpad.
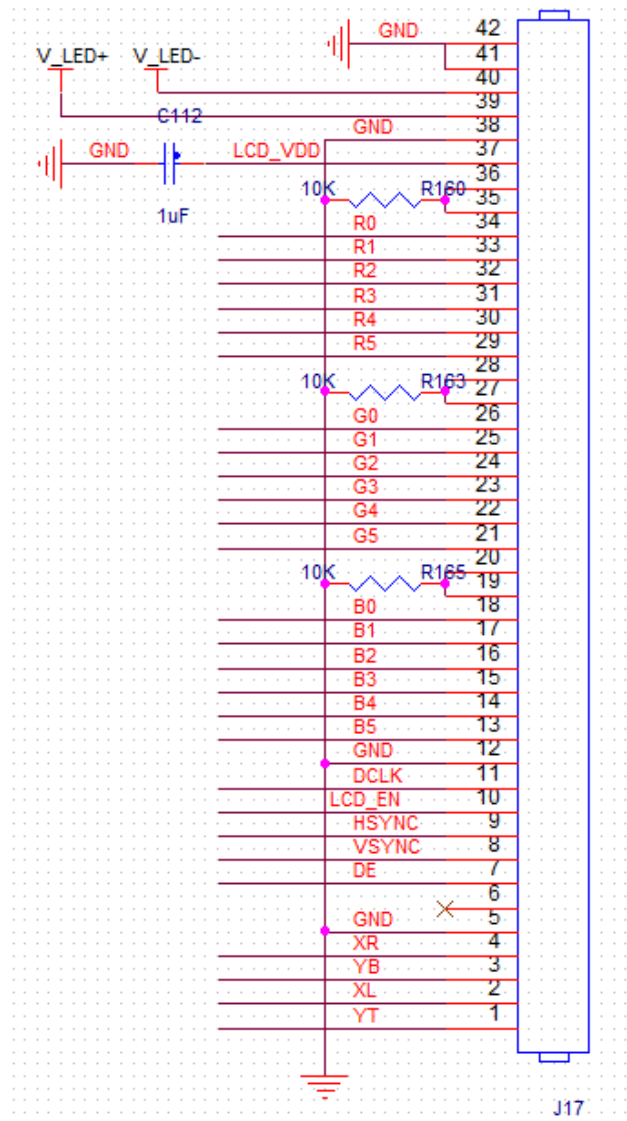
Figure 7. 40Pin LCD FPC connector pin connection schematic

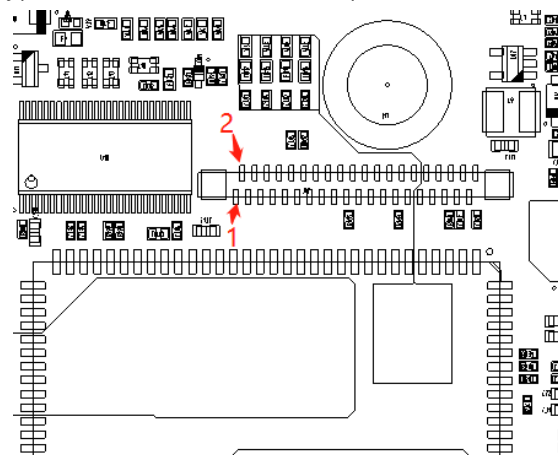J17 use vertical patch type FPC connector，the 1st pin defined as follow：

Figure 8. 40Pin LCD FPC connector pin direction

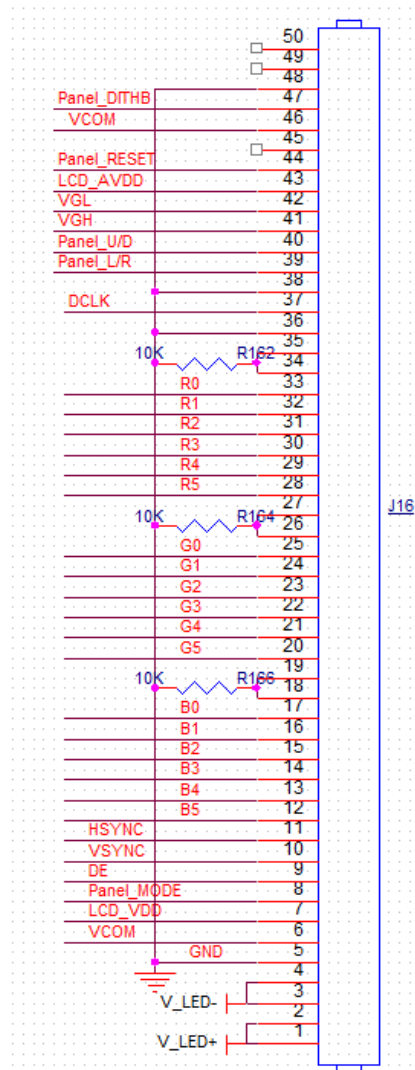## 3.10   50Pin RGB LCD interface

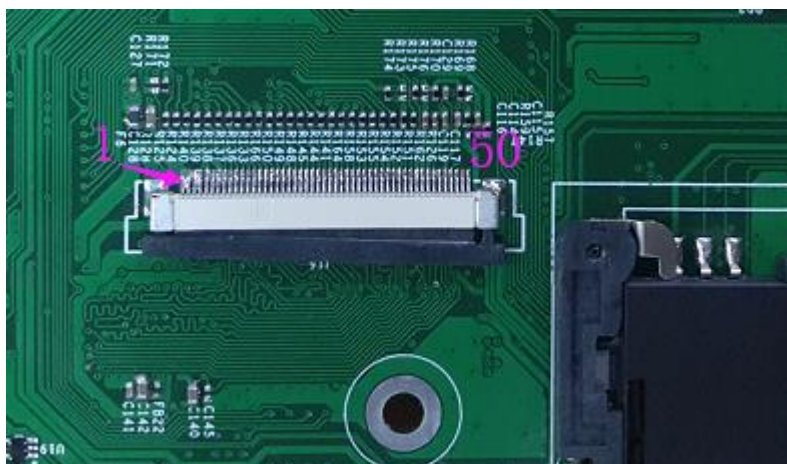Figure 9. 50Pin LCD FPC connector pin connection schematic

Figure 10. 50Pin LCD FPC connector pin connect direction

The 50Pin LCD FPC connector is suitable for most 7inch and 10.1inch RGB interface LCD screens. The backlight brightness of different screens can be adjusted by modifying the R142 and R143 resistor value . The circuit diagram of the backlight part is as follows:
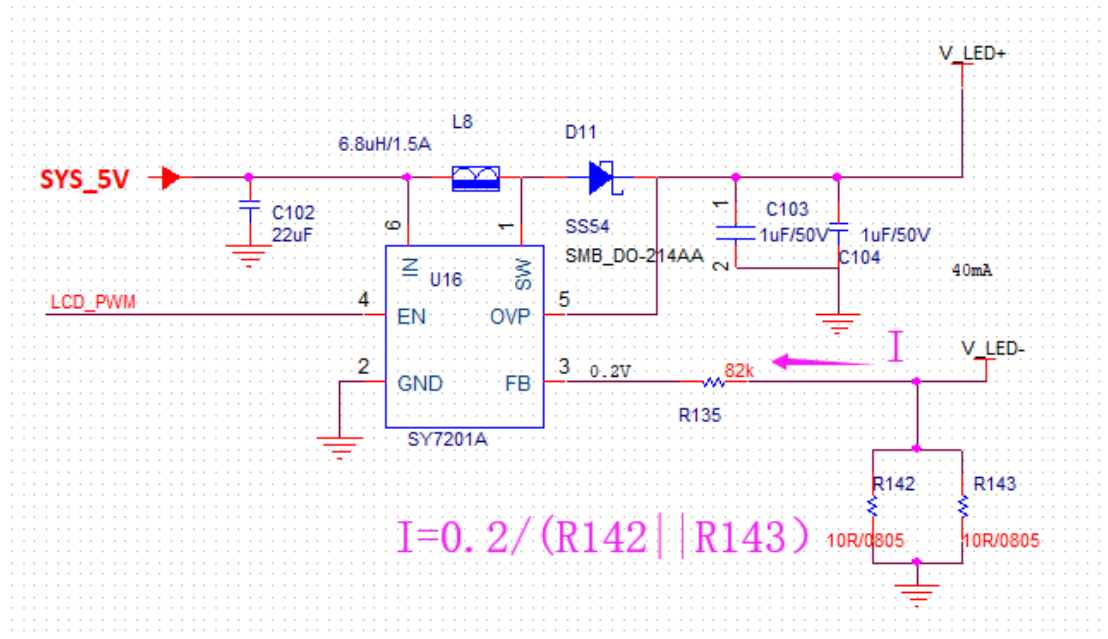
According to the above calculation formula (above), the backlight current of different screens can be adjusted by adjusting the R142 and R143 resistors.

3.11 LVDS screen interface and LVDS backlight interface

LVDS signal interface connector is 2×10 Pin horn socket，2.0mm pitch， pins are shown below. Use a 14 to 24 AWG cable and wire as described below.
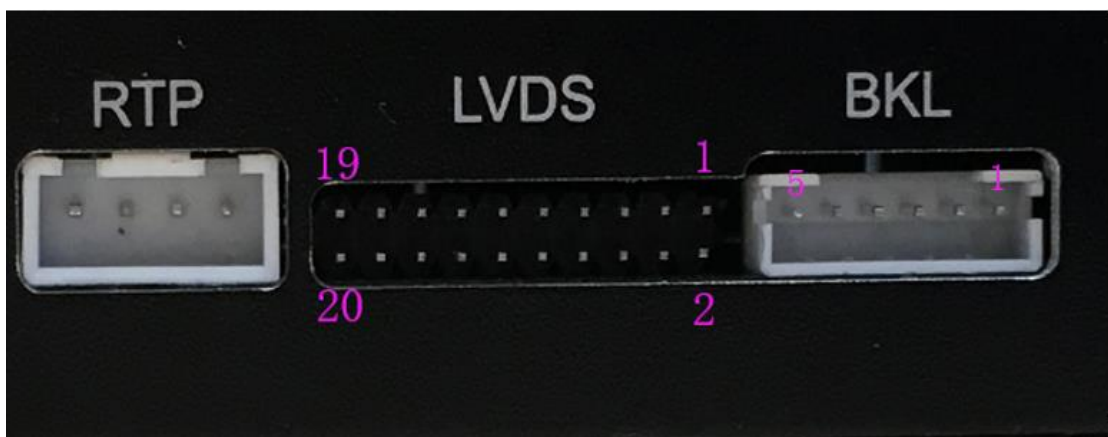

Figure 11. LVDS interface pin num

LVDS signal interface table

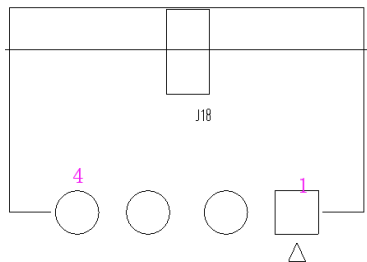| Pin num	Pin definition	Description
Pin1-Pin3	LVDS_PWR	LVDS screen power（3.3V,5V can be selected by jumper）
Pin4	-	None connection
Pin5-Pin6	GND	Power ground
Pin7-Pin8	LVDS0_TX0_N ~ LVDS0_TX0_P	LVDS0_TX0 negative, positive signal pair
Pin9-Pin10	LVDS0_TX1_N ~ LVDS0_TX1_P	LVDS0_TX1 negative, positive signal pair
Pin11-Pin12	LVDS0_TX2_N ~ LVDS0_TX2_P	LVDS0_TX2 negative, positive signal pair
Pin13-Pin14	GND	Power ground
Pin15-Pin16	LVDS0_CLK_N ~ LVDS0_CLK_P	LVDS0 clock negative, positive signal pair
Pin17-Pin18	-	None connection
Pin19	-/V_LED-	None connection（default）/LED backlight negative power supply（optional）
Pin20	-/V_LED+	None connection（default）/LED backlight positive power supply（optional）

3.12 LVDS screen backlight interface

LVDS backlight interface connector is a plug-in 1×6 Pin PH socket, 2.0mm pitch， pin defined as follow:
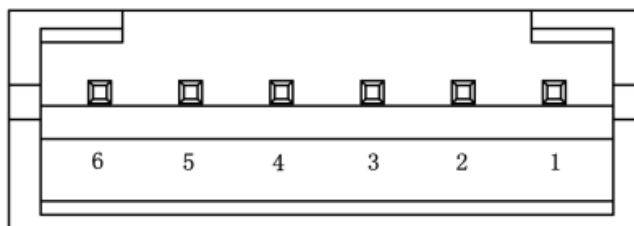
Pin num	Pin definition	Description
Pin1-Pin2	LCD_VCC_BL	LVDS screen backlight voltage, 5V,12V can be selected by jumper . If choose 12V ， DC power need supply 12V input.
Pin3	LCD_EN	Backlight enable output, 3.3V,5V can be selected by jumper .

Pin4	LCD_PWM	Backlight adjustment control signal, 3.3V,5V can be selected by jumper .
Pin5-Pin6	GND	Power ground

3.13 RTP（Resistive Touch Panel）interface

Pin num	Pin definition	Description
Pin1	XR	RTP X direction right side sampling signal.
Pin2	YB	RTP Y direction lower side sampling signal
Pin3	XL	RTP X direction left side sampling signal
Pin4	YT	RTP Y direction upper side sampling signal

3.14 SIM card holder

The SIM card holder is located on the back of the board. Under the TF card slot, the card slot can be took out when the yellow spring-twist is pressed. The card slot is suitable for the SIM card with the standard size, as follows:

Figure 12. SIM card diagram

If you want to adapt to the Micro SIM card or Nano SIM card, you need to adapt the

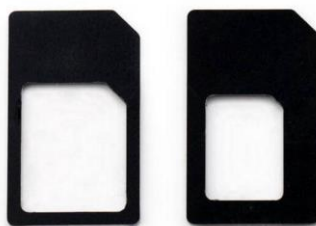appropriate card sleeve as follows:

Figure 13. Card sleeve diagram

SIM card installation direction as shown below, insert the card holder。

Figure 14. SIM card placement diagram

3.15　4G antenna

　　EDK adopts SMA external screw inner hole antenna socket, adapts the inner screw inner pin 4G antenna. It is usually a sucker antenna.

　　By default, only the main set antenna needs to be connected.

3.16　HP headphone

　　Headphone header adapts OMTP standard (national standard) 4 sections 3.5mm headphone connector（CTIA standard headphone optional）. OMTP standard headphone connector defined as follow：

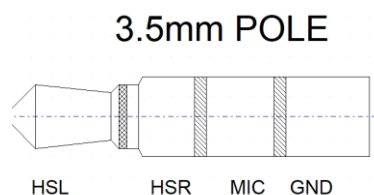### 3.5mm POLE

HSL　　HSR　　MIC　GND

Figure 15. 3.5mm headphone definition

3.17 Speaker interface

EDK is connected to the two-channel speaker interface through the PH 2mm 4P connector (J5), 8 ohm 1W speakers per channel. The speaker interface pins are defined as follow：
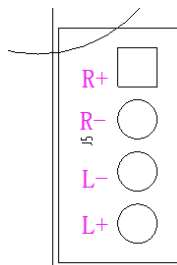

Figure 16. Speaker interface pin definition diagram

Table 7. Speaker pin definition:

Pin num	Pin definition	Description
1	SPK_R+	Right channel speaker drive output
2	SPK_R-	
3	SPK_L-	Left channel speaker drive output
4	SPK_L+	

3.18 LED indicator light
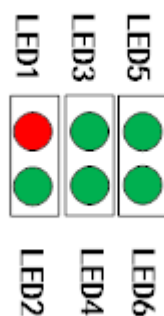
Figure 17. LED indicator light diagram

Table 8. LED indicator light definition

LED num	LED definition	Description
LED1	PWR	Power light
LED2	SYSTEM	System status light, frequency indicates current CPU load
LED3	4G Status	4G status light： Slow flicker (200ms high / 1800ms low)

		searching network; Slow flicker (1800ms high/ 200ms low) standby status; Fast flicker (125ms high / 125ms low) data transfer mode; High-level, Calling status
LED4	4G Mode	High level, register LTE Network status Low level, others
LED5	S1	User light 1, customize
LED6	S2	User light 2 ,customize

3.19   Debug UART

Support 2 debug uart:

➢ UART1（TTL Level），J13 lead out UART1 TX，RX and GND.
➢ UART1 to USB，UART1 to USB transfer chip is loaded on board，can be connected directly to the PC USB port through the J30 Micro USB interface . Windows system can be recognized as a serial device without driver.

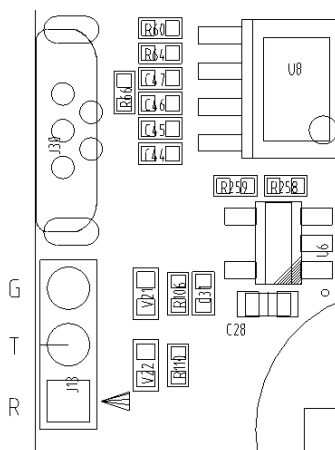Use such as minicom, putty tools，developer can login the Linux console.

Figure 18. A part of PCB of J30 and J13 debug interface

J13 is a PH-3A （2mm pitch）needle header，definition of the 3 pins as follow：

Pin num	Pin definition	Description
1	UART1_RXD	Connect i.MX6ULL pin directly，3.3V level
2	UART1_TXD	Connect i.MX6ULL pin directly，3.3V level
3	GND	

4. Software development description

4.1 System and compile tool

system：Ubuntu16.04.5 LTS 64bit
tool：arm-linux-gnueabihf-*

4.2 debug uart

UART1：J13 (TTL) or J30（USB)
Baud rate：115200,n,8,1

4.3 RS232

UART2:/dev/ttymxc1
UART3:/dev/ttymxc2

4.4 RS485

RS485 use automatically control sending and receiving，baud rate up to 115200.
RS485_1: /dev/ttymxc3
RS485_2: /dev/ttymxc4

4.5 CAN

```
ip link set can0 type can bitrate 125000 triple-sampling on
ifconfig can0 up
```
Generating network nodes：can0
send：
```
    cansend can0 5A1#1122334455667788
```
receive：
```
    candump can0
```
Application development can refer to canutils

4.8 LED

Device node：/dev/led1，/dev/led2
write："ON":LED on

"OFF":LED off

4.9 Audio test

Configuring the sound card device with amixer before playing the audio file：

amixer cset numid=47,iface=MIXER,name='Left Output Mixer PCM Playback Switch' 1

amixer cset numid=44,iface=MIXER,name='Right Output Mixer PCM Playback Switch' 1

amixer cset numid=13,iface=MIXER,name='Speaker Playback Volume' 127,127

amixer cset numid=11,iface=MIXER,name='Headphone Playback Volume' 127,127

volume adjustment， like：

amixer cset numid=10,iface=MIXER,name='Playback Volume' 210

max volume 255， min volume 0.

Play mp3 file， like：

mplayer -ao alsa /opt/1.mp3

play： aplay /usr/local/share/sounds/Side_Left.wav

Note: Mono files only have sound on the left speaker, stereo files have sound on both channels.

Record option：

First configure the sound card with amixer tool：

amixer cset numid=26,iface=MIXER,name='ALC Function' 3

amixer cset numid=51,iface=MIXER,name='Left Input Mixer Boost Switch' 1

amixer cset numid=36,iface=MIXER,name='ADC PCM Capture Volume' 230

Set record volume， like：

amixer cset numid=1,iface=MIXER,name='Capture Volume'60

Record to wav file， like：

arecord -D hw:0 -f S16_LE temp.wav -d 5

note: the parameter behind the -d express the time(s) to record.）